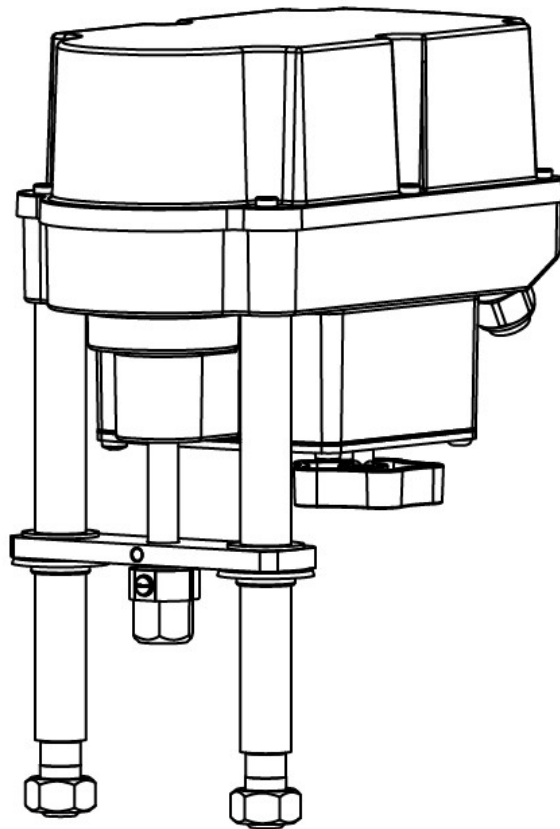


Operating Instructions



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Type key

Example	PSF-M 402	/	24VAC	/	50-60Hz	/	9W	/	2,0kN	/	0,33
Actuator type											
Voltage supply											
Frequency											
Max. input power											
Force											
Operating speed [mm/s]											

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.



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.

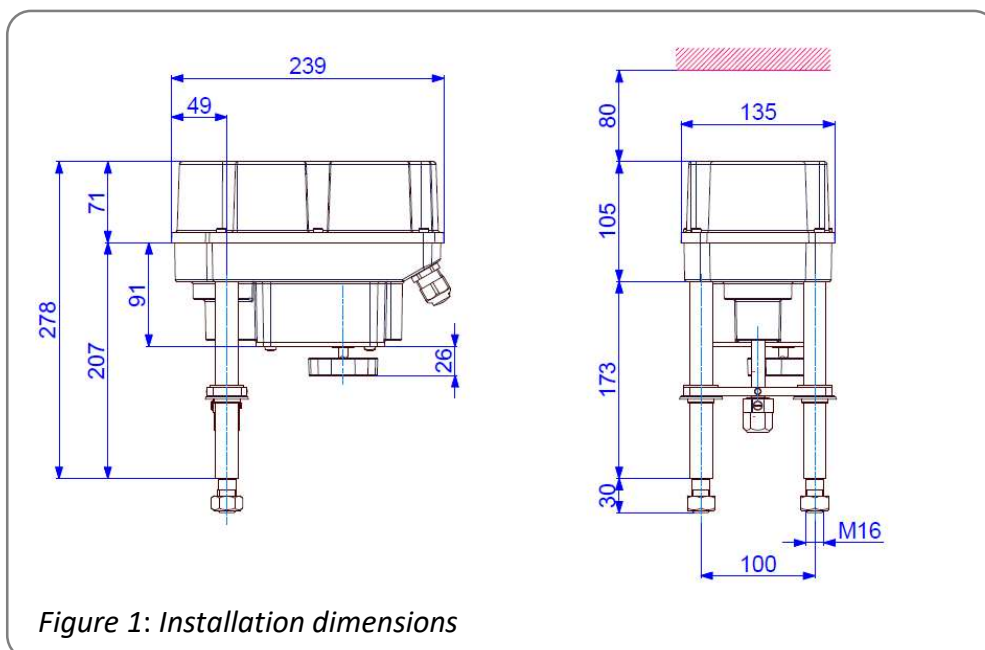
3. Storage

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

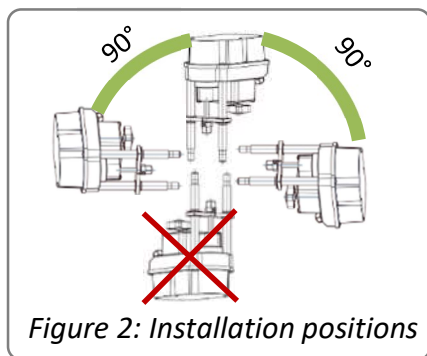
- Only store the actuators in ventilated, dry rooms.
- Store the actuators on shelves, wooden boards, etc., to protect them from soil moisture.
- Cover the actuators with plastic foil to protect them from dust and dirt.
- Protect the actuators against mechanical damage.

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 using a 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 bracket is required.

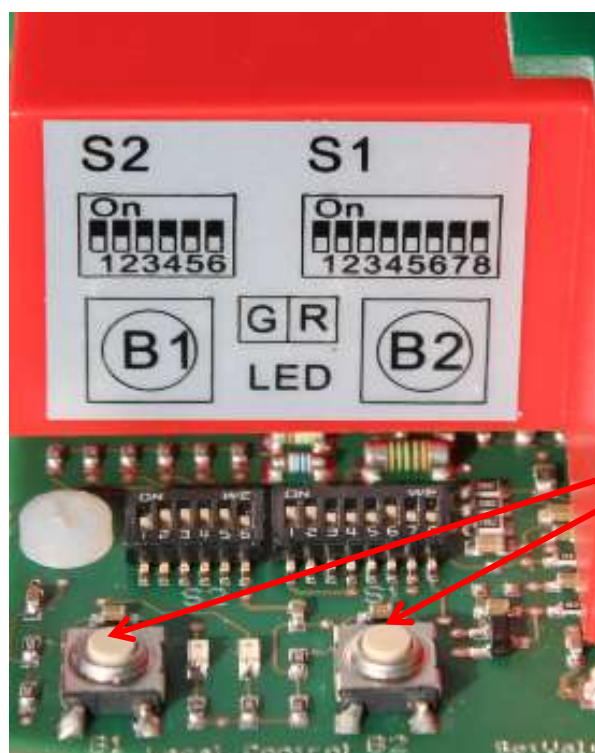
Based on a brushless DC motor (BLDC) the generated torque is transmitted via a multi-stage spur gear onto a spindle nut. The spindle nut transmits the input torque into an axial thrust force via a threaded stem. The linear stroke is transmitted to the valve spindle by a coupling piece.

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

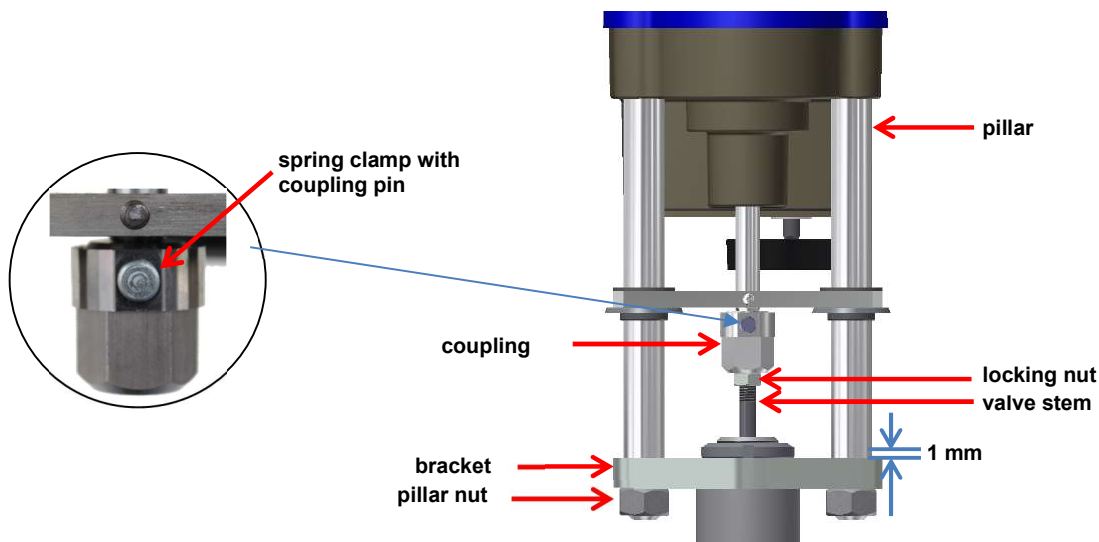


Figure 4: Valve mounting

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

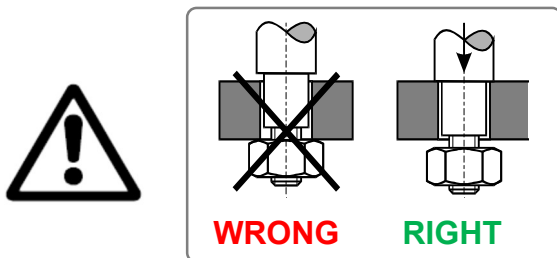
Initial position: Valve stem is retracted, actuator stem is extended.

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 9.).
5. Retract the actuator spindle manually (see 10.6) until the edges of the pillars rest on the bracket.
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, actuator stem is retracted.

1. Remove the spring clamp with the coupling pin and screw the coupling 13 mm on the valve stem.
2. Put actuator onto the bracket, make sure actuator stem is immersed into the coupling. Screw on and fix the pillar nuts.
3. Connect the actuator to electric supply (see chapter 9.), either electrically or with the handwheel and drive the actuator manually (see chapter 10.6) until the spring clam with the coupling pin is ready to be re-inserted.



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 and closing the cover

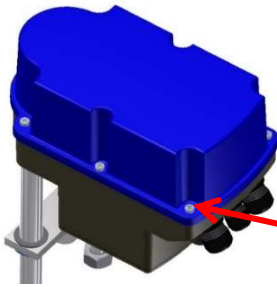


Open the cover only in a dry environment.



Attention! Observe precautions for handling.

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



Hexagon
socket screws

Figure 5: Removing and closing the cover

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.

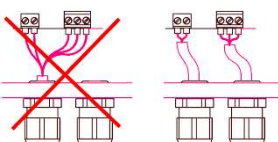
Remove the cover of the actuator in order to connect the electric supply (see 8.).

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.

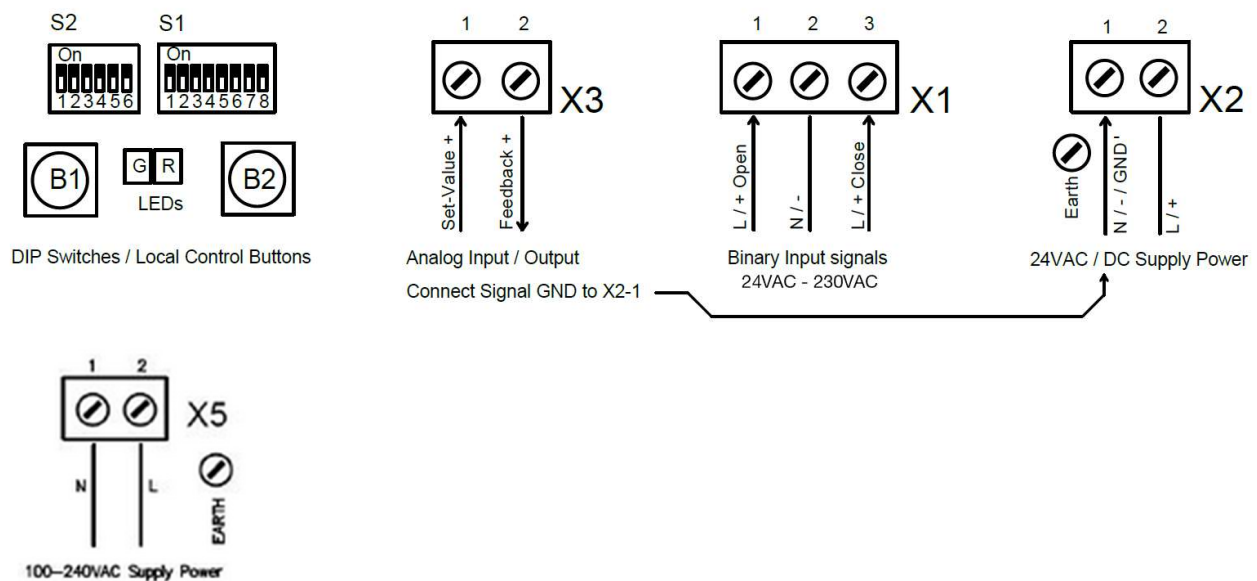
The building installation must also provide power surge trips or fuses corresponding to standard IEC 60364-4-41 with protection class I resp. protection class III (24 VAC / 24 VDC) for the actuator connections.



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.



*optional

Figure 6: Wiring diagram



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. Signalisation and 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 ²⁾	4 ²⁾	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 force ¹⁾						On	On		
	Close with force / Open with 20 mm stroke						On	Off		
	Close with force / Open with 30 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 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 automatic commissioning. 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
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 once		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
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
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
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 Automatic commissioning

- Ensure secure connection between valve and actuator.
- **CAUTION!** To start the automatic commissioning 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” (20/30/40 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. Please check valve mounting.
- For commissioning, a remaining 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.

10.5 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 stroke-dependent 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 set value 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 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.

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 commissioning. The actuator drives to the end position defined by force with a minimum shut-off window of 3%.

12. 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 chapter 10.4) or manual commissioning (see chapter 10.5).
- 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!

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

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



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.

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 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.

15.3 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 to 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 to 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

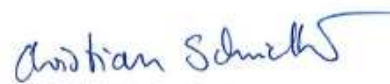
EN 61000-6-3: 2007

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

EN 61010-1: 2020

Safety Requirements for Electrical Equipment for
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Bad Dürkheim, 2021


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Our representatives

Italy

PS Automazione S.r.l.
Via Pennella, 94
I-38057 Pergine Valsugana (TN)
Tel.: <+39> 04 61-53 43 67
Fax: <+39> 04 61-50 48 62
E-mail: info@ps-automazione.it

India

PS Automation India Pvt. Ltd.
Srv. No. 25/1, Narhe Industrial Area,
A.P. Narhegaon, Tal. Haveli, Dist.
IND-411041 Pune
Tel.: <+ 91> 20 25 47 39 66
Fax : <+ 91> 20 25 47 39 66
E-mail : sales@ps-automation.in
www.ps-automation.in

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>



PS Automation GmbH

Philipp-Krämer-Ring 13
D-67098 Bad Dürkheim
Tel.: +49 (0) 6322 94980-0
E-mail: info@ps-automation.com
www.ps-automation.com

