

Operating Instructions PSF-M

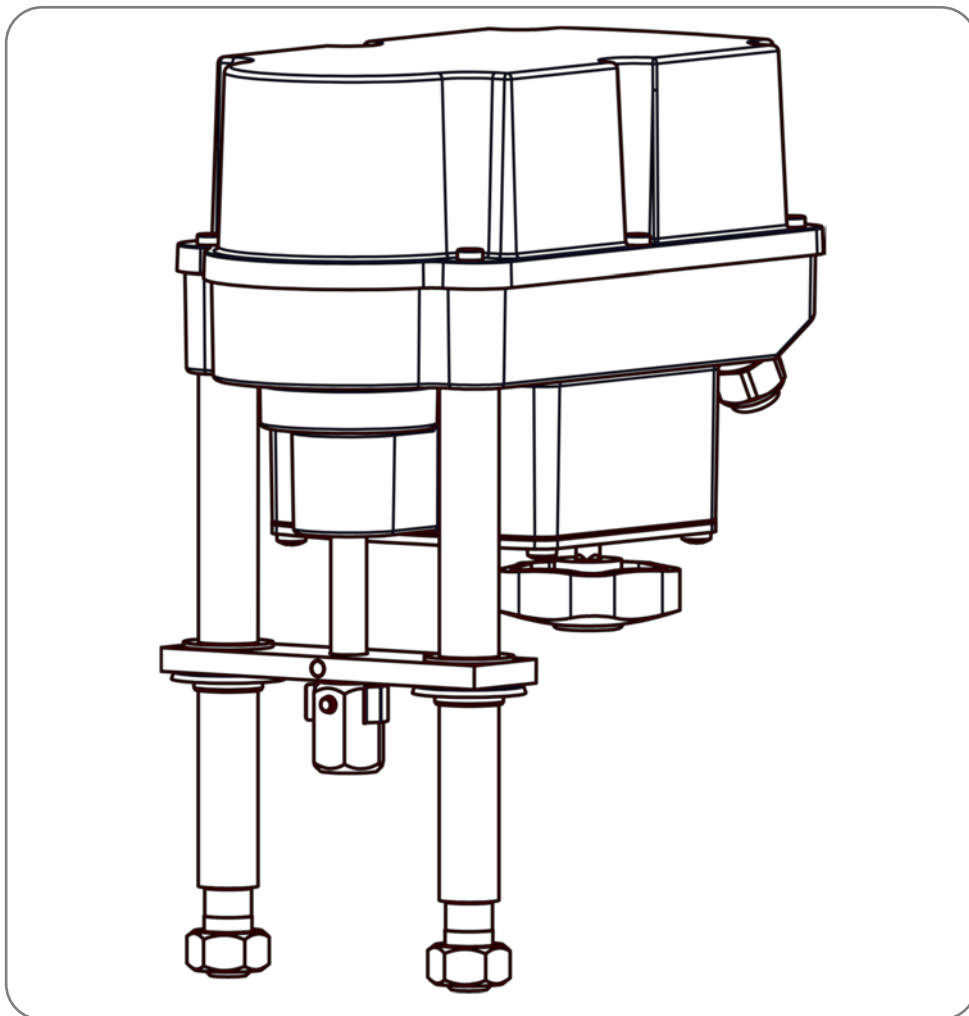
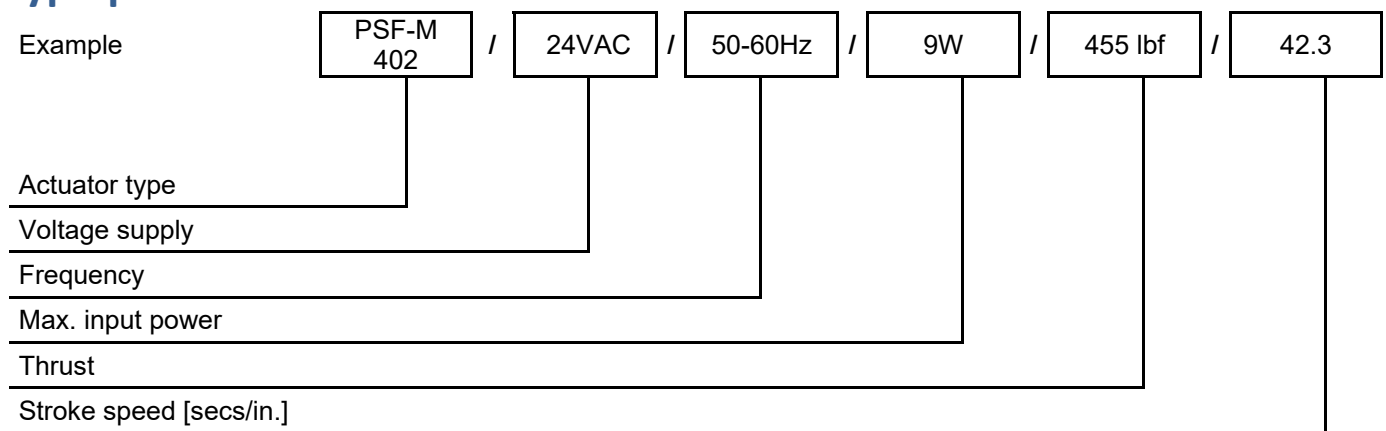


Table of contents

- Type plate..... 2
- 1. Symbols and safety 3
- 2. Usage as per specification..... 4
- 3. Storage 4
- 4. Operating conditions and installation position..... 4
- 5. Function 5
- 6. Manual operation 5
- 7. Valve mounting 6
 - 7.1 Valve mounting for cut-off by force at extended actuator stem..... 6
 - 7.2 Valve mounting for cut-off by force at retracted actuator stem..... 6
- 8. Cover removal 7
- 9. Electric supply 7
 - 9.1 Safety instructions 7
 - 9.2 Wiring diagram..... 8
- 10. Signals and functions 9
 - 10.1 DIP switch..... 9
 - 10.2 Operator push button 10
 - 10.3 Status display 11
 - 10.4 Auto-calibration 11
 - 10.5 Manual calibration 12
 - 10.6 Manual Operation..... 12
 - 10.6.1 Push buttons 12
 - 10.6.2 Handwheel 12
- 11. Operation 12
- 12. Commissioning 12
- 13. Maintenance 13
 - 13.1 Cleaning..... 13
 - 13.2 Spare parts 13
- 14. Decommissioning and disposal 13
- 15. Appendix 13
 - 15.1 Accessoires..... 13
 - 15.2 Declaration of incorporation of part completed machinery and EC declaration of conformity in compliance with the directives on EMC and low voltage 14

Type plate



1. Symbols and safety

General dangers of non-compliance with safety regulations

PSF-M 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 the chapter on "Safety" 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. 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.

Other notes

- The motor surface temperature may rise when maintaining, inspecting and repairing the actuator immediately after the operation. There is a danger of burning the skin!
- Always consult the relevant operating instructions when mounting PS 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-M 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.
- Supply voltage may only be switched on after the proper closure of the main cover or terminal box.

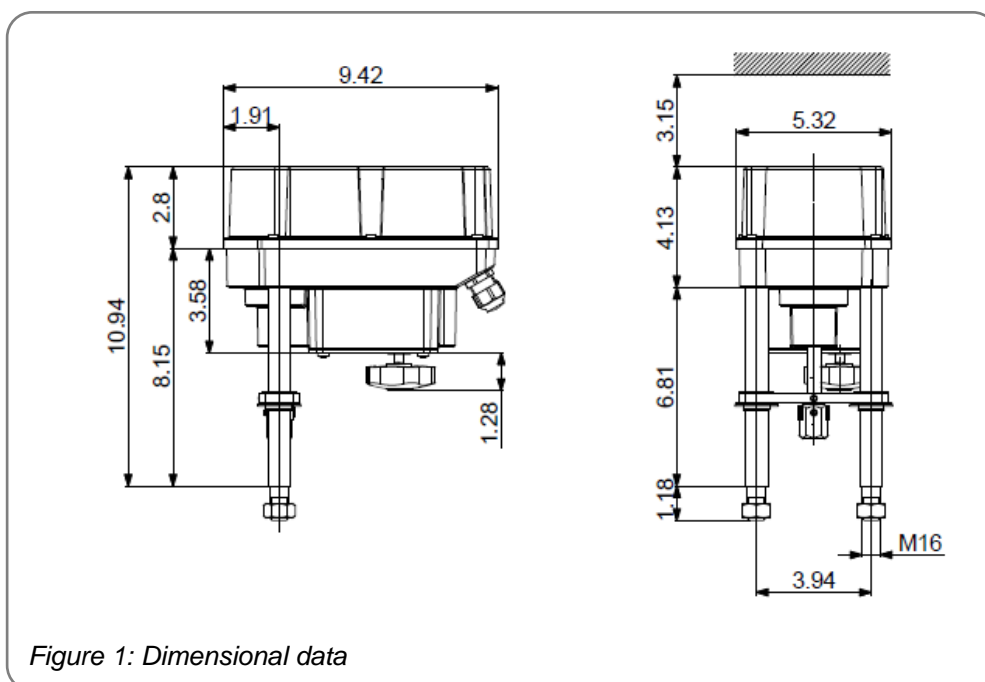
3. Storage

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

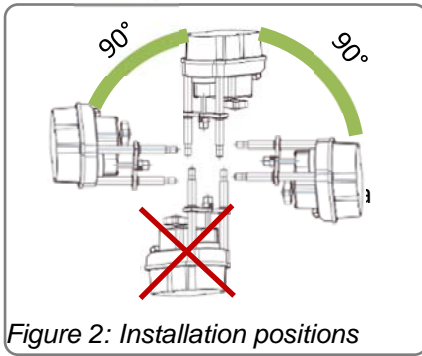
- Only store the actuators in ventilated, dry rooms.
- Store the actuators on shelves, wooden boards, etc., to protect them from soil moisture.
- Cover the actuators with plastic foil to protect them from dust and dirt.
- Protect the actuators against mechanical damage.

4. Operating conditions and installation position

- Standard actuators may be operated at ambient temperatures according to the 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 (Fig.1).
- The actuator can be installed vertically or horizontally or any position in between. The actuator must not be installed with the cover pointing downwards (Fig.2).



Installation position



Outdoor usage:



When using the actuators in environments with high temperature fluctuations or high humidity, we recommend heating resistor.

5. Function

The PSF-M actuators are designed as electric valve actuators with manual override. The actuator is mounted onto the valve via pillars. Depending on the type of valve used, mounting pillars or a special valve mounting base is required.

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 threaded stem. 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.

In case of mains power loss, a manual override of the actuators is possible using the handwheel.

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

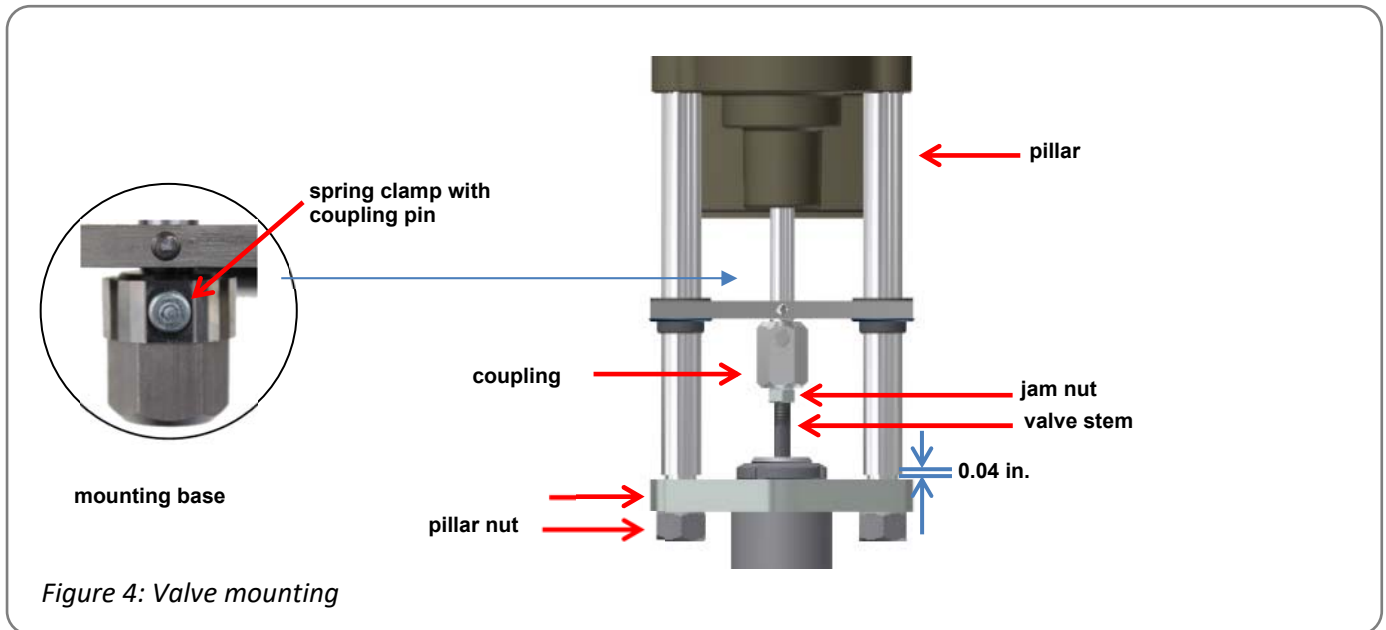
6. Manual operation



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 10.6).

Figure 3: Manual operation

7. Valve mounting



7.1 Valve mounting for cut-off by force at extended actuator stem

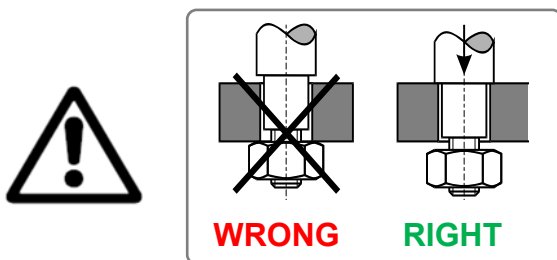
Initial position: Valve stem is retracted

1. Put actuator onto the mounting base.
2. Remove the coupling pin and screw the coupling 0.52 in. on the valve stem. There must be a 0.04 in. gap between the pillars and the mounting base.
3. Insert the coupling pin again and fix the jam nut.
4. Connect the actuator to electric supply (see 9.).
5. Retract the actuator spindle manually (see 10.6) until the edges of the pillars rest on the mounting base.
6. Screw and tighten the pillar nuts.

7.2 Valve mounting for cut-off by force at retracted actuator stem

Initial position: Valve stem is extended

1. Put actuator onto the mounting base, screw on and fix the pillar nuts.
2. Connect the actuator to electric supply (see chapter 9.).
3. Drive the actuator manually (see chapter 10.6) until the coupling rests on the valve stem.
4. Remove the spring clamp with the coupling pin and screw the coupling 0.52 in. on the valve stem.
5. Redrive the actuator manually (see chapter 10.6) until the spring clamp with the coupling pin can be re-inserted.



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

8. Cover removal



Open the cover only in a dry environment.



Attention! Observe precautions for handling.

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

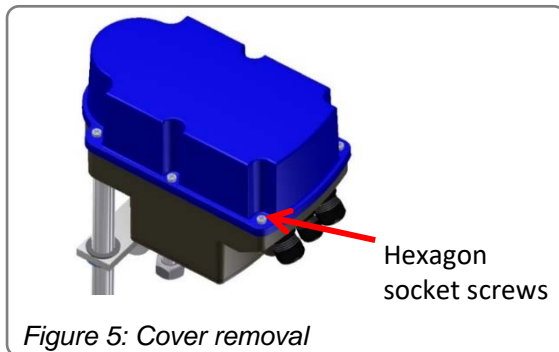


Figure 5: Cover removal

Open:

Loosen the 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 on the gear casing and press down slightly.

Tighten the screws gently and then crosswise.

9. Electric supply

9.1 Safety instructions



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

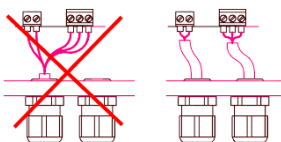
Remove the cover of the actuator in order to connect the electric supply (see 8.).

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-M 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 should be easily accessible for the user and shall be labelled as the mains isolator switch for the actuator.

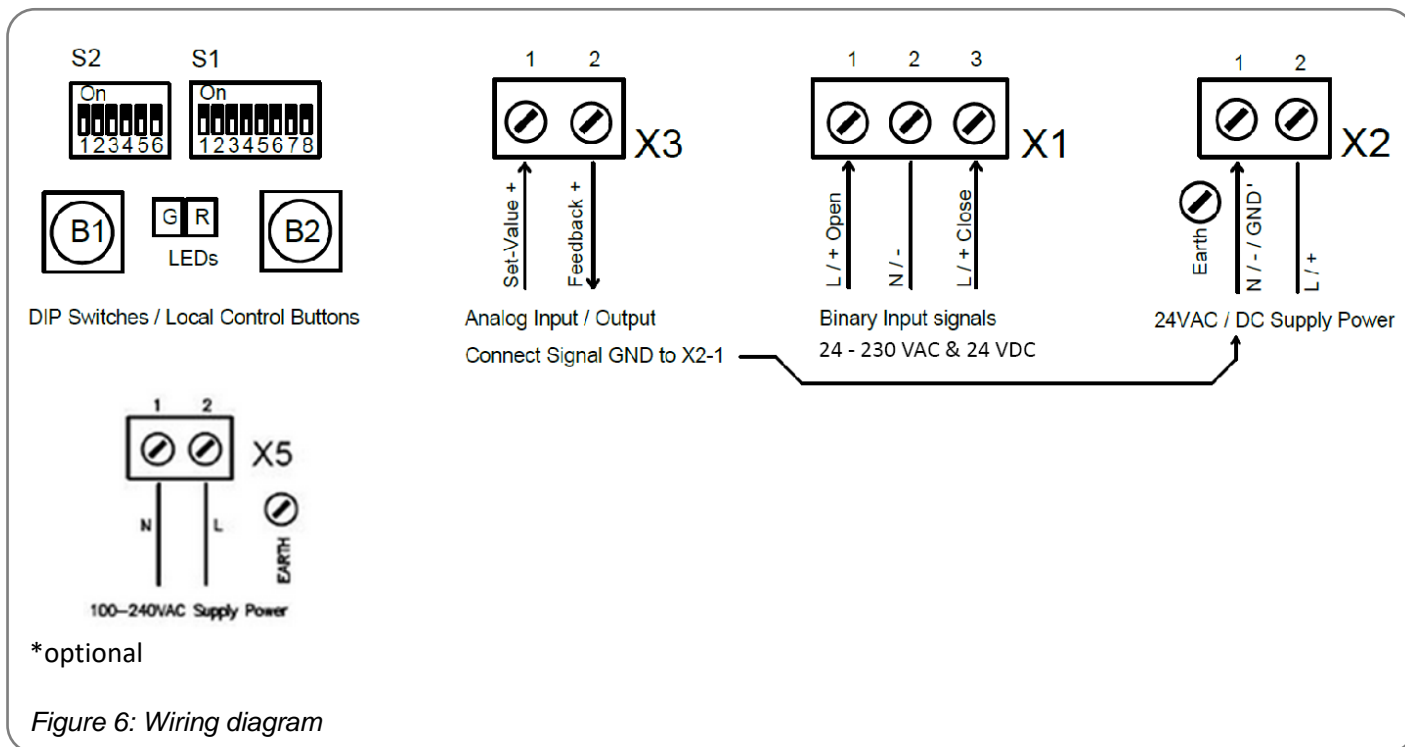
The building installation must also provide power surge trips or fuses corresponding to standard IEC 60364-4-41 with protection class I resp. protection class III (24 VAC / 24 VDC) for the actuator connections.




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 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.

10. Signals and functions

10.1 DIP switch

| S1 Function | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------------|----------------|-----|-----|-----|-------------------|-----|-----|-----|
| Signal | control signal | | | | 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 ²⁾ | 4 ²⁾ | 5 | 6 |
|------------------------------------------------------------|--------------------------------------------------|-----|-----------------|-----------------|-----|-----|
| Control via analogue control signal | | | | | | On |
| Control via binary inputs | | | | | | Off |
| Extend valve stem with increasing control signal | | | | | On | |
| Retract valve stem with increasing control signal | | | | | Off | |
| Auto- calibration | Close with force / Open with force ¹⁾ | | On | On | | |
| | Close with force / Open with 0.79 in. stroke | | On | Off | | |
| | Close with force / Open with 1.19 in. stroke | | Off | On | | |
| | Close with force / Open with 1.58 in. stroke | | Off | Off | | |
| Manual calibration | Close with force / Open with required stroke | | | On | On | |
| Control signal range / feedback signal: 0-10 V / 0-20 mA | | | On | | | |
| Control signal range / feedback signal: 2-10 V / 4-20 mA | | | Off | | | |
| Cut-off by force if actuator stem is in retracted position | | On | | | | |
| Cut-off by force if actuator stem is in extended position | | Off | | | | |

¹⁾ "Open with force" refers solely to auto-calibration. During operation the actuator will stop at the found position
-> see chapter 11. Operation

²⁾ 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 |
| Auto-calibration | 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 once | | Red or green LED is on |
| Manual calibration | 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 |
| Running speed | Set ¹⁾ | | Push 4 seconds | Green LED is on, red LED is flashing 100% 3x 75% 2x 50% 1x |
| | Change | | Push 1x to change the level | Green LED is on, red LED is flashing 100% 3x 75% 2x 50% 1x |
| | Accept | Push 1 x | | |

¹⁾ If there's no other action, the actuator will leave this set function after 15 minutes automatically and will not change the setting.

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 |
| Auto-calibration running | On | On |
| Automatic and manual calibration successful | Is flashing 7 x – 1.5 seconds off | On |
| Auto-calibration 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 |
| Control signal 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 |
| Operation by handwheel | Is flashing | Is flashing |

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

10.4 Auto-calibration

- Ensure secure connection between valve and actuator.
- **CAUTION!** To start the auto-calibration push button B2 for minimum 7 seconds. Pushing the button for only 4 sec. starts sequence „Set running speed“ (the button is assigned to two sequences).
 - 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” (0.79/1.19/1.58 in.), 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 control signal and the valve position.
- In case of unsuccessful commissioning the green LED is flashing quickly. Please check valve mounting.
- For commissioning, a remaining stroke of at least 0.04 in. 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 0.2 in.

10.5 Manual calibration

- 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 stroke-dependant valve position is reached.
- Start commissioning of both positions and store them by simultaneously pushing the buttons B1 and B2 for minimum 3 seconds. The actuator will drive to both end positions.
- 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 control signal and the valve position.
- In case of unsuccessful commissioning the green LED is flashing quickly. Please check valve mounting.
- For commissioning, a stroke of at least 0.04 in. 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 0.2 in.

10.6 Manual Operation

10.6.1 Push buttons

- 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.

10.6.2 Handwheel

- Push the handwheel towards the gear casing: the motor is deactivated.
- 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.

11. Operation

All internal parameters, like required motor torque, actual position, functional status, etc., are being permanently monitored during operation of the actuator PSF-M. 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 calibration. The actuator drives to the end position defined by force with a minimum shut-off window of 3%.

12. Commissioning



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!



- Open the cover (see chapter 8.), put the actuator on the valve (see chapter 7.), connect the electric supply (see chapter 9.).
- Perform automatic (see 10.4) or manual calibration (see 10.5).
- Close the cover.

13. 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.

13.1 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.

13.2 Spare parts

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

If you prefer repairs in-house, we can provide you with our price list for spare parts.

14. 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



According to 2012/19/EU on waste electrical and electronic equipment (WEEE), the devices described here must not be disposed of via municipal waste disposal companies.

If you are unable or unwilling to arrange for disposal 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.

15. Appendix

15.1 Accessoires

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 switches, mechanical | 2WE | 2 potential-free position switches, mechanical, with silver-plated changeover contacts 24 V to 230 V AC/DC @ 0.1 A – 5 A |
| | Position signal switches gold, mechanical | 2WE gold | 2 potential-free position switches, mechanical, with gold-plated changeover contacts 5 V to 30 V AC/DC @ 1 mA – 100 mA; contact resistance 30 mOhm |
| | Position signal relays | | 2 position signal relays with changeover contacts, calibrated automatically to valve stroke 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 | | For 100 - 240 VAC 1~ supply voltage |
| | Increased enclosure | IP | Increase of enclosure to IP67 |

15.2 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 to 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 to 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.

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