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for Future Generations

# ELC 2500

Installation manual for ELC range
linear electric actuators

CE

## Contents

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

CAUTION / NOTE / WARNING
as indicated in the manual.

## 1.1 Proper use

ELC 2500 linear actuators are controlled by three-point control or constant control methods. 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.

## 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 2500.

## 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, air conditioning 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.

## 2. Product specification

The linear actuators control a stepper motor using a micro controller. The stepper motor's rotational movement is converted into a linear movement via planetary gears and a threaded spindle with a spindle nut.

### 2.1 Component parts

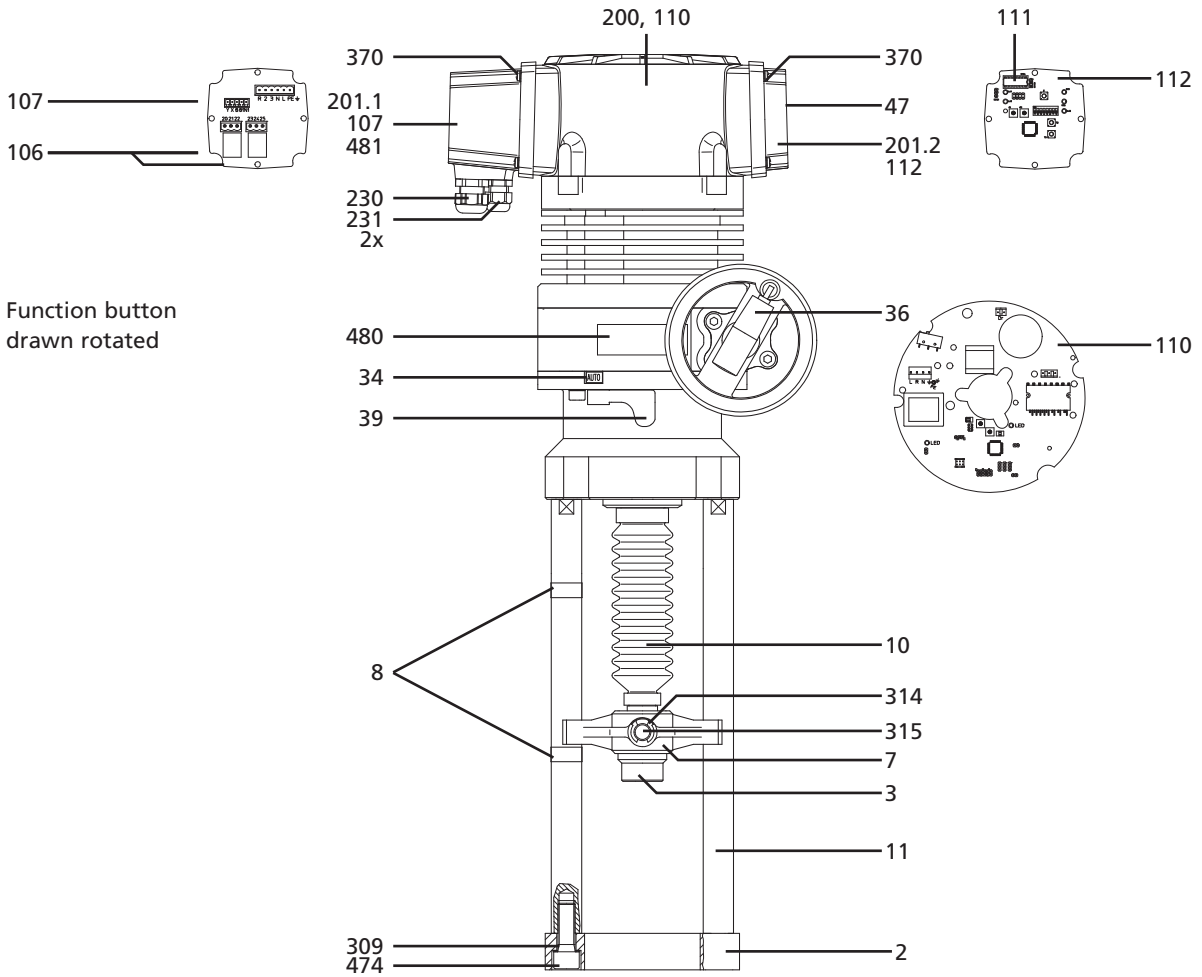


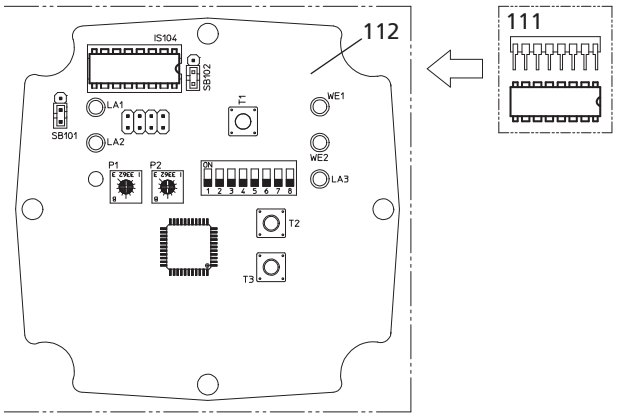

*Fig 2.1 Component part denominations*

| ITEM | DESCRIPTION |
|---|---|
| 2 | Traverse |
| 3 | Coupling piece* |
| 7 | Spin-lock |
| 8 | Position indicator* |
| 10 | Bellow |
| 11 | Distance sleeve |
| 34 | Knob |
| 36 | Handwheel |
| 39 | Hand lever |
| 47 | Viewing panel |
| 106 | PCB with 2 travel switches* |
| 107 | PCB |
| 110 | Main PCB |
| 111 | Converter IC (IS104) for the current output* X = 0/4 to 20 mA |

| ITEM | DESCRIPTION |
|---|---|
| 112 | Control PCB |
| 200 | Function head |
| 201.1 | Cover for Clamp-PCB* |
| 201.2 | Control PCB* |
| 230 | Cable lead in M20 × 1,5* |
| 231 | Cable lead-in M12 × 1.5* |
| 309 | Safety disk S14* |
| 314 | Blank* |
| 315 | Bolt* |
| 370 | Screw M4 x 25 |
| 474 | Hexagon socket head cap screw M14* |
| 480 | Type plate |
| 481 | Wiring diagram on cover 201.1 |

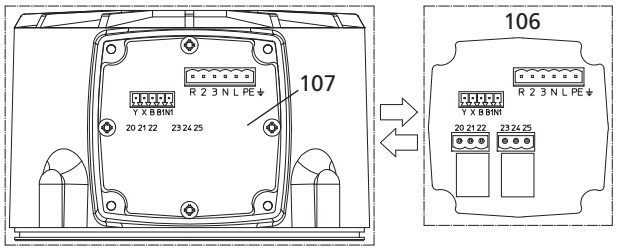
* This component part is available as a spare part.

## 2.2 Accessories




111 IC converter for power output 112 Control PCB

*Fig 2.2 Converter IC (111) for current output signal on the control board (112)*




107 Clamp-PCB 106 Clamp-PCB with 2 limit switches

*Fig 2.3 Clamp with 2 position switch-PCB (107) under the cover (201.1)*

## 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. The built-in drive positioner compares the predetermined desired position (Y) with the actual position of the driving spindle (X). The driving spindle is moved until its position to the target value (y).

The output-signal X is the current position of the spindle.

In continuous mode, when a driving command is carried out, the green and orange LED light up continuously. The actuator is indicated by a flashing green LED light.

**Input signal (Y)**

The analogue input signal (Y) of the system control specifies the desired position for the linear actuator. It is applied in the form of an analogue signal to terminal Y.

Possible analogue input signals:

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

**Output signal (X)**

The analogue output signal (X) determines the actual position of the linear actuator.

It is applied to terminal X in the form of an analogue signal.

0% to 100% valve lift is output as:

- 0 to 10 V / 2 to 10 V
- 0 to 20 mA or 4 to 20 mA (accessories IC converter for current output (111) on terminal X)

### 2.3.2 Three-point mode

The direction of rotation is set via control-voltage at terminal 2 and terminal 3:

- When the control voltage is applied to terminal 2, the spindle nut will be extended
- When the control voltage is applied to terminal 3, the spindle nut will be retracted
- In the three-point mode, the green LED lights up permanently. If a move command is carried out, the green LED flashes

### 2.3.3 Local control

Local control mode allows the operator to adjust the actuator “locally”. The direct adjustment on the actuator is possible. Except for the "MAN“-mode (manual adjustment), the local control mode has priority over all other operating modes. The operating mode local control is indicated by alternately flashing the green and the orange LED.

Button 3 (T3) = actuator spindle retracts

Button 2 (T2) = actuator spindle extends

The function of the limit switch and the X signal is maintained.

Simultaneous pressing of the buttons T2 and T3 changes control to normal operation (alternately flashing of the green and the orange LED ends).

## 2.4 Functions

### 2.4.1 Binary signal

Terminals B and B1 at screw terminal (SK1) are bridged when it not in use. If the connection between B and B1 interrupted, the actuator stem moves into the end position which was selected by DIL switch 5.

All other control signals will be ignored during this process.

The linear actuator will remain in limit position until the electric circuit between B1 and B2 has closed.

The operating mode "binary mode" (interruption of low impedance connection between B and B1) is indicated by flashing of green and orange LED in unison.

*See Section 4.5.1, Screw plug-in terminals.*

If the connection between B and B1 is restored, the actuator resumes following the controlling signals at terminals 2,3 (TP) or Y.

### 2.4.2 Wire-break detection

Wire break detection is only available for continuous mode with an input signal 2 to 10 VDC and 4 to 20 mA.

If the input signal drops below 1 V / 2 mA the actuator stem remains in it's current position. The wire-break is indicated by the red LED flashing.

An increase of the input signal to above 1 V or 2 mA causes a return to the continuous operation mode. If there is a binary signal while the actuator is in wirebreak operating mode, the binary signal has priority. The wire break is still indicated.

During a wire-break, the actuator stem can be moved by hand.

### 2.4.3 Actuating time

The time required for the spindle nut to travel a defined distance is called actuating time. Actuating time is specified in s/mm.

### 2.4.4 Hysteresis

Hysteresis equals the difference of the input signal (Y) that is required after a reversal of signal direction in order to move the spindle nut.

It serves to prevent permanent oscillation of the actuator motor around a certain hoisting position during minor input signal alterations.

*See Section 5.3, Setting the hysteresis.*

### 2.4.5 Manual mode and response signal

In manual mode it is possible to change the lift without supply voltage being applied.

- Motor and control electronics are turned off in manual mode to make hoisting movements of the control impossible. Manual mode is activated by hand lever (39)
- When you set the linear actuator to manual mode the control switches a signal to terminal R, provided supply voltage is applied

*See Section 4.5.1, Screw plug-in terminals.*

**⚠ NOTE**

**The feedback voltage at terminal "R" has the power supply potential of the conductor L!**

### 2.4.6 Potential-free limit switch (accessory)

The optional limit switch PCB (106) allows you to set up separate relays in relation to the stroke. The adjustment of the switching point can be done with the potentiometers P1 and P2 (105) located on the control-PCB (112). The switching status of the limit switch relay (106) is indicated by the yellow-coloured LED's (1 resp. 2).

## 2.5 Technical data

| Type | ELC 2500 |
|---|---|
| **Supply Voltage** | 230 V +6% -10%<br>Control mode for a short time ≤ 500 VA |
| **Input** | Motor without load ≤ 25 VA<br>standby power≤ 10 VA |
| **Weight (with "standard" mounting kit)** | ~24 kg |
| **Dimensions** | See technical data sheets |
| **Stroke** | 100 mm |
| **Frequency** | 50 Hz ±10 Hz |
| **Ambient temperature** | -10 °C to +60 °C |
| **Operating mode** | S3 50% ED |
| **Enclosure protection** | IP65 |
| **Actuating time** | 0.5 s/mm |
| **Actuating force** | 25 kN |

*Table 1 Technical specifications*

| | |
|---|---|
| **Input signal Y / Resistance of load** | • 0 to 10 V / 77 kΩ<br>• 2 to 10 V / 77 kΩ<br>• 0 to 20 mA / 510 Ω<br>• 4 to 20 mA / 510 Ω |
| **Output X / Load rating** | • 0 to 10 V / burden ≥ 1200 Ω, Imax. 8 mA<br>• 0 to 20 mA / burden ≤ 500 Ω - converter IC with accessories for power<br>• output (111)<br>• 4 to 20 mA / burden ≤ 500 Ω - converter IC with accessories for power<br>• output (111) |
| **Response signal R / load rating** | • 230 VAC / $I_{max}$. 1 A |
| **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.*

**ELC2500-1000-0**

F.-Nr.: 07204142/01/0607

| | | |
|---|---|---|
| AC 50 Hz 230 V | max. 500 VA | 25 kN |
| Y=0 to 10 V | IP 65 | 0.5 s/mm |
| X=0 to 10 V | S3 50% ED | Hub 100 mm |

*Fig 2.4 Example of type plate*

## 3. Transportation and storage

⚠ **CAUTION**

**Non-compliance with safety regulations may result in injury!**

- **WEAR THE REQUIRED PERSONAL PROTECTION 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:

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

2 *See Section 4.4, Assembling/disassembling the cover.*

3 *See Section 4.5, Electrical connection.*

### 4.1 Checking the scope of delivery

1 Checking the scope of delivery.

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 valve causes damage!**

**If you operate the linear actuator without its valve, the spindle nut may fall off due to the missing stop.**

- **ALWAYS OPERATE THE LINEAR ACTUATOR WITH A VALVE ATTACHED.**

1 Allow for about 200 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 valve.

4 Determine the assembly position of the linear actuator. Do not arrange linear actuators in a hanging position. If the drive is installed horizontally, it may have to be supported on site.

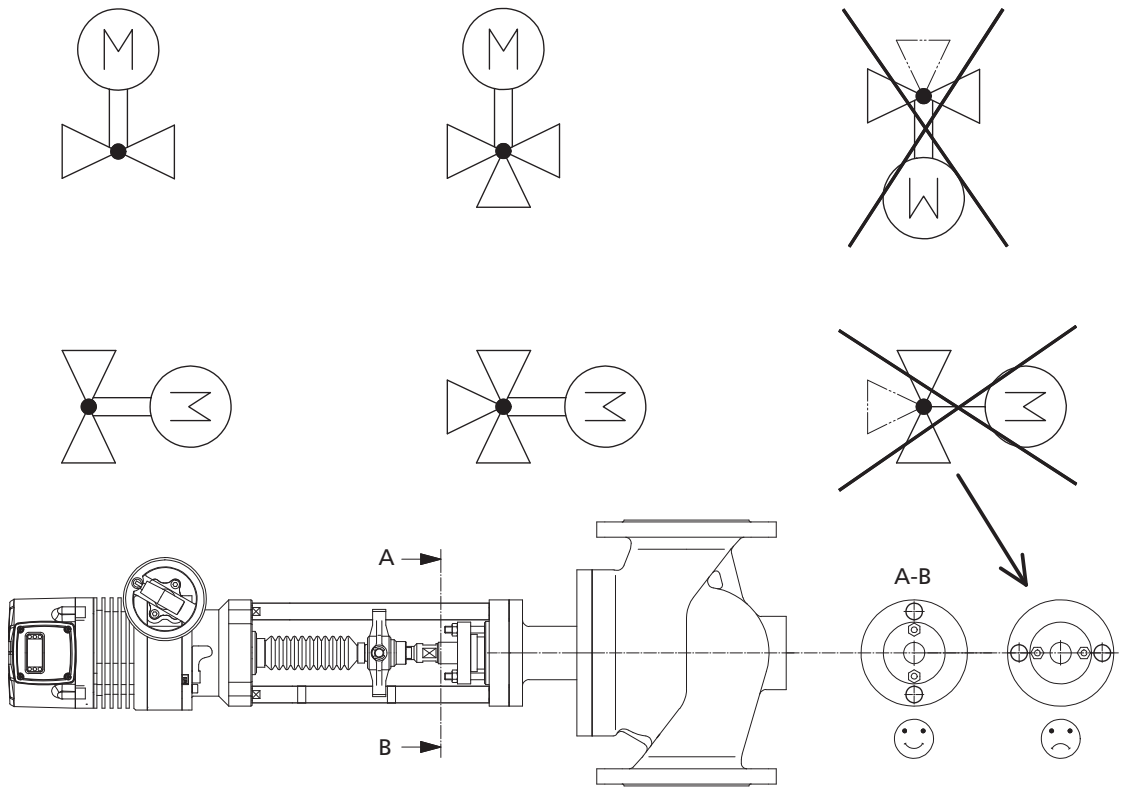



*Fig 4.5 Assembly positions of linear actuator and valve*

## 4.3 Mounting the linear actuator on the valve

If the linear actuator and the valve are supplied separately, the linear actuator must be mounted onto the valve.

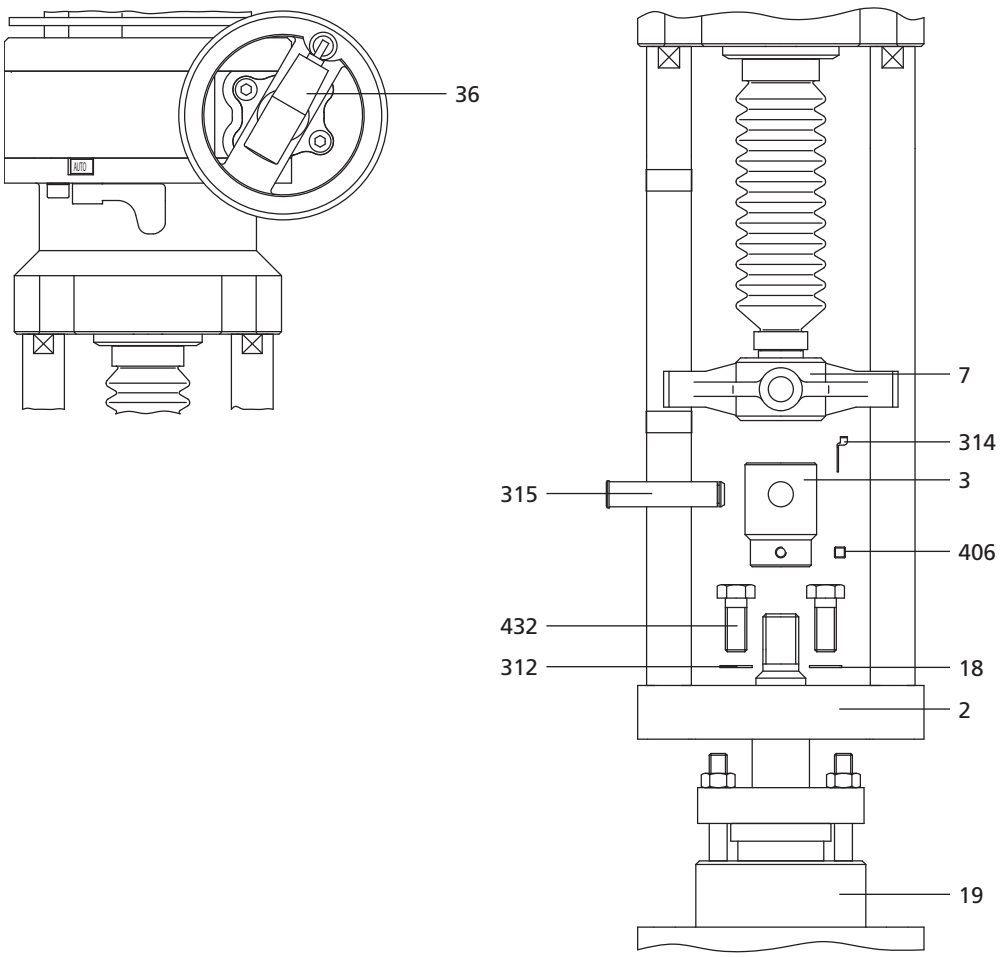



*Fig 4.6 Mounting the linear actuator on the valve*

| ITEM | DESCRIPTION |
|---|---|
| 2 | Traverse |
| 3 | Coupling piece |
| 7 | Spin lock |
| 18 | Valve spindle |
| 19 | Valve neck |
| 36 | Handwheel |

| ITEM | DESCRIPTION |
|---|---|
| 312 | Lock washers |
| 314 | Blank |
| 315 | Bolt |
| 406 | Grub screw M6 |
| 432 | Hexagon screws M12 |

**How to mount the linear actuator**

1 Pull off the blank (314).

*See Section diagram (6).*

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

3 Turn the coupling piece (3) onto the valve spindle (18).

4 Put the traverse (2) on the valve neck (19).

5 Fix the traverse (2) using the screws (432) (wrench size 19) and blanking plate (312) on the valve neck (19).

6 Insert the spin lock (7) on the coupling piece (3).

7 Hold the actuator spindle against rotation and adjust them by handwheel (36) in height so until the holes for the bolts (315) in spin lock (7) and actuator spindle are aligned.

8 Mount the bolts (315).

9 Insert the blank (314).

10 Tighten the hexagon screw (406) (hex key size 3) into the coupling piece (3) firmly.

**How to disassemble the linear actuator**

1 Perform the steps in the reverse order of assembly.

## 4.4 Assembling/disassembling the cover

The terminals for the electrical connection are under the cover (201.1). The coding (201.2) are under the cover (116).

**⚠ WARNING**

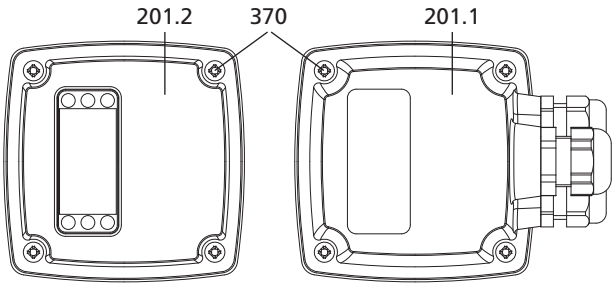
**Risk of injury from electric shock by live parts!**

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 Loosen the screws (370) (Torx® T20) on the cover.




370 Screws

201.1 Cover for clamping plate
201.2 Cover for control board

*Fig 4.7 Removing the cover*

2 Remove the cover (201.1 / 201.2) carefully.

**⚠ NOTE**

**Damage cables result in damage to the device!**

When removing or replacing the cover, you may tear off or damage the cabling inside the cover.

- Remove the cover carefully and put it on gently.

3 Pull the screw clamp terminals (106) on the determined connectors.

*See Section 4.5.1, Screw plug-in terminals.*

**To put the cover on**

1 Insert the previously stripped screw clamp terminals (106) in the corresponding connector of the terminal board (107).

2 Pay attention to the notch on the plug and socket!

3 Put the cover (201.1 / 201.2) and tighten the screws (370) (Torx T20) evenly to strong.

Pay attention to the correct position of the cable glands and the viewing window.

Pay attention to the correct fit of the grooved rubber seal in the cover.

*See Section 4.5.1, Screw plug-in terminals.*

### 4.4.1 Function head disassemble / assemble

**⚠ WARNING**

**Risk of injury by electric shock.**

- Disconnect the device from the mains.
- Unplug.
- Wait 10 minutes until the capacitor is discharged.
- Secure against unauthorised switching.
- Remove the function head (200) temporarily.

**To remove a function header**

1 Loosen the screws (465) (hex key size 4) the function head (200). Ensure that the disks (305) are not lost.

2 Raise the functional head (200) carefully, if necessary pry off carefully with a screwdriver or similar.

3 Pull the plug (3, 4, 5, 7, 9) on the motherboard (110) and the control board (112).

*See Fig 4.11, Plug / Harness assignment.*

4 Remove the function head (200) carefully in direction of the arrow.

**⚠ NOTE**

**Be careful to not damage inner parts. Mark the position of the function head.**

**To reset the function head**

1 Raise the functional head (200) above the components and decrease it in the retained position.

**⚠ NOTE**

**Pay attention to the correct seat of the O-ring in the groove. The O-ring must not be damaged.**

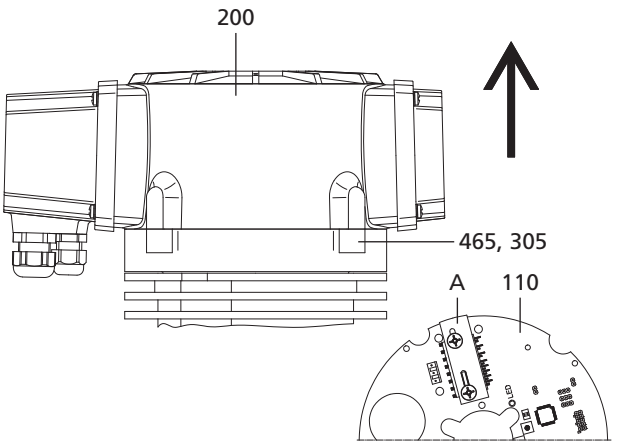
2 Insert the plug (3, 4, 5, 7, 9) back onto the motherboard (110) and the control board (112).

*See Fig 4.11, Plug / Harness assignment.*

3 When installing the heat sink (A) on the main board ensure that the wall of the function head (200) is engaged (in the direction of centre of the board). Then the function head (200) can be placed.

4 Insert the discs (305) on the screws (465) and tighten the screws (465) (hex key size 4).

5 Check that the function head (200) fits properly, ensuring the correct tightness.




110 Motherboard
200 Function head
305 Lock washer
465 Screw

*Fig 4.8 Detaching the function head*

## 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 place 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 of the supply voltage with a power transformer cannot be met, the usage of a AC voltage stabiliser is needed.

*See Section 2.5, Technical data.*

**How to establish electrical connection**

1 Remove the cover (201.1).

*See How to remove the cover.*

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

3 Connect the electrics in accordance with circuit diagram.

*See Fig 4.9.*

The circuit diagram (481) is also printed in the cover (201.1).

**⚠ 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, Legend to wiring diagram on page 15.*

4 Tighten the cable glands.

5 Put on the cover (201.1).

*See To put the cover on.*

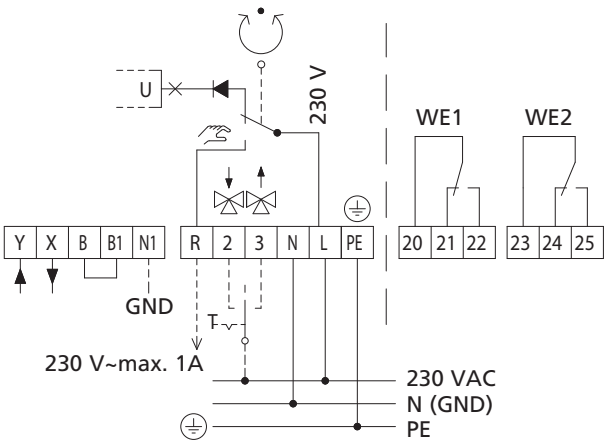
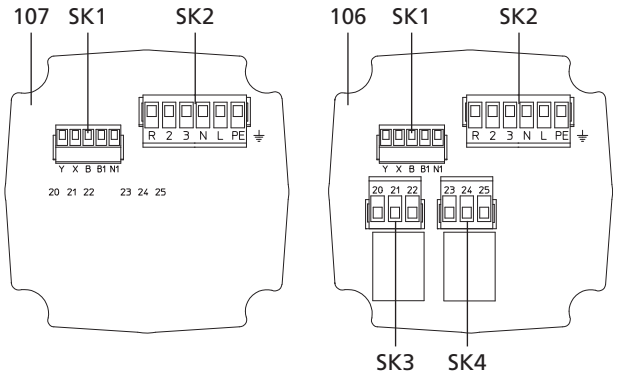



*Fig 4.9 Circuit diagram*

| Terminal | Description |
|---|---|
| **L** | Supply voltage |
| **N** | Neutral |
| **2** | Control voltage for downward movement during three-point mode |
| **3** | Control voltage for upward movement during three-point mode |
| **R** | Feedback voltage in "Manual mode"<br>• R= 230 V max. 1 A |
| **B, B1** | Binary-input / frost protection function |
| **N1** | Zero potential of the signals X, Y<br>• If you operate the drive in continuous operation with 230 V, then you have to connect N1.<br>• If you operate the drive in three-point operation with 230 V, then you have to connect N1 if you wish to use additional X. |
| **PE** | Protective conductor |
| **Y** | Modulating control operation |
| **X** | Output steady operation |
| **20, 21, 22** | Terminals limit switch relay WE1 |
| **23, 24, 25** | Terminals limit switch relay WE1 |

*Table 3 Legend to wiring diagram*

### 4.5.1 Screw plug-in terminals




107 Clamp

106 Clamp with 2 travel switches SK1-SK4 Screw plug-in terminals

*Fig 4.10 Screw plug-in terminals*

### 4.5.2 Plug / Harness assignment

| | | |
|---|---|---|
| (1) Motor connection | → | (1) Plugged plug on the motherboard |
| (2) Signal line | → | (2) Plugged plug on the motherboard |
| (3) Position measuring system | → | (3) Plugged plug on the control board |
| (4) Choke in the function header (200) | → | (4) Plugged plug on the motherboard |
| (5) Connecting cable on the clamping plate with 2 limit switches | → | (5) Plugged plug on the motherboard |
| (6) Connecting cable on the clamping plate with 2 limit switches | → | (6) Plugged plug on the control board |
| (7) Line on the control board | → | (7) Plugged plug on the motherboard |
| (8) Line to the clamping plate with 2 limit switches (optional) | → | (8) Plugged plug on the control board |
| (9) Connector plugged into the motherboard (optional) | → | (10) Plugged plug on the motherboard (optional) |

*Table 4 Plug / Harness assignment*

Pay attention to the correct position of the plug.

To disassemble the function head (200) the connector 3, 4, 5, 7,9, have to be deducted.

*See Fig 4.11, Plug / Harness assignment.*

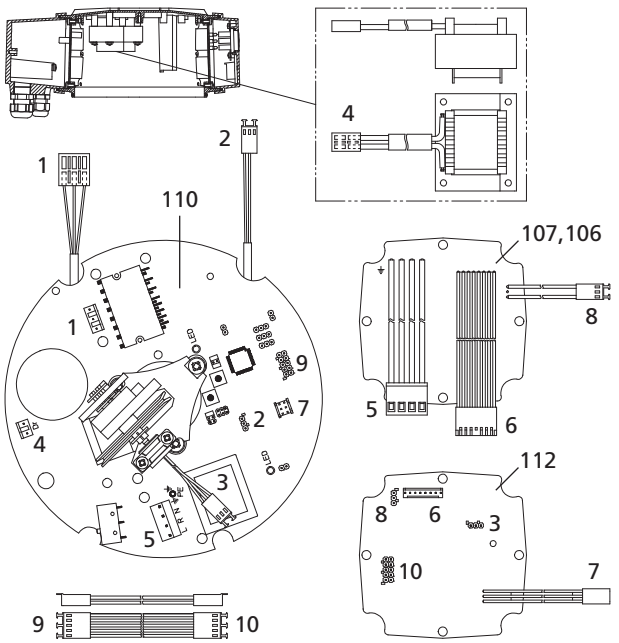



*Fig 4.11 Plug / Harness assignment*

## 4.6 Fitting accessories

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:

- Clamp with 2 limit switches (106)
- Converter IC (IS104) (Integrated Circuit) (111) for current output signal X = 0/4 to 20 mA

*See Section 2.2, Accessories.*

### 4.6.1 Fitting a PCB for a limit 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 Loosen the screws (370) (Torx T20) on the cover.

2 Remove the cover (201.1) carefully. Loosen the screw terminals while (106) on the terminal board (107).

3 Remove the function head (200).

*See Section 4.4.1, Function head disassemble / assemble.*

4 Loosen the screws (369) (Torx T20) on the terminal board. Make sure that the serrated lock washers (307) will not be lost.

5 Remove the terminal board (107) carefully and carry it out the harnesses.

6 Remove the terminal board with 2 limit switches (106) and run the cables down strands in the function head (200) and connect the appropriate plug to the control board.

*See Table 4, Plug / Harness assignment on page 15.*

7 Place the serrated lock washers (307) under the screws (369) (Torx T20) and tighten the screws (369) to the terminal board with 2 travel switches.

8 Place the function head (200).

*See Section 4.4.1, Function head disassemble / assemble.*

9 Replace the cover (201.1) and insert it into the assembly.

*See To put the cover on.*

Screw plug (SK1-SK4 ) back to the terminal board with 2 limit switches (106).

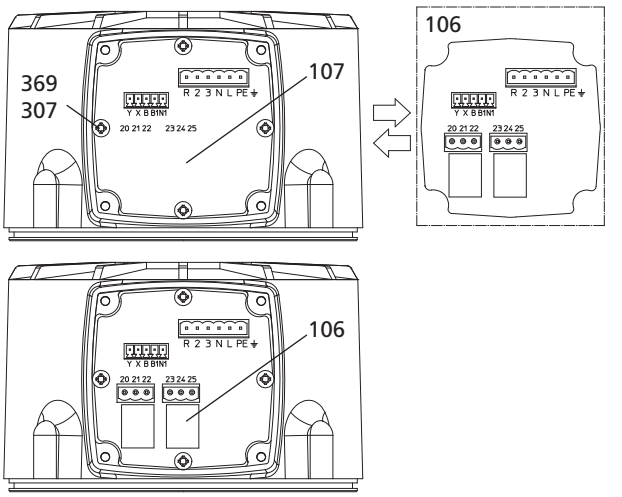
10 Tighten the screws (370) (Torx T20) on the cover (201.1) firmly.

Pay attention to the correct position of the cable glands.

11 Check the proper fit of the lid, so that tightness is guaranteed.

12 Set the limit switch.

*See Section 5.6, Setting a potential-free limit switch.*




107 Clamp
106 Clamp with 2 travel switches
307 Serrated lock washer
369 Screws

*Fig 4.12 Installation of the clamping plate with 2 travel switches under the cover*

### 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

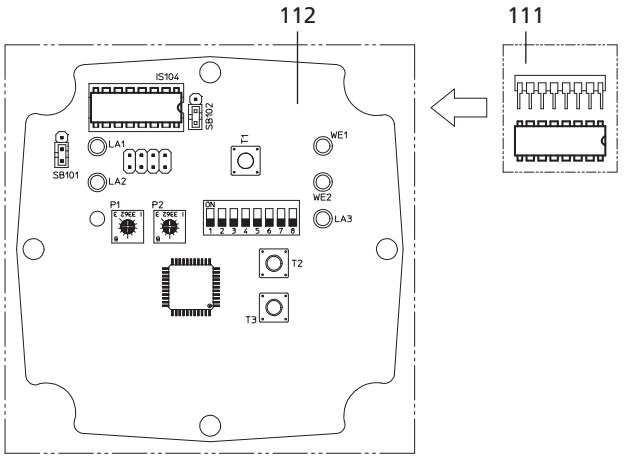
1 Open the cover (201.2).

*See Section 4.4, Assembling/disassembling the cover.*

2 Put the converter IC for the current output signal to the terminal legs into the socket on the control board (112).

3 Pay attention to the correct installation position of the converter IC.

*See Fig 4.13, Converter IC (111) for current output signal on the control board (112).*




111 Converter IC for power output 112 Control board

*Fig 4.13 Converter IC (111) for current output signal on the control board (112)*

4 Select the signal range of the output signal with the jumper (SB 101):

- SB101 up: 0 to 20 mA
- SB101 down: 4 to 20 mA

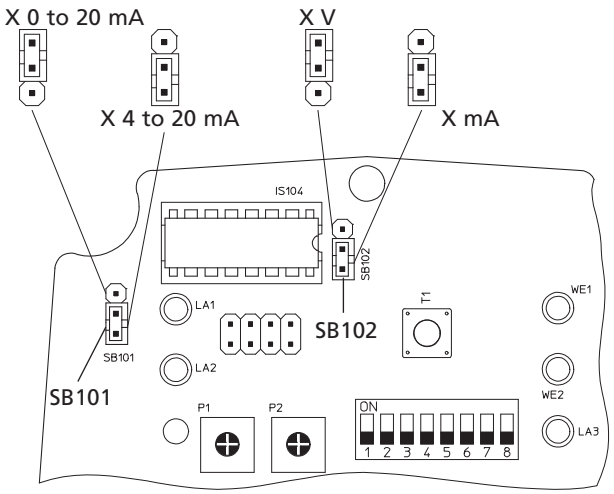



*Fig 4.14 Setting the signal range for mA output signal X*

5 Select the signal range of the output signal with the jumper (SB 102):

- SB102 up: V
- SB102 down: mA

**⚠ 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

During commissioning, the device is in the operation mode continuous operation.

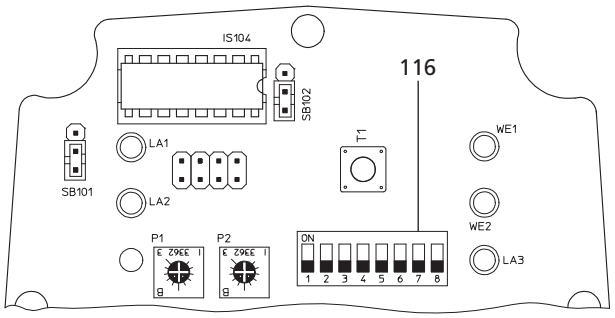
Is applied to a three-point inputs 2 and 3 the control voltage, the drive goes to the three-point operation mode.

After a shutdown of the actuator (by switching on the manual mode or shutdown or power failure), the operating mode remains the same.

The instrument is in principle after each initialization, in the steady operation mode.

With the DIP switches (116) the operating parameters are selected. The Encoding switches are located under the cover (201.2).

*See Section 4.4, Assembling/disassembling the cover.*




116 Encoding switch

*Fig 5.1 Encoding switch*

## 5.1 Operating parameters and encoding switch settings

Prior to commissioning the linear actuator you will have to set the operating parameters on the encoding switches.

**⚠ NOTE**

**Malfunction caused by incorrect switch settings S1**

Switch S1 has to be set to "on" at all times.

- Ensure that switch S1 is set to "on"

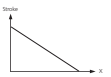
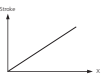
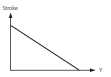
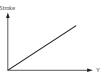
| Switch/ Jumper | On | Off |
|---|---|---|
| **S1** | Ready | - |
| **S2** | X-characteristic line  | X-characteristic line  |
| **S3** | Y-characteristic line  | Y-characteristic line  |
| **S4** | Input (Y) 0 to 10 V DC or 0 to 20 mA | Input (Y) 2 to 10 V DC or. 4 to 20 mA |
| **S5** | Limit position actuator spindle extended | Limit position actuator spindle extended |
| **S6, S7** | With S6 and S7, the hysteresis (0.05 to 0.5 V) is set | |
| **S8** | Input signal (Y) in mA | Input signal (Y) in V |

*Table 5 Positions of encoding switch*

## 5.2 Setting the input signal

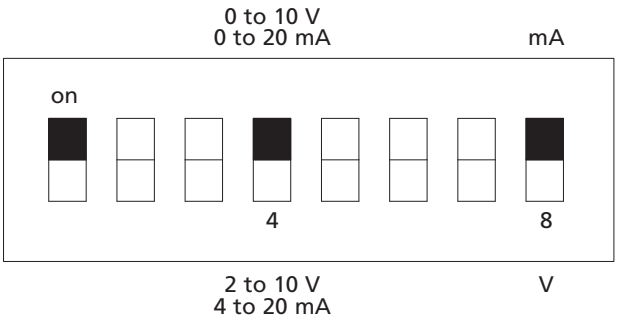



*Fig 5.2 Setting the input signal*

*See Section Input signal (Y).*

## 5.3 Setting the hysteresis

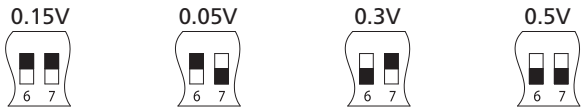



*Fig 5.3 Setting the hysteresis*

*See Section 2.4.4, Hysteresis.*

## 5.4 Setting the actuating direction

You can use the encoding switch (reverse operation) to reverse the actuating direction of the linear actuator.

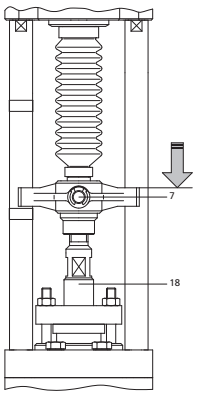
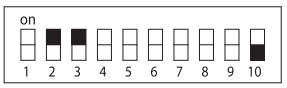
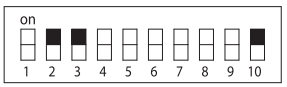
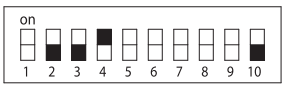
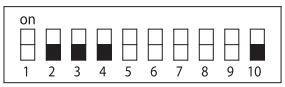
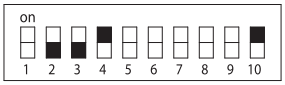
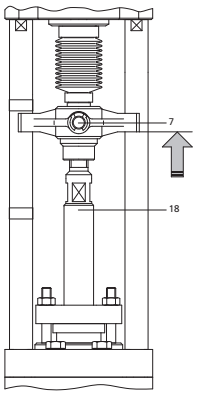
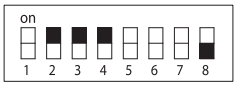
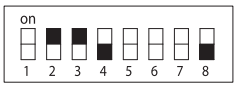
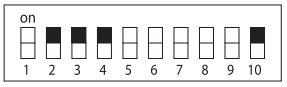
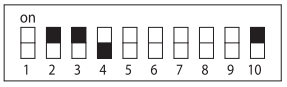
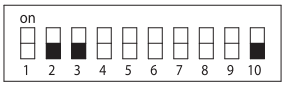
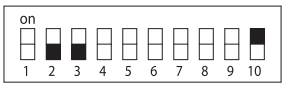
| Drive control | Normal operation | Reverse operation |
|---|---|---|
|  |  Y = 10 V DC<br>  Y = 20 mA |  Y = 0 V DC<br>  Y = 2 V DC<br>  Y = 0 mA<br>  Y = 4 mA |
|  |  Y = 0 V DC<br>  Y = 2 V DC<br>  Y = 0 mA<br>  Y = 4 mA |  Y = 10 V DC<br>  Y = 20 mA |
| **Encoding switch S2: X (output signal), encoding switch S3: Y (input signal)** | | |

*Table 6 Setting the actuating direction*

## 5.5 Setting end position in a binary event

The coding switch S5 selects the final position of the linear actuator when entering a binary event:

- S5 ON: Final position with extended spindle nut
- S5 OFF: Final position with retracted spindle nut

The end position is approached in the following situations:

- In a binary event (circuit between terminals B and B1 is interrupted)

## 5.6 Setting a potential-free limit switch

Trim-pots P1/P2 are used to set the limit switches independently. Try out the sequence of operations for each position switch once.

**To set a limit switch**

1 Ensure that the linear actuator has been commissioned and initialised.

*See Section 5.8, Commissioning.*

*See Section 5.7, Initialising the path measuring system.*

**⚠ NOTE**

**Malfunction caused by imprecisely set limit switches.**

To set the limit switch accurately, set the actuator to automatic mode and not manual mode.

Perform the following steps when power is being supplied.

2 Move the actuator to the required position where the switch event will be triggered. Follow the sequence of operations below with the supply voltage turned on.

**⚠ WARNING**

**Risk of injury from electric shock by live parts.**

If 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 short-circuit

3 Open the cover (201.2).

*See Section 4.4, Assembling/disassembling the cover.*

The control board is under the lid (112).

**Recommendation:**

Adjust the stroke of the actuator using the local control. The position can be checked on the basis of the X signal. Prerequisite: actuator is initialised.

4 Twist the trimmer with a screwdriver until the limit switch engages. The switching status is indicated by the associated LED.

With the potentiometer P1 (105) set limit switch 1.
The LED WE 1 (yellow) indicates the switching status.

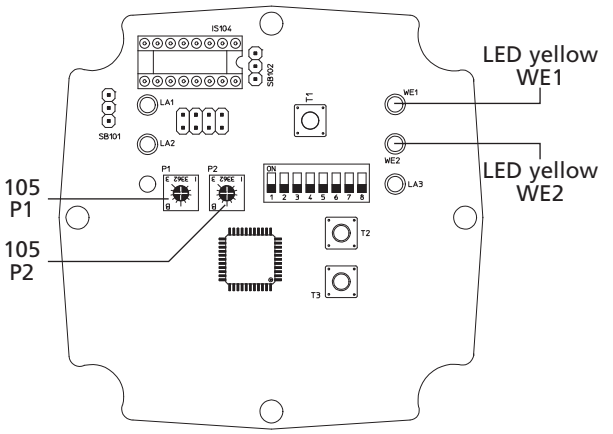
With the potentiometer P2 (105) set limit switch 2.
The LED WE 2 (yellow) indicates the switching status.

Turn the potentiometer clockwise until it stops →
The limit switch is always switched on.

Turn the potentiometer counter-clockwise until it stops →
The limit switch is always off.

In between, any shift position can be selected with the potentiometer.

*See Fig 5.4, Control Board under the cover.*




105 P1 Trim-potentiometers 105 P2 Trim-potentiometers

*Fig 5.4 Control Board under the cover*

5 Comply with the allowable contact load for the path switch:

| | |
|---|---|
| **Nominal load** | 8 A, 250 VAC<br>8 A, 30 VDC |
| **Switch voltage** | max. 400 VAC<br>max. 125 VDC |

*Table 7 Contact load of the path switch*

6 Disconnect the actuator from the supply and connect the path switch contacts.

7 Close the cover (201.2) of the linear actuator.

*See Section To put the cover on.*

## 5.7 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 must 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.

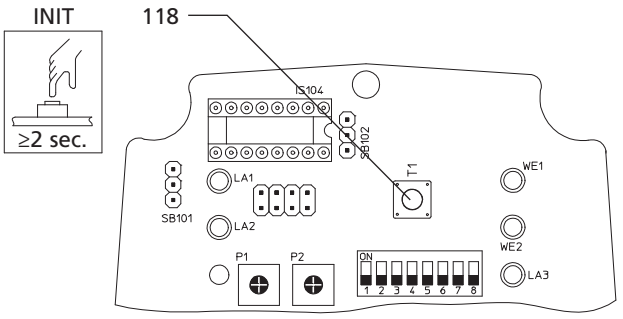
- Take care not to touch any live parts.
- Take care to apply the tool in a way that does not cause short-circuit.

1 Open the cover (201.2).

*See Section 4.4, Assembling/disassembling the cover.*

2 Make sure that the supply voltage is applied.

3 Press the initialisation key (118) and hold it (for about 2 seconds) until the green LED starts flashing (flickering) at high frequency (about $10s^{-1}$).




118 Initialisation button

*Fig 5.5 Initialise position measuring system*

**To install on the terminals**

1 Insert the supply voltage simultaneously to terminals 2 and 3. Make sure that the supply voltage is applied for at least 2 seconds.

*See Fig 4.9.*

The initialization procedure is indicated by the high-frequency (about $10s^{-1}$) flashing (flickering) LED.

During the installation process, the X signal is 0 and the function of the limit switch is inoperative.

After each initialisation, the device is basically in steady operation.

#### 5.7.1 Basic setting of position measuring system

**⚠ NOTE**

**The position measuring system has been calibrated at the factory before delivery. A readjustment is not usually required.**

The following description is for information only to the user.

1 Bring the actuator spindle, with its position measuring system coupled to it, into the maximum or minimum possible position. This can also be detected at the position of the pulley (position the cable crimping sleeve (A) Fig 5.6.

2 Turn off the device and bring the red hand lever (39) from position AUTO into position MAN.

3 Press the button (T3) and hold it down.

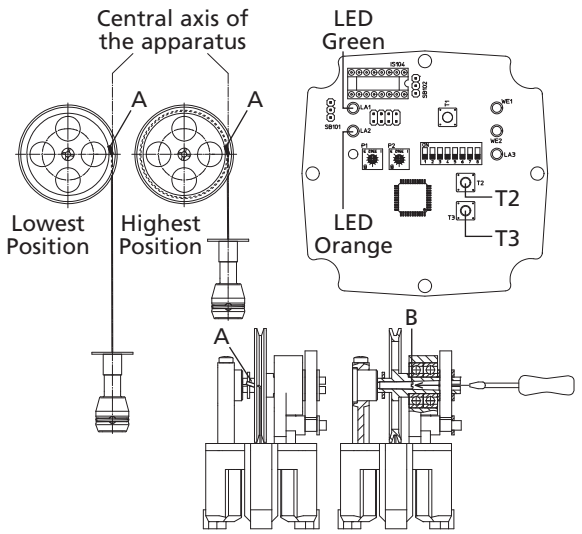
4 Turn on the device by turning the red hand lever (39) to the AUTO position. Then release the button (T3).

5 Insert the screwdriver (2 mm) gently into the hollow shaft of the rotary encoder, the driving leg of the coil spring over it.

6 When you have found the slot (B) of the angle encoder magnet shaft (Fig 5.6), turn until the green LED goes off and the orange LED lights up immediately or vice-versa. Prevent the pulley from turning by holding it firmly. The optimum position is reached when both LEDs light up or flicker at the same time. Avoid higher axial pressure on the handle of the screwdriver to prevent the magnet shaft of the angle encoder from being pushed out of its seat in the hollow shaft of the rope wheel.

7 Press the button (T2) to return to normal operation of the device (green LED and possibly orange LED lit).

- If the device was previously in continuous mode, the orange LED lights up continuously.
- If the device was previously in three-point mode, the orange LED turns off after a short time (about 3 sec.).




T2 Extend button 2 for the spindle
T3 Retract button 3 for the spindle
A Cable crimping sleeve
B Slot

*Fig 5.6 Basic setting of the position measuring system*

## 5.8 Commissioning

1 Check whether all fitting and assembly work has been competently finished.

*See Section 4, Assembly.*

2 Ensure that the electrical actuation of the linear actuator can take place safely without putting people or devices at risk.

3 Ensure that the linear actuator is attached correctly and that the cover of the linear actuator (201.1) is closed.

*See Section 4.4, Assembling/disassembling the cover.*

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

*See Section 6.1, Changing between manual and automatic mode.*

5 Ensure that the operating parameters are set correctly.

*See Section 5.1, Operating parameters and encoding switch settings.*

6 Ensure that the path measuring system is initialised.

*See Section 5.7, Initialising the path measuring system.*

7 The linear actuator is ready for operation.

**⚠ DANGER**

**Do not operate the actuator without fixed stops (e.g. A valve).**

There is a danger of a separation of the distance measuring system and actuator spindle and a destruction of the bellows (particularly with extending the spindle drive).

Before bringing the linear actuator into operation, you need to initialise it, and select the operating mode.

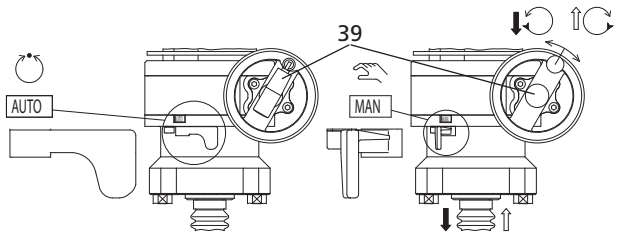
*See Section 5, Commissioning.*

*See Section 5.7, 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).

- 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**
39 Hand lever

*Fig 6.1 Switch to automatic mode*

**How to change-over in manual mode**

Insert the red hand lever (39) into position manual mode (MAN).

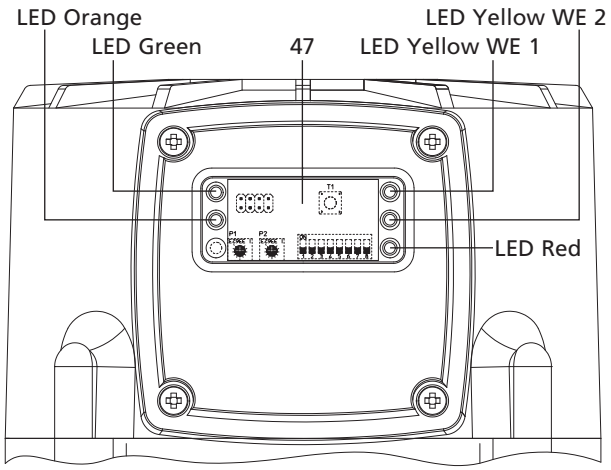
**How to change-over in automatic-mode**

Insert the red lever (39) into position automatic mode (AUTO).

## 6.2 LED display

The LEDs on the viewing panel (47) show the operating status or errors.

*See Section 10.2, Check list for breakdown.*




47 Viewing window

*Fig 6.2 LED display*

| Green LED | Operating status |
|---|---|
| Continuously | **Normal operation, standby**<br>The LED lights up continuously, actuator awaits drive command. |
| 0.3s 0.3s 0.3s 0.3s | **Normal operation**<br>Drive executes operation commands. |
| 0.05s 0.05s 0.05s 0.05s | **Initialisation** |

*Table 8 Display green LED*

| Orange LED | Operating status |
|---|---|
| Continuously | **Continuous operation**<br>The LED lights up continuously |
| Off | **Three-point operation**<br>The LED does not light up |
| 0.3s 0.3s 0.3s 0.3s | **Binary event**<br>The LED blinks with the green LED in unison |

*Table 9 Display orange LED*

| Yellow LEDs | Operating status |
|---|---|
| Continuously | **Limit switch 1**<br>Yellow LED W1 shows the switch condition (relay energised) |
| Continuously | **Limit switch 2**<br>Yellow LED W2 shows the switch condition (relay energised) |

*Table 10 Display yellow LED*

| Red LED | Error |
|---|---|
| 0.3s 0.3s 0.3s 0.3s | **Wire break detection**<br>In the operating modes 2 to 10 V or 4 to 20 mA input signal drops below 1 V or below 2 mA.<br>*See Section 2.4.2, Wire-break detection.* |

*Table 11 Display red LED*

### 6.2.1 Light signals optional

| LED green and orange | Operating status |
|---|---|
| 0.3s 0.3s 0.3s 0.3s | **Local control active**<br>LEDs flash alternately. |
| 0.05s 0.05s 0.05s 0.05s | |

*Table 12 Display green and orange LED*

## 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.**

- Only use original spare parts.

*See Section 2.1, Component parts.*

*See Section 2.2, Accessories.*

## 9. Decommissioning and disposal

Dispose of the linear actuator according to national regulations and laws.

## 10. Removal of faults

After remedying faults you will have to re-initialise the path measuring system.

*See Section 5.7, Initialising the path measuring system.*

### 10.1 How to remedy faults

If the linear actuator does not work properly follow the sequence of operations described below to remedy the fault:

1 Check whether the linear actuator was correctly assembled.

2 Check the settings for the linear actuator against the specifications on the type plate.

3 Remedy the fault by following the check list.

*See Section 10.2, Check list for breakdown.*

4 If you are unable to remedy the fault contact the manufacturer.

5 For all queries at the manufacturer and when sending back the device please quote the following:

- SN (serial number = order number)
- Type denomination
- Supply voltage and frequency
- Accessory equipment
- Error report

6 If you are unable to remedy the fault despite inquiry you can send the device to the manufacturer.

## 10.2 Check list for breakdown

| Fault | Cause/reason | Remedy |
|---|---|---|
| **1. Linear actuator is not working.** | Handwheel (39) is in manual mode position. | Turn the handwheel (39) to automatic mode position. |
| | Power cut. | Determine the cause and remedy. |
| | Fuse defective (in control cabinet). | Determine the cause and remedy, replace fuse. |
| | Linear actuator incorrectly connected. | Set the connection correctly according to the wiring diagram (on cover). |
| | Short circuit due to humidity. | Determine the cause, dry the linear actuator; replace the cover seal or screw joints and/or attach protective cover, as required. |
| | Short circuit due to incorrect connection. | Correct the setting for connection. |
| | Motor has winding damage (burnt-out)<br>• e.g. voltage too high<br>• Electronic system defective | Determine cause, measure current data, Compare to type plate and table, Disassemble linear actuator and send it in for repairs. |
| **2. Linear actuator running unsteadily, i.e. veering between clockwise and anti-clockwise rotation.** | Drop of voltage due to excessively long connecting cables and / or insufficient diameter. | Measure the current data; if required, recalculate and replace the connecting cables. |
| | Public power supply fluctuations greater than admissible tolerance. *See Section 2.5, Technical data.* | Improve public power supply conditions. |
| **3. Linear actuator pauses intermittently or initialises frequently.** | Slack contact in feeder line. | Check and tighten the connections (terminal strips). |
| **4. Linear actuator does not move to limit position. Valve does not open/ close.** | Valve is stuck. | Provide a smooth-running valve. |
| | Excessive system pressure. | Adjust the system pressure. |
| **5. Linear actuator does not move at all or not correctly to the position preset by input signal Y.** | Input signal Y is faulty:<br>• Interfering signals<br>• Signal variations | Check input signal Y on linear actuator, remove the cause of fault. |
| | Main PCB defective. | Replace the main PCB or disassemble the linear actuator and send it in for repair. |
| **6. Green LED is flashing in short/short rhythm.** | Blockage detection was triggered. | Press INIT and observe actuator during initialisation. |
| | | Check valve for smooth-running along entire traverse range. |

*Table 13 Check list breakdown*

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