

3003 PS (Control Version)

Operation Instructions



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1. Safety

Dangers of non-compliance with safety regulations

3003 PS actuators are built to state-of-the-art technology and are safe to operate. Despite 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 mains 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 warning symbols are used in this manual:



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



Danger! Electrical voltages may be present that are dangerous to life!
There is a risk of damage to health and/or properties with danger to lives.

Other notes

- The motor surface may have elevated temperature when servicing, inspecting or repairing it immediately after operation. Danger of burning the skin!
- Always observe the relevant operating instructions when fitting accessories or operating the actuator with accessories.
- Connections for signal in- and output are double isolated from circuits that can be under dangerous voltage.

2. Usage as per specification

- The 3003 PS quarter turn actuators are exclusively designed as electric valve actuators. They are meant to be mounted on valves for motor-operation.
- Any other use is considered to be not in accordance with standard specification, and the manufacturer cannot be held liable for any damage resulting from it.
- The actuators may not be used outside the limits laid out in data sheets, catalogs and order documentation. 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 adjustment of the actuator, and servicing. Special precautions have to be taken while doing this!
- The actuators may only be used, serviced and repaired by personnel that are 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 be switched on only after properly closing the main cover or terminal box.

3. Storage

Proper storage means:

- 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.

4. Principle of operation

The electric quarter-turn actuators series 3003 PS are designed to operate valves with 90° angular motion. The 3003 PS actuators are provided with a mechanical interface according to ISO 5211 for valve mounting. The motor torque is transmitted via spur gear, indirectly transmitted onto an coupling with double square. This is used as connecting piece between actuator and valve shaft.

The 90° rotation is adjustable mechanically $\pm 5^\circ$ in one end position. Two adjustable switches limit the rotation in both directions, interrupting the motor current when reaching the adjusted end position.

The handwheel allows manual operation in case of power failure and during adjustment. Depending on the operating time of the actuator, the handwheel is either permanently engaged, or it has to be pushed down against a spring for manual operation. A sticker on the actuator cover indicates the relevant mode for manual operation. At motor operation, the handwheel serves as running indicator.

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

5. Operating conditions and installation position

Standard actuators may be operated at ambient temperatures from -20°C to $+80^\circ\text{C}$

Ambient temperature range for modulating service is -20°C to $+60^\circ\text{C}$.

Operating modes correspond to IEC 60034-1, 8: S2 for short cycle and S4 for control service (see data sheet for specific values for each actuator size).

For protection against moisture and dust, enclosure rating is IP65 according to EN 60529. To ensure this enclosure, the cover must be fitted correctly and the screws tightened cross wise after opening. The handwheel must be fitted to the handwheel shaft. The cable glands must be suitable for the wiring and correctly fitted to the actuator.

When installing the actuators, leave enough space to allow cover removal (Fig.1).

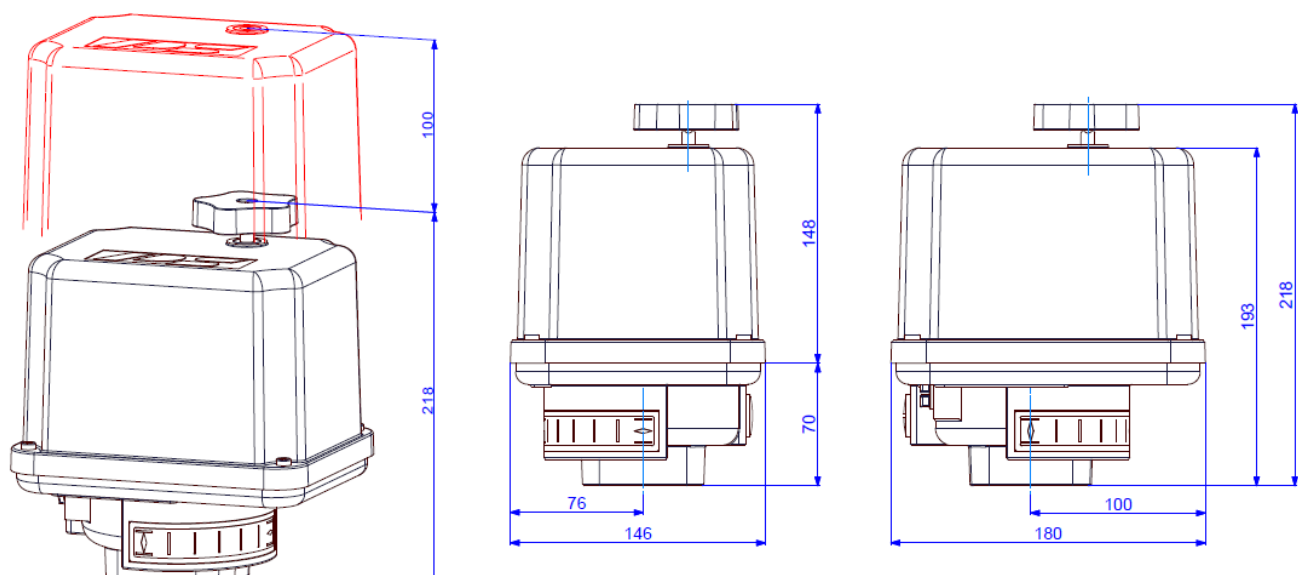
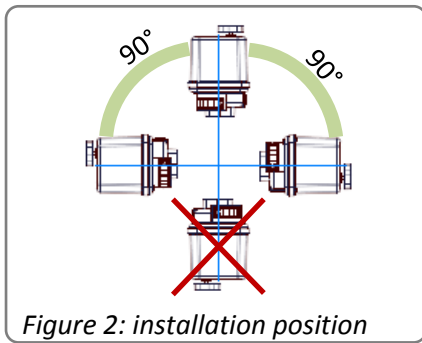


Figure 1: Installation dimensions

Installation dimensions



Outdoor usage:

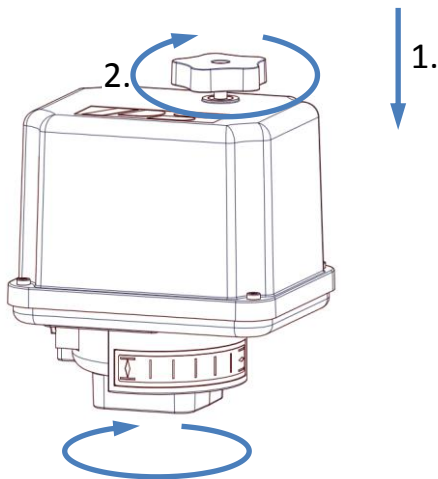


When using actuators in environments with high temperature fluctuations or high humidity, we recommend using a heating resistor.

The actuator may be mounted in any desired position except “cover facing downwards”.

6. Manual operation

The hand wheel allows manual operation in case of power failure or during adjustments (Mounting or positioning the valve). For manual operation, the hand wheel has to be pushed down against a spring.



Do not exceed the adjusted electrical stroke limits by handwheel.

The mechanical limits must be set accordingly.

Failure to observe this warning will change the electrical feedback setting!

Figure 3: Manual operation

7. Electric supply



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

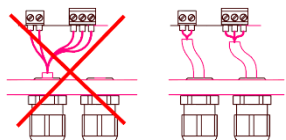
Mains connection cables must be dimensioned suitably to accept the maximum current requirement of the actuator and correspond to IEC 227 and IEC 245.

The yellow-green coloured cables may be used only for connecting to earth.

When inserting cables through the cable connector, ensure that the maximum bending radius for the cable is observed.

3003 PS electric actuators do not have an internal electrical power switch. A switch or power mains switch has to be provided therefore in plant installation. This should be positioned close to the device and easily accessible to the user; it shall be labelled as the mains isolator switch for the actuator.

Electric installation as well as over-current and overvoltage protection devices must conform to the standard DIN VDE 0100-410:2007-06, protective class I resp. protection class 3 (24VAC/24VDC) and also to the standard DIN IEC 60364-4-44 according to the applied overvoltage category of the actuator.



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.

7.1 Wiring diagram

Figure 3 shows the standard electrical connections. However, the wiring diagram inside the actuator hood is valid for the specific actuator. For any optional extras see the individual wiring diagram in the related service instructions.

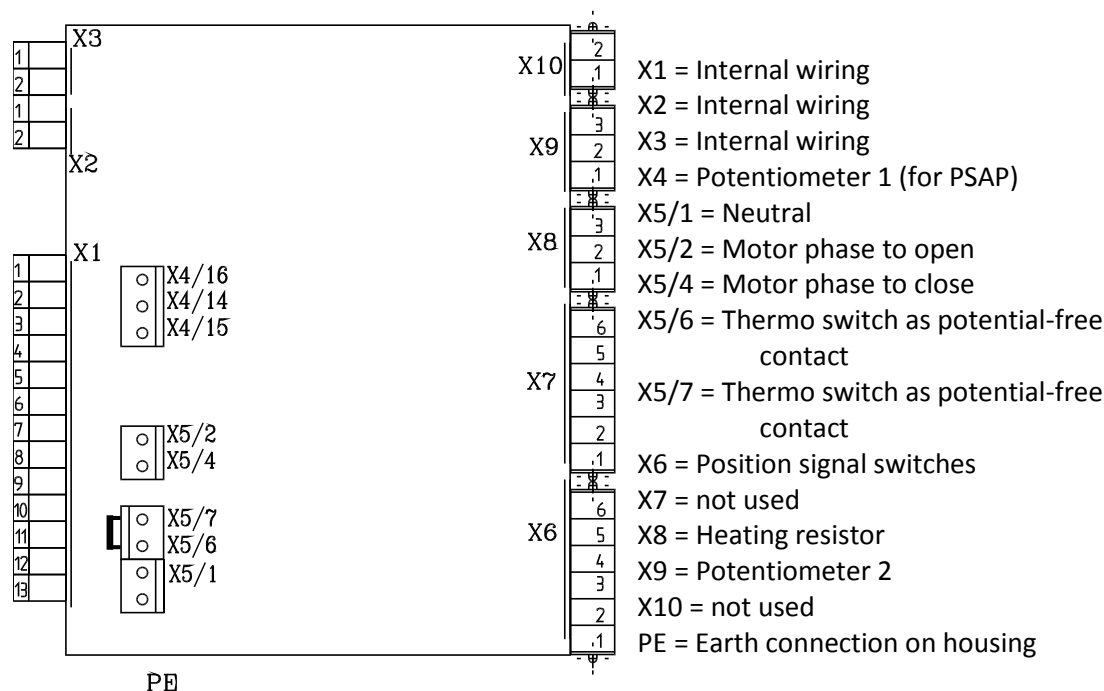


Figure 4: Wiring terminals

1-Phasen Wechselstrom
1-Phase a.c.

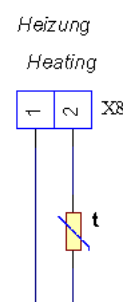
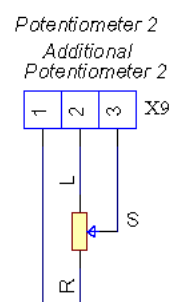
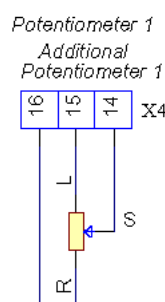
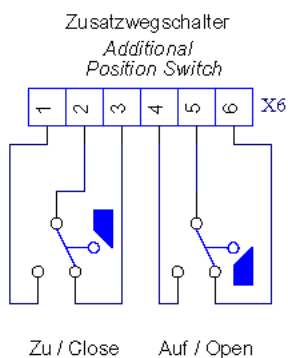
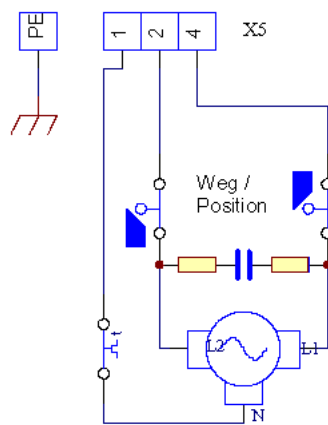


Figure 5: Wiring diagram



PE Earth connection on housing plate has to be connected!

Two adjustable limit switches are installed to limit the stroke of the actuator, and cut-off the motor current in the relative direction.

Most motors have a thermal switch, depending on the actuator type, to cut off the current in both directions when a maximum temperature is reached (only at standard single phase power supply). The thermal switch loop is closed by the bridge between the X5/6 and X5/7 connections (see Figure 3).

7.2 Thermal switch as potential free contact

The thermo switch can be wired to the outside as follows:

- Remove the bridge between connections X5/6 and X5/7.
- Change the connections X1/11 and X1/13.
- Check conductivity between connections X5/6 and X5/7 (connection must be there).
- Connect the thermo switch as potential free contact to the connections X5/6 and X5/7.

Maximum thermal switch loading:

The thermo switch can be loaded up to the maximum nominal value for the motor (see motor nameplate).



When using the thermo switch as a potential-free contact, the switching signal must immediately stop the motor. Re-starting the motor is allowed only after the thermo switch has reset. Failure to observe this warning may result in damage to the actuator.

8. Valve mounting

The 3003 PS actuators are designed with a mechanical interface according to ISO 5211 for valve mounting. The gear contains a double square SW17 to connect the actuator to the valve shaft.

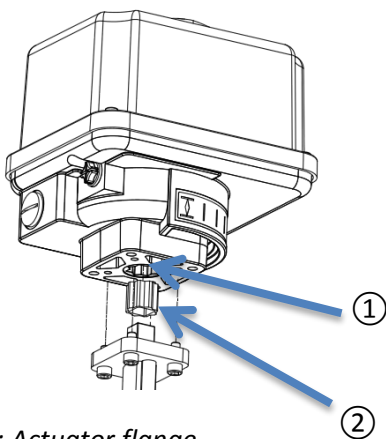


Figure 6: Actuator flange

- Check that the actuator flange suits the valve flange.
- Use standard adapters to adapt to the valve shaft
- Clean the surface of the connection components, lubricate valve shaft slightly
- Position the actuator on the valve. Tighten the screws in a diagonal sequence according to the required torque.

Pos. ①: Actuator flange

Pos. ②: Drive bush

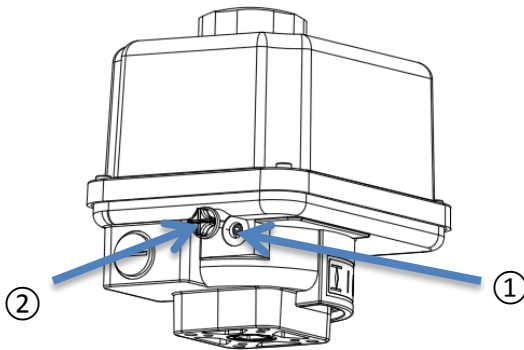
9. Setting the mechanical stop

There is one adjustable screw available for setting the mechanical limit of the 90° angular stroke.



When setting the mechanical end positions, only the handwheel may be used. Do not operate the actuator electrically.

- Remove the protection cap (Figure 6; Pos. 2) from the stop screw.
- Back off the stop screw anti-clockwise approx. 5 turns.
- Move the actuator to the closed position by turning the handwheel clockwise.
- Turn stop screw for closed position (Figure 6, Pos. 1) finger tight, then a half turn back.
- Replace the protection cap onto the stop screw.

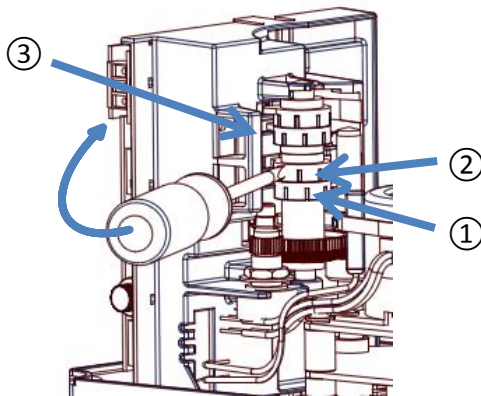


Pos. ①: Stop screw

Pos. ②: Protection cap

Figure 7: Mechanical stop

10. Adjustment of limit switches



Pos. ①: Switching cam CLOSE position

Pos. ②: Switching cam OPEN position

Pos. ③: Supporting bridge for screw driver

NOTE:

Use the bridge (Figure 8, Pos. 3) as support for the screw driver when adjusting the cams.

The standard limit switches serve to switch-off the motor when the end positions are reached.

Additional limit switches are free of voltage and serve to indicate the valve position. These are available as optional auxiliaries. The switches are activated by cams. These cams are stepless adjustable on their shaft by means of a friction coupling.



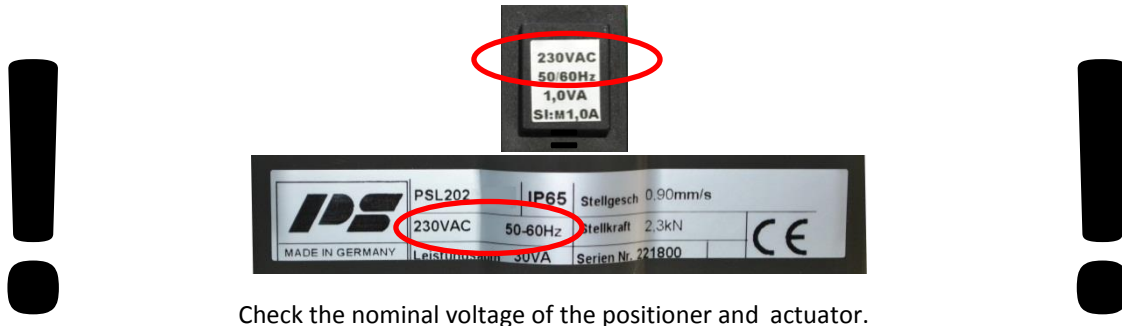
Ensure that the mains supply is secured against accidental switching-on!

- Run the actuator electrically to the closed position until the required position is reached.
- Turn the cam of the CLOSE limit switch (Figure 8, Pos. 1) with a suitable screw driver (4 mm blade width) anti-clockwise until the micro switch is heard to click.
- Run the actuator electrically to the open position until the required position is reached.
- Turn the cam of the OPEN limit switch (Figure 8, Pos. 2) with a suitable screw driver (4 mm blade width) clockwise until the micro switch is heard to click.

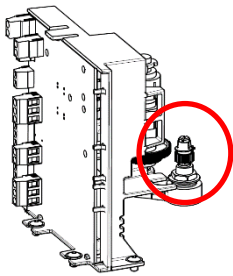
11. Commissioning

- Close the cover, re-install the handwheel.
- Drive the valve to an intermediate position using the handwheel.
- Switch the setting signal briefly between OPEN and CLOSE and ensure that the actuator operates in the correct direction either. If necessary, reverse the setting signal for OPEN/CLOSE.
- Drive the actuator in both directions, using the setting signal until the limit switch cuts-off. Ensure that the limit switch positions are correct. If necessary re-adjust the limit switches.

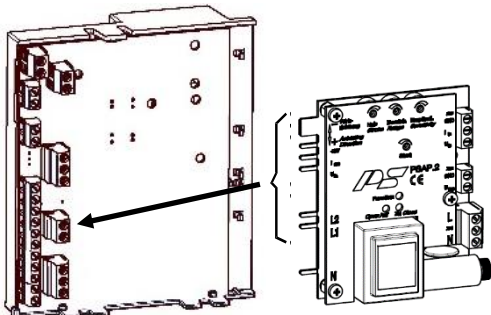
12. Installation Instruction PSAP.2A / PSAP.3



Check the nominal voltage of the positioner and actuator.

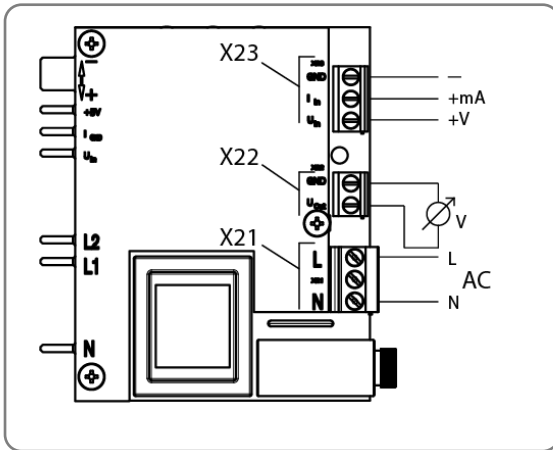


Check that a feedback potentiometer is installed.



1. Insert contact pegs of the positioner PSAP into the terminals.
2. Tighten terminals.
3. Press onto blocks X22 and X23 to fit card into place - avoid bending of the PSAP-board!

12.1 Wiring



1. Input signal to terminal X23.
2. Feedback signal to terminal X22.
3. Power supply to terminal X21.
4. Connect Protection Earth of the mains supply to the PE of the actuator housing.

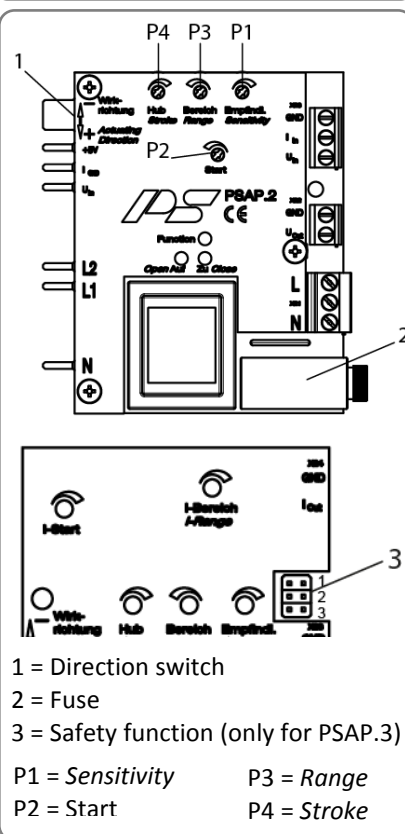
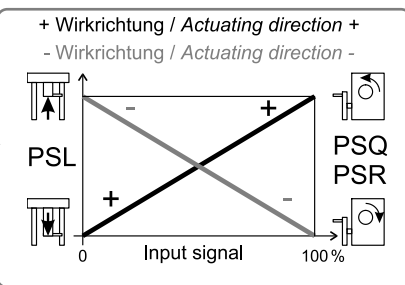
12.2 Commissioning



Caution! Dangerous electrical voltage can be present!

All setting have to be done with an isolated screwdriver!

Needed tools: Screwdriver, measurement instrument for V (0-10), set value source (mA or V).

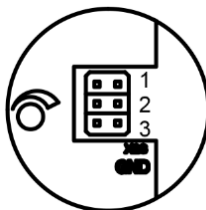


1. Check the limit switch settings of the actuator, if necessary adjust.
2. Set the direction switch (pos. 1) to the required position.
3. Set the sensitivity of the positioner using potentiometer P1 (usually intermediate value).
4. Turn potentiometers P2 - P4 anti-clockwise to the limit.
5. Connect a measuring instrument for 10 VDC to the terminal X22.
6. Set minimum input signal (0(4) mA or 0(2) V) at X23.
7. Connect power supply voltage to terminal X21 and switch on mains supply, the LED "Function" glows green. The actuator drives to the corresponding end position and stops due to the position switch.
8. Turn the shaft of the feedback potentiometer via the friction coupling to „0“ so that the measuring instrument displays $U_{out} = 0$ V.
9. Turn potentiometer P2 (START) clockwise until both operating LEDs are switched off.
10. Set maximum input signal (20 mA or 10 V) at X23.
11. The actuator drives to the opposite end position and cuts off due to the position switch.
12. Turn potentiometer P4 (STROKE) clockwise until the measuring instrument displays $U_{out} = 10$ V.
13. Turn potentiometer P3 (RANGE) clockwise until both operating LEDs are switched off.
14. Check that the actuator positions correctly by driving through the whole input signal range. If necessary, re-adjust.
15. At active signal „Open AUF“ or „Close ZU“ the corresponding LED is on.

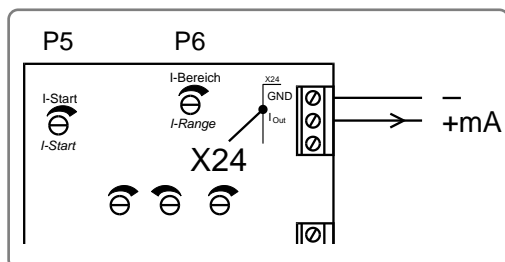
12.3 Safety function (only for PSAP.3)

Jumper setting (pos. 3 on page 3) to define action at input signal failure.

- 1 = Actuator drives to position of max. input signal.
- 2 = Actuator stops.
- 3 = Actuator drives to position of min. input signal.



12.4 Active current feedback (only for PSAP.3)



1. Commissioning as described under 4. must be done first.
2. Connect a measuring instrument for 20 mA DC to terminal block X24.
3. Drive the actuator to the end position that should be displayed with maximum output signal.
4. Turn potentiometer P5 anti-clockwise until limit is reached.
5. Adjust current range using potentiometer P6 (16 mA for output range 4-20 mA/20 mA for output range 0-20 mA).
6. Drive actuator to the opposite end position.
7. Adjust minimum output signal (0 mA or 4 mA) using potentiometer P5.

12.5 Technical data

	PSAP.2A	PSAP.3
Input	0(4)-20 mA / 0(2)-10 V	4-20 mA / 2-10 V
Output	0-10 V	0(4)-20 mA / 0-10 V
Safety Function	No	Yes
Impedance	$I_{in}: 100 \text{ Ohm} / U_{in}: 50 \text{ kOhm}$	
	$U_{out}: > 10 \text{ kOhm}$	$I_{out}: 300 \text{ Ohm} / U_{out}: > 10 \text{ kOhm}$

13. Maintenance

The actuators are maintenance-free if used under the operating conditions as stated in the data sheet. The gearboxes are lubricated for lifetime 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.

13.2 Spare parts

Defective actuators should be returned Buerkert, for evaluation of failures and repair.

14. Appendix

14.1 Technical data and accessories

Please refer to the actuator data sheets for technical data.

Various auxiliaries are available in order to adapt the actuators to the various service conditions. A list of auxiliaries for each actuator type is shown on the actuator data sheet.