

Operation instructions

Electronic position transmitter ESR

2SX9000-1WR00

(R410134; C73451-A383-A1)

2SX9000-1MR00

(R410136; C73451-A383-A2)

2SX9000-1WR01

(R410145)



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2SX9000-1WR00 = R410134 = C73451-A383-A1
 2SX9000-1MR00 = R410136 = C73451-A383-A2
 2SX9000-1WR01 = R410145

1 General information

1.1 Safety instructions: Used symbols and their meanings

The following symbols, which have different meanings, are used in the operation instructions. **Non-observance** may lead to serious injuries or property damage.



Warning marks activities which, if not carried out correctly, can affect the safety of persons or property.



Notice marks activities which have major influence on the correct operation. Non-observance of these notes may lead to consequential damage.

1.2 Safety information



For the sake of clarity, not all details of all versions of the product are described in these instructions, nor can they cover all conceivable cases regarding installation, operation and maintenance.

For further information or solution of special problems not covered in detail in these instructions, please contact SIPOS Aktorik.

The contents of these operation instructions shall not become part of or modify any prior or existing agreement, commitment or legal relationship. All obligations result from the applicable purchase agreement which contains the complete and exclusive regulation on material defect liability of SIPOS Aktorik. Any statements contained in this document do not create new warranties or restrict the existing warranty.



The device may only be mounted and operated if qualified personnel has arranged for use of suitable power supply. Thereby it can be ensured that no hazardous voltage, neither during normal operation or failure of the installation nor from parts of the plant, may be transmitted to the device. Failure to observe this warning could result in death, serious injury or considerable property damage. Heed all moving parts during assembly and adjustment. Danger of injuries and property damage.

Qualified personnel within the meaning of the relevant safety instructions of this documentation are all persons authorized to perform the required tasks according to the standards of safety technology and who may recognize and avoid potential hazards. They must be thoroughly familiar with the warnings at the device and the safety instructions of these operation instructions.

For work on power installations, the prohibition of the use of non-qualified persons or similar is stipulated in EN 50110-1 (formerly DIN VDE 0105) or IEC 60364-4-47 (VDE 0100 part 470).

1.3 Transport, storage and disposal

1.3.1 Transport and storage

- The dispatch must be performed in sturdy packaging.
- Store in well-ventilated, dry room.

1.3.2 Disposal and recycling

- The packaging of our products consists of environmentally friendly materials which can easily be separated. For the disposal of the packaging material, we recommend recycling and collection centers.
- Arrange for controlled waste disposal of the disassembled electronic position transmitter or for separate recycling according to materials.
- Observe the national/local regulations for waste disposal.

2 Technical description

2.1 Range of application

The electronic position transmitter converts a rotary movement into a load-independent direct current proportional to the rotation angle.

The position transmitter without restoring spring R410 134 (C73451-A383-A1), R410145

- no stops can be rotated continuously
- transmits a rotation angle from 0 to 340°
- requires a sufficiently small gear backlash in the drive to enable exact measurements

The position transmitter with restoring spring R410136 (C73451-A383-A2)

- is equipped with stops (take into account when fitting!)
- transmits a rotation angle from 0 to 320°
- reduces the gear backlash in the drive by its restoring spring

The position transmitter be electrically connected

to indicators, recorders, controllers or process computers using

- a two-wire system with an output current of 4 to 20 mA or
- a three-wire system with an output current of 0 to 20 mA or 4 to 20 mA

2.2 Design and functional principle

2.2.1 Mechanical design

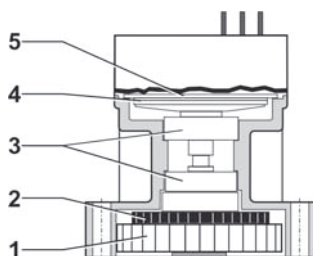


Fig. 1

- 1 Drive gear wheel
- 2 Adjustment wheel
- 3 Ball bearing
- 4 Rotor
- 5 Stator with amplifier

Fig. 1: Design of electronic position transmitter (ESR)

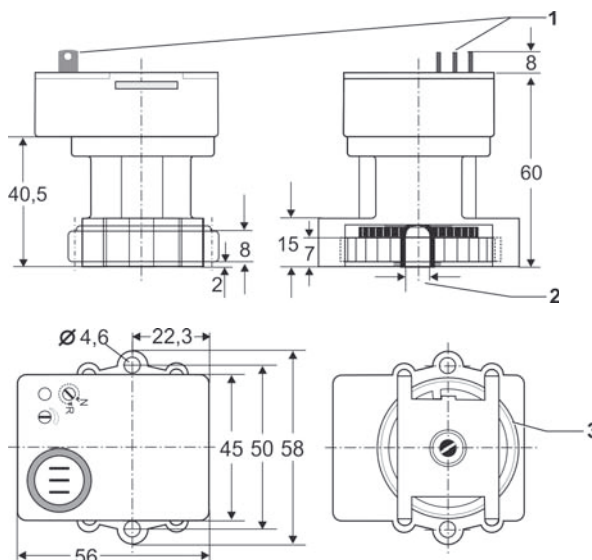


Fig. 2

- 1 Tab for flat receptacles
acc. to DIN 46247 – A2,8-0,5
- 2 Splines
acc. to DIN 5481 - 7 x 8
- 3 Gear wheels
external straight teeth
acc. to DIN 867, m=1, z=40

Fig. 2: Views of ESR, dimensions in mm

2.2.2 Functional principle

The drive gear wheel supported by ball bearings (fig. 1, item 1) transmits the rotary movement to the rotor (fig. 1, item 4). The rotor position is measured with a capacitive pick-up system.

Ten stator segments (fig. 3, item 3) are incited using chronological pulses (2). The phase relationship of the signal – capacitively decoupled from the rotor – depends on the rotation angle. The signal is amplified (item 4) and is converted via the phase comparator (5) to the voltage converter (6) into an output current proportional to the rotation angle.

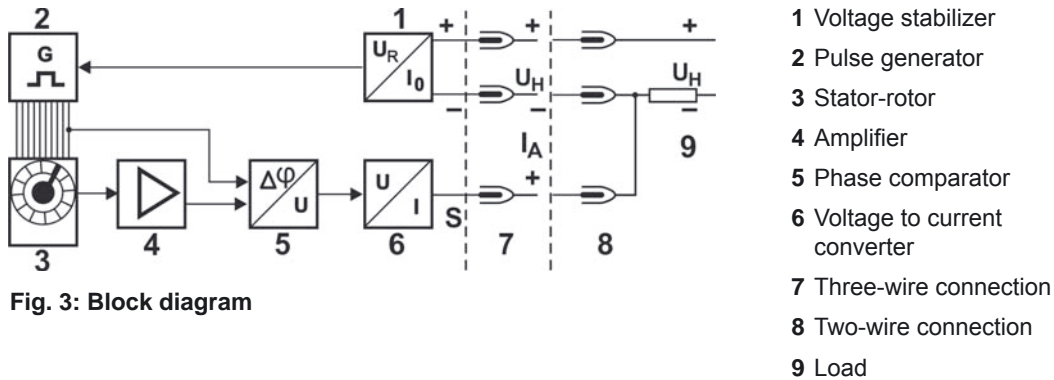


Fig. 3: Block diagram

2.3 Technical data

Electrical connection	Two-wire or three-wire connection	three-wire connection
Auxiliary power U_H	12 to 30 VDC including ripple	18 to 30 VDC including ripple
Max. load R_B	50 (U_H-12) Ω	50 ($U_H-2.5$) Ω
Output current	4 to 20 mA	0 to 20 mA or 4 to 20 mA
Current consumption	max. 30 mA or 35 mA for R410145	max. 30 mA or 35 mA for R410145

Mechanical version	without restoring spring R410134 (C73451-A383-A1)	with restoring spring R410136 (C73451-A383-A2)
Measuring range	340° can be rotated continuously	320° with stops
Minimum span	80°	80°
Maximum span	340°	320°
Torque on drive	approx. 0.1 Ncm	approx. 2.5 Ncm
Mechanical coupling	Gear wheel with external teeth ($m = 1$, $z = 40$) or splines DIN 5481 – 7 x 8	
Permissible ambient temperature	-25 °C to +80 °C	
Weight	approx. 0.1 kg	

Transmission response for a span of 270°

Conformity error (tolerance band setting)	$\leq \pm 1 \%$
Impact of auxiliary power supply	$\leq 0.1 \%$ over complete range
Impact of load	$\leq 0.1 \%$ over complete range
Impact of temperature	$\leq 0.3 \%$ /10 K

2.4 Ordering data for electronic position transmitter

Order no.	Order no.	Measuring range
R410134 (C73451-A383-A1)	Without restoring spring	0° to 80°/340°
R410136 (C73451-A383-A2)	With restoring spring and stops	0° to 80°/320°
R410145	modified without restoring spring	0° to 80°/340°

3 Fitting and connection to actuator



The position transmitter is driven by rotating gear wheels:
Risk of finger injuries during fitting and adjustment.

3.1 Fitting position transmitter without restoring spring

(R410134 [C73451-A383-A1] R410145 can be rotated continuously)

Depending on the version, the position transmitter is either driven via the drive gear wheel (fig. 4) or the splines (fig. 4).

1. Place position transmitter to position.
2. Secure using two M4 screws (min. length 18 mm).

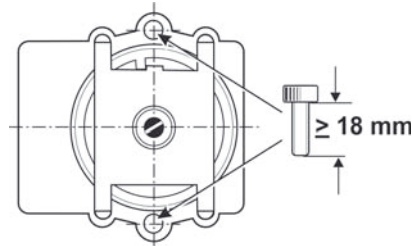


Fig. 4: Fitting of the position transmitter without restoring spring

3.2 Fitting position transmitter with restoring spring

(R410136 [C73451-A383-A2] cannot be rotated continuously)

The position transmitter with restoring spring has stops which limit the rotary movement. To prevent damage to the stops when selecting incorrect direction of rotation, proceed as follows for installation:

1. Operate the actuator to the end position from which the position transmitter is moved in a clockwise direction ("normal" direction of rotation (fig. 5, item. a)
2. Pre-assemble position transmitter loosely using one M4 screw (min. length 18 mm) b.
3. Rotate drive gear wheel of the position transmitter to approx. 1 tooth from the stop c.
4. Hold gear wheel while engaging the position transmitter into the actuator, insert second M4 screw and tighten d.

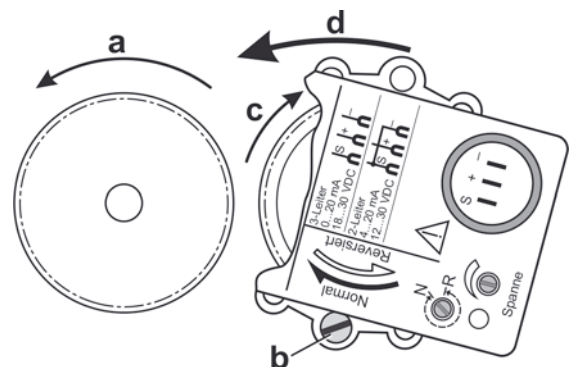


Fig. 5: Fitting of the position transmitter with restoring spring

3.3 Electrical connection

The electrical connection of the transmitter can be made via three receptacles DIN 46247 – A2,8-0,5.

Power supply:

- for two-wire system 12 to 30 V DC (fig. 6, item 2)
- for three-wire system 18 to 30 V DC (fig. 6, item 1)

Refer to illustration "block diagram" in section 2.2.2.

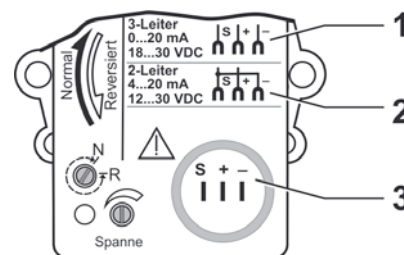


Fig. 6: Electrical connection



- Only use suitable power supplies which ensure that no dangerous voltages can be applied to the position transmitter.
- When using the position transmitter within the electric actuator, the external (customer) connecting cables of the electronic position transmitter (ESR) have to be screened and fixed at both sides. If required, use special EMC cable glands. When using the position transmitter in other devices or for other applications, appropriate proof has to be furnished for the individual applications.

4 Operation

The position transmitter can be operated in two modes. Selection is made via the mode adjuster (fig. 7).

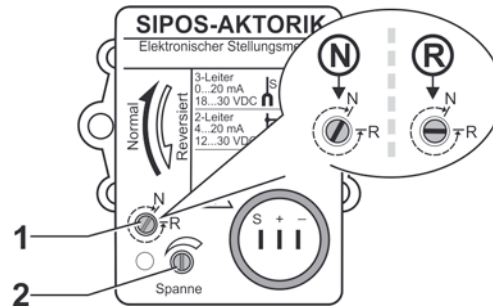


Fig. 7: Mode adjuster (1) and span adjuster (2)



Normal mode:

- Rising characteristic when rotating the drive gear wheel clockwise or
- Falling characteristic when rotating the drive gear wheel counterclockwise

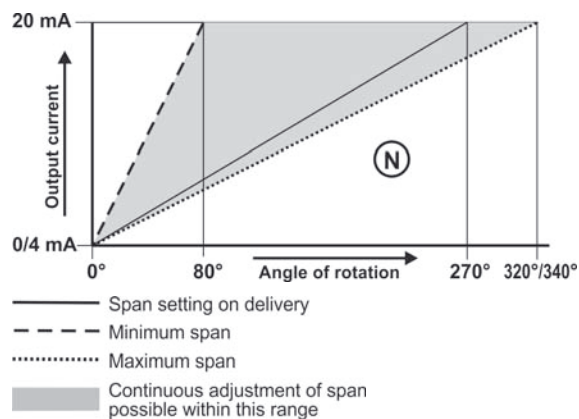


Fig. 8: Adjustment range of the measuring span during normal operation



Reverse mode:

- Rising characteristic when rotating the drive gear wheel counterclockwise or
- Falling characteristic when rotating the drive gear wheel clockwise

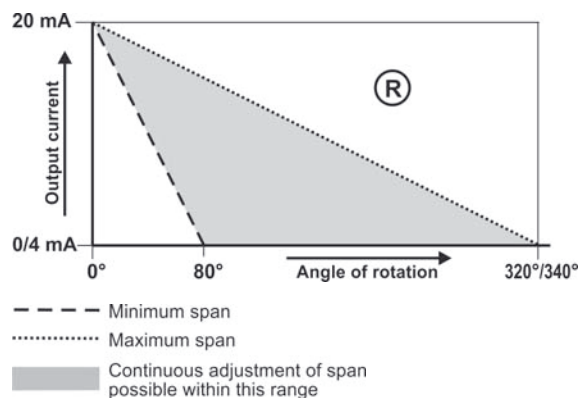


Fig. 9: Adjustment range of the measuring span during reverse operation

4.1 Setting to normal mode

Factory setting for the mode adjuster (fig. 10, item 1) is in position "N".

If not, rotate adjuster clockwise to stop "N".

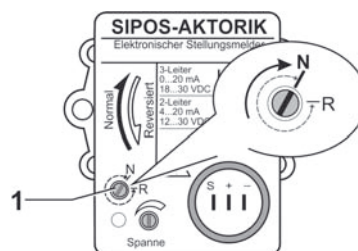


Fig. 10: Setting to normal mode



The mode adjuster (fig. 10, item 1) must always be in an end position, otherwise the function of the position transmitter is faulty (initial and full-scale values cannot be set). Carefully turn screw so that stop in end position is not damaged.

4.2 Setting to reverse mode

Rotate mode adjuster (fig. 11, item. 1) counterclockwise to stop "R".

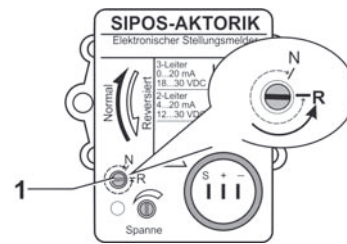


Fig. 11: Setting to reverse mode



The mode adjuster (fig. 11, item 1) must always be in an end position, otherwise the function of the position transmitter is faulty (initial and full-scale values cannot be set).

Carefully turn screw so that stop in end position is not damaged.

4.3 Adjustment of output current 0 or 4 mA

1. Operate actuator to position in which the output current is to be 0 mA or 4 mA.
2. Rotate black positioning wheel (fig. 12, item 3) compared to the white drive gear wheel (item 2) manually or by using a screw driver to adjust the output current
 - ▶ between 3.98 and 4.02 mA for two-wire system
 - or
 - ▶ between 0.01 and 0.02 mA for three-wire system.

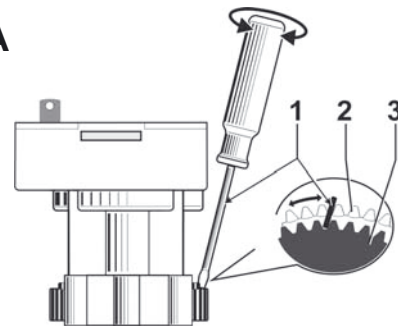


Fig. 12: Adjustment of output current 0 or 4 mA



The sign does not change if the zero is crossed with a three-wire system. The device indicates 0 mA for a range of 8°. Therefore set a value as low as possible but not equal to zero (e.g. +0.01 mA).

4.4 Adjustment of output current 20 mA

1. Operate actuator to position in which the output current is to be 20 mA.
2. Set output current using span adjuster (fig. 13, item 1) to 20 ± 0.02 mA.
3. Check adjustment according to 4.3 and repeat adjustment according to sections 4.3 and 4.4, if required.

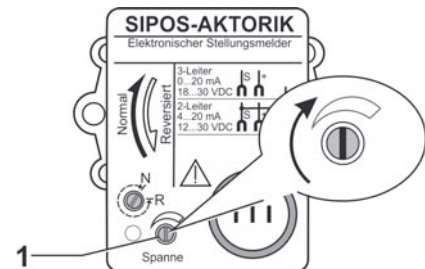


Fig. 13: Adjustment of output current 20 mA

4.5 Adjustment of output current to 4 to 20 mA with three-wire system

1. Output current adjustment of 0 mA according to section 4.3.
2. According to section 4.3, set output current to 16 mA instead of 20 mA.
3. Operate actuator to position in which output current is to be 4 mA, then increase output current from 0 to 4 mA (turn black positioning wheel).
4. Operate actuator to position in which output current is to be 20 mA; check output current; readjust using span adjuster, if required.

5 Maintenance

The electronic position transmitter is maintenance-free.