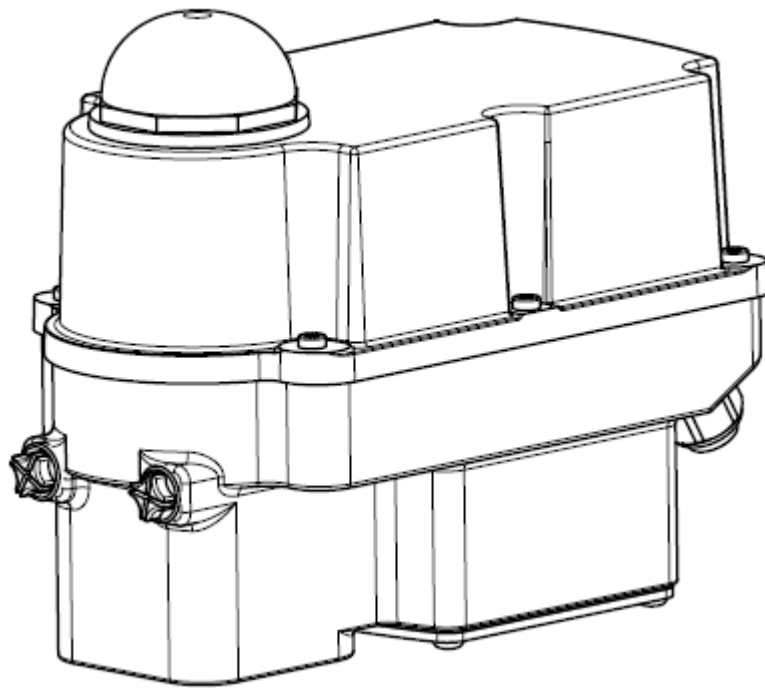


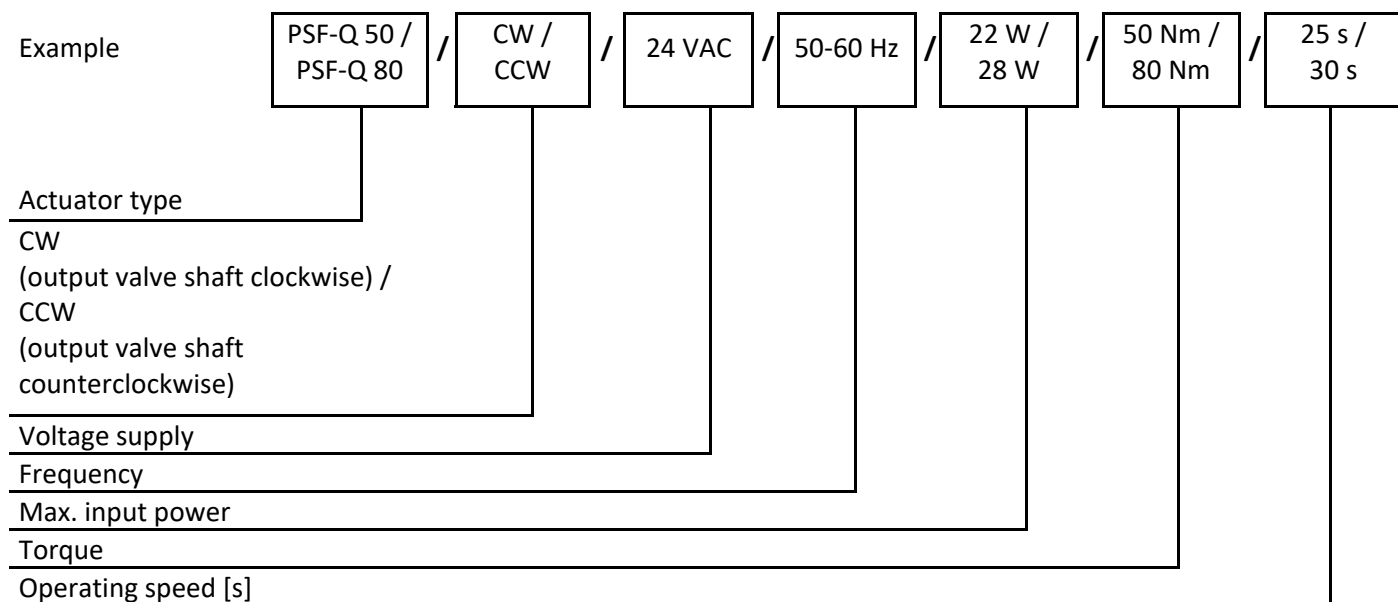
Operating Instructions



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Type key



1. Symbols and safety

General dangers of non-compliance with safety regulations

PSF-Q 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 chapter in particular have been read and understood by all personnel involved in the installation, commissioning, operation, maintenance and repair of the actuators.

Basic safety notes

- The actuators may only be operated by skilled and authorized operating personnel.
- Make sure to follow all security advices 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 can be under voltage have to be isolated before working on them.
- 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 are used in this operating 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.



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.

Other notes

- The motor surface temperature may rise when maintaining, inspecting and repairing the actuator immediately after operation. There is a danger of burning the skin!
- Always consult the relevant operating instructions when mounting PS-S accessories or operating the actuator with PS accessories.

Connections for signal in- and output are double isolated from circuits that can be under dangerous voltage.

2. Usage as per specification

- PSF-Q actuators are exclusively designed to be used as electric valve actuators. They are meant to be mounted on 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 within the limits laid out in the data sheets, catalogues and other documents. 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 laid down by the manufacturer.
- Not to be regarded as usage as per specification are mounting and adjusting the actuator as well as servicing. Special precautions have to be taken while doing this!
- The actuators may only be used, serviced and repaired by personnel that is familiar with them 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.

3. Storage

For appropriate storage, the following instructions have to be met:

- 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 data sheet.
- Operating modes correspond to IEC 60034-1, 8: S2 for short cycle, and S4 for control operation (actuator-specific values see actuator-specific data sheets).
- For protection against moisture and dust, enclosure rating is IP65 (optionally IP67) according to EN 60529.
- The actuators must be installed with sufficient clearance to remove the cover (Figure 1). The mounting position is arbitrary with the exception of "cover down" (Figure 2).

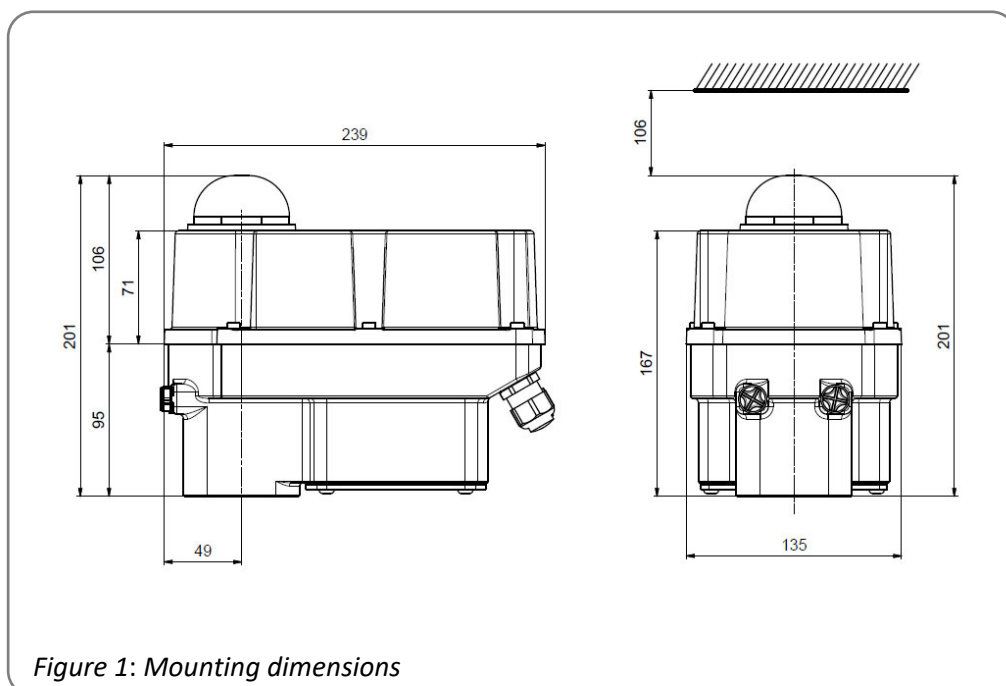


Figure 1: Mounting dimensions

Mounting positions

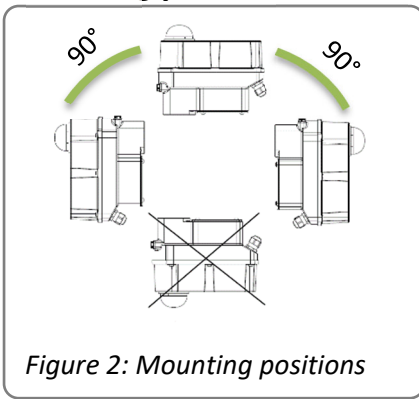


Figure 2: Mounting positions

Outdoor usage:



When using actuators in environments with high temperature fluctuations or high humidity, we suggest a heating resistor to be fitted to prevent the build-up of condensation within the enclosure.

5. Function

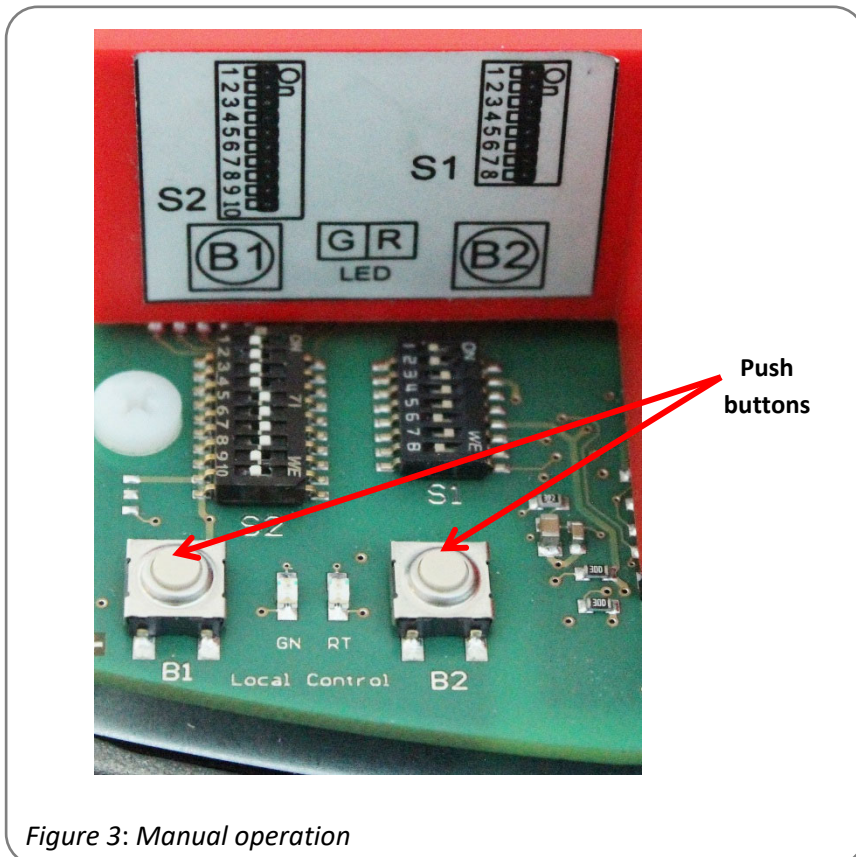
The PSF-Q electric actuators are designed for the operation of 90° quarter-turn actuators. For mechanical connection to the valve, the actuators are equipped with flanges according to ISO 5211.

The torque generated by a brushless DC motor (BLDC) is transmitted via a multi-stage spur gear spur gearbox to a coupling with double square drive. This serves as a connecting element to the valve shaft. The mechanical limitation of the rotation angle is continuously adjustable by $\pm 5^\circ$ in one end position. The rotation angle is measured and controlled by a linear 12 Bit Hall sensor.

In case of mains power loss, the stroke movement is in OPEN or CLOSE direction by spring force.

Electrical wiring is done to a terminal block under the actuator cover.

6. Manual operation

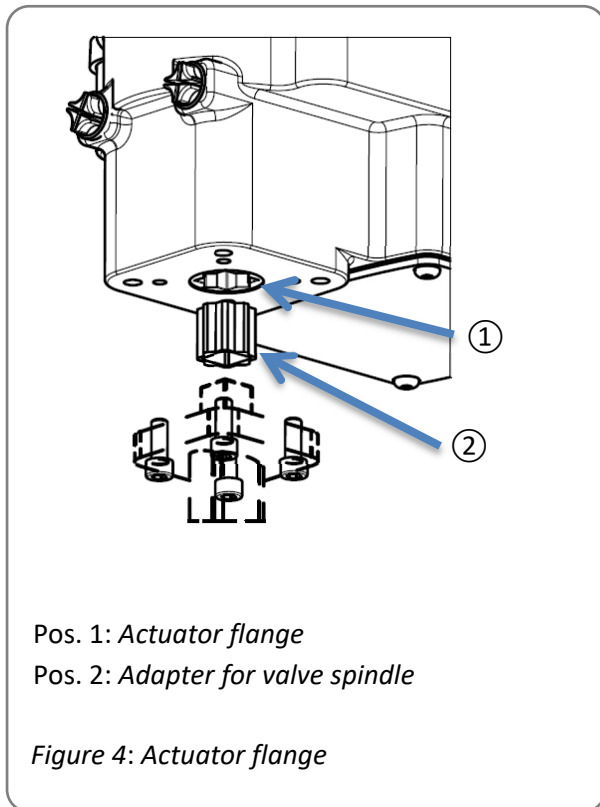


For commissioning the actuator during adjustment work (valve mounting and end position adjustment), an electrical manual override by means of a push-button is available (see 12.7 Manual operation).

Figure 3: Manual operation

7. Valve mounting

The PSF-Q actuators are designed with a mechanical interface according to ISO 5211 for valve mounting. The gear contains an exchangeable drive bush to connect the actuator to the valve shaft.



- Check if the actuator flange suits the valve flange.
- Check whether the plug-in coupling of the actuator matches the design of the valve shaft. If necessary, commercially available adapters can be used to adapt to the valve shaft.
- Connect the actuator electrically (see 11. Electric supply).
- Position the actuator by means of manual operation (see 12.7 Manual operation) so that it matches the position of the valve.
- Clean the surface of the connection components, lubricate valve shaft slightly.
- Tighten the screws in a diagonal sequence according to the required torque.

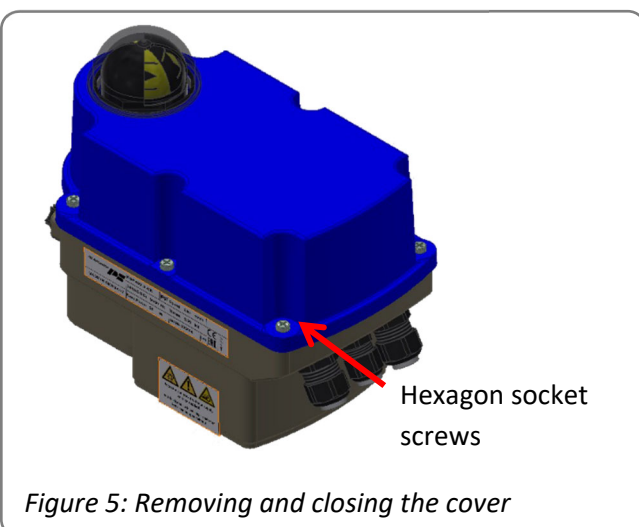
8. Removing and closing the cover



Open the cover only in a dry environment.



Attention! Observe precautions for handling. Ground the actuator. Before opening the cover, touch grounded housing parts.



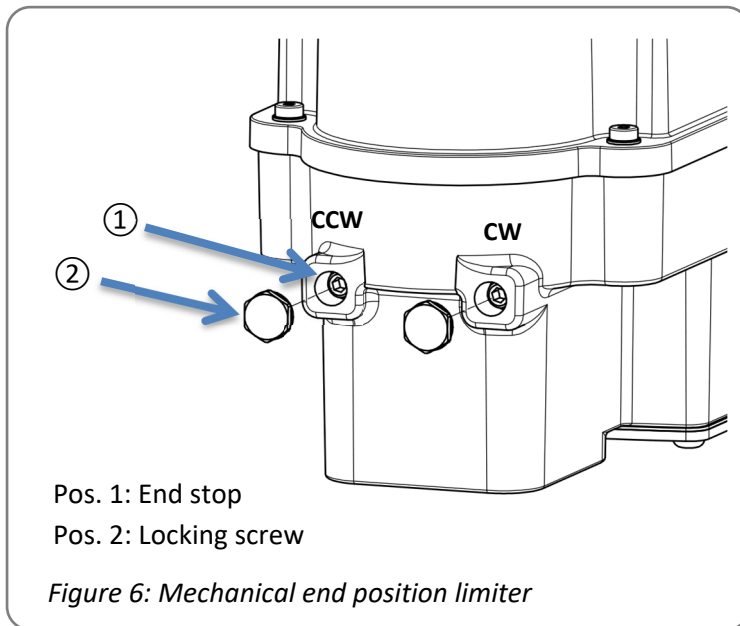
Open:

Loosen the screws by using a screwdriver and unscrew them entirely out of the gear casing. The screws are protected against loss. Carefully remove the cover so that the injected seal is not damaged.

Close:

Put the cover on the gear casing and press down slightly. Tighten the screws gently and then crosswise.

9. Setting the mechanical stops

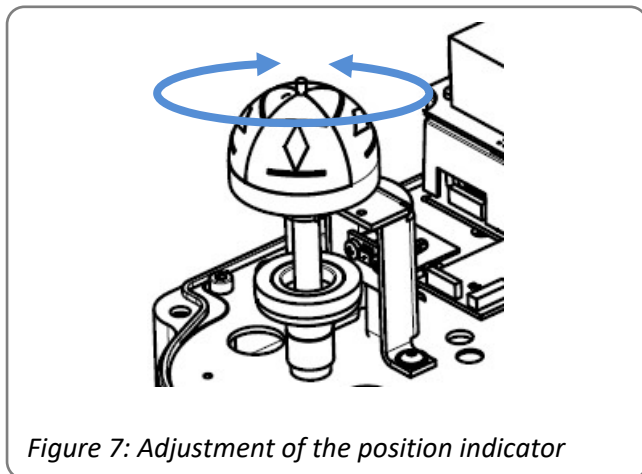


- Remove the protection cap from either stop screw.
- Unscrew both hexagon sockets anti-clockwise by approximately 5 turns.
- Activate manual operation by pressing buttons B1 and B2 simultaneously for 3 seconds (see chapter 12.3 Operator push buttons, section " Manual Operation").
- Move the actuator clockwise to the closed end position using button B1 or B2 (see chapter 12.3 Operator push buttons).
- Turn stop screw for closed position to the stop.
- Use button B1 or B2 to move the actuator anti-clockwise to this open end position (see chapter 12.3 Operator push buttons).
- Turn stop screw for open position to the stop.
- Screw on hexagon sockets clockwise.
- Screw on protection cap.



If the stop screws for the CLOSED position are in the opposite position, the actuator must be moved anti-clockwise to the closed end position.

10. Adjustment of the position indicator



The position indicator is a two-coloured half ball turning under a transparent dome with blackened quarter segments.

Take off the cover and turn the half ball as appropriate to adjust the position indicator.

11. Electric supply

11.1 Safety instructions



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

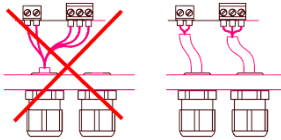
Remove the cover of the actuator in order to connect the electric supply (see 8.).

The mains connecting cables must be suitably dimensioned to accept the max. current requirement of the actuator. The yellow-green coloured 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.

PSF-Q 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.

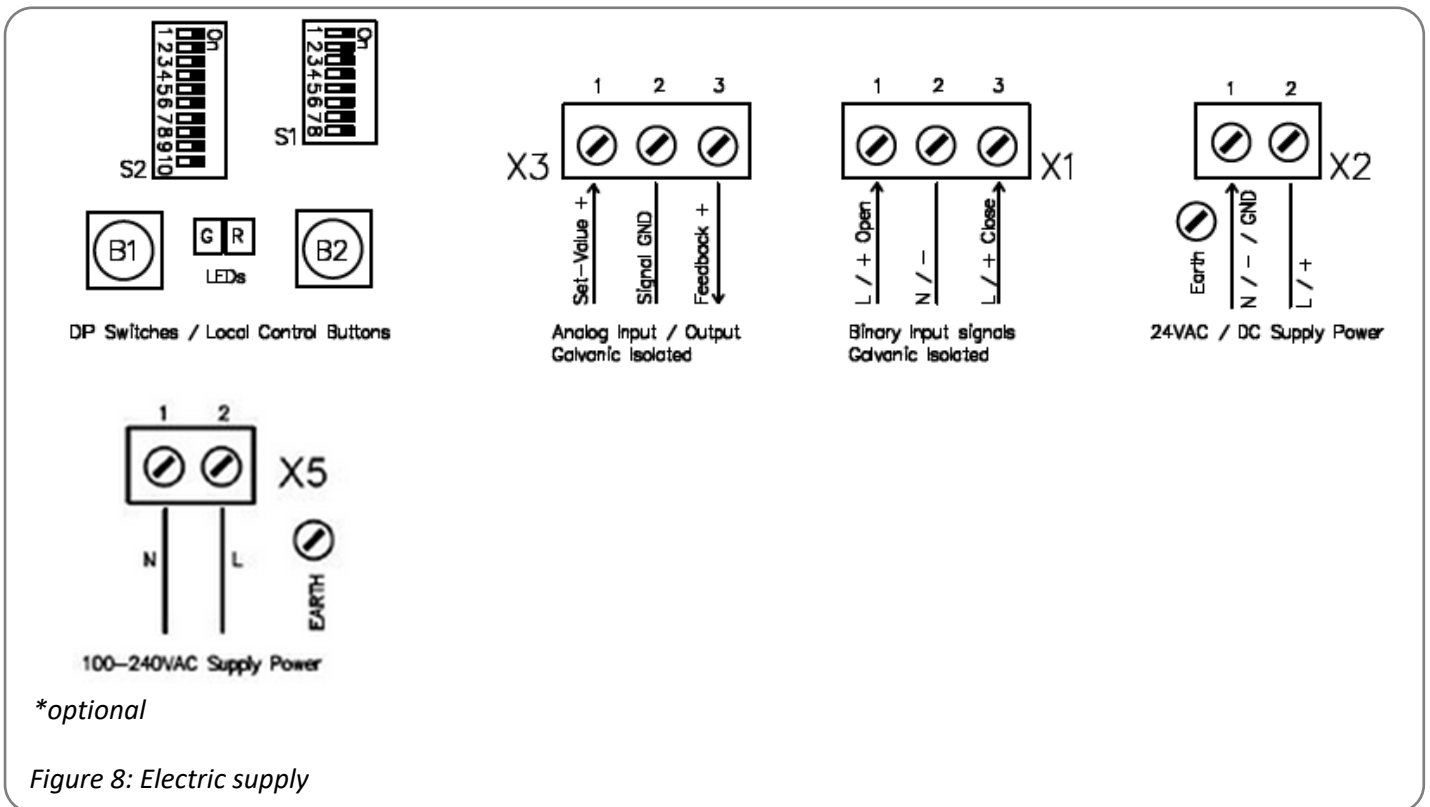
The building installation must also provide power surge trips or fuses corresponding to standard IEC 60364-4-41 with protection class I resp. protection class III (24 VAC / 24 VDC) for the actuator connections.



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.

11.2 Wiring diagram

Figure 8 indicates the electrical connections for standard actuators. 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.



PE earth connection has to be connected to gear casing at !

Ensure that all connecting cables are stripped to the correct length so that they are protected against electric shock.

12. Signalisation and functions

12.1 DIP switches

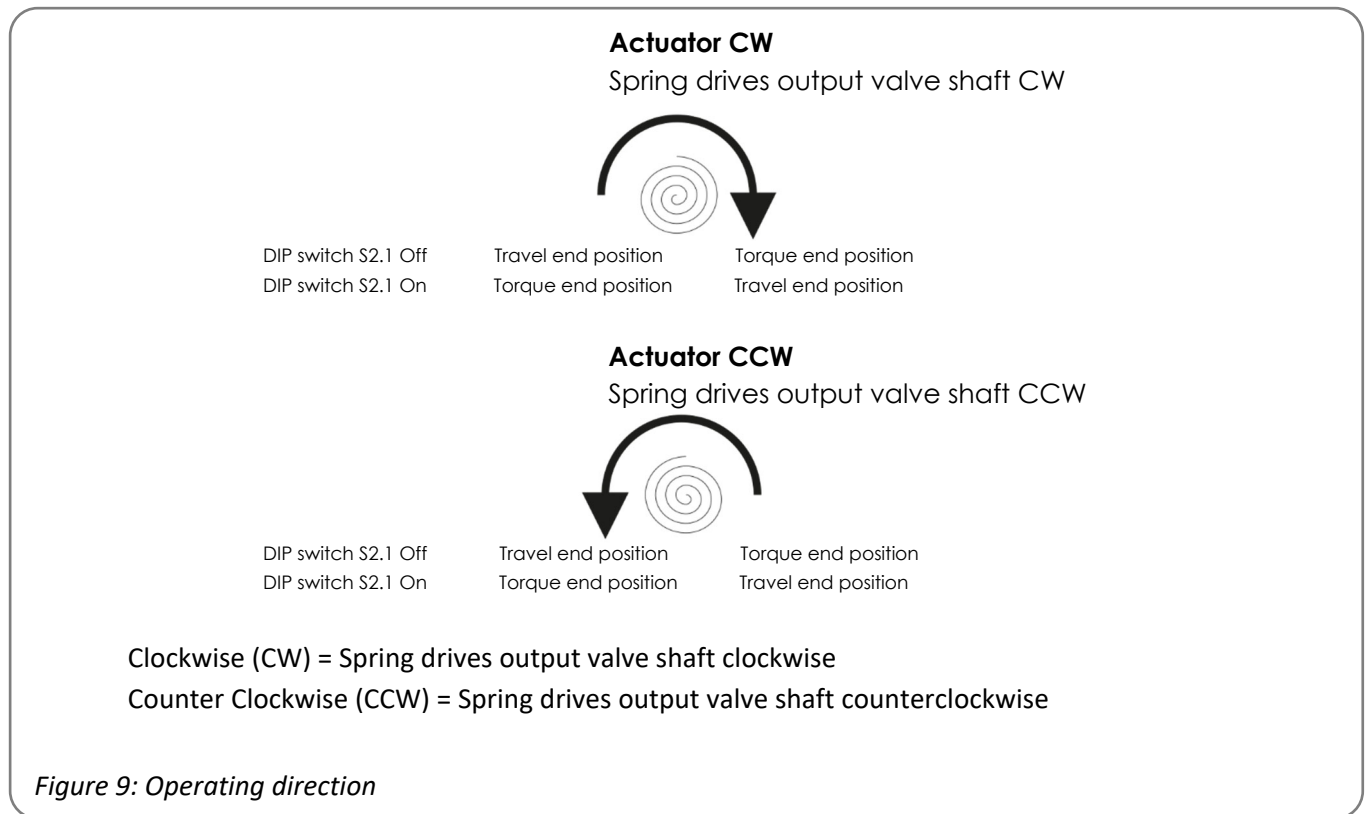
S1 Function	1	2	3	4	5	6	7	8
Signal	Set value				Position feedback			
Voltage	On	On	Off	Off	Off	On	Off	On
Current	Off	Off	On	On	On	Off	On	Off

S2 Function	1	2	3 ¹⁾	4 ¹⁾	5	6	7	8	9 ¹⁾	10
Control via set value						On				
Control via binary inputs						Off				
Output valve shaft counterclockwise (CCW) with increasing set value					On					
Output valve shaft clockwise (CW) with increasing set value					Off					
Automatic Commissioning	Close with torque / Open with torque			On	On					Off
	Close with torque / Open with travel ²⁾			On	On					On
Manual commissioning	Close with torque / Open with required rotation angle			On	On					On
Set value range: 0-10 V / 0-20 mA			On				On	On		
Set value range: 2-10 V / 4-20 mA			Off				On	On		
Set value / Split-Range 5-10 V/10-20 mA			On				On	Off		
Set value / Split-Range 6-10 V/12-20 mA			Off				On	Off		
Set value / Split-Range 0-5 V/0-10 mA			On				Off	On		
Set value / Split-Range 2-6 V/4-12 mA			Off				Off	On		
Torque end position with counterclockwise rotating valve shaft (CCW)		On								
Torque end position with clockwise rotating valve shaft (CW)		Off								
Valve curve LINEAR setpoint/position										Off
Valve curve QUICK OPENING Setpoint/position										On

¹⁾ After changing the switches S2-3, S2-4 and S2-9, perform re-calibration to activate the new operating mode!

²⁾ The position will be defined by torque during commissioning. During operation the actuator will stop at the found position (see 12.5 Automatic commissioning).

12.2 Operating direction



12.3 Operator push buttons

Function	Action	Push button B1	Push button B2	LED sequence
Manual Operation	Activate	> Push 3 seconds	> Push 3 seconds	Both LEDs are flashing alternately
	Output valve shaft clockwise (CW)	Push		Green LED is flashing
	Output valve shaft counterclockwise (CCW)		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
	output valve shaft clockwise (CW)	Push		Green LED is flashing
	output valve shaft counterclockwise (CCW)		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

12.4 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: output valve shaft counterclockwise (CCW)	Off	Is flashing
Manual mode: output valve shaft clockwise (CW)	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.

12.5 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 torque – close with torque”, the actuator will drive to the final open valve position via torque, and back to the final closed valve position.
 - Option 2: If adjusted “open with travel”, the actuator will store the open position with the torque end stop (through adjusted end stop screw e.g.) and stop at the saved position during normal operation.
- After successful commissioning, the green LED is flashing 7 times.
- Push button B1 to return to normal operation.
- After successful commissioning, check the determined or set rotation angle by comparing the set value and the valve position.
- In case of unsuccessful commissioning the green LED is flashing quickly. Please check valve mounting.
- For commissioning, it is necessary that a residual rotation angle of at least 2° is available in the end positions before the actuator has reached its mechanical stop.

12.6 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.
- Check the set rotation angle by specifying the setpoint and measuring the actual value.
- In case of unsuccessful commissioning the green LED is flashing quickly.
- For commissioning, it is necessary that a residual rotation angle of at least 2° is available in the end positions before the actuator has reached its mechanical stop.

12.7 Manual operation

- Push button B1 and B2 simultaneously for minimum 3 seconds to change to manual operation mode.
- Push button B1 to output valve shaft clockwise (CW).
- Push button B2 to output valve shaft counterclockwise (CCW).
- Push button B1 and B2 simultaneously for minimum 3 seconds to exit from manual operation mode.

13. Operation

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

Cut-off in end positions

Depending on the selected switch position S2-3/4/9, it is determined how the actuator approaches an end position. When selecting "closing/opening with torque", the end position retraction of 3% is active in both directions, in which case switch S2-1 has no function. In the operating modes "opening with swing angle", the actuator remains in the open position that was set during automatic or manual calibration. The end position to be reached by torque is always approached with a retraction of 3%.

13.1 Split Range

With the setting "Set value signal/Split range" switch position S2-2/7/8, the set value is split into a lower or upper range. This means that several actuators can be controlled with only one set value signal.

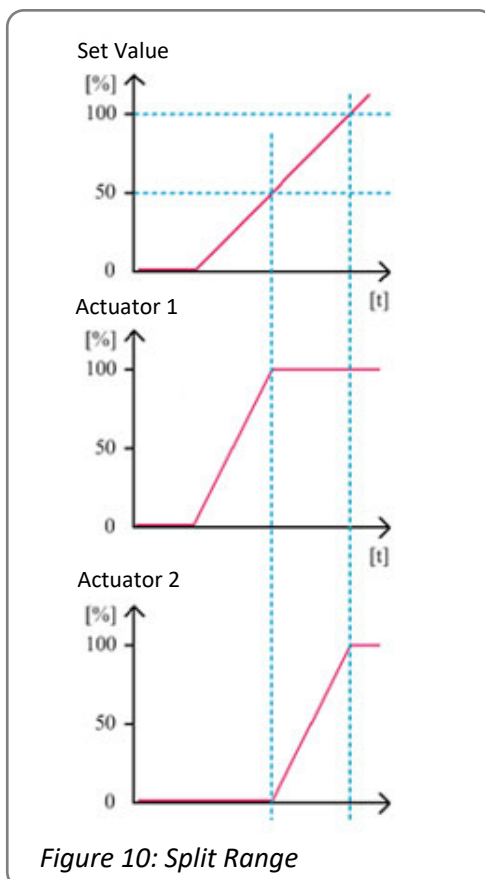
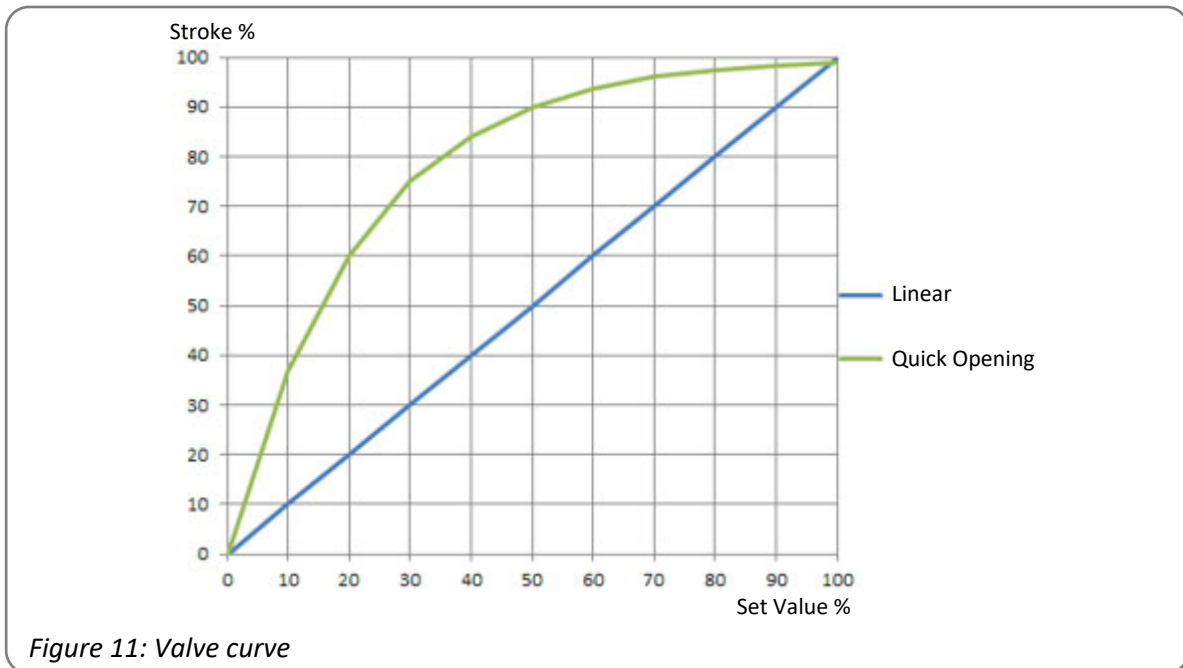


Figure 10: Split Range

13.2 Valve curve

Switch position S2-10 can be used to select the relationship between the set value and the actuator position. Two curves are available. With the linear valve curve, the actuator position in % corresponds to the set value in %. The "Quick Opening Curve" enables fast valve opening with a small set value.



14. Commissioning



- Open the cover (see 8.), mount the actuator on the valve (see 7.), connect the electric supply (see 11. Electric supply).
- Perform automatic (see 12.5 Automatic commissioning) or manual commissioning (see 12.6 Manual commissioning).
- Close the cover.



The electrical connection and commissioning with mains voltage applied may only be carried out by trained specialist personnel!

Do not touch any connection lines during commissioning!

15. 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.

15.1 Cleaning

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

15.2 Maintenance



The actuators have a pre-tensioned spring inside, the gearbox housing **must not** be opened. Defective actuators should be returned to our plant in Bad Duerkheim, Germany, or to our representatives, to be checked for damages and their possible causes.

15.3 Spare parts

Damaged actuators should be returned to our plant in Bad Duerkheim, Germany, or to our representatives, to be checked for damages and their possible causes.

16. Decommissioning and disposal

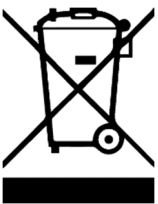
- Disconnect the mains supply and ensure that it is secured against an accidental switching-on.
- Open the cover.
- Remove external electrical connections.
- Take off the actuator from the valve.

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 our plant in Bad Duerkheim.



In accordance with 2012/19/EU on waste electrical and electronic equipment (WEEE), the devices described here may not be disposed of via municipal waste disposal companies.

If you are unable or unwilling to arrange for the equipment to be disposed of by a specialist company, you may return the equipment to the manufacturer, who will then ensure that the equipment is disposed of properly for a flat fee.

17. Appendix

17.1 Accessories

Various options are available in order to adapt the actuators to the various service conditions. For technical data, please refer to the respective data sheets.

Accessories/ Options	Position Signal Relays	2 position signal relays with changeover contacts, calibrated automatically to angular travel 24 V to 230 V AC/DC @ 0.1 A – 1 A Switching point adjustable 0-100 % of the stroke using potentiometers
	Heating Resistor	HR Heating resistor to prevent condensation
	Wide Range Power Supply	100 - 240 VAC 1~
	Increased Enclosure	IP Increase of enclosure to IP67

17.2 EC Declaration of Conformity

Declaration of Incorporation of Part Completed Machinery and EC Declaration of Conformity in compliance with the Directives on EMC and Low Voltage

We,

**PS Automation GmbH
Philipp-Krämer-Ring 13
D-67098 Bad Dürkheim**

Declare under our sole responsibility that we manufacture electric actuator series

**PSR-E...; PSQx03...; PSQ-E...; PSQ-AMS...; PSL-Mod.4...;
PSL-AMS...; PSF...; PSF-M...; PSF-Q...; PSF-Q-M...**

according the requirements of the

EC Directive 2006/42/EC

as part completed machinery. These actuators are designed to be installed on industrial valves. It is prohibited to take the actuator into service until it has been ensured that the complete machine conforms the applicable machinery directives.

The technical documentation described in Annex VII, part B has been prepared.

The above actuators further comply with the requirements of the following directives.

2014/30/EU	Electromagnetic Compatibility (EMC)
2014/35/EU	Low Voltage (LVD)
2011/65/EU + 2015/863/EU	Restriction of Hazardous Substances (RoHS)

furthermore, the following harmonised standards have been applied:

EN 61000-6-2: 2005	Electromagnetic compatibility (EMC), Generic standards-Immunity for industrial environments
EN 61000-6-3: 2007	Electromagnetic compatibility (EMC), Generic standards-Emission standard for residential, commercial and light-industrial environments
EN 61010-1: 2020	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use

Bad Dürkheim, 2022



Christian Schmidhuber
(General Manager)

CAUTION!

To ensure compliance of these actuators with the above directives, it is the responsibility of the specifier, purchaser, installer and user to observe the relevant specifications and limitations when taking the product into service. Details are available on request, and are mentioned in the Installation and Maintenance Instructions.

17.3 CA Declaration of Conformity

Declaration of Incorporation of Part Completed Machinery and CA Declaration of Conformity in compliance with the Legislation on EMC and Low Voltage

We,

**PS Automation GmbH
Philipp-Krämer-Ring 13
D-67098 Bad Dürkheim**

Declare under our sole responsibility that we manufacture electric actuator series

PSR-E...; PSQx03...; PSQ-E...; PSQ-AMS...; PSL-Mod.4...; PSL-AMS...; PSF...; PSF-M...

according the requirements of the

2008 No. 1597

Supply of machinery (safety) regulations

as part completed machinery. These actuators are designed to be installed on industrial valves.

It is prohibited to take the actuator into service until it has been ensured that the complete machine conforms the applicable machinery legislation.

The technical documentation described in Annex VII, part B has been prepared.

The above actuators further comply with the requirements of the following legislations:

**UK SI 2016 No. 1091 and
Amendments**

The Electromagnetic Compatibility Regulations 2016

**UK SI 2016 No. 1101 and
Amendments**

The Electrical Equipment (Safety) Regulations 2016

**UK SI 2012 No. 3032 and
Amendments**

**The Restriction of the Use of Certain Hazardous Substances in
Electrical and Electronic Equipment Regulations 2012**

the provisions of the legislations and their compliance are given by the following named standard(s), which have been applied:

EN 61000-6-2: 2005

Electromagnetic compatibility (EMC), Generic standards-
Immunity for industrial environments

EN 61000-6-3: 2007

Electromagnetic compatibility (EMC), Generic standards-
Emission standard for residential, commercial
and light-industrial environments

EN 61010-1: 2020

Safety Requirements for Electrical Equipment for
Measurement, Control and Laboratory use

Bad Dürkheim, 2021



Christian Schmidhuber
(General Manager)

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To ensure compliance of these actuators with the above directives, it is the responsibility of the specifier, purchaser, installer and user to observe the relevant specifications and limitations when taking the product into service. Details are available on request, and are mentioned in the Installation and Maintenance Instructions.

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To find out more about all our sales partners and subsidiaries please scan the QR code below or visit our website:

<https://www.ps-automation.com/locations/?lang=en>



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