SIPOS AKTORIK

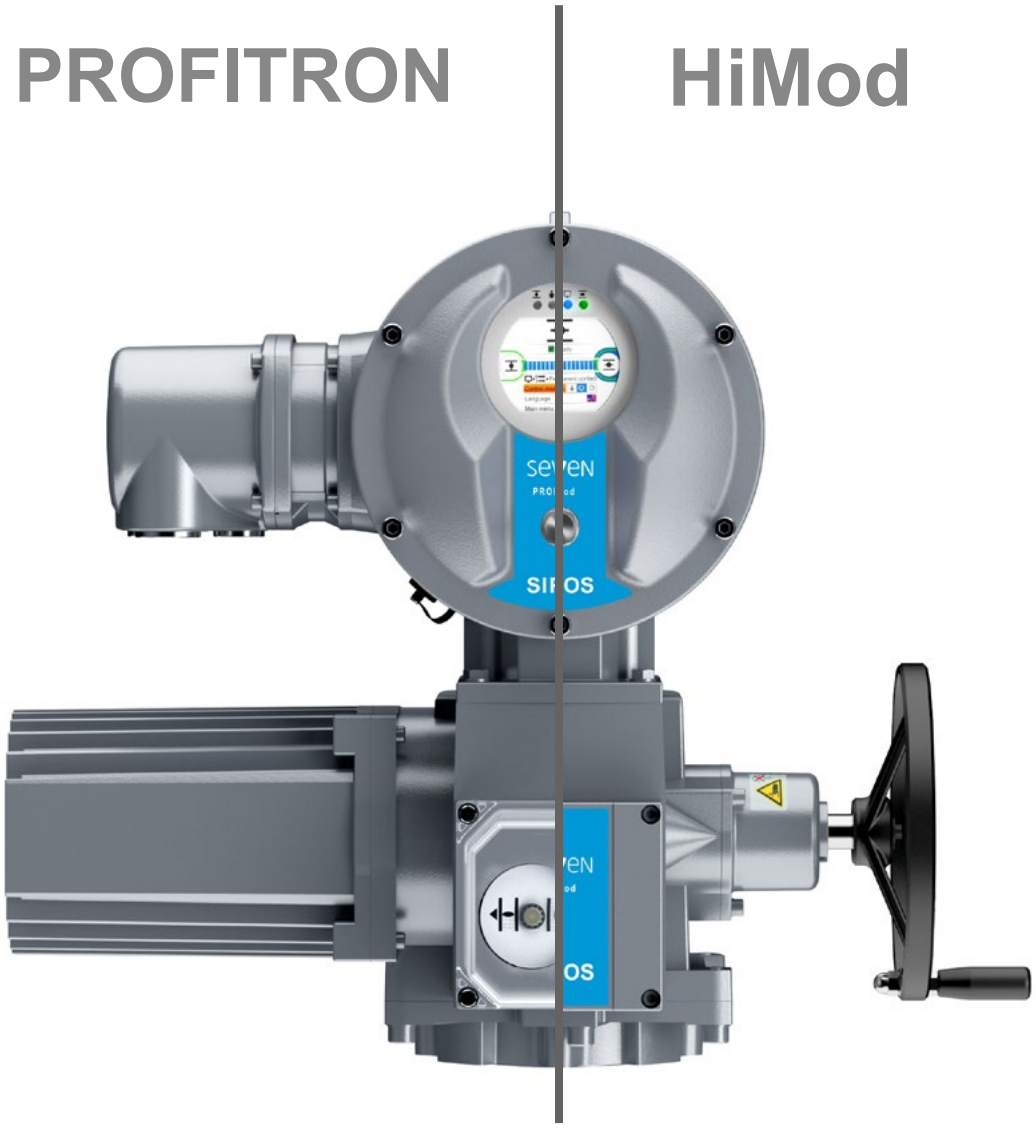
seven

Operation instructions

Electric actuators

2SA7, 2SG7, 2SQ7

PROFITRON HiMod



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1 General information

1 General information

1.1 Safety information

General information

The devices referred to in this document are components of installations conceived for industrial applications. They are designed in accordance with the recognized engineering rules.

All work involved in transport, assembly, installation, commissioning, maintenance and repair has to be performed by qualified personnel.

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).

- **Leakage currents**
  As standard, the leakage current of the actuators exceeds 3.5 mA (iin combination with separate installation > 10 m with LC filter operating point dependent above 30 mA). Therefore, fixed installation in accordance with IEC 61800-5-1 is required.
- **Residual current circuit breaker or monitoring devices**
  The integral frequency converter can be used to generate a direct current within the protective grounding conductor.
  Should a residual current-operated protective (RCD) or monitoring (RCM) device be used upstream the network, it must be of type B.

Correct transport, proper storage, mounting and installation, as well as careful commissioning are essential to ensure trouble-free and safe operation.

The distribution of this product is restricted according to IEC 61800-3.
and may cause radio interferences in domestic environments. In this case it may be necessary to take additional measures.

The following is of particular importance:

- The technical data and information concerning the permissible use (installation, connection, ambient and operating conditions) provided in the catalog, order documents, operation instructions, name plate data and in the other product documentation;
- The general installation and safety guidelines;
- The local, plant-specific regulations and requirements;
- The local ambient conditions, in particular the vibration load, which can be caused when mounting an actuator to a vibrating valve;
- The proper use of tools and lifting and transport equipment;
- The use of personal protective equipment, especially in high ambient temperatures and with potential high actuator surface temperatures.

Warnings on the device

Danger of crushing. When pressing in the crank handle or the hand wheel ensure that neither the hand nor the fingers are crushed, refer to figure.

Applicable for devices of the 2SA7.5/6/7/8 series: Indicates the lubricant used. Refer also to chapter “14.2 Lubrication intervals and lubricants” on page 113

Hot surface. Risk of hot surface temperatures (caused by high ambient temperatures and frequent operation as well as long activation times).

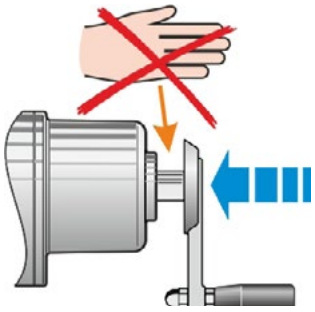


Fig.: Danger of crushing

1.2 Transport and storage

- The device must be supplied in sturdy packaging.
- For transport, loop the rope around the hand wheel housing, refer to illustration. Only use the eyes (1) on the electronics unit to lift the actuator's own weight.
- Do not attach the ropes and hooks at the crank handle or hand wheel for the purpose of lifting.
- Store in well-ventilated, dry room.
  at –30 °C – +80 °C.
- Protect against damp floors by storing on a shelf or pallet.
- Keep connection hood/cover and cable glands as well as the cover of the electronics unit and position recording closed.

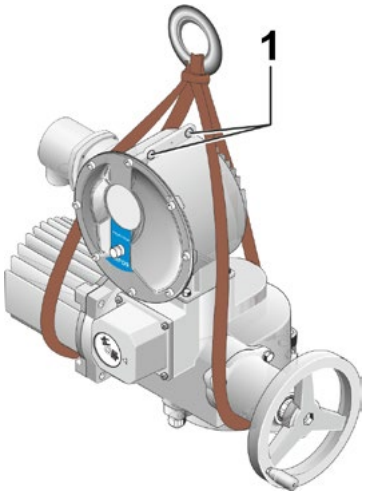


Fig.: Transport

The actuators contain electronic components, in particular large DC capacitors, which are subject to aging and must be pretreated after long-term storage before operation on mains voltage. before operation on mains voltage.
At the latest after 8 years of storage without voltage, the drive electronics must be prepared in stages by means of a controllable power supply before operation at nominal voltage:

- 30 minutes with 25 % of the nominal voltage
- 30 minutes with 50 % of the nominal voltage
- 30 minutes with 75 % of the nominal voltage
- 30 minutes with 100 % of the nominal voltage

1.3 Disposal and recycling

Packaging

The packaging of our products consists of environmentally friendly materials which can easily be separated and recycled. We use the following packaging materials: Wood-based panels (MSB/OSB), cardboard, paper, PE foil. For the disposal of the packaging material, we recommend recycling and collection centers.

Actuator

Our actuators have a modular design and may therefore be easily disassembled, separated and sorted according to materials, i.e.: electronic parts, different metals, plastics, greases and oils.

The following generally applies:

- Collect greases and oils during disassembly. As a rule, these are substances hazardous to water and must not be released into the environment.
- Arrange for controlled waste disposal of the disassembled material or for separate recycling according to materials.
- Observe the national/local regulations for waste disposal.

1.4 Notes to the operation instructions

1.4.1 Warnings: Used symbols and their meanings

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

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

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

Electrostatically endangered parts are located on circuit boards, which may be damaged or destroyed by electrostatic discharges. If the boards need to be touched during setting, measurement or for exchange, it must be assured that immediately before touching an electrostatic discharge through contact with an earthed metallic surface (e.g. the housing) has taken place.

Procedure may have been performed by valve manufacturer:
If actuators are delivered mounted to a valve, this step has been done in the valve manufacturer's factory. The setting has to be checked during commissioning.

1.4.2 Scope

For the sake of clarity, not all details of all versions of the product are described in these operation instructions, nor can they cover all conceivable cases regarding installation, operation and maintenance. For this reason, the operation instructions only contain instructions for qualified personnel (refer to section 1.1) that are necessary when the equipment is used for the purpose for which it is intended or in industrial applications.

If the devices are used in non-industrial applications with increased safety requirements, they have to be ensured by additional safety measures during assembly.

In case of any questions, and especially where detailed product information is not available, contact the sales representative in charge. Always state the type designation and the serial number of the respective actuator (see name plate).

It is recommended that the services and support of the responsible SIPOS Aktorik service centers are utilized for all planning, installation, commissioning and service tasks.

The contents of these operation instructions and product documentation shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The Purchase Agreement contains the complete and exclusive regulation on material defect liability of SIPOS Aktorik. These contractual regulations are neither amended nor limited by the descriptions contained in these operation instructions and documentation.

1.5 Supplementary operation instructions

2SG7 small electric part-turn actuators	
2SQ7 small electric part-turn actuators	
COM-SIPOS PC parameterization software	
PROFIBUS operation instructions	
MODBUS operation instructions	
HART operation instructions	
Enclosure protection IP68-8 m "K51“	
Increased vibration resistance "K57“, "K58“	
Increased vibration resistance according to seismic class S2A "K59“	
Very high corrosion protection corrosivity category C5 with long protection duration "L38"	
SIPOS SEVEN with USP	
Binary and analog inputs freely available via fieldbus	
and other	

Any special installation and operation instructions furnished by the suppliers of subcontracted components, attachments or fixtures are attached to the set of instructions and have to be observed.

2 General information

2.1 Functional principle

Description

The electronics with integral frequency converter **(1)** controls the motor **(2)**. The motor turns the output drive shaft **(4)** via the worm shaft **(3)**. The output drive shaft **(4)** drives a gear or a valve stem (5) via a stem nut.

The motion of the worm shaft **(3)** is transferred via the signaling shaft **(6)** to

- the signaling gear **(7a)**. The signaling gear reduces the movement and turns the potentiometer **(8).**

or:

- the non-intrusive position encoder (niP) **(7b)** for "non intrusive“ version. The non-intrusive position encoder counts the number of rotations and records the position within one rotation. The position recording is also performed without external power supply.

From the position of the potentiometer or the non-intrusive position encoder, the electronics recognizes the position of the output shaft **(9)** and therefore the position of the operated valve. The motor is controlled according to the process requirements.

The torque detection (TD) is performed electronically.

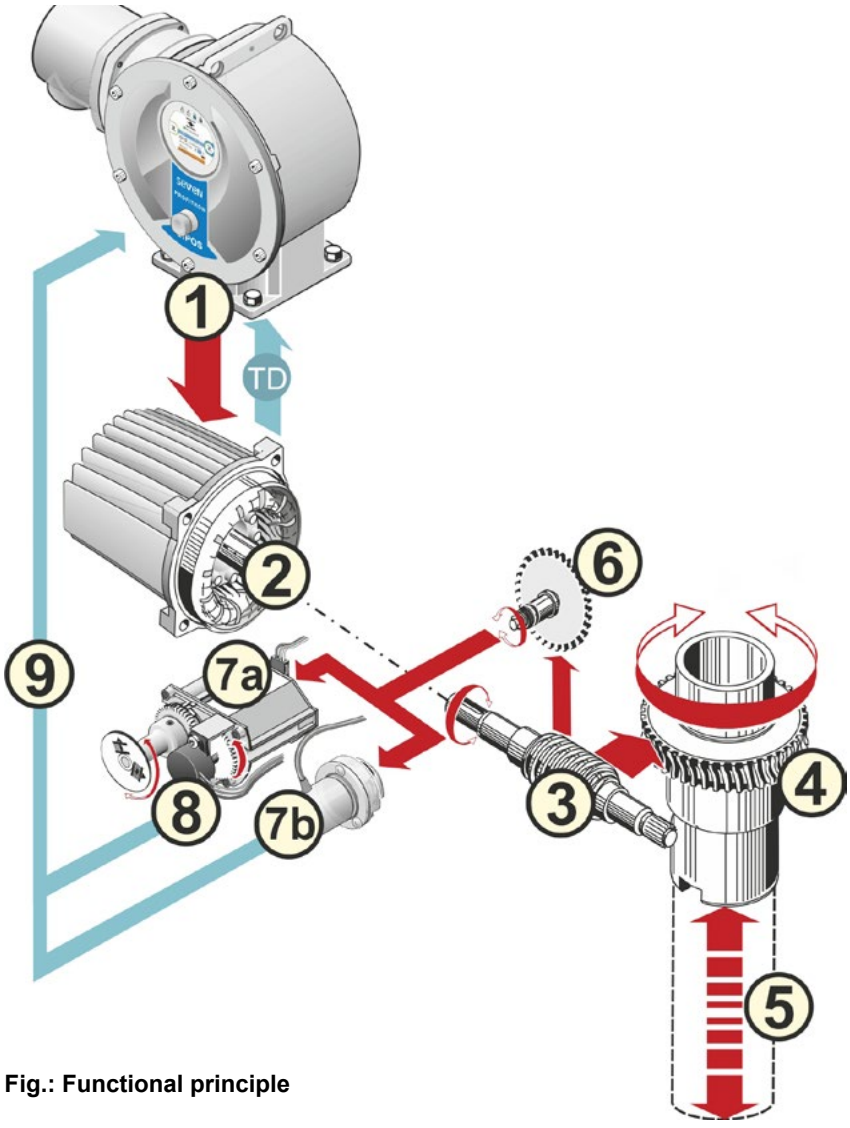


Fig.: Functional principle

2.2 Sub-assemblies

The actuators of the SIPOS SEVEN series comprise two main assemblies: gear unit and electronics unit.

For details, refer to chapter “15.3 Exploded views”.

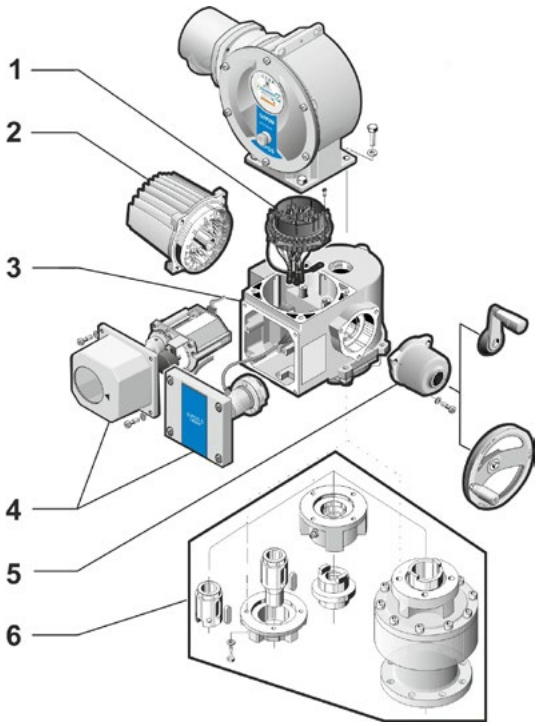


Fig.: Gear unit sub-assemblies

The main sub-assembly gear consists of the sub-assemblies:

1 Plug element electronic connection,

2 Motor,

3 Gear unit,

4 Signaling gear or non-intrusive position encoder (not for 2SG7) with cover,

5 Manual drive (with crank handle or hand wheel),

6 Possible mechanical extensions, depending on the version.

For the 2SG7 and 2SQ7 small part-turn actuators, the signaling gear is omitted and the gear unit has a different shape. For 2SG7, the manual drive has a different design.

The main sub-assembly electronics unit consists of the sub-assemblies:

1 Electrical connection (two versions available),

2 Plug element gear connection,

3 Electronic housing with cover,

4 Power control PCB, including power module,

5 Relay board (option),

6 Control PCB with display,

7 Additional analog module for additional input and output (option) or HART control input (option).

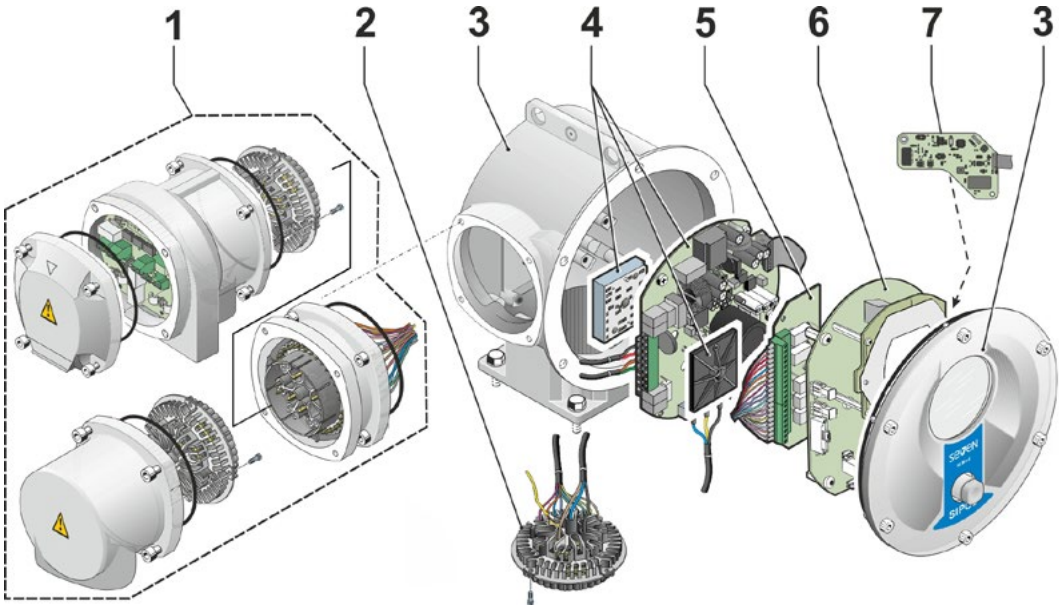


Fig.: Electronics unit sub-assemblies

2.3 Block diagram (electrical connections)

The block diagram shows the electronic sub-assemblies and the inputs and outputs for possible customer-specific connections.

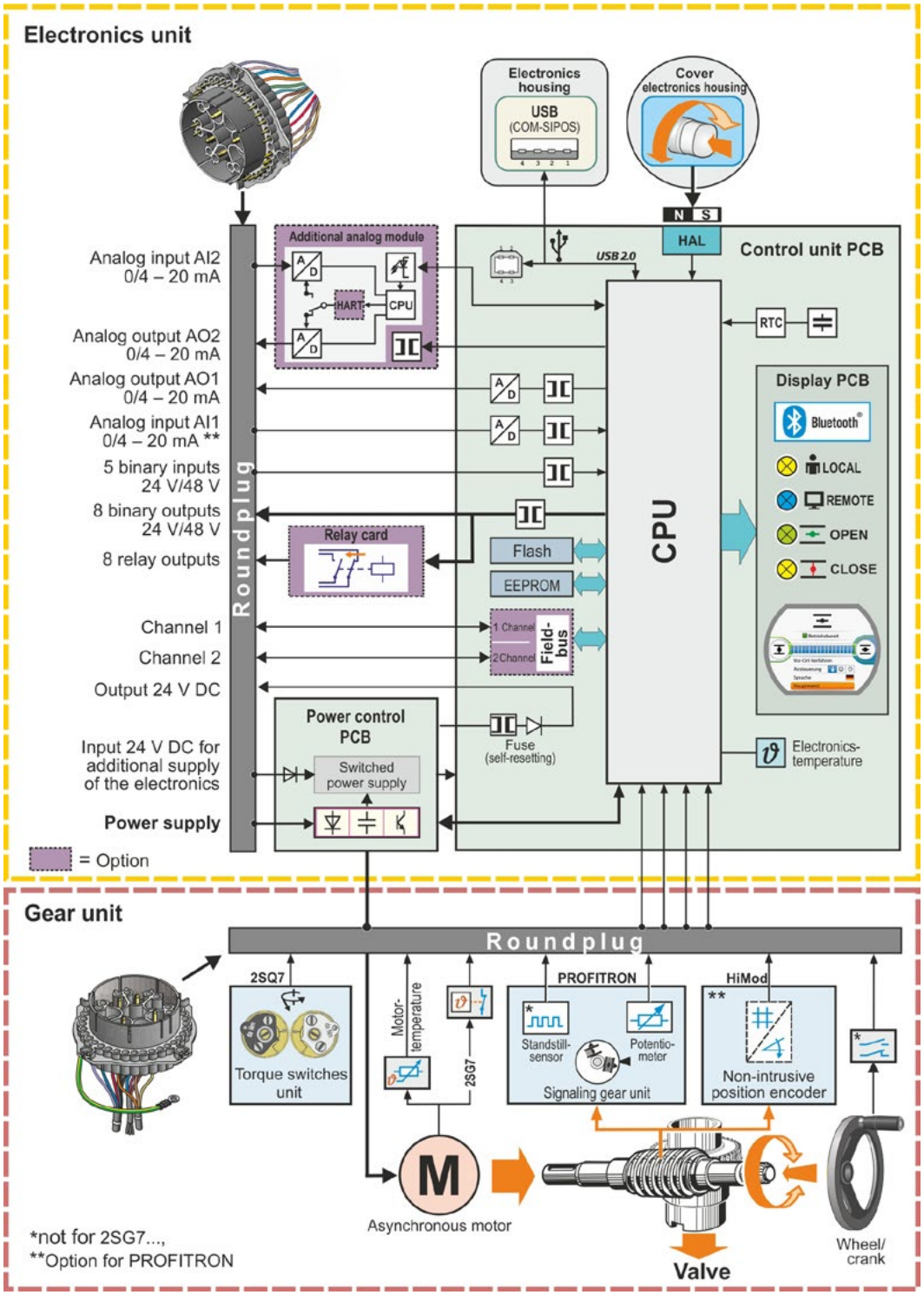


Fig.: Block diagram

3 Assembly and connection

3.1 Mount to valve/gear

If actuators are delivered mounted to a valve, this step has been done in the valve manufacturer's factory. However, the setting has to be checked during commissioning.

- Heed safety information (refer to chapter 1.1)!
- Prior to starting the assembly
  - Make sure that the intended measures (possible operation of the valve, etc.) are not likely to cause any injuries to persons or to interfere with the equipment.
  - Heed the local ambient conditions, in particular the vibration load, which can be caused when mounting an actuator to a vibrating valve
- During assembly, the output shaft insert may fall out of the output drive shaft.
- When disassembling the electronics cover, make sure the insert does not fall down.

It is recommended that the services and support of the responsible SIPOS Aktorik service centers are utilized for all planning, installation, commissioning and service tasks.

3.1.1 General assembly instructions for all output shaft types

- Mounting and operation is possible in any position. Heed the local ambient conditions, in particular the vibration load, which can be caused when mounting an actuator to a vibrating valve.
- Do not apply force and avoid shocks!
- Thoroughly clean mounting faces of output mounting flanges at actuator and valve/gear.
- Slightly grease the connection points.
- Place the actuator on the valve/gear, making sure it is properly centered.
- The bolts used upon delivery are not greased. Use bolts with at least 8.8 quality. If similar stainless steel bolts are used, they should be greased slightly using petroleum jelly.
  The depth of engagement should be at least 1.25 x the thread diameter.
- Position the actuator on the valve/gear and tighten the bolts evenly in diagonally opposite sequence.
- The housing of the SIPOS SEVEN actuator consists of an aluminum alloy which is corrosion resistant under normal environmental conditions. If the paint was damaged during assembly, it can be touched up with original paint supplied in small quantity units by SIPOS Aktorik.

3.1.2 Output shaft type A

Assembly instruction

The stem nut is screwed onto the valve stem by turning the crank handle or the hand wheel.

Spring-loaded A end shafts are subject to high pre-tension. Fitting and removal of the stem nut for thread cutting must be performed in accordance with assembly instructions!

Fitting and removing the stem nut

If the stem nut was not ordered with a trapezoidal thread (suffix "Y18" to order number), or if the stem nut is worn and has to be replaced, proceed as follows:

Output flange (fig. item 1) does not have to be removed from the rotary actuator!

1. Unscrew centering ring (fig. item 5) from output flange.
2. Take off stem nut (4) together with axial needle-roller assembly and axial bearing washers (3).
3. Remove the axial needle-roller assembly and the axial bearing washers (3) from the stem nut.
4. Only if the stem nut was delivered without thread: Cut a thread in the stem nut (4) (check the concentricity and the axial run-out when clamping the stem nut) and clean it.
5. Lubricate axial needle-roller assembly and axial bearing washers (3) with ball bearing grease and fit them on the new or machined stem nut (4).
6. Insert stem nut (4) with axial needle-roller assembly into output flange (claws have to engage properly into the groove of the output shaft of the actuator).
7. Screw in the centering ring (5) and tighten it to the stop. Make sure that the radial shaft seal (6) is inserted correctly.
8. Using a grease gun, press ball bearing grease into the nipple until lubricant is discharged between the centering ring (5) and the stem nut (4).

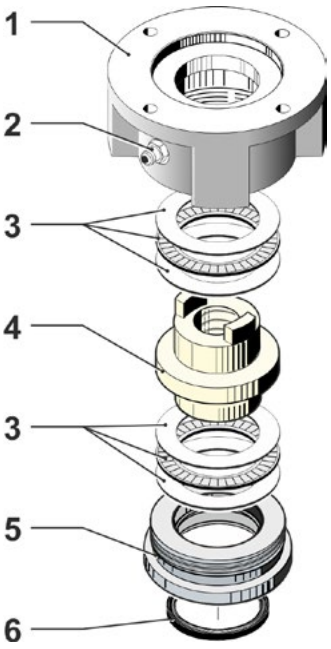


Fig.: Output shaft type A assembly

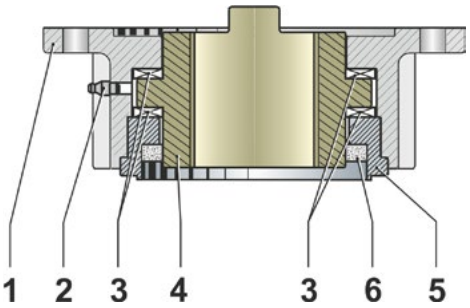


Fig.: Output shaft type A installed

For output shaft form A, ensure that the valve stem is greased separately!

3.1.3 Mount stem protection tube

1. Remove fastener (fig. item 1).
2. Check that the extended stem does not exceed the length of the protection tube.
3. Apply sealing compound to the thread and the sealing faces (e.g. 732 RTV from Dow Corning, Munich, Germany).
4. Screw in the stem protection tube (2).

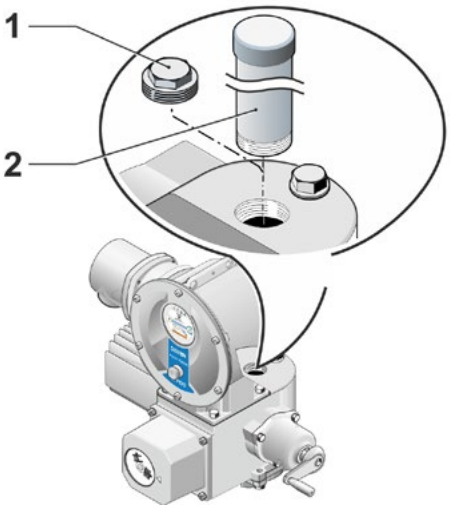


Fig.: Mount stem protection tube

3.2 Electrical connection

The components are designed as to ensure that once connected correctly, uninsulated, live parts cannot be touched directly; i.e. protection against electric shock is provided in accordance with IP2X or IPXXB.

Dangerous voltages are also applied when the motor is at standstill. Before opening the terminal cover or the connection hood, disconnect the supply voltage from the actuator. Allow **at least 1 minute** for the capacitors to discharge and do not touch any contacts.

- The supply voltage must always lie within the voltage range specified on the name plate.
- On site fuses and disconnect switches are required for short circuit protection and enabling the actuator. For the current values for sizing, refer to the “Technical data”.
- **Mains cable**: Use metal cable glands for mains connection.
- **Signal cable**: Use metal cable glands with cable shielding for the connection of the signal cable to avoid the occurrence of electronic faults. The signal cable must be shielded and the shield must be fixed or grounded on both sides. Ensure careful connection of the screen within the cable gland!
- It must be ensured that the **cable glands and seals** (O-rings) are fitted carefully and correctly in order to guarantee the enclosure protection. For details of the permissible conductor cross-sections, see wiring diagram.
- Cable glands and cables are not included in the scope of delivery.

3.2.1 Connection with round plug

1. Unscrew connection hood (fig. item 2) with plug element (1).
2. Unscrew screw plugs from the required cable entries in the connection hood.
3. Unscrew plug element (1) from connection hood (2).
4. Screw in the cable gland (3) only slightly and insert the connecting cables (4).
5. Connect the connecting cables in accordance with the terminal plan enclosed in the connection housing, connecting the earth lead to the provided terminal in the connection box.
6. Screw plug element (1) into the connection hood (2) and then fix connection hood.
7. Tighten cable glands (3).

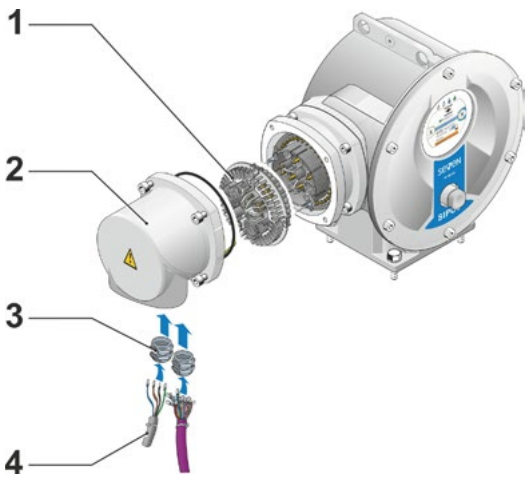


Fig.: Connection with round plug

3.2.2 Fieldbus connection

1. Dismantle fieldbus connection housing (fig. item 2) and connection cover (4).
2. Unscrew plug element (1) from fieldbus connection housing (2).
3. Unscrew screw plugs from the required cable glands in the connection hood.
4. Screw in the cable glands (5) only slightly and insert the connecting cables (6).
   For fieldbus cables, cable glands without shield are sufficient, refer to point 7 below.
5. Connect the mains cables and, if required, signal cables in accordance with the circuit diagram enclosed in the connection housing, connecting the earth lead conductor to the provided terminal in the connection box.
6. Fit plug element (1) into fieldbus connection housing (2) again.
7. Connect fieldbus connecting cables to the fieldbus termination PCB (3). Lead shielding (7) under metal clamp (8).
8. Fit connection cover (4) and fieldbus connection housing (2) again.
9. Tighten cable glands (5).

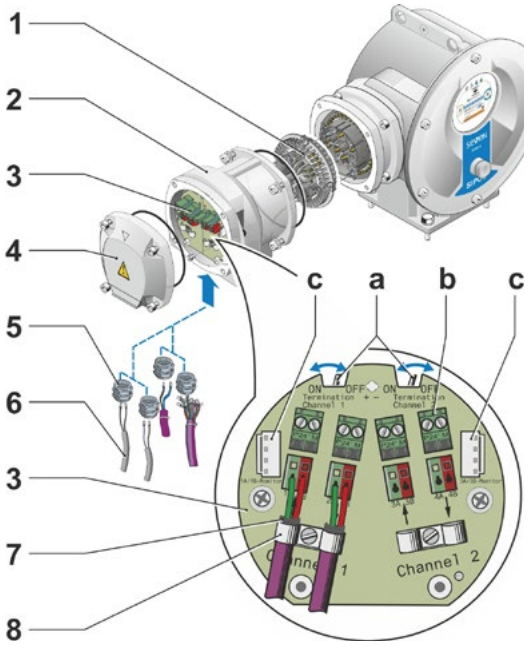


Fig.: Fieldbus connection

a = If the actuator is the last device of the fieldbus segment, the termination resistor must be set to ON or a termination must be done externally.

b = Connection for external 24 V power supply. Enables communication even if the mains are disconnected.

c = Connection for PROFIBUS DP fieldbus monitor (Protocol Analyzer).

3.2.3 External potential conductor connection

The external potential conductor connection can be used for functional grounding and not for protective grounding.

1. Remove plastic fastener (1) from the electronics housing.
2. Fit potential conductor (4) and gripping disc (5) (shims point in direction of the housing!) with M5 screw (2) and washer (3).

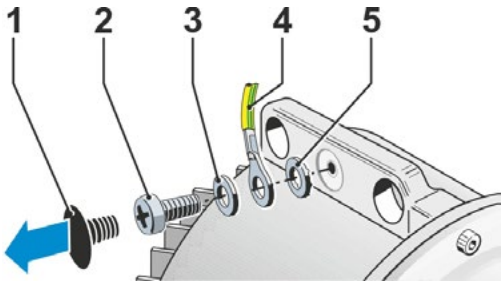


Fig.: Fit potential conductor

3 Assembly and connection

3.3 Separate mounting

If the ambient conditions such as extreme vibration, high temperature and/or if access is difficult, the electronics unit is to be mounted separately from the gear unit.

The assembly kit for mounting the gear unit and electronics unit separately can be ordered directly with the actuator or separately as an accessory (2SX7300-...). The assembly kit is preassembled. If the assembly kit is ordered directly with the actuator, it is included separately with the actuator.

Before starting the work, disconnect actuator from the mains!

Procedure

1. Install mounting bracket (fig. item 3) at the mounting location of the electronics unit.
2. Remove electronics housing (1) from the gear unit (6) and mount it on the mounting bracket (3) with the O-ring (2).
3. **Standard assembly, refer to A**
   Fit “Separate mounting” assembly kit: Plug cover with contact pins (4) on lower side of wall bracket (3) and plug cover with contact sockets (5) on the gear unit (6).
4. **Assembly with stem protection tube, refer to B**
   Turn connection hood by 90° or 180° to ensure that cables are not impaired by the stem protection tube:
   Remove screws (7) from round plug, turn round plug by 90° to 180° and fix screws again. Continue as described in section 3.

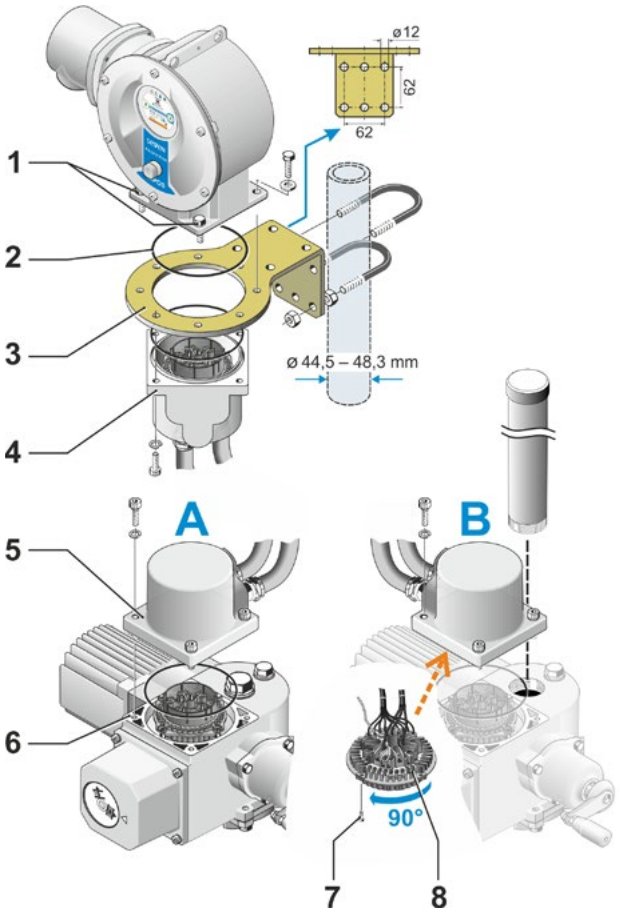


Fig.: Separate mounting
A = Standard,
B = with stem protection tube

- During installation, it is important to ensure that the O-rings are fitted correctly in order to guarantee the degree of protection.
- Generally, it has to be ensured that movable parts, e.g those of the swing lever, are not impaired by the cables.
- In exceptional cases, the motor might become very hot. Therefore the cables should not touch the motor.

Specification of the connecting cable between the electronics unit and the gear unit

The connecting cables are available in different versions:

- Standard lengths: 3 m, 5 m, 10 m;
- with additional equipment (filter) up to 150 m.
  For separate mounting exceeding 10 m including filter, the value ‘> 10 m with LC filter’ has to be set for the ‘Separate mounting’ parameter. Refer to “Special parameters” section “8.6.2 Separate mounting” on page 85.

The actuator can also be equipped with a remote control unit that allows local operation in distances up to 100 m. The remote control unit has the function of a second local control unit. Refer to “9.4 Remote control unit” on page 97.

4 Instructions on operator control and operation

4.1 Crank handle, hand wheel

- Motor driven operation of the crank handle/hand wheel is not permitted.
- After commissioning, the actuator must not be operated beyond the parameterized end positions using the crank handle/hand wheel.
- When pressing in the crank handle/the hand wheel, make sure that the hand is removed between the crank handle/the hand wheel and the housing: Danger of crushing! See the following operation step 3.

The crank handle/hand wheel does not rotate during motor operation.

Operation

Operation of all actuators except for 2SG7 and 2SQ7:

1. The actuator must be at standstill (1).
2. Remove the clamp (option) (2). The clamp is used as protection against accidental engaging of the crank handle/the hand wheel, if the actuator is exposed to heavy vibration or water pressure (enclosure protection IP68).

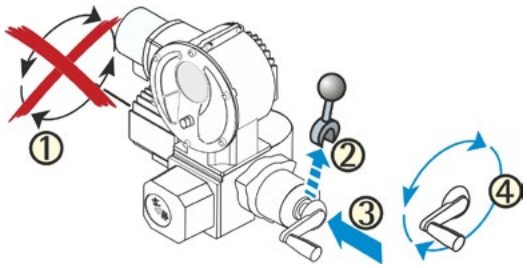


Fig.: Operate crank handle

3. Press crank handle/hand wheel in direction of the gear housing against the spring force (3) and turn (4). (Caution: Danger of crushing when engaging!)

If crank handle/hand wheel is pressed in, the motor stops. The actuator can only be operated electrically once the crank handle/hand wheel is released.

If the actuator is operated manually in "REMOTE“ state and an operation command is present, the actuator is immediately operated after releasing the crank handle/hand wheel.

2SG7 only:

Turn hand wheel without pressing it in. Manual operation interferes with motor operation: If the hand wheel is turned during motor operation, the positioning time is either extended or reduced, depending on the direction of rotation.

2SQ7 only:

Only engage manual drive while motor is at standstill, refer to illustration.
Manual operation is automatically disengaged when switching on the motor.

The hand wheel does not rotate during motor operation!

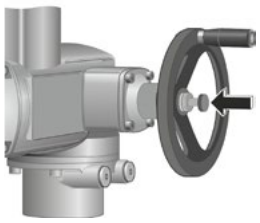


Fig.: Engage manual operation for 2SQ7

Direction of rotation

Clockwise turning of crank handle/hand wheel leads to

- 2SA7 rotary actuator: Clockwise rotation of the output drive shaft (exception: 2SA7.7. and 2SA7.8.)
- 2SG7, 2SQ7 part-turn actuator: With view on the mechanical position indicator: clockwise rotation at the coupling or at the swing lever.

Depending on the gear unit installed, the direction of rotation may vary.

4.2 Light emitting diodes (LED) and display

The actuator informs the user via

- Light emitting diodes (LED).
  The light emitting diodes indicate the current status of the actuator.
- Display.
  The graphic color displays informs the user on the status of the actuator. Clearly arranged representation and menu structure allow for comfortable operation and parameter setting. The Drive Controller (rotary push button) enables operation directly at the actuator.

This chapter contains an overview of light emitting diodes and the information they provide for the user.

An overview of the display status indication shows the multitude of information available for the user.

4.2.1 Overview of light emitting diodes

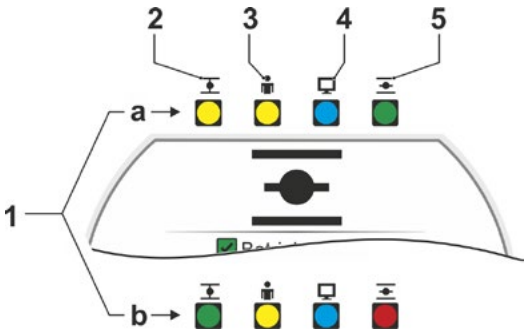


Fig.: LEDs

1 Depending on the actuator ordered, the colors of the light emitting diodes might vary:
a) Standard,
b) With add. version C73.

2 LED (CLOSE).
The CLOSE LED is flashing if the actuator moves in CLOSE direction and is continuously illuminated, if the actuator is in end position CLOSED.

3 LED (LOCAL)
The LOCAL LED is illuminated if "local" control is selected.

4 LED (REMOTE)
The REMOTE LED is illuminated if "REMOTE" control is selected.

5 LED (OPEN)
The OPEN LED is flashing if the actuator moves in OPEN direction and is continuously illuminated, if the actuator is in end position OPEN.

Further descriptions included in these operation instructions always refer to the standard version of the LEDs.

4.2.2 Overview of status indication

Display areas

If the Drive Controller (rotary push button) is operated in the initial state, the display will be activated and show the status indication The status indication has two areas, refer to illustration:

- **A** = The upper section provides actuator status information.
- **B** = The lower section shows the start menu which allows access to the different operating and parameterization menus.

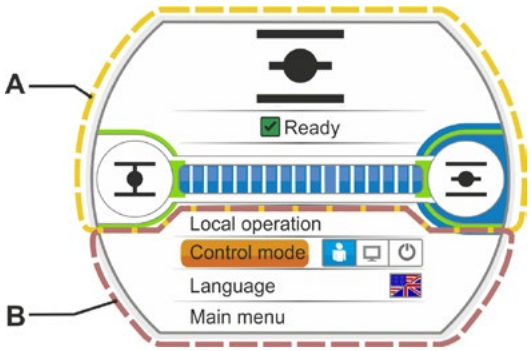


Fig.: Display areas

If the Drive Controller is not operated, the display automatically changes from the active state to the standby state after a preset duration (default value: 10 min.):
– Display illumination is reduced and
– The display changes to standby screen.

Turning or pressing the Drive Controller resets the display to the active state.

Refer also to “Standby screen” on page 95.

Texts/symbols in the status indication

1 Indicates the state of the actuator.
Refer to chapter “4.3 Actuator status indication” on page 18.

2 Position indication.
The figure and the position bar indicate how far the actuator has progressed in position OPEN. The decimal places are displayed in accordance with the actuator variant:
- HiMod – two decimal places;
- PROFITRON with niP – one decimal place;
- PROFITRON with signaling gear – no decimal place;

If the actuator is in one of the end positions, an end position symbol is indicated instead of the number, refer also to fig. 2.

3 Symbol for end position OPEN, end position CLOSED.
For a detailed description, refer to the following section “End position symbols and position bars”.

4 Symbols for control mode.
They indicate the selected control mode: ‘LOCAL’, ‘REMOTE’ or ‘OFF’,
refer to chapter “5 Start menu” on page 26.

5 Flag of the selected language.

6 Start menu.
For a detailed description, refer to chapter “5 Start menu” on page 26

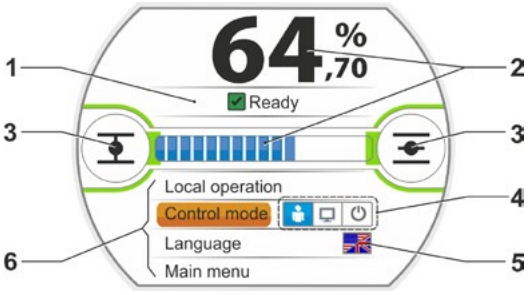


Fig. 1: Status indication

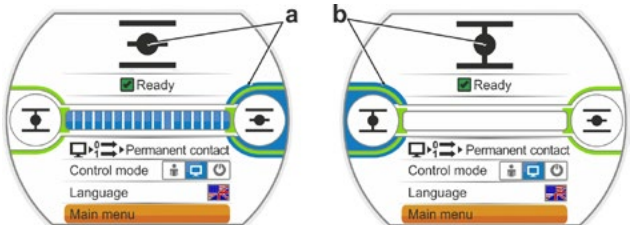


Fig. 2: Actuator in end position
a = End position OPEN; b = End position CLOSED

End position symbols and position bars

The top area of the status indication provides information on the cut-off mode in the end positions and on the current status of the actuator.

1 Cut-off mode in end positions:
1a = Orange closed circle means 'torque-dependent cut-off mode'.
1b = Green open circle means 'travel dependent cut-off mode'.

2 End position range indication:
2a = End position range of end position CLOSED.
2b = End position range of end position OPEN.
The length of the indication bar represents the scope of the end position range.

3 Indication during operation:
3a = The position bar indicates the progress during operation (opening and closing the valve).
The value indicates in % how far the actuator has been operated to position OPEN.
3b = The symbol of the end position into which the actuator is currently being operating is flashing.

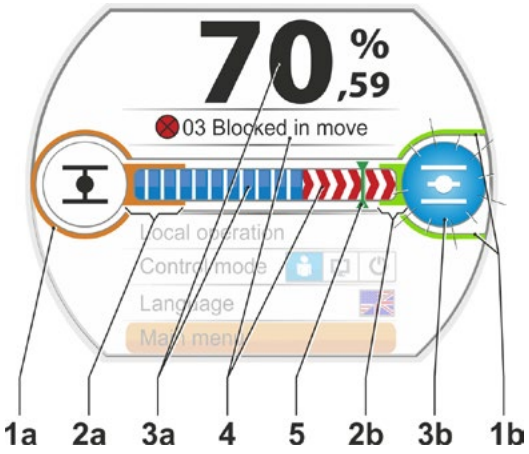


Fig. 1: End position symbols and progress bar

4 Should a block occur during operation, the respective status message is indicated and the remaining travel is represented as red hatched area, refer to fig. 2

5 If an EMERGENCY position or a setpoint is being approached, the target position is indicated by a symbol (vertical line on the position bar).

6 If the actuator is in one of the end positions, the respective symbol is shaded in blue.

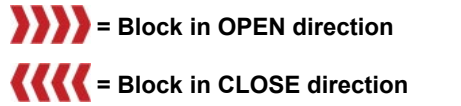


Fig. 2: Indication of operation direction during block

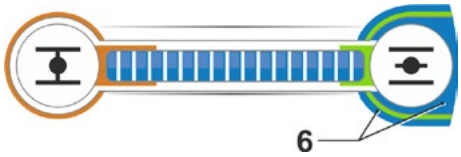


Fig. 3: Indication Actuator in end position OPEN

4.3 Actuator status indication

The actuator state is indicated in the display, refer to fig. item 1.

If a fault has occurred, the display shows a warning symbol (fig. item 2) and a hint with regard to potential causes. If the actuator is not ready for operation, the display is framed in red (item 4).

By selecting the fault signal, additional information, e.g. possible remedies, are indicated.

The figures in front of the message (fig. item 3) refers to the type of fault and allows unambiguous identification by the service staff.

The first digit of the figure signifies:

0 = operational state;

1, 8 = self-resetting fault;

2 = acknowledgeable fault;

3 = fault due to external causes;

4, 5, 6 = fault within the device.

For a detailed description of possible fault signals, refer to the table below.

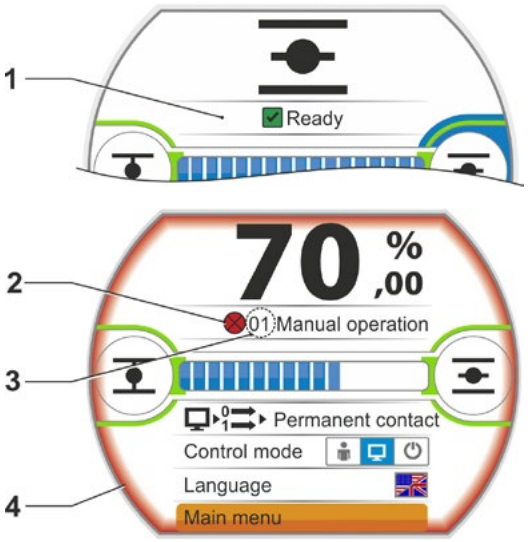


Fig.: Status indication

Status messages in the display including explanation		
Signal	**Explanation**	**Possible remedy**
01 Manual mode	■ Hand wheel/crank handle is pressed. ■ Cable to the hand wheel is defective	■ Pull hand wheel/crank handle and/or ■ Check feed cables and contact points of electronics/gear! Should this message occur sporadically, vibration could be the cause. In this case, use brackets. Refer to “4.1 Crank handle, hand wheel” on page 15.
02 Emergency mode	An EMERGENCY signal is present. The parameterized EMERGENCY position is approached.	

Status messages in the display including explanation		
Signal	**Explanation**	**Possible remedy**
03 Blocked in move	A block has been detected within actuator travel. The actually required torque exceeds the set tripping torque.	Operate actuator into opposite direction. Should the message occur rather frequently, ■ Check valve and torque setting, increase tripping torque if necessary or use the “Move again if blocked in move” function! ■ Check MOV for sluggishness.
04 Local blocked	Status signal only! Local control can be disabled via fieldbus or a binary signal (refer to section “8.3.7 MODE input”). In case of a fieldbus communication error, local control is automatically re-enabled.	
05 REMOTE commissioning	Status signal only! Actuator is commissioned in REMOTE mode.	Wait for termination of commissioning in REMOTE mode.
11 Motor temp. too high	The motor has exceeded the maximum temperature of 155 °C. Possible reasons: ■ Excessive ambient temperature, ■ Excessive runtime, ■ Too many switching cycles. ■ Actually required torque too high or ■ Short-circuited motor coil or for 2SG7 connection to the motor temperature sensor interrupted. ■ Parameter for separate mounting ‘>10 m with filter’ not set.	**Note:** The motor temperature monitoring can be deactivated by programming at the actuator (plant protection has priority over motor protection). However, the warranty for the actuator immediately becomes void. ■ Check operation conditions, valve as well as motor; ■ Check **‘Separate mounting’** parameter.
12 Overvoltage	Mains voltage too high (outside the tolerance +15 %).	■ Check connection voltage, ■ Check mains voltage for variations.
13 Undervoltage	Mains voltage too low (outside the tolerance –30 %).	■ Check power supply! ■ Check mains voltage for variations!
14 Power supply fault	Power supply failed or too low.	■ Check power supply! ■ Check connecting cable!
21 Run time error	After 3 % of the positioning time, the actuator has covered less than 0.5 % travel. The positioning time is measured and saved following the end position adjustment. Possible reasons: ■ Potentiometer contacts in the plug/socket connector were ejected. ■ Incorrect assembly and/ or setting of the potentiometer after replacement. ■ Motor cable interrupted (motor is not running). ■ Error during position recording (the gear backlash between potentiometer and central wheel is either too small or too large: No change of position is detected although the motor is running.) ■ Signaling gear ratio was changed: – Signaling gear turns in the opposite direction or – Setting of the slide wheel (rev/stroke) in the signaling gear is too high ■ Actuator is blocked (actuator cannot be operated from position/end position). ■ Faulty potentiometer (film is interrupted). ■ Parameter for separate mounting ‘>10 m with filter’ not set.	■ Check valve, signaling gear, motor as well as potentiometer! ■ Check **‘Separate mounting’** parameter.

Status messages in the display including explanation		
Signal	**Explanation**	**Possible remedy**
22 Process Interlock	STOP input is active. Binary control only: Pulse contact.	Deactivate STOP input. Refer to chapter “8.3.3 Control system – Control mode” on page 67
24 Motor lock	The “Enable motor operation” function is selected for the mode input, however the signal for enabling motor operation is missing.	Verify voltage level at mode input or deselect function if activated by accident.
30 Execute last command	No signal from signal source (wire break). The actuator continues to complete the last command according to parameterization (OPEN, CLOSE, setpoint). The actuator can be operated in ‘LOCAL’ control (e.g. hand wheel, emergency operation, alternative control mode).	Check cables/contacts in the round plug.
31 Set end positions!	No valid end position adjustment available. The indication may have the following reasons: ■ End position adjustment has not yet been performed, ■ End position was passed due to hand wheel operation, ■ Friction coupling of the signaling gear was twisted or the signal gear reduction was changed or ■ Cut-off type was changed (e.g. from torque-dependent to travel-dependent)	Perform end position adjustment!
32 No AI1 signal	This indication is only possible for live-zero setting (4 – 20 mA). Threshold I: > 21 mA or < 3.6 mA, or programmed values for detection of wire break (refer to chapter 8.6.12) exceeded or fallen short of.	Check input current!
33 Fault fieldbus	Fieldbus communication interrupted (timeout). This error status is only signaled as a fault if the REMOTE control is performed via fieldbus. **Note:** The fieldbus address must deviate from the default setting (126 for PROFIBUS and 247 for Modbus)!	Check fieldbus communication and connection!
34 No signal - Pos. held	No signal from signal source (wire break). Actuator stops. The actuator can be operated in ‘LOCAL’ control (e.g. hand wheel, emergency operation, alternative control mode).	Check cables/contacts in the round plug.
35 No signal – EMERGENCY pos.	No signal from signal source (wire break). Actuator performs an EMERGENCY operation. The actuator can be operated in ‘LOCAL’ control (e.g. hand wheel, emergency operation, alternative control mode).	Check cables/contacts in the round plug.

Status messages in the display including explanation		
Signal	**Explanation**	**Possible remedy**
36 Keep actual process value	No signal (setpoint) from signal source (wire break). When detecting a wire break, the last detected actual process value will still be controlled. The actuator can be operated in 'LOCAL' control (e.g. hand wheel, emergency operation, alternative control mode). After change-over to 'REMOTE', the available actual process value will be controlled.	Check cables/contacts in the round plug.
37 Move to fixed setpoint	No signal from signal source (wire break). Fixed process setpoint is approached and maintained The actuator can be operated in 'LOCAL' control (e.g. hand wheel, emergency operation, alternative control mode).	Check cables/contacts in the round plug.
38 No AI2 signal	This indication is only possible for live-zero setting (4 – 20 mA). Threshold I: > 21 mA or < 3.6 mA, or programmed values for detection of wire break (refer to chapter 8.6.12) exceeded or fallen short of.	Check input current!
39 No signal FO	For fieldbus with ring topology: No telegram received from one or both sides.	Check feed cables or contact points!
41 No signal motor temp.	Connection to the temperature sensor interrupted	Check feed cables and contact points of electronics/gear!
42 No signal potentiometer	No data received from the potentiometer.	■ Check feed cables and contact points of electronics/gear! ■ Check feed cables for separate installation. ■ Replace signaling gear.
43 No signal position encoder	No data received from the non-intrusive position encoder (niP).	■ Check feed cables and contact points of electronics/gear! ■ Check feed cables for separate installation. ■ Replace non-intrusive position encoder.
44 End position overrun	Position of the central wheel is too close to the mechanical end stop of the signaling gear. ■ The end positions have been exceeded by hand wheel operation or ■ The friction coupling in the signaling gear was twisted or the signaling gear ratio was changed.	End position re-adjustment required. ► refer to chapter "7.4 Adjust end positions for version with signaling gear" on page 45.
45 No signal standstill sensor	No data received from the standstill sensor.	■ Check feed cables and contact points of electronics/gear! ■ Check feed cables for separate installation.
46 Analog add-on module	No signal received from additional analog module.	■ Check ribbon cable to analog module. ■ Switch voltage on/off (AC/DC). If the indication is still displayed, replace electronics unit.

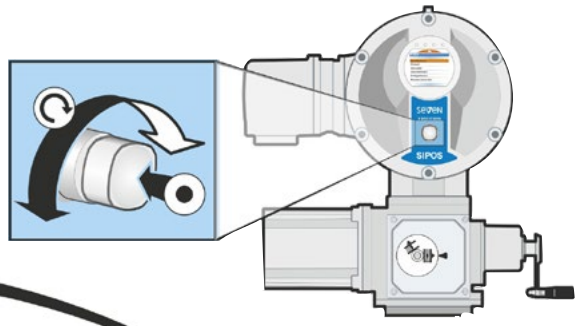
Status messages in the display including explanation		
Signal	**Explanation**	**Possible remedy**
47 Failure HART Comm.	Analog module defect. No HART communication possible.	Switch voltage on/off (AC/DC). If the indication is still displayed, replace electronics unit.
48 Fault AO2	No analog output via AO2 possible.	Switch voltage on/off (AC/DC). If the indication is still displayed, replace electronics unit.
49 No signal AO2	Connection between AO2 and DCS interrupted.	Check feed cables or points of contact!
50 Fault hardware	Fault within the electronics.	Switch voltage on/off (AC/DC). If the indication is still displayed, replace electronics unit.
60 Fault Bluetooth	Communication fault in the Bluetooth module. The actuator still is ready for operation and can be programmed using the local control station or COM-SIPOS.	Switch voltage on/off (AC/DC). If the indication is still displayed, replace electronics unit.
61 Electronics temperature	Electronics temperature sensor defective. The actuator is still ready for operation.	Switch voltage on/off (AC/DC). If the indication is still displayed, replace electronics unit.
62 Fault position encoder	Bad signal quality of non-intrusive position encoder (niP); position cannot be validated.	■ Check feed cables and contact points of electronics/gear! ■ Check feed cables for separate installation.
63 No signal torque switch	2SQ7 only: Signals from both torque switches are not recognized.	■ Check feed cables and contact points of electronics/gear! ■ Check feed cables for separate installation.
80 Warning RCU	No connection to the remote control unit.	■ Check feed cables or points of contact! ■ Verify parameterization of the remote control unit at the actuator and at the remote control unit.
90 Fault hardware		
	The signature of the control electronics PCB is either missing or faulty. If, for example, older actuators are equipped with firmware version V3.12 or higher, this fault signal will be display due to missing signature.	Request a current control PCB via service@sipos.de, stating the current parameterization (COM-SIPOS file).

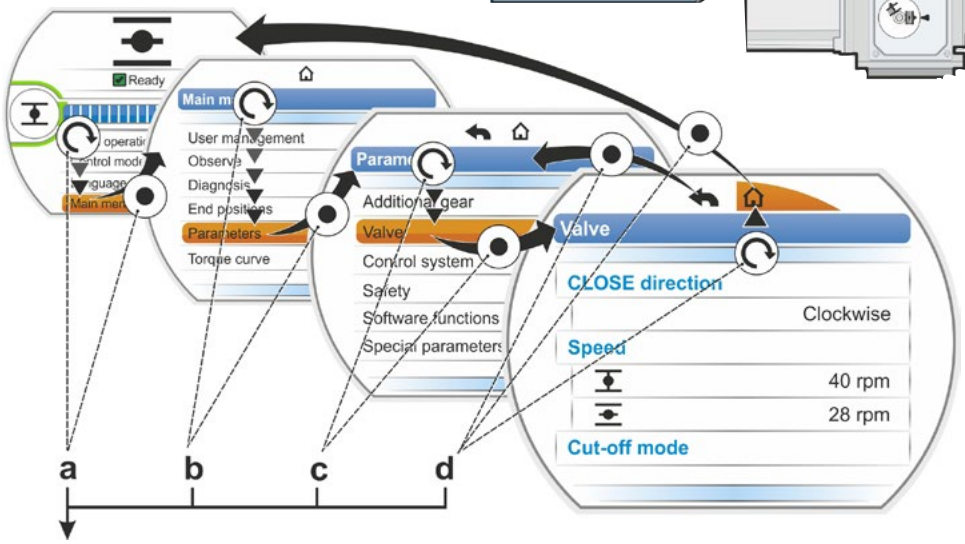
4.4 Navigation through the menus

4.4.1 Operation of the Drive Controller

= **Turn** Drive Controller (rotary push button):
Selection (selected menu item is shaded in orange).

= **Press** Drive Controller:
Confirm selection.





Operation sequence:

a = Select ‘Main menu’ and confirm . Display changes to ‘Main menu’.

b = Select ‘Parameter’ and confirm . Display changes to ‘Parameter’ menu.

c = Select ‘Valve’ and confirm . Display changes to ‘Valve’ menu.

d = Select ‘Back’, or and confirm .

- : Display changes to status indication.
- : Display changes one level back to ‘Parameter’ menu.

Representation of operating sequence in the operation instructions:

a → Main menu
b → Parameter
c → Valve
d → *or*

If the Drive Controller is not operated for a preset time (default value: 10 min.), the display changes from the active state to the standby state.
– Display illumination is reduced and
– The display changes to standby screen.

Turning or pressing the Drive Controller resets the display to the active state.

Refer also to “Standby screen” on page 95.

4.4.2 Explanation of symbols, texts within menu

Overview of a menu

1 Name of the menu.

2 ⌃ ⌄ Reference to further menu items above/below within the menu.

3 Selected menu item (shaded with an orange bar).

4 Menu items, selections within the menu.

5 Progress bar, indicates that there are further menu items than currently displayed.

6 Slider, changes its position on the scrollbar according to the position of the selected item within the menu.

7 Return to previous menu level.

8 Return to status indication.

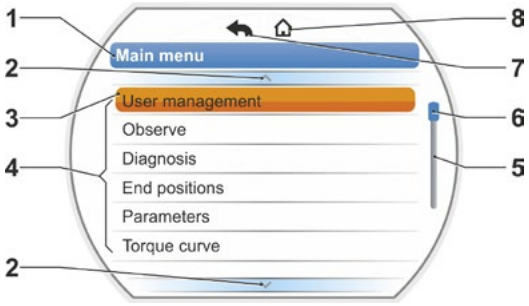


Fig.: Overview of a menu

Parameter selection

Select parameter first (shaded in orange) to change the value/characteristics of a parameter. The figure on the right shows the example of the selection of a parameter to be changed

1 Name of the menu.

2 Parameter name (cannot be selected)

3 Selection marker

4 Parameter value (current setting)

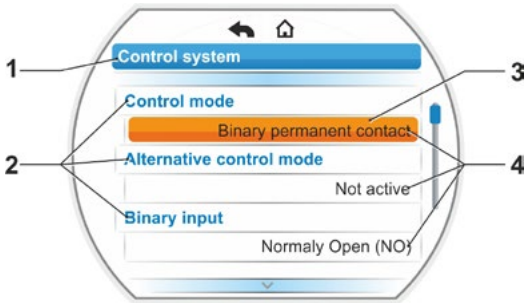


Fig.: Parameter selection menu

Changing parameter values/ characteristics

Adjustment varies depending on the type of parameter

Either/or setting

Select parameter value/characteristics out of two possible options, like for example, for the cut-off mode: Either ‘torque-dependent’ or ‘travel-dependent’, refer to illustration on the right:

1 Parameter name ‘ Cut-off mode’ (cut-off mode in end position CLOSED)

2 Selection marker (orange bar)

3 Possible parameter values/settings

4 Setting active

5 Setting not active

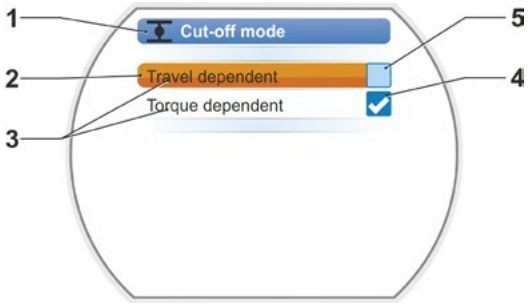


Fig.: Cut-off mode end position CLOSED menu

Yes/no setting

Furthermore, one or several settings/parameter values can be set to active. Active settings are ticked ☑, refer to fig. item 4.

Step-by-step setting

Depending of the parameter, parameter values are modified in predefined steps e.g. for tripping torque adjustment.

1 Parameter name

2 Operation direction. In this example, the setting applies to operation in CLOSE direction.

3 Current setting, indicated as number.
If changed, the color of the number changes from blue to orange.

4 Current setting, graphic representation with regard to the entire setting range.

5 Setting range, from ... to

6 Unit of the parameter value.

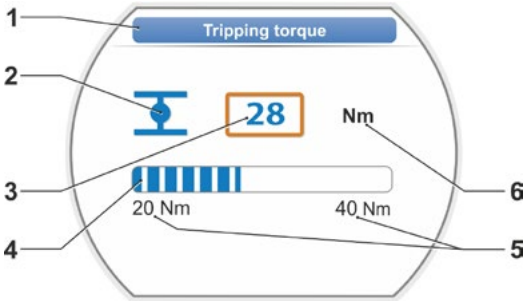


Fig.: Change parameter value

Digit setting

Some settings require entry of a multi-digit figure such as the 4-digit enable code for special functions. The parameter value can be directly entered as figure.

1 Parameter name.

2 Current setting, indicated as number.
If changed, the color of the number changes from blue to orange.

3 Current setting, graphic representation with regard to the entire setting range.
Possible setting range <----->, in the above example 0 to 100 %.

4 Setting acknowledgment.

5 Setting aborted.

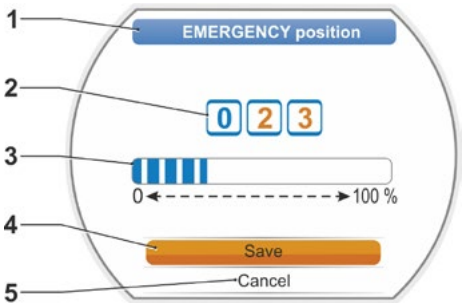


Fig.: Change numerical value

The following generally applies:

- Black writing = Functions/settings can be selected.
- Gray writing = Function cannot be selected since access rights are insufficient, refer also to chapter “6 User management” on page 31.

5 Start menu

5 Start menu

1 Depending on the selected control mode, this menu line is active:
- If 'LOCAL' control is selected,'Local operation' is displayed in this menu line.
- For 'REMOTE' control further information on control mode REMOTE is displayed here.

2 Control:
Change over between 'LOCAL', 'REMOTE' or 'OFF'.

3 Language selection:
The display language is selected via this menu item. In addition to the text in the desired language, the respective flag is displayed.

4 Main menu:
Access into the main menu for observing, parameterization of the actuator as well as end position setting.

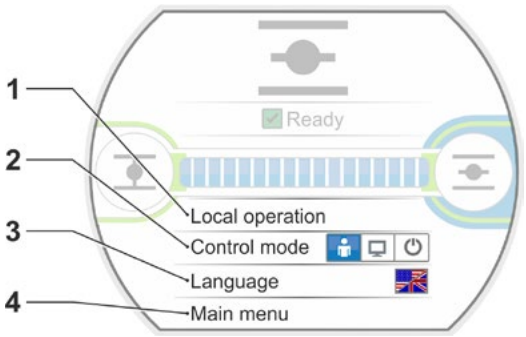


Fig.: Start menu

5.1 Control mode

Use the 'Control mode' menu item to change between 'LOCAL', 'REMOTE' and 'OFF'. The following table indicates the actuator control mode and which parameters can actually be changed and which parameters can only be displayed.)

Display/change parameters at the actuator			
Menu	**Control mode**		
	LOCAL	**REMOTE**	**OFF**
Parameter	Display = O, Change* = X		
Language selection	X	X	X
Operate actuator	X	–	–
Observing			
Electronic name plate	O	O	O
Inputs and outputs	O	O	O
Actuator status	O	O	O
Diagnosis			
Operating data of actuator	O	O	O
Maintenance limits	O	O	O
Valve maintenance	O	O	O
End position adjustment	X	–	–
Parameter			
Parameter values	X	O	X
USB flash drive			
Firmware update	X	–	X
Download parameters to USB flash drive	X	X	X
Upload parameters from USB flash drive	X	–	X
Save log data on USB flash drive	X	X	X
Save torque curves	X	X	X
Clone actuator	X	–	X
System settings			
Display orientation	X	O	X
Latching function in local operation	X	O	X
Real time clock	X	O	X
Bluetooth activation	X	O	X
Remote control unit	X	O	X
*if the selected user level has sufficient access rights			

5.1.1 'LOCAL' control mode: 'Local' actuator operation

If 'LOCAL' control is selected, the menu item 'Local operation' is displayed. Via this menu item, the actuator can be operated locally (OPEN, CLOSE as well as STOP), control from 'REMOTE' is disabled.

Operation sequence

1. Select 'Control mode' menu item.
2. Press Drive Controller until symbol for LOCAL is active,fig. 1, item 1.
   'Local operation' is displayed in the line above (refer to item 2) and the yellow LOCAL LED is illuminated (item 3).

Should the message appear that the function cannot be performed with the logged on access level, change the access level, refer to chapter "6 User management" on page 31.

3. Select 'Local operation' menu item and confirm.
   'Local operation' is indicated in the display, refer to fig. 2, item 1.
4. Select direction of operation (refer to fig. 3 on the right)
   - a: Symbol = operation in CLOSE direction

   or
   - b: Symbol = operation in OPEN direction

   Selected end position symbol is shaded in orange.
5. Press Drive Controller.
   The actuator operates and
   - The end position symbol in operation direction, in our example end position OPEN, is flashing in blue (fig. 4, item 3);
   - The value (item 1) indicates in % how far the actuator has been operated to position OPEN and
   - The position bar (2) indicates the progress of the operation;
   - If a torque measurement flange is connected, the current torque will be indicated (5).

   If the Drive Controller is held down for more than 3 seconds, 'Latching active' (fig. 4, item 4) is indicated in the display and the actuator resumes operation once the Drive Controllers is released until;
   - the end position or the target position has been reached or
   - the Drive Controller is pressed once again.

   Once the end position has been reached, this is indicated by the blue field behind the end position symbol (fig. 5, item d) and the respective LED is illuminated.

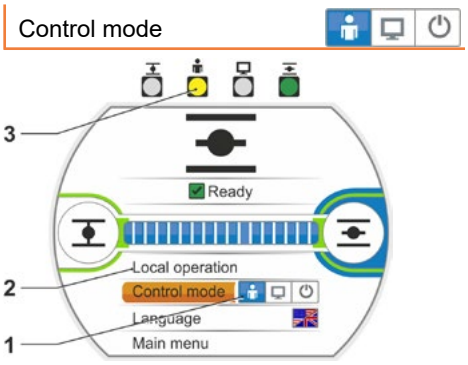


Fig. 1: Control mode Local operation

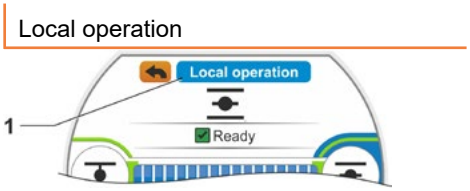


Fig. 2: "Local operation" display

Fig. 3: Selection operation direction

Fig. 4: Indication during operation

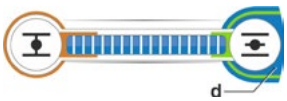


Fig. 5: Actuator in end position indication

- In the local state, all changes (display language, end positions, parameters values) are possible, if you have sufficient access rights. Refer to table above.
- The 'latching' function can also be deactivated, refer to chapter "9.1.3 Operation – latching function" on page 95.

5 Start menu

5.1.2 'REMOTE' control mode:

In the 'REMOTE' status state, the actuator is controlled by the automation system (DCS).
In the REMOTE state, the display language can be selected and parameters be read.

Operation sequence

1. Select 'Control mode' menu item.
2. Press Drive Controller until symbol for remote is active,fig. item 1.
   Additional information on the control mode is displayed in the line above (item 2) and the
   blue REMOTE LED is illuminated (item 3).
   Actuator control is performed via the automation system, e.g. the DCS.

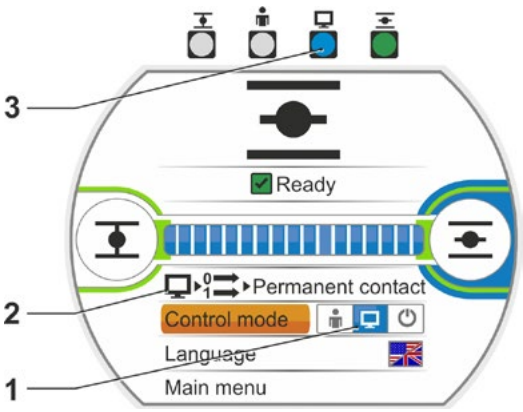


Fig.: Remote control mode

If LOCAL control is changed to 'remote' control, the actuator is operated if an operation command by the automation system (DCS) is present!

In REMOTE mode, the following can be performed on the actuator without interrupting operation:

- Selecting another language.
- Use the main menu to access information on the actuator, refer to table in chapter "5.1 Control mode" on page 26.

5.1.3 'OFF' control mode:

In this state, local or remote actuator operation is not possible.

Operation sequence

1. Select 'Control mode' menu item.
2. Press Drive Controller until symbol for OFF is active, fig. item 1.
   The message 'OFF' is displayed in the line above refer to fig. item 2.

Now the following options are available at the actuator

- Selecting another language.
- Use the main menu, parameters and system settings as well as to display information on the actuator and valve maintenance, refer to table in chapter "5.1 Control mode" on page 26.

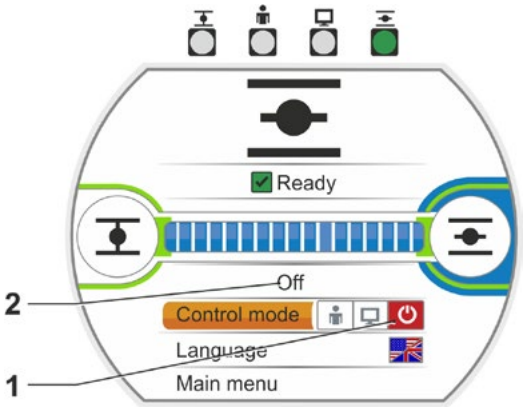


Fig.: Off control mode

5.2 Language selection

Language selection is only required if the text in the display is not shown in the desired language.

Operation sequence

1. Select ‘Language’ in the start menu (fig. 1).
   Display changes to the Language menu, refer to fig. 2.
   The currently selected language (fig. 2, item 1) is displayed as well as a list with the symbols (flags) of the languages which can be selected.
   The scrollbar (item 3) indicates, that more languages can be selected than those currently indicated in the display.

2. Set the orange selection marker (fig. 2 item 2) to the desired language.

3. Confirm selection.
   Display texts are indicated in the selected language.

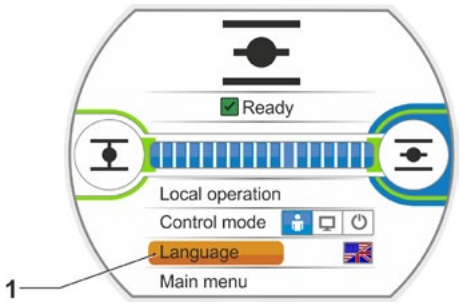


Fig. 1: Language selection within status menu

Fig. 2: Language menu

5 Start menu

5.3 Main menu overview

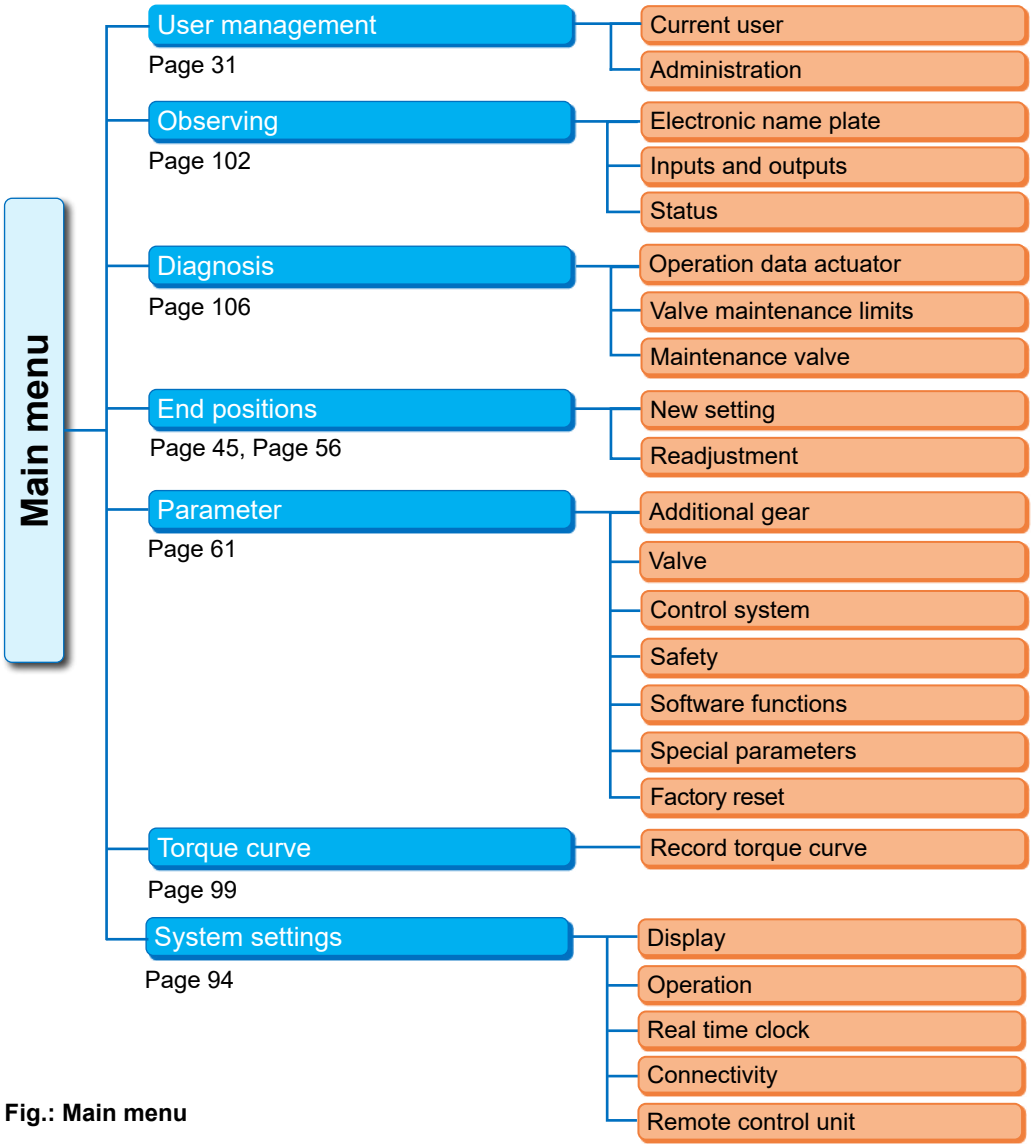


Fig.: Main menu

The main menu contains the following menu items:

- **User management:** For enabling access authorization.
- **Observe**: Indication
  - 'Electronic name plate'
  - Input and output status and
  - Actuator status.
- **Diagnosis**: Indication
  - of operating data (number of starts, cut-offs, operating hours) of the actuator since initial commissioning;
  - of operating data until next maintenance of the valve;
  - whether maintenance of the valve is required or not as well as confirmation of performed maintenance.
- End positions: End positions can be set via this menu item.
- **Parameters**: This menu is used to display and change the actuator parameters. Parameter values can only be changed with user level 'Supervisor' or higher.
  If the access authorization has not been generally enabled, a prompt to enter the password is displayed (4-digit code).
- **Torque curve:** Three torque curves can be recorded.
- **System settings**: Display orientation and internal clock settings as well as activation/deactivation of the latching function, the Bluetooth module,USB-interface and the remote control unit.

6 User management

6.1 General information

Many functions as well as parameterization can only be accessed using an access authorization (4-digit code). This prevents unauthorized persons from changing parameters inadvertently or advertently. Functions and parameters are grouped in user levels. Possible user levels are listed in the following table:

User level	Access rights required (default setting)	Reading parameters	Operate actuator	Write "simple" parameters	Write "expert" parameters
1 Observer	No	YES			
2 Operator	YES (**0000**)	YES	YES		
3 Supervisor	YES (**9044**)	YES	YES	YES	
4 Expert	YES (**9044**)	YES	YES	YES	YES

- **Observer**
  - Parameters can be displayed but not changed.
  - This user level has no special access authorization.
- **Operator**
  - Parameters can be displayed but not changed.
  - Local actuator operation is possible.
  - For this user level, a 4-digit password is required. ‘0000’ is the default setting. The user level remains enabled by user level "0000" (refer to indication below).
- **Supervisor**
  - Parameters can be displayed.
  - Parameterization of "simple" parameters.
  - Local actuator operation is possible.
  - For this user level, a 4-digit password is required. ‘9044’ is the default setting (see reference below).
- **Expert**
  - Like for ‘Supervisor’ but in addition:
  - Parameterization of expert parameters.
  - Load firmware from USB flash drive, clone actuator.
  - This user level is also protected by a 4-digit password. ‘9044’ is the default setting (see reference below).

If a user level is assigned the password ‘0000’, this user level remains enabled, even if the password ‘0000’ has also been assigned for lower user levels. Renewed enabling is not required.

6.2 General procedure

Access to each user level, except for ‘Observer’ requires authorization, i.e. an individual password. The default settings of these authorization passwords are listed in the previous chapter ‘General’.

The password can be changed at any time via the ‘Administration’ menu.

The following generally applies:

1. **Once**
   Assign a password (4-digit code) to the desired user level:
   ‘User management’ menu --> ‘Administration’ Refer to the following chapter “6.3 Assign password to user level/change password of a user level”
2. **Prior to each session**
   Enable authorization for desired user level:
   ‘User management’ --> ‘Current User’. Refer to the following chapter “6.4 Enable user level”.

3. **Once work is complete**
   Reset user access level:
   'User management' --> Set 'Observer'.
   'Observer' is the user level (default setting) the actuator changes to when not operated for more than 10 minutes. Exception if '0000' was assigned as password, refer to the following note on Page 33.

6.3 Assign password to user level/change password of a user level

The password can only be changed for the current user or a lower user level.

1. Select 'User management' in the main menu.
   The 'User management' menu with the menu items
   – Current user
   – Administration opens.
2. Set orange selection marker to 'Change password' menu item (fig. 2, item 1).
3. Confirm selection (fig. 2, item 2)
   The display changes to 'Change password' menu
4. Select user level, set orange selection marker to the desired user level (item 3).
5. Confirm selection (4).
   Display changes to the entry of the new password. The currently assigned password is displayed and the frame of the first digit is shaded in orange.
6. If the first digit is
   a) not to be changed:
   Turn Drive Controller, the frame of the next digit changes to orange.
   or
   b) to be changed:
   - Press Drive Controller (digit is flashing).
   - Turn Drive Controller (5), until the desired digit of the new password is displayed.
   - Confirm selection (6). The changed digit is accepted and the next digit is flashing.
7. Repeat step 6 until all four digits have been entered. Once the fourth digit has been confirmed (item 7), the selection marker jumps to menu item 'Continue'.
8. Press Drive Controller (item 8).
   Display changes to the 'User management' menu.

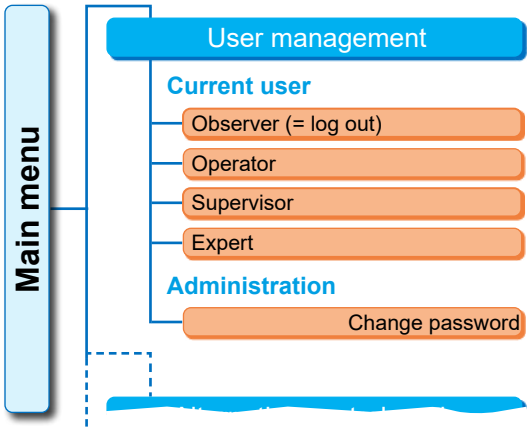


Fig. 1: User management menu

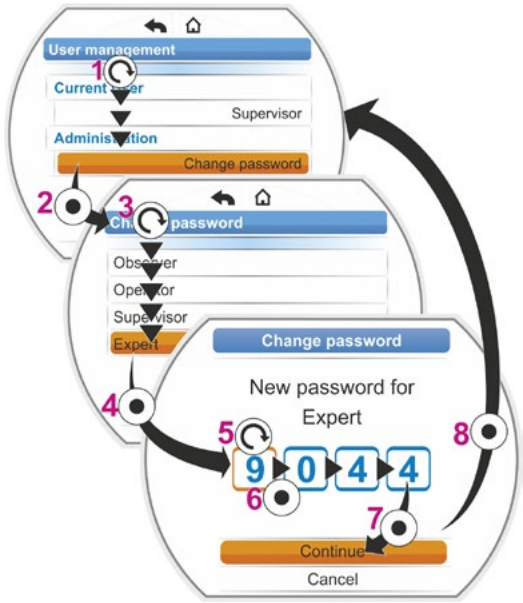


Fig. 2: Assign user access level

6.4 Enable user level

1. Select ‘User management’ in the main menu.
   The ‘User management’ menu with the menu items
   – Current user
   – Administration opens.
2. Set the orange selection marker to the line below ‘Current user’ (fig. item 1).
3. Confirm selection (fig. item 2)
   Display changes to ‘Current user’ menu.
   Comment: The current user level is ticked ☑.
4. Select desired user level; set orange selection marker to the desired ‘User level’, in our example ‘Supervisor’ (item 3).
   For information on ‘Observer’ user level, refer to note below.
5. Confirm selection (item 4).
   Display changes to prompt of the 4-digit password, the frame of the first digit is shaded in orange.
6. Turn Drive Controller, until the first digit of the password is displayed (item 5).
   If the user has not yet entered an individual password, the default password applies (refer to table in the previous chapter “4.7.1 General”).
7. Confirm selection (item 6)
   Selection marker prompts the entry of the second digit.
8. Repeat operation steps 6 and 7 (item 5 and 6) until all four digits have been entered.
   Once the fourth digit has been confirmed (item 7), the selection marker jumps to ‘Continue’.
9. Press Drive Controller (8).
   Display changes to ‘User management’ menu and ‘Supervisor’ is displayed as ‘Current user’.

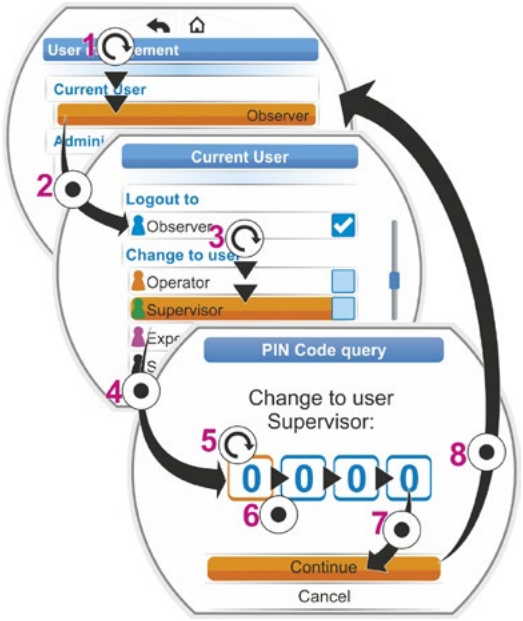


Fig.: Enable user level

- If a user level is assigned the password ‘0000’, this user level remains enabled, even if the password ‘0000’ has also been assigned for lower user levels. Renewed enabling is not required.
- If the user levels have been assigned individual passwords (not ‘0000’), the following applies:
  – Logging out from a password-protected user level is done by changing to the ‘Observer’ user level.
  – If not operated for more than 10 minutes, the user level is automatically reset to ‘Observer’ or to the highest access level with password ‘0000’.
  – Before changing an existing password of a user level, the user level or a higher user level has to be enabled first.
  – If you have forgotten the password of a user level, it can be reset with the next higher user level, ‘Administration’ menu item.
- If a function has been selected for which you have no access rights (e.g. parameters written in gray), a message prompting to change the user level appears.

7 Commissioning

7.1 General information

- Before performing any work on the installed and electrically connected actuator, check with the plant personnel in charge that commissioning may not cause any fault of the plant or hazards to persons.
- If a cut-off mode or torque setting is selected that is not appropriate for the valve, the valve may be damaged!
- If LOCAL control is changed to REMOTE control, the actuator is operated if an operation command by the automation system (DCS) is present!
- There are hazardous voltage levels within the actuator.

It is recommended that the services and support of the responsible SIPOS Aktorik service centers are utilized for all planning, installation, commissioning and service tasks.

Ensuring prerequisites for commissioning

Check and ensure the following points after assembly or during revision and inspection:

- The actuator is correctly assembled.
- All fixing screws and connecting elements are firmly tightened.
- The grounding and equipotential bonding has been correctly implemented.
- The electrical connections have been correctly implemented.
- All protection against accidental contact has been implemented for moving or live parts.
- Neither the actuator nor the valve is damaged.
- The permitted temperature range for the actuator is maintained and heat dissipation from the final control element is also taken into account.

Further checks are also necessary in accordance with the plant-specific conditions.

Prior to commissioning

- Set language if the texts in the display are not shown in the desired language, refer to chapter “5.2 Language selection” on page 29.
- Enable access rights for at least user level 3 ‘Supervisor’, refer to chapter “6 User management” on page 31.

The overview below shows the sequence of the commissioning actions.

Action	Explanation	For a description, refer to:
Select additional gear	Check/set gear type and model.	Page 36
Select closing direction	Set/check closing direction: clockwise or counterclockwise.	Page 40
Program output speed or positioning speed, positioning time	Program/check output speed or positioning speed, positioning time	Page 41
Select cut-off mode	Check/set cut-off mode: torque-dependent, force-dependent or travel-dependent.	Page 42
Program tripping torques	Check/Program tripping torques/ cut-off forces.	Page 42
Adjust signaling gear	Check/adjust signaling gear ratio. For version with signaling gear only.	Page 47
Adjust end positions	End position adjustment for actuators with signaling gears. End position adjustment for actuators in “non-intrusive version”.	Page 48 Page 56
Adjust position indicator	Check/set mechanical position indicator, if available.	Page 55
Program REMOTE control	Adapt actuator to the requirements of the automation system.	Page 66

- For the control system parameters refer to chapter “8.3 Control system parameters” on page 66.
- You do no have to perform all settings. Depending on whether settings have already been specified when ordering the actuator or whether the actuator was delivered mounted to the valve, checking the settings will be sufficient.

7 Commissioning

7.2 Additional gear

“Additional gear” functional principle

This chapter does not apply to 2SG7 and 2SQ7 part-turn actuators.

The “Additional gear” function allows convenient adaptation of all display variables to the overall system >Actuator + mounted units<. The properties (parameters) of the most common gear types are included in the actuator firmware.

Procedure

Mount additional gear to actuator, refer fig. item (a).

Select mounted additional gear in the “Additional gear” menu, item (b).

The actuator converts the parameter values (e.g. speeds and torques) to the properties of the additional gear and indicates the converted values und units in the ‘Valve’, ‘Safety’ and ‘Observe’ menu, item. (c).

During programming, the values present at the output side of the additional gear are indicated as actual values (d).

Furthermore, the signaling gear reduction ratio to be set is displayed in the ‘Additional gear’ menu, refer to “7.4.2 Signaling gear ratio” on page 47

If the gearbox fitted is not included in the options displayed, manual user-defined gearbox parameter entry is required for appropriate selection.

The following parameters of an additional gear can be individually adjusted. The parameters and the available setting options are displayed according to the selected model.

- Rotary gearbox
  - Reduction ratio
  - Factor output/input torque
  - Max. output torque [Nm]
  - Max. input speed [rpm]
  - Rev./stroke
- Part-turn gearbox
  - Reduction ratio
  - Factor output/input torque
  - Max. output torque [kNm]
  - Max. input speed [rpm]
  - Positioning angle [°]
- Linear thrust unit
  - Spindle pitch
  - Factor input torquer/output force
  - Max. output force [kN]
  - Max. input speed [rpm]
  - Stroke [mm]

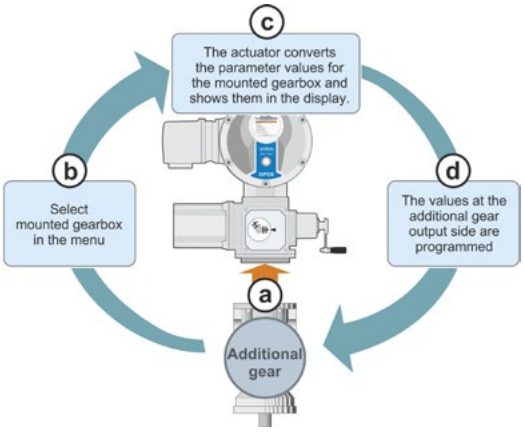
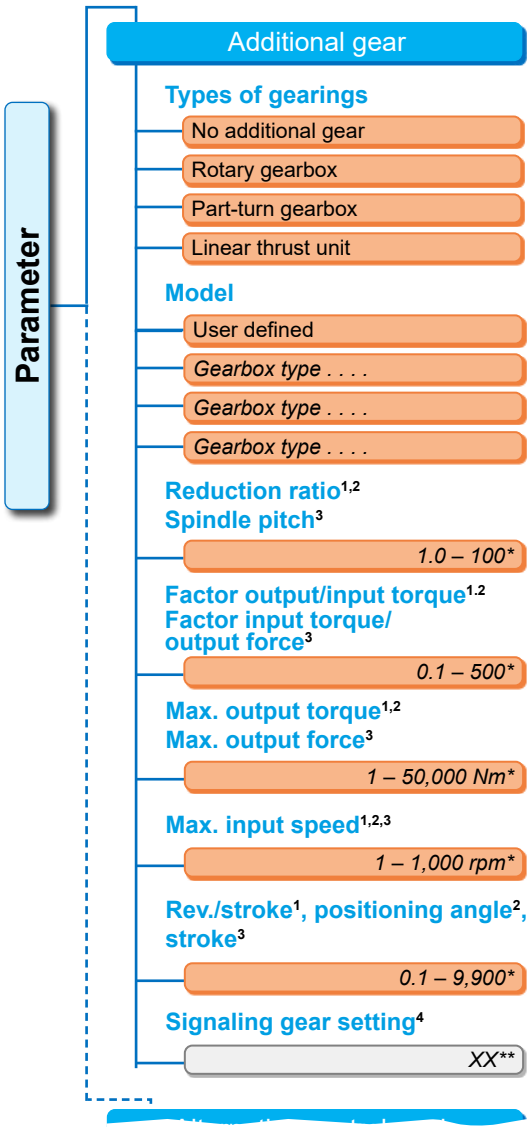


Fig. 1 ”Additional gear“ principle



[1]for rotary gearboxes
[2]for part-turn gearboxes
[3]for linear thrust units
[4]Actuators with signaling gear only
**Cannot be changed prerequisite for signaling gear setting.

Fig. 2: ‘Additional gear’ menu

7.2.1 Select additional gear and change parameters

Select additional gear operation sequence

1. Select ‘Parameter’ in the ‘Main menu’ (fig. 2, item 1) and confirm (2).
   The ‘Parameter’ menu opens.

2. Select ‘Additional gear’ menu item (3) and confirm (4).
   Display changes to the ‘Additional gear’ menu.
   – If the additional gear has not yet been selected, ‘No additional gear’ is displayed under the ‘Gear type’ menu item.
   – If the additional gear has been selected, gear type, model and the respective parameters will be displayed.

3. Set selection marker below ‘Gear type’ parameter. In our example to ‘No additional gear’ (5) and confirm (6).
   The following options appear:
   – No additional gear
   – Rotary gearbox
   – Part-turn gearbox
   – Linear thrust unit

4. Select ‘Gear type’, in our example ‘Part-turn gearbox’ (7) and confirm (8).
   Display changes to ‘Additional gear’. Now, the model can be selected.

5. Select model (9) and confirm (10).
   The display changes to the ‘Model’ menu with the available model options for this actuator. The currently selected model is ticked ☑.

6. Select model *:
   a) Select model from list (11) and confirm selection (12).
   The display changes to the previous screen; now suitable parameter values for the selected model will be set and displayed.

   or

   b) If the connected gear is not included in the list, select ‘User defined’. The display returns to ‘Additional gear’.
   Now the parameter values for the additional gear can be set individually, refer to the following description.

Main menu
Parameter
Additional gear
Types of gearings
No additional gear

Fig. 1: Navigation to “Additional gear; gear type“

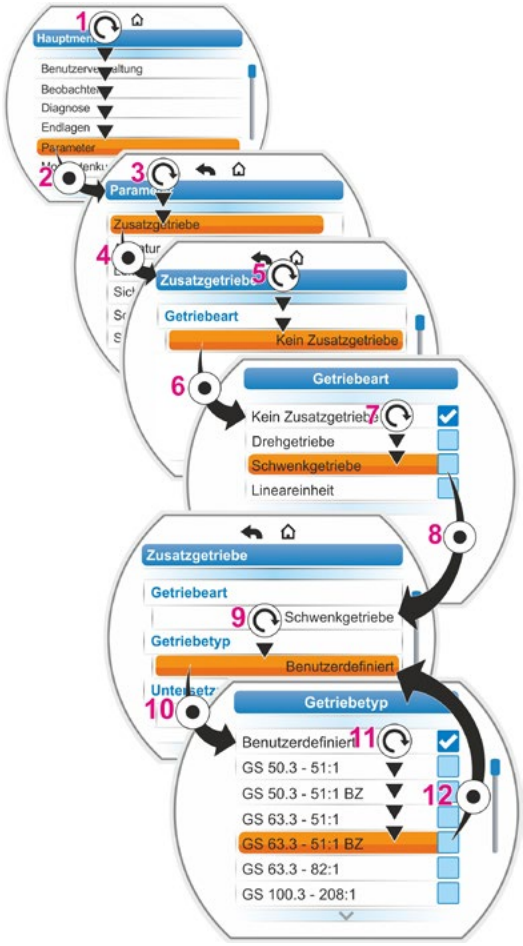


Fig. 2: Select additional gear

* BZ = Version with gear wheel made of bronze.

Change parameter value operation sequence for additional gear

The operation sequence described here is identical for all parameters of the additional gear and is the continuation of the previous operation sequence 6b); the display shows the 'Additional gear' menu and 'User defined' has been selected for 'Model'.

Main menu
Parameter
Additional gear

Fig. 1: Navigation to 'Additional gear'-menu

7. Select parameter; turn Drive Controller (11) and set selection marker to the parameter. The slider (fig. 2, item 1) changes its position on the scrollbar (2) according to the position of the selected item within the menu.
8. Confirm; press Drive Controller (12). The setting menu opens.
9. Change parameter value:
   – Press Drive Controller (digit is flashing).
   – Turn Drive Controller, until the desired digit is displayed.
   – Press Drive Controller; the selected digit is accepted.

Refer also to "Changing parameter values/ characteristics" on page 24.

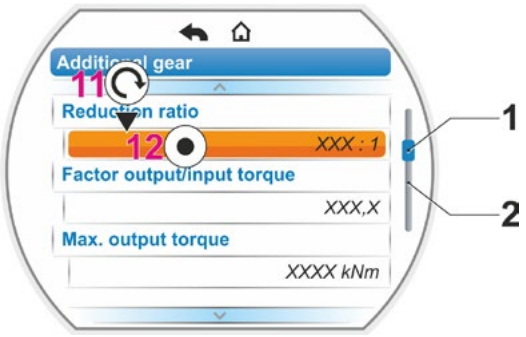


Fig. 2: Parameters within 'Additional gear' menu

7.2.2 Parameters and their values in the 'Additional gear' menu

The values which can be programmed in the 'Additional gear' menu refer to the properties of the additional gear and are listed on the gearbox name plate.

Reduction ratio (for rotary and part-turn gearboxes),
Spindle pitch (for linear thrust unit)

Reduction ratio
1.0 – 100

$$i_{(Reduction\ ratio)} = \frac{n_{(gearbox\ input)}}{n_{(gearbox\ output)}}$$

Formula: Reduction ratio

The reduction ratio is the ratio between speeds at gearbox input and gearbox output.

Setting range for
- Rotary gearboxes (reduction ratio) 1.0 to 100
- Part-turn gearboxes (reduction ratio): 1 to 10000
- Linear thrust unit (spindle pitch [mm]): 1.0 to 100

Factor output/input torque (for rotary and part-turn gearboxes),
Factor input/output force (for linear thrust unit)

Factor output/input torque
0.1 – 500

$$f_{(Factor)} = \frac{M_{(gearbox\ output)}}{M_{(gearbox\ input)}}$$

Formula: Factor output torque/input torque for rotary/part-turn gearboxes

The 'output torque/input torque' factor indicates the amount by which the torque or force at the gearbox output exceeds the torque or force at the gearbox input.

Setting range for
- Rotary gearbox (factor output/input torque) 0.1 to 500
- Part-turn gearbox (factor output/input torque) 1.0 to 5000
- Linear thrust unit (factor input torque [Nm]/output force [kN]): 1.0 to 100

Max. output torque (for rotary and part-turn gearboxes),
Max. output force (for linear thrust units)

Max. output torque [Nm]

1 – 50000

The maximum torque/maximum force which may occur at the gearbox input (fig. item 2); i.e. the torque/force the additional gear may be loaded with.

Setting range for

- Rotary gearbox (max. output torque): 1 to 50,000 Nm
- Part-turn gearbox (max. output torque): 0.01 to 500 kNm
- Linear thrust unit (max. output force): 1 to 1,000 kN

The tripping torque (max. torque for the valve) is set in the 'Parameter' menu --> 'Valve', refer to "Tripping torque/tripping force" on page 44 et seqq.

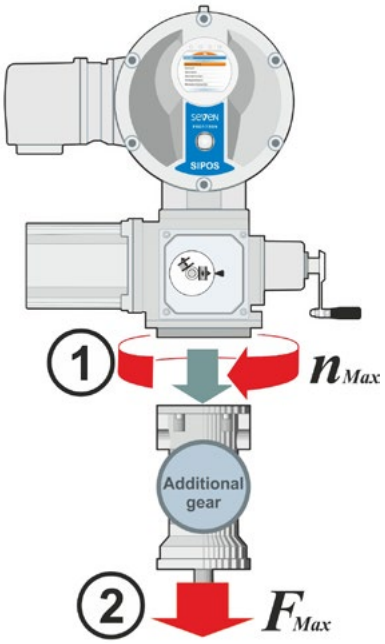


Fig.: 1 = Max. input speed
2 = Max. output torque/force

Max. input speed

Max. input speed

1 – 1,000 rpm

The maximum speed which can be applied to the additional gear input is entered here. Refer to fig. item 1.

Setting range: 1 to 1,000 rpm

Rev./stroke (for rotary gearboxes)
Positioning angle (for part-turn gearboxes)
Stroke (for linear thrust units)

Rev./stroke

0.1 – 9900

This menu item is only available for actuators with signaling gear.

The value required for covering the whole travel is set here.

Setting range for

- Rotary gearbox [rev/stroke] 0.1 to 9,900
- Part-turn gearbox (positioning angle): 1 to 360°
- Linear thrust unit (stroke): 1 to 10,000 mm

Signaling gear setting

Signaling gear setting

XX

This menu item is only available for actuators with signaling gear.

The value calculated on the basis of the parameter values above is displayed here.,

The signaling gear has to be adjusted to this value, refer to chapter "7.4.2 Signaling gear ratio" on page 47.

7 Commissioning

7.3 Program closing direction, speeds, cut-off modes and tripping torques

New actuators are set in the factory. Unless required otherwise by the customer, the default parameters are as follows:

- Clockwise closing direction;
- Cut-off mode in OPEN and CLOSE directions: travel-dependent;
- Tripping torque in OPEN and CLOSE directions. Lowest device-specific parameter value, for actuators of duty classes A and B (standard actuators) 30 %, for actuators of duty classes C and D (modulating actuators) 50 % of the maximum value (cannot be changed at all for 2SG7, for 2SQ7 not via parameter).
- – Speed* for normal and EMERGENCY operation in CLOSE and OPEN directions:
  35 % of maximum output speed.
  – Positioning time for 2SG7 and 2SQ7: 28 seconds.

*Depending on the gearboxes mounted, the following parameters apply:

Model: 2SA7... rotary actuator	**Parameter**	**Unit**	**Parameter**	**Unit**
... without or with rotary gearbox	Tripping torque	Nm	Speed	rpm
... with linear thrust unit	Tripping force	kN	Positioning speed	mm/min
... with part-turn gearbox 2SG7... or 2SQ7... part-turn actuator	Tripping torque	Nm	Positioning time	s/90°

If the current values are to be retained, continue with chapter “7.4 Adjust end positions for version with signaling gear” on page 45, or “7.5 Adjust end positions for version with “non-intrusive” position encoder” on page 56.

If you are already familiar with the operation, you may also continue with chapter “8.2 Valve-specific parameters” on page 62.

7.3.1 Select the closing direction (This chapter does not apply to 2SQ7.)

Unless required otherwise by the customer, the actuators are delivered with clockwise closing direction. If the output drive shaft has to turn counterclockwise in CLOSE direction, the closing direction has to be changed.
If the current closing direction is to be retained, continue with the next chapter.

After each change of the closing direction, the end position setting has to be performed again.

Operation sequence

1. Select ‘Parameter’ menu item in the ‘Main menu’.
   The ‘Parameter’ menu opens.
2. Select ‘Valve’ menu item.
   ‘CLOSE direction’ is displayed as first parameter with the current setting (clockwise or counterclockwise).
3. If the indicated setting is to be changed, set selection marker to the setting and confirm.
   ‘CLOSE direction’ menu opens. The current setting is indicated by a symbol ☑ (fig. 2, item 2).
4. Set the orange selection marker to desired setting (item 3) and confirm.
   A message is displayed that the end positions have to be readjusted when changing the closing direction.
5. Click ‘Yes’ to confirm.
   Display returns to the ‘Valve’ menu and the current (modified) setting is displayed for ‘CLOSE direction’.

Fig. 1: Navigation to ‘CLOSE direction’ parameter

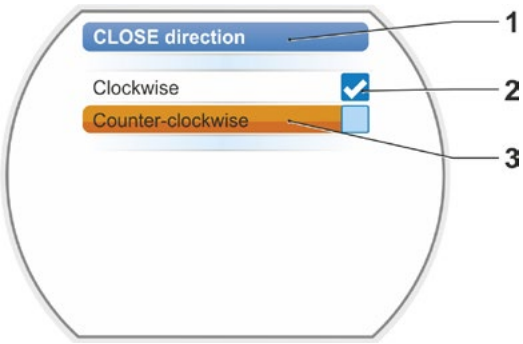


Fig. 2: ‘CLOSE direction’ menu

7.3.2 Program speeds/positioning times

By programming the speeds, the speed of the actuator during closing, opening and approaching the EMERGENCY position is determined.

The speed range of an actuator is based on the sizing, defined by the application. Refer to name plate for the possible actuator speed.

The following values apply to the actuator (without additional gear).

Tripping torque ranges [Nm]	Flange		Speed ranges [rpm]	Standard output speed [rpm] without additional gear
Classes A and B (type of duty in compliance with EN 15714-2)				
3 ~ 380 – 460 V				
1200 – 4000	F30		1.25 – 10	3.5
600 – 2000	F25		2.5 – 20	7
300 – 1000	F16		5 – 28	14
150 – 500	F14, F16		5 – 40	14
75 – 250	F12, F14		10 – 80	28
37 – 125	F10, F12, F14		20 – 112	56
18 – 60	F10		20 – 160	56
9 – 30	F7, F10			
1 ~ 220 – 230 V / 3 ~ 190 – 200 V			5 – 40	14
37 – 125	F10, F12, F14		10 – 80	28
18 – 60	F10		20 – 160	56
9 – 30	F7, F10		20 – 112	56
1 ~ 110 – 115 V			5 – 20	14
37 – 112	F10, F12, F14		10 – 40	28
18 – 60	F10		20 – 56	56
9 – 30	F7, F10		20 – 80	56
Classes C and D (type of duty in compliance with EN 15714-2)				
3 ~ 380 – 460 V				
1400 – 2800	F30		1.25 – 10	3.5
700 – 1400	F25		5 – 40	14
350 – 700	F16		10 – 80	28
175 – 350	F14, 16			
87 – 175	F12, F14			
40 – 80	F10, F12, F14			
20 – 40	F10			
10 – 20				
3 ~ 190 – 200 V				
40 – 80	F10, F12, F14		5 – 40	14
20 – 40	F10			
10 – 20	F07, F10			
1 ~ 220 – 230 V				
40 – 80	F10, F12, F14		5 – 40	14
20 – 40	F10		10 – 80	28
10 – 20	F07, F10			
1 ~ 110 – 115 V				
40 – 80	F10, F12, F14		5 – 14	14
20 – 40	F10		5 – 20	14
10 – 20	F07, F10			

When programming the speed, the defined model (refer to chapter “7.2 Additional gear” on page 36) is considered: The speed values are converted considering the reduction ratio of the additional gear and indicated in the the display. Parameter names and units are displayed accordingly:
– For rotary actuator: Rev./stroke rpm];
– For linear thrust unit: Stroke [mm/min];
– For part-turn actuator: Angle [s/90°].

In the following operation sequence, programming the the speed is described as example. For linear thrust units or part-turn actuators, the operation sequence is identical; however values and units are displayed in accordance with the additional gear selected.

Operation sequence

1. Select ‘Parameters’ menu item in the ‘Main menu’.
   The ‘Parameter’ menu opens.

2. Select ‘Valve’ menu item.
   ‘Speed’ is displayed as second parameter with the current values for operation in CLOSE ( ) and OPEN ( )-directions.

3. If the indicated value is to be changed, set selection marker to the value to be changed and confirm.
   ‘Speed’ setting menu opens, refer to fig. 2.
   The current value of the speed parameter is flashing in blue (fig. item 1).

4. Turn Drive Controller until desired value is displayed.
   The color of the number changes from blue to orange and the progress bar (item 3) graphically represents the setting within the setting range of both speed (2) and positioning time (4).
   In addition, the time is displayed (5), which is required to operate across the whole travel including the end position ranges.

5. Confirm selected value.
   Display returns to ‘Valve’ menu.

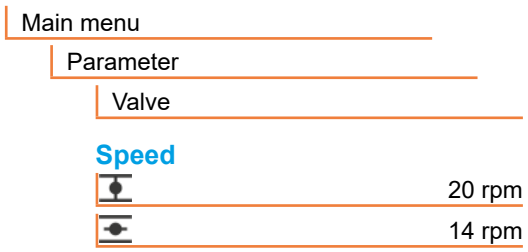


Fig. 1: Navigation to ‘Speed’ parameter

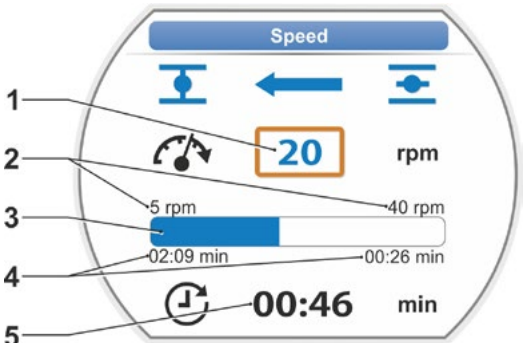


Fig. 2: Speed setting menu

7.3.3 Program cut-off modes and tripping torques/forces

Cut-off mode

If the actuator operates, the cut-off mode can be travel-dependent or torque-dependent.

Travel-dependent cut-off means the actuator trips once the valve has reached a defined position.

Torque dependent/force dependent cut-off means the actuator trips after reaching the tripping torque when moving in the end position range.

The set cut-off mode in the respective end position is shown in the display, refer to fig.:

- item 1 = torque-dependent
- item 2 : travel-dependent.

Default value for the cut-off mode of both end positions, OPEN and CLOSED, is **travel-dependent.**

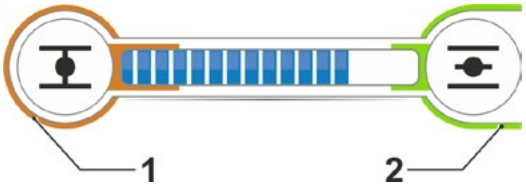


Fig.: Indication of cut-off mode
1 = torque dependent
2 = travel dependent

- After each change of the cut-off mode, the end position setting has to be performed again.
- If a cut-off mode or a torque/force setting is selected that is not appropriate for the valve, the valve may be damaged!

Operation sequence

1. Select ‘Parameter’ menu item in the ‘Main menu’.
   The 'Parameter' menu opens.
2. Select ‘Valve’ menu item.
   The parameters (blue writing) with the current setting (parameter value) are displayed.
3. Turn Drive Controller until the settings for CLOSE and OPEN are displayed at ‘Cut-off mode’ parameter.
   If, for example. the setting for end position CLOSED are to be changed, set marker to symbol CLOSED.
4. Confirm selection (press Drive Controller).
   Display changes to ‘ Cut-off mode’ setting menu and shows both options; ‘Travel dependent’ and ‘Torque dependent’, refer to fig. 2 .
   The current setting is ticked (fig. 2, item 1).
5. Set the selection marker to desired setting (item 2) and confirm.
   A message is displayed that the end positions have to be readjusted when changing the cut-off mode.
6. Click ‘Yes’ to confirm.
   Display returns to the ‘Valve’ menu and the current (modified) setting is displayed for ‘Cut-off mode CLOSE ’.
7. The operation for changing the cut-off mode in end position OPEN applies accordingly (from operation step 3).

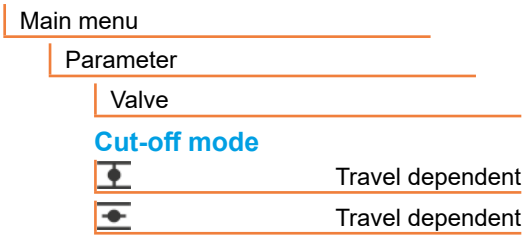


Fig. 1: Navigation to ‘Cut-off mode’ parameter

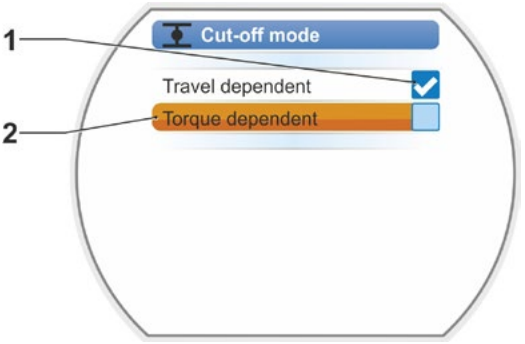


Fig. 2: Cut-off mode in end position CLOSED setting menu

Tripping torque/tripping force

The setting determines the torque or force to be achieved in relation to the load, to cause the motor to trip. This applies to torque/force-dependent tripping in the end position as well as to a block. For this reason, tripping torque or force also have to be set for travel-dependent cut-off mode.

The tripping torque/tripping force of an actuator is based on the sizing, defined by the application. The tripping torque of the actuator is listed on the name plate.

A programmed addtional gear is considered during programming (refer to chapter “7.2 Additional gear” on page 36): The values for tripping torque/force are converted using the factor output/input torque or input torque/output force and displayed. Only those values are provided for programming in the display which are revelant to the combination of the actuator with the connected gearbox. Setting values are displayed accordingly:

– Rotary gearbox: Tripping torque [Nm];
– Linear thrust unit: Tripping force [kN];
– Part-turn gearbox: Tripping torque [Nm].

The setting range for actuators of classes A and B ranges from 30 – 100 % and for modulating actuators of classes C and D from 50 – 100 % in 10 % steps of the maximum torque each (for some additional gears, other limit values apply). Default setting is the lowest possible value (typically 30 % of the maximum value for classes A and B, and 50 % of the maximum value for classes C and D).

The following table shows the possible parameter values without additional gear.

- For 2SG7 part-turn actuator, the tripping torque cannot be changed.
- For 2SQ7, the tripping torque can be set via the torque switching, refer to supplement to operation instructions Y070.449.
- If a cut-off mode or torque setting is selected that is not appropriate for the valve, the valve may be damaged!

Tripping torques (without additional gear)								
Tripping range [Nm]	**Possible values for setting in Nm of Md_{max}**							
	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100 %
Classes A and B (type of duty in compliance with EN 15714-2)								
9 – 30	9	12	15	18	21	24	27	30
18 – 60	18	24	30	36	42	48	54	60
37 – 125	37	50	62	75	87	100	112	125
75 – 250	75	100	125	150	175	200	225	250
150 – 500	150	200	250	300	350	400	450	500
300 – 1000	300	400	500	600	700	800	900	1,000
600 – 2000	600	800	1,000	1,200	1,400	1,600	1,800	2,000
1,200 – 4,000	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000
▲30 % are set as standard								
Classes C and D (type of duty in compliance with EN 15714-2)								
10 – 20			10	12	14	16	18	20
20 – 40			20	24	28	32	36	40
40 – 80			40	48	56	64	72	80
87 – 175			87	105	122	140	157	175
175 – 350			175	210	245	280	315	350
350 – 700			350	420	490	560	630	700
700 – 1,400			700	840	980	1,120	1,260	1,400
1,400 – 2,800			1,400	1,680	1,960	2,240	2,520	2,800
▲50 % are set as standard								

For reasons of simplicity, the designation ‘torque’ shall also apply to force in the following description. For example, instead of torque or force dependent, only torque dependent will be used.

Operation sequence

1. Turn Drive Controller in the ‘Valve’ menu until the settings for CLOSE and OPEN are shown under ‘Tripping torque’ parameter in the display.

2. If the tripping torque for end position CLOSED is to be changed, for example, set selection marker to the value to be changed and confirm.Display changes to ‘Tripping torque ’
 setting menu (refer to fig.) and the current value is flashing (fig. item 1).

3. Turn Drive Controller until desired value is displayed.
The progress bar (item 2) shows the current position within the setting range (3).

4. Confirm selected value.
Display returns to ‘Valve’ menu.

5. Proceed accordingly to set tripping torque in end position OPEN.

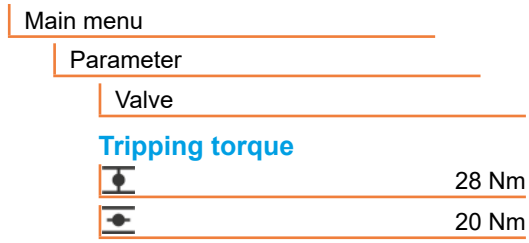


Fig. 1: Navigation to "Tripping torque” parameter

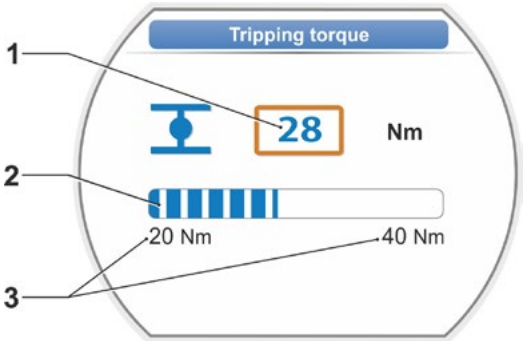


Fig. 2: Tripping torque setting menu

7.4 Adjust end positions for version with signaling gear

PROFITRON actuators are either available with signaling gear or as “non-intrusive” version with the non-intrusive position encoder. End position adjustment for HiMod and PROFITRON with the non-intrusive position encoder is described in chapter 7.5.

7.4.1 General information

If actuators are delivered mounted to a valve, this step has usually been done in the valve manufacturer’s factory. The setting has to be checked during commissioning.

For 2SG7 and 2SQ7 part-turn actuators, the signaling gear ratio does not have to be set. These actuators are not equipped with an adjustable signaling gear. Continue with chapter 7.4.3.

Position recording functional principle

By setting the signaling gear ratio and the end positions, it is ensured that the length, as well as start and end of the valve travel (end positions OPEN and CLOSED) **are** correctly signaled to the electron**ics.**

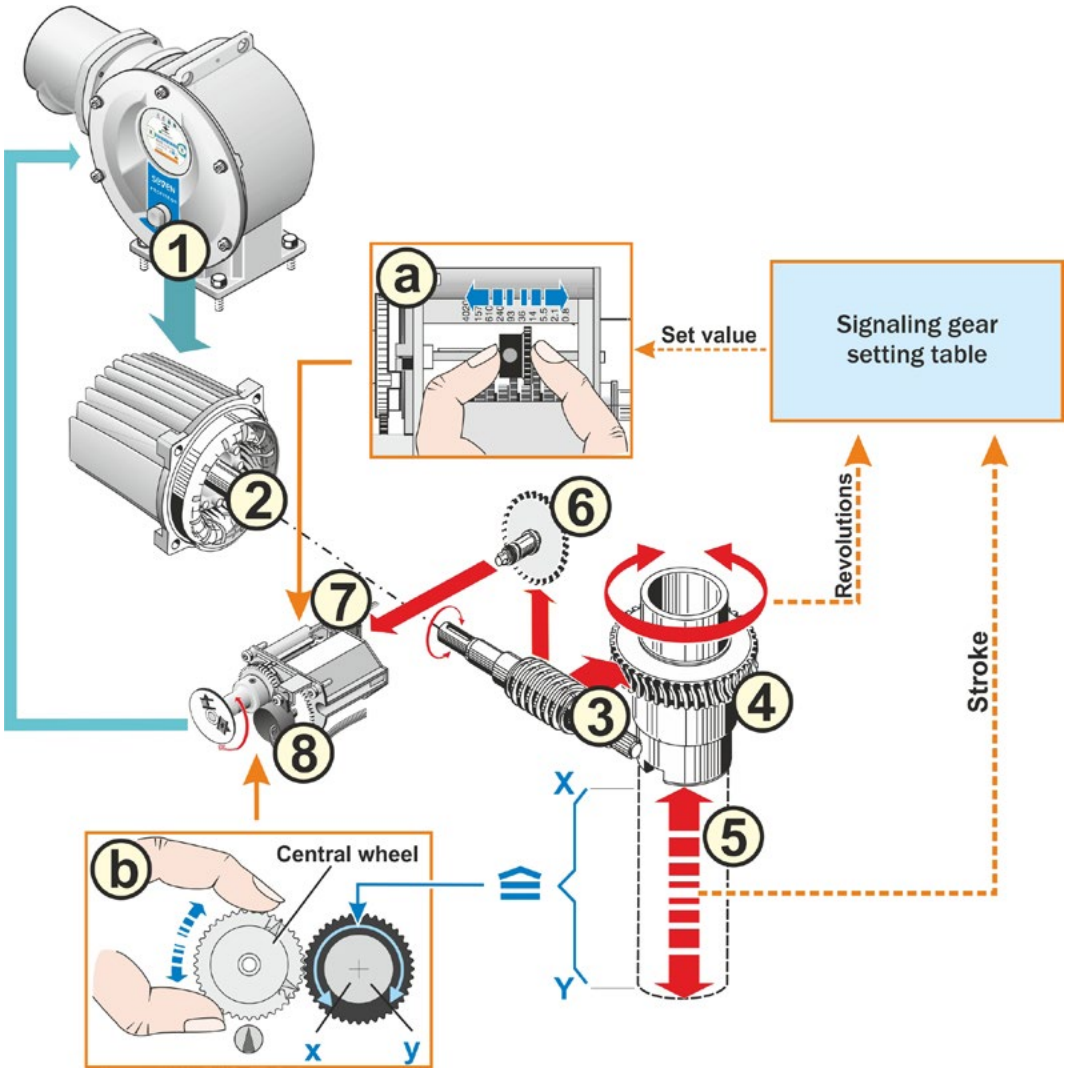


Fig.: Schematic representation of the signaling gear ratio and end position settings

Explanation

From the position of the potentiometer (**8**), the electronics unit recognizes the position of the output drive shaft (**4**) and therefore the position of the connected valve.

Two settings are required:

1. The signaling gear (refer to a in illustration) reduces the rotations of the output shaft (**4**) required for the complete travel [(**5) X to Y**] to a rotary movement of ≤ 300° (**x to y**) of the potentiometer (**8**).
2. One of the mechanical end positions of the valve (**X** or **Y**) corresponds to one limit of the electric setting range of the potentiometer (**x** or **y**) (refer to **b** in illustration),

For a detailed description, refer to the following chapters “7.4.2 Signaling gear ratio” and “7.4.3 Procedure for initial end position adjustment”.

7.4.2 Signaling gear ratio

The number of rotations required to cover the whole travel must be known. For the required setting of the signaling gear, refer to the "Signaling gear setting" table below. Intermediate values are rounded up to the next incremental value (e.g. for 30 rev/stroke, the incremental value 36 has to be set).

If an additional gear was set in the ‘Additional gear’ menu (“7.2 Additional gear” on page 36), the firmware will calculate the signaling gear setting.

Setting the amount of the stroke at the additional gear output in the display is therefore required. Depending on the additional gear, the following setting units are displayed:

– Actuator without or with rotary gearbox = rev./stroke,
– Actuator with connected linear thrust unit = mm/stroke,
– Actuator with connected part-turn gearbox = degrees [°].

The valve maker can also provide the data (number of revolutions for the entire travel).

If the number of revolutions per stroke is not known, because, for example, the actuator is to be operated on an available "old" valve, operate the actuator over the whole travel and note the number of revolutions of the output drive shaft.

If the output shaft cannot be observed, proceed according to the descriptions of the following chapter “Procedures for end position adjustment” and heed the information in the display under “Help” on the signaling gear and proceed accordingly.

The table shows possible signaling gear setting for actuators without additional gears.

Signaling gear setting without additional gear										
Actuator type	**Valve travel [rev/stroke]**									
2SA7.1/2/3/4/5/6	0.8	2.1	5.5	14	**36***	93	240	610	1,575	4,020
2SA7.7/8	0.2	0.52	1.37	3.5	**9 ***	23.2	60	152	393	1,005
10 possible settings at the signaling gear (scale) ▶	▼ 0.8	▼ 2.1	▼ 5.5	▼ 14	▼ 36	▼ 93	▼ 240	▼ 610	▼ 1,575	▼ 4,020
* Default setting, unless required otherwise by the customer..										

7 Commissioning

7.4.3 Procedure for initial end position adjustment

The end positions are directly set at the actuator.

The valve must not be jammed. Use the crank handle/hand wheel for release, if necessary. For crank handle/hand wheel operation, refer to chapter “4.1 Crank handle, hand wheel” on page 15.

The setting procedure can be aborted by selecting ‘Back’ . The formerly valid end position adjustment is maintained unless the central wheel was turned.

1. Select LOCAL control .
2. Select ‘End positions’ menu item in the ‘Main menu’.
   Display changes to ‘End positions’ menu.
3. Confirm ‘New setting’ menu item.
   Display changes to ‘Only end positions’ (fig. 2, item 1) or ‘Complete’ setting query, including all parameters required for correct end position adjustment (item 2).
   These parameters include:
   – CLOSE direction (clockwise or counter-clockwise)
   – Speed (in OPEN and CLOSE directions)
   – Cut-off mode (torque-dependent or travel-dependent in end positions CLOSED and OPEN)
   – Tripping torque (in end position CLOSED and end position OPEN)

   These parameters have already been described in chapter 7.3.
4. Select ‘Only end position’ menu item and confirm. (For 2SG7 and 2SQ7, continue with step 11.)
   Display changes to ‘Remove signaling gear cover’ animation.
5. Loosen 4 screws (fig. 3, item 1) from the signaling gear cover and remove cover.
6. Select ‘Continue’ in the display.
   Display changes to ‘Adjust signaling gear ratio to valve’.
7. Adopt scale value, either from
   – Additional gear menu, refer to “Signaling gear setting” on page 39,
   – or from table “Signaling gear setting without additional gear” on page 47

   and adjust slide wheel (fig. 3, item. 2) so that the gear rim faces the desired incremental value on the scale.

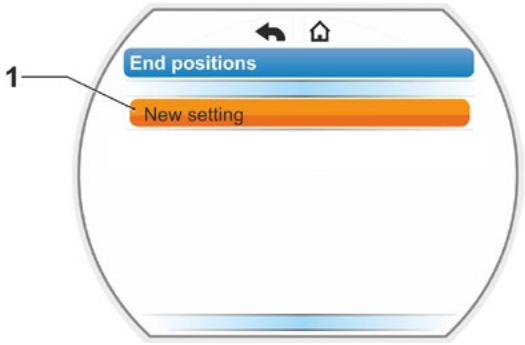


Fig. 1: End position readjustment

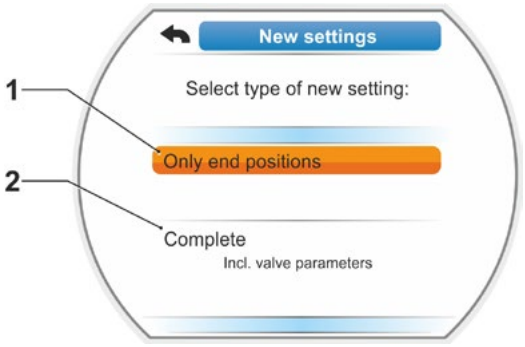


Fig. 2: End position setting with or without parameters

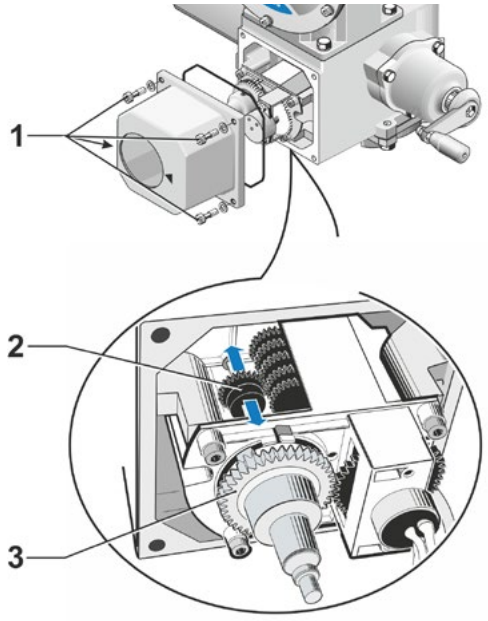


Fig. 3: Adjust signaling gear ratio

- If the value for the valve travel (rev/stroke) does not match the level value of the table, adjust the slide wheel to the next higher level value.
- Push the slide wheel in the desired direction, applying only little pressure. Adjusting the slide wheel is facilitated by a slight movement of the central wheel (fig. 3, item 3).
- If the number of revolutions/stroke is not known, proceed as follows, heeding the notes in the display for operating step 16.

8. Select ‘Continue’ in the display.
   You are prompted to adjust the central wheel to mid-position.

9. Turn central wheel to mid-position.
   Set the central wheel so that arrows 1 and 2 point in upward direction, see illustration 4.
   The correct position is confirmed in the display and the selection marker is set to ‘Continue’.

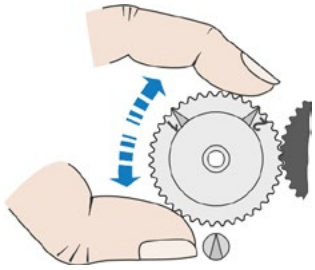


Fig. 4: Turn central wheel to mid-position

10. Confirm ‘Continue’.
    The display changes to the query which end position CLOSED or OPEN is to be set first (fig. 5).
    The end positions must not be set according to a specific sequence. Adjustment of end position OPEN is described in the following. End position CLOSED is adjusted accordingly.

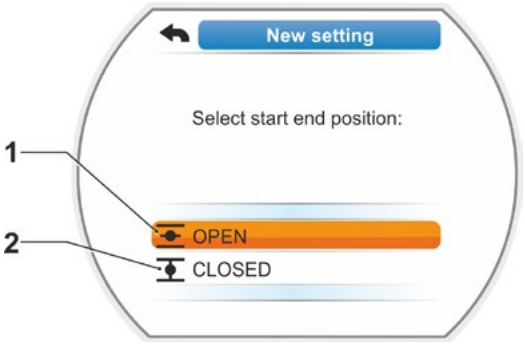


Fig. 5: End position selection

11. Select end position to be set first (in our example end position OPEN) (fig. 5, item 1) and confirm.
    Display changes to end position adjustment and you are requested to approach end position OPEN (fig. 6). Operation in OPEN direction is suggested: End position OPEN symbol is shaded in orange (fig. 6, item. 1).
    If operation in the opposite direction is desired, turn Drive Controller and set orange selection marked to symbol CLOSED (fig. 6, item 2).

Generally, the end position selected in operation step 11 is to be adjusted first!

Furthermore, the display indicates the set cut-off mode. In our example

- End position CLOSED = torque-dependent (fig. 6, item 3) and
- End position OPEN = travel-dependent (item 4)

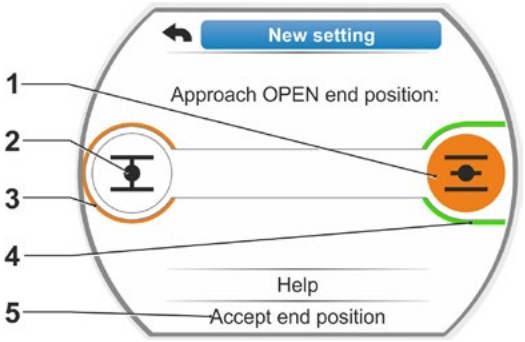


Fig. 6: Approach end position in OPEN direction

12. Depending on whether the cut-off mode for the end position is travel-dependent or torque-dependent, select the following operation sequence.

- **Travel-dependent cut-off mode:**

a) Heed valve position and approach end position; press Drive Controller.
Operate the actuator until the valve has reached the end position.
The LED of the selected end position flashes while the actuator is operated.

- When pressing the Drive Controller for a short time (< 3 s), the actuator moves as long as the Drive Controller is pressed. For longer activation (> 3 s), latching starts (display shows 'Latching active') and the actuator moves unit the Drive Controller is pressed again.
- If torque-dependent tripping occurred in travel-dependent cut-off mode, e.g. if the MOV is sluggish, unfavorable torque characteristics or approaching of a mechanical stop, **'Torque dependent cut-off'** is shown in the display.

b) Once the desired position has been reached, press Drive Controller to stop the actuator. Perform possible fine adjustment by operation in the opposite direction.

c) Turn Drive Controller and set selection marker 'Accept end position' (fig. 7).

d) Press Drive Controller.
For 2SG7 and 2SQ7, continue with step 15.

Shown in display

– Request to 'turn central wheel in direction of the arrow until 0 is displayed' (fig. 8); continue with step 13;

– Adjustment is correct, continue with step 14.

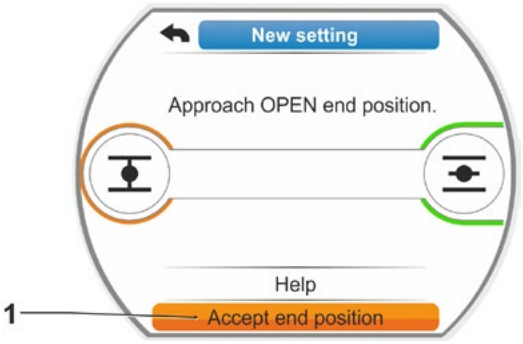


Fig. 7: Accept end position

- **Torque-dependent cut-off mode:**

Hold down Drive Controller – refer to note below – for more than 3 s. The actuator automatically moves until reaching the end position. (For 2SG7 and 2SQ7, continue with step 14.)
Shown in display

– Request to 'turn central wheel in direction of the arrow until 0 is displayed' (fig. 8); continue with step 13;

– Adjustment is correct, continue with step 14.

When holding down the Drive Controller for more than 3 seconds and the actuator does **not** change to latching, activate the latching function "9.1.3 Operation – latching function" on page 95.

When pressing the Drive Controller for a short time (< 2 s), the actuator moves as long as the Drive Controller is pressed. If the actuator is operated, i.e. by pressing the buttons repeatedly for a short time, torque dependent cut-off is not immediately performed.

13. Turn central wheel (fig. 8, item. 1) in the indicated direction of the arrow (item 2) until the value (item 3) is set to ‘000’.
    The correct setting of the first end position is confirmed in the display and the orange selection marker jumps to ‘Continue’ (fig. 9).
14. Select ‘Continue’ in the display.
    The first end position is set. The system changes to setting the other end position. The request to approach the end position (in our example end position CLOSED) is shown in the display.
15. If the actuator is equipped with a mechanical position indicator, we recommend setting the indicator at this stage. Separate approaching of the end position can thereby be avoided. For the setting, refer to the following chapter “7.4.5 Adjust mechanical position indicator” on page 55.
16. Depending on whether the cut-off mode for the end position is travel-dependent or torque-dependent, move the actuator accordingly to the end position.

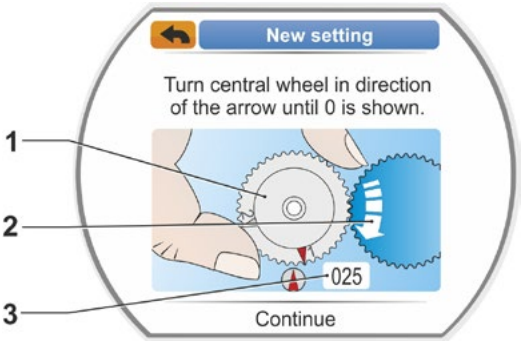


Fig. 8: Adjust central wheel

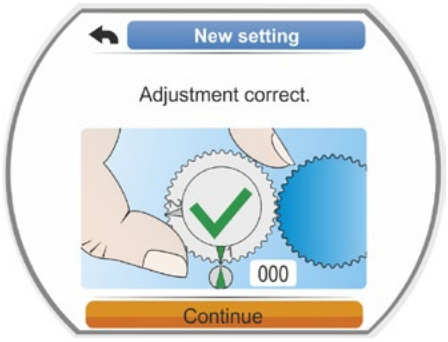


Fig. 9: First end position setting is correct

■ **Travel-dependent cut-off mode**

a) Operate the actuator until the valve has reached the end position. Pay attention to the valve during operation!
   Display indicates whether the valid setting range (fig. 10, item 1) has been reached (3b) or not yet (3a) and the progress bar (2)* changes the color from yellow to green.

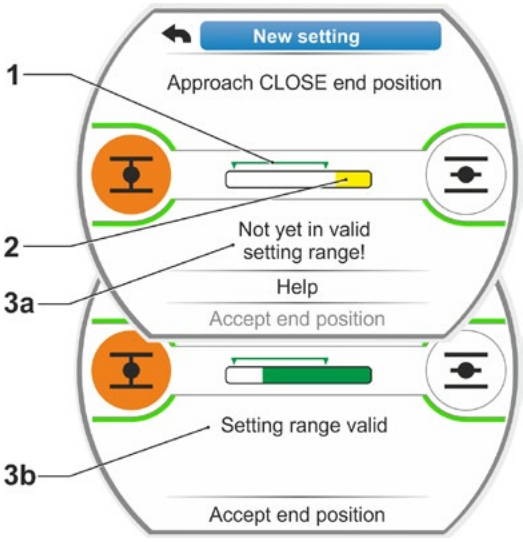


Fig. 10: Approach end position CLOSED in travel dependent cut-off mode

■ If the valid setting range is exceeded, the progress bar changes color from green to red (fig. 11, item 1) and the ‘Setting range exceeded’ message is displayed.
  Select ‘Help’ (fig. 11, item 2) and confirm. An information to change the signaling gear ratio is displayed. Confirm the info box and adjust the sliding wheel within the signaling gear accordingly (also refer to step 7) and repeat end position adjustment.

■ Once the end position has been reached before the valid setting, or in case of torque-dependent cut-off due to a block before reaching the end position, e.g. if the MOV is sluggish, unfavorable torque characteristics or approaching of a mechanical stop (return to desired end position), this is indicated by ‘Torque dependent cut-off’ in the display.

In this case, check the following:

- Smooth valve operation;
- Set tripping torque;
- Cut-off mode.

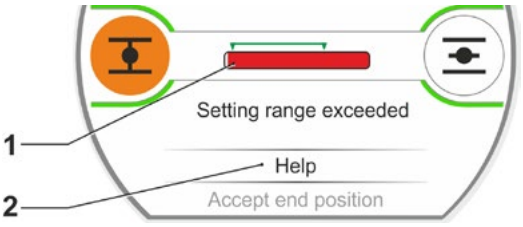


Fig. 11: End position range exceeded

* Progress bar is not displayed for 2SG7, 2SQ7.

b) Set selection marker to 'Accept end positions' menu item (fig. 12, item 4).

Continue with operation step 17.

- **Torque-dependent cut-off mode:**

  Select operation CLOSE direction (OPEN for setting in OPEN direction) and hold down Drive Controller for more than 3 s (refer also to note on page 50).
  The actuator automatically moves until reaching the end position.
  Display indicates whether the valid setting range (fig. 12, item 1) has been reached (3b) or not yet (3a) and the progress bar (2) changes the color from yellow to green.
  Once the tripping torque has been reached, the 'Tripping torque reached' message (3b) is displayed and the 'Accept end position' menu item is active (fig. 12, item 4).

  If 'Torque dependent cut-off' is displayed prior to reaching the valid setting range, select 'Help' and adjust the sliding wheel in the signaling gear accordingly and repeat end position adjustment (refer also to step 7).

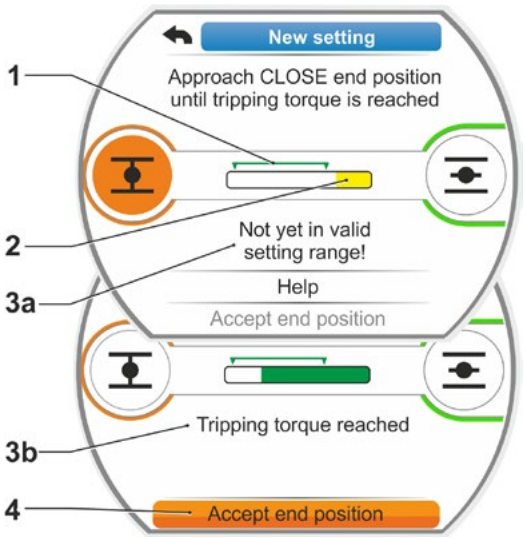


Fig. 12: Approach end position CLOSED in torque dependent cut-off mode

17. Confirm 'Accept end position'.
    The correct setting is confirmed in the display (fig. 13).

18. Press Drive Controller. Actuator changes to 'End position' menu.
    Now set the second end position of the mechanical position indicator, refer to chapter "7.4.5 Adjust mechanical position indicator" on page 55.

Fig. 13: End position setting correct

- When changing to 'REMOTE' control, the actuator moves once an operation command from the DCS is present!
- Once the end positions have been adjusted during commissioning, the central wheel must not be moved! Otherwise a complete readjustment of the end positions is required.

7.4.4 Readjust end positions

Prerequisites

- Valid end position adjustment is mandatory! If there is no valid end position adjustment, refer to previous section “7.4.3 Procedure for initial end position adjustment” on page 48.
- At the beginning of the end position adjustment, the valve must not be in a jammed state; if necessary, release it by means of the crank handle/hand wheel (see chapter 4.1).
- After initial setting, the position of the central wheel must not be changed and will not be changed during readjustment!

The setting procedure can be aborted by selecting ‘Back’ . The formerly valid end position adjustment is maintained unless the central wheel was turned.

Operation sequence

1. Select LOCAL control .
2. Select ‘End positions’ menu item in the ‘Main menu’.
   Display changes to ‘End positions’ menu.
3. Confirm ‘Readjustment’ menu item (fig. 1, item 1).
   Display changes to selection of end position to be readjusted (fig. 2).
4. Select end position to be readjusted (in our example end position OPEN) and confirm.
   Display changes and prompts to approach the desired end position. If end position OPEN is selected, the orange selection marker is on end position symbol OPEN .
   If end position CLOSED is selected, the selection marker is on end position symbol CLOSED .
   Display additionally indicates:
   – Current position within the travel in percent (fig. 3, item 1);
   – The valid setting range for the new end position (fig. 3, item 2);
   – The progress bar* as graphic representation of the potentiometer signal (item 3a);
   – deviation in percent from the currently valid end position (item 4**).**
   – The signal that
   - The valid setting range has not yet been reached (item 5a) or
   - the setting range is valid (item 5b)

   The end position can be accepted within the valid setting range (6).
5. If required, set selection marker on the end position symbol to the end position to be approached (new end position).

Fig. 1: End position readjustment

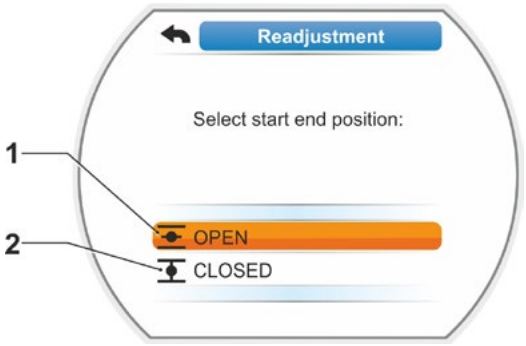


Fig. 2: Select end position

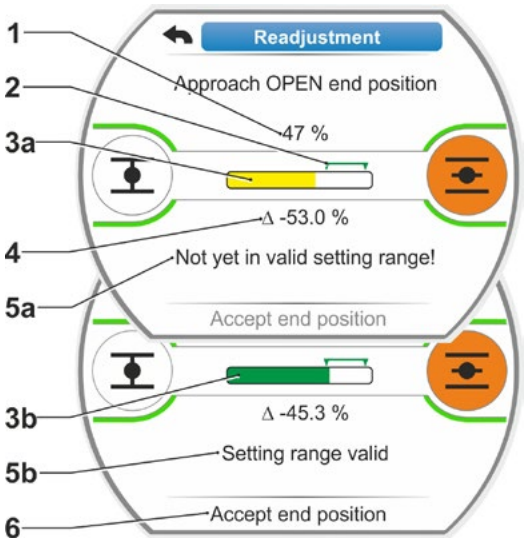


Fig. 3: Approach new end position

* Progress bar is not displayed for 2SG7, 2SQ7.

6. Move actuator to new end position.
   - **Travel dependent cut-off mode:**
     Hold down Drive Controller until new end position is reached. Changing the operation direction enables fine adjustment. Once the value is outside the valid adjustment range, the color of the progress bar changes. Refer also to instruction in chapter “Procedure for initial ...” on page Page 51.

   - **Torque-dependent cut-off mode:**
     Readjustment of the end positions in torque dependent cut-off mode might become necessary in exceptional cases if, e.g. the ‘Adaptive end position’ function is switched of or a deviation up to 0.7 % is to be corrected (refer also to Page 92). Hold down Drive Controller for more than 3 s. The actuator automatically moves until reaching the end position, refer also to the following note:

> When pressing the Drive Controller for a short time (< 2 s), the actuator moves as long as the Drive Controller is pressed. If the actuator is operated, i.e. by pressing the buttons repeatedly for a short time, torque dependent cut-off is not immediately performed.

   The display indicates the valid adjustment range as well as the change in percent compared to the overall travel covered so far as well as the deviation up to the previous end position.

7. Set selection marker to ‘Accept end position’ (fig. 4, item 3) and confirm.
   A signal confirms successful readjustment.

8. Confirm ‘OK’ (fig. 5, item 1).
   Display changes to ‘End position’ menu.

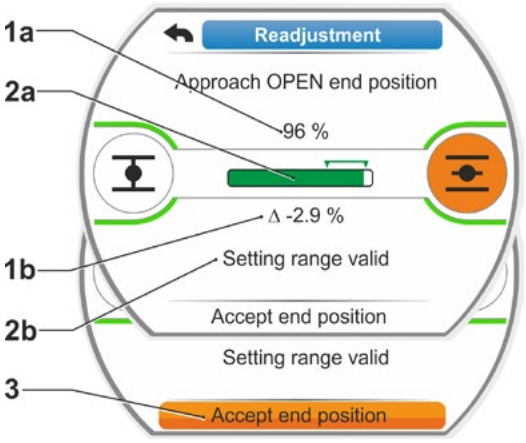


Fig. 4: Accept new end position

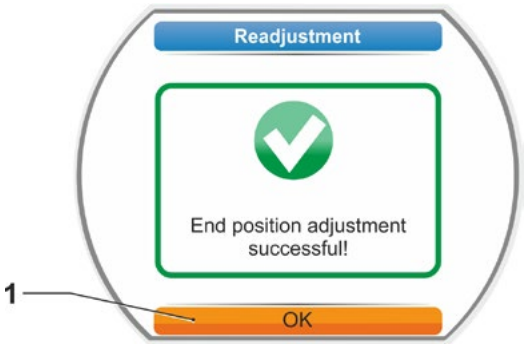


Fig. 5: End position readjustment correct

7.4.5 Adjust mechanical position indicator

The mechanical position indicator indicates the valve position. The symbol stands for OPEN and the symbol for CLOSED (refer to fig. 1, items 1 and 2).

The mechanical position indicator is an option, and not included in all devices.

If the actuator was delivered mounted on a valve, the setting may already be performed by the valve manufacturer. The setting must be checked during commissioning.

If the mechanical position indicator was not yet set with the end positions, set the indicator as follows.

Operation sequence

1. Operate the actuator into the end position CLOSED.
2. Remove signaling gear cover.
3. Turn white disc with red symbol (fig. 2, item 1) until the symbol for CLOSED (fig. 1, item 1) and the arrow (3) are aligned in the indicator glass of the cover.
4. Operate actuator to position OPEN.
5. Hold white disc (fig. 2, item 1) in position and turn transparent disc (2) until the green symbol for OPEN (fig. 1 item 2) and the arrow (3) are aligned.
6. Fix signaling gear cover with screw while heeding proper fit of the seal.

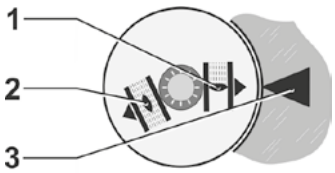


Fig. 1: Position indicator symbols

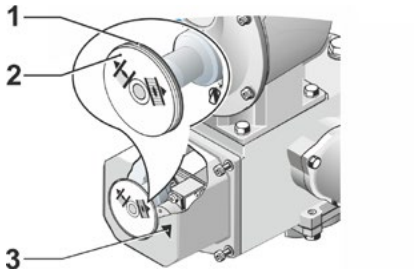


Fig. 2: Adjust position indicator

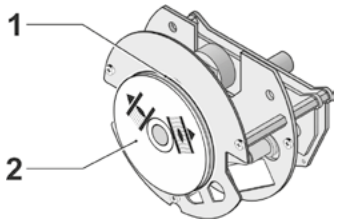


Fig. 3: Position indicator for 2SG7

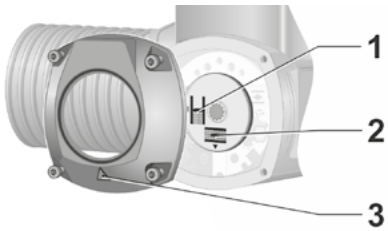


Fig. 4: Position indicator for 2SQ7

7 Commissioning

7.5 Adjust end positions for version with "non-intrusive" position encoder

PROFITRON actuators are either available with signaling gear or as “non-intrusive” version with the non-intrusive position encoder (niP). End position adjustment with signaling gear is described in the previous chapter 7.4.

The non-intrusive position encoder is standard for HiMod actuators.

If actuators are delivered mounted to a valve, this step has usually been done in the valve manufacturer’s factory. The setting has to be checked during commissioning.

7.5.1 New setting (initial setting)

The end positions are directly set at the actuator.

The valve must not be jammed. Use the crank handle/hand wheel for release, if necessary. For crank handle/hand wheel operation, refer to chapter 4.1.

The end positions must not be set according to a specific sequence. In the following example, the display messages for end position OPEN are shown. The messages for setting end position CLOSED are similar.

The setting procedure can be aborted by selecting ‘Back’ . The formerly valid end position adjustment is maintained unless the actuator was operated.

Operation sequence

1. Select LOCAL control .
2. Select ‘End positions’ menu item in the ‘Main menu’.
   The display changes to ‘New setting’ (fig.1).
3. Confirm selection.
   Display changes to ‘Only end positions’ (fig. 2, item 1) or ‘Complete’ setting query, including all parameters required for correct end position adjustment (item 2).
   These parameters include
   – CLOSE direction (clockwise or counter-clockwise)
   – Speed (in OPEN and CLOSE directions)
   – Cut-off mode (torque-dependent or travel-dependent in end positions CLOSED and OPEN)
   – Tripping torque (in end position CLOSED and end position OPEN)

   These parameters have already been described in chapter 5.3.
4. Select ‘Only end positions’ menu item and confirm. The display changes to query which end position CLOSED or OPEN is to be set first.

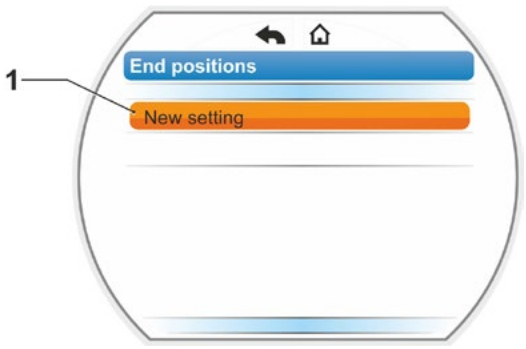


Fig. 1: End position readjustment

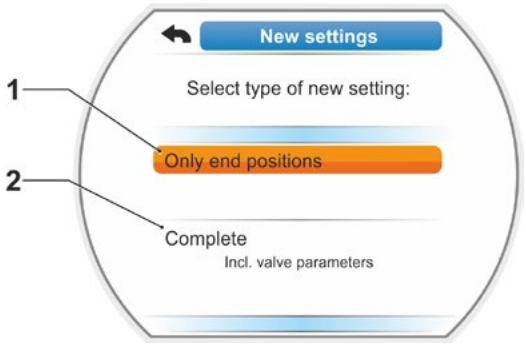


Fig. 2: End position setting with or without parameters

The end positions must not be set according to a specific sequence. Adjustment of end position OPEN is described in the following. End position CLOSED is adjusted accordingly.

5. Select end position to be set first (in our example end position OPEN) (fig. 3, item 1) and confirm.
   Display changes to end position adjustment and you are requested to approach end position OPEN (fig. 4). OPEN direction is offered as operation direction. End position OPEN symbol is shaded in orange (fig. 4, item 1).
   If operation in the opposite direction is desired, turn Drive Controller and set orange selection marked to symbol CLOSED (fig. 4, item 2).

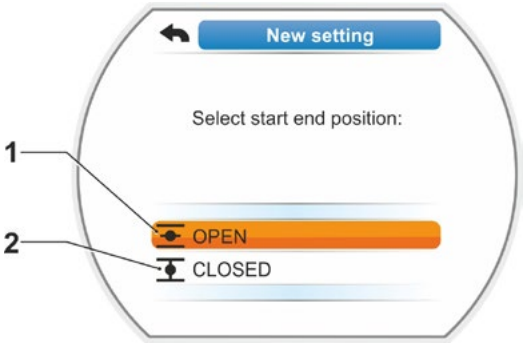


Fig. 3: End position selection

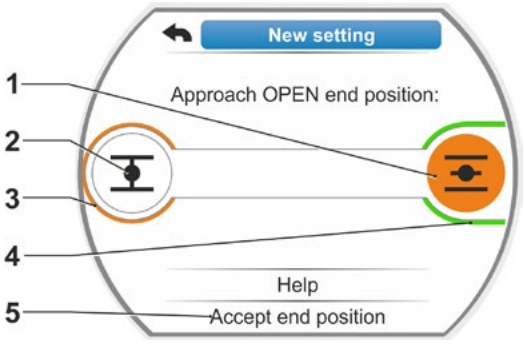


Fig. 4: Approach end position in OPEN direction

> Generally, the end position selected in operation step 4 is to be adjusted first!

Furthermore, the display indicates the set cut-off mode. In our example

- End position CLOSED = torque-dependent (item 3) and
- End position OPEN = travel-dependent (item 4).

6. Depending on whether the cut-off mode for the end position is travel-dependent or torque-dependent, select the following operation sequence.

   - Travel dependent cut-off mode:

     a) Heed valve position and approach end position; press Drive Controller.
     Operate the actuator until the valve has reached the end position.*
     The LED of the selected end position flashes while the actuator is operated.

> - When pressing the Drive Controller for a short time (< 3 s), the actuator moves as long as the Drive Controller is pressed. For longer activation (> 3 s), latching starts (display shows ‘Latching active’) and the actuator moves until the Drive Controller is pressed again.
>   When holding down the Drive Controller for more than 3 seconds and the actuator does **not** in change to latching, activate the latching function “9.1.3 Operation – latching function” on page 95.
> - If torque-dependent tripping occurred in travel-dependent cut-off mode, e.g. if the MOV is sluggish, unfavorable torque characteristics or approaching of a mechanical stop, **“Torque dependent cut-off”** is shown in the display.

     b) Once the desired position has been reached, press Drive Controller to stop the actuator. Perform possible fine adjustment by operation in the opposite direction.

* If the actuator has switched off automatically before reaching the end position, two causes are possible:
– Sluggish MOV or unfavorable torque curve. In this instance, abort process. Or
– Valve has reached mechanical stop. In this instance, return to desired end position.

c) Acknowledge position with ‘Accept end position’ (fig. 5).
The non-intrusive position encoder will be initialized This will take a few seconds. The first end position is then set and the system changes to setting the other end position.
The request to approach end position CLOSED is shown in the display.

Continue with operation step 7.

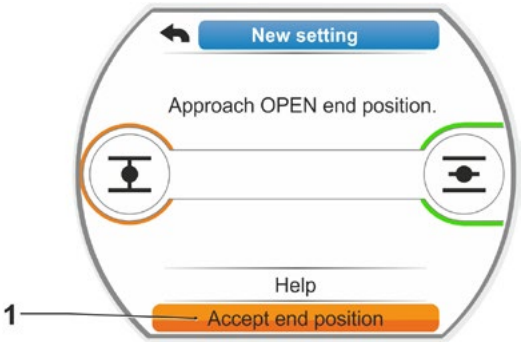


Fig. 5: Accept end position

- **Torque-dependent cut-off mode:**

a) Hold down Drive Controller for more than 3 s. (Refer also to note on p. 57.)
The actuator moves automatically.
Note:
When pressing the Drive Controller for a short time (< 2 s), the actuator moves as long as the Drive Controller is pressed. If the actuator is operated, i.e. by pressing the buttons repeatedly for a short time, torque dependent cut-off is not immediately performed.

Once the tripping torque has been reached in the end position, the actuator switches off automatically and ‘Tripping torque reached’ is shown in the display.

c) Acknowledge position with ‘Accept end position’. This will take a few seconds.
The non-intrusive position encoder will be initialized
The first end position is then set and the system changes to setting the other end position. ‘Approach CLOSE end position’ is displayed.

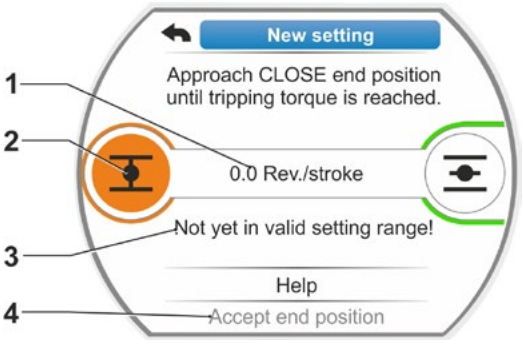


Fig. 6: Approach end position CLOSED

7. Move the actuator to the other end position:
Depending on whether the cut-off mode for the end position is travel-dependent or torque-dependent, select the operation sequence in accordance with step 6.

During operation to the second end position, the number of revolutions/stroke (fig. 6, item 1) is displayed, indicating whether the valid setting range (item 3) has been reached.
Once the tripping torque has been reached for travel-dependent cut-off mode, this will be indicated in the display (fig. 7, item 1).
If torque-dependent tripping occurred in travel-dependent cut-off mode, ‘Torque dependent cut-off’ is shown in the display. In this case, refer to note below.*

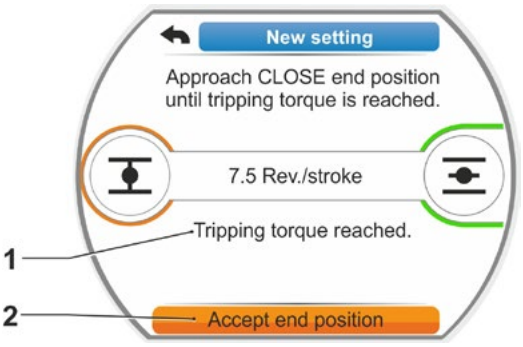


Fig. 7: End position CLOSED reached

8. Set marker to ‘Accept end position’ (fig. 7, item. 2) and confirm; end positions are now set and the respective message confirms correct adjustment (fig. 8).

9. Confirm ‘OK’ menu item (fig. 8, item. 1). Actuator changes to ‘End position’ menu.

Fig. 8: End position setting complete

7.5.2 Readjust end positions

Prerequisites

- Valid end position adjustment is mandatory! If there is no valid end position adjustment, refer to previous section “7.5.1 New setting (initial setting)” on page 56.
- At the beginning of the end position adjustment, the valve must not be in a jammed state; if necessary, release it by means of the crank handle/hand wheel (see chapter 4.1).

The setting procedure can be aborted by selecting ‘Back’ . The formerly valid end position adjustment is maintained unless the central wheel was turned.

Operation sequence

1. Select LOCAL control .

2. Select ‘End positions’ menu item in the 'Main menu'.
   Display changes to ‘End positions’ menu.

3. Confirm ‘Readjustment’ menu item (fig. 1, item. 1).
   Display changes to selection of end position to be readjusted (fig. 2).

4. Select end position to be readjusted (in our example end position OPEN) and confirm. Display changes and prompts to approach the desired end position. If end position OPEN is selected, the selection marker is on end positon symbol OPEN. If end position CLOSED is selected, the selection marker is on end position symbol CLOSED.

Fig. 1: End position readjustment

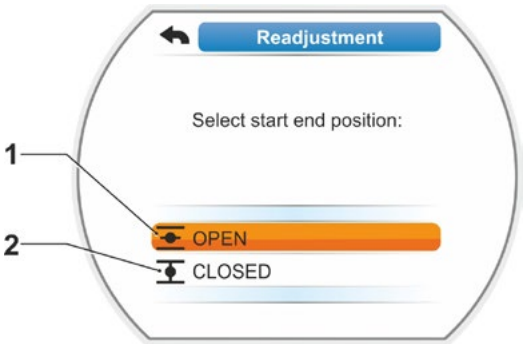


Fig. 2: Select end position

* If the actuator has switched off automatically before reaching the end position, two causes are possible:
  – Sluggish MOV or unfavorable torque curve. In this instance, abort process. Or
  – Valve has reached mechanical stop. In this instance, return to desired end position.

Display additionally indicates:

- Current position within the travel in percent (fig. 3, item 1);
- Travel in revolutions per stroke without considering and additional gear (fig. 3, item 2);
- Deviation in percent from the currently valid end position (item 3).
- Signal whether the setting range is valid (item 4). The end position can be accepted for a valid setting range (5).

5. If required, set selection marker on the end position symbol to the end position to be approached (new end position).

6. Move actuator to new end position.
   - Travel dependent cut-off mode:
     Hold down Drive Controller until new end position is reached. Changing the operation direction enables fine adjustment.

   - **Torque-dependent cut-off mode:**
     Hold down Drive Controller for more than 3 s. (Refer also to note on page 57.)
     The actuator automatically moves until reaching the end position, refer also to the following note:

> When pressing the Drive Controller for a short time (< 2 s), the actuator moves as long as the Drive Controller is pressed. If the actuator is operated, i.e. by pressing the buttons repeatedly for a short time, torque dependent cut-off is not immediately performed.

   The display indicates whether the actuator is within the valid adjustment range, as well as the change in percent compared to the overall travel covered so far as well as the delta up to the previous end position.

7. Set selection marker to ‘Accept end position’ (fig. 3, item 5) and confirm.
   A signal confirms successful readjustment (fig. 4).

8. Confirm ‘OK’ (fig. 4, item 1).
   Display changes to ‘End position’ menu.

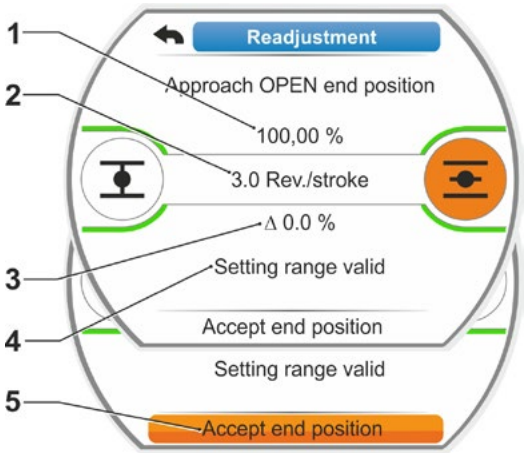


Fig. 3: Approach and accept new end position

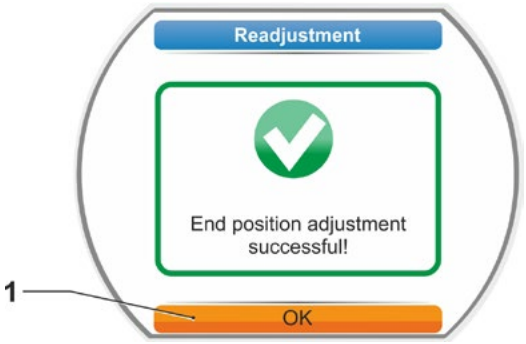


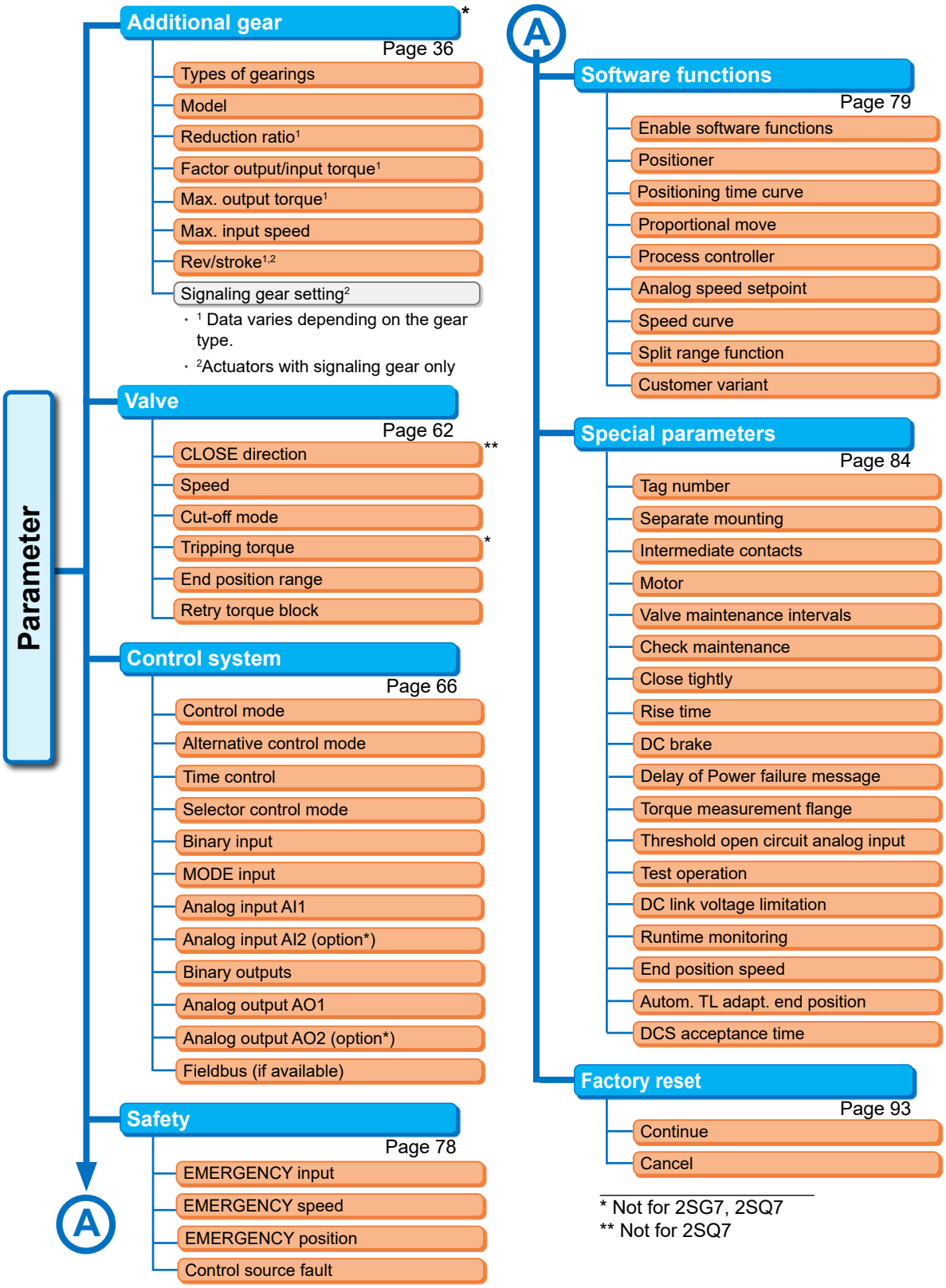
Fig. 4: End position readjustment correct

8 Parameters and possible parameter values

The present chapter describes the parameters and the possible parameter values.

Should a factory reset of all adjustable parameter values be required, this can be done via the “Reset to factory setting” on page 93.
In the following description of the parameters the default values set in the factory are listed.

8.1 Parameter menu



8.2 Valve-specific parameters

This chapter lists the parameters and the parameter values which directly affect the valve. The sequence of the description of the individual parameters corresponds to the menu structure, refer to illustration.

Navigation in the menu is described in chapter “4.4 Navigation through the menus” on page 23.

The available parameter values for

- Speeds (positioning times for 2SG7, 2SQ7) refer to tables in chapter “7.3.2 Program speeds/positioning times” on page 41;
- For tripping torques, refer to chapter “7.3.3 Program cut-off modes and tripping torques/ forces” on page 42.

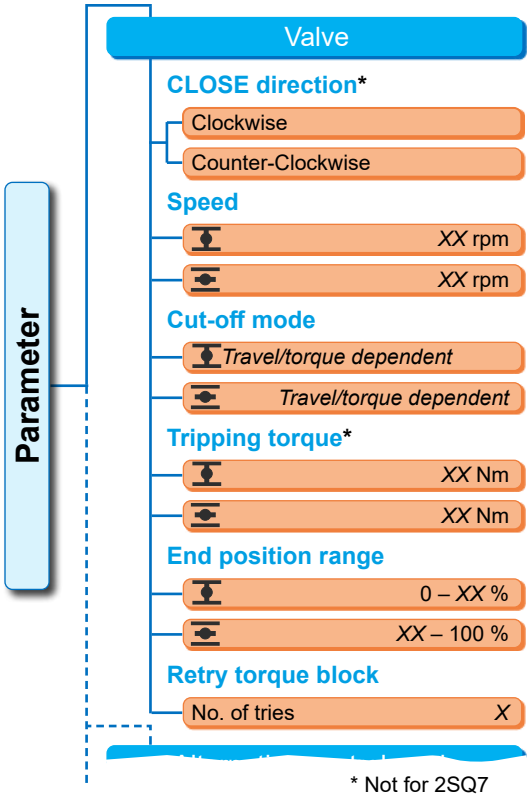


Fig.: Valve menu

8.2.1 Change parameters in the ‘Valve’ menu

Changing the parameter values in the ‘Valve’ menu varies, depending on whether a

- Characteristic or
- A figure is changed.

The individual steps are described in the following operation sequences.

Change the characteristic of a parameter

In our example, the ‘CLOSE direction’ parameter characteristic is changed from ‘Clockwise’ to ‘Counter-rclockwise’.

1. Select ‘CLOSE direction’ in the ‘Valve’ menu; set the orange selection marker to the line below ‘CLOSE direction’ (fig. item 1).
   The selection marker cannot be set to the header, in our example ‘CLOSE direction’ but only to the line below showing the current parameter.

2. Confirm selection (item 2).
   The display changes to the ‘CLOSE direction’ menu, the selection marker is set to the first parameter value.
   Comment: The current parameter value is ticked ☑.

3. Select new parameter for control; set the orange selection marker to ‘Counter-clockwise’ in the example on the right (item 3).

4. Confirm selection (item 4).
   A message is displayed that the end positions have to be readjusted when changing the closing direction.

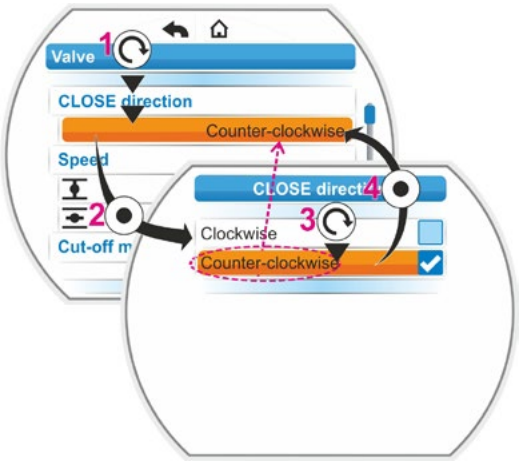


Fig.: Change parameter characteristic in Valve menu

5. Confirm message.
   Display returns to ‘Valve’ menu and the newly set characteristic is displayed for ‘CLOSE direction’.
   Comment: When changing to the ‘CLOSE direction’ menu, the ‘Counter-clockwise’ parameter is ticked.

Change the numerical value of a parameter

In our example, the value of the ‘Tripping torque’ parameter for CLOSE direction is changed.

1. Select ‘Tripping torque’ in the ‘Valve’ menu; set the orange selection marker to the line below ‘Tripping torque’ (fig. item 2).

2. Confirm selection (item 3).
   Display changes to the ‘Tripping torque’ menu and the value of the current tripping torque value is flashing in blue.

3. Turn Drive Controller. The tripping torque is changed and flashes in orange. (item 4).

4. Confirm selection (item 5).
   Display returns to ‘Valve’ menu and the newly set characteristic is displayed for ‘Tripping torque’.
   Comment: When changing to the ‘Tripping torque’ menu, the newly set value is flashing in blue.

In the following the parameters and possible parameter settings for the valve are listed in a table. The sequence of the parameters corresponds to the structure of the ‘Control system’ menu.

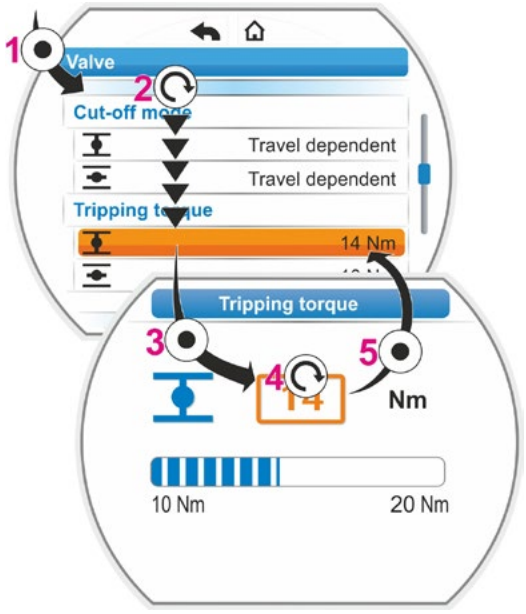


Fig.: Change parameter value in Valve menu

8.2.2 Parameters and their values in the ‘Valve’ menu

Unless stated otherwise during order, the following values/settings are set as default.

CLOSE direction parameter (Not for 2SQ7.)

CLOSE direction

Clockwise

Direction of rotation of the output drive shaft when closing. Possible setting: Clockwise or Counter-clockwise.

If the closing direction was changed, the end positions must be set afterwards.

Speed parameter

Speed

	14 rpm
	14 rpm

= Speed in CLOSE direction. = Speed in OPEN direction

Parameterization within the speed range, refer to name plate.

Cut-off mode parameter

Cut-off mode

	Travel dependent
	Travel dependent

= Cut-off mode in end position CLOSED. = Cut-off mode in end position OPEN.

Possible setting: Clockwise or Counter-clockwise.

If the cut-off mode was changed, the end positions must be set afterwards.

Tripping torque parameter (Not for 2SQ7.)

Tripping torque

	20 Nm
	20 Nm

= Tripping torque in end position CLOSED. = Tripping torque in end position OPEN.

Possible setting: in 10 % steps:

- Actuators classes A and B (8 levels) from 30 % to 100 % M_{trip} (default setting = 30 %)
- Actuators classes C and D (6 levels) from 50 % to 100 % M_{trip} (default setting = 50 %)

Cannot be set for 2SG7.

End position range parameter

End position range

	0 – 2 %
	98 – 100 %

= End position range in end position CLOSED.
= End position range in end position OPEN.

Possible setting (in 1 % steps):

- End position range CLOSED
  from [0 % to 2 %] to [0 % to 20 %]
- End position range OPEN
  from [98 % to 100 %] to [80 % to 100 %]

Within the end position range, travel is at a low speed (or long positioning time). If the actuator trips torque-dependently outside this range, it is recognized as a fault (‘Blocked in move’, refer to chapter “4.3 Actuator status indication” on page 18.

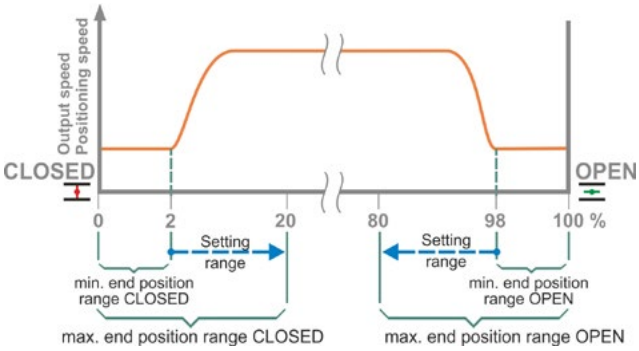


Fig.: End position ranges

Retry torque block parameter

Retry torque block

No. of tries	0

In case of block outside the end position range, the actuator repeatedly moves against the block (1 to 5 times).

If the ‘Retry torque block’ parameter value is equal to 0, this means that the position does not have to be approached again.

If the parameter value is not equal to zero, the actuator is automatically operated in the opposite direction (for a travel which corresponds to the end position range, but not longer than 2 s) and the back in direction of the block.
This happens until the block has been overcome or the programmed number of tries has been reached.
If the block is not overcome, the actuator is tripped and the ‘Blocked in move’ fault signal is set. The actuator continues to signal ‘ready’ since it can still be operated into the opposite direction.

Default setting is 0.

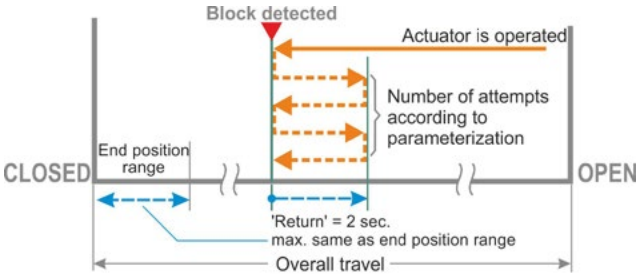


Fig.: Retry torque block

8.3 Control system parameters

8.3.1 Overview of Control system menu

The orange selection marker cannot be set to the blue group header, but directly on the lines below showing the possible parameter values.

The following overview lists possible parameters. Depending on the product configuration, the indication in the display may vary.

- Main menu
  - Parameter
    - Control system
      - **Control mode**
        - **Binary**
          - Permanent contact
          - Pulse contact
          - Proportional move
        - **Analog**
          - Positioner AI1
          - Process controller AI1
          - Process controller AI2
          - Process controller AI2
        - **Fieldbus**
          - Permanent contact
          - Positioner
          - Process controller
          - Proportional move
        - **Internal**
          - Process controller fixed setpoint
          - Time control
      - **Alternative control mode**
        - Not active
        - **Binary**
          - Permanent contact
          - Proportional move
        - **Analog**
          - see Control mode
        - **Fieldbus**
          - see Control mode
        - **Internal**
          - see Control mode
      - **Time control**
        - **Switching Point 1**
          - HH:MM
          - Deactivated / CLOSE / OPEN
        - ...
        - **Switching Point 10**
      - **Selector control mode**
        - Not active
        - Binary input STOP
        - Binary input EMERGENCY
      - **Binary input**
        - Normally Closed (NC)
        - Normally Open (NO)
      - **MODE input**
        - No function
        - Interlock LOCAL/REMOTE
        - Enable motor operation
        - Enable LOCAL

- **Analog input AI1**
  - Slope
    - Rising
    - Falling
  - Range
    - 4 – 20 mA
    - 0 – 20 mA
- **Analog input AI2**
  - Slope
    - Rising
    - Falling
  - Range
    - 4 – 20 mA
    - 0 – 20 mA
- **Binary outputs**
  - Signal assignment
    - Output 1
      - *Signal*
      - *Level*
    - Output 2
    - Output 3 ... 8
- **Analog output AO1**
  - Signal
    - Position actual value
    - Process actual value
  - Range
    - 4 – 20 mA
    - 0 – 20 mA
  - Slope
    - Rising
    - Falling
- **Analog output AO2**
  For available additional analog module only. Parameterization like for analog output AO1.
- **Fieldbus**
  - PROFIBUS DP
    - Channel 1
    - Channel 2
    - Process data
  - MODBUS
    - Address
    - Baud rate
    - Parity/stop bit
    - Monitoring time
  - HART
    - Address *0 – 63*
    - Monitoring time *0 – 3600 s.*

8.3.2 Operation sequence: Changing the parameters in the ‘Control system’ menu

The procedure for changing the parameter values within the ‘Control system’ menu is identical for all parameters and is done in four steps.

The individual steps are described in the following operation sequences. In our example the ‘Binary‘ control - ‘Permanent contact’ is change to ‘Binary’ - ‘Pulse contact’.

Operation sequence

1. Select the parameter in the ‘Control system’ menu, in our example ‘Control mode’; set the orange selection marker to the line below ‘CLOSE direction’ (fig. item 1).
   The selection marker cannot be set to the heading, in our example ‘Control mode’ but only to the line below showing the current parameter. If the current parameter is to be changed, continue with step 2.
2. Confirm selection (item 2).
   The display changes to the ‘Control mode’ menu, the selection marker is set to the first parameter value.
   Comment: The current parameter value is ticked ☑.
3. Select new parameter for control; set the orange selection marker to ‘Pulse contact’ in the example on the right (item 3).
4. Confirm selection (item 4).
   Display returns to ‘Control system’ menu and the newly set characteristic is displayed for ‘Control mode’.
   Comment: When changing to the ‘Control mode’ menu, the ‘Pulse contact’ parameter is ticked.

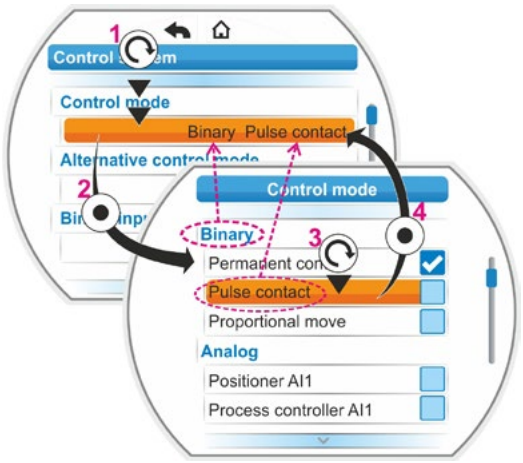


Fig.: Programming in Control system menu

In the following, the parameters and possible parameter settings for the control system are listed in a table. The sequence of the parameters corresponds to the structure of the ‘Control system’ menu.

8.3.3 Control system – Control mode

The illustration on the right shows an overview of the ‘Control system’; depending on the version, the actuator can be differently controlled from the control system:

- ‘Binary’,
- ‘Analog’ or via
- ‘Fieldbus’.

The control mode is determined by setting a (parameter) value (shown in orange in the menu illustration on the right) for the ‘Control mode’ parameter.

Permanent contact, Pulse contact or Proportional move can be selected for Binary control mode.

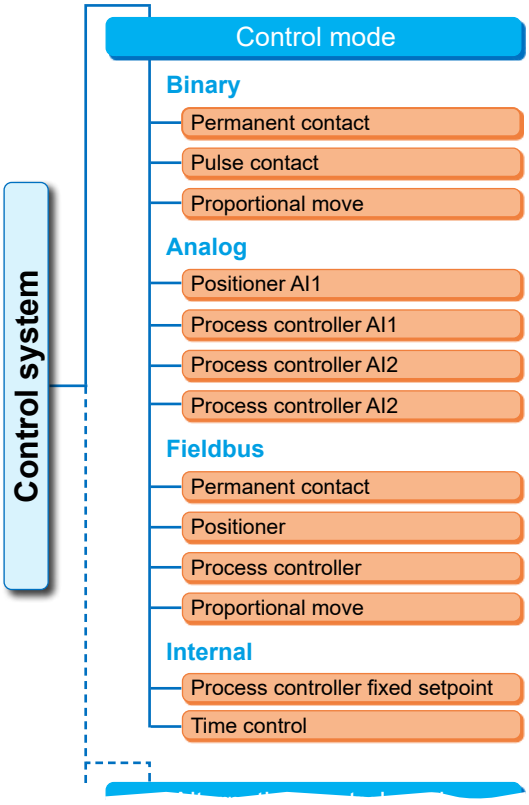


Fig.: Parameters menu: ‘Control mode’

Binary control mode

Binary

- Permanent contact
- Pulse contact
- Proportional move

Permanent contact

Permanent contact via binary inputs OPEN and CLOSE.

The actuator moves as long as an OPEN or CLOSE signal is present. The actuator stops, if the signal is deactivated, the end position has been reached or the OPEN and CLOSE commands are present simultaneously.

Default setting unless ordered with positioner.

Pulse contact

Pulse contact signal via binary inputs OPEN, CLOSE, and STOP.

After an OPEN/CLOSE pulse, the actuator operates until a STOP command is present or the end position has been reached. A signal for the opposite direction leads to a direct change of the direction of operation.

Only possible if the ‘Alternative control mode’ parameter is set to ‘non-active’.

Proportional move

Even for very short control times, the actuator is operated proportionally to the length of the control time on the OPEN/CLOSE binary inputs. The ratio of the actuator travel to the total travel is identical to the ratio of the control time to the total positioning time, refer to formula on the right.

$$\frac{\Delta \text{ Travel}}{\text{Total travel}} = \frac{\text{Control time}}{\text{Total positioning time}}$$

Formula: Travel positioning time ratio

The entire positioning time (run time) has to be parameterized to this end. It will be automatically determined by the actuator once end position setting is complete. Refer also to “8.5.3 Proportional move” on page 82.

Only adjustable for enabled positioner function.

Analog control mode

Analog

- Positioner AI1
- Process controller AI1
- Process controller AI2
- Process controller AI2

Positioner AI1

Positioner with setpoint via analog setpoint input AI1.
The positioner within the actuator is activated and the actuator moves proportionally to the analog signal 0/4 – 20 mA.

Only adjustable for enabled positioner function.

Default setting if ordered with positioner.

Process controller AI1

The process controller within this actuator is activated. Setpoint is recorded via analog input AI1 (0/4 – 20 mA). The actual process value is recorded via AI2 (0/4 – 20 mA).
Only adjustable with enabled process controller.

Process controller AI2

Only if analog setpoint input AI2 is available.
As for positioner AI1, however, only setpoint input AI2 is used.

(If an analog setpoint input AI2 is available, you may decide at your own discretion whether the setpoint of the positioner is to be defined via AI1 or AI2.)

Process controller AI2

As for process controller AI1, however setpoint definition via analog input AI2 and actual process value via analog input AI1. Only possible, it AI2 is available (generally valid for process controller). (If an analog setpoint input AI2 is available, you may decide at your own discretion whether the setpoint is to be defined via AI1 or AI2.)

Fieldbus control mode

Fieldbus

- Permanent contact
- Positioner
- Process controller
- Proportional move

Permanent contact

Permanent contact signal via fieldbus with OPEN and CLOSE commands.
The actuator moves as long as an OPEN or CLOSE signal is sent. The actuator stops if the commands are deactivated in one of the following telegrams or if the end position has been reached.
Only adjustable for available fieldbus interface.

Positioner

Positioner with setpoint vial fieldbus interface (refer to positioner AI1. Page 68).
Only for available fieldbus interface and enabled positioner.

Process controller

As for analog control mode ‘Process controller AI1’ or ‘Process controller AI2’, refer to Page 68. Process controller with setpoint via fieldbus.

Proportional move

As for ‘Binary control modes’, ‘Proportional move’, refer to Page 68.
Control for proportional move is implemented via OPEN/CLOSE commands within the fieldbus telegram.
Only for enabled positioner function.

Internal control mode

Internal

- Process controller fixed setpoint
- Zeitsteuerung

Process controller fixed setpoint

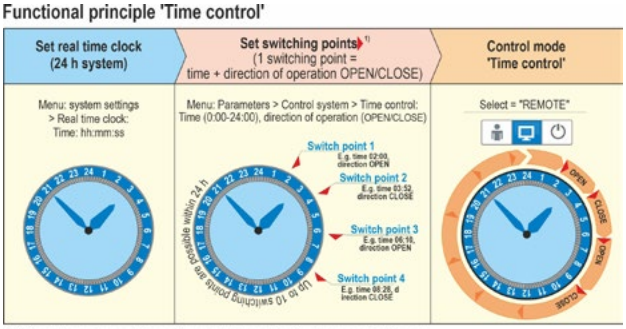
The adjustable fixed setpoint is controlled by the process controller.
The fixed setpoint is set under software functions (refer also to “8.5.1 Enable software functions and customer variants” on page 80 and “Process controller” supplementary operation instructions).
Actual process value via AI2 (if available) otherwise AI1.
Only for enabled process controller.

Time control

Actuator control (OPEN or CLOSE) at predefined times.
Prerequesites are:

- The RTC is set (refer to extensive operation instructions for PROFITRON/HiMod, chapter „9.2 Real time clock“ on page 97). As standard, the following time is set in the factory.
- Control mode or alternative control mode for time control is set.
- Switching points (time and direction of operation) are set.
- REMOTE is selected as control mode

Functional principle 'Time control'



1) Control mode or alternative control mode for time control is set.

Fig.: Functional principle ‘Time control’

- If during active time control the subsequent switching point is reached, the actuator operates in the predefined direction
  – until the respective end position is reached, or
  – to the next switching point with operation command in opposite direction, or
  – operation is interrupted by manual operation, REMOTE-LOCAL switch-over or a fault.

  Following an interruption, operation is not automatically resumed. Only once the next time switching point is reached, the actuator operates into the direction defined for the switching point. If required, operate the actuator into the desired position in ‘LOCAL control mode’.
- If the same time is selected for several switching points with different directions of operation OPEN/CLOSE, these switching points are ignored.

Refer to the chapter 8.3.5 for the procedure to set the time control.

8.3.4 Control system – Alternative control mode

The “Alternative control mode” parameter enables the change-over to a second control mode, to change, e.g. in case of an error, from analog to binary control. As a prerequisite, ‘Binary Pulse Contact’ may not be selected for the ‘Control mode’ parameter. Change over between control mode and alternative control mode is done via binary input STOP or EMERGENCY (Can be selected via “Selector control mode”).

The setting of the parameters is identical to ‘Control mode’, refer to previous chapter “8.3.3 Control system – Control mode” on page 67. By setting a parameter value, the alternative control mode option is activated. The alternative control mode option is deactivated via ‘Not active’.

Alternative control mode

Not active

‘Not active’: ‘Alternative control mode’ is not active. It can only be controlled via the control mode set via the ‘Control mode’ parameter.

8.3.5 Time control setting

Operation sequence

Select ‘Time control’ as control mode

1. In menu ‘Control system’, set the selection marking to the line below ‘Control mode’ (**5**) and confirm (**6**).
   The display changes to currently active control mode (blue check mark ☑).
2. Set selection marking to ‘Internal’ ‘Time control’ (**7**) and confirm (**8**).
   The display returns to the ‘Control system’ menu and ‘Time control’ is displayed as control mode.

Time control setting: Select switching points (time and direction of operation).

3. Select ‘Time control setting‘ (**9**) and confirm (**10**). The menu ‘Time control setting’ is displayed.
4. Set the first switching point:
   a) Setting the time
      - Set the selection marking to the first line below ‘Switching point’ (**10a**) and confirm (**10b**)
      - Set time (hour and minutes) (**10b** up to **f**) and save (**10g**).
        The menu returns to ‘Time control setting’ and the selection marking is located in the second line below ‘Switching point 1’.

   b) Setting the direction of operation
      - Press Drive Controller (**11**).
        The display changes to the ‘Command’ menu‘.
      - Selection operation direction; in the present example ‘OPEN‘ (**11a**) and confirm (**b**).
        The display returns to ‘Time control setting’ and the time and direction of operation for the first switching point are indicated.
5. Set the further switching points, as described as of step 4 (**10a** ...).
   Please heed notes indicated below in ☞ .

Time control activation

6. Set ‘Control mode’ to REMOTE (fig. 2 pos. 2). In the first line of the start menu, the display shows that time control is active (pos. 1).

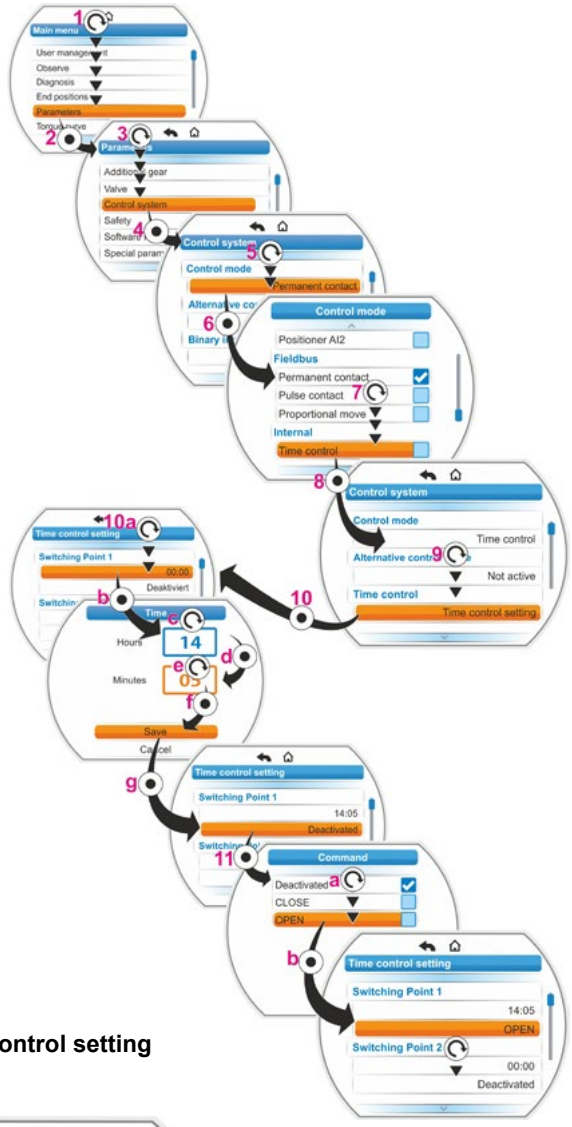


Fig. 1: Time control setting

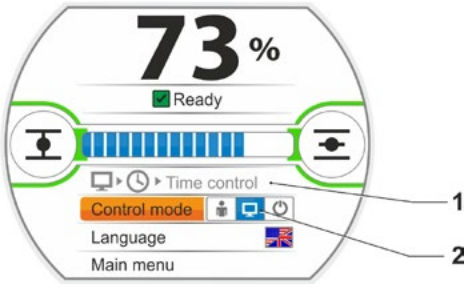


Fig. 2: Time control active

8.3.6 Control system - Selector control mode

Only visible if „Alternative control“ has been selected.

Selection of the binary input for switching between control and alternative control.

Selector control mode

- Not active
- Binary input STOP
- Binary input EMERGENCY

Not active

The „Alternative control“ is not active. It can only be controlled via the control mode that was set via the „Control“ parameter.

Binary input STOP

Binary input STOP can be used to switch to „Alternative control“.

Binary input EMERGENCY

The binary input NOT can be used to switch to „Alternative control“.

8.3.7 Control system – Binary input

Adjustment of OPEN, CLOSE, STOP and MODE inputs.

Binary input

- Normally Open [NO]
- Normally Closed [NC]

Normally open [NO] (high active)

Active for 24/48 V DC signal.

Normally CLOSED [NC] (low active)

Active for 0 V DC signal.

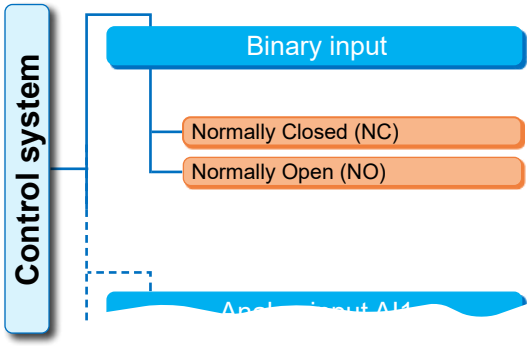


Fig.: Parameter menu ‘Binary inputs’

EMERGENCY input adjustment is made in the ‘Safety’ menu, “8.4.1 EMERGENCY input” on page 78.

Open circuit behavior is only detected if the level of the binary OPEN, CLOSE, STOP and MODE inputs is set to NO, i.e. active for 24/48 V DC. Should the signal drop to 0 V DC due to open circuit behavior, the switch-over lock is immediately deactivated!

8.3.8 MODE input

Additional functions can be controlled by the control system via this binary input.

MODE input

- No function
- Interlock LOCAL/REMOTE
- Enable motor operation
- Enable LOCAL

No function

Signal from the control system shows no effect.

Interlock LOCAL/REMOTE

This control system signal prevents control mode change-over of the actuator between REMOTE and LOCAL.

Signal = active: Change-over interlocked.

Signal = not active: Change-over possible.

Enable motor operation

A signal from the DCS enables or disables electric operation of the actuator (motor lock).

Signal = high (24/48 V, irrespective of NO/NC setting): Actuator can be operated.

Signal = low (0 V): The actuator is not ready for operation. 'Motor lock' is displayed in the status bar.

Enable LOCAL

The DCS can enable or restrict local actuator operation.

Signal = active: Local actuator operation is enabled in accordance with the selected user level.

Signal = not active: Operation is only possible in the 'Observer' user level. In addition, you can change between LOCAL, REMOTE or OFF control mode.

8.3.9 Control system – Analog input AI1

Setpoint at analog input 1 for positioner or process controller setpoint or for speed setpoint.

Slope

Slope
- Rising
- Falling

Rising

Rising: 20 mA corresponds to 100 % OPEN, refer to fig. 2.

Falling

Falling: 20 mA corresponds to 0 % OPEN.

Range

Range
- 4 – 20 mA
- 0 – 20 mA

4 – 20 mA

Detection of wire break is possible (live zero).

0 – 20 mA

Detection of wire break is not possible (dead zero).

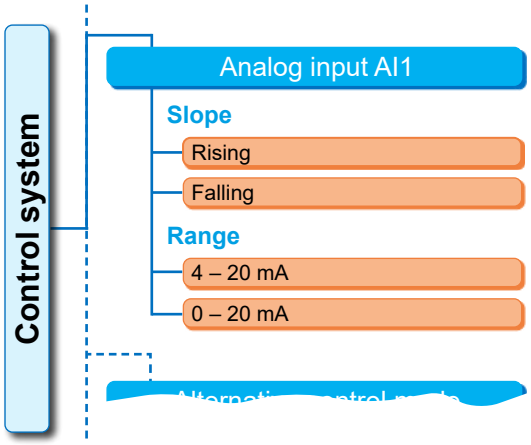


Fig. 1: Parameter menu 'Analog input AI1'

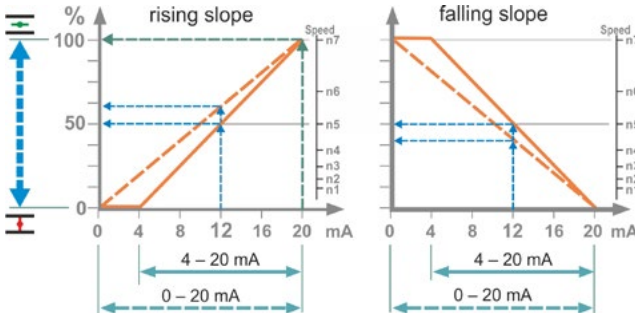


Fig. 2: Conversion 0/4 – 20 mA to 0 – 100 % or to speed with different curve

8.3.10 Control system – Analog input AI2

Analog input AI2 is only displayed if the additional analog module is available. The setting of the parameters is identical to 'Analog input AI1', refer to previous chapter.

8.3.11 Control system – Binary outputs

All in all 8 signaling outputs are available for the binary feedback signal of the actuator to the control system. Each of these outputs can be deactivated or assigned one of 23 available status messages, refer to menu overview on the right.

Furthermore, the level of the feedback signal can be determined: Normally Closed (NC) or Normally Open (NO).

Normally Open (NO): Active for 24/48 V DC signal.
Normally Closed (NC): Active for 0 V DC signal.

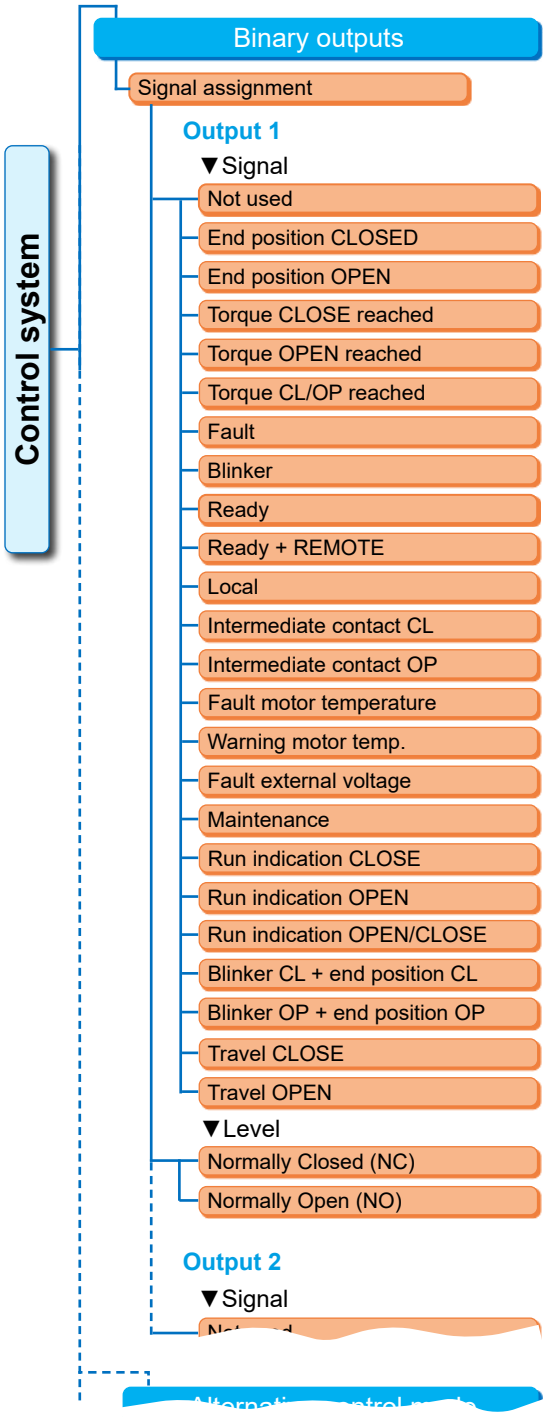


Fig.: "Binary outputs" menu parameters

Output 1

For a menu overview, refer to illustration on the right

The default setting shows the table on the next page.

Not used
Signaling output 1 is not assigned a possible status message. 'Output 1' is switched off.

End position CLOSED
The actuator has cut off in end position CLOSED.

End position OPEN
The actuator has cut off in end position OPEN.

Torque CLOSE reached
Torque-dependent actuator cut-off in CLOSE direction.

Torque OPEN reached
Torque-dependent actuator cut-off in OPEN direction.

Torque CL/OP reached
Torque-dependent actuator cut-off in CLOSE or OPEN direction.

Fault
A fault has occurred (for the type of fault refer to chapter "4.3 Actuator status indication" on page 18.

Blinker
The actuator operates. Signal changes between 'high' and 'low' state every 2 sec.

Ready
The actuator can be operated in 'LOCAL' and 'REMOTE' control mode.

Ready + REMOTE
The actuator can be operated in 'REMOTE' control mode.

Local
The actuator ins in LOCAL control of OFF.

Intermediate contact CL

The actuator position is within the range from 0 % to the position programmed as 'Intermediate contact CL' position, refer also to Page 85.

Intermediate contact OP

The actuator position is within the range from the position programmed as 'Intermediate contact OP' position to 100 %. Refer also to Page 85.

Fault motor temperature

The max. motor temperature (155 °C) has been exceeded.

Warning motor temp.

The programmed motor warning temperature has been exceeded (not for 2SG7…), refer to Page 86.

Fault external voltage

Low voltage or excessive voltage has been detected, or power supply has failed.

Maintenance

One of the set maintenance limits has been exceeded, refer to Page 87.

Run indication CLOSE

The actuator operates in CLOSE direction .

Run indication OPEN

The actuator operates in OPEN direction .

Run indication OPEN/CLOSE

The actuator runs in OPEN or CLOSE direction.

Blinker CL + end position CL

The actuator runs in CLOSE direction; the signal changes between 'high' and 'low' every 2 sec. Once end position CLOSED has been reached, the signal is set to 'active'.

Also refer to figure on the right.

Blinker OP + end position OP

The actuator runs in OPEN direction; the signal changes between 'high' and 'low' every 2 sec. Once end position CLOSED has been reached, the signal is set to 'active'.

'Travel CLOSE' or 'Travel OPEN'

– For travel-dependent cut-off mode: Signal will be issued if position 0 %, or 100 % is reached.

– For torque-dependent cut-off mode: Signal will be issued once the individual end position range has been reached.

Default setting of signaling outputs		
Signaling output	Signal	Level
1	End position OPEN	NO
2	End position CLOSED	NO
3	Torque OPEN reached	RS
4	Torque CLOSE reached	RS
5	Fault	RS
6	Local	NO
7	Blinker	NO
8	Warning motor temp.	RS

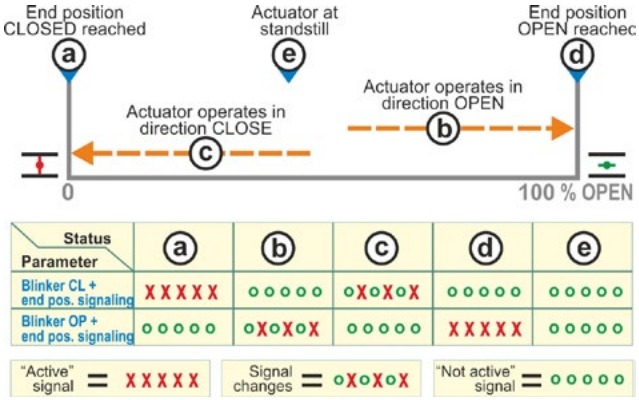


Fig.: Blinker CL/OP parameter + end position signaling

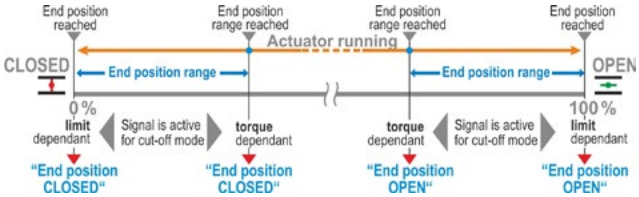


Fig.: Signal Travel CLOSE/OPEN

8.3.12 Control system – Analog output AO1

The analog output provides analog signals on:

- The position of the actuator,

or

- The actual process value for activated process controller (transfers the sensor signal).

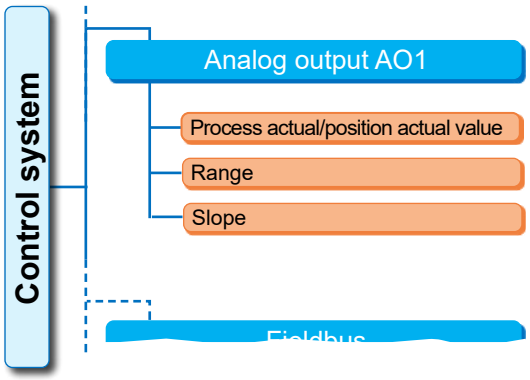


Fig.: Parameter menu ‘Analog output AO1’

Process actual/position actual value

Process actual/position actual value
- Process actual value
- Position actual value

Process actual value
Actual process value is issued via the analog output. Only adjustable for process controller.

Position actual value
Actual position value is issued via the analog output.

Range

Range
- 4 – 20 mA
- 0 – 20 mA

4 – 20 mA
Detection of wire break is possible (live zero).

0 – 20 mA
Detection of wire break is not possible (dead zero).

Slope

Slope
- Rising
- Falling

Rising
4 mA corresponds to 0 % OPEN, 20 mA corresponds to 100 % OPEN.

Falling
4 mA corresponds to 100 % OPEN, 20 mA corresponds to 0 % OPEN.

8.3.13 Control system – Analog output AO2

Analog output AO2 is only displayed if the additional analog module is available. The setting of the parameters is identical to ‘Analog input AI1’, refer to previous chapter.

8.3.14 Control system – Fieldbus

PROFIBUS DP

Only for available PROFIBUS interface.
For more detailed information, refer to PROFIBUS operation instructions.

PROFIBUS DP
- Channel 1 address
- Channel 2 address
- PZD settings

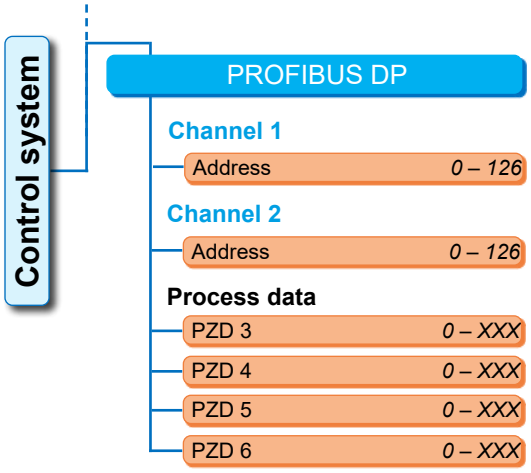


Fig.: 'PROFIBUS DP' menu

Channel 1

Channel 1
- Address 0 – 126

Fieldbus address of the actuator on channel 1 from 0 to 126.
Set to 126 in the factory.

Channel 2

Channel 2
- Address 0 – 126

Channel 2 (redundant version only)

Fieldbus address of the actuator on channel 2 from 0 to 126.
Set to 126 in the factory.

Process data

Process data
- PZD 3 0 – XXX

In the 'PPO2' process representation, four process data values (PZD) can be "fed" with data from the actuator. The parameter numbers entered under PZD 3 to 6 are valid for both channels 1 and 2.
For detailed information, refer to the PROFIBUS operation instructions.

MODBUS

Only for available MODBUS interface.
For more detailed information, refer to MODBUS operation instructions.

MODBUS
- Channel 1
  - Address
  - Data transmission speed
  - Parity/stop bit
  - Monitoring time
- Channel 2

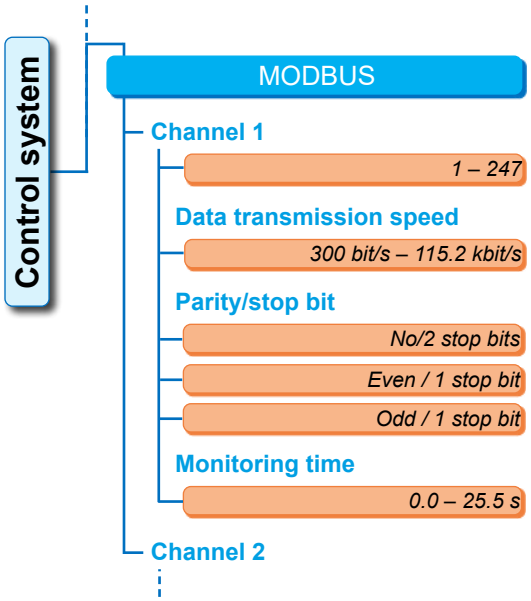


Fig.: 'MODBUS' menu

Channel 1

Channel 1
- Address 1 – 247

Fieldbus address of the actuator on channel 1 from 1 to 247.
Set to 247 in the factory.

The following communication parameters, i.e. baud rate, parity and connection control time must match those of the DCS (master).

Data transmission speed

Data transmission speed
300 bit/s – 115.2 kbit/s

Transmission rate
in bits per second.
Possible settings:
300 bit/s, 600 bit/s. 1.2 kbit/s, 2.4 bit/s, 4.8 bit/s, 9.6 kbit/s, 19.2 kbit/s, 38.4 kbit/s, 57.6 kbit/s, 115.2 bit/s. Set to 19.2 kbit/s in the factory.

Parity/stop bit

Parity/stop bit
No / 2 stop bits
Even / 1 stop bit
Odd / 1 stop bit

No / 2 stop bits
No parity and 2 stop bits.
Even / 1 stop bit
Even parity and 1 stop bit.
Odd / 1 stop bit
Odd parity and 1 stop bit.
Set to ‘even /1 stop bit’ in the factory.

Monitoring time

Monitoring time
0.0 s – 25.5 s

Connection control time, possible setting:
0.0 to 25.5 s.
For setting ‘0’, the monitoring is deactivated.
3.0 s are set in the factory.

HART

Only for available HART interface.
For more detailed information, refer to HART operating instructions.

HART communication
Address
Monitoring time

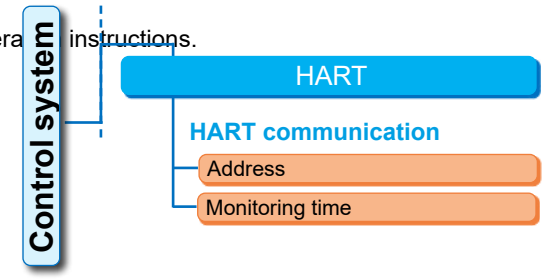


Fig.: ‘HART’ menu

Address
Can be set from 0 s to 63 s
Set to 0 in the factory.
Monitoring time
Monitoring time can be set from 0 to 3,600 s; whereas the monitoring is switched off for ‘0’ setting.
0 s are set in the factory.

8.4 Safety related parameters

The present chapter describes

- the parameters for EMERGENCY operation (EMERGENCY input, EMERGENCY speed, EMERGENCY position) and
- Possible actuator behavior on interruption of the control signal.

The sequence of the description of the individual parameters corresponds to the menu structure, refer to illustration.

The procedure for changing the parameter values in the 'Safety' menu is identical to the procedure in the 'DCS' menu, refer to "8.3.2 Operation sequence: Changing the parameters in the 'Control system' menu" on page 67.

Parameter
- Safety
  - EMERGENCY input
  - EMERGENCY speed
  - EMERGENCY position
  - Control source fault

EMERGENCY operation:

EMERGENCY operation can be triggered in REMOTE mode via

- Binary input EMERGENCY, or
- Fieldbus telegram or in case of
- Wire break of control source.

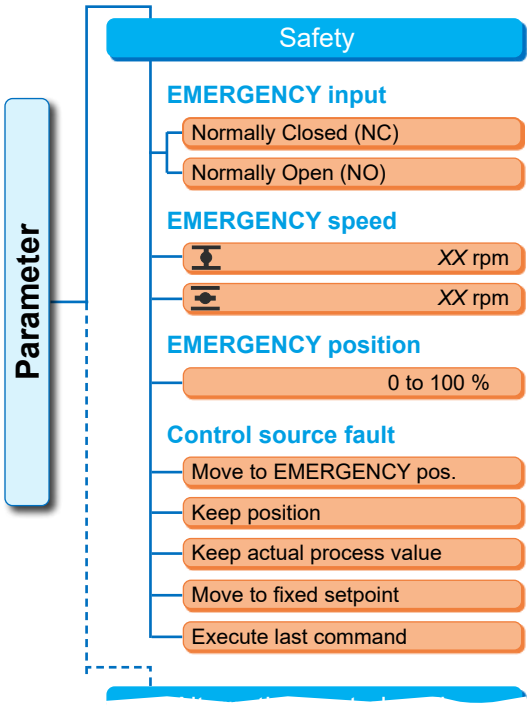


Fig.: Safety menu

8.4.1 EMERGENCY input

EMERGENCY input
- Normally Closed (NC)
- Normally Open (NO)

Normally Closed (NC)
Active for 0 V DC signal.

Normally Open (NO)
Active for 24/48 V DC signal.

Set to active high in the factory.

8.4.2 EMERGENCY speed

During EMERGENCY operation, EMERGENCY position is approached at EMERGENCY speed.

EMERGENCY speed
- XX rpm
- XX rpm

= EMERGENCY speed in CLOSE direction
= EMERGENCY speed in OPEN direction

Parameterization within the speed range, refer to name plate.

Factory settings:
- Speed 35 % $n_{max.}$
- Positioning time 28 s/90°

8.4.3 EMERGENCY position

During EMERGENCY operation, the position indicated here will be automatically approached.

EMERGENCY position

XX %

EMERGENCY position 0 to 100 % in 1 % increments.
Set to 0 in the factory.

8.4.4 Fault control source

A control wire interruption is detected for control via:

- Analog inputs with signal range 4 – 20 mA;
- Fieldbus

Control source fault

- Move to EMERGENCY pos.
- Keep position
- Keep actual process value
- Move to fixed setpoint
- Execute last command

Move to EMERGENCY pos.
In the event of signal loss from the control room, EMERGENCY operation will be triggered.
The following is shown in the display: 'No signal – EMERGENCY pos.'

Keep position
In the event of signal loss, the current position is held and 'No signal - Pos. held' is shown in the display.

Keep actual process value
The actual process value is held and 'Keep actual process value' is shown in the display. Only if 'Process controller' is active

Move to fixed setpoint
On loss of signal of the actual process value, the fixed process setpoint is approached and held. The following indication will then be displayed: 'Move to fixed setpoint'

Execute last command
In the event of signal loss from the DCS, the last command prior to signal loss will be executed.
The following is shown in the display: 'Execute last command'.
This setting is only useful for control via fieldbus.

'Keep position' is set in the factory.

8.5 Software functions

In addition to the standard functions, further software functions can be enabled. The additional functions are classified as

- Software functions and
- Customer variants.

Software functions are functions which enhance the scope of delivery of the actuator (refer also to the following section "Optional software functions").

Customer variants are customized programmed functions deviating from the standard functions and adapting the actuator behavior to specific customer requirements.

Software functions and customer variants are already enabled within the actuator if they were part of the order. They can also be enabled at a later date, refer to fig. "Software function menu" above and the following chapter.

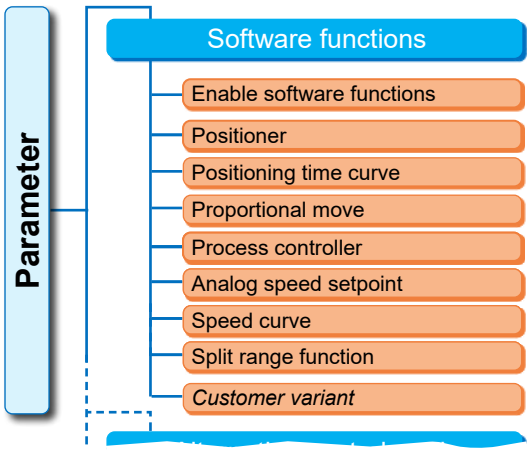


Fig.: Software functions menu

8.5.1 Enable software functions and customer variants

The present chapter describes how to enable optional software functions and customer variants. A software function or customer variant can only be enabled in the ‘Expert’ user level. For information on changing the user level, refer to “6 User management” on page 31.

To enable a software function or a customer variant, a PIN code available as accessory is required. The PIN code is different for each actuator.

Unauthorized enabling, setting of customer variants can lead to damage of the actuator/valve/plant!

The operation sequence for enabling the software functions is always the same and therefore described as an example.

Operation sequence

1. Select ‘Software functions’ in the ‘Parameter’ menu.
   The ‘Software function menu’ with ‘Enable software functions’ menu item opens (fig. 1, item 1).
   Should software functions and/or customer variants, which can be programmed, already be enabled, their names will be displayed, fig. 1, item 2.
2. Select ‘Enable software functions’ (fig. 2, item **1**) and confirm (fig. 2, item **2**).
   A menu listing all possible software functions including status appears:
   – ‘Enabled’ Function is already enabled.
   – ‘Enter PIN Code’: Function is not enabled.
3. Select desired software function*, fig. item **3**; in our example ‘Process controller’.
4. Confirm selection, fig. item **4**.
   The display changes to the PIN code entry.
5. Enter PIN code, fig. item **5**.
   Once all four characters of the PIN code have been entered, ‘Continue’ will be highlighted.
6. Confirm ‘Continue’ (item **6**).
   The display changes to the 'Software functions' menu where the enabled function will be display accordingly (see above operation step 1. and fig. 1, item 2).
7. Select ‘Software functions’ for programming the function.
   Continue as described in the supplementary operation instructions.

Procedures for programming software functions and customer variants are described in separate operation instructions.

*If a **customer variant** is to be enabled, turn the Drive Controller until ‘Customer variant’ is highlighted by the orange selection marker.

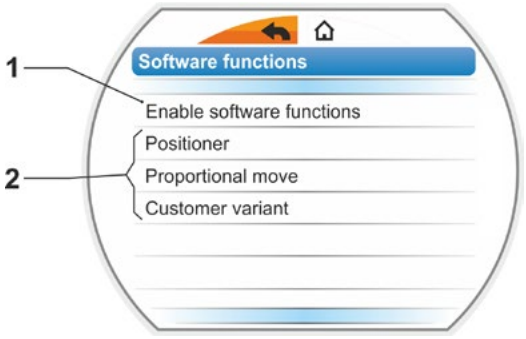


Fig. 1: Indication in the display: ‘Software functions’ menu

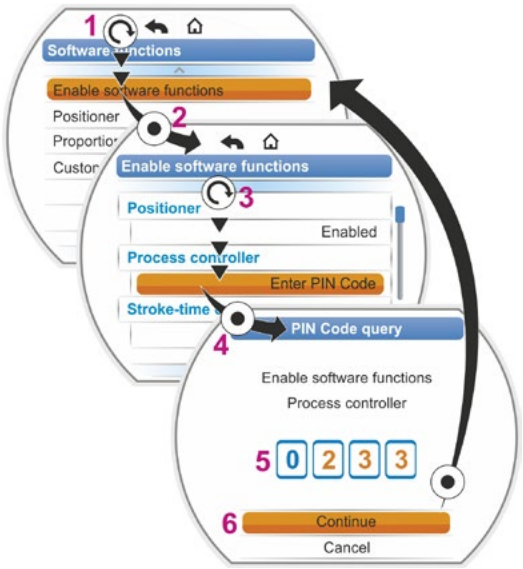


Fig. 2: Enable software function

8.5.2 Positioner

Positioner
- Setpoint
  - Linear
  - Equal percentage
  - Fast opening
- Dead band
  - Min. 0.2 %
  - Max. 2.5 %

Setpoint

For the default setting of the setpoint input "rising/ falling", it is possible to adapt the curve and to deviate from the linearity.

Setpoint
- Linear
- Equal percentage
- Fast opening

Linear
Identical to default setpoint curve.

Equal percentage
The actual position value (of the actuator) between end positions is considerably lower than the defined position setpoint, refer to fig. on the right.

Fast opening
The actual position value (of the actuator) between end positions is considerably higher than the defined position setpoint, refer to fig. on the right.

The positioner works in adaptive control mode, i.e. the dead zone (threshold) is continuously adapted to the controlled system. Depending on the process requirements both minimum and maximum values of the dead band can be set.

Dead band

Dead band
- Min. 0.2 %
- Max. 2.5 %

Minimum dead band
0.2 % to 5 %.
Default setting is 0.2 %

Maximum dead band
0.2 % to 5 %.
Default setting is 2.5 %

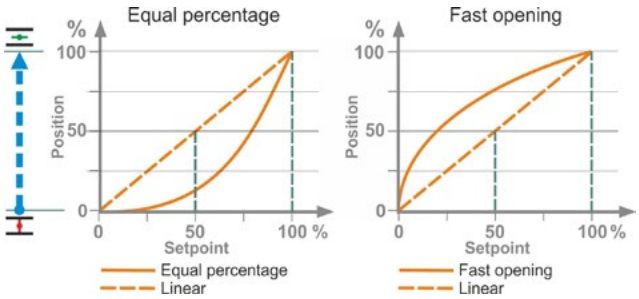


Fig.: Curve adaptation

8.5.3 Proportional move

Even for very short control times, the actuator is operated proportionally to the length of the control time.

The entire positioning time (run time from end position to end position) has to be determined to this end. The time can either be automatically determined by the actuator after end position adjustment or measured and defined by the user.

Refer also to “Binary control mode” on page 68.

Proportional move

Duration
Autom. determination
User defined

Duration

Duration

Autom. determination
User defined

Autom. determination
Automatic determination of the run time.

User defined
Duration is defined by the user.

Autom. determination

Duration OPEN	X.X s
Duration CLOSE	X.X s

Duration OPEN
Duration CLOSE
The duration (run time) will automatically be determined after any end position adjustment or changes in the ramp-up time. For determining the duration, the actuator must be operated into one direction for at least 3 % of the travel.

User defined

Duration OPEN	X.X s
Duration CLOSE	X.X s

Duration OPEN
Duration CLOSE
Individual durations for OPEN and CLOSE can be specified.
Possible setting for the positioning time: 5 to 3,276 s.
Default setting is 60.

8.5.4 Optional software functions

- Positioner (for the description refer to “8.5.2 Positioner” on page 81), order no.: 2SX7200-3FC00*
  Type: 2S . 7 . . . - . . . . . -4 . B .
  For HiMod, the “positioner” software function is included in the scope of delivery.

- Process controller (PI controller), order no.: 2SX7200-3FG00* or 2SX7200-3FG08 for HiMo**d.**
  Type: 75 **. . - . .** . . . . -4 . C/L . or 2SA78 . . - . . . . . -4.C/L.
  Supplementary operation instructions Y070.346

- Travel-dependent speed adjustment (speed curve)**, order no.: 2SX7200-3FD00*
  Type: 7 . . . - . . . . . -4 . D/E .
  Supplementary operation instructions Y070.345
- External analog speed setpoint**, order no.: 2SX7200-3FE00*
  Type: 2S . 7 . . . - . . . . . -4 . F/G .
  Supplementary operation instructions Y070.344
- Positioner with split range function, order no.: 2SX7200-3FH00* or 2SX7200-3FH08 for HiMod.
  Type: 7. . . - . . . . . -4 . H .
  Supplementary operation instructions Y070.343

- Travel-dependent freely settable positioning times, order no.: 2SX7200-3FJ00*
  Type: 7 . . . - . . . . . -4 . J/K.
  Supplementary operation instructions Y070.340

Order number for subsequent enabling of the software function.

** - Speed for 2SA7 rotary actuator. . . ;
- Positioning time for 2SG7, 2SQ7 part-turn actuator. . . or 2SA7. . . with part-turn gearbox

Always state the serial number of the actuator when ordering the optional software functions at a later date.

Serial number is indicated on the name plate of the electronics unit (refer to fig.) and can also be viewed via ‘Main menu’ ► ‘Observing’ ► ‘Electronic name plate’► ‘Serial number’.

If the control board was exchanged, the serial number of the new control board is not identical to the number on the name plate. When ordering the software function, always state the number displayed in the ‘Observing’ menu.

Enabling an optional software function is described in the previous chapter. If a later firmware version is required for a software function, the firmware can be requested from the Service.

The firmware update of the actuator is performed with the COM-SIPOS parameterization software.

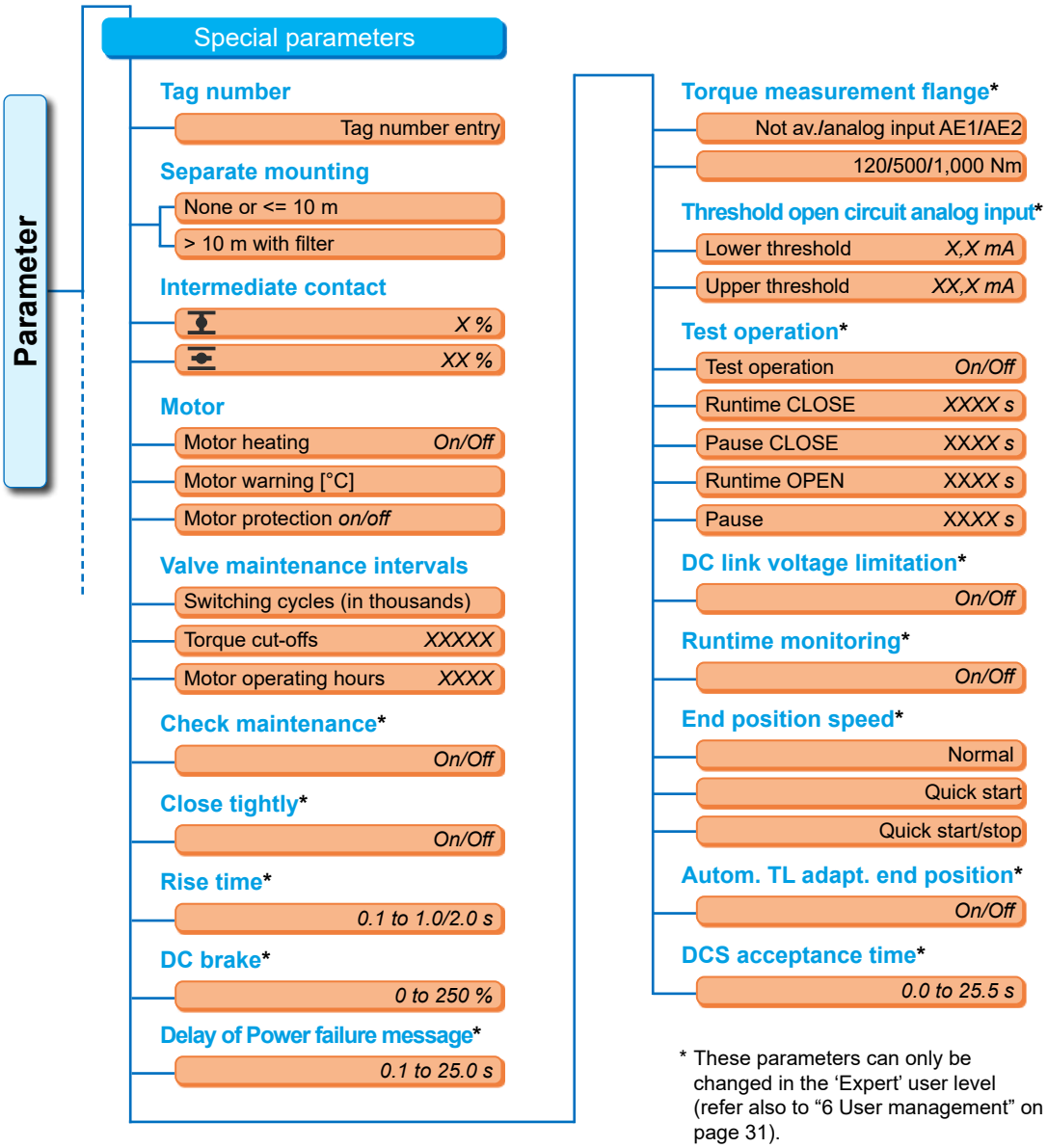
During a firmware update, the actuator parameters (customer settings and work parameters) including end position setting and operational data are not changed.

Fig.: Serial number on electronics unit

8.6 Special parameters

Special parameters enable adaptation of the actuator behavior to the automation environment. Furthermore, they allow efficient planning of valve maintenance intervals in relation to the number of starts or the operating hours.

The following illustration shows an overview of the “Special parameters” menu.



* These parameters can only be changed in the ‘Expert’ user level (refer also to “6 User management” on page 31).

Fig.: ‘Special parameters’ menu

8.6.1 Tag number

The tag number is used for plant identification. It may contain up to 20 characters.

If “Tag number” is selected in the “Special parameters” menu, the indication on the right with the current tag number is shown in the display, fig. 2, item 1.

Parameter
Special parameters
Tag number

Fig. 1: Navigation to ‘Tag number’ parameter

Tag number entry

1. Turn Drive Controller and highlight desired character with the orange selection marker (fig. 2, item 2).
2. Press Drive Controller. The desired character is copied to the entry line (fig. 2, item 1)

To correct the last entry use x button (fig. 2, item 3)

Use 123 key **to change over to digit entry** (item 4).

Blanks are entered via the space bar (item 5).

Fig. 2: Tag number entry

8.6.2 Separate mounting

If the electronics unit is mounted separately from the gearbox, this parameter is vital for fault-free operation of the actuator.

For incorrect setting, the actuator might switch off for insufficient torque.

Separate mounting
None or <= 10 m
> 10 m with filter

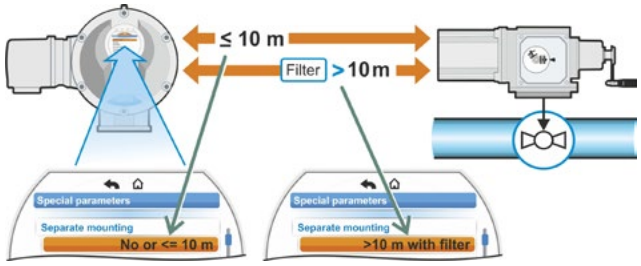


Fig.: Separate mounting

None or <= 10 m
Setting if no separate mounting or separate mounting of up to 10 m is used
> 10 m with filter
Setting for separate mounting of more than 10 m with LC filter.
In the factory, the parameter is set according to order.

8.6.3 Intermediate contacts

The “Intermediate contacts” parameter is used to define a setting range and if the actuator is within this range, a signal (active) will be sent to the DCS.

Intermediate contact
0 %
100 %

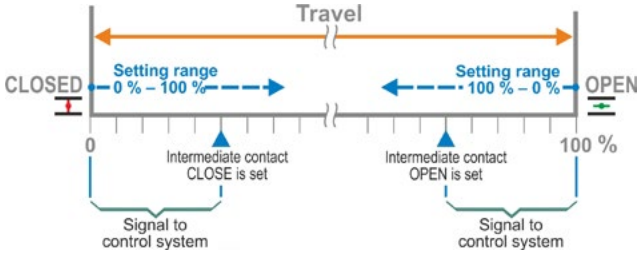


Fig.: Intermediate contact function principle

Intermediate contact CL

The signal is active from 0 % to the programmed value.

Setting range: 0 to 100 % of the travel

In the factory, 0 to 2 % are set for torque-dependent cut-off, 0 to 0 % for travel-dependent cut-off.

Intermediate contact OP

The output signal is active from the programmed value to 100 %.

Setting range: 100 to 0 % of the travel

In the factory, 98 to 100 % are set for torque-dependent cut-off, 100 to 100 % for travel-dependent cut-off.

8.6.4 Motor

Motor

- Motor heating
- Motor warning
- Motor protection

Motor heating On/Off

To prevent condensation while the motor is at standstill, the motor can be heated with DC current
when the heater is activated. The heating up depends on the difference between motor temperature and ambient temperature.

If exposed to strong climatic fluctuations, the actuator should be operated with the motor heater switched on.

In the factory, the motor heater is set according to order.

Motor warning

If the temperature set here (within a range between 0 and 155 °C) is exceeded, a warning signal will be issued. The warning signal can be provided via binary signal and fieldbus protocol. For 2SG7, this parameterization is not available.
135 °C is set in the factory.

Motor protection on/off

The motor is equipped with full electronic motor protection against thermal damage. The motor protection is activated in the factory and can be disabled.

Disabling the motor protection will void the warranty for the motor!

To prevent accidental disabling of the motor protection, the information on the right will be displayed and must be confirmed.

Fig.: Motor protection warning

8.6.5 Maintenance intervals of valve

Maintenance parameters enable effective planning of valve maintenance intervals depending on the number of starts performed or the operating hours, for example.

If one of the values programmed here is not achieved, the “Maintenance necessary” message will be issued.

Refer to chapter Observe “12.2 Valve maintenance limits” on page 107.

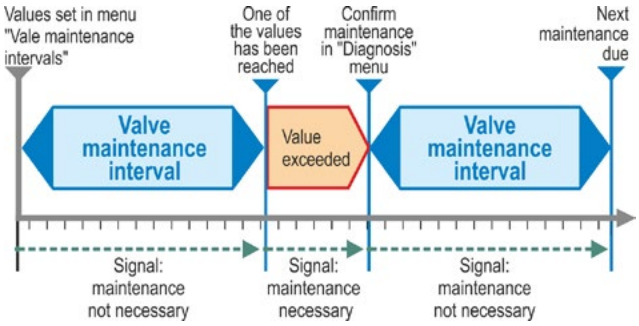


Fig.: Maintenance intervals of valve

Valve maintenance intervals

Switching cycles (in thousands)	*XXXX*
Torque Cut-offs	*XXXX*
Motor operating hours	*XXX*

Switching cycles (in thousands)

After reaching the programmed number of switching cycles, the "Maintenance necessary" signal is generated.

Possible settings:

– Actuators of duty classes A and B: 1,000 to 100,000, in steps of 1,000 each.
Factory settings: 30,000.

– Actuators of duty classes C and D: 1,000 to 30,000,000, in steps of 1,000 each.
Factory settings: 10,000,000.

Torque cut-offs

After reaching the programmed number of torque-dependent cut-offs, the “Maintenance necessary” message is generated.

Possible settings:

– Actuators of duty classes A and B: 1 to 10,000 in steps of 1 each.
Factory settings: 3,000.

– Actuators of duty classes C and D: 1 to 20,000 in steps of 1 each.
Factory settings: 10,000.

Motor operation hours

After reaching the programmed number of motor operation hours, the “Maintenance necessary” message is generated.

Possible settings: 1 h to 2,500 h in steps of 1 each.

Factory settings: 2,500 h.

8.6.6 Check maintenance

If one of the values programmed in the ‘Valve maintenance intervals’ is reached, the ‘Maintenance necessary’ message is generated, refer to previous chapter 8.6.5.

If the ‘Check maintenance’ parameter is set to off, the maintenance limits will not be checked.

Check maintenance

	On
	Off

8.6.7 Close tightly

If the ‘Close tightly’ function is active, closed-loop control within the end position ranges is not possible.

If, within a end position range, the operation command in direction of this end position is canceled or a STOP signal sent, the actuator continues its operation until either a torque-dependent cut-off occurs or a command in the opposite direction is issued.

Even for travel-dependent cut-off mode and for control via positioner or process controller, similar to torque-dependent cut-off mode, the internal operation command is extended until the end position (0 % or 100 %) is reached.

Close tightly

On

Off

Close tightly off

This setting is required, if closed-loop control is to be applied within the end position ranges.

Close tightly is activated in the factory.

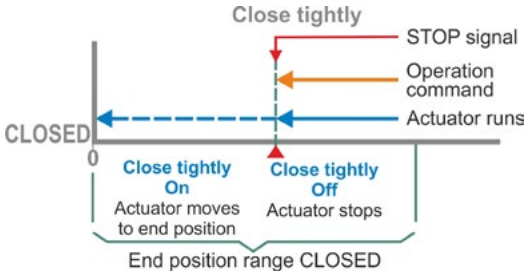


Fig.: Close tightly functional principle

8.6.8 Rise time

The ‘Rise time’ parameter accesses the integral frequency converter. The shorter the rise time the faster the actuator reaches the specified speed. The setting of the rise time influences the modulating behavior. Longer rise times lead to higher modulating accuracy, which reduces the control dynamics at the same time.

Rise time

X.X

The setting range is, in 0,1 s increments, for actuators of duty classes

– A and B: 0.1 s to 1 s.

– C and D: 0.1 s to 2 s.

Set to 0.5 s in the factory.

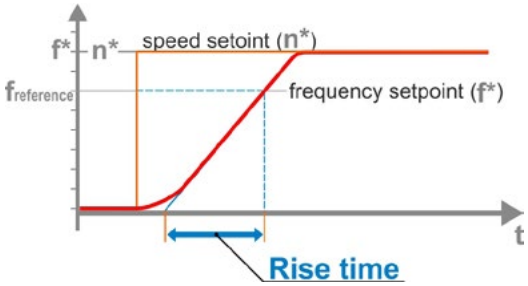


Fig.: Rise time principle

8.6.9 DC brake

A value not equal to ‘0 %’ triggers the DC brake via the integral frequency converter. The higher the value, the higher the DC braking current is set.

For a value of ‘0 %’ the speed of the motor is reduced as quickly as possible to a standstill via the frequency converter. For nearly all operation points, this is the shortest time to achieve a standstill. We therefore recommend maintaining the default settings.

DC brake

X %

The setting range is 0 to 250 % in 1 % increments.

Set to 0 % in the factory.

8.6.10 Delay of Power failure message

If the mains voltage is outside the tolerance of –30 %/ +15 % , a fault signal is set. To prevent fault signals for short-term voltage fluctuations, a delay time (duration of the power failure) can be defined after which the fault signal will be issued. Also refer to figure on the right.

Delay of Power failure message

X.X s

Delay

Possible setting for tolerance time: 0 to 25 s. Factory setting is 6 s.

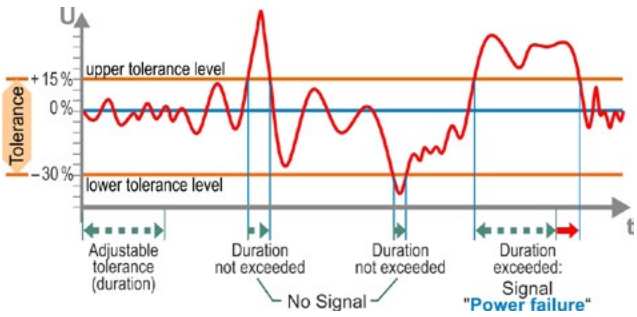


Fig.: Delay of Power failure message

8.6.11 Torque measurement flange

This menu item is used to set whether a torque measurement flange is actually available and if so, where the signal cable is actually connected. Furthermore, the size of the torque measurement flange is set: 120 Nm, 500 Nm or 1,000 Nm. Depending on the actuator type, the correct torque measurement without flange reduction has been preset.

Torque measurement flange

- *Input*
  - Not valid
  - Analog input AI1
  - Analog input AI2
- *Size*
  - 120 Nm (10.1, 2SX7100-6A..)
  - 500 Nm (14.5, 2SX7100-6B..)
  - 1,000 Nm (16.1, 2SX7100-6C..)

The current value can be displayed via the Observe > Status menu. Possibly required zero adjustments can also be performed via this menu , refer to “11.4 Torque zero adjustment” on page 105.

8.6.12 Thresholds for detection of wire break at analog outputs

According to NAMUR specification on the harmonization of signal levels for the 4 – 20 mA interface,

- the lower threshold is 3.6 mA,
- the upper threshold for the failure detection is 21 mA.

For analog inputs with this programming, 4– 20 mA signals outside these limits are detected as failures (wire break).

Changing the lower and/or upper limit is only reasonable for control systems whose signals might not lie within the NAMUR specification.

Threshold open circuit analog input

- Lower threshold
- Upper threshold

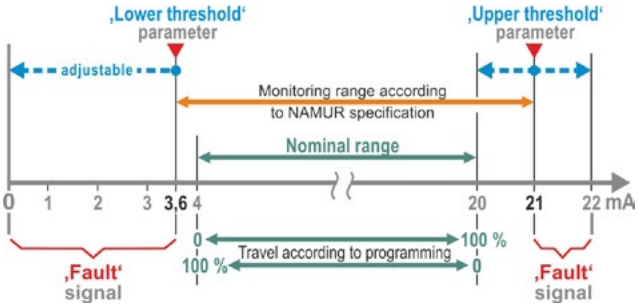


Fig.: Threshold open circuit analog input

Lower threshold

Possible setting from 0.0 to 3.6 mA.

Upper threshold

Possible setting from 20.0 to 22.0 mA.

3.6 mA have been set for the lower threshold and 21 mA or the upper threshold in the factory. This parameter is not applicable for “Split range function”.

8.6.13 Test operation

With this function, the actuator is switched to a continuous duty in REMOTE mode, by continuously repeating a cycle with the following steps:

Operation into CLOSE direction – pause– operation into OPEN direction – pause – operation into CLOSE direction etc. The duration of each step can be individually set from 0 to 6,553 s.

The number of cycles can be completed can be read via the ‘Diagnosis’ - ‘Operation data actuator’ - ‘switching cycles’. In this case, a switching cycle corresponds to a cycle.

Prerequisites: The actuator must be ready for operation, i.e. end position, speed, cut-off mode and tripping torques are set.

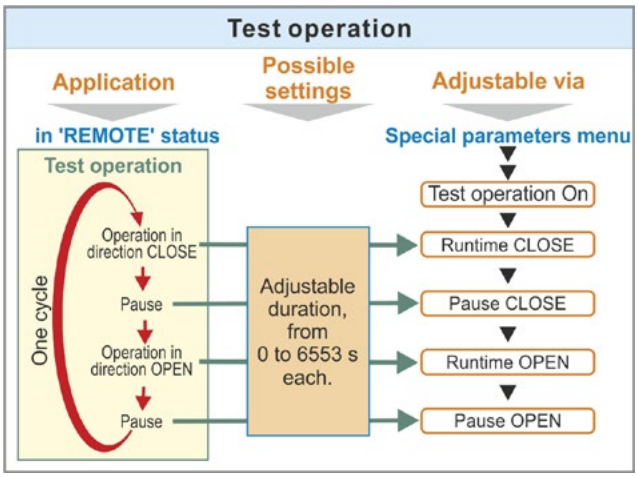


Fig.: Test operation principle

Test operation

Test operation	*Off/On*
Runtime CLOSE	*XXXX s*
Pause CLOSE	*XXXX s*
Runtime OPEN	*XXXX s*
Pause OPEN	*XXXX s*

Hints for operation

1. Set duration of each pause and for operation into OPEN and CLOSE directions individually (from 0 to 6,553 s), refer also to “Changing parameter values/ characteristics” on page 24.
2. Switch on test operation, select ‘On’ in the ‘Test operation’ menu and switch actuator to REMOTE mode. Changing over to LOCAL mode will stop the test operation.

If test operation is switched on and off again, the cycle will be continued from the step the test was STOPed.

Operation in the LOCAL mode via Drive Controller is not detected by the cycle. If the actuator has ready reached the end position when changing over to REMOTE mode, the remaining run time and the following pause first have to expire before the actuator starts to move again.

Should the actuator reach the end position before the set operation time has elapsed, it will switch off.

8.6.14 DC link voltage limitation

Some torque peaks exceeding the voltage tolerance (+15 %), can cause charging of the DC link during standstill.

This is avoided if the parameter (DC link voltage limitation = on) is active.

Deactivating this function is only useful for very specific plant conditions and should only be performed after consulting SIPOS!

DC link voltage limitation

	On
	Off

8.6.15 Runtime monitoring

As standard, SEVEN actuators are equipped with runtime monitoring. When running the actuator for the first time over a distance of at least 3 % of the entire travel after setting the end positions, the runtime is measured and stored in a non-volatile memory. The actual motor frequency or speed is taken into account during the measurements.

During future operation, it will be checked whether the position reached after the runtime is plausible. Tolerances due to different loads and measurement inaccuracies during position measurement are taken into account. If the expected position is not reached in time, the actuator changes over to the “fault” state and signals ‘runtime error’.

This internal monitoring can be deactivated, i.e. exceeding the runtime will not cause a fault signal. This can prove useful for special applications.

Runtime monitoring

On
Off

Runtime monitoring On
Runtime check.
Runtime monitoring Off
No runtime check.
Runtime monitoring is activated on delivery.

8.6.16 End position speed

Within the end position ranges, the actuator operates at an end position speed defined for each device to change to the defined speed when leaving the end positions.

For extremely long total runtimes, it may be desired that the actuator changes as quickly as possible, even before leaving the end position range to the adjusted, typically high speed. It may, however, also be required that the actuator operates as long as possible at the defined speed when approaching the end position to be able to quickly stop in the end position.

Refer also to “End position range parameter” on page 65 and “Program speeds/positioning times” on page 41.

End position speed

Normal
Quick start
Quick start/stop

Normal

For **travel and torque-dependent** cut-off mode, the actuator runs

- from the end position at the lowest speed, approx .1 sec. (fig. 1: curve **a**), to change to the end position speed, refer to **b**;
- Between the end position ranges with the set speed. This speed is usually higher than the end position speed (curve **c**). It can also be set lower, refer to curve **d**.
- To the end position with the “normal” end position speed (**e**).

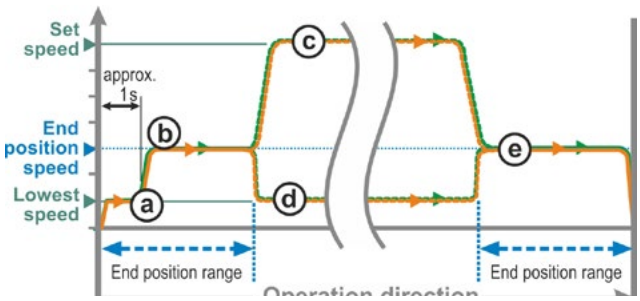


Fig. 1: End position speed ‘Normal’

Quick start

Leaving the end position:

- For **travel-dependent** cut-off, it will be immediately changed to the set speed to keep the runtime as short as possible. Refer to fig. 2, curve **a**.
- For **torque-dependent** cut-off, the end position is left at the lowest possible speed for approx. 1 sec. prior to changing to the set speed; refer to curve **b**.

The speed can however be lower than the end position speed, refer to curve **c**.

Approaching the end position:

Shortly before reaching the end position range (independent of the cut-off mode), the speed will be reduced to the end position speed as for the “Normal” setting.

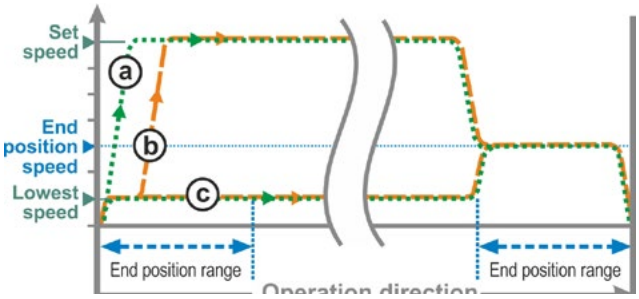


Fig. 2: End position speed ‘Quick start’

Quick start/stop

Leaving the end position is identical to ’Quick start‘ setting.

Approaching the end position:

- For **travel-dependent** cut-off mode, the speed will be reduced shortly before reaching the end position so that the actuator comes to a standstill; refer to fig. 3, curve a.
- For **torque-dependent** cut-off, the speed will still be changed to the end position speed before actually reaching the end position range to avoid excessive torque and potential damage to the valve, refer to curve b.

End position speed “Normal” is set in the factory.

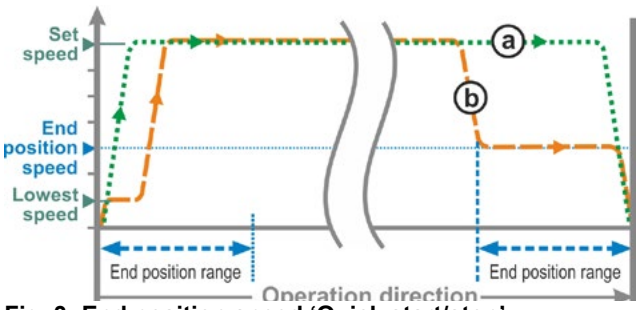


Fig. 3: End position speed ‘Quick start/stop’

8.6.17 Autom. TL adapt. end position

Due to longer operation, the travel between end positions OPEN and CLOSE (0 to 100 %) for torque dependent cut-off mode can change due to temperature, wear and deposits. If the actuator is in torque dependent cut-off mode and should the change of the end position deviate by more than ±0.7 % from the currently set end position, the actuator will detect this deviation and reset the new position as end position.

If the ‘Autom. TL adapt. end position’ parameter is switched to ‘Off’, the autom. standardization (adaption) is suspended and the end position set during commissioning remain unchanged. In case of torque dependent tripping of the actuator during operation within the end position range, ‘End position reached’ will be displayed. Should the actuator trip outside the end position range, the actuator signals ‘Blocked in move’.

Autom. TL adapt. end position

On

Off

8.6.18 DCS acceptance time

General information

Should the DCS signal drop, the actuator can nevertheless continue its operation e.g. if the functions ‘Close tightly’ or ‘Control mode REMOTE’ are programmed to ‘Proportional move’.

Should the end position be reached due to continued operation, or the actuator trip torque dependently within the end position range, the DCS receives the signal (‘End position...’ or ‘Torque.. reached.’)

Should this signal occur once the acceptance time has expired, the DCS might consider this signal as failure.

This is prevented by means of the ‘DCS acceptance time’ function.

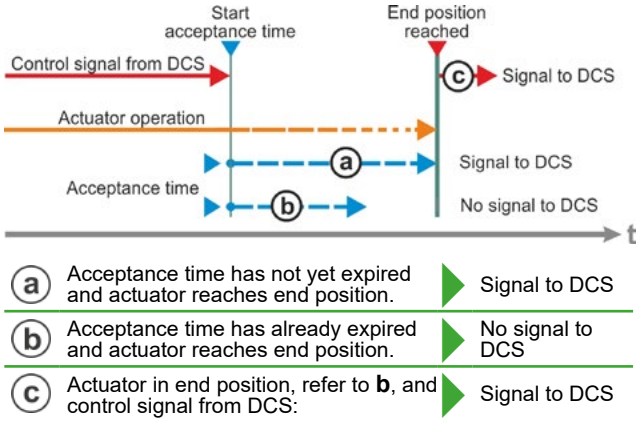


Fig.: DCS acceptance time

Function

a The interval during which the DCS will accept the ‘End position reached’ signal without failure interpretation after the control signal is no longer present can be adjusted via this parameter.

b Once the set interval (acceptance time) has expired, no signal is sent to the DCS (refer to b in fig.)

c The signal will only be issued for the next operation command into the same direction (refer to c in fig.)

DCS acceptance time

0.0 to 25.5

DCS acceptance time

Possible settings: 0 to 25.5 s.
Setting 0.0 s – 25.4 = No signal at DCS if the end position is reached once the acceptance time has expired.
The signal will only be issued for the next operation command into the same direction.
Setting 25.5 s = Signal is always sent.

Factory setting is 25.5 s.

8.7 Reset to factory setting

With this function, the following settings/parameters are reset to the default values:

- All parameter values which can be set via the ‘Parameter’ menu
- End position setting.
- All parameter values which had already been changed in the factory due to an additional feature.
- Settings which had already been changed via the ‘System settings’ menu
  Exception: Real time clock

The ‘Current user’ settings made via the ‘User management’ menu as well as assigned passwords will not be reset.
Refer also to “Save log data on USB flash drive” on page 110, enabling to undo any parameter changes.

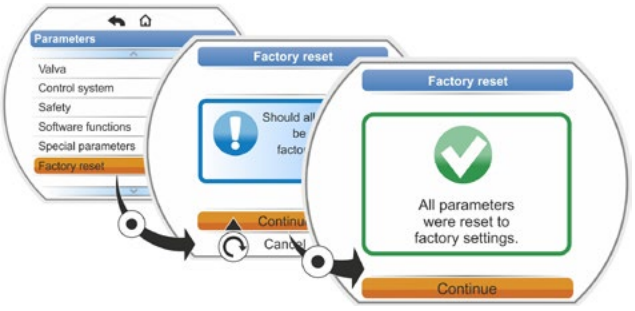


Fig.: Factory reset

9 System settings

The ‘System setting’ menu enables setting the

- Display:
  - Display orientation; rotation of the display depending on the actuator mounting position.
  - Standby screen: selection of information shown in standby mode on the display.
- Operation:
  Switching on and off the latching function during local operation.
- Real time clock:
  Setting date and time.
- Connectivity:
  Activation and deactivation from Bluetooth and USB.
- Remote control unit:
  Only for available Modbus hardware.

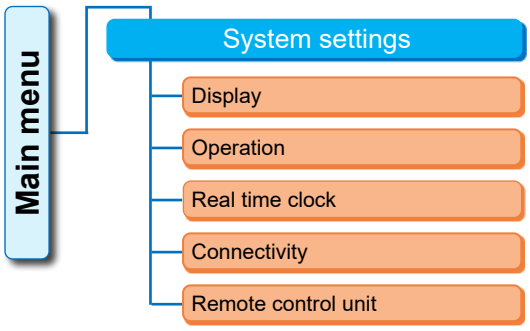


Fig.: System settings menu

9.1 Display

9.1.1 Display orientation

Depending on the mounting position, shifting the display indication by 90° ccw or cw or by 180° for improved legibility is possible. Default setting is 0 degree.

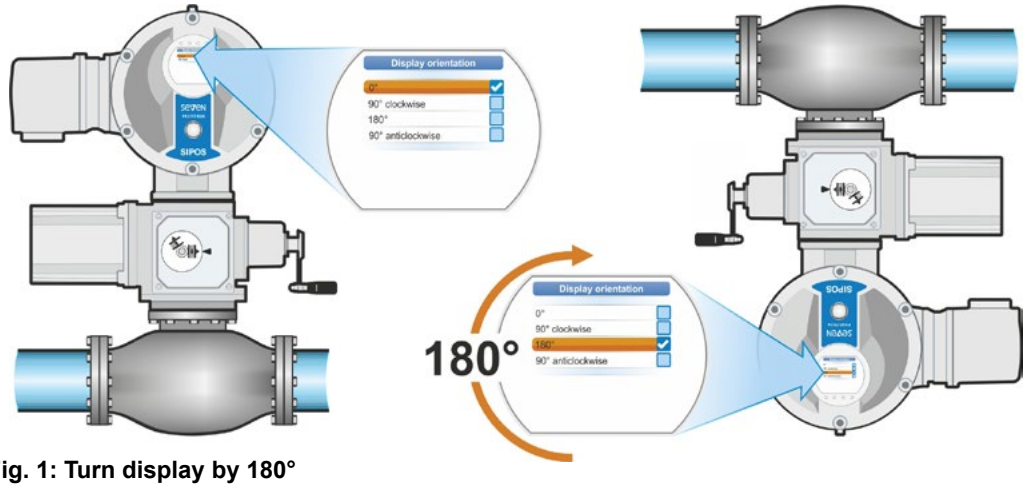


Fig. 1: Turn display by 180°

Operation sequence

1. Select 'System settings’ in the main menu (fig. 2, item 1) and confirm (fig. 2, item 2). ‘The ‘System settings’ menu appears.
2. Set selection marker to ‘Display‘ (3) and confirm (4).
   The currently set number of degrees by which the display is shifted is shown in the ‘Display’ menu.
3. Set selection marker to number of degrees (5) and confirm (6).
   The display changes to ‘Display orientation’.
   The current setting is ticked ☑.
4. Set selection marker to desired setting (7) and confirm (8).
   The indication in the display is adapted accordingly.

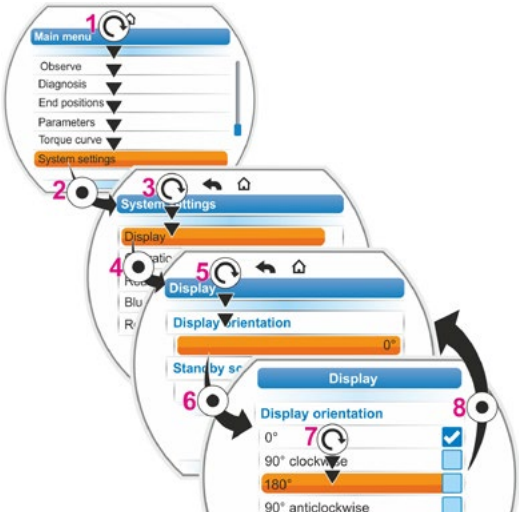


Fig. 2: Change display orientation

9.1.2 Standby screen

This function is used to the select the information shown on the display in standby mode.

If the Drive Controller is not operated during the set interval, the display changes to the standby mode;

– The display illumination is dimmed;
– The display changes to the standby screen and
– The user is signed off.

If a USB flash drive is connected, the display will not change to the standby mode.

The follow representations can be selected as standby screen:

- 'Standard' (fig. 1):
  The status indication is shown.
- 'Position' (fig. 2):
  – Position in percent OPEN (a).
  – If the actuator is in end position OPEN or CLOSED, the respective symbol is shown (b).
- 'Position+filling' (fig. 3):
  – Position in percent
  – Opening percentage, visually indicated as filling level.
- 'Position+Bar+Status' (fig. 4):
  – Position in percent (item 1)
  – Position bar, visually indicates the opening percentage (item 2).
  – Status of the actuator (item 3)
  – If a torque measurement flange is available, the torque applied is indicated (item 4).
- 'Fast to local': Refer to the following chapter.

Fig. 1: 'Standard' standby screen

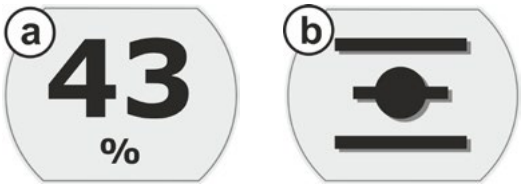


**Fig. 2: 'Position' standby screen:
a: Position 43 % OPEN,
b: End position OPEN**

Fig. 3: 'Position+Filling' standby screen

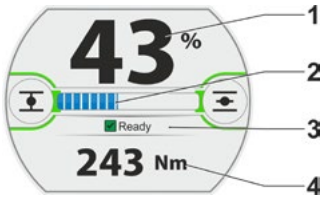


Fig. 4: 'Position+Filling+Status' standby screen

Operation sequence

1. Perform steps item 1 to item 4, as described in the previous chapter, 'Display orientation'.
2. Set selection marker for 'Standby screen' to 'Standard' (fig. 5, item 5) and confirm (item 6).
   The display changes to 'Standby screen' menu.
   The current setting is ticked ☑.
3. Set selection marker to desired setting (7) and confirm (8).
   As soon as the display changes to the initial state, the newly selected standby screen is shown in the display.

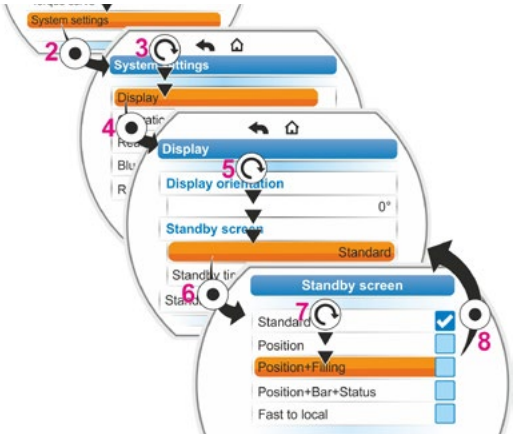


Fig. 5: Select standby screen

9.1.3 Operation – latching function

If the Drive Controller is held down for more than 3 seconds during local operation, 'Latching function active' is displayed and the actuator will continue its operation once the controller is released.

If the actuator should not continue its operation once the Drive Controller is released, deactivate the latching function, refer to fig.

Refer also to pages 27, 50, 57.

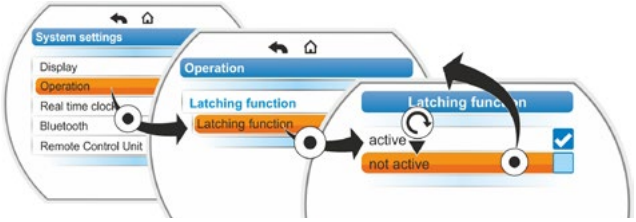


Fig.: Deactivate latching function

9.1.4 Fast to local

This setting is reasonable under critical conditions where immediate operation is required directly at the actuator, irrespective of control and user level.

If the Drive Controller is held down in standby mode during “Fast to local”, the actuator switches to

- Local operation: The operation direction can be immediately selected and the actuator be operated, even if ‘Observer’ user level is set;
- Control from ‘REMOTE’ to ‘LOCAL’,
- The user level to the highest access level with password ‘0000’, if password ‘0000’ has been assigned to the lower user levels. Refer to hints in chapter “6.4 Enable user level” on page 33.

For set “Fast to local” function, the display shows the same standby screen as for ‘Position+Bar+Status’ selection, refer to above.

9.1.5 Set standby time

The standby time defines the interval, after how many minutes after the last operation of the Drive Controller the display will change to standby mode.

Default setting is 10 minutes.

9.1.6 Activate Standby

Via this menu item, the display is directly switched to the standby mode;

- The brightness of the display is dimmed;
- The selected standby screen appears and
- The user level is reset according to the settings, refer to chapter “6 User management” on page 31.

9.2 Adjust real time clock

On delivery, date and time match the time zone of the manufacturer.

Operation sequence

1. Select 'System settings’ in the main menu (fig. item **1**) and confirm (item **2**).
   ‘The ‘System settings’ menu appears.
2. Set selection marker to ‘Real time clock’ (**3**) and confirm (**4**).
   The ‘Real time clock’ menu appears and both date and set time is displayed.
3. Set selection marker to date or time (**5**) and confirm (**6**).
   The display changes to the setting menu, in our example, of the date. The current setting is displayed.
4. Set selection marker to the number to be changed (**7**) (the frame around the number changes from blue to orange) and confirm (**8**).
5. Change number (turn Drive Controller) (**9**) and confirm (press Drive Controller) (**10**).
   The orange selection marker changes to ‘Save’.
6. Confirm ‘Save’ (**11**).
   Display changes to ‘Real time clock’ menu and the changed value is displayed.

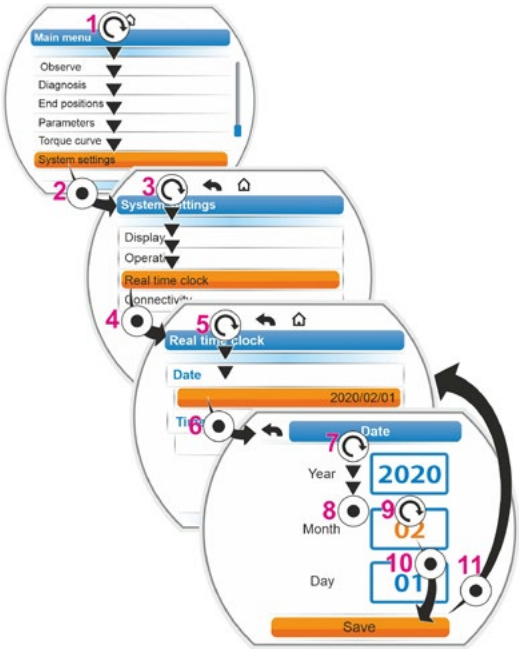


Fig.: Adjust real time clock

9.3 Activate, deactivate Bluetooth

Actuators are equipped with Bluetooth. Each Bluetooth device (slave) has an unambiguous Bluetooth address for identification. To facilitate selection, each Bluetooth device has a device name, consisting of the plant ID (if available) and the 9-position serial number of the actuator as a standard.

The actuator signals Bluetooth communication via the flashing Bluetooth symbol (fig. item 1) in the display.

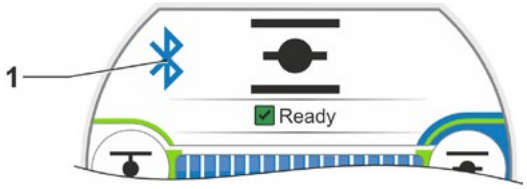


Fig.: Indication in the display: Communication via Bluetooth

As standard, Bluetooth is active, but can also be deactivated. The operation sequence below shows Bluetooth deactivation.

Operation sequence

Select ‘System settings’ in the main menu (fig. item **1**) and confirm (item **2**).
The ‘System settings’ menu appears.

1. Set selection marker to ‘Connectivity’ (**3**) and confirm (**4**).
   Set selection marker to ‘Bluetooth’ (**5**) and confirm (**6**)
   The ‘Bluetooth’ menu appears in the current state, in our example ‘Bluetooth Active’
2. Set selection marker to ‘Active’ (**7**) and confirm (**8**).
   The display changes to ‘Bluetooth active’ setting menu.
   The current setting is ticked ☑.
3. Set selection marker to desired setting (**9**) and confirm (**10**).
   The indication in the display changes to the ‘Bluetooth’ menu.

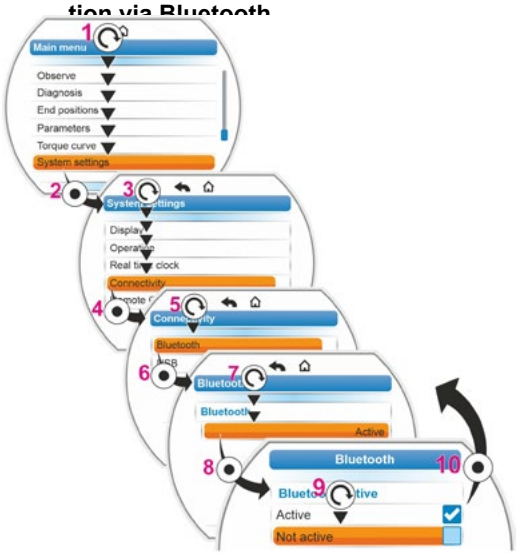


Fig.: Activate/deactivate Bluetooth

9.4 Activate, deactivate USB

Actuators are equipped with USB-Interface (see 13.3).

The actuator signals USB communication via the flashing USB symbol (fig. item 1) in the display.

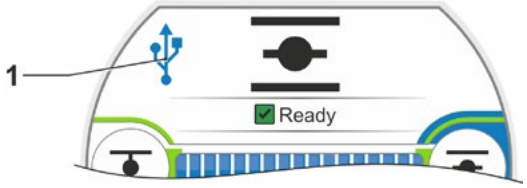


Fig.: Indication in the display: Communication via USB

As standard, USB is active, but can also be deactivated. The operation sequence below shows USB deactivation.

Operation sequence

Select ‘System settings’ in the main menu (fig. item **1**) and confirm (item **2**).
The ‘System settings’ menu appears.

1. Set selection marker to ‘Connectivity’ (**3**) and confirm (**4**).
   Set selection marker to ‘USB’ (**5**) and confirm (**6**)
   The ‘Bluetooth’ menu appears in the current state, in our example ‘USB Active’
2. Set selection marker to ‘Active’ (**7**) and confirm (**8**).
   The display changes to ‘USB active’ setting menu.
   The current setting is ticked ☑.
3. Set selection marker to desired setting (**9**) and confirm (**10**).
   The indication in the display changes to the ‘USB’ menu.

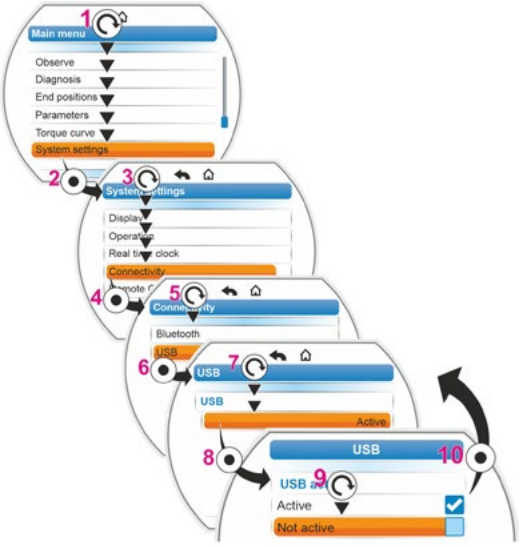


Fig.: Activate/deactivate USB

9 System settings

9.5 Remote control unit

The remote control unit provides the option to operate an actuator from a distance of up to 100 m and thus has the function of a second local control unit. The representation on the display and the LED indication of the actuator is “projected” to the remote control unit. This ensures 1:1 operation of the actuator from the remote control unit.

The actuator must be prepared for using a remote control unit. Data exchange between actuator and remote control unit is made via a RS485 connection with just one 2/4-wire fieldbus cable. Refer to the terminal plan for proper wiring.

When connecting the remote control unit, the two termination resistors must be set to ON!

Operation sequence: Activate remote control unit

Activate the ‘Remote control unit’ function both at the actuator and the remote control unit. Except for step 3 of the operation sequence, the operation sequence is identical for both cases. The following operation sequence applies to the actuator.

1. Select ‘System settings’ in the main menu (fig. 3, item 1) and confirm (item 2).
   ‘The ‘System settings’ menu appears.
2. Set selection marker to ‘Remote control unit’ (3) and confirm (4).
   The ‘Remote control unit’ menu appears.
3. Select ‘Actuator’ parameter for ‘mode’ (5).
   Select ‘Remote control unit’ for parameterization of the remote control unit.
4. Select the transmission rate for ‘Baud rate’.

   Should the connection quality not be sufficient (see bottom part of the display), reduce baud rate.
5. Set the remote control unit in ‘Active’ selection to ‘Yes’.
6. Also execute operation steps 1 to 5 at remote control unit.

- The connection is visualized by means of the connection symbol in the status bar:
  - Symbol is illuminated: Connection available,
  - Symbol is flashing: No connection
  - No symbol: Connection ‘Not active’
- Prior to a possible firmware update at the remote control unit, set the remote control unit in ‘Active’ selection to ‘No’.

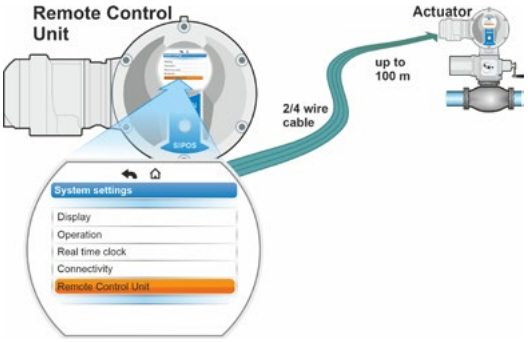


Fig. 1: Remote control principle

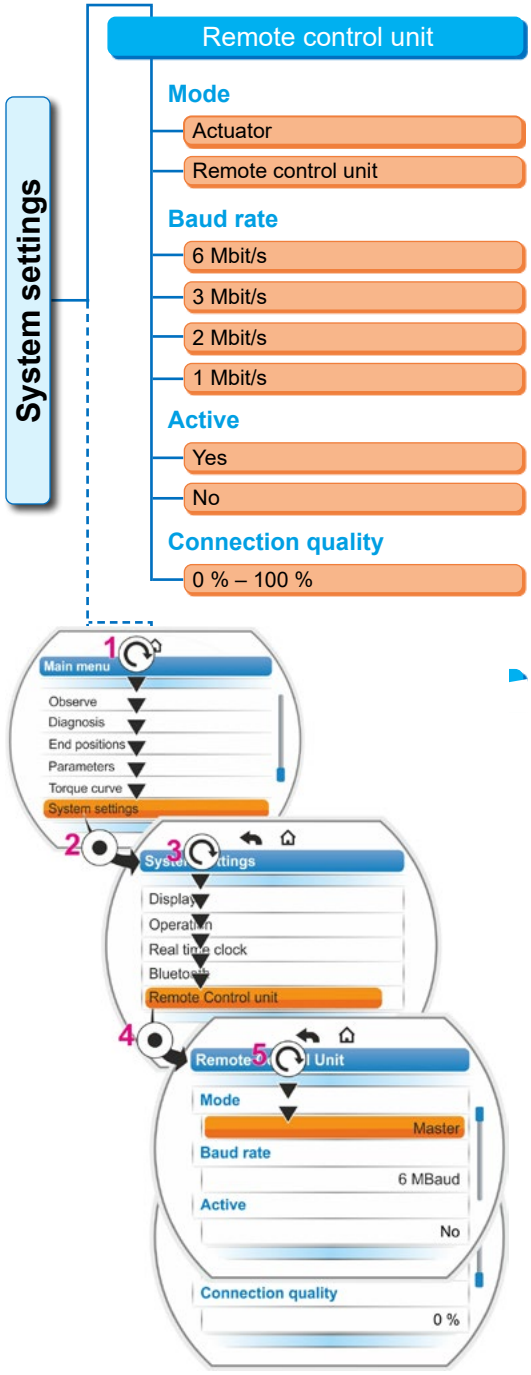


Fig. 3: Activate remote control unit

10 Torque curve

This chapter does not apply to 2SG7 and 2SQ7.

Preventive valve monitoring is possible by comparing up to three torque curves recorded at different times which the actuator is in operation.

- Prerequisite for the recording of the torque curves is a valid end position setting.
- Realistic comparison of the recorded torque curves is only possible for identical actuator settings during recording.

10.1 General information

The recording of the torque curves can be performed:

- Directly at the actuator via
  - display using the Drive Controller. This method is described in the following,
  - The COM-SIPOS PC parameterization software (actuator must be in LOCAL mode);
- From the DCS via PROFIBUS DP-V1 (actuator must be in REMOTE mode, ‘Ready’).

The travel is scanned in 1 % steps. Each curve can be overwritten.

There are different methods to determine the torques recorded in a torque curve.

- Calculation using the DC link converter current

  The torque values may differ from the actual torque, especially in the end positions and for speed variations during operation.
  This version is automatically used if no torque measurement flange is programmed.

Or

- Measurement wit torque measurement flange

  Prerequisite is that a torque measurement flange is available and the ‘Torque measurement flange’ parameter is set to analog input AI1/AI2.
  If this parameter is set, the value of the torque measurement flange is automatically used for the torque curve.

For actuators with linear thrust units and part-turn gearboxes, the displayed curve is proportional to the actual force curve of the linear actuator or the torque curve of the part-turn actuator (the torque at the actuator output/additional gear input is displayed)

- When recording the torque curves, the actuator operates the valve at least twice across the complete travel.
- The procedure can be aborted at any time: Press Drive Controller.
- Faults during recording (blockage of the travel, cancellation by the operator, failure of the power supply etc.) are shown in the display. Acknowledge signal.
  The actuator changes to the ‘Record torque curve’ initial state. The aborted recording or curve is not saved.

The recorded torque curves can be viewed via the COM-SIPOS parameterization program or PROFIBUS DP (e.g. SIMATIC PDM, DTM).

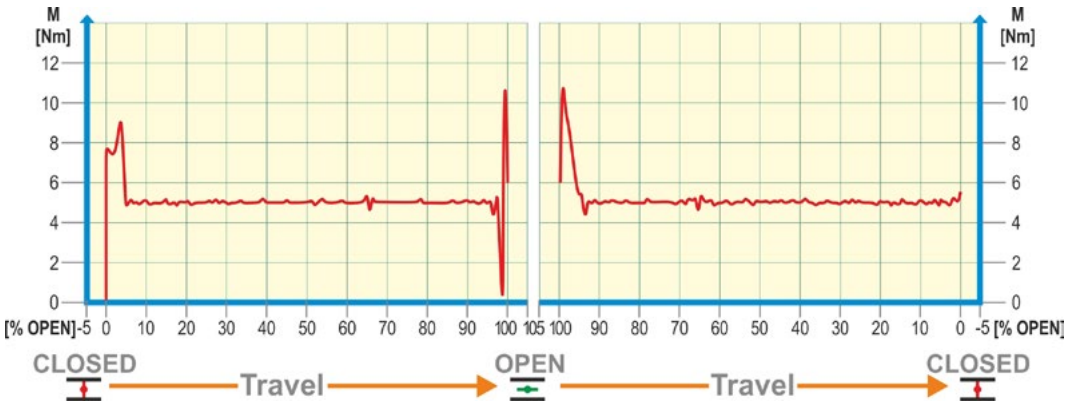


Fig.: Example of a valve torque curve

10.2 Record torque curve

Operation sequence

1. Select 'Torque curve' in the main menu (fig. item **1**) and confirm (item **2**).
   The 'Torque curve' menu appears.
2. Set selection marker to 'Torque curve' (**3**) and confirm (**4**).
   'Record torque curve' appears and you can choose between three curves.
3. Set selection marker to curve 1, 2 or 3.
   In our example 'curve 1' (**5**) and confirm (**6**).
   The display changes to the 'Record torque curve' screen and the actuator starts the recording.

   The display shows
   - the current position in percent and on the progress bar,
   - The torque applied.

   The actuator runs into both directions over the complete travel.
   The recording can be aborted. Confirm 'Abort'.
   The torque curve is saved and the successful saving is confirmed in the display.
4. Confirm 'Continue' (**7**). The display changes to the selection of the torque curves.

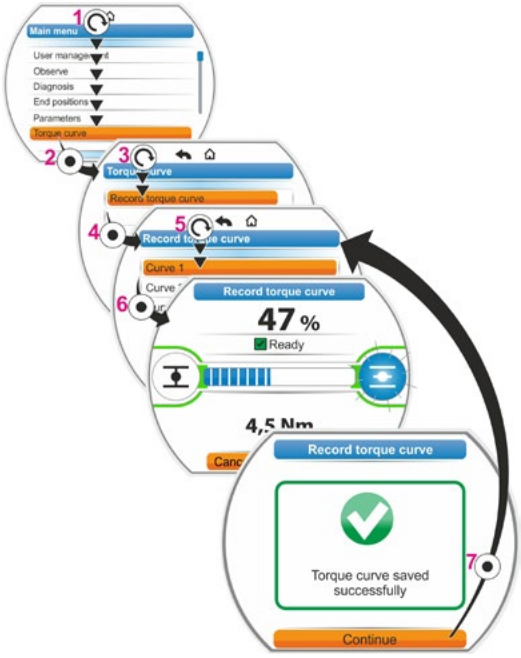


Fig.: Record torque curve

10.3 Save torque curve on USB flash drive

Operation sequence

1. Connect USB flash drive:
   - Unscrew cover of USB port on the left below the electronics unit (fig.1, item 1).
   - Connect USB flash drive (item 2).
     The 'USB flash drive' selection menu appears.

2. Select 'Save torque curves' (fig. 2) and confirm.
   'Select folder' menu opens. If the USB flash drive comprises several folders, they will be displayed for selection.

3. Select folder and confirm.
   The data is saved and a message confirms successful saving.

The torque curve may be viewed using COM-SIPOS.

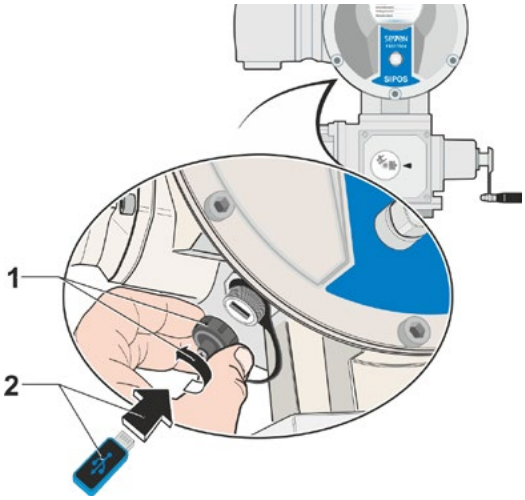


Fig. 1: Connect USB flash drive

Fig. 2: USB flash drive menu

11 Observing

11 Observe

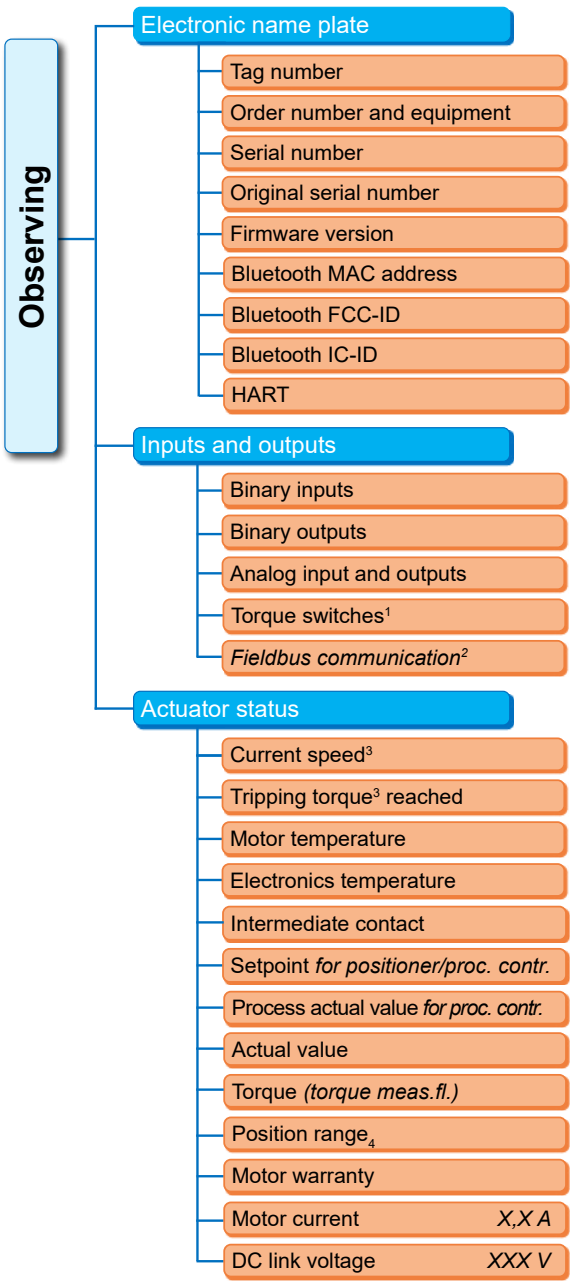
Use the ‘Observe’ menu to display information on the actuator:

- Electronic name plate
- Inputs and outputs
- Actuator status

The illustration on the right shows the structure of the ‘Observe’ menu.

Parameters cannot be change in the ‘Observe’ menu.

Navigation through the menu ‘Observe’ is identical to the other menus, refer also to “4.4 Navigation through the menus” on page 23.



[1] 2SQ7 only.

[2] Different indication depending on the fieldbus:
- PROFIBUS
- Modbus
- HART

[3] Depending on the additional gear the following is displayed:
- Speed for rotary gearbox
- Positioning time for part-turn gearbox
- Positioning speed for linear thrust unit
- Tripping torque for rotary and part-turn gearboxes
- Tripping force for linear thrust unit.

[4] Actuator with niP only.

Fig.: Observe menu

11.1 Electronic name plate

11.1.1 Tag number

The tag number is displayed here.

The tag number is entered in the ‘Special parameters’ menu, refer to “8.6.1 Tag number” on page 85.

11.1.2 Order number and equipment

If “Equipment” is selected in the “Order number and equipment” menu, a list with all characteristics of the actuator appears.
The overview is generated by decoding the order number.

11.1.3 Serial number

The 13-digit number of the current electronics unit is displayed. If the electronics unit is replaced, the serial number of the ‘former’ electronics unit can be found under the ’Original serial number’ menu item.

11.1.4 Original serial number

Here, the number of the originally supplied electronics unit is displayed (only relevant when exchanging the electronics unit). When delivering an actuator, serial number and original serial number are identical. If the electronics unit is replaced once again, the first number remains identical.

11.1.5 Firmware version

Version number and issue number is displayed, see illustration on the right.

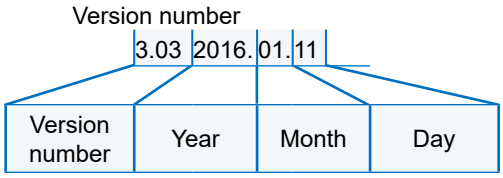


Fig.: Example of firmware version number

11.2 Inputs and outputs (observe)

11.2.1 Binary inputs

Display of the voltage level applied (low oder high):

- Binary input CLOSE,
- Binary input OPEN,
- Binary input STOP,
- Binary input EMERGENCY and
- Binary input MODE

Refer also to chapter “8.3.6 Control system – Binary input” on page 71 and chapter “8.4.1 EMERGENCY input” on page 78.

Binary outputs

The voltage level issued via signaling outputs 1 – 8 (low or high) is indicated here.
Refer also to “8.3.10 Control system – Binary outputs” on page 73.

11.2.2 Analog input and outputs

The currently measured currents at analog inputs AI1 and AI2 as well as the currents supplied at analog outputs AO1 and AO2 can be viewed here.

Analog input AI2 and analog output AO2 are only displayed if the HART module or the additional analog sub-assembly are available.

Refer also to “8.3.11 Control system – Analog output AO1” on page 75 and “8.3.12 Control system – Analog output AO2” on page 75.

11.2.3 Torque switch (2SQ7 only)

Here, it will be indicated whether the torque switches in CLOSE direction and OPEN direction are active.

11.2.4 Fieldbus communication

PROFIBUS DP

Displayed for available PROFIBUS interface:

- Active channel
  - Channel 1 active
  - Channel 2 active
  - No channel active
- Baud rate:
  - No data exchange
  - 9.6 kbit/s – 1.5 mbit/s; e.g. Baud 187.5 kbit/s
- Status:
  - Wait Prm (no fieldbus parameterization)
  - Wait Cfg (no fieldbus configuration)
  - Data Exchange (cyclic data exchange)

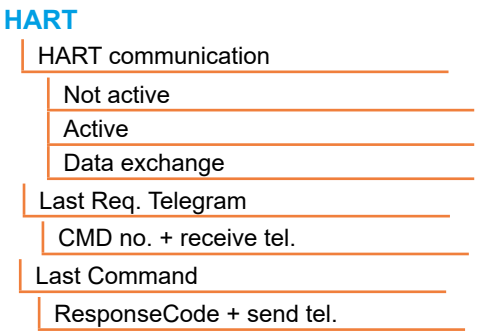
Modbus

Displayed for available MODBUS interface:

- Active channel
  - No channel active
- Channel 1
  - No communication
  - Baud rate
  - Data Exchange
- Channel 2
  - No communication
  - Baud rate
  - Data Exchange

HART

Displayed for available HART interface.



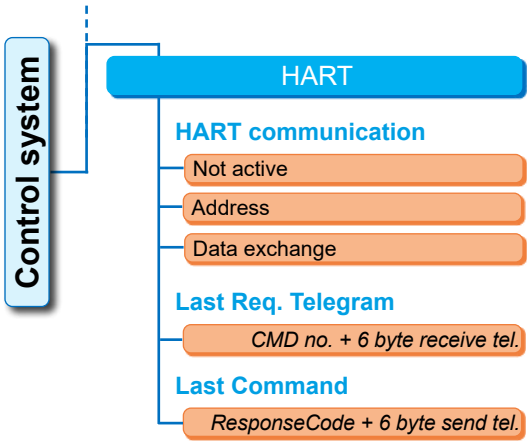


Fig.: 'HART' menu

- HART communication
  - Not active: Communication via HART is not active.
  - Active: Communication via HART is active.
  - Data exchange: Cyclic data exchange with the actuator.
- Last Req. Telegram
  CMD no. + 6 bytes of the last receive telegram are displayed.
- Last Command
  ResponseCode 6 bytes of the last sent telegram are displayed here.

11.3 Actuator status

In this menu, the current operating data of the actuator is displayed:

- Current speed [rpm] for rotary actuator;
  current positioning speed [mm/min] for linear actuator;
  current positioning time [90°/s] for part-turn actuator
- Tripping torque reached for rotary actuator/part-turn actuator;
  Tripping force reached for linear actuator
  - CLOSE (yes/no)
  - OPEN (yes/no)
- Motor temperature [°C]
- Electronics temperature [°C]
- Intermediate contact
  - CLOSE (active/not active)
  - OPEN (active/not active)
- Setpoint for positioner/proc. contr.
  - Position [%]
  - DCS (only for non linear valve curve) [%]
- Process actual value (for process controller) [%]

- Actual value
  - Position [%]
  - DCS (only for non linear valve curve) [%]
- Torque (with torque measurement flange only).
  For a detailed description refer to ‘Torque zero adjustment’.
  - Actuator [Nm]
  - Additional gear [Nm] (only if additional gear has been parameterized.)
  - Offset [Nm]

  Zero adjustment

  Reset zero adjust*

  *User level ‘Supervisor’ or higher required.
- Travel (non-intrusive version only)
  - Rev./stroke for rotary actuator
  - STROKE [mm] for linear actuator
  - Angle [°] for part-turn actuator
- Motor warranty
  - Valid
  - Not valid
- Motor current [A]
- DC link voltage [V]

11.4 Torque zero adjustment

This chapter only applies for mounted and parameterized torque measurement flange.

Depending on the mounting position of the actuator and the valve as well as on the ambient temperature, torque can already be present under no load conditions. This torque would distort the indication of the actual torque displayed under load conditions. Zero adjustment is required for correction.

Operation sequence

1. Move actuator to no load condition.

2. Select ‘Torque’ parameter in the ‘Observe’ ‘status’ menu.
   The ‘Actuator’ line (fig. item 1) indicated the torque of the actuator under no load conditions.

3. Select ‘Zero adjust’ (fig. item 5) and confirm.
   The rotating symbol (item 2) indicates that zero adjustment is in progress.
   ‘0’ will be displayed in the ‘Actuator’ line and the corrected value in the ‘Offset’ line (item 4) .

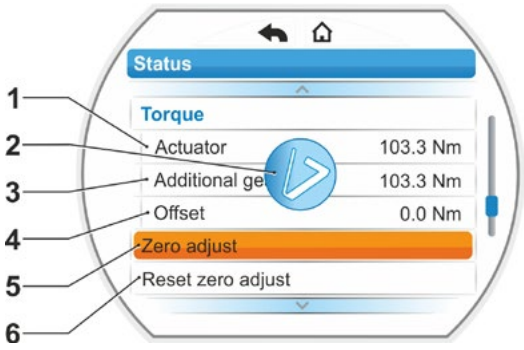


Fig.: Zero adjust menu

Item 3 will only be displayed if an additional gear has been parameterized.

Use the ‘Reset zero adjust’ (item 6) to reset the value for zero adjust to the factory setting (12 mA from torque measurement flange = 0 Nm).

12 Diagnosis

12 Diagnosis (operating data and maintenance limits)

Operational data is collected and stored in the RAM. For backup purposes, the data is written to the internal EEPROM. The values for maintenance limits are stored for any modification. Therefore operational data and the values for the maintenance limits are safe, even in case of power failure.

Operating data and maintenance limits can be read via the ‘Diagnosis’ menu. The indicated values cannot be changed as they represent the state of the actuator.

The Diagnosis menu has three submenus:

- Operation data actuator
- Valve maintenance limits
- Maintenance valve

The illustration on the right shows the functions.

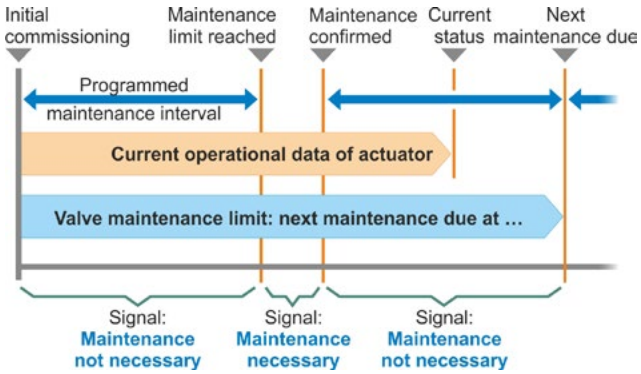


Fig.: ‘Diagnosis’ menu function

12.1 Operation data actuator

Information on the actuator is displayed here.

Switching cycles

Total number of switching cycles since first commissioning.

Switching cycles per hour

Average number of switching cycles/hour calculated over the last 10 minutes.

Torque cut-offs

Total number of torque-dependent cut-offs since commissioning.

Travel cut-offs

Total number of travel-dependent cut-offs since commissioning.

Motor operating hours

Total number of motor operating hours since commissioning.

Electronic operating hours

Total number of electronics unit operating hours since commissioning.

Cycles per hour

Relative operational time during the last 10 minutes.

For further information on actuator maintenance, refer to chapter “14 Maintenance, inspection, service” on page 112.

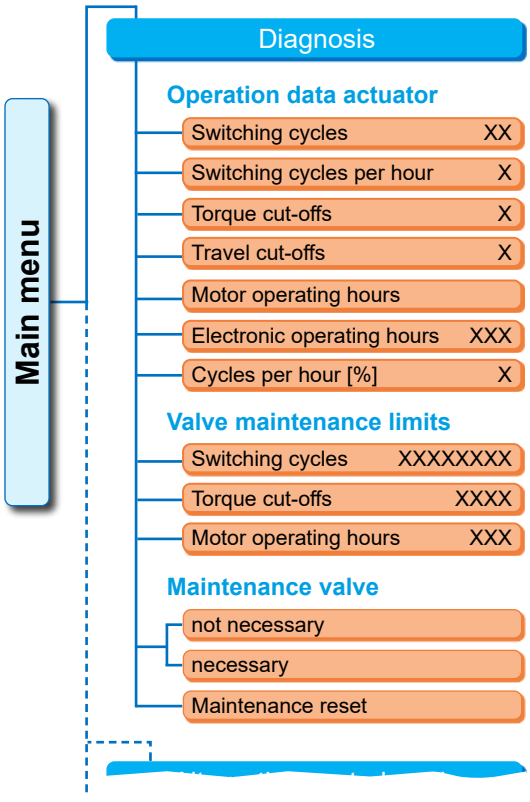


Fig.: ‘Diagnosis’ menu

12.2 Valve maintenance limits

The data shown in this menu are values for which maintenance is required. This enables effective planning of valve maintenance operated the actuator in compliance with specified operation criteria for

- Number of switching cycles,
- Number of torque cut-offs
- Number of operating hours of the motor.

Once of these criteria has reached the defined value, i.e. the maintenance limits, the ‘Maintenance necessary’ indication is issued.

The maintenance limit is re-set every time ‘Maintenance reset’ menu item has been confirmed. The limit consists of the number e.g. of switching cycles since the first commissioning to the last ‘Maintenance reset’ confirmation and the parameterized values in the ‘Maintenance interval’ menu, refer to figure on the right.

Maintenance intervals are defined in the ‘Special parameters’ menu, refer to chapter “8.6.5 Maintenance intervals of valve” on page 87 and is only possible in the ‘Expert’ user level, refer to “User management” on page 31.

Maintenance limits do not affect actuator maintenance.

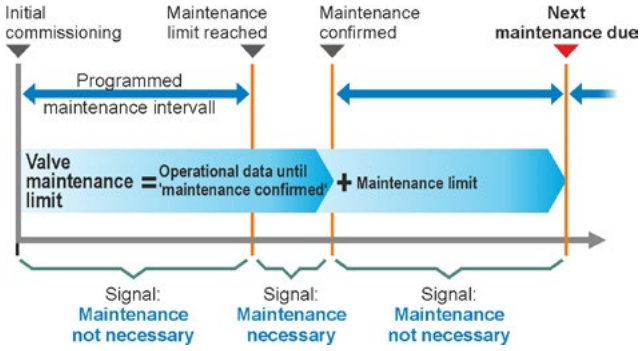


Fig.: Maintenance limit

12.3 Maintenance valve

For an explanation, refer to previous chapter, “Valve maintenance limit”

‘Maintenance not necessary’

Indicates that none of the defined maintenance limits for the number of switching cycles or torque-dependent cut-offs or operating hours has been reached so far.

‘Maintenance necessary’

Indicates that one of the current values has reached the defined maintenance limit.

‘Maintenance reset’

This menu item has to be confirmed after each maintenance. The next maintenance limits are set.

13 Communication and data exchange

In addition to operation directly at the actuator, the actuator c**an also be controlled**

- from remote (DCS, automation system);
- via the COM-SIPOS PC parameterization system whereby data exchange via Bluetooth or USB cable is possible.

13.1 Remote control

Depending on the automation system and the parameterization for ‘REMOTE control’ and ‘Alternative control mode’ (refer to 8 chapter), actuator control is done via

- Conventional connection (24/48 V binary or 0/4 – 20 mA analog) or
- Fieldbus (e.g. PROFIBUS DP, MODBUS or HART).

The operation via a fieldbus interface is also described in separate operation instructions, refer also to chapter “1.5 Supplementary operation instructions”.

An EMERGENCY command sent from the DCS is always executed by the actuator (irrespective of the selected control type and signal source), even if the actuator is conventionally controlled and the EMERGENCY command is sent via fieldbus and vice versa.

13.2 COM-SIPOS PC parameterization software

The COM-SIPOS PC parameterization program is a software tool for:

- Operation: Operation of the actuator in LOCAL mode
- Observe: Reading the actuator parameters and the device state;
- Diagnosis: Trouble shooting;
- Parameterization: Reading and changing the actuator parameters;
- Loading new firmware: Software update to the state-of-the-art;
- Archiving: Saving of the actuator parameters and torque reference curves of the actuator.

Connection from the laptop to the actuator is possible via:

- Bluetooth
  The communication is wireless via the Bluetooth interface integrated in the actuator.
- USB cable
  Communication is established via the USB port on the left bottom of the electronics housing.

Refer also to the following chapter.

The COM-SIPOS PC parameterization program is described in separate operation instructions.

13.3 USB port

The USB port is protected against dust and water and is located at the bottom left of the electronics housing.

Connect USB cable or USB flash drive:

1. Unscrew the protective cap of the USB port (fig.1, item 1) (it is provided with a plastic band for retention).
2. Connect
   a) USB flash drive
   or
   b) USB cable
   to the USB port (item 2).

   The backlight is activated and the communication via USB port is indicated with a USB symbol in the display, refer to fig. 2

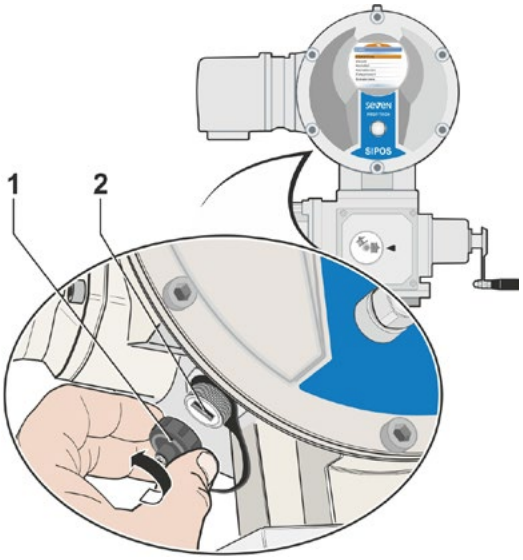


Fig. 1: USB port

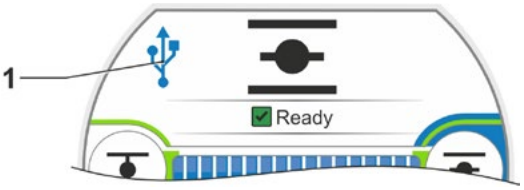


Fig. 2: Indication in the display: Communication via USB

The reference potential of the auxiliary voltage supply (M24 ext. pin 39) is often grounded. If the reference potential is different from the grounding potential of the actuator (PE), transient currents may occur when connecting the USB communication cable, which might cause damage to laptop.
To avoid this,

- prevent potential differences (lay compensating cables), or
- use galvanically isolated USB cables, or
- Use laptop **without** mains cable.

13.4 Data exchange via USB flash drive

Once a USB flash drive is connected, the actuator displays the 'USB flash drive' menu with the respective items (refer also to fig.):

- Firmware update,
- Save parameters
- Upload parameters
- Save log data,
- Save torque curves,
- Clone actuator.

Select menu items/functions as usual.

Fig.: USB menu

The following functions are only available in 'Expert' user level and in 'LOCAL' or 'Off' mode.

- Firmware update
- Upload parameters
- Clone

13 Communication and data exchange

13.4.1 Firmware update

Firmware updates are only possible in ‘LOCAL’ or ‘OFF’ mode
and in the ‘Expert’ user level.

Firmware versions are updated via the ‘Update firmware’ menu item.
The following current data, settings and parameter values will not be modified:

- Factory parameters
- End position adjustment
- Parameters to be changed by the customer
- Torque curve
- Operational data

Prior to a firmware update at a remote control unit, set the remote control unit in the ‘Active’ menu to ‘No’.

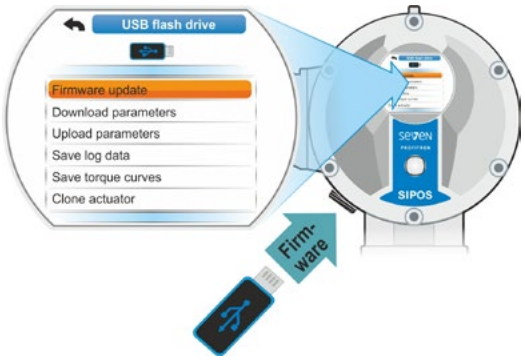


Fig.: Firmware update

13.4.2 Download parameters to USB flash drive

Use this menu item to save the following parameter values on the USB flash drive.

- Factory parameters
- End position adjustment
- Operational data
- All parameters, including the parameters that can be modified by the customer.
- ‘System settings’, without real time clock.

This function is useful for plant documentation and, in the event of failure, to allow using data stored on the USB flash drive

– To write them to a replacement electronics (refer to chapter below, ‘Clone actuator’);
– To provide it to SIPOS service for fault diagnostics.

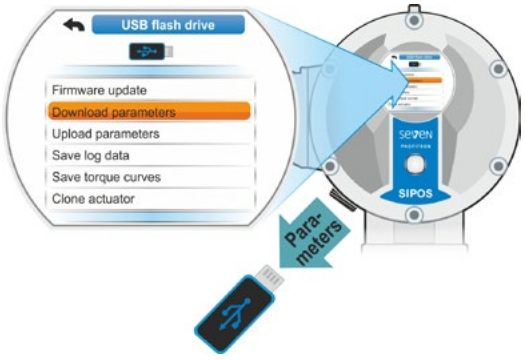


Fig.: Save parameter on USB flash drive

13.4.3 Upload parameters from USB flash drive

Via this menu item, only the parameters that can be changed by the customer are loaded to the actuator. The follwing parameters will not be loaded

- Factory parameters
- End position adjustment
- Diagnostic values

This function can be used to restore the original parameter settings stored on the flash drive after modifying some parameters.

13.4.4 Save log data on USB flash drive

Log data can prove extremely helpful during trouble shooting and when eliminating faults.

All changes are stored with time stamp in an internal storage area. They can be saved to a USB flash drive afterwards.

- Parameter changes – File: “<Tag number>_<works number>Param-Chg.csv“.
- Fault changes (start - end) – file: “<Tag number>_<works number>Errors.csv“.

These files can be opened with EXCEL, for example, and help to

- undo selected parameter changes,
- Identify in case of a fault, during which period the faults have occurred.

13.4.5 Save torque curve

This function is described in chapter “10.3 Save torque curve on USB flash drive” on page 101.

13.4.6 Clone actuator

Only available in ‘Expert’ user level and in ‘LOCAL’ or ‘Off’ mode.

The ‘Clone actuator’ function is used to write all actuator parameter values (factory parameters including end position adjustment, parameters which can be modified by the customer and operating data such as motor operating hours, number of cut-offs, etc.), which were written to the USB flash drive (refer to “13.4.2 Download parameters to USB flash drive” on page 110), to a ‘new’ electronics unit. In terms of the functions, the actuator with the ‘new’ electronics unit is a duplicate of the ‘original actuator’.

This function enables quick and easy commissioning, for example after replacing the electronics unit.

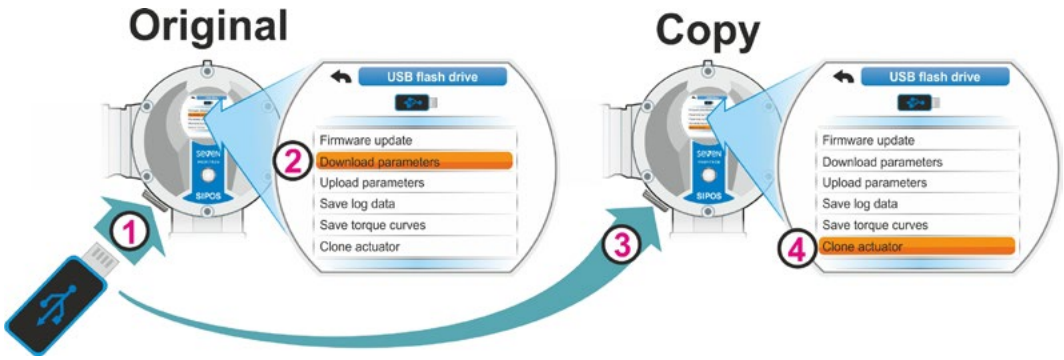


Fig. 1: Clone actuator procedure

Operation sequence

1. Connect USB flash drive to the original electronics unit refer to fig. item 1.
   The ‘USB flash drive’ menu appears.
2. Select ‘Download parameters’ from the menu (item 2) and confirm. (Refer also to “13.4.2 Download parameters to USB flash drive” on page 110.)
   The .STE file is saved to the USB flash drive. Successful saving is confirmed via a message.
3. Connect USB flash drive to the “new” replacement electronics unit (fig. item 3). The ‘USB flash drive’ menu appears.
4. Select ‘Clone actuator’ in the menu (fig. item 4) and confirm. The display changes to the ‘Select file’ menu.
5. Select .STE file of the ‘original actuator’ and confirm.
   A note is displayed requesting you to verify whether conversion rate and mains voltage of the target actuator match.
6. If not, abort cloning selecting ‘No’. If yes, continue cloning selecting ‘Yes’.
   Data is written from the USB flash drive to the actuator. Successful cloning is confirmed with a message, refer to fig. 3.

Fig. 2: Note: Check conversion rate and mains voltage

Fig. 3: Message: Cloning successful

14 Maintenance, inspection, service

Before any work is carried out on the actuator, ensure that

- the planned measures (possible operation of valves, for example) will not result in injury to persons or faults in the plant,
- the actuator or plant section is properly isolated. In addition to the main circuits, also check that any additional or auxiliary circuits are disconnected!

Furthermore, the general safety regulations have to be observed:

- Disconnect all poles (also 24/48 V DC),
- Prevent accidental reconnection.
- Confirm that equipment is not live.
- Ground and short-circuit equipment.
- Fit barriers or covers to neighboring live components.

This can also be achieved by removing the connection hood.

14.1 General information

The actuators are virtually maintenance-free (for the relubrication intervals, refer to chapter 14.2).

We recommend submitting the actuators after commissioning or after approx. 50 operation hours to a general inspection to verify that

- correct functioning is guaranteed,
- no unusual noises/vibration occur,
- the fixing components have not become loose,
- no leakages occur.

The housing of the SEVEN actuator consists of an aluminum alloy which is corrosion resistant under normal environmental conditions. If the paint was damaged during assembly, it can be touched up with original paint supplied in small quantity units by SIPOS Aktorik.

This list cannot cover every eventuality. Further checks may be necessary in accordance with the plant-specific conditions. Any impermissible deviations or changes detected during inspection must be rectified immediately.

Under normal operation conditions, service or inspection of the devices is recommended every 8 years, including storage time. The following maintenance work also has to be performed:

- Replace lubricant within gear housing,
- Replace seals,
- Check all parts within the direct power drive for wear,
- Tighten screw connections of electrical connections.

Depending on the operation conditions, shorter maintenance intervals may be required.

This applies in particular to actuators in high temperature version – add. version T09. They have to be checked for proper condition by the SIPOS service every 2 years and wear parts have to be replaced!

It is recommended that the services of the local SIPOS Aktorik service centers are utilized for this purpose.

Please contact **SIPOS Aktorik GmbH** for any service requests. You can find the address and the phone number of your competent contact at **www.sipos.de**. You may also send your requests directly via e-mail to service@sipos.de.

14.2 Lubrication intervals and lubricants

Lubrication intervals

Perform service or inspection after approx. 8 years (refer to previous chapter 14.1).

After 50 operating hours or 1 year, regrease coupling shaft A, if available, at the greasing nipple.

For output shaft form A, ensure that the valve stem is greased separately!

These intervals are valid for normal load. When exposed to more intensive loads, the maintenance intervals are reduced accordingly.

Actuators in high temperature version – add. version T09 – have to be checked for proper condition by the SIPOS service every 2 years and wear parts have to be replaced!

Whenever the covers and hoods are removed, the seals must be inspected for damage. Replace and regrease if necessary.

14.3 Lubricant assignment and quantity

		Actuator type		
		2SA7.1/2	**2SA7.3/4**	**2SA7.5/6/7/8**
Gear oil	Lubricant quantity	760 cm^3	1,600 cm^3	2400 cm^3
	Filling level *1)*	max. 46 mm	max. 58 mm	23 – 27 mm
	Lubricant*2*	Klübersynth GH 6 – 220 N (by Klüber)*3*) or Alphasyn PG 220 Polyglycol (by Castrol), Berusynth EP 220 (by Bechem), Panolin EP gear synth 220 (by Kleenoil).		Mobil SHC Gear 220*3*,
Other lubrication points*4)*	Lubricant quantity	50 cm^3		
	Lubricant*2*	Lubrication grease AR1 (ZEPF)		
Output shaft form A*5* (2SA7)	Lubricant quantity	2 cm^3		
	Lubricant*2*	Commercial ball bearing grease		
2SG7... part-turn actuator 2SQ7... part-turn actuator		virtually maintenance-free		

- The manufacturer's instructions and relevant regulations are to be observed when handling and disposing of lubricants. Technical information concerning lubricants is available on request.
- Before using a new alternative lubricant (other than the lubricant filled in the factory), the gear units and gear parts have to be rinsed and cleaned. (Avoid mixing the oils!)

*

* _____

* *1* Measured from the lubricant surface to the external wall of the housing at oil filling screw

* *2* Ambient temperature range -20 – +70 °C.

* *3* Lubricant used in the factory

* *4* e.g. sealing rings, gear systems, bearings, feather keys, uncoated surface etc.

* *5* If applicable

15 Spare parts

15 Spare parts

15.1 General information

With the exception of standardized, generally available components, only original spare parts may be used. Spare parts are usually supplied as complete sub-assemblies (see list below). In the following representation drawings, desig**nati**ons with 3 digit**s** are listed. These numbers are prefixed with "2SY7" to give the full spare parts designation.

When ordering spare parts, always provide the following information:

1. Order number and serial number of the actuator (refer to name plate),
2. Spare parts designation 2SY7 . . . (refer to following list),
3. Quantity required.

- All external metallic housing parts are made of a corrosion resistant aluminum alloy, painted with color similar to RAL 7037 (silver-gray) as standard and meet the requirements up to corrosivity category C5.
- Other finish paint color ► add. version **Y35**
- Very high corrosion protection corrosivity category C5 with long protection duration ► add. version **L38**

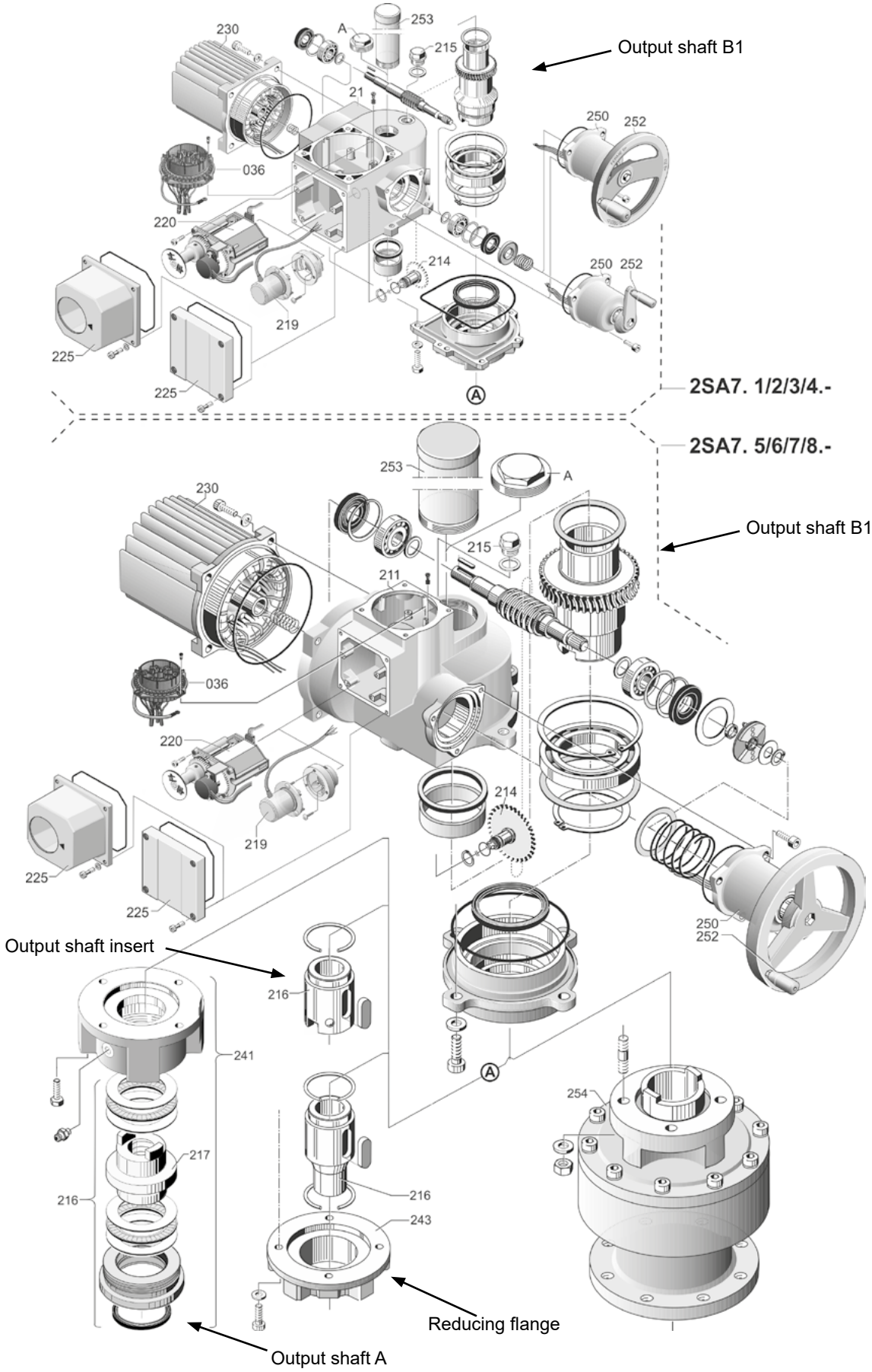
15.2 Spare parts list

Our actuators are designed for fault-free operation within the maintenance intervals. As we know from experience, external causes may damage the actuator already during commissioning stage. For such events, the recommended spare parts are listed in the following table. If you require other parts, please contact our service.

No.	Designation
2SY7001	Electronics unit (010 – 042)
2SY7041	Cover for electronics unit
2SY7218	Sealing kit (without illustration)
2SY7219	Non-intrusive position encoder (niP)
2SY7220	Signaling gear
2SY7225	Signaling gear cover
2SY7250	Manual drive
2SY7252	Handle
▲▲▲	= The last three digits indicate the part numbers in the exploded views.

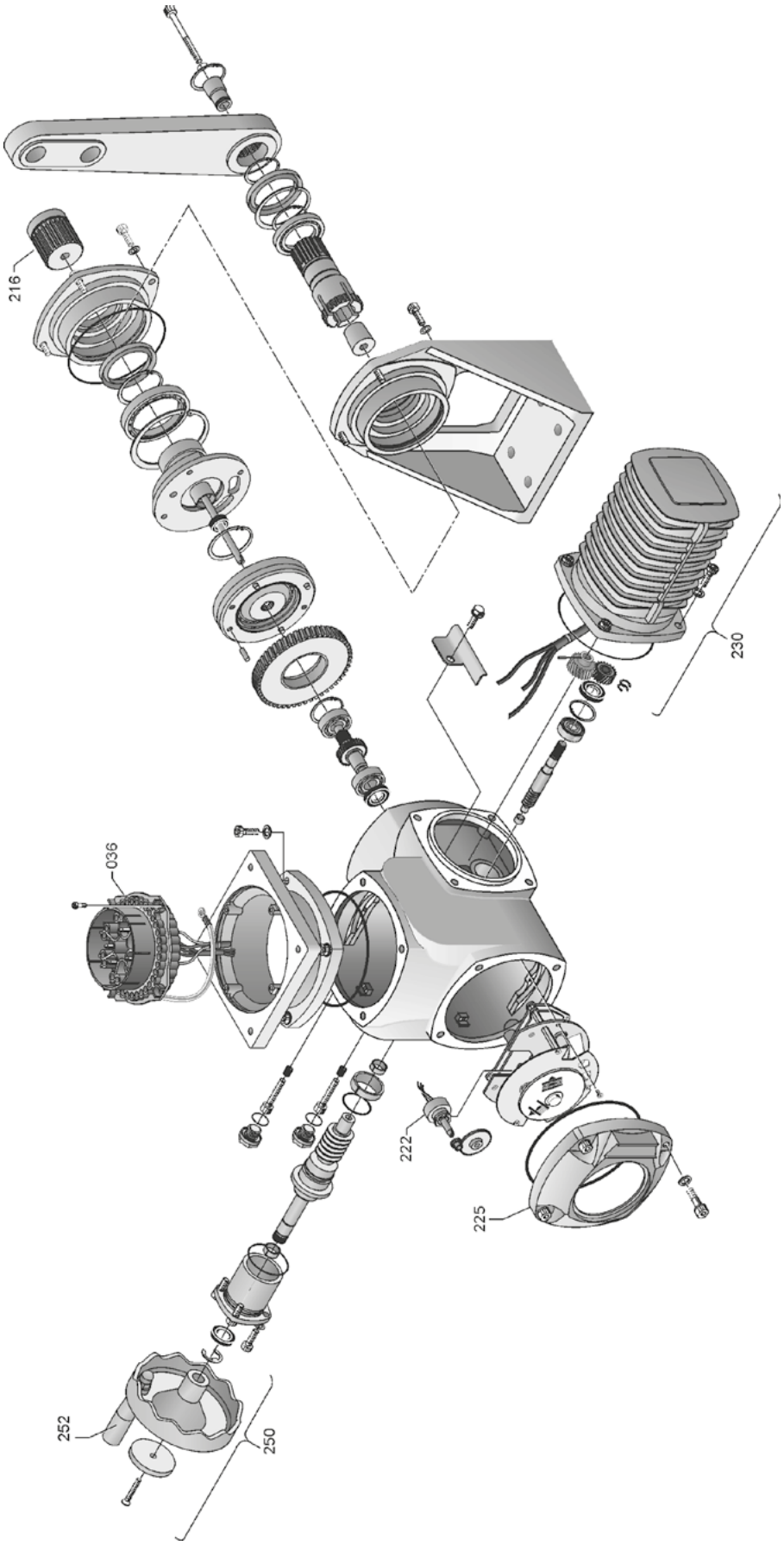
15.3 Exploded views

15.3.1 Gearboxes 2SA7...-

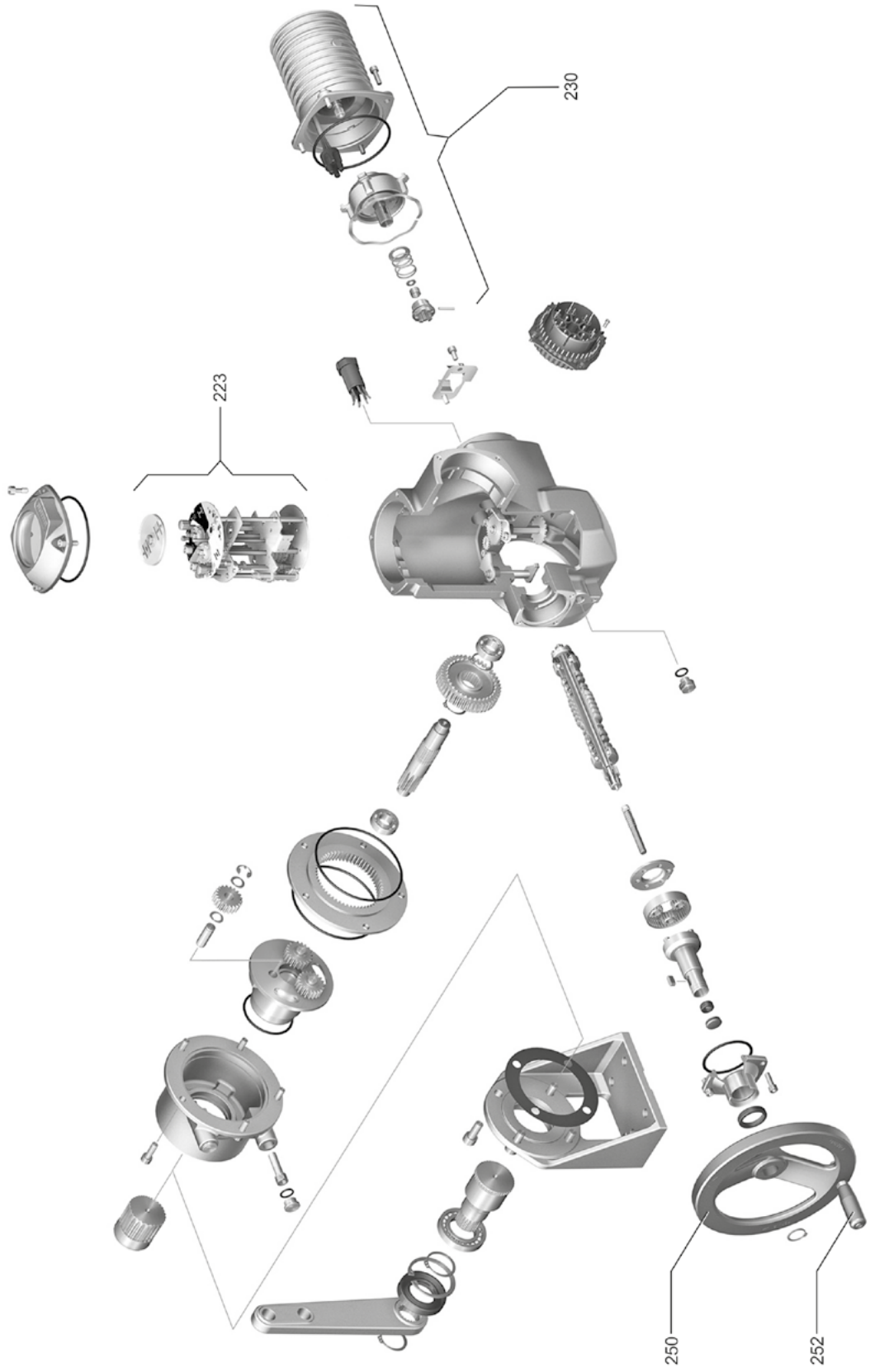


15 Spare parts

15.3.2 Small part-turn gear unit 2SG7...-

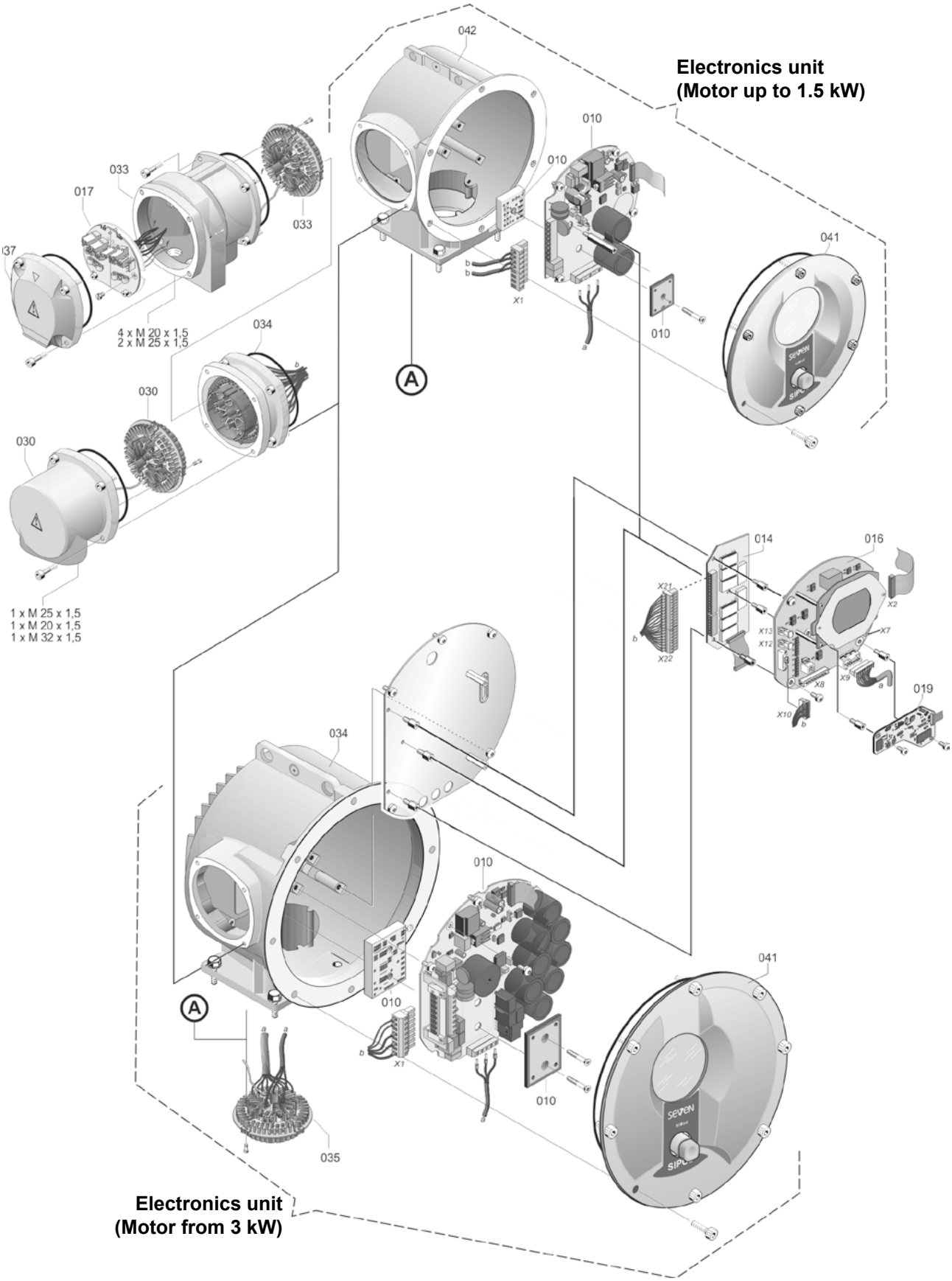


15.3.3 Small part-turn gear unit 2SQ7



15 Spare parts

15.3.4 Electronics unit



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Declaration of Incorporation of Partly Completed Machinery in compliance with Machinery Directive 2006/42/EC

for multi-turn and part-turn actuators of the following SIPOS SEVEN type ranges:

2SA70, 2SA73, 2SA75, 2SA78
2SQ70, 2SQ73, 2SQ75

in versions:

ECOTRON
PROFITRON
HiMod

Manufacturer: SIPOS Aktorik GmbH, Im Erlet 2, 90518 Altdorf, Germany

The before mentioned multi-turn and part-turn actuators are intended for operation of industrial valves.

The following essential health and safety requirements in compliance with annex I of Directive 2006/42/EC are respected:

Articles 1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.6, 1.3.1, 1.3.7, 1.5.1, 1.6.3, 1.7.1, 1.7.3, 1.7.4

SIPOS Aktorik GmbH shall be obligated to electronically submit the documents for the partly completed machinery to national authorities on request. The relevant technical documentation pertaining to the partly completed machinery described in annex VII, part B has been prepared.

Putting into service is not permitted until the final machinery into which the before mentioned multi-turn and part-turn actuators are to be incorporated has been declared in conformity with the provisions of the Directive 2006/42/EC.

Furthermore, the safety requirements of the Low Voltage 2014/35/EU are fulfilled by applying the following harmonised standards, as far as applicable for the products.

EN 60204-1:2006/A1:2009/AC:2010 EN 60034-1:2010/AC:2010 EN 50178:1997

Authorised person for documentation: Thomas Weber, Im Erlet 2, 90518 Altdorf, Germany

EU Declaration of Conformity

The manufacturer SIPOS Aktorik GmbH declares herewith in sole responsibility, that the before mentioned devices meet the essential requirements of the following directives. The following harmonised directives were applied:

RoHS- Directive 2011/65/EU
EN 50581:2012

EMC Directive 2014/30/EU for versions (1)
EN 61800-3:2004/A1:2012

RED Directive 2014/53/EU for versions (2)
EN 301 489-1 V2.1.1 EN 301 489-17 V3.1.1 EN 300 328 V2.1.1

Furthermore, the before mentioned standards of the EMC Directive 2014/30/EU and the Low Voltage Directive 2014/35/EU were applied.

Altdorf, 2021-02-23

Thomas Weber
Managing Director

This declaration does not contain any guarantees. The safety instructions in product documentation supplied with the devices must be observed. This declaration shall lose its validity in the event of unauthorized modification of the equipment.

Certificates are valid as from the indicated date of issue. Subject to changes without notice!
The latest versions are available for download at http://www.sipos.de.