ELECTRIC ACTUATOR LINEAR CAL M301 & M302
INSTALLATION/OPERATION & USER MANUAL

Clorius CONTROLS

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APPROVAL: APPROVED BY JMI

CONTENT

CLORIUS CONTROLS installation & user manual

1. Warning information

Clorius electric actuators are built at state-of the art technology and are safe to operate. Despite of this, the actuators may be hazardous if operated by personnel that has not been sufficiently trained or minimum instructed, and if the actuators are handled improperly, or not used as per specification.

This may
cause danger to life and limb of the user or a third party, damage the actuator and other property belonging to the owner, reduce safety and function of the actuator.

To prevent such problems, please ensure that these operating instructions and this Section in particular have been read and understood by all personnel involved in the installation, commissioning, operation, maintenance and repair.

Basic safety notes.

- The actuators may only be operated by skilled and authorized personnel.
- Make sure to follow all security advice mentioned in this manual, any national rules for accident prevention, as well as the owner´s instructions for work, operation and safety.
- The isolating procedures specified in these operating instructions must be followed for all work pertaining to the installation, commissioning, operation, change of operating conditions and modes, maintenance, inspection, repair and installation of accessories.
- Areas that the actuators are always operated in faultless conditions.
- Ensure that the actuators are always operated in faultless condition. Any damage or faults, and changes in the operational characteristics that may affect safety, must be reported at once.

Danger signs: The following danger signs used in this manual.

Caution! There is a general risk of damage related to health and/or properties

Danger! Electrical voltages are present that may lead to death. Life threatening risks may occur due to electrical voltages!

Danger! *This sign warns of hazards posing a risk to health. Ignoring these instructions can lead to injuries.*

Attention! Observe precautions for handling. Electrostatic sensitive devices

2. Usage as per specification

- The actuators are allowed to be used as electric valve actuators only. They are designed to be mounted on 2 and 3 ways Clorius linear control valves in order to run their motors.
- Any other use is considered to be non-compliant, and the manufacturer cannot be held liable for any damage resulting from it.
- The actuators can only be used as described in this manual, belonging data sheet and catalog. Otherwise, the manufacturer cannot be held liable for any resulting damage.
- Usage as per specification includes the observance of the operating, service and maintenance conditions defined by the manufacturer.
- During service of actuator it is necessary and mandatory to follow instructions and precautions specified in this manual.
- The actuators may only be used, serviced and repaired by personnel that is familiar with the actuators and informed about potential hazards. The specific regulations for the prevention of accidents have to be observed.
- Damages caused by unauthorized modifications carried out on the actuators are excluded from the manufacturer's liability.
- Supply voltage may only be switched on after the proper closure of the main cover or terminal box.

3. Storage

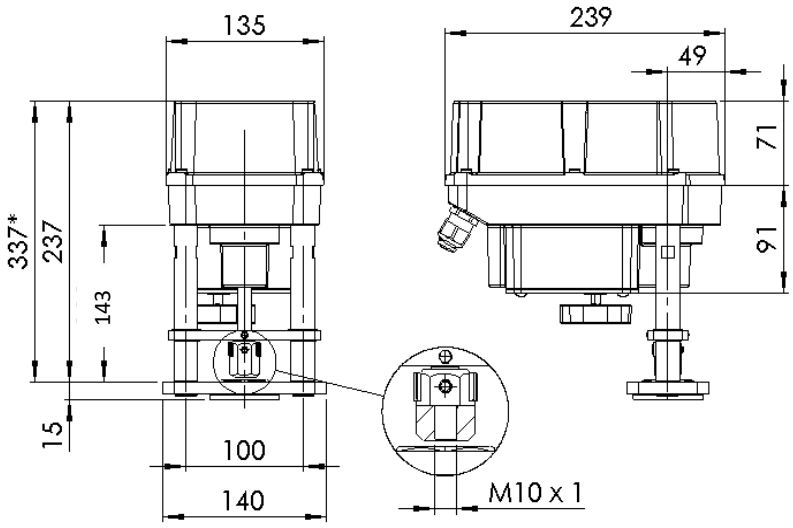
For appropriate storage, this instruction needs to be followed

- Only store the actuators in ventilated, dry rooms
- Store the actuators on shelves, wooden boards, etc., to protect them from soil moisture
- Cover the actuators with plastic foil to protect them from dust and dirt
- Protect the actuators against mechanical damage

4. Operating conditions and installation position

- Standard actuators may be operated at ambient temperatures according to the technical data sheet
- Operating modes correspond to IEC 60034-1, 8: S2 for short cycle and S4 for modulating operation
- For protection against moisture and dust, the enclosure rating is IP65 according to EN 60529
- When installing the actuators, leave enough space to allow cover removal (see section 4.2)
- The actuator can be installed vertically or horizontally or any position in between (see section 4.2)

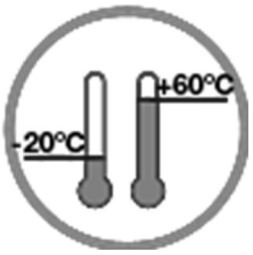
4.1. Operating conditions and installation position (Dimensions)



(*) For temperature up to 240°C

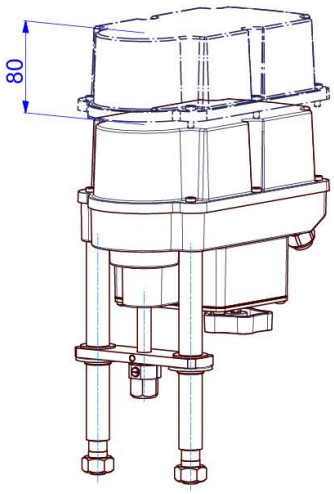
4.2. Operating conditions and installation position (Installation position)

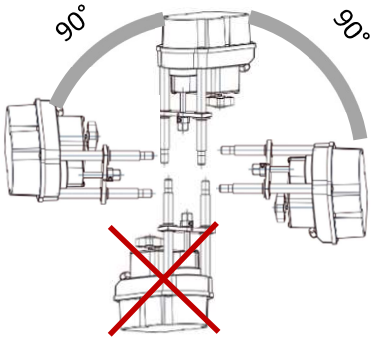
The actuator must not be installed with the cover pointing downwards (Fig.2).
Required space for taking off the cover: 80 mm



Ambient temperature

Mounting positions





5. Function

The actuator is mounted onto the valve via adaptor.
Based on a brushless DC motor (BLDC) the generated torque is transmitted via a multi-stage spur gear onto a spindle nut. The spindle nut transmits the input torque into an axial thrust force via a spindle. The linear stroke is transmitted to the valve spindle by a coupling piece.
The stroke is measured and controlled by a linear 12 Bit Hall sensor.

6. Push button for manual operation

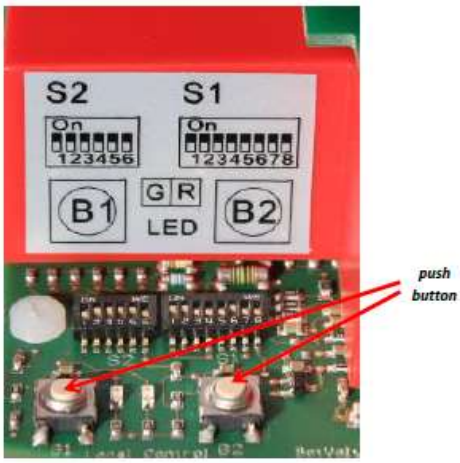
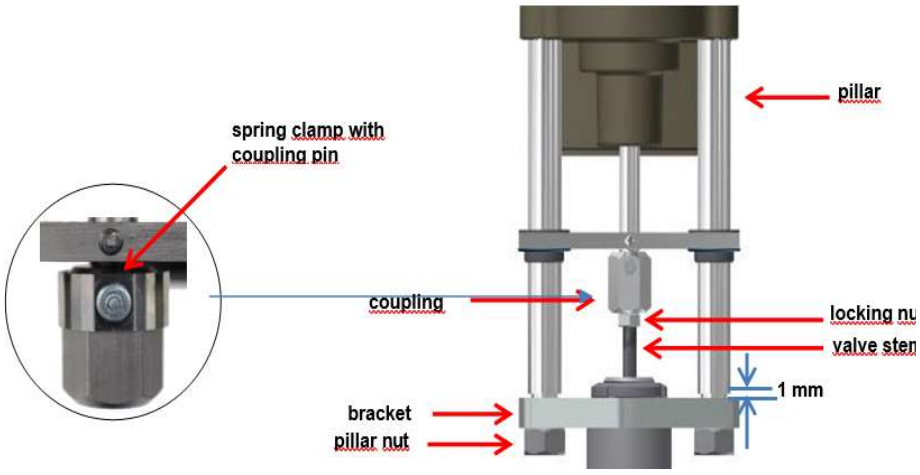


Figure 3: Manual operation

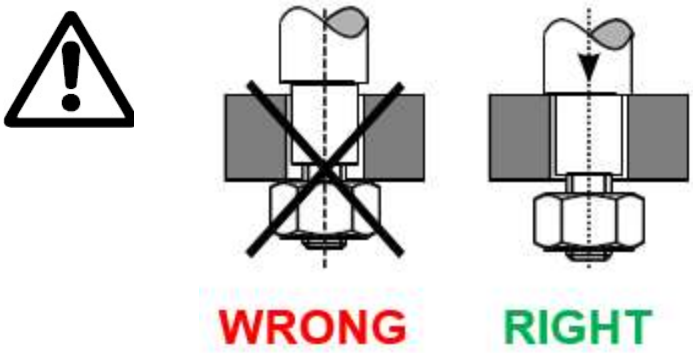
Two push buttons are installed to drive the actuator in case of installation work such as mounting onto a valve or setting the limit switches positions (see Section 13)

7. Valve mounting



Initial position: Valve stem is extended

1. Put actuator onto the bracket.
2. Remove the coupling pin and screw the coupling 13 mm on the valve stem.
   There must be a 1 mm gap between the pillars and the bracket.
3. Insert the spring clamp with the coupling pin again and fix the locking nut.
4. Connect the actuator to electric supply. (see section 9.)
5. Retract the actuator spindle manually. (see section 10)
   until the edges of the pillars rest on the bracket.
6. Screw and tighten the pillar nuts.



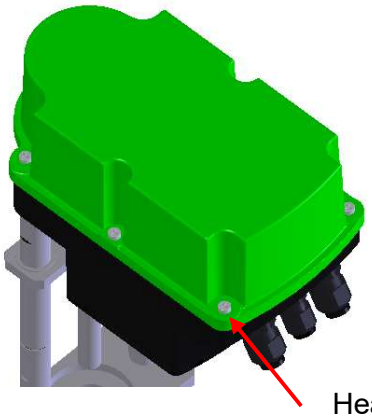
Before the pillar nuts are tightened, make sure that the pillars are sitting on the valve mounting bracket. If necessary, correct the position of the actuator by using manual operation. If these instructions are not observed, personal injury or damage to the actuator and/or valve may result

8. Removing/closing the cover

Open the cover only in a dry environment

ATTENTION! Observe precautions for handling

- Ground the actuator
- Before opening the cover, touch grounded housing parts



Open:
Loosen the head screws by using a screwdriver and unscrew them entirely out of the gear casing
The screws are protected against loss
Open the cover only in a dry environment

Close:
Put the cover over the gear casing and press down slightly
Tighten the screws gently and then crosswise

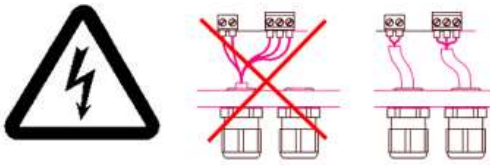
9. Electric supply – Safety instructions

Before connecting to the mains, ensure that the mains supply is isolated and secured against an accidental switching-on.

Remove the cover of the actuator in order to connect the electric supply (see also page 8)

The mains connecting cables must be suitably dimensioned to accept the max. current requirement of the actuator. The yellow-green colored cables may **only** be used for connecting to earth.
When you insert the cable through the drive cable connector, ensure that the max. bending radius for the cable is observed.

The electric actuators do not have an internal electrical power switch. A switch or power mains switch must be provided in the building installation. It should be positioned closely to the device and be easily accessible for the user and shall be labelled as the mains isolator switch for the actuator.
The building installation must also provide power surge trips or fuses corresponding to standard IEC 60364-4-41 with protection class I resp. protection class III (24 VAC / 24 VDC) for the actuator connections.



Please protect all of the power supply and control cables in front of the terminals mechanically by using suitable measures against unintentional loosening. Never install the power supply and the control cables together in one line but instead please always use two different lines

9.2. Wiring diagram

Figure 6 indicates the wiring diagram inside the actuator is binding for the specific actuator wiring. For any optional accessories, see the separate wiring diagram in the corresponding installation instructions.

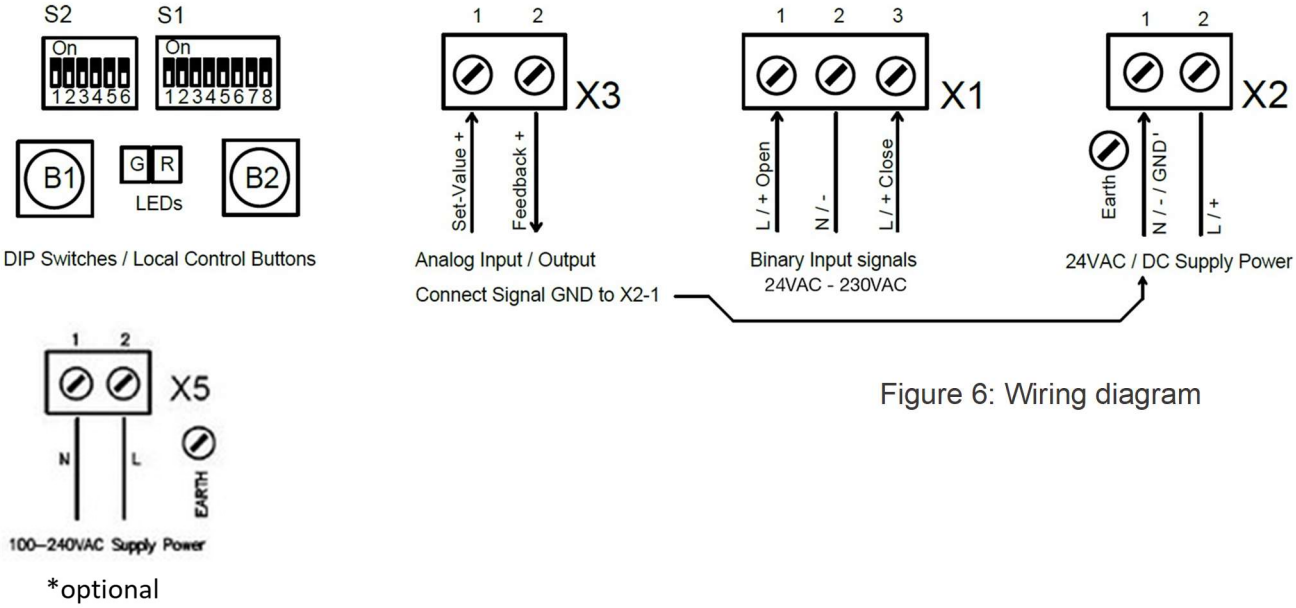


Figure 6: Wiring diagram

PE earth connection has to be connected to gear casing at

10. Signalization/functions

10.1 DIP Switch

S1 Function	1	2	3	4	5	6	7	8
Signal	set value				position feedback			
Voltage	On	On	Off	Off	Off	On	Off	On
Current	Off	Off	On	On	On	Off	On	Off

S2 Function		1	2	3 [1]	4 [1]	5	6
Control via analogue set value							On
Control via binary inputs							Off
Extend valve stem with increasing set value						On	
Retract valve stem with increasing set value						Off	
Automatic commissioning	Close with force / Open with stroke			On	On		
	Close with force / Open with force			On	Off		
	Close with force / Open with 20 mm stroke			Off	On		
	Close with force / Open with 40 mm stroke			Off	Off		
Manual Commissioning	Close with force / Open with required stroke			On	On		
Set value range / feedback signal: 0-10 V / 0-20 mA			On				
Set value range / feedback signal: 2-10 V / 4-20 mA			Off				
Cut-off by force if valve stem is in extended position		On					
Cut-off by force if valve stem is in retracted position		Off					

[1] After changing the switches S2-3 and S2-4, perform re-calibration to activate the new operating mode

10.2. Operator push button

Function	Action	push button B1	push button B2	LED sequence
Manual operation	Activate	> Push 3 seconds	> Push 3 seconds	Both LEDs are flashing alternately
	Retract valve stem	Push		Green LED is flashing
	Extend valve stem		Push	Red LED is flashing
	Stop			Both LEDs are flashing alternately
	Exit	Push 3 seconds	Push 3 seconds	Red or green LED is on
Automatic commissioning	Start		Push 7 seconds	Both LEDs are on
	Commissioning finished			Green LED is flashing 7x (if commissioning is finished), green LED is flashing quickly. (if commissioning failed)

	Exit	Push 1 x		Red or green LED is on
Manual commissioning	Activate	Push 7 seconds		Both LEDs are flashing alternately
	Retract valve stem	Push		Green LED is flashing
	Extend valve stem		Push	Red LED is flashing
	Start	Push 3 seconds	Push 3 seconds	Both LEDs are on
	Exit	Push 1 x		Red or green LED is on

10. 3. Status display

	Green LED	Red LED
Actuator not commissioned	Off	is flashing quickly
Normal operation / actuator running	On	Off
Normal operation / actuator stationary	Off	On
Manual mode active	is flashing alternately	is flashing alternately
Manual mode: Extend valve stem	Off	is flashing
Manual mode: Retract valve stem	is flashing	Off
Automatic commissioning running	On	On
Automatic and manual commissioning successful	is flashing 7 x – 1.5 seconds off	On
Automatic commissioning failed	is flashing quickly	On
Overvoltage	is flashing 1 x – 1.5 seconds off	On
Undervoltage	is flashing 2 x – 1.5 seconds off	On
Memory error	is flashing 3 x – 1.5 seconds off	On
Set value error (< 1 V, < 2 mA)	is flashing 4 x – 1.5 seconds off	On
Torque error	is flashing 5 x – 1.5 seconds off	On
Under- / Overtemperature	is flashing 6 x – 1.5 seconds off	On

Blue LED: Ready for operation status, when supply voltage is applied. LED glowing makes reading the position of the DIP switches easier

11. Automatic commissioning

- Ensure secure connection between valve and actuator
- To start the automatic commissioning push button B2 minimum 7 seconds
  - Option 1: If adjusted “open with force – close with force”, the actuator will drive to the final open valve position via force, and back to the final closed valve position
  - Option 2: If adjusted “open with calibrated stroke” (20 mm), the actuator will store the lower position and the stroke is calculated according to the settings. If the possible travel is smaller than the preset stroke, the operating stroke will be automatically reduced to the max. possible resulting value
- After successful commissioning, the green LED is flashing 7 times
- Push button B1 to return to normal operation
- After successful commissioning, check the found or adjusted stroke by comparing the set value and the valve position
- In case of unsuccessful commissioning the green LED is flashing quickly
  see also valve mounting section
- For commissioning a stroke of at least 1 mm in direction “close with force” is required before the actuator has reached its mechanical stop. Furthermore, the actuator must be able to perform a stroke of at least 5 mm

12. Manual commissioning

- Ensure secure connection between valve and actuator
- To activate the individual commissioning push button B1 for minimum 7 seconds
- For manual operation use push buttons B1 and B2 until the required open valve position is reached
- Start commissioning of both positions and store them by simultaneously pushing the buttons B1 and B2 for minimum 3 seconds
- After successful commissioning, the green LED is flashing 7 times
- Push button B1 to return to normal operation
- After successful commissioning, check the found or adjusted stroke by comparing the set value and the valve position
- In case of unsuccessful commissioning the green LED is flashing quickly
  See also valve mounting Section
- For commissioning, a stroke of at least 1 mm in direction “close with force” is required before the actuator has reached its mechanical stop. Furthermore, the actuator must be able to perform a stroke of at least 5 mm

13. Manual operation

- Push button B1 and B2 simultaneously for minimum 3 seconds to change to manual operation mode
- Push button B1 to retract valve stem
- Push button B2 to extend valve stem
- Push button B1 and B2 simultaneously for minimum 3 seconds to exit from manual operation mode

13.1. Handwheel operation

- Push the handwheel towards the gear casing: the motor is deactived.
- Hold down and turn the handwheel:
- To the left: the spindle is moving downwards.
- To the right: the spindle is moving upwards.
- Release the handwheel: the handwheel is out of function, the motor is reactivated after 5 seconds.

14. Operation

All internal parameters, like required motor torque, actual position, functional status, etc., are being permanently monitored during operation of the actuator. This ensures that the actuator positions with optimum accuracy, and closes the valve always tightly.

Cut-off in end positions

In normal operation, the actuator will stop at the position which was found at a mechanical stop during automatic or manual commissioning. The actuator drives to the lower end position by force with a minimum shut-off window of 3%.

15. Commissioning

- Open the cover (see Section 8), mount the actuator on the valve (see Section 7), connect the electric supply (see Section 9)
- Perform automatic (see Section 11) or manual commissioning (see Section 12)
- Close the cover

16. Maintenance

The actuators are maintenance-free if used under the operating conditions as designated in the data sheet. The gearboxes are lubricated for life and do not require further lubrication.

Caution!

During maintenance and repair, the actuator must not be operated electrically

17. Cleaning

The actuators should be cleaned dry. Do not use abrasive cleaning agents or cleaning products containing solvents as the labelling of the safety stickers and the type of plate might become illegible.
Do not operate the actuator during the cleaning process.

18. Warning

The actuators have a pre-tensioned spring inside, the gearbox housing **must not** be opened. **Defective actuators should be returned to our factory in Poland (see under contacts), to be checked for damages and their possible causes.**

19. Decommissoning and disposal

- Disconnect the mains supply and ensure that it is secured against an accidental switching-on
- Open the cover.
- Remove external electrical connections
- Take off the actuator from the valve

Disposal

For its disposal, the product should be treated as waste containing electrical and electronic equipment and should not be disposed of as household waste.

The actuators have a pre-tensioned spring inside. For disassembly, please contact Clorius Controls **(see under contacts)**

20. Accessories

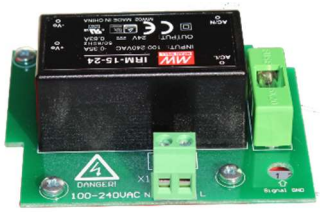
½ Various options are available in order to adapt the actuators to the various service conditions. For technical data. Please refer to respective data sheets no. 4.20.01

ACCESSORIES	
MODULE 100-240 VAC FOR M301 AND M302	Module 100 - 240 VAC
TEMPERATURE ADAPTOR CAL M301 AND M302	Adapter for temperatures up to 240°C
POSITION SIGNAL SWITCHES	2 potentional-free position switches, mechanical, with silver changeover contacts (0.1 A - 5 A switching current)
POSITION SIGNAL RELAYS	Switching points can be adjusted from 0 - 100% of the stroke using potentiometers 2 position signal relays with changeover contacts, calibrated automatically to valve stroke 24V to 230V AC/DC 0.1 A - 1 A

20. Accessories

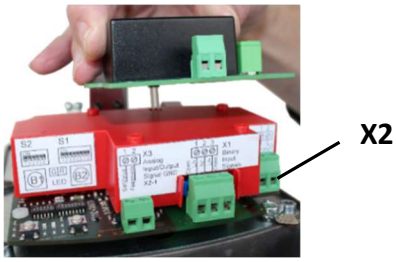
Module 100-240VAC

1 power supply board, 1 label “100-240VAC”



Mounting Module 100-240VAC wide Range Power Supply Converter

①



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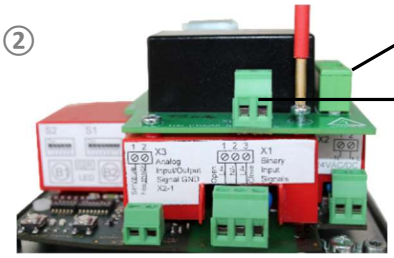

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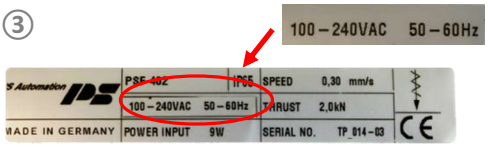


Disconnect the 24 VDC power (X2).

Remove the screws of the protective cover but don’t remove the cover. Put the power supply board converter with the connecting pins carefully through the opening of the protective cover and fix it with the screws.

Connect 230 VAC power supply (X5).

Safety Regulations

- To energize apply in reverse order as described under chapter 1.

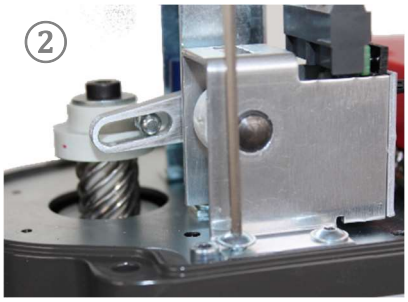
20. Accessories

Circuit board with position switches mechanical

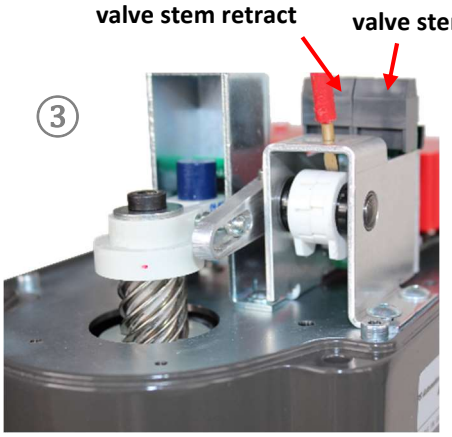
1 pre-assembled bracket with limit switch board, switching cams and lever, 1 ball pin, 3 screws
Standard switches 2WE: silver/nickel contacts, current: 0,1 A to 5 A, voltage: 24 V to 230 V.
Optional 2WE gold: gold contacts, current 0, 1mA to 100 mA , voltage: 5 V to 24 V

Mounting Additional Position Switches Mechanical

Screw the ball pin in the drilled hole of the magnet holder by using an open-end wrench (size 5,5 mm).



Place the bracket with the lever over the ball pin and screw it tight.



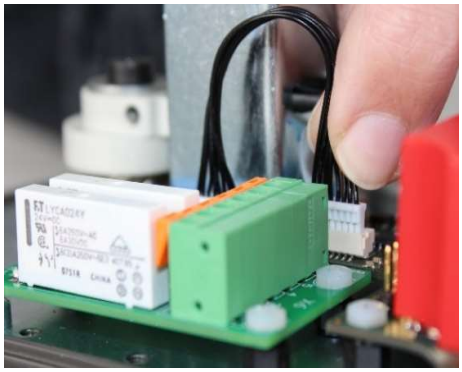
Connect the limit switches as NO or NC. Switch on power supply. Drive the actuator in manual operation until the required switch position is reached. Turn the switching cams with a screwdriver (blade width 4 mm) until the microswitches are heard to click. The operating directions “Extend” respectively “Retract” refer to the actuator stem.

20. Accessories

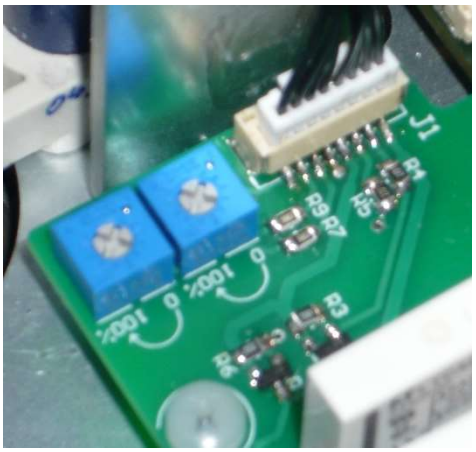
Wide Range Supply Position Switches Relay

1 relay board, 1 connecting cable, 3 plastic screws, 3 spacers

Mounting Additional Position Switches Relay

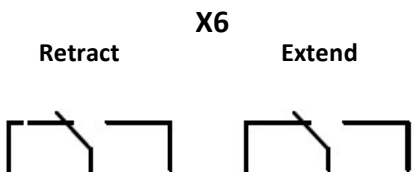


Clip the relay board with the spacers in the locating holes. Connect the main board with the connection cable. Connect according to the wiring diagram.

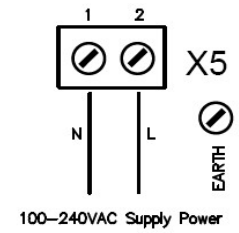


Switch on power supply. Adjust the switch positions with the trimmers R1 (Retract) and R2 (Extend).
The relay is switching when the switching position is reached or passed. The switching point can be adjusted from 0 to 100 %. The actuator doesn't need to be re-calibrated.
X6: The operating directions "Extend" respectively "Retract" refer to the actuator stem.

Diagram



Additional position switches relay and
Circuit board with position switches mechanical



Wide Range Power Supply converter

Contact

Clorius Controls: **mail@cloriuscontrols.com**

See also **www.cloriuscontrols.com** for further information