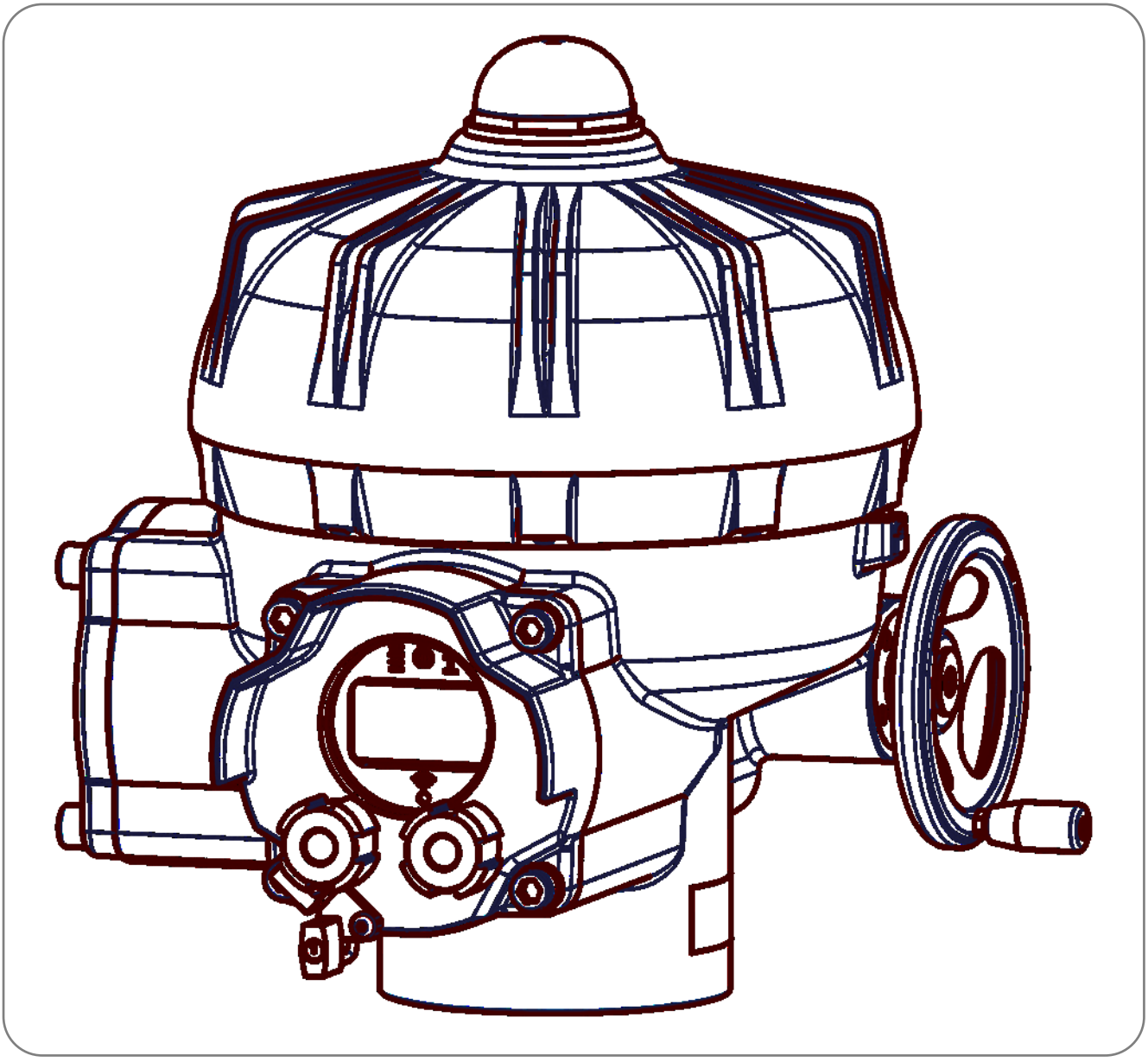
# Operating Instructions



*Subject to changes!*

Version 2025/06/23 Art. No.: 8035992 ©2025 PS Automation GmbH

# Contents

# 1. Product description

The actuator PSQ-S-EX is an industrial, multifunctional modulating actuator with fail-safe function for the operation of industrial valves of various types across a wide range of applications. The actuator is designed for assembly with valves and their motor operation. The actuator is designed for assembly with valves and their motor operation.

It is used as an electric valve actuator in hazardous areas of
device category II 2G (Ex zone 1, Ex d e, device protection level Gb) or
device category II 2D (Ex zone 21, device protection level Db) installed in a fixed position using mounting columns.

A position indicator on the cover shows the current position of the actuator.
Parameterisation of the actuator is possible in the **safe range** by cable or with mobile WiFi solutions suitable for the area. To protect against environmental influences, the cover and lower section are powder-coated. Conduit entries are available in the lower section of the housing for inserting the electrical cables.

The construction, as well as the interaction of the individual components and the housing regarding their suitability for use in hazardous areas, are tested by PS Automation GmbH and confirmed by the identification with the type label.

The actuator PS-AMS PSQ-S-EX essentially consists of:

- the flange
- the plug-in coupling
- the housing section
- the mechanical section is located in the lower section of the housing (mounting plate)
- the Ex d terminal compartment is located in the upper section of the housing (underneath the cover hood)
- the Ex e/ t terminal compartment is located on the side of the actuator and consists of the lower part of the housing (mounting plate) with terminal compartment and the terminal compartment cover
- with conduit entries
- with connection panel for the electrical connections (electrical connection compartment)
- with Ex d motor control housing

# 2. Applicable standards

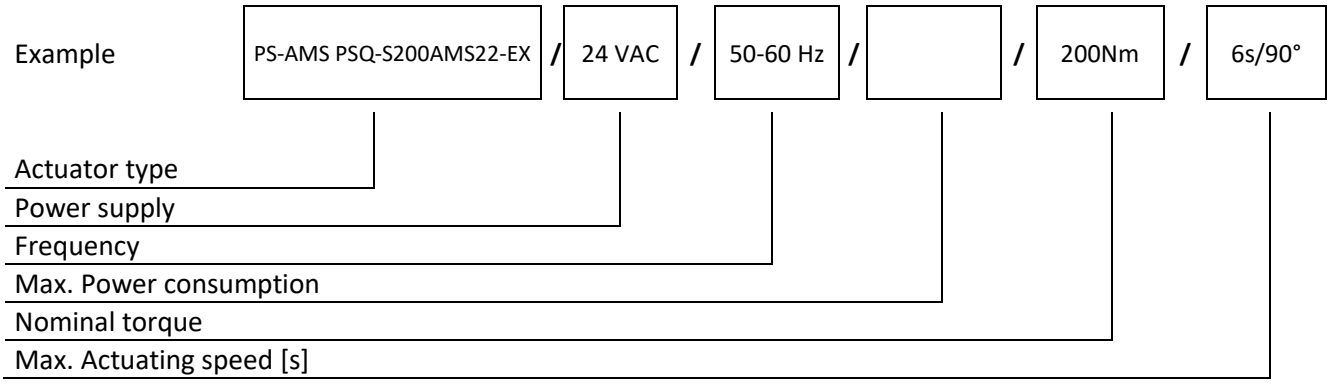
| | |
|---|---|
| IEC 61000-6-2 | Electromagnetic compatibility (EMC),<br>Generic standard - Immunity standard for industrial environments |
| IEC 61000-6-3 | Electromagnetic compatibility (EMC),<br>Generic standard - Emission standard for equipment in residential environments |
| IEC 61010-1 | safety requirements for electrical equipment used in measurement,<br>control, and laboratory environments. |
| IEC 301 489-1 V2.1.1 | Electromagnetic Compatibility (EMC)<br>standard for radio equipment and services - part 1 |
| IEC 301 489-17 V3.1.1 | Electromagnetic Compatibility (EMC)<br>standard for radio equipment and services - part 17 |
| IEC 300 328 V2.1.1 | Wideband transmission systems - Data transmission equipment operating in the 2,4 GHz band - Harmonised Standard for access to radio spectrum |
| IEC 60079-0 | General requirements |
| IEC 60079-7 | Equipment protection by increased safety “e" |
| IEC 60079-1 | Equipment protection by flameproof enclosures “d" |

# 3. Characteristics

| | | |
|---|---|---|
| Device category | II 2G \| II 2D | |
| IECEx CoC | IECEx BKI 25.0010X | |
| Ex marking | Ex db eb IIC T6 Gb<br>Ex db eb IIC T4 Gb<br>Ex tb IIIC T72 °C Db<br>Ex tb IIIC T104 °C Db | oder<br>bzw.<br>oder |
| Housing size | ca. 480x345x375mm (BxLxH)<br>(Ex e / Ex t housing) | |
| Torque | Depending on variant | |
| Operating speed 90° | 60 – 200Nm: 6-20s/90° | |
| Angle | 90° | |
| Nominal voltage | 24VAC/DC – 575VAC (depending on variant) | |
| Rated current | | |
| Fuse:<br>(only ati 100 – 240VAC power supply; mounted internally) | | |
| External housing material: | | |
| Surface treatment | Powder-coated (see marking X) | |
| Ambient temperature range<br>extended | -20 °C ≤ Ta ≤ 40 °C<br>-20 °C ≤ Ta ≤ 60 °C | |
| Temperature class | T6 (at Ta +40 °C) / T4 (at Ta +60 °C) | |
| Max. surface temperature | 80 °C (bei Ta +40 °C) /<br>100 °C (bei Ta +60 °C) | |
| IP-protection rating | ≥IP64 | |

### 3.1 Type key

**PS-PSQ-S-***-AMS22-EX**




# 4. Symbols and safety

## General Dangers of Non-compliance with Safety Regulations

PS-AMS PSQ-S-EX actuators are built to 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 at least 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.
- Before opening the actuator cover, ensure that the main supply is isolated and prevented from unintended re-connection.
- 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.

**Caution!** 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.

## 5. Usage as per specification

- The type PS-AMS PSQ-S-EX actuator is a fixed installed device for use in Ex zone 1, 2, 21 or 22. The type PSF-EX actuator is not suitable for use in Zone 0 and Zone 20.
- The type PS-AMS PSQ-S-EX actuator is not suitable for use in Zone 0 and Zone 20.
- The electrical data shown on the type plate as well as the unit category for the place of use must be observed.
- The operator of an electrical system in a potentially explosive atmosphere must keep the equipment in proper condition, operate it properly, monitor it and carry out maintenance and repair work. See also IEC 60079-17 / IEC 60079-19.
- The PSF-Q-M-EX actuators are constructed exclusively for use as electronic valve actuators. They are designed for assembly with valves and their motorised operation.
- Any other use is considered to be non-compliant. 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!
- Mounting and adjustment of the actuator as well as its maintenance are not considered as intended use. Enhanced safety precautions must be implemented in such situations.
- Damages caused by unauthorized modifications carried out on the actuators are excluded from the manufacturer's liability.

### 5.1 Special conditions

- To avoid critical electrostatic charges, the devices must not be installed in the vicinity of highly charge-generating processes.
- The devices are only cleaned with damp or antistatic fabric.
- The length of the flameproof joints is partly larger and the distances of the flameproof joints is partly smaller than the values of table 3 for IIC of IEC 60079-1:2014 Information regarding the dimensions of the flameproof joints can be obtained from the manufacturer.
- The fastening screws of flameproof enclosure parts must have a yield strength of at least 640 N/mm².

## 6. 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 floor moisture.
- Cover the actuators with plastic foil to protect them from dust and dirt.
- Protect the actuators against mechanical damage.

## 7. Operating conditions

- When setting up and operating explosion-protected electrical equipment, care must be taken to ensure protection against harmful environmental influences that restrict the intended use of the equipment. These can be, for example, protection against aggressive liquids or climatic influences. During installation, observe EN IEC 60079-14 and other applicable national standards and regulations at the place of installation.
- The information on the type plate and the applicable documents must be taken into consideration.
- For cable entries with special installation conditions, (see „X“ marking on the cable entry), the relevant instructions given by the manufacturer must be followed.
- The actuators can be operated in the explosion-proof version at ambient temperatures according to the data sheet.
- The duty cycles are according to IEC 60034-1, 8: S2 for short-time duty and S4 for modulating operation (for actuator-specific values, see actuator-specific data sheets).
- For protection against moisture and dust, the enclosure rating is IP65 according to IEC 60529.

## 8. Function

The PS-AMS PSQ-S-EX electrical quarter-turn actuator is designed for the actuation of quarter-turn valves.
The rotary movement of the output drive is detected by a contactless, absolutely encoded sensor system and electronically evaluated. The powerful and energy-efficient brushless DC is regulated and monitored by the electronics. Its torque is transferred to the output drive via compact multi-stage planetary gear.
The torque of the actuator is electronically monitored and limited.
The valve position is indicated by a contactless mechanical position indication in the cover of the quarter-turn actuator.

# 9. Mechanical assembly

## 9.1 Mounting the manual override

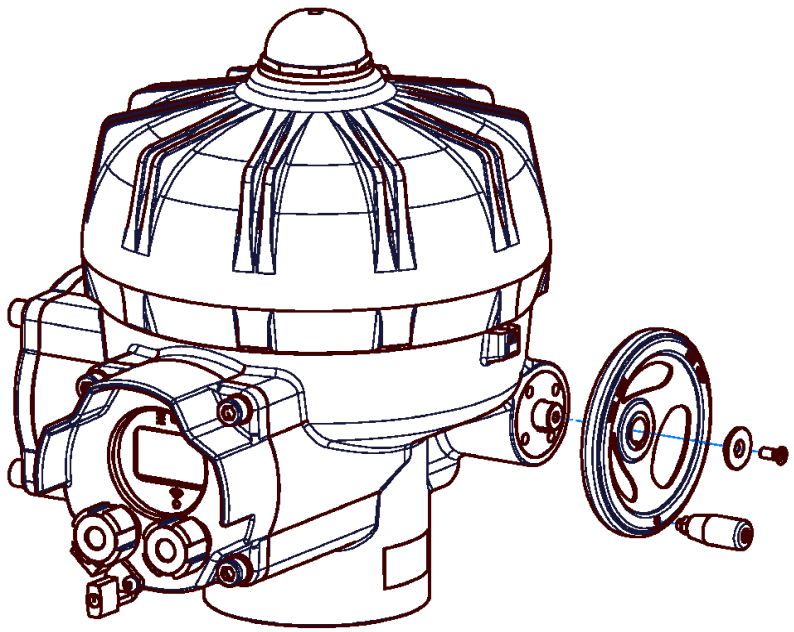


*Figure 1 : Mounting the handwheel*

## 9.2 Installation positions

The actuator may be installed in any orientation.

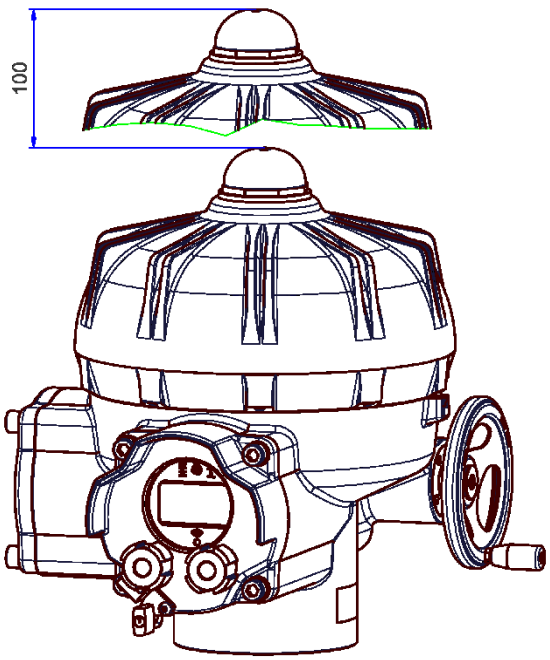



*Figure 2 : Space required to remove the cover*

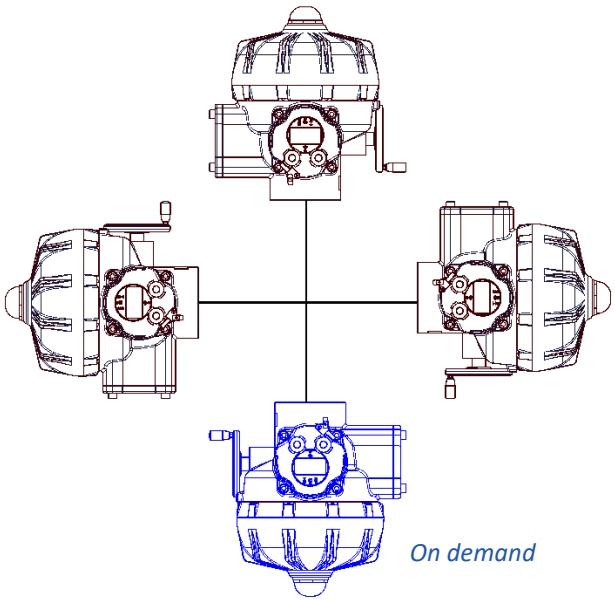



*Figure 3 : Installation positions*

## 9.3 Valve mounting

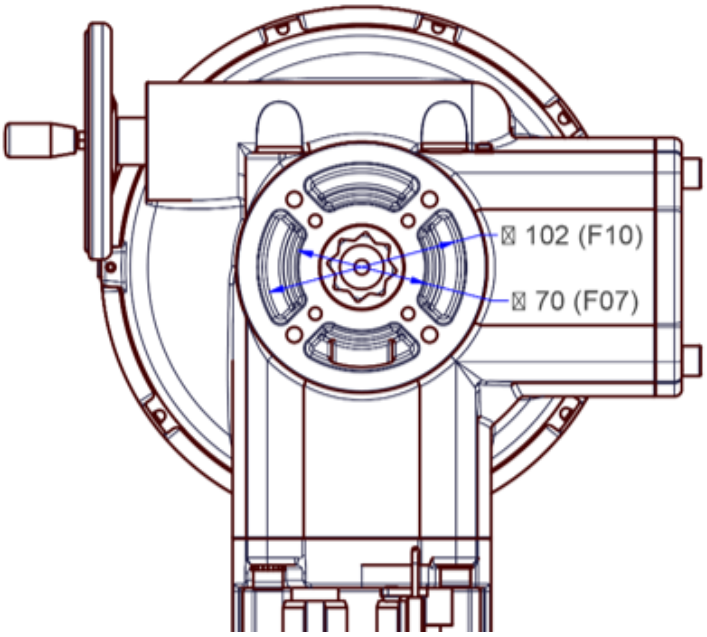



*Figure 4: Mechanical interface*

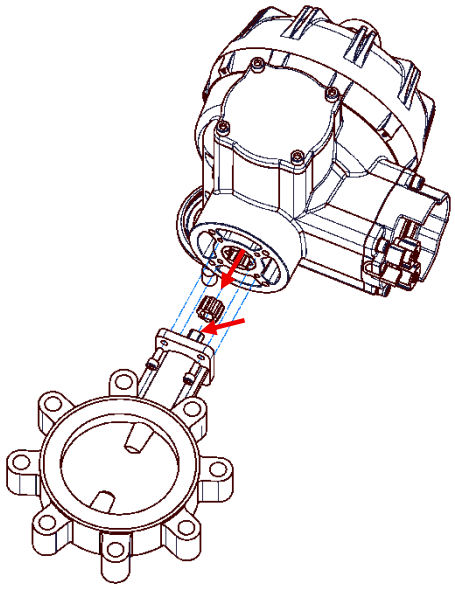


*Figure 5 : Valve mounting*

The PSF-Q actuators are designed with a mechanical interface for valve mounting according to ISO 5211. The gear does contain a double square SW22 to connect the actuator to the valve shaft.

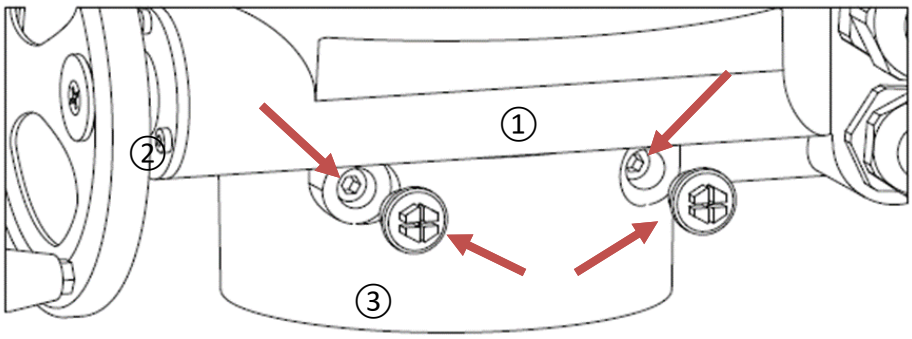
- Check if the actuator flange suits the valve flange.
- Check whether the plug-in coupling of the actuator matches the design of the valve shaft. If necessary, commercially available adapters can be used to adapt to the valve shaft.
- Connect the actuator electrically (see 10.).
- Position the actuator electrically by means of manual operation (see 12.1) so that it matches the position of the valve.
- Clean the surface of the connection components, lubricate valve shaft slightly.
- Attach the actuator to the fitting and fasten it. Tighten the screws in a diagonal sequence according to the required torque.

## 9.4 Setting the mechanical stop

Shown is the adjustment of a mechanical stop in closing direction for a valve closing clockwise.

**When adjusting the mechanical end stops, the actuator shall be actuated only with the handwheel (not electrically).**

- Remove the protective caps (*fig. 6; item 3*) from the two adjusting screws.
- Unscrew both hexagon sockets anti-clockwise by approximately 5 turns.
- Move the actuator to the closed position by turning the handwheel clockwise.
- Turn stop screw for closed position (*fig. 6*; *item 1*) to the stop.
- Move the actuator to the open position by turning the handwheel clockwise.
- Turn stop screw for open position (*fig. 6*; *item 2*) to the stop.
- Refit the screw plugs.




Item 1: Allen screw for CLOSED position

Item 2: Allen screw for OPEN position

Item 3: protective caps

*Figure 4 : Mechanical stop*

# 10. Electric supply

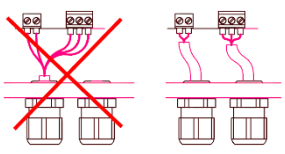
## 10.1 Safety Note

The cover of the electrical connection must be opened for electrical connection.

**During the connection of the mains voltage, this must be disconnected and secured against unintended reactivation!**

- Electrical connections shall be implemented only by an electrician and in compliance with DGUV regulation 3 [German accident prevention regulations]!
- Observe IEC 60204-1 (VDE 0113 part 1) to ensure human safety, integrity of the assets as well as the proper functioning of the unit.
- The mains connecting cables must be suitably dimensioned to accept the maximum current requirement of the actuator. The yellow-green coloured cables may only be used for connecting to earth. When leading wires through the cable glands on the actuator, their minimum bending radius has to be considered.
- The PS-AMS PSQ-S-EX electric actuators do not have an internal electrical power switch. Therefore, a power mains switch has to be provided for installation. It should be installed close to the actuator and should be easy to access for the user. It is important to mark the circuit breaker as this actuator‘s isolator.
- The building installation must provide over-current protection devices according to DIN VDE 0100-430 / IEC 60364-4-43. Protective measures against electric shock must be implemented in accordance with DIN VDE 0100-410 / IEC 60364-4-41 for the connection of actuators of protection class I or protection class III at 24 VAC / 24 VDC.
- All mains connection lines and control lines must be mechanically secured ahead of the terminals with suitable measures to prevent unintentional loosening. Never install the power supply and the control cables together in one line but instead please always use two different lines.
- The connection to the terminal block is specified by the manufacturer. Strip the insulation from the conductors over a length of 8 mm … 10 mm. Flexible conductors can be fitted with ferrules. Crimp the wire end ferrules using a crimping pliers and ensure that the test requirements are in accordance with DIN 46228 Part 4. The length of the copper sleeves must correspond to the specified stripping length of the conductors. Rigid or flexible conductors with ferrules can be connected directly without tools. Insert the conductor into the terminal's connection opening up to the stop. For small conductor cross-sections and flexible conductors without ferrules, open the clamping point before inserting the conductor. For this, use a flat-blade screwdriver (recommended tool, see accessories) to press down the integrated actuating push button.

When closing the cover, make sure that no cables are crushed between the housing and the cover.



**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.**

## 10.2 Electrical connection PE

**PE earth connection has to be connected to gear casing at the marked position PE!**

**The connection for equipotential bonding is made at the external equipotential bonding connection of the actuator. (see fig. *5*).**

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

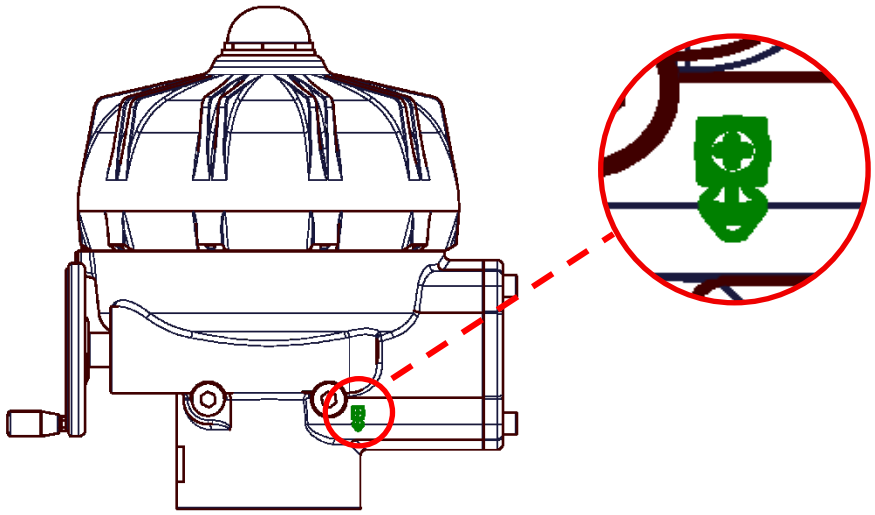


*Figure 5 : Electrical connection PE*

## 10.3 Connecting mains

Attention: Mains voltage, mains frequency and available power must be compliant with the data on the name plate!

### 10.3.1 Connection to terminals on the control board of the actuator

#### 10.3.2 Connection diagram

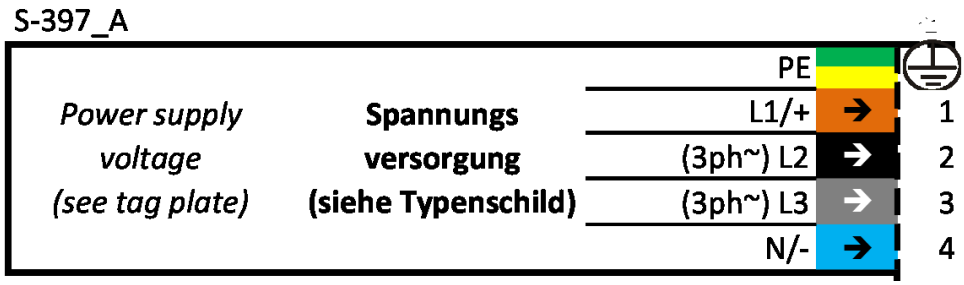



*Figure 6 : Wiring diagram*

Connect power supply 24 V AC/DC to terminals 1(+) and 4(-)
Power supply Connect 100-240 VAC 1~ to terminals 1(L1) and 4(N)
Power supply Connect 180-500 VAC 3~ to terminals 1(L1) , 2(L2), 3(L3)

Two phases of the power supply must be connected to the power supply unit to distribute the mains load. Unused cables must be isolated.

#### 10.3.2.1 Power supply 24 V AC/DC

Connection to the control board with reverse polarity protection integrated.

#### 10.3.2.2 Supply voltage 100-240 VAC 1~ (optional)

Connection to the wide-range power converter unit for 1~ AC
Power supply  Connect 100-240 VAC 1~ to terminals 1(L1) and 4(N).

#### 10.3.2.3 Supply voltage 180-500 VAC 3~ (optional)

Connection to the wide-range power converter unit for 3~ AC
Power supply  Connect 180-500 VAC 3~ to terminals 1(L1) , 2(L2), 3(L3).

## 10.4 Close the cover

Screw on the cover up to the stop, then turn it back slightly until the grub screw fits exactly into the hole and secure it with the marked grub screw.

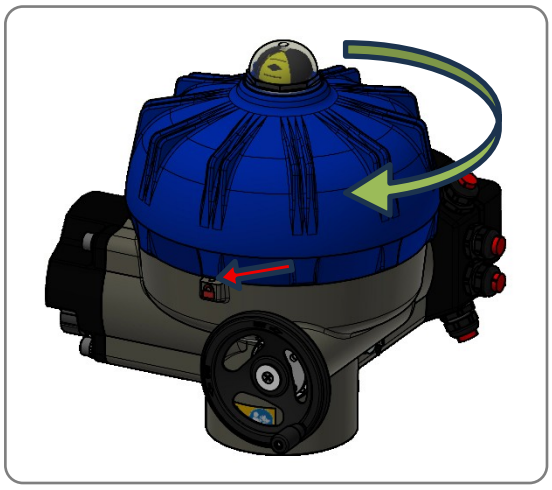


*Figure 7 : Close the cover*

### 10.4.1 Electrical connection diagram

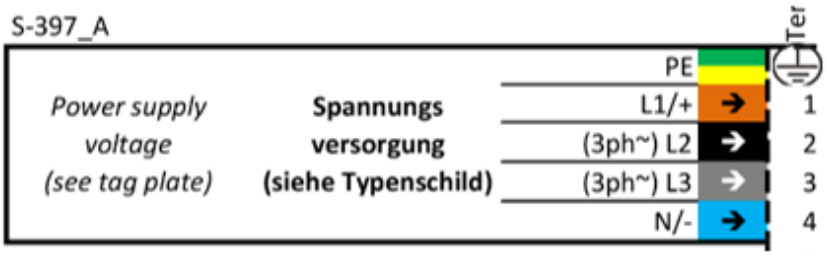



*Figure 10 : Connection diagram*

Connect the 24 V AC/DC power supply to terminals 1(+) and 4(-)
Connect the 100-240 VAC 1~ power supply to terminals 1(L1) and 4(N)
Connect the 180-500 VAC 3~ power supply to terminals 1(L1) , 2(L2), 3(L3)

Two different phases can be connected to the power supply unit to distribute the mains load. Unused cables must be insulated.

#### 10.4.1.1 Power supply 100-240 VAC 1~ (optional)

Connection to upstream wide-range power supply unit for 1~ AC voltage
Connect 100-240 VAC 1~ power supply to terminals 1(L1) and 4(N)

#### 10.4.1.2 Power supply 180-500 VAC 3~ (optional)

Connection to upstream wide-range power supply unit for 3~ AC voltage
Connect power supply 180-500 VAC 3~ to terminals 1(L1) , 2(L2), 3(L3)

*Figure 10: Connection 180-500 VAC 3~*

## 10.5 Interfaces

### 10.5.1 Inputs with galvanic isolation

#### 10.5.1.1 Analogue Set value A

Connection of the parameterisable set value A as position set value, range 0 (4)-20 mA or 0 (2)-10 V.


#### 10.5.1.2 Analogue Set value B

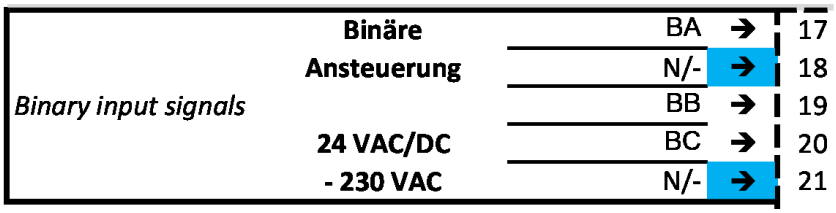
Connection of the parameterisable set value B, output from a process sensor as process actual value for use with PSIC or as set value for the speed controller, range 0 (4) -20 mA or 0 (2)-10 V.


#### 10.5.1.3 Binary input ports BA / BB / BC

The actuator has galvanically isolated binary multi-voltage input ports, BA/BB have a common neutral line connection COM. BC is galvanically isolated from BA/BB.

If a voltage is present at a binary port, the system drives to the parameterised corresponding position regardless of the analogue or digital set value applied.

Prioritisation is from BA (highest priority) to BC (lowest priority).). Exception when parametrizing BA PWM.




#### 10.5.1.4 Fieldbus interface (optional)

A fieldbus interface is available as an option for the PS-AMS PSQ-S actuators. If you have any questions, please contact your PS Automation representative.

### 10.5.2 Outputs with galvanic isolation

#### 10.5.2.1 Analogue Position Feedback

Connection of the parameterisable position feedback, range 0 (4)-20 mA or 0 (2)-10 V.

### 10.5.2.2 Auxiliary voltage output (optional)

This output provides a regulated voltage of 24 VDC max. 42mA, e.g. for the direct supply of binary signal inputs.

| | | | |
|---|---|---|---|
| *auxiliary voltage output* | **Hilfs -Spg. Ausgang** | + ← | 15 |
| | | - ← | 16 |

### 10.5.2.3 Potential-free position signal switches (optional)

For PS-AMS PSQ-S-EX, two potential-free limit switches for position feedback are factory-fitted as an option available:

| | | |
|---|---|---|
| Position Signal Switches | 2WE | Potential-free position signal switches with silver contacts (0,1 A - 5 A Schaltstrom) |
| Position Signal Switches Gold | 2WE Gold | Potential-free additional position switches with gold contacts (0,1 mA - 100 mA switching current) |

Connection goes to terminal X6 or terminals 22/27/28 and 23/29/30 in case of wiring to the terminal box.

| | | | |
|---|---|---|---|
| *Position switch CCW* | **Wegschalter CCW** | COM ←→ | 7 |
| | | NO ←→ | 8 |
| | | NC ←→ | 9 |
| *Position switch CW* | **Wegschalter CW** | COM ←→ | 10 |
| | | NO ←→ | 11 |
| | | NC ←→ | 12 |

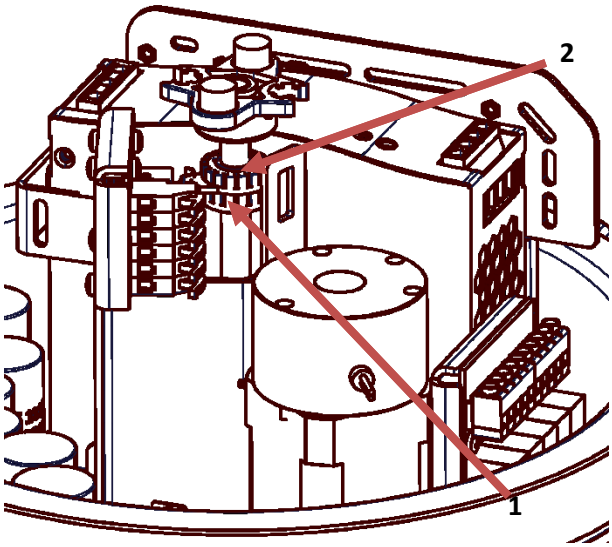
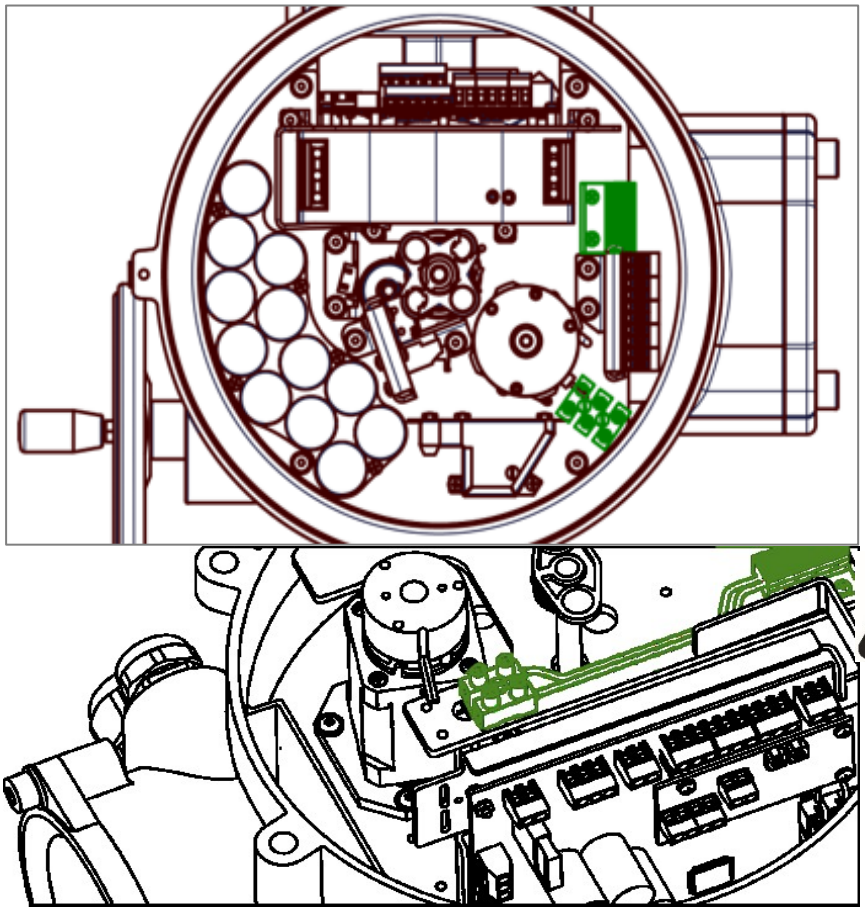



*Figure 81 : Adjusting of the cams*

The switching cams for activating the position switches are mounted on the switching shaft by means of a friction clutch. They can be adjusted with a flat-blade screwdriver, using the metal bracket as a counter bearing. At actuators closing clockwise, the lower cam (1) activates the switch for closing direction, the upper cam (2) for opening direction.

### 10.5.2.4 Heating resistor (optional)

The PS-AMS PSQ-S-EX actuators can be equipped with an optional heating resistor. Recommended for outdoor installations, with severely fluctuating ambient temperature or high levels of humidity in order to prevent condensation in the interior of the actuator.

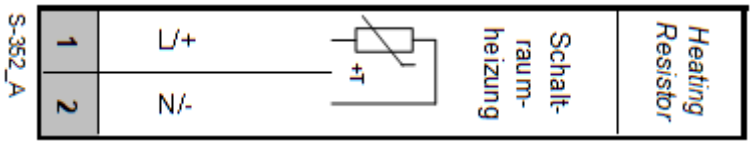


The supply voltage for the heating resistor must be fed to a separate terminal. The heating resistor is available for 110 V - 230 V and for 24 V.

Mounting of the heating resistor has to be made to the indicated place on the base plate by using the screws provided.

**Route the cables in a way to prevent them from being squashed by the main cover, and from being touched by moving parts inside the actuator.**

*Figure 92 : Mounting and connection of the heating resistor*




NTC heating resistor to prevent condensation

| | | | |
|---|---|---|---|
| *Heating* | **Schaltraum-** | L/+ → | 13 |
| *Resistor* | **heizung** | N/- → | 14 |
| *auxiliary voltage* | **Hilfs -Spg.** | + ← | 15 |
| *output* | **Ausgang** | - ← | 16 |

### 10.5.2.5 Potential-free Signal relays with changeover contact 1-5 (optional)

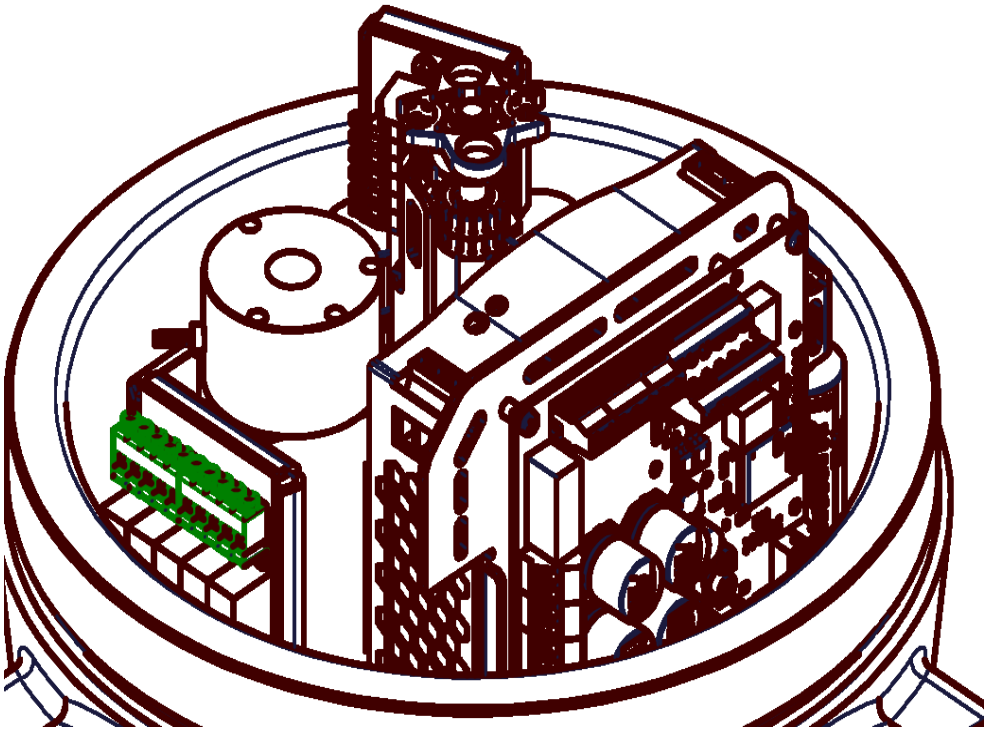


*Figure 103: Relays*

Connection for parameterisable feedback information, range 24 V AC/DC @ 0.1 A - 1 A.

| | | | |
|---|---|---|---|
| *relay 1* | **Relais 1** | COM | 33 |
| | | NO | 34 |
| *relay 2* | **Relais 2** | COM | 35 |
| | | NO | 36 |
| *relay 3* | **Relais 3** | COM | 37 |
| | | NO | 38 |
| *relay 4* | **Relais 4** | COM | 39 |
| | | NO | 40 |
| *relay 5* | **Relais 5** | COM | 41 |
| | | NO | 42 |

#### 10.5.2.6 Communication Interface

The actuator has a TTL communication interface, enabling communication with the actuator via the AMS.2-USB communication cable and the PSCS.2 communication software.

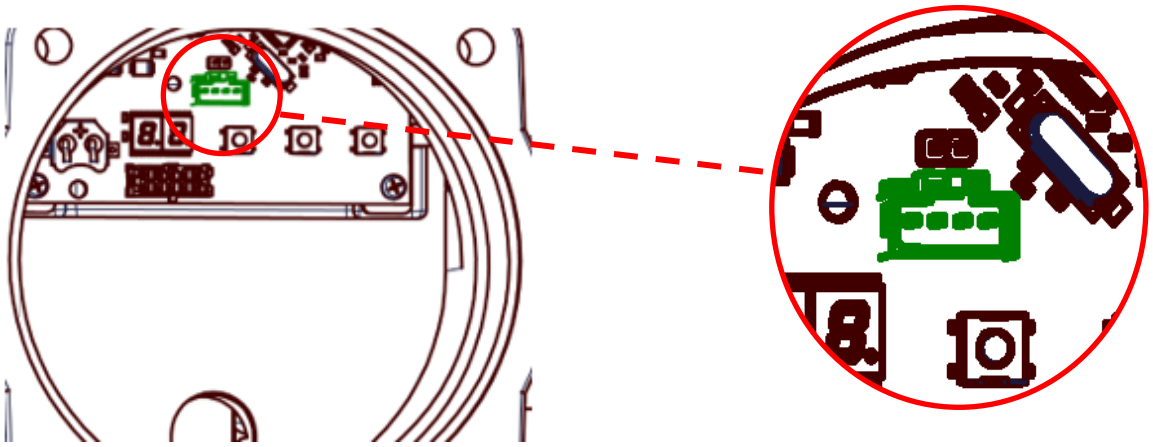


*Figure 114 : Communication cable connection*

# 11. Commissioning

**The electrical connection and commissioning with <u>mains</u> voltage applied may only be carried out by trained specialist personnel!**

**Do not touch any connection lines during commissioning!**

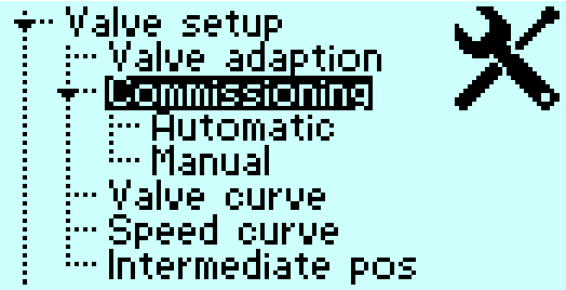
- Before the first commissioning, the equipment must be checked for its suitability in the corresponding zone on the basis of its marking. The values indicated on the type plate and in the applicable documents must not be exceeded.
- Commissioning and use may only be carried out if the equipment is installed within the system in a functional, undamaged and clean condition.

- Open the cover, mount the actuator on the valve (see 9.3), connect the electric supply (see 10.).
- Automatische oder manuelle Inbetriebnahme durchführen.
- Close the cover (see 10.4).

## 11.1 Automatic start up

## 11.2 Function menu

The function menu allows functions to be called up directly on the actuator. It is also possible to start up the actuator.
To access the function menu, press the UP and DOWN buttons simultaneously for 10 seconds. The functions can then be selected by pressing the UP / DOWN buttons. To start the function, press the ENTER button.




The menu is automatically exited if there is no activity for 60 seconds. If at least one valve position is set to torque, the valve adjustment can be carried out automatically.
The actuator moves through the valve stroke range at reduced speed in the parameterized direction VALVE OPEN and/or VALVE CLOSED. If a torque is detected, the actuator saves this position. If both end positions have been parameterized for torque, the actuator automatically determines the angle between them. If only one end position has been parameterized for torque, the actuator adds the preset angle to the detected torque position. The actuator does not check whether the parameterized angle is too large for the remaining range.
Operation

# 12. Operation

## 12.1 Manual operation

The handwheel moves the complete planetary gear set via a worm shaft. It does not move during automated operation but is available in each position without clutching. Turning the handwheel clockwise turns the actuator output clockwise, when viewed from above.

**Attention**: If the PSCP failsafe is active (option), manual operation is not possible as the actuator returns to the failsafe position.

**Attention:** In modulating operation, the actuator counteracts the manual override. In this case, to move by hand, the actuator must be electrically de-energised or the selector switch on the (optional) local control PSC.3 must be set to “OFF”.

## 12.2 Mechanical position indication

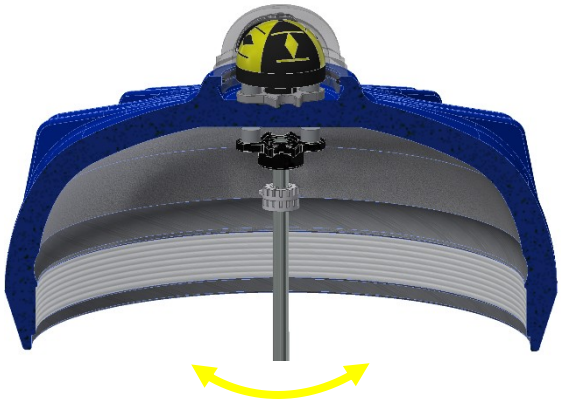


*Figure 12 : Adjustment of the position indicator*

A contactless mechanical position indicator is installed underneath the dome on the cover of the actuator. The orientation of the indicator can be adapted to the valve by turning the magnetic driver under the cover to the corresponding position.

# 13. Status display / Commissioning elements

There is an integrated control unit located on the PS-AMS PSQ-S-EX control board, comprising a 7-segment LED display and three push buttons.

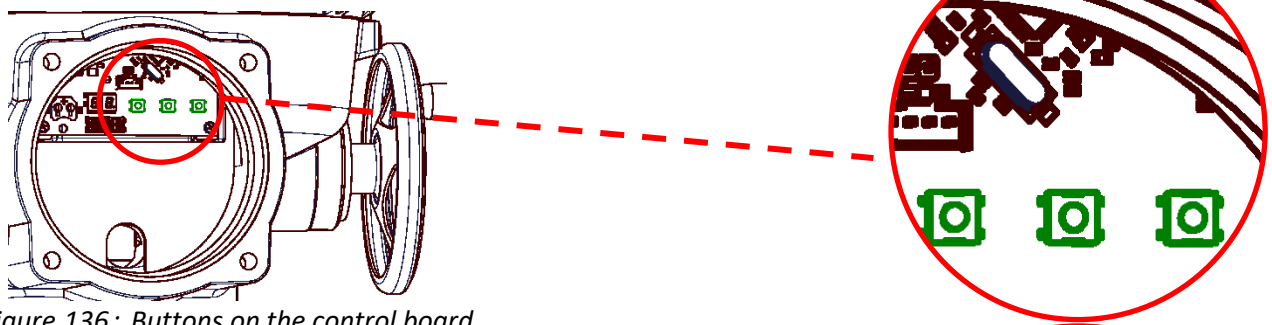


*Figure 136 : Buttons on the control board*

*Figure 14 : 7-segment LED display on the control board*

## 13.1 Actuator position / status / error messages

In operation, the actuator position is indicated as a percentage on the 7-segment actuator position display. At 0% actuator position a bar is shown at the bottom „ __ “ and at 100% a bar is shown at the top „ __ “, .

The corresponding status number is displayed in the event of a status change or an error message:

| NE107 | Status no. | Message |
|---|---|---|
| C | 2 | Not commissioned |
| F | 7 | Motor fault |
| F | 9 | CRC fault |
| S | 17 | Overvoltage |
| S | 8 | Over-temperature |
| S | 16 | Under-temperature |
| C | 5 | Mains power failure |
| S | 11 | Undervoltage |
| C | 14 | Torque error CLOSE |
| C | 4 | Torque error OPEN |
| S | 6 | Set value B error |
| S | 3 | Set value A error |
| C | 13 | End position not reached |
| C | 12 | End position overrun |

During manual commissioning:

| Manual commissioning | | |
|---|---|---|
| **NE107** | **Status no.** | **Message** |
| C | 18 | Manual commissioning only possible for cut-offs by position! |
| C | 19 | Travel/angle cannot be changed! |
| C | 20 | Manual commissioning - error: travel/angle too small |
| C | 21 | Manual commissioning - OPEN end position reached |
| C | 22 | Manual commissioning - CLOSED end position reached |
| C | 23 | Manual commissioning - torque error OPEN |
| C | 24 | Manual commissioning - torque error CLOSE |

During automatic commissioning:

| Automatic commissioning | | |
|---|---|---|
| **NE107** | **Status no.** | **Message** |
| C | 1 | Automatic commissioning running |
| C | 25 | Automatic commissioning completed |
| C | 26 | Automatic commissioning - error, OPEN end position |
| C | 27 | Automatic commissioning - error, CLOSED end position |
| C | 28 | Automatic commissioning - error, no movement |
| C | 29 | Automatic commissioning - error, travel/angle too small |
| C | 30 | Automatic commissioning not possible! No cut-off by force/torque |

## 13.2 Manual Operation

The ENTER button must be pressed for 5 seconds to start manual operation (see figure *13*). If the mode is active, two dots illuminate on the 7-segment display.

The actuator position can be set between the end positions with the UP / DOWN buttons.

## 13.3 Function menu

Functions can be called up directly on the actuator with the function menu. It also allows to start the commissioning run. The UP and DOWN buttons must be pressed simultaneously for 10 seconds to access the function menu. The functions can then be selected by pressing the UP / DOWN buttons. The ENTER button must be pressed to start the function.

The system exits the function menu automatically if there is no activity for 60 seconds. If at least one valve end position is set to torque, the valve compensation can be automatically carried out.
The actuator runs through the stroke of the valve with reduced speed in the parametrised direction valve OPEN and/or valve CLOSE. If a torque is detected, the actuator saves this position.
If both end positions have been parametrised to torque, the actuator determines the intermediate angle autonomously.

If only one end position has been parametrised to torque, the actuator adds the pre-adjusted angle from the recognised torque position. In doing so, the actuator does not check whether the parametrised angle is too large for the remaining range.

| | | |
|---|---|---|
| P0 | WI-FI Auto | Wi-Fi switches OFF automatically if no one is logged on at the actuator or if there is no activity for a defined period of time. This prevents the actuator having a permanent Wi-Fi connection. |
| P1 | | |
| P2 | | |
| P3 | | |
| P4 | | |
| P5 | | |
| P6 | | |
| P7 | | |
| P8 | | |
| P9 | Automatic commissioning torque | If at least one valve end position is set to torque, the valve compensation can be automatically carried out.<br><br>The actuator runs through the stroke of the valve with reduced speed in the parametrised direction valve OPEN and/or valve CLOSE. If a torque is detected, the actuator saves this position.<br><br>If both end positions have been parametrised to torque, the actuator determines the intermediate angle autonomously.<br><br>If only one end position has been parametrised to torque, the actuator adds the pre-adjusted angle from the recognised torque position. In doing so, the actuator does not check whether the parametrised angle is too large for the remaining range. |

## 13.4 PSC.3 local control panel (optional)

The PSC.3 local control panel allows manual operation of the actuator and modification of its parameters. A display and four LEDs show the actuator position and status. Information on the operation of the local control can be found in the “PSC.3 Local Control for PS-AMS PSQ-S-EX” operating instructions.

## 13.5 Operation

### 13.5.1 Power regulation

During operation, the power consumption of the actuator is regulated and limited. This prevents the actuator controller and the power converter from being overloaded at short operating times with high torque levels.

Upon reaching the maximum power limit, the motor reduces its rotational speed in order to continue to generate the required torque.

**Note:** When the power regulation is active, the operating time will increase!

### 13.5.2 Torque regulation

If the maximum torque is reached apart from the stored end positions, the actuator limits the rotational speed until it comes to a standstill. The actuator controller holds the torque constant for a defined period of time in this condition and then reports a torque error, or will try for three times (at setting “Re-Try”) to travel back and pass the detected hard point.

The torque of the output drive will then be maintained through the integrated holding brake.

# 14. Wifi

See operating instruction PS-AMS PSC.3 PSQ-S-EX.

# 15. Diagnostics

The actuator is equipped with comprehensive diagnostics functionality which can be used to optimise the process and carry out a targeted assessment in the event of an error.

The actuator saves various diagnostics data records during operation.

## 15.1 Event logging

The actuator saves up to 25600 events arising during operation.

| | | | |
|---|---|---|---|
| 06.11.2019 | 12:09:07 | Sysmode-Change | Mode: Goto_Automatik |
| 06.11.2019 | 12:09:07 | Sysmode-Change | Mode: Automatik |
| 06.11.2019 | 12:09:12 | Parameter-Change | Par.Nr.: 00825 Par.Val.:0000000000 |
| 06.11.2019 | 12:10:45 | Parameter-Change | Par.Nr.: 00825 Par.Val.:0000000000 |

## 15.2 Logg-Time

The actuator saves up to 153,000 measurements of the actuator status and the set/actual value, in cycles with an adjustable period of between 10 and 3,600 seconds. For setting the cycle rate refer to 3.7.13.1 Logg-Time [P.12.1] in the “Operating Instruction PSC.3 Local control for PS-AMS PSQ-S-EX”.

| Datum | Uhrzeit | Event | Sollwert_A | Sollwert_B | Binär | Istwert | Drehzahl |
|---|---|---|---|---|---|---|---|
| 06.11.2019 | 14:53:00 | Timelog | 00000 | 00000 | 0 | 00476 | 00000 |
| 06.11.2019 | 14:53:10 | Timelog | 00000 | 00000 | 0 | 00476 | 00000 |
| 06.11.2019 | 14:53:20 | Timelog | 00000 | 00000 | 0 | 00476 | 00000 |
| 06.11.2019 | 14:53:30 | Timelog | 00000 | 00000 | 0 | 00476 | 00000 |
| 00.00.2000 | 02:33:37 | Timelog | 00000 | 00000 | 0 | 01000 | 00000 |

## 15.3 Daily logging

The actuator saves the status of the internal counters every 24 hours and calculates histograms.

| | Log | Datum | Uhrzeit | Event | Einschaltvorgänge | Motorlaufzeit | Betriebszeit | Position_0-10 | Position_ |
|---|---|---|---|---|---|---|---|---|---|
| ▶ | 000001 | 06.11.2019 | 12:19:58 | Dailylog | 0000000004 | 0000000186 | 0000000018 | 0 | 0 |
| | 000002 | 06.11.2019 | 13:26:19 | Dailylog | 0000000004 | 0000000186 | 0000000024 | 0 | 0 |

## 15.4 Histogram

### 15.4.1 Reaction histogram

This histogram shows whether the actuator is stationary, driving or oscillating, in relation to the total operating time.

### 15.4.2 Position histogram

This histogram shows how often the actuator stopped in a particular position, in relation to the starts.

# 16. Maintenance and Servicing

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.**

Personnel carrying out work and maintenance and servicing must be skilled and familiar with the work.

## 16.1 Cleaning

The actuators should be cleaned dryly.
Do not operate the actuator during the cleaning process. Do not operate the actuator during the cleaning process.

## 16.2 Servicing

.
Defective actuators should be returned to our plant in Bad Duerkheim, Germany, or to our representatives for repair (see 16.4).

## 16.3 Spare parts

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. (see 16.4).

## 16.4 Service address

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

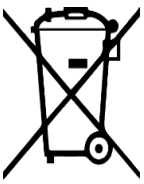
Tel.: +49 (0) 6322/ 94980-0
Mail: info@ps-automation.com
http://www.ps-automation.com/

# 17. Decommissioning and disposal

1. Disconnect the mains supply and ensure that it is secured against an accidental switching-on.
2. Open the cover.
3. Remove external electrical connections.
4. 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.

# 18. Accessoires

| | | | |
|---|---|---|---|
| Accessories/Options | Add'l Position Switches | 2WE | Potential-free additional position switches with silver contacts (0.1 A - 10 A switching current) |
| | Add'l Position Switches Gold | 2WE Gold | Potential-free additional position switches with gold contacts (0.1 mA - 100 mA switching current) |
| | Integrated process | PSIC | Enables the autonomous control of a process so that an external controller is not required |
| | Fail-Safe* | PSCP | Emergency power supply based on supercapacitors, safety position OPEN, CLOSED or free defined position |
| | Fieldbus Interface* | | Digital transmission of nominal and actual value per mill or percent, report of monitoring and diagnostic data using Profibus DP (PSPDP), CANOpen (PSCA), PROFINET, MODBUS-RTU interfaces, additional interfaces available on request |
| | Local Control* | PSC.3 | Illuminated display to show the actuator status and lockable selector to switch between modes: automatic, manual process ON/OFF, STOP and parameter menu. Control buttons for manual movement, menu operation and adjustment of parameters, display of diagnostic information. Also available for mounting separately from the actuator (Modbus Connection, Master/Slave) |
| | Rotational speed controller, set value B | | External regulation of the rotational speed via set value B. |
| | Relay module | | 5 potential-free relays with changeover contacts for reporting parameterisable events. Suitable for switching currents 0.1 A to 1 A at a voltage of 24 VAC/DC |
| | Heating Resistor | HR | Heating resistor to prevent condensation |

*not retrofittable

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