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for Future Generations

ELC 55
ELC 55Y

Installation manual for ELC range
linear electric actuators

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 55/24, ELC 55/230, ELC 55Y 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 55/24, ELC 55/230, ELC 55Y.

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 actuators control a stepper motor by means of a micro controller. The rotational movement of the stepper motor is converted into a linear movement by spur gears and a threaded spindle with spindle nut.

2.1 Component parts

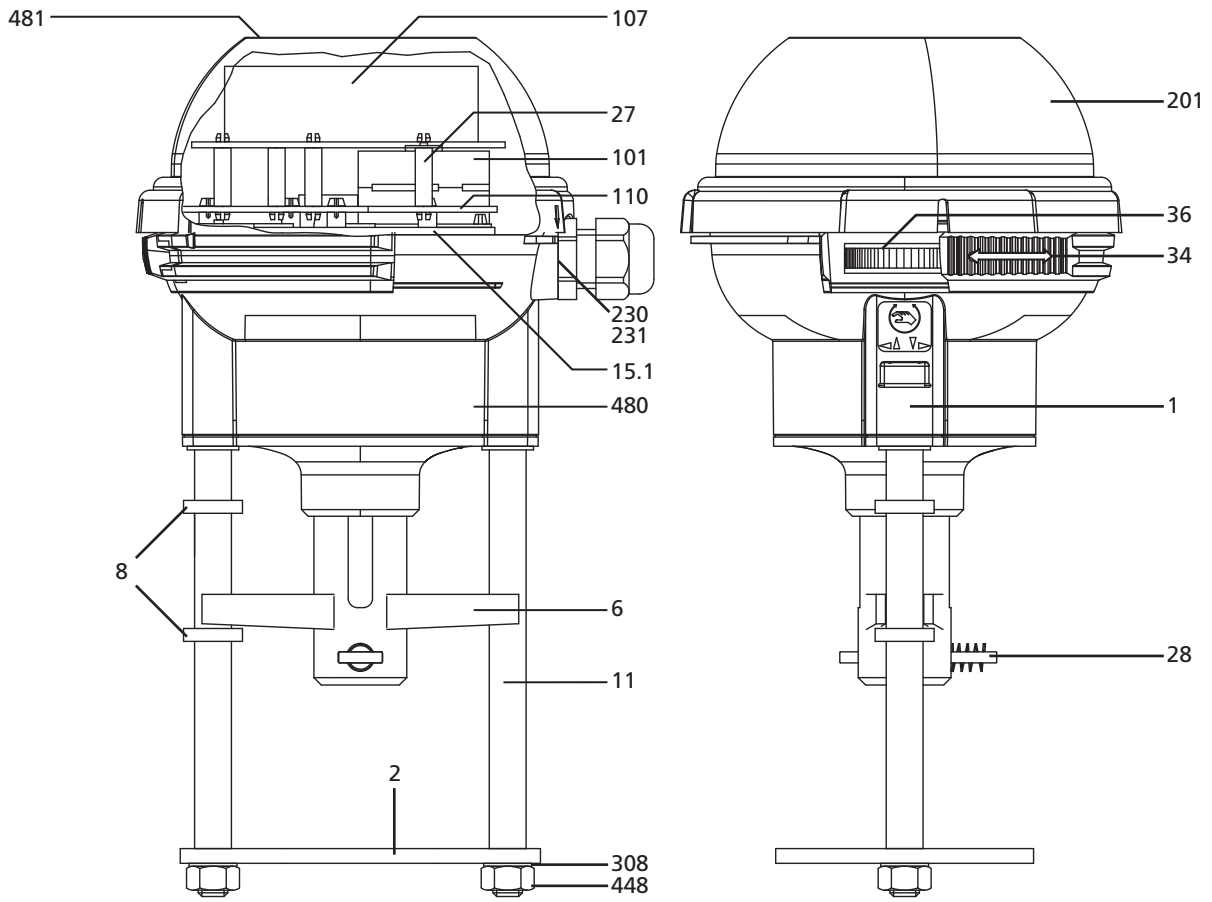

Fig 2.1 Component part denominations

ITEM	DESCRIPTION
1	Actuator housing
2	Crossbeam
6	Clutch
8	Position display unit
11	Distance sleeve
15.1	Gear plate
27	Spacer for 230 V*
28	C-frame
34	Slide valve
36	Handwheel

ITEM	DESCRIPTION
101	Engine/ motor
107	Push-fit PCB for 24 V, 230 V or 115 V
110	Main board
201	Cover*
230	Cable lead-in M16 × 1,5*
231	Cable lead-in M12 × 1.5*
308	Safety disk*
448	Hexagon nut M8*
480	Type plate
481	Wiring diagram on cover

* This component part is available as a spare part.

2.2 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

2.2.1 Continuous mode ELC 55Y

In continuous mode, the system control presets the position of the linear actuator whilst 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) 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 input signals:

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

Output signal (X)

The 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 VDC

2.2.2 Three-point mode ELC 55/24, ELC 55/230

The direction of rotation is set via the control voltage at terminal 2 and terminal 3 on the main PCB:

- 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

Output signal (X)

The 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 VDC

2.3 Functions

2.3.1 Binary signal / frost protection function ELC 55Y

The terminals B1 and B2 on the main PCB are bridged during normal operation. If the electric circuit between B1 and B2 is interrupted, the linear actuator will store the current position and afterwards move automatically to its limit position.

All other control signals will be ignored during this process.

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

As soon as the electric circuit between B1 and B2 is closed, the desired position of the input signal will be reached.

See Section 5.5, Setting the limit position for ELC 55Y.

2.3.2 Blockage detection

When the linear actuator is mechanically blocked, the blockage detector will turn off the motor as soon as one of the two limit positions have been reached or a blockage occurs due to overload.

2.3.3 Wire break detection ELC 55Y

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

The linear actuator moves to the limit position set by jumper JP2 if the input signal drops below 1 V or 2 mA.

See Section 5.5, Setting the limit position for ELC 55Y.

2.3.4 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. Jumper JP3 on the plug-in jumper wire is used to set the actuating time.

See Section 5.3, Setting the actuating time.

2.3.5 Manual operation

In manual mode it is possible to change the stroke without the presence of the supply voltage.

- Motor and control electronics are turned off in manual mode to make hoisting movements of the control impossible

See Section 6.1, Changing between manual and automatic mode.

2.4 Technical data

Type	ELC 55/24, ELC 55Y	ELC 55/230
Supply voltage	24 VAC ± 10% 24 VDC ± 10%	230 VAC ± 10% 115 VAC ± 10%
Power consumption	3.5 VA	7 VA
Weight	1.5 kg	1.5 kg
Dimensions	See technical data sheets	
Stroke ELC 55	max. 20 mm	max. 20 mm
Frequency	50/60 Hz ± 5%	50/60 Hz ± 5%
Ambient temperature	0 to +60°C	0 to +60°C
Enclosure protection	IP 54 IP 30 in manual mode	IP 54 IP 30 in manual mode
Operating mode	S3-50% ED	S3-50% ED
Actuating time	9 or 5 s/mm	9 or 5 s/mm
Actuating force	0.6 kN	0.6 kN

Table 1 Technical data

Type	ELC 55/24, ELC 55/230	ELC 55Y
Input signal Y/Resistance of load	Three-point	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, $I_{max.}$ 8mA	
Cable impedance between B1 and B2		max. 10 Ω

Table 2 Technical data signals

2.5 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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ELC55Y-0100-0	**08203017/01/0408**
AC 50/60 Hz	24V
max 3.5 VA	IP 54/30

Fig 2.2 Example of type plate

3. Transportation & 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.

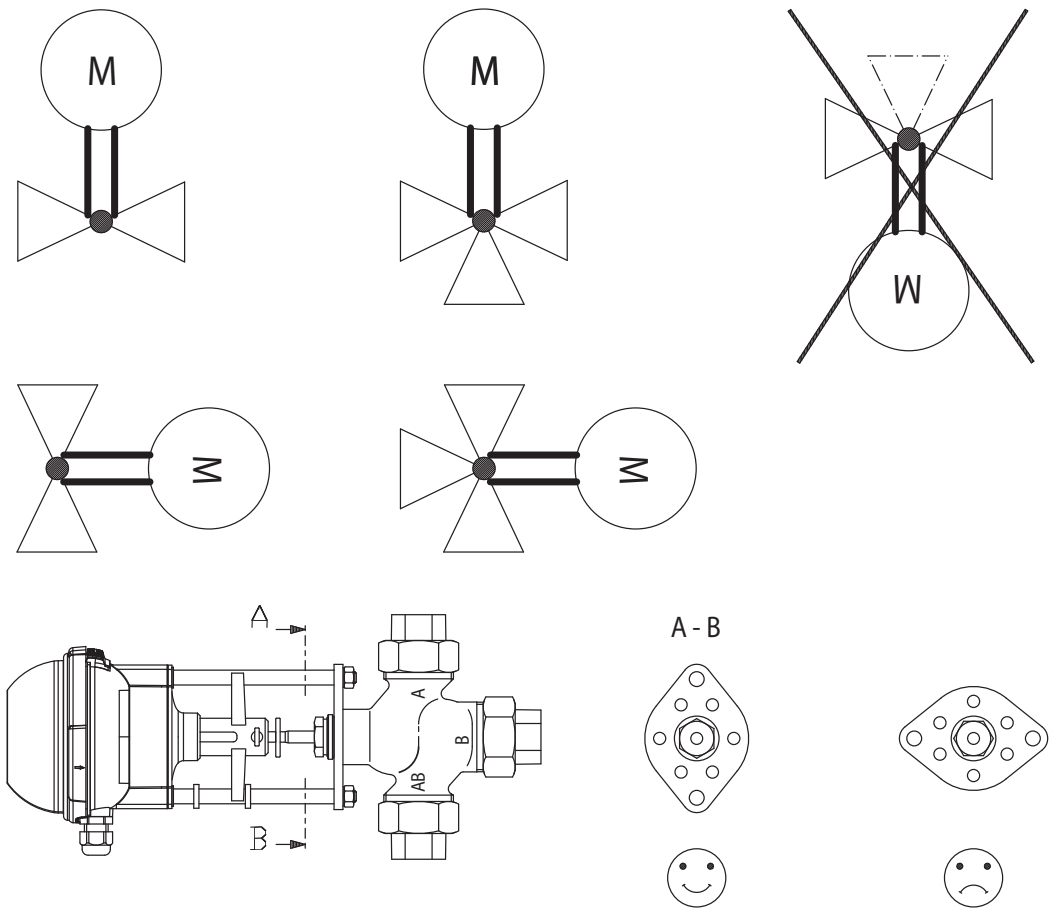


Fig 4.1 Assembly positions for linear actuator and valve

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.

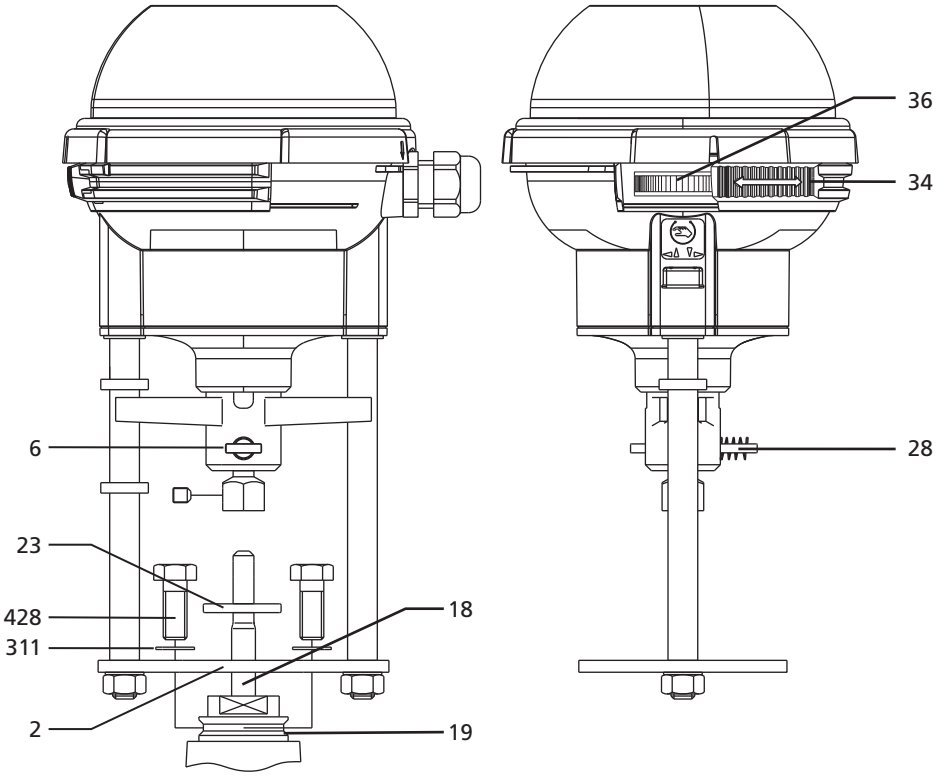


Fig 4.2 Mounting the linear actuator on the valve

ITEM	DESCRIPTION
2	Crossbeam
6	Clutch
18	Valve stem
19	Valve neck
23	Assembly aid

ITEM	DESCRIPTION
28	C-frame
34	Slide valve
36	Handwheel
311	Lock washers
428	Screws

How to assemble linear actuator:

1 Place the actuator with crossbeam (2) on the valve neck (19). *See Fig 4.2*.

2 Insert the C-frame (28) and, using a mounting aid, pull the valve stem upwards (18) (23) until the valve stem (18) locks inside the clutch (6).

3 Fix the crossbeam (2) of the actuator with the help of screws (428) spanner width 13 and lock washers (311) on the valve neck (19).

How to disassemble the linear actuator

1 Follow the above sequence of operations in reverse order.

4.4 Assembling/disassembling the cover

⚠ 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).

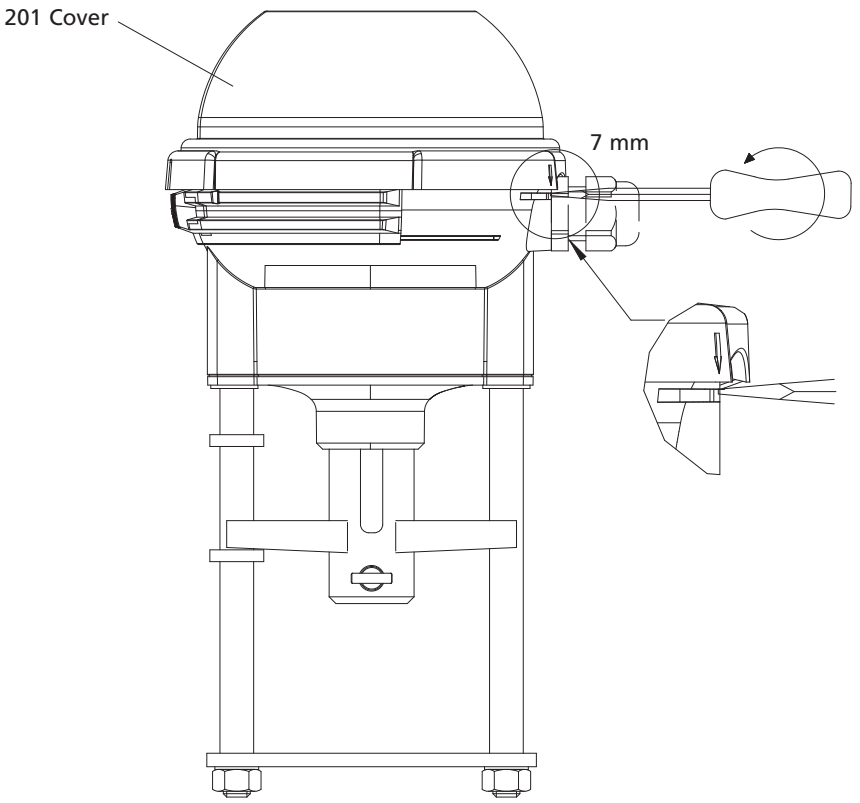


Fig 4.3 Removing the cover

2 Remove the cover (201) carefully.

How to attach the cover

The cover may be mounted in any position.

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

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

4.5 Electrical connection

⚠ WARNING

Danger of life caused by incompetent 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 2.4, Technical data*.

How to establish electrical connection

1 Remove the cover (201). *See Section 4.4, How to remove the cover*.

2 Run the cable through the screw joint to the terminal strip.

3 Connect the power supply according to the wiring diagram. See Fig 4.4.

The wiring diagram (481) is on the cover (201).

⚠ 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 on page 13*

4 Tighten the screw joints.

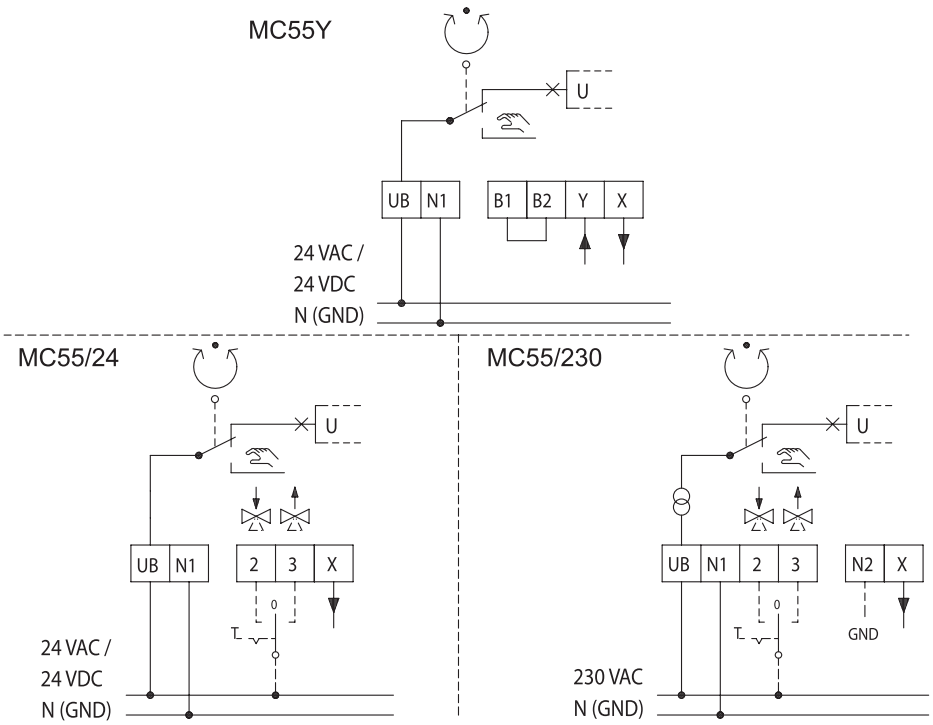


Fig 4.4 Circuit diagram

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
B1, B2	Binary input / frost protection function
N2	Zero potential of signal X at 230 VAC • If you run the actuator in three-point mode at 230 V you will have to connect N2 before you can use X.
Y	Input signal continuous mode
X	Output signal

Table 3 Key to wiring diagram

4.5.1 Controller independent circuit ELC 55Y

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.

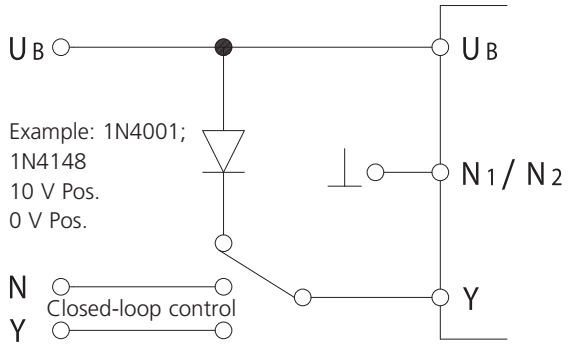


Fig 4.5 Controller independent circuit

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 on the plug-in jumper selected by jumper JP2 at 2 to 10 VDC

See Section 5.1, Operating parameters and jumper settings.

See Section 5.5, Setting the limit position for ELC 55Y.

4.5.2 Remove push-fit PCB and transformer ELC 55/230

To change settings remove the push-fit PCB (107) on the 230 V model.

⚠ 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 Detach the two screws (367).

2 Pull off the push-fit PCB (107) in a straight movement from the spacers (27) and hold the gear plate by pressing it against the motor.

3 Access to plug-in jumpers (113) JP2 to JP5 is now established.

4 After making changes to the setting carefully put the PCB back on.

When doing so, make sure that the socket strip fits correctly on the pin strip (124).

5 Tighten both screws (367).

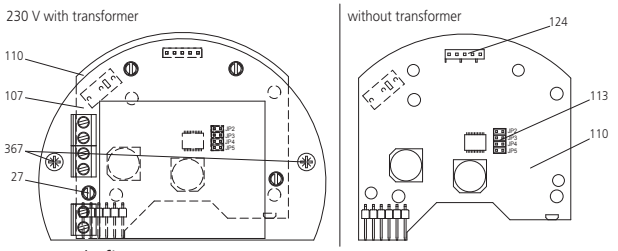


Fig 4.6 Remove push-fit CB and transformer

⚠ WARNING

Risk of injury from electric shock by live parts.

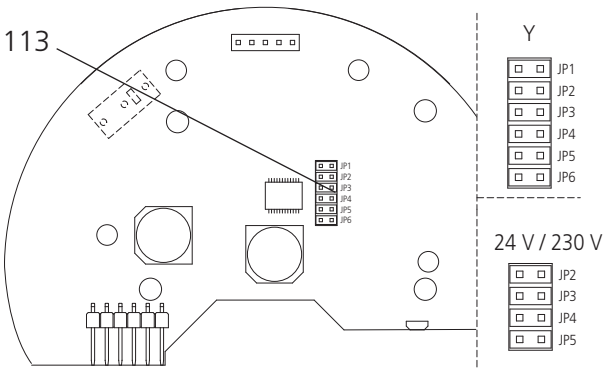
When the power supply is on there is a danger of electric shock due to live parts.

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

The jumpers on the plug-in jumper are used to set the operating parameters (113). The plug-in jumper and the jumpers are underneath the push-fit PCB (107) in the actuator housing (1).

See Section 4.4, Assembling/disassembling the cover.

See Section 4.5.2, Remove push-fit PCB and transformer ELC 55/230.



113 Plug-in jumper JP1-JP6 ELC 55Y
113 Plug-in jumper JP2-JP5 ELC 55/24, ELC 55/230

Fig 5.1 Plug-in jumper position on the main PCB

5.1 Operating parameters and jumper settings

Before starting to operate the linear actuator set the operating parameters with the help of the jumpers.

⚠ NOTE

Malfunctions caused by incorrect jumper setting JP5

The jumper JP5 must be set to "on" at all times.

- Ensure that jumper JP5 is set to "on"

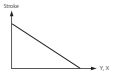
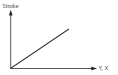
Jumper	On □□	Off □□
JP1	Input signal (Y) 0 to 10 VDC or 0 to 20 mA	Input signal (Y) 2 to 10 VDC or 4 to 20 mA
JP2	Limit position actuator spindle moved out	Limit position actuator spindle moved in
JP3	Actuating time 9 s/mm	Actuating time 5 s/mm
JP4	Y, X characteristic curve 	Y, X characteristic curve 
JP5	Ready for operation	-
JP6	Input signal (Y) in mA	Input signal (Y) in V

Table 4 Jumper settings ELC 55Y

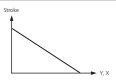
Jumper	On □□	Off □□
JP2	No function	No function
JP3	Setting time 9 s/mm	Setting time 5 s/mm
JP4	X-characteristic curve 	X-characteristic curve 
JP5	Ready for operation	-

Table 5 Jumper settings ELC 55/24, ELC 55/230

5.2 Setting the input signal for ELC 55Y

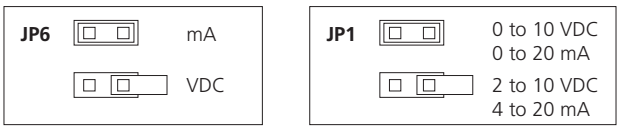


Fig 5.2 Setting the input signal

See Section 2.2.1, Input signal (Y) for additional information.

5.3 Setting the actuating time

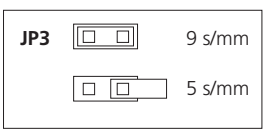


Fig 5.3 Set actuating time

See Section 2.3.4, Actuating time.

5.4 Setting the actuating direction

You can reverse the actuating direction for the linear actuators on the plug-in jumper (113) using jumper JP4 (reverse operation).

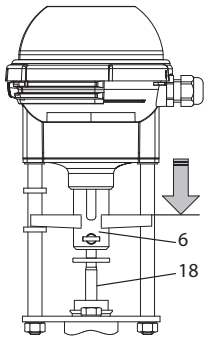
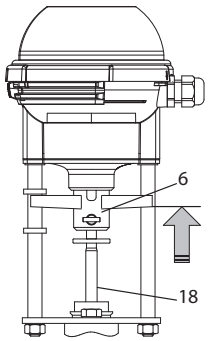
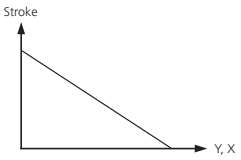
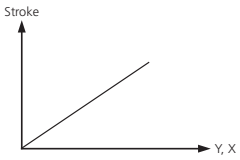
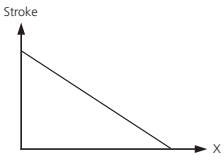
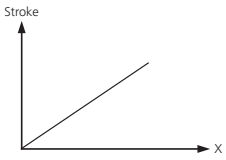
Actuator setting	Normal operation	Reverse operation
	Y = 10 VDC JP6 □ □ Y = 20 mA JP6 □ □ X = 10 VDC	Y = 0 VDC JP1 □ □ JP6 □ □ Y = 2 VDC JP1 □ □ JP6 □ □ Y = 0 mA JP1 □ □ JP6 □ □ Y = 4 mA JP1 □ □ JP6 □ □ X = 0 VDC
	Y = 0 VDC JP1 □ □ JP6 □ □ Y = 2 VDC JP1 □ □ JP6 □ □ Y = 0 mA JP1 □ □ JP6 □ □ Y = 4 mA JP1 □ □ JP6 □ □ X = 0 VDC	Y = 10 VDC JP6 □ □ Y = 20 mA JP6 □ □ X = 10 VDC
JP4	□ □	□ □
ELC 55Y		
ELC 55/24 **ELC 55/230**		

Table 6 Setting the actuating direction

5.5 Setting the limit position for ELC 55Y

Use Jumper JP2 to select a limit position for the linear actuator.

- JP2 ON: Limit position with extended spindle nut
- JP2 OFF: Limit position with retracted spindle nut

The limit position is approached in the following situations:

- Due to wire break detection by the Y signal (2 to 10 VDC or 4 to 20 mA only)
- Due to a binary signal (When the electric circuit between terminal B1 and B2 is interrupted)

5.6 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 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 jumper settings.*

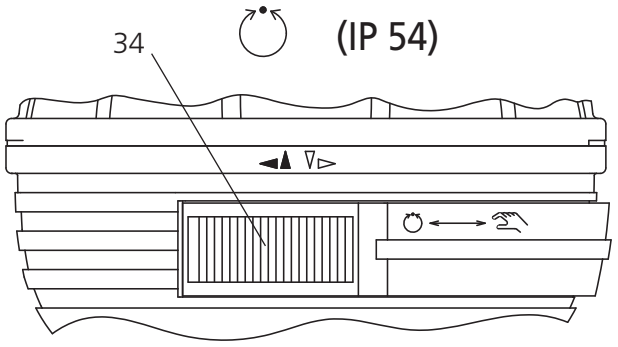
6 Apply supply voltage. The linear actuator will now move to the reference point. The linear actuator is ready for operation.

Prior to commissioning the linear actuator, select the operating mode. *See Section 5, Commissioning.*

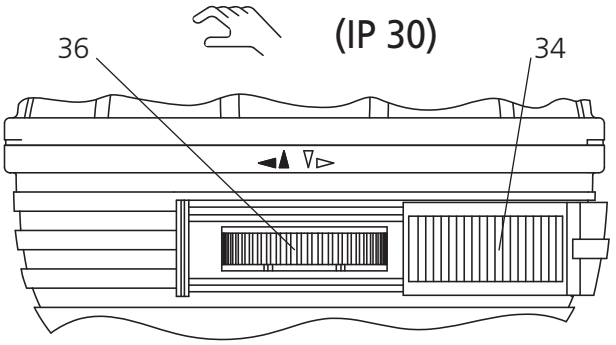
6.1 Changing between manual and automatic mode

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
34 Slide valve



Manual operation
36 Handwheel

Fig 6.1 Selecting automatic mode

How to change-over in manual mode

1 Push the slide bar (34) into its manual position until you hear an audible locking sound.

⚠ NOTE

Risk of damage to valve and actuator during manual mode.

The valve may get damaged if it is pushed too hard into its receptacle during manual mode.

- Do not try and keep turning the handwheel when you realise that the required effort increases noticeably
- Never use force

2 Use the handwheel to turn the spindle nut to the desired position. Turn the handwheel until the preset potentiometer increases. Do not use force.

How to change-over in automatic mode

1 Push the slide bar to (34) position automatic mode.

2 The linear actuator first moves to both limit positions and afterwards to the position specified by the controller.

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*

9. Decommissioning and disposal

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

10. Removal of faults

10.1 How to remedy faults

If the linear actuator does not work properly, follow the sequence of operations described below in order 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's 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.	Slide bar (34) in position manual mode.	Switch the slide bar to position automatic mode.
	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 the 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) • e.g. voltage too high • Electronic system defective	Determine the cause, measure the current data, Compare to the type plate and table, Disassemble the 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 connecting cables.
	Public power supply fluctuations greater than admissible tolerance. *See Section 2.4, Technical data*.	Improve public power supply conditions.
3. Linear actuator pauses intermittently or initialises frequently.	Slack contact in feeder line.	Check connections (terminal strips / connecting cables) and tighten, as required.
4. Linear actuator does not move to limit position. Valve does not open/ close.	Valve is stuck.	Provide smooth-running valve.
	Excessive system pressure.	Adjust 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: • Interfering signals • Signal variations	Check input signal Y on linear actuator, remove cause of fault.
	Main PCB defective.	Disassemble the linear actuator and send it in for repair.

Table 7 Check list breakdown

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