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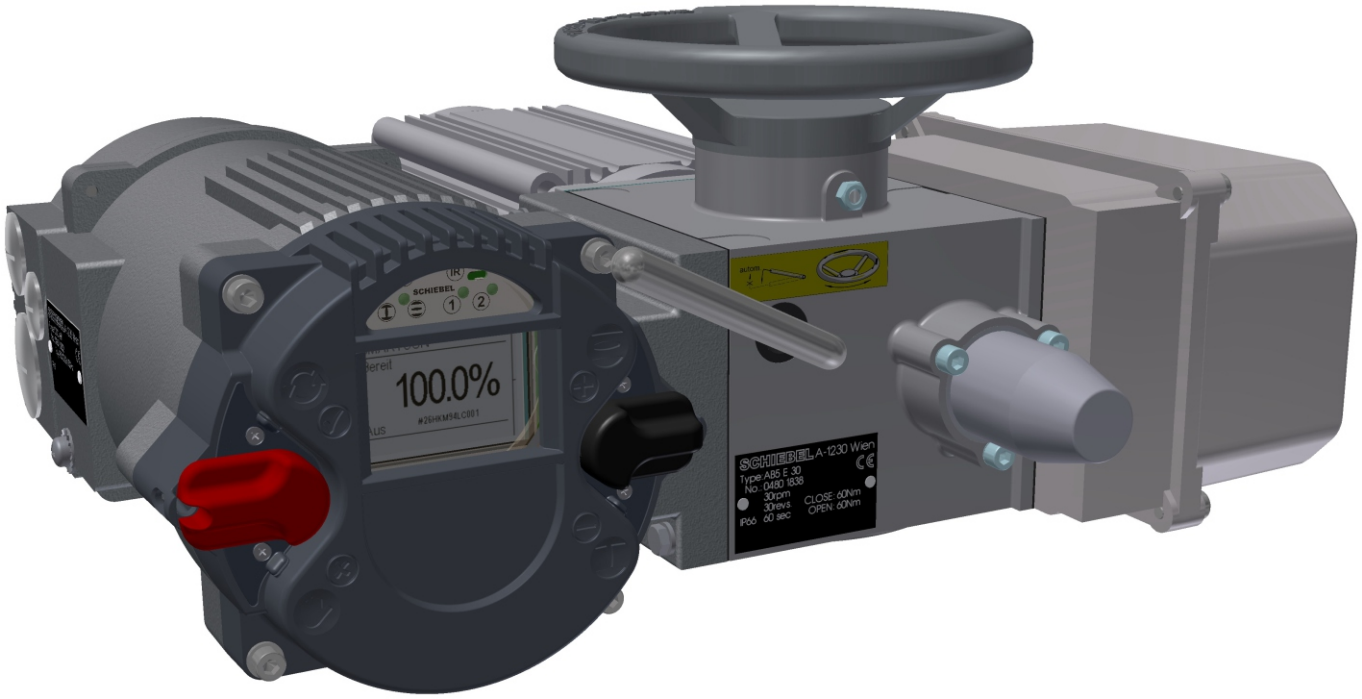
Operating instructions for actuators type AB with SMARTCON control unit
Version 1.2



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SEC-OM-ENGLISH-CSC-V1.2-V1.07-2020.03.20

Operating instructions for actuators type AB with SMARTCON control unit Version 1.2

1 Introduction/Notes

These operating instructions apply to SCHIEBEL actuators of the type AB with integrated SMARTCON control unit Version V1.2..

The scope of application covers the operation of industrial valves, e.g., globe valves, gate valves, butterfly valves and ball valves. For other applications please consult with the factory.
The manufacturer shall not be liable for incorrect use and possible damage arising thereof. The risk shall be borne solely by the user.

Using the unit as intended also entails the observance of these operating instructions!

When operating electrical equipment, certain parts inevitably carry hazardous voltage levels. Work on the electrical system or equipment must be carried out only in accordance with electrical regulations by a qualified electrician himself or by specially instructed personnel under the control and supervision of a qualified electrician.

Maintenance instructions must be observed as otherwise the safe operation of the actuator cannot be guaranteed.

Failure to follow the warning information may result in serious bodily injury or property damage. Qualified personnel must be thoroughly familiar with all warnings contained in this operating manual.

Proper transport, storage, installation, assembly and careful commissioning are essential to proper and safe operation.

When working in potentially explosive areas, observe the European Standards EN 60079-14 ”Electrical Installations in Hazardous Areas” and EN 60079-17 ”Inspection and Maintenance of Electrical Installations in Hazardous Areas”.

Maintenance work on open actuators may only be conducted if these are de-energized. Reconnection during maintenance is strictly prohibited.

2 General

2.1 Overview

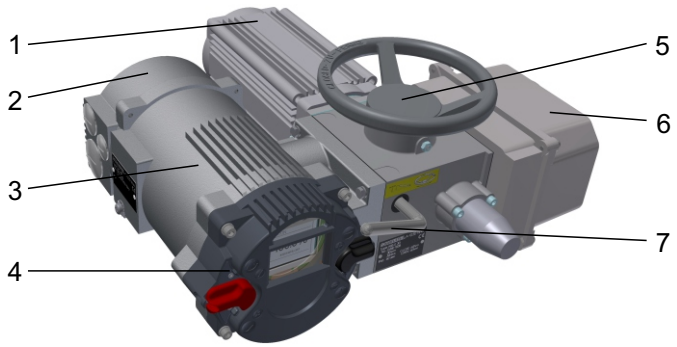

Figure 1: *1. . . Motor, 2. . . Connection compartment, 3. . . SMARTCON control unit, 4. . . Operating unit, 5. . . Handwheel, 6. . . Signalling lid, 7. . . Lever for manual operation*

2.2 Serial number and nameplate

Each actuator and each SMARTCON control unit carries a serial number. The serial number is a 8-digit number that begins with the year and that can be read from the nameplate (see Figure 2 and 3)
The nameplate of the actuator is located under the hand lever and the nameplate of the SMARTCON control unit is located on the control unti (see Figure 4).
Using this serial number, SCHIEBEL can uniquely identify the actuator (type, size, design, options, technical data and test report).

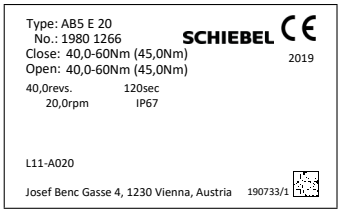

Figure 2: *nameplate of the actuator*

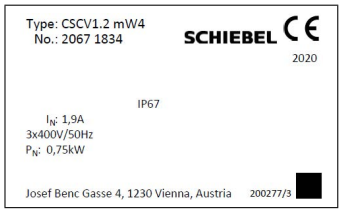

Figure 3: *nameplate of the SMARTCON control unit*

Figure 4: *1. . . nameplate of the SMARTCON control unit, 2. . . nameplate of the actuator*

Actuators which are suitable for operation in explosive atmosphere (see EU-Richtlinie 2014/34/EU and EN60079-0 Standard) are separately designated by a special model plate (Ex, TÜV-Standard, see Figure 5 and 6).

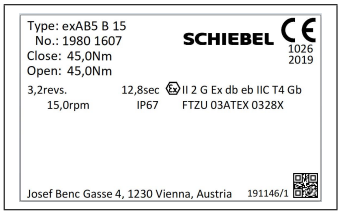

Figure 5: *nameplate of the actuator for operation in explosive atmosphere*

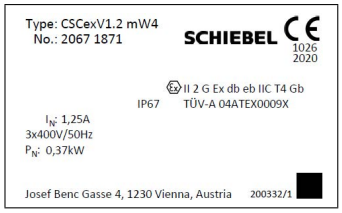

Figure 6: *nameplate of the SMARTCON control unit for operation in explosive atmosphere*

2.3 Operating mode

There are two distinct modes of operation: open-loop control operation (operational mode S2 for ON-OFF) and closed-loop control operation (operational mode S4) according to EN 60034-1. But since there is a great number of varying and special models made to order, it is recommended to consult the motor model plate for the mode of operation and the running time.

2.4 Protection class

Actuators with three-phase motors are standardly equipped with the IP 66 protection system (according to DIN-Standard 40050). **Explosion-proof** actuators and actuators with plugs are furnished with the IP 65 protection system. Exceptions are the AC, DC and brake-motor actuators as well as those for other protection systems made to special order.

CAUTION: The protection class specified on the nameplate is only effective when cable glands also provide the required protection class, the cover of the connection compartment is carefully screwed and the mounting position (see section 2.5, page 5) is observed.

We recommend metallic screwed cable glands with a metrical thread. Furthermore, cable inlets not be needed must be closed with screw plugs. On explosion-proof actuators cable glands with protection class **Ex e according EN60079-7** must be used. **After removing covers** for assembly purposes or adjustment work, take special care upon reassembly so that seals are not damaged and remain properly fastened. Improper assembly may lead to water entrances and to failures of the actuator.
Allow a certain sag in the connector cables before reaching the screwed cable glands so that water can drip off from the connector cables without running to the screwed cable glands. As a result, forces acting on the screwed cable glands are also reduced. (see section 2.5)

2.5 Mounting position

In principle, the installation position is irrelevant. However, based on practical experience, it is advisable to consider the following for outdoors use or in splash zones:

- Mount actuators with cable inlet facing downwards
- Do not arrange the motor so that it hangs downwards
- Ensure that sufficient cable slack is available

2.6 Direction of rotation

Unless specifically ordered otherwise, the standard direction is (see Figure 7 and Figure 8):

Clockwise rotation = Close **Counter-clockwise rotation = Open**

Clockwise rotation of the actuator is given when the output shaft turns counter clockwise when looking on the output shaft.

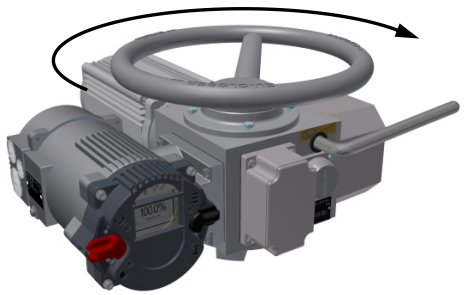

Figure 7: *AB3 - AB80*

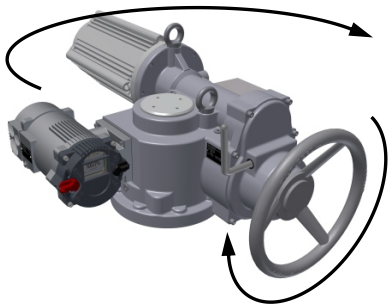

Figure 8: *AB100 - AB500*

All data in these operating instructions refer to the standard rotating direction.

2.7 Protection devices

2.7.1 Electromechanical protection devices (design potentiometer torque)

The torque protection of the actuators with integral SMARTCON control unit is controlled mechanically by plate springs which pass the current torque through a conductive plastic potentiometer to the control unit.
The switch off torque can be changed in the menu of the control unit for the left and right direction. The factory default switch off torque is set to the ordered torque. If no torque was specified in the order, the actuator is supplied from the factory with the maximum adjustable torque.

See also section 7.2, page 27

2.7.2 Mechanical protection devices (design switch for torque)

All actuators have at least one torque switch for clockwise and counter-clockwise rotation. These can be separately adjusted and are preset ex works to the torque required

The adjusting screws are varnish-protected and must not be reset without prior consultation with the Schiebel Company.
However, the torque for the relevant rotating direction can be reduced by means of plastic cams on the torque switch. Counter-clockwise rotation torque is reduced as follows: Using a screwdriver, turn the plastic cam marked “L“in the direction of the decreasing scale markings (clockwise).
To reduce the clockwise rotation torque, turn the plastic cam marked “R“in the direction of the decreasing scale markings (clockwise). See Figure 9.

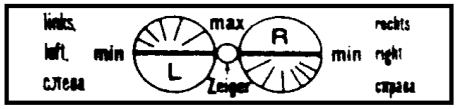

Figure 9

2.7.3 Electrical protection devices

All motors have temperature switches as standard equipment (temperature sensors upon special order), which are wired into the control and protect the motor from overheating.
In the housing of the connection plug super fast safety fuses are located the protect the integrated thyristors (electronic reversing contactors).
Further we recommend the installation of a motor protection circuit breaker on site as additional protection for rapid engine

warming up (block). The tripping current must be adjusted to 1.2 . . . 1,5-times of the motor current, or at explosion-proof models proceed according to the corresponding guidelines of the National Explosion Protection Authority.

2.8 Ambient temperature

Unless otherwise defined according to special order, the following operational temperature generally applies:

- open-loop control actuators from -25°C to +70°C
- closed-loop control actuators from -25°C to +60°C
- Explosion-proof actuators (according to EN60079-0 Standard):

Type	min. Temp.	max. Temp
Standard	-20°C	+40°C
TT40	-40°C	+40°C
TT50	-50°C	+40°C
HT60	-20°C	+60°C
HT70	-20°C	+70°C

Warning: The maximum operational temperature also depends on the built-in components. Please observe the technical data sheets.

2.9 Delivery condition of the actuators

For each actuator, an inspection report is generated upon final inspection. In particular, this comprises a full visual inspection, calibration of the torque measurement in connection with an extensive run examination and a functional test of the micro controllers.
These inspections are conducted and documented according to the quality system and can be found in the document gag (mounted on the handwheel).
The basic setting of the end position must be performed after assembly on the actuator.

CAUTION: Commissioning instructions (see section 5, page 12) must be strictly observed!
During assembly of the supplied valves at the factory, end postions are set and documented by attaching a label (see Figure 10).During commissioning at the plant, these settings must be verified.

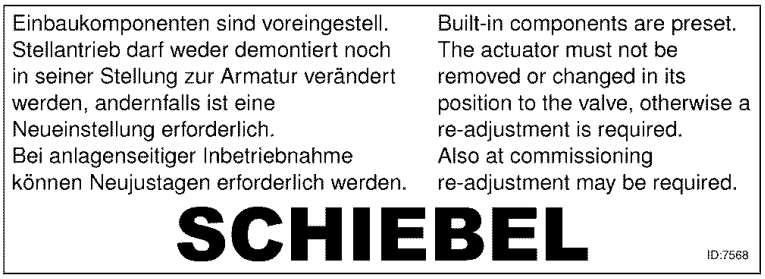

Figure 10: *Label*

2.10 Information notice (tag)

Each actuator is provided with a bilingual tag containing key information, which is attached to the handwheel after final inspection. This tag also shows the internal commission registration number (see Figure 11)

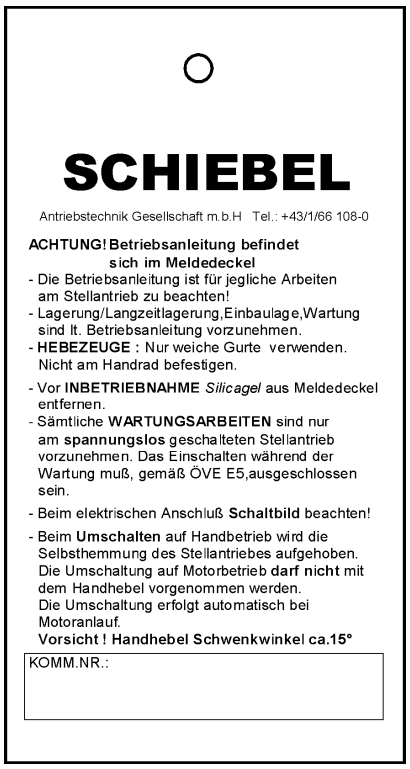

Figure 11: *tag*

3 Packaging, transport and storage

You can order the actuators to be delivered with or without packing. Special packing requirements must be specified along with your order. Use extreme caution when unpacking or repacking the actuator.

Use soft belts for hoisting equipment. Do not attach hoisting belts to the handwheel.

3.1 General

The indicator lids of all actuators contain a minimum of 5 g of silica gel ex factory.

WARNING! Prior to start-up of the actuator (refer to section 5, page 12) all of the silica gel must be removed!

3.2 Storage

CAUTION
Observing the following precautions will help to avoid damage when storing actuators:

- Store actuators in well-ventilated, dry premises
- Protect against floor dampness by storing actuators on wooden grating, pallets, mesh boxes or shelves
- Protect the actuators against dust and dirt with plastic foil
- Actuators must be protected against mechanical damage. It is not necessary to open the controller of the actuator for servicing batteries or similar operations.
- The storage temperature must be between -20°C to +40°C

It is not necessary to open the controller of the actuator for servicing batteries or similar operations.

3.3 Long-term storage

CAUTION: If you intend to store the actuator for over 6 months, follow additionally the instructions below:

- **CAUTION:** The silica gel in the connection compartment must be replaced after 6 months of storage (from date of delivery from SCHIEBEL's factory in Vienna)
- After replacing the silica gel, brush with glycerine the connection cover seal. Then, carefully close again the connection compartment
- Coat screw heads and bare spots with neutral grease or long-term corrosion protection
- Renovate damaged paintwork arising from transport, improper storage, or mechanical influences.

  CAUTION: For explosionproof actuators it is not allowed to overlacquer the actuator extensive. According to the standard, to avoid elecrostatical charge, the maximal thickness of the varnish is limited with 200 μm.

- Wrap the motor (especially the brake motor) with oiled paper.

- Every 6 months. all measures and precautions for long term storage must be checked for effectiveness and corrosion protection and silica gel renewed.

  - Failure to follow the above instructions may lead to condensation which can damage to the actuator.

4 Installation Instructions

Installation work of any kind of actuator may only be performed by qualified personnel.

4.1 Mechanical Connection

Make sure that the fitting flanges and the actuator flanges match each other, and that the borehole matches the shaft or, in the case of actuator model "A"(threaded bushing), that the actuator and fitting threads match each other.

- Grease the spindle.
- Clean all exposed parts which have been coated with anti-corrosive.
- Thoroughly clean the bolting surfaces of the fittings.
- Lightly grease the connecting joints between the actuator and the fittings.
- Place the actuator on the fittings or the gear.
- Tighten the fastening screws crosswise (torque acc. below table).

size	torque [Nm] for screws 8.8
M6	10
M8	25
M10	48
M12	84
M16	206
M20	415

4.2 Mounting position of the control unit

The control unit can be rotated in 90° steps

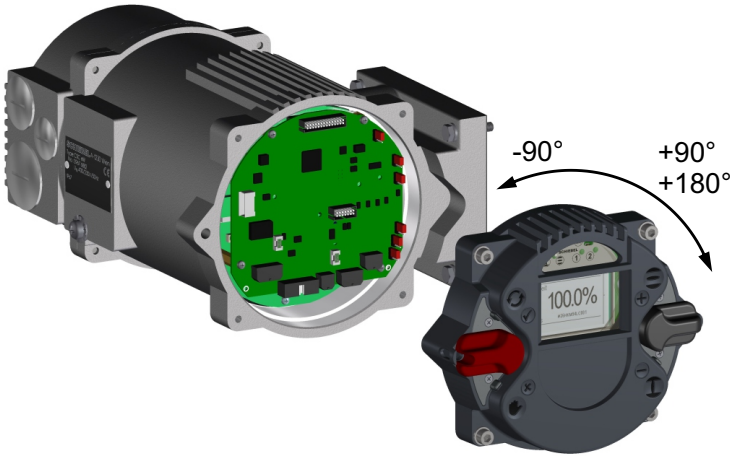

Figure 12

- Disconnect the actuator and control system from the power supply.
- To prevent damage to the electronic components, both the control system and the person have to be earthed!
- Undo the bolts for the interface surface and carefully remove the service cover.
- Turn service cover to new position and put back on.
  - Ensure correct position of the O-ring
  - Turn service cover by max. of 180°.
  - Put service cover on carefully so that no cables get wedged in.
- the bolts evenly in a crosswise sequence. IMPORTANT: max. torque 5 Nm

For output type A (unbored threaded bushing), you must sufficiently lubricate both needle bearings in the output form after processing and cleaning the spindle nut.
For this purpose, use the optional SCHIEBEL grease lubricant or a grease lubricant according to our recommendation (section 15, page 50).

4.3 Electrical connection

Electrical connections may only be carried out by qualified personnel.
Please observe all relevant national security requirements, guidelines, and regulations.
The equipment should be de-energized before working on electrical connections.
Furthermore, confirm the absence of electrostatic discharges during the connection.
First of all, connect the ground screw.

The line and short circuit protection must be done on the system side.
The ability to unlock the actuator is to be provided for maintenance purposes.
For the dimensioning the rated current is to be used (see Technical Data).

Check whether the power supply (voltage, frequency) is consistent with the connection data (see name plate of the motor)
The connection of electrical wiring must follow the circuit diagram.
This can be found in the appendix of the documentation. The circuit diagram can be ordered from SCHIEBEL by specifying the serial number.

The standard model can be ordered with the following connection options:

- size 1: connection of the control signals and power supply via plugs (see Figure 13) with screw connection.
- size 2: connection of the control signals is the same as size 1, the connection of the power supply is made by an additional plug (see Figure 14), both plugs aer with screw connection.
- **Explosion-proof actuators** or on special request the connection will be mady via terminals (see Figure 15).

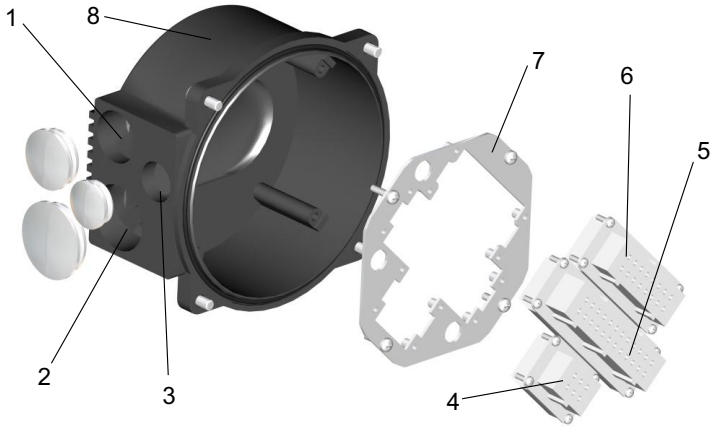

Figure 13: *1. . . metallic cable glands (closed with blind screw connections at delivery) M32x1,5, 2. . . M40x1,5, 3. . . M25x1,5, 4. . . plug (for power supply), 5. . . plug (for control signals)„6. . . plug for options, 7. . . connection plug plate, 8. . . connection plug housing*

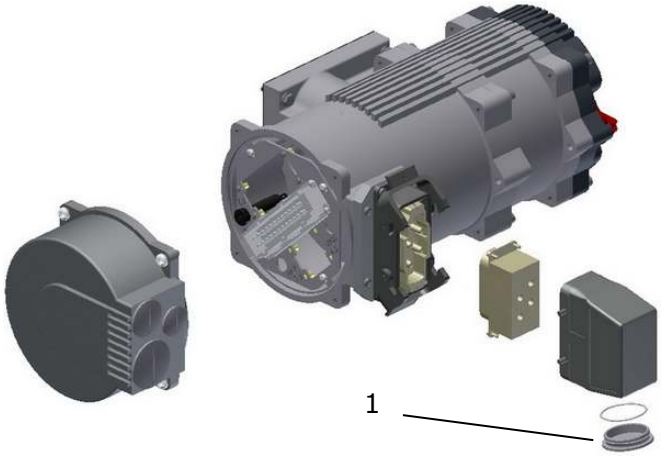

Figure 14: *size 2 with the additional plug, 1. . . M40x1,5*

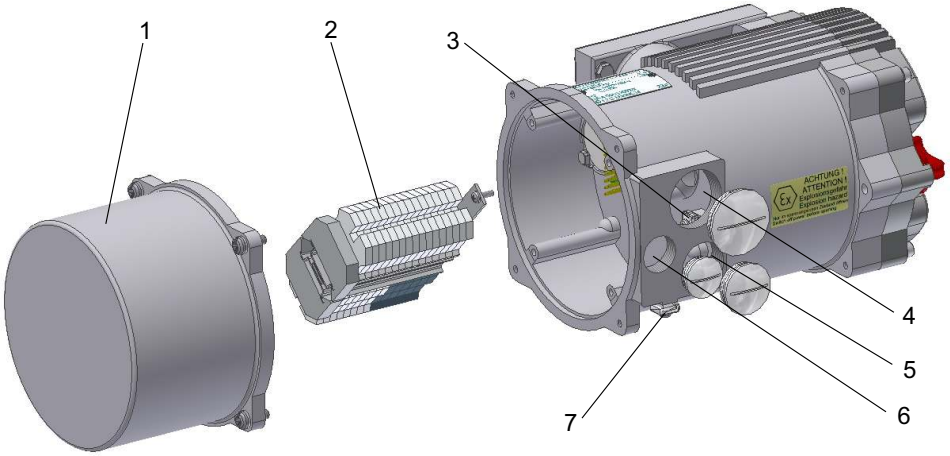

Figure 15: *1. . . connection plug housing, 2. . . terminal strip, 3. . . inside ground connection, 4. . . metallic cable glands (closed with blind screw connections at delivery) M40x1,5, 5. . . M32x1,5, 6. . . M25x1,5, 7. . . outside ground connection*

3 phase power is applied in positive turning direction of the electric field on the connectors L1, L2, L3 according the wiring diagram.
Before starting the actuator the turning direction of the electronic field should be checked.

NOTE: If phase sequence of the three phase power supply system is wrong the integrated phase sequence monitoring generates an error and the actuator is blocked. (see section 7.1, page 25)

If you need a reverse rotation of the actuator (ccw) you must change this in the control unit (section 7.1, page 25).

Please also note the information about the installation of an external motor protection circuit breaker - see section 2.7.3, page 6.

If, during outdoor installation, commissioning is not carried out immediately after electrical connection, the power supply must be connected at a minimum to achieve a heating effect. In this case, the silica gel may remain in the connection compartment until commissioning.
CAUTION: see section 3.3, page 8

5 Commisioning

Before commissioning, please ensure the actuator is correctly assembled and electrically connected. (see section 4, page 9)
CAUTION: Remove silica gel from the connection compartment

5.1 General

CAUTION: During commissioning and after every disassembly of the actuator, you have to make the mechanical preadjustment (see sction 5.3, page 13), adjust the mechanical position indication (see section 5.4, page 14), adjust the additional components (see scetion 5.5, page 14) and adjust the end positions (see section 5.7, page 14).

ATTENTION: The torque unit is adjusted at work and **must not** be changed.

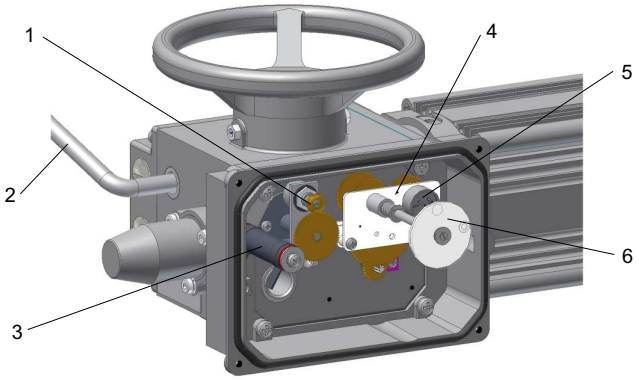

Figure 16: *design potentiometer for travel: 1. . . torque unit , 2. . . hand lever, 3. . . heating resistor - **Attention: HOT!!!**, 4. . . gearing of travel unit, 5. . . potentiometer for travel sensing, 6. . . mech. position indicator (option)*

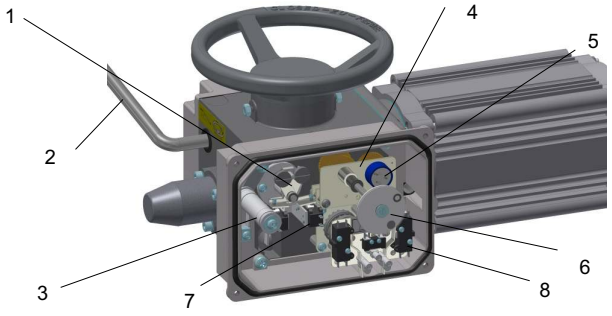

Figure 17: *design switch for travel: 1. . . torque unit , 2. . . hand lever, 3. . . heating resistor - **Attention: HOT!!!**, 4. . . gearing of travel unit, 5. . . potentiometer for travel sensing, 6. . . mech. position indicator (option), 7. . . switch for torque, 8. . . switch for travel*

5.2 Switching the actuator to manual operation

The actuator is switched to manual operation by moving the hand lever (see Figure 18 u. 19) by approximately 15°, and by simultaneously turning the hand wheel. The lever remains in this position and will be switched back automatically as the motor starts up.

WARNING:

- When switching to manual operation, the actuator's **automatic interlock is deactivated**, that means that the driven valve must not initiate reverse torque to the output shaft of the actuator!
- Switching back to motor operation is made **automatically** as the motor starts up. It **must not** be undertaken with the hand lever!
- Only switch to manual operation when the motor is idle!
- Hand lever has a slewing angle of approximately 15°, therefore release the hand lever immediately upon activation!

WARNING:
Special approach to switching to manual mode for actuator types AB100, AB200 and AB500!

1. Push the hand lever away from the handwheel and simultaneously move the handwheel in any direction to engage the clutch. The clutch is enganged when the hand lever don't move back automatically and the handwheel is stronger to move.
2. After the clutch is engaged, the hand lever must be pulled back to the handwheel one single time to fix the position of the clutch.
3. The actuator is now in manual operation mode. Switch back to normal operation mode happens automatically by starting the motor. **Switching back to the normal operation mode is not possible with the hand lever!**

Labels on the actuator:

Figure 18: *AB3, 5, 100, 200, 500*

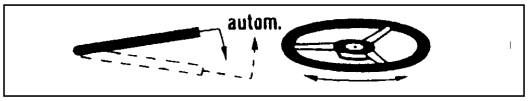

Figure 19: *AB8, 18, 40, 80*

5.3 Mechanical default settings, preparation (only for design potentiometer for travel)

Instructions:

- Switch with the hand lever to manual operation (see section 5.2, page 12) and turn the actuator with the handwheel to the next end position
- Remove cover of the signalling unit
- Switch with the control switch (black switch) to the status menu S4 (see section 8.1.4, page 44)
- For units without mechanical position indicator turn the slotted shaft (see Figure 20) with a screwdriver carefully until the below value is reached (see Figure 23)
  - when the actuator in in the closed position: Pos: 10.0
  - when the actuator is in the open position: Pos: 90.0
- For units with mechanical position indicator turn the wheel (see Figure 21 and Figure 22) until the below value is reached (see Figure 23)
  - when the actuator in in the closed position: Pos: 10.0
  - when the actuator is in the open position: Pos: 90.0
- Close cover of the signalling unit. Take special care upon reassembly so that seals are not damaged and remain properly fastened

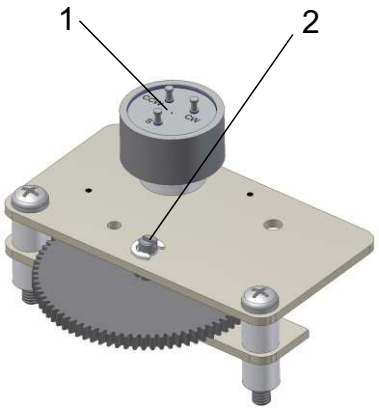

Figure 20: *1. . . potentiometer for position sensing, 2. . . slotted shaft for turning the potentiometer*

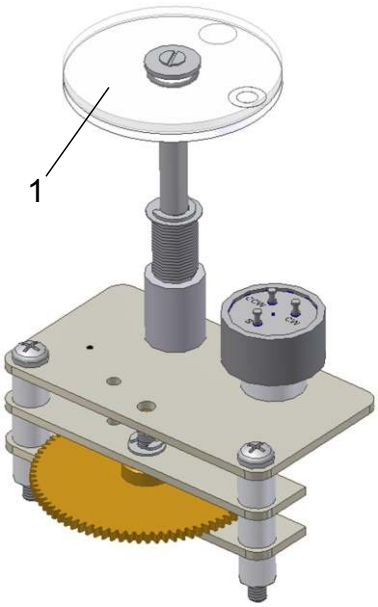

Figure 21: *1. . . mechanical position indicator*

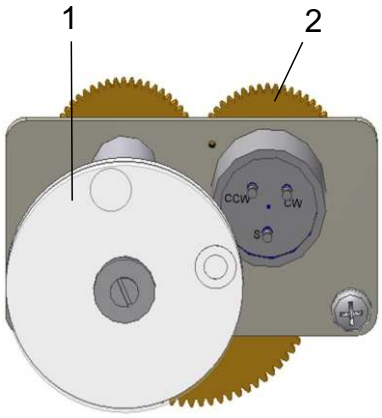

Figure 22: *1. . . mechanical position indicator, 2. . . wheel turning the potentiometer*

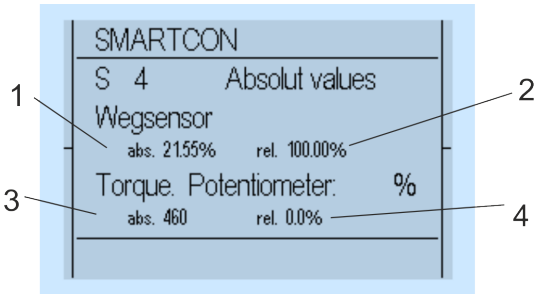

Figure 23: *1. . . absolute value of the position unit, 2. . . value for the torque unit (is factory adjusted)*

For the set up of the end positionsl see section 5.7, page 14.
The abobe transmitter gear is made according to the customer's specifications. If another travel of the actuator is necessary, a new transmitter gearbox can be supplied.

5.4 Adjustment of the mechanical position indication (Option)

The adjustment of the mechanical position indication should be done together with the mechanical pre-setup.
Vorgehensweise:

- Switch with the hand lever to manual operation (see section 5.2, page 12) and turn the actuator to the next end position.
- Remove cover of the signalling unit
- turn Indicator slide according below end position:
  - when the actuator in in the closed position: Display with the filled circle
  - when the actuator is in the open position: Display with the circle
- move the actuator to the other end position and turn the other Indicator slide. It is necessary that you hold the second slide in its earlier set position.
- Check the clamping screw
- Close cover of the signalling unit. Take special care upon reassembly so that seals are not damaged and remain properly fastened

5.5 Additional components (Option)

Possibly installed additional components have to be set-up according their separately supplied technical descriptions.

5.6 Parameterize of the SMARTCON control unit

After finishing the pre-setup of teh actuator (see section 5.3, page 13) all further settings can be done via the SMARTCON interface.

WARNING: It is absolutely necessarily to control the torque settings of the actuator and to teach in the end positions of the travel.

5.7 End limit setting (design potentiometer for travel)

A detailed description of the operation of the SMARTCON control unit can be found in section 6.3, page 21.

5.7.1 End limit OPEN

Set the selector switch and control switch to the centre position.

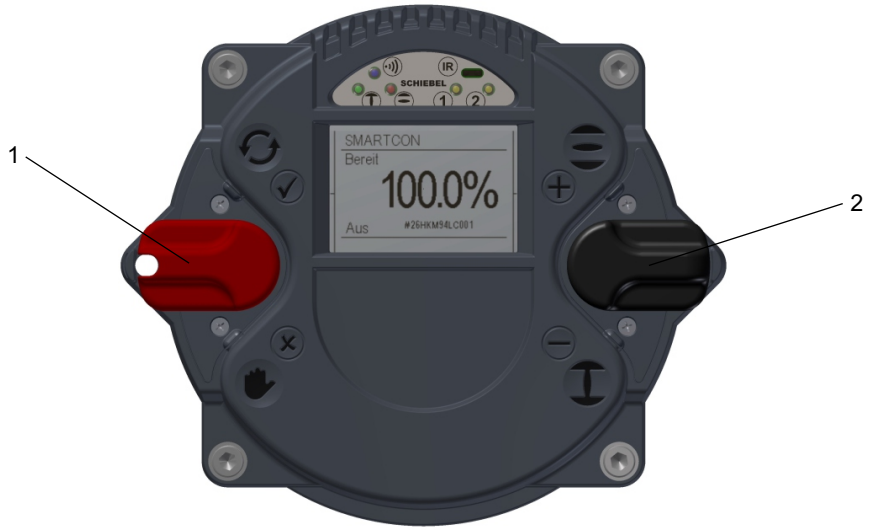

Figure 24: *1. . . selector switch (red), 2. . . control switch (black)*

Scroll through the menu with the control switch. Move the control switch towards the first menu item⊖ „P 1.1 End limit – Open“.

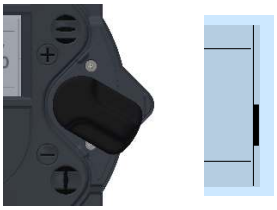

Figure 25

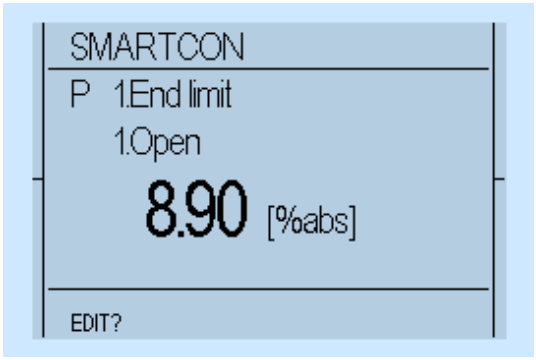

Figure 26

Afterwards, flip up the selector switch slightly and let it snap back to its neutral position ✓

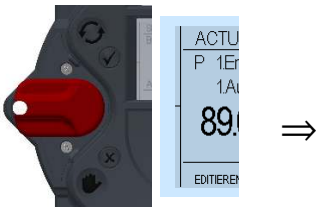

Figure 27

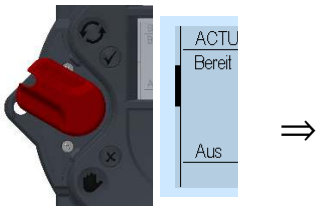

Figure 28

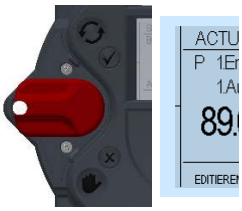

Figure 29

This changes the bottom line of the display from "EDIT?" to "SAVE?"

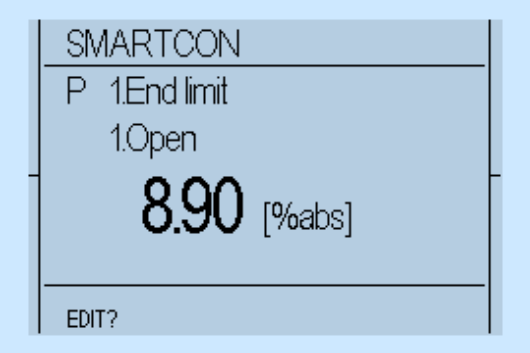

Figure 30

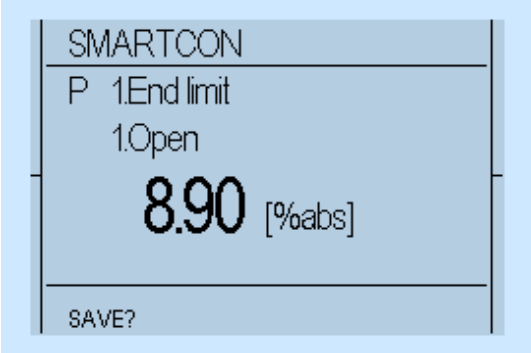

Figure 31

Then, push down the selector switch until it snaps into place. In doing so, the bottom right now on the display will show "TEACHIN" ⊗

CAUTION: Once the display shows "TEACHIN", use the operating switch (black switch) to start the motorised operation of the actuator. In this mode, no travel-dependent switch off occurs in the end position.

CAUTION: Please note that, during motor operation, only torque monitoring remains active, as travel adjustment will happen subsequently. Therefore, please check beforehand whether the maximum torque has been already parameterised

Absolute and relative values on the display will change continuously along with position changes.

Figure 32

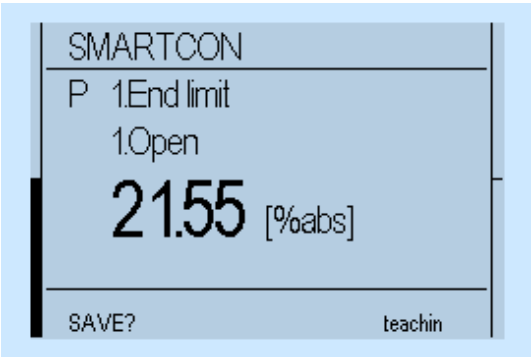

Figure 33

Manually move the actuator with the handwheel (see section 2.1, page 4 or 2.6, page 6) or by motor via the operating switch (black button) to the end position OPEN of the valve.

- Absolute value: Absolute value of the position feedback

- Relative value: the value to the other end postion

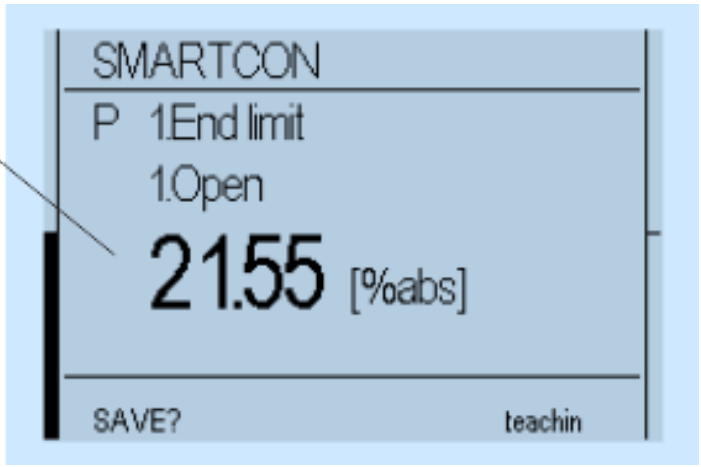

Figure 34: *1. . . Absolute value, 2. . . Relative value*

When the desired end position OPEN of the valve is reached, move the selector switch back to the middle position. Thus, the line "TEACHIN" disappears.

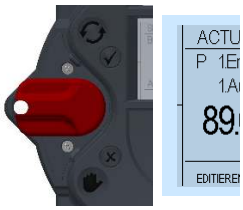

Figure 35

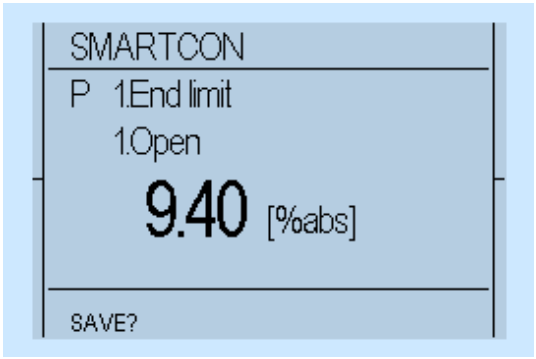

Figure 36

In order to confirm the end position (save), slightly flip up the selector switch and let it snap back to its neutral position ✓

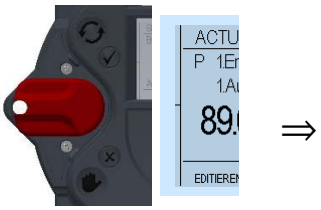

Figure 37

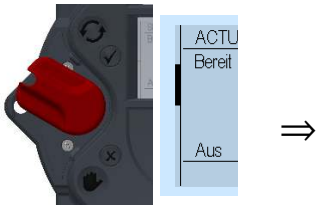

Figure 38

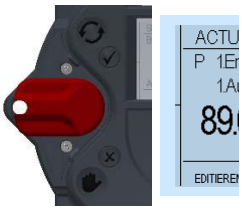

Figure 39

This changes the bottom line of the display for "SAVE?" to "EDIT?" and the end position is stored.

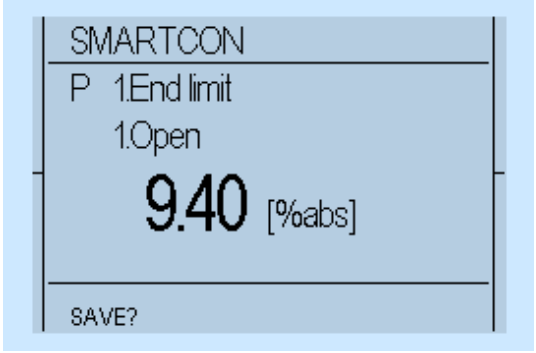

Figure 40

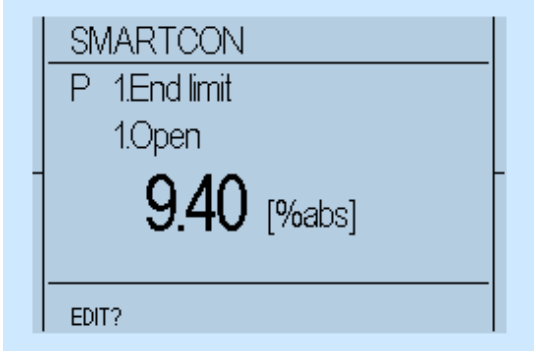

Figure 41

5.7.2 End limit CLOSE

Use menu item "P 1.2 End limit - End limit CLOSE" as for End limit OPEN

5.7.3 Setting of the end positions (design for switch for travel)

Caution: : Depending on the load intensity, special actuators with high output speed display a trailing effect when switched off. This must be taken into consideration accordingly when adjusting the travel switches. The actuator can use either a roller-type counter or a camshaft gear for travel determination, as need be.

Roller-type Counter (operational range starting at 1 rev. at the output)

- Setting the position „CLOSE“:
  Move the actuator into the position „CLOSE“by hand. To set the final position, push the flasher shaft with square cam (see Figure 42) downwards with the finger. Using a screwdriver, turn the slotted shaft of the “R“rollers in the direction of the arrow, until the corresponding counter-clockwise trip cam activates the travel switch (see Figure 43). Release flasher shaft and be sure that the toothed roller locks in.

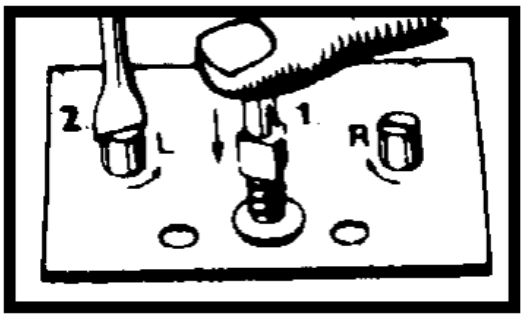

Figure 42

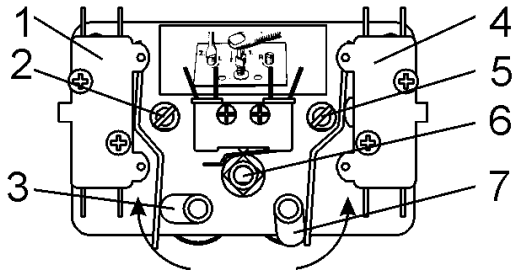

Figure 43: *1. . . switch S4, 2. . . L, 3. . . trip cam for counter-clockwise (OPEN), 4. . . switch S3, 5. . . R, 6. . . flasher shaft, 7. . . trip cam for counter-clockwise (CLOSE)*

- Setting the position „OPEN“:
  Move the actuator into the position „OPEN“by hand. To set the final position, push the flasher shaft with square cam (see Figure 42) downwards with the finger. Using a screwdriver, turn the slotted shaft of the “L“rollers in the direction of the arrow, until the corresponding clockwise trip cam activates the travel switch (see Figure 43). Release flasher shaft and be sure that the toothed roller locks in.

5.7.4 Final works

Following commissioning, check for proper sealing the covers to be closed and cable inlets. (see section 2.4, page 5) Check actuator for paint damage (by transport or installation) and repair if necessary.

6 Control Unit

The controller is intended to monitor and control the actuator and provides the interface between the operator, the control system and the actuator.

6.1 Operating unit

Operation relies on two switches: the control switch and a padlock-protected selector switch.
Information visualization is provided by 4 integrated indicator lights, as well as the graphic display.
For better visibility, switch symbols (✓, ✗, ⊕, ⊖) are on the cover

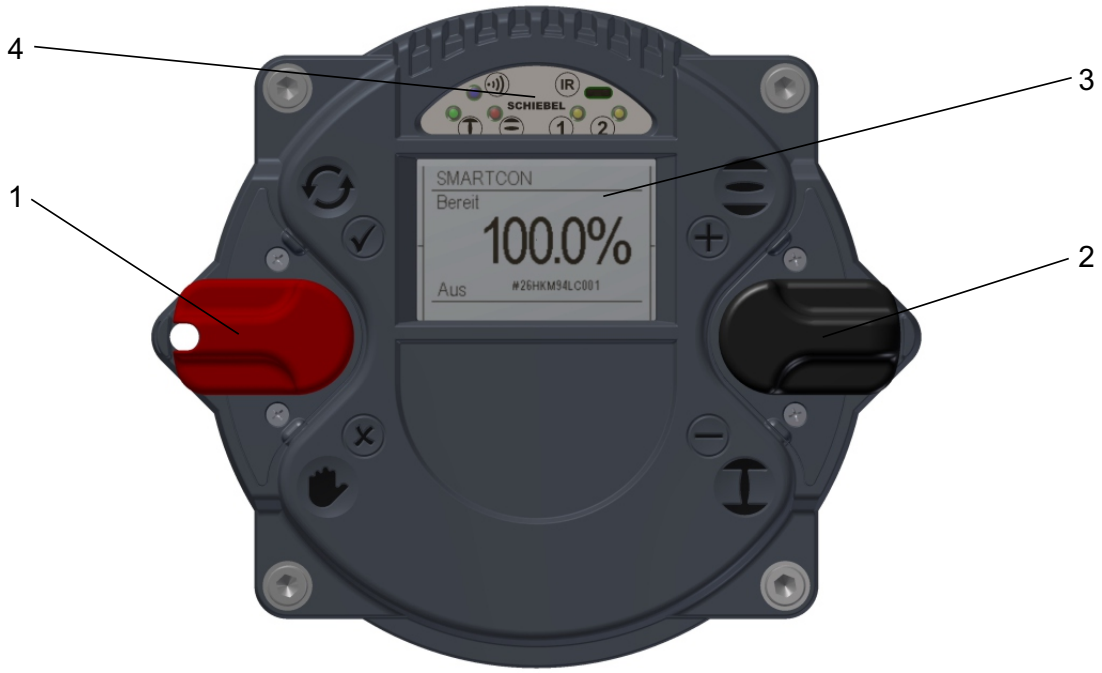

Figure 44: *1. . . Selector switch, 2. . . Control switch, 3. . . Graphic display, 4. . . LED display*

The controller switches serve on the one hand for electric-motor operation of the actuator and, on the other hand, to configure and view various menu items.

The controller cover may be wiped clean with a damp cloth.
The mounting position of the control unit can be turned in 90° steps (see section 4.2, page 9).

6.2 Display elements

6.2.1 Graphic display

The graphic display used in the controller allows text display in different languages.

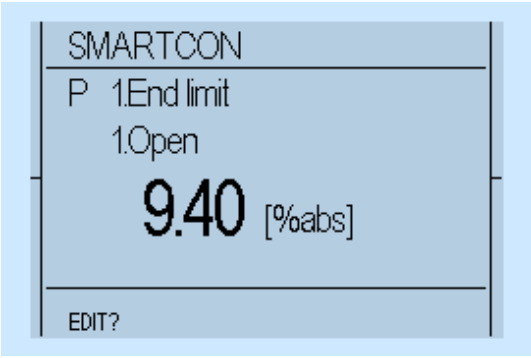

Figure 45

During operation, the displays shows the position of the actuator as a percentage, operation mode and status.
When using the option "identification", a customer-specific label is shown at the bottom of the display (e.g., PPS Number).

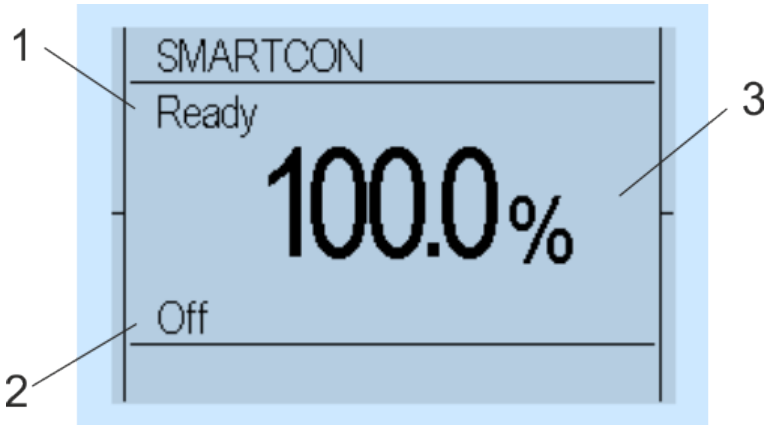

Figure 46: *1. . . Status, 2. . . Operation mode, 3. . . Position*

6.2.2 LED Display

To provide users with better status information, basic status data is displayed using 4-colour LEDs.
As the device powers up, it undertakes a self-test whereby all 4 LEDs briefly lit up simultaneously.

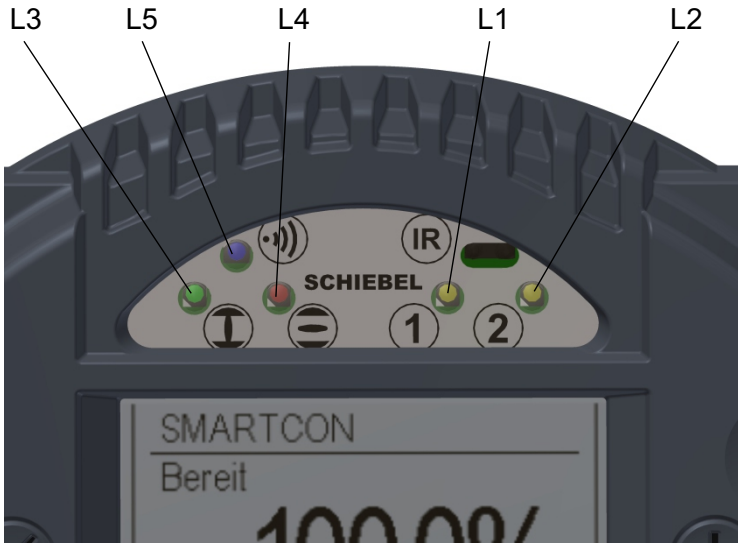

Figure 47

Description	Colour	Lits up	Flashes quickly	Flashes slowly	Does not light up
L1	Yellow	No torque error	Torque fault	—	[1]
L2	Yellow	Ready (operational readiness)	Travel fault (no operational readiness!)	—	Error (no operational readiness) motor temperature, supply voltage absent, internal error [1]
L3	Green [2]	CLOSE [3]	Moving to CLOSE position	Applies upon torque-dependent closing: Occurs when the end position CLOSE is reached but the cut-out torque has not yet been reached	Actuator is not in the CLOSE position.
L4	Red [2]	OPEN [3]	Moving to OPEN position	Applies upon torque-dependent opening: Occurs when the end position OPEN is reached but the cut-out torque has not yet been reached	Actuator is not in the OPEN position.
L5	Blue	Bluetooth connected	Bluetooth data transmission	Bluetooth ON, not connected	Bluetooth/Infrared OFF
	Red	Infrared connected	Infrared data transmission	Infrared ON, not connected	

6.3 Operation

The actuator is operated via the switches located on the controller (selection- and control switch). All actuator settings can be entered with these switches. Furthermore, configuration is also possible via the IR interface or the Bluetooth Interface (see section 9, page 46). Flip the switch up or down to regulate the parameter menu scrolling speed.

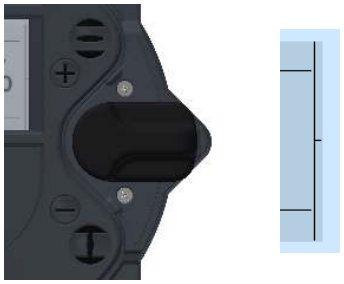

Figure 48: *Neutral position*

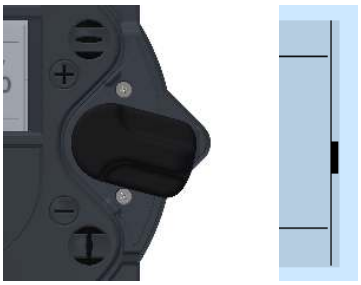

Figure 49: *Slight switch flip (it will move to the next parameter)*

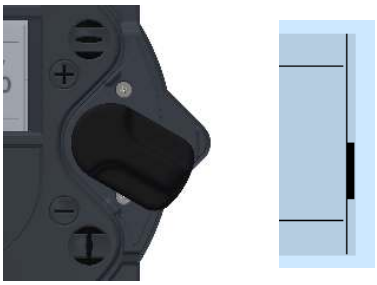

Figure 50: *halfway switch flip (it will jump to the next parameter category)*

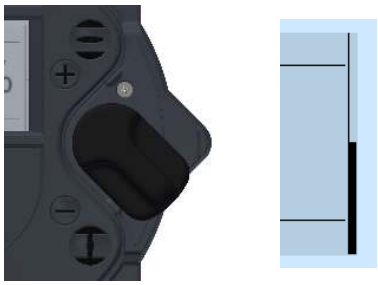

Figure 51: *Full switch flip (it will jump to the end of the menu)*

6.3.1 Operation mode

Use the selector switch (red) to determine the various operating states of the actuator. In each of these positions, it is possible to block the switch by means of a padlock and thus protect the actuator against unauthorized access.

[1] LED L1 and L2 are turned off as long as an infrared connection is active.
[2] Colour of LED L3 and L4 can be changed by parameter P1.7 - see section 7.1, page 25.
[3] A travel fault is indicated by a lit L3 and L4

The selector switch has the following positions:

OFF	The actuator can be neither operated via the remote control nor via the control switches of the controller.
Local	It is possible to operate the actuator by motor via the control switch. Control via the remote inputs may be possible with appropriate configuration (superimposed control commands, emergency commans)
Remote	The actuator is ready to process control commands via input signals. The control switch for the motor operation of the actuator is not enabled.

Besides defining the operational status, the selector switch is used in configuration mode to confirm or cancel parameter inputs.

Depending on the selector switch position, the control switch performs different functions:

Selector switch in the OFF position:	The control switch is used to scroll up or down the menu according to internal symbolism. From the neutral position towards ⊕ you reach the status and history data areas. Towards the ⊖ symbols you reach the parameter menu. Here, the selection switch either confirms ✓ or rejects ✗ the current input according to associated symbolism.
Selector switch in the REMOTE position:	The control switch gives you access to status, history data and parameter area.
Selector switch in the LOCAL position:	With the control switch, the actuator can be operated by motor. You may also operate the actuator in inching and self-hold mode. Switches are spring-loaded to snap back automatically into their neutral position. (To confirm a control command, the control switch must be pushed all the way into its mechanical locking position.)

6.3.2 Configuration

In principle, all parameters are shown as numbers in the corresponding parameter point. From the actuator menu, use the control switch to access different menu points. The lower left corner of the display shows the "EDIT" option.

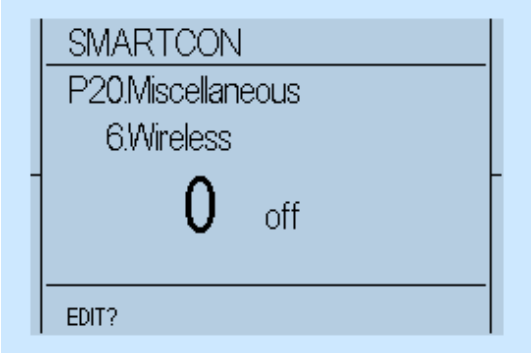

Figure 52

Confirm the selector switch (with a slight flip towards ✓, (see Figure 37, page 17 to Figure 39, page 17) to change the selected parameter. To confirm this input readiness, the display changes from "EDIT" to "SAVE".

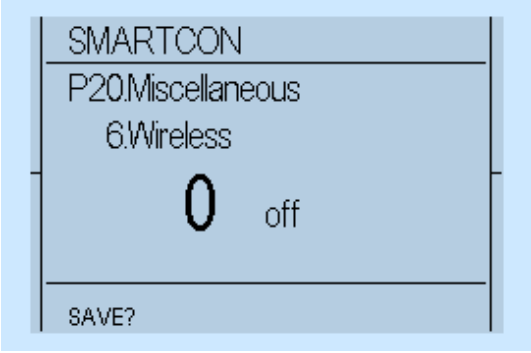

Figure 53

Use the control switch towards to the characters to change the parameter. ⊕ or ⊖ (see Figure 48 til Figure 51, page 21)

After reaching the desired parameter value, confirm the value with the selector switch (again, flip it slightly towards ✓, (see Figure 37, page 17 til Figure 39, page 17).

6.3.3 Configuration example

By way of example, we will change parameter P20.6 (wireless) from 0 (wireless off) to 2 (Bluetooth communication on). Thus, the Bluetooth connection is activated for a short time and then deactivated again automatically:

The operating and control switch must be in the neutral position

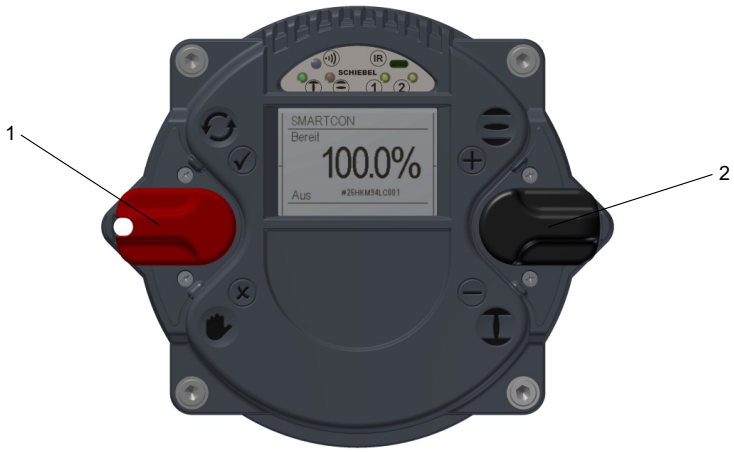

Figure 54: *1. . . Selector switch (red) , 2. . . Control switch (black)*

Now, move the control switch down (towards) until the menu item "P 20.6 Miscellaneous - Wireless" is displayed.

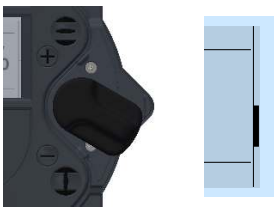

Figure 55

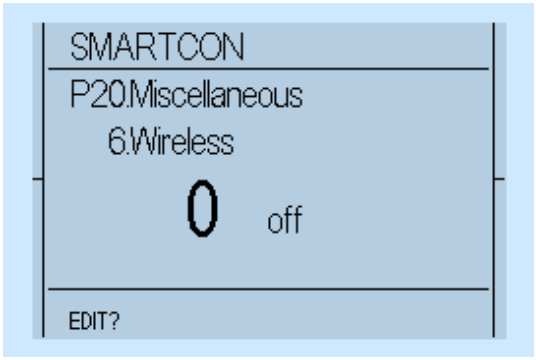

Figure 56

Afterwards, flip up slightly the selector switch (towards) and let it snap back to its neutral position

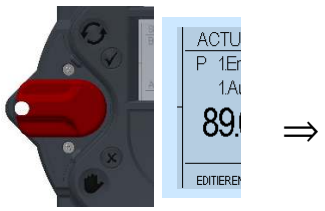

Figure 57

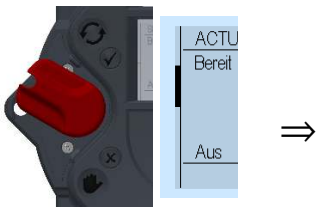

Figure 58

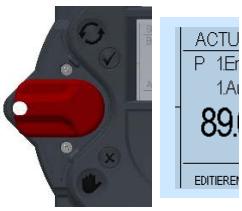

Figure 59

This changes the bottom line of the display from "EDIT?" to "SAVE?"

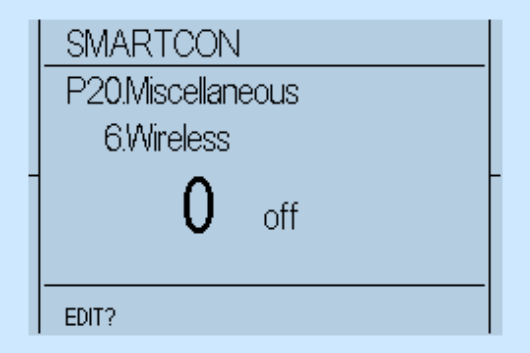

Figure 60

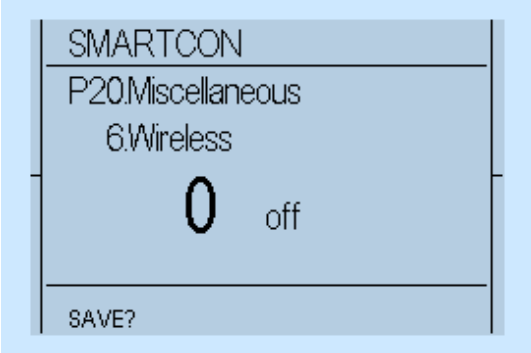

Figure 61

Thereafter, flip up the control switch (toward) to change the value from 0 (off) to 2 (Bluetooth)

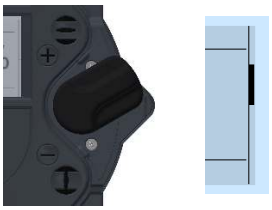

Figure 62

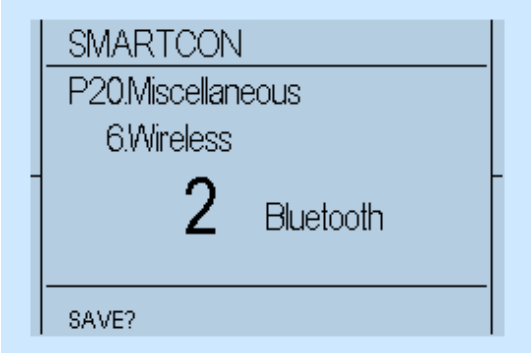

Figure 63

If the value changes to 1, confirm the selection by flipping halfway up the selector switch (towards) and letting it snap back to its neutral position (see Figure 57 til Figure 59).

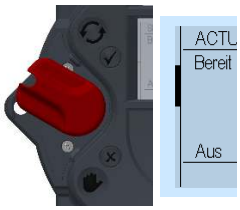

Figure 64

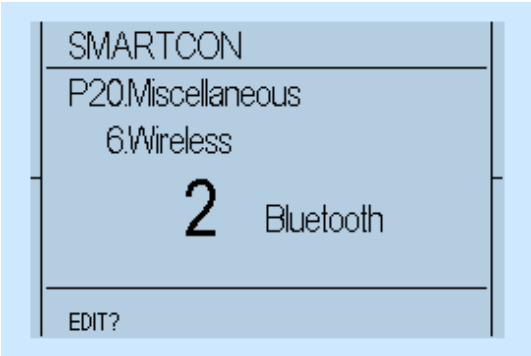

Figure 65

This changes the bottom line of the display from "SAVE?" to "EDIT?" and the parameter is stored.

6.3.4 "TEACHIN“ (only for design potentiometer for travel)

Furthermore, certain parameters (end positions, intermediate positions).can be set using "TEACHIN". Thus, their configuration is greatly simplified.
After selecting the appropriate menu item (for example: End position) and chanching the the input type from "EDIT?" to "SAVE?", move the selector switch (red) to "manual mode" and lock it into place. As you do so, the display will show the message "TEACHIN" and the current position value will be applied continuously to the parameter value. In this mode, further to manual operation by hand wheel, the actuator can be motor-driven with the control switch to the desired position. (see section 33, Figure 33, page 16)

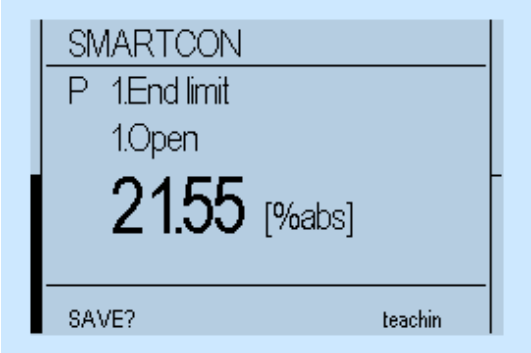

Figure 66

CAUTION: Please note that, during motor operation, only torque monitoring remains active, as travel adjustment will happen subsequently. Therefore, please check beforehand whether the maximum torque has been already set.

After reaching the desired, to-be-defined position, move the selector switch back to the neutral position. Finally, the parameter value must still be saved by flipping the selector switch halfway up and letting it snap back to the neutral position (see Figure 57 til Figure 59, page 23).

7 Parameter menu

For each parameter group, you can find a description, tabular overview of the menu items and possible configurations. The parameter list below also includes all possible options per menu item. Please note that some of the menu items listed and described may not be delivered with your configuration.

7.1 Parameter group: End limit

These parameters are used to configure the end position and switch off behavior of the actuator. In this regards, it is important to ensure that the basic mechanical configuration described in section **??**, page **??** has already been made.

Ensure that these parameters are set during commissioning before operating the actuator. In addition, the settings in the "Torque" menu (see section 7.2, page 27 must be compared with the permissible values of the valve and corrected as appropriate)

CAUTION: Generally, 100% stands for fully open and 0% for fully closed. Please note that these values cannot be changed. The end position range is reached as soon as 0% or 100% is shown on display.

	Menu item	Sub-menu item	poss. setting	Notes / comments
P1.1	End limit	Open	TEACHIN; 0...100 U[1)]	The parameter value can be set using TEACHIN. With a known travel, the second end position can be entered after setting the first end position.
P1.2	End limit	Close	TEACHIN; 0...100 U[1)]	The parameter value can be set using TEACHIN. With a known travel, the second end position can be entered after setting the first end position.
P1.3	End limit	Switch-off Open	0: travel	The actuator uses end-position signals to switch off and report the end position. **Attention: For failsafe-actuators in failsafe-direction not applicable. End limit by travel in failsafe-position only possible by changing the mechanical connection to the valve.**

continued on next page

[1)] representative for CM03; U...number of revolutions

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	Menu item	Sub-menu item	poss. setting	Notes / Comments
			1: torque	The actuator signals the end position or stops the motor only after reaching the specified torque in the end position. If the torque is reached and end position signal not, the actuator reports an error. If the end position is reached and the control command drops off during the build-up of the torque, the motor stops and the required torque is not reached. **Attention: For failsafe-actuators in failsafe-direction not applicable. Torque/Force in failsafe-position depends on residual spring torque/force**
			2: torque1	Like „torque“, but in the end position range, the torque is also increased when the control command drops off during the build-up of the torque, until the required torque is reached. **Attention: For failsafe-actuators in failsafe-direction not applicable. Torque/Force in failsafe-position depends on residual spring torque/force**
			3: torque2	Like „torque1“, but in the end position range automatically an additional control command is generated to reach and hold the torque. If the torque decrease and the actuator is in the end position it will be restored automatically. e.g.: Changes due to temperature differences, settlement. **Attention: For failsafe-actuators in failsafe-direction not applicable. Torque/Force in failsafe-position depends on residual spring torque/force**
			4: travel1	Like „travel“, however, the actuator still continues to drive the set Overrun time after reaching the end position, even when the positioning command is released. Only relevant if Overrun time (P1.10, P1.11) is greater than 0. **Attention: For failsafe-actuators in failsafe-direction not applicable.**
P1.4	End limit	Switch-off Close	1: travel	see P1.3
			1: torque	see P1.3
			2: torque1	see P1.3
			3: torque2	see P1.3
			4: travel1	see P1.3
P1.5	End limit	Closing direction	right (0)	Actuator is designed for clockwise = closing.
			left (1)	Reverse direction of rotation! Counterclockwise = closing. The crossing of all signals and commands is performed by the controller.
P1.6	End limit	Rot. sense pos.	0	Rotation sense of the Potentiometer. No function in ACTUSMART CM series.
			1	
P1.7	End limit	LED function	Close = green (0)	Definition of the LED colour of the CLOSED or OPEN end postion signalization.
			Close = red (1)	
P1.8	End limit	End limit hyst.	0.1. . . 10.0%	Hysteresis range for end position signals: Example: End position hysteresis 1% means that the End position OFF is reached when closing 0%, and will be left when opening only at 1%, i.e., a re-closing can only take place after leaving this hysteresis.
P1.9	End limit	Ramp	0.1. . . 100%	When approaching the end position, the speed is reduced.
P1.10	End limit	Range	0. . . 100%	End position range for torque (P1.3, P1.4). Permissible range in which the torque is to be achieved. If the actuator comes to the end of the end position range, the motor shuts off even if the torque has not been reached.

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	Menu item	Sub-menu item	poss. setting	Notes / Comments
P1.11	End limit	Overrun Open	0. . . 60 s	Switch-off delay after reaching the end position see travel1 (P1.3, P1.4)
P1.12	End limit	Overrun Close	0. . . 60 s	Switch-off delay after reaching the end position travel1 (P1.3, P1.4)

CAUTION: When installing the actuator on an gear or a thrust unit, please take into account the limits and factors of the gear / thrust unit at parametrization.

When using end limit switch off by torque, the end position limit must be set before reaching the torque limit. Accordingly, the actuator will only signal the final end position if the configured torque and the associated end position are reached. If the end position is not reached, a torque error is reported (see section 6.2.2, page 20)

7.2 Parameter group: Torque

If no torque was specified with the order, the actuator is supplied from the factory with the maximum configurable torque.

	menue item	sub menue item	poss. setting	notes / comments
P2.1	Torque	Open	40 - 100%	Switch off torque in OPEN direction CAUTION: The range can be restricted via the menu item P2.3
P2.2	Torque	Close	40 - 100%	As P2.1 but in CLOSED direction
P2.3	Torque	Torque limit	40 - 100%	Torque to protect the valve, the transmission or the thrust unit. This value limits the setting of the Parameters P2.1 and P2.2 and to prevent an erroneous increase above the allowed value of these two parameters.
P2.4	Torque	latching	{off (0)}	For self locking actuators
			on (1)	If the adjusted torque is reached the actuator cannot drive into the same direction. You must first drive the actuator in the other direction. That means that a reduction of the torque after a torque switch off, the actuator will not drive into the same direction. That is necessary for non self locking actuators
P2.5	Torque	Boost Open	0 – 120% {0%}	Increase the torque during motor start (approx. 0.5 sec) in direction OPEN. On large flywheel masses a unwanted shut off can be avoided. Furthermore, break free effect can thus be achieved. When setting values are less than the switch off torque in OPEN direction (P2.1) there will be no torque increasing during motor start. The torque increase should occur only if the valve is designed for it!
P2.6	Torque	Boost Close	0 – 120% {0%}	As P2.5 but in CLOSED direction.
P2.7	Torque	Hysteresis	{0: 50%}	After a torque shut off the current torque must be reduced by at least the hysteresis to enable the actuator to drive in the switch off direction.
			1: 25%	
			2: 12%	
			3: 6%	
			4: 3%	
			5: 1%	

When installing the actuator on an additional gear, please take into account the corresponding values of the gear / thrust unit as you enter the actuator parameters. To achieve an effective output torque (incl. gear) / output power (including thrust unit) ratio, the factor gear/thrust unit must be considered.

7.3 Parameter group: Speed (option)

	Menu item	Sub-menu item	poss. setting	Notes / Comments
P4.1	Speed	Local Open	5 – 100%	Output speed for local operation in direction OPEN
P4.2	Speed	Local Close	5 – 100%	As P4.1 but in direction CLOSE
P4.3	Speed	Remote Open	5 – 100%	Output speed for remote operation in direction OPEN
P4.4	Speed	Remote Close	5 – 100%	As P4.3 but in direction CLOSE
P4.5	Speed	Emergency Open	5 – 100%	Output speed for emergency operation in direction OPEN
P4.6	Speed	Emergency Close	5 – 100%	As P4.5 but in direction CLOSE
P4.7	Speed	Torque-dependent.	5 – 100%	seal-tight speed. Speed at which the actuator runs near the end position at torque-dependent switch off (see P1.3 u. P1.4)
P4.8	Speed	Minimum	5 – 100%	Minimum speed

CAUTION: 50% means nominal output speed (50Hz) and 100% meens that the output speed is 2 times faster (100Hz)

7.4 Parameter group: Ramp (optional)

The start ramp can be set separately for each operation mode. Thus, a 100% start ramp means that the motor attains its maximum speed in about a second. Higher speeds (see section 7.3) lead to shorter runtimes. If the ramp is set below 100%, the starting time increases in an inversely proportional fashion.

	Menu item	Sub-menu item	poss. setting	Notes / comments
P5.1	Ramp	Local	1. . . 100%	Start ramp for local operation
P5.2	Ramp	Remote	1. . . 100%	Start ramp for remote operation
P5.3	Ramp	Emergency	1. . . 100%	Start ramp for emergency operation

7.5 Parameter group: Control

	Menu item	Sub-menu item	poss. setting	Notes / Comments
P6.1	Control	Phase sequence	0: off	Phase sequence detection is deactivated. A wrong phase sequence will not be shown on the display and also not corrected. In case of wrong phase sequence the actuator will drive in the wrong direction.
			1: on	Phase sequence detection is activated. A wrong phase sequence will be shown on the display but not corrected. In case of wrong phase sequence the actuator cannot be driven electrical.
			2: auto	The phase sequence will be corrected automatically. The actuator will always drive in the right direction.
P6.2	Control	Ready delay	0 - 10 sec.	Drop-out delay for the ready signal (Bin. outputs)
P6.5[2)]	Control	24V output	0	24V auxiliary output is deactivated (chapter 20.5, page 60). The function of the auxiliary input is still activated.
			{1}	24V auxiliary output is activated (capter 20.5, page 60).
P6.6	Control	Min. Impuls	0,1 - 2,0s	minimum switch-on time of the motor

7.6 Parameter group: Password

The actuator control can be password-protected to prevent access at different levels. It is possible to prevent entry by unauthorized personnel or to entirely lock motor operation.
Default password is set to "000" and thus deactivated.

[2)] since firmware 1.303

You can use both numbers and capital letters in your password. After entering a password, password protection is activated. To remove password protection, enter an empty password (000).

When accessing a password-protected parameter, the user is automatically prompted for its introduction. Only after correctly entering the password, it is possible to change the corresponding parameters.

	Menu item	Sub-menu item	poss. setting	Notes / Comments
P7.1	Password	Reading PWD	3-digit	Status display and history data are still viewable; access to the parameter menu is locked until this password is introduced. Parameter menu scrolling is only enabled after entering the password. Electric motor operation is unlocked.
P7.2	Password	Writing PWD	3-digit	Status display, history data and parameter menu can be viewed. However, parameters become read-only.
P7.3	Password	Bluetooth PWD	15-digit	password for the Bluetooth connection, empty password deactivates the password request.

7.7 Parameter group: Position

In addition to OPEN and CLOSED end positions, you may define intermediate positions. These can be used as feedback signals for the binary outputs or as target value for fix position approach.

CAUTION: If you change the end positions (see section 7.1, page 25), intermediate positions are retained percentage-wise, i.e., the absolute positions of the intermediate positions change.

	Menu item	Sub-menu item	Poss. setting	Notes / comments
P8.1	Position	Intermed.pos.1	TEACHIN 0...100%	Position value of intermediate position 1
P8.2	Position	Intermed.pos.2	TEACHIN 0...100%	see above
P8.3	Position	Intermed.pos.3	TEACHIN 0...100%	see above
P8.4	Position	Intermed.pos.4	TEACHIN 0...100%	see above
P8.5	Position	Emerg.position	TEACHIN 0...100%	Position value of the emergency position.
P8.6	Position	Hysteresis	0.1...10.0%	Hysteresis range of intermediate positions. Within this hysteresis, no repositioning occurs upon reaching the intermediate positions (option: fix position approach). Furthermore, the output functions for position = intermediate position are active within this range (see P10.1 ...).

7.8 Parameter group: Binary inputs

The controller is equipped with 5 freely configurable binary inputs. Please find further information on technical data of the binary inputs in section 20.2, page 57. Binary inputs are also effective during actuator control via Profibus (option).

Default binary inputs are as follows:

Input 1: OPEN
Input 2: CLOSED
Input 3: STOP
Input 4: EMERGENCY OPEN
Input 5: EMERGENCY Closed

	Menu item	Sub-menu item	poss. setting	Notes / comments
P9.1	Bin. Input	Input 1	0: no function	this input has no function
			1: Open	OPEN command in REMOTE mode (selector switch in position REMOTE).
			2: Closed	CLOSED command in REMOTE mode (selector switch in position REMOTE).
			3: Stop	STOP command in REMOTE mode (selector switch in position REMOTE).

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	Menu item	Sub-menu item	poss. setting	Notes / comments
			4: Open Self-hold	Self-hold for OPEN, i.e., a short pulse is sufficient and the actuator moves then into the end position. Use the STOP command to stop the actuator.
			5: Closed Self hold	Self-hold for CLOSED, see OPEN SELF-HOLD
			6: Emergency Open	Superimposed run command; run the actuator in direction OPEN regardless of whether the selection switch is set to REMOTE or LOCAL operation
			7: Emergency Closed	Superimposed run command; run the actuator in direction CLOSED regardless of whether the selection switch is set to REMOTE or LOCAL
			8: Release	The actuator may be operated only with a switched signal. Both in local and remote operation
			9: Open/Closed	The actuator moves towards OPEN if input is active and towards CLOSED otherwise
			10: Close/Open	The actuator moves towards CLOSED if input is active and towards OPEN otherwise
			11: Positioner	Release of the postioner
			12: Open inv.	As open but active low
			13: Close inv.	As CLOSED but active low
			14: Stop inv.	As STOP but active low
			15: Open Self-Hold.inv	As Open Self-Hold but active low
			16: Closed Self-Hold inv	As Closed Self-Hold. but active low
			17: Emergency-Open inv.	As Emergency-Open but active low
			18: Emergency-Closed inv.	As Emergency-Closed but active low
			19: Block	with activated (switched) signal, the actuator is locked for operation also in local mode
			20: Contoller lock	Positioner lock
			21: Release Local	The actuator may be operated only with a switched signal.
			22: Block Local	as Release Local but active low
			23: Lock Open	Trigger lock OPEN (in LOCAL and REMOTE mode). Actuator moves with the highest priority to OPEN; command continues internally active after reaching the end position OPEN. Dropping only with LOCK OFF, Supply OFF or operating mode OFF.
			24: Lock Closed	Trigger lock CLOSED (in LOCAL and REMOTE mode). Actuator moves with the highest priority to CLOSED; command continues internally active after reaching the end position CLOSED. Dropping only with LOCK OFF, Supply OFF or operating mode OFF.
			25: Lock Off	Drop the lock
			26: Failsafe	Trigger the failsafe function in all operating modes (only functional in Failsafe actuators).
			27: Failsafe inv.	As Failsafe, but active low
			28: Lock Open inv.	As Lock Open, but active low
			29: Lock Closed inv	As Lock Closed, but active low
			30: Lock Off inv.	As Lock Off, but active low

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	Menu item	Sub-menu item	poss. setting	Notes / comments
			31: Intermediate position1	Approach intermediate position 1 (P8.1) in REMOTE mode (fix position approach). There is no repositioning upon reaching the intermediate position within the hysteresis (see P8.6). Higher priority than intermediate position 2, 3 and 4
			32: Intermediate position2	As intermediate position 1, but with higher priority than intermediate positions 3 and 4
			33: Intermediate position3	As intermediate position 1, but with higher priority than intermediate position 4
			34: Intermediate position4	As intermediate position 1, but with lowest priority.
			35: Emergency position	Approach emergency position (P 8.5). As intermediate position 1, but with higher priority than intermediate positions 1, 2
			36: Intermediate position1 inv.	As Intermediate position 1, but active low
			37: Intermediate position2 inv.	As Intermediate position 2, but active low
			38: Intermediate position3 inv.	As Intermediate position 3, but active low
			39: Intermediate position4 inv.	As Intermediate position 4, but active low
			40: Emergency position inv.	As Emergency position, but active low
			41: Travel Open	reserved for future use
			42: Travel Close	reserved for future use
			43: Travel Open inv.	reserved for future use
			44: Travel Close inv.	reserved for future use
			45: Failsafe lock	reserved for future use (only for Failsafe actuators)
			46: Failsafe lock inv.	reserved for future use (only for Failsafe actuators)
P9.2	Bin. Input	Input 2	see Input 1	
P9.3	Bin. Input	Input 3	see Input 1	
P9.4	Bin. Input	Input 4	see Input 1	
P9.5	Bin. Input	Input 5	see Input 1	

7.9 Parameter group: Binary outputs

The controller is equipped with 8 freely configurable binary outputs. Please find further information on technical data of the binary outputs in section 20.1, page 57. Provided with external supply, binary outputs are optically isolated from the rest of the controller.

Default binary outputs are as follows:

Output 1: Ready	Output 2: End position OPEN
Output 3: End position CLOSED	Output 4: Run OPEN
Output 5: Run CLOSED	Output 6: Torque
Output 7: LOCAL	Output 8: REMOTE

	Menu item	Sub-menu item	poss. setting	Notes / comments
P10.1	Bin. Output	Output 1	0: User defined	Optional
			1: Ready	Actuator is ready
			2: Fault	General fault; actuator is not ready
			3: Open	Actuator is in open position

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	Menu item	Sub-menu item	poss. setting	Notes / comments
			4: Closed	Actuator is in closed position
			5: Running Open	Actuators runs in direction Open
			6: Running Closed	Actuators runs in direction Closed
			7: Runing	Actuator is running in either Open or Closed
			8: Torque Open	Switch-off torque was reached in Open direction, actuator has been switched off
			9: Torque Closed	Switch-off torque was reached in Closed direction, actuator has been switched off
			10: Torque	Switch-off torque was reached in either Closed or Open direction
			11: Travel Open	The Open end position has been reached
			12: Travel Closed	The Closed end position has been reached
			13: Pos. > Int.1	Position > Intermediate position 1
			14: Pos. < Int.1	Position < Intermediate position 1
			15: Pos. > Int.2	Position > Intermediate position 2
			16: Pos. < Int.2	Position < Intermediate position 2
			17: Pos. > Int.3	Position > Intermediate position 3
			18: Pos. < Int.3	Position < Intermediate position 3
			19: Pos. > Int.4	Position > Intermediate position 4
			20: Pos. < Int.4	Position < Intermediate position 4
			21: Local	Local oerating mode (selector switch in position)
			22: Remote	Remote operating mode (selector switch in position Remote)
			23: Off	Off operating mode (selector switch in the Off position)
			24: no function	no function
			25: motor error	The motor temperature sensor has reported an error
			26: Always	Signal is always on
			27: Never	Signal is always off
			28: Bin. Input 1	Forwarding of binary input to output
			29: Bin. Input 2	Forwarding of binary input to output
			30: Bin. Input 3	Forwarding of binary input to output
			31: Bin. Input 4	Forwarding of binary input to output
			32: Bin. Input 5	Forwarding of binary input to output
			33: Torque Open ma.	As Torque OPEN, but it will supress (mask) this signal in the end position upon torque-dependent switch-off.
			34: Torque Closed ma.	As Torque CLOSED, but it will supress (mask) this signal in the end position upon torque-dependent switch-off.
			35:Ready Remote	Ready and Remote operating mode
			36: Ready Local	Ready and Local operating mode
			37: Ready Local/remote	Ready and Local or Remote mode
			38: Lock Open	Lock OPEN is enabled. OPEN command is internally queued with the highest priority and will not be dropped even in the end position.
			39: Lock Closed	Lock CLOSED is enabled. CLOSED command is internally queued with the highest priority and will not be dropped even in the end position.
			40: Failsafe OK1	Failsafe OK (only for Failsafe actuators)
			41: Failsafe OK2	Failsafe OK and Ready (only for Failsafe actuators)
			42: Failsafe OK3	Failsafe OK,Ready and Remote (only for Failsafe actuators)
			43: Lock	Lock Open or Lock Closed is enabled.
			44: Ready/TorqueOK	Actuator is ready and no torque switch-off

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	Menu item	Sub-menu item	poss. setting	Notes / comments
			45: Ready / Remote / TorqueOK	Actuator is ready for operation in REMOTE mode and no torque switch-off
			46: Pos.=Int1	Position = Intermediate position 1. The width of the interval is set with the parameter P8.6.
			47: Pos.=Int2	Position = Intermediate position 2. The width of the interval is set in parameter P8.6.
			48: Pos.=Int3	Position = Intermediate position 3. The width of the interval is set in parameter P8.6.
			49: Pos.=Int4	Position = Intermediate position 4. The width of the interval is set in parameter P8.6.
			50: Pos.=EmergPos	Position = emergency position. The width of the interval is set in parameter P8.6.
			51: Bus Bit 1	In existing bus interface (hardware option), the output is set according to the selected bit bus. [3)]
			52: Bus Bit 2	
			53: Bus Bit 3	
			54: Bus Bit 4	
			55: Bus Bit 5	
			56: Bus Bit 6	
			57: Bus Bit 7	
			58: Bus Bit 8	
			59: Virtual 1	Configurable output function
			60: Virtual 2	
			61: Virtual 3	
			62: Virtual 4	
			63: Line voltage OK	Supply voltage for the motor is OK
			64: Control voltage OK	The auxiliary voltage for the SMARTCON control is OK. This function is only available if the auxiliary voltage output is not switched on (P6.5 to 0).
			65: Oil pressure OK	The oil pressure is higher than the minimum pressure (P6.10).
			66: Oil level OK	The oil level is OK.
			67: pump OK	The temperature sensor in the pump motor and the external motor protection have not tripped.
4-5 P10.2	Bin. Output	Output conf. 1	0: normal	Output 1 is set to normal, i.e. if the condition in point P10.1 is met, Output 1 is set to HIGH (active HIGH).
			1: inverted	If the condition in point P10.1 is met, Output 1 is set to LOW (active LOW).
			2: norm. flashing	If the condition in point P10.1 is met, Output 1 starts blinking (active HIGH).
			3: inv. flashing	If the condition in point P10.1 is not met, Output 1 starts blinking (otherwise it is set to HIGH).
P10.3	Bin. Output	Output 2	see Output 1	
P10.4	Bin. Output	Output 2 Konf.	see Output 1 conf.	
P10.5	Bin. Output	Output 3	see Output 1	
P10.6	Bin. Output	Output 3 Konf.	see Output 1 conf.	
P10.7	Bin. Output	Output 4	see Output 1	
P10.8	Bin. Output	Output 4 Konf.	see Output 1 conf.	
P10.9	Bin. Output	Output 5	see Output 1	
P10.10	Bin. Output	Output 5 Konf.	see Output 1 conf.	
P10.11	Bin. Output	Output 6	see Output 1	
P10.12	Bin. Output	Output 6 Konf.	see Output 1 conf.	

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	Menu item	Sub-menu item	poss. setting	Notes / comments
P10.13	Bin. Output	Output 7	see Output 1	
P10.14	Bin. Output	Output 7 Konf.	see Output 1 conf.	
P10.15	Bin. Output	Output 8	see Output 1	
P10.16	Bin. Output	Output 8 Konf.	see Output 1 conf.	

CAUTION: When using the parameters torque-dependent OPEN or torque-dependent CLOSED (see section 7.1, page 25, items P1.3 and P1.4), the actuator will only be open or closed when the set torque and the associated end position is reached. If the end position is not reached, a torque error is reported (see section 6.2.2, page 20).

7.10 Parameter group: Position output (optional)

Position output is used to indicate the current position of the actuator using 0/4. . . 20 mA; it can be retrofitted using a Smartcode.
If this option is not enabled, the menu point shows the message "inactive".
No adjustment to the end positions or the travel is required. Adjustment is automatically performed during the configuration of travel limit positions (see section 7.1, page 25).
No further settings are necessary for torque-dependent switch-off, because the controller exclusively uses travel limit positions for the calculation, regardless of whether this is defined by the torque or the travel limit positions.

The factory default setting is:
4 mA at 0% position 20 mA at 100% position

	Menu item	Sub-menu item	poss. setting	Notes / comments
P11.1	PositionOutput	Function 1	0: off	mA output disabled
			1: Position	mA output corresponds to the actual position value.
			2: Pos. Valvechar.	mA output corresponds to the actual position value taking into account the valve characteristic.
			3: Torque 1	mA output corresponds to the actual torque value.
				torque = 100% Close: mA output = start
				torque = 0%: mA output = center
				torque = 100% Open: mA output = end
			4: Torque 2	mA output corresponds to the actual torque value.
				torque = 100% Close: mA output = end
				torque = 0%: mA output = start
				torque = 100% Open: mA output = end
			5: Torque 3	mA output corresponds to the actual torque value.
				torque = 150% Close: mA output = start
				torque = 0%: mA output = center
				torque = 150% Open: mA output = end
			6: Torque 4	mA output corresponds to the actual torque value.
				torque = 150% Close: mA output = end
				torque = 0%: mA output = start
				torque = 150% Open: mA output = end
P11.2	Position output	Begin 1 (at 0%)	0. . . 20.5 mA {4 mA}	mA value for the Closed (0%) position
P11.3	Position output	End 1 (at 100%)	0. . . 20.5 mA {20 mA}	mA value for the On (100%) position
P11.4	Position output	Calib. 20 mA 1	-10%. . . +10%	Calibrating the output position during the setting of this parameter will output a 20 mA (100%) signal. Use this parameter to calibrate accurately the 20 mA output signal (e.g., if you measure 19.8 mA at the output, just add 1% (0.2 mA. . . 1% of 20 mA) to the displayed value).
P11.5	Analog output	Function 2	see Function 1	

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	Menu item	Sub-menu item	poss. setting	Notes / comments
P11.6	Analog output	Begin 2 (at 0%)	see Begin 1	
P11.7	Analog output	End 2 (at 100%)	see End 1	
P11.8	Analog output	Calib. 20 mA 2	see Calib. 20 mA 1	

7.11 Parameter group: Step mode

Step mode operation can be used to extend the operating time in certain ranges or for the whole travel; it is available in local, remote and emergency mode.
Step mode operation can be activated individually for the directions OPEN and CLOSED.
Cycle start, cycle end, cycle duration and interval time can be set separately for both directions (see Figure 67, page 36).

	Menu item	Sub-menu item	poss. setting	Notes / comments
P12.1	Step mode function	Mode	0: disabled	Step mode operation is disabled
			1: enabled	Step mode operation is enabled in LOCAL, REMOTE and EMERGENCY operation
			2: Local only	Step mode mode is only enabled in LOCAL mode
			3: Remote only	Step mode mode is only enabled in REMOTE mode
			4: Local + Remote only	Step mode mode is enabled in REMOTE and LOCAL mode
P12.2	Step mode function	Start Open	0. . . 100%	In OPEN direction, position in % from which the step mode operation should start.
P12.3	Step mode function	End Open	0. . . 100%	In OPEN direction, position in % of which the step mode operation should end.
P12.4	Step mode function	Runtime Open	0.1. . . 60	Runtime in OPEN direction
P12.5	Step mode function	Pause time Open	0.2. . . 60	Pause time in OPEN direction
P12.6	Step mode function	Start Closed	0. . . 100%	In CLOSED direction, position in % from which the step mode operation should start.
P12.7	Step mode function	End Closed	0. . . 100%	In CLOSED direction, position in % of which the step mode operation should end.
P12.8	Step mode function	Run time Closed	0.1. . . 60	Runtime in Closed direction
P12.9	Step mode function	Pause time	0.2. . . 60	Pause time in Closed direction
P12.10	Step mode function	Timebase	0: Seconds	Time basis for run and pause times
			1: Minutes	
P12.11	Step mode function	Speed adaption	0:	Speed adaption not activated. Normal step mode function.
			1:	Speed adaption is activated. The speed is reduced according to the runtime and pause time in the step mode range. (Example: Running time 1 sec and pause time 1 sec results in half the speed). If the minimum speed is undershot, the actuator clocks in the converted ratio with the minimum speed. The speed adjustment is only applicable to actuators of the type CM and AB CSC.

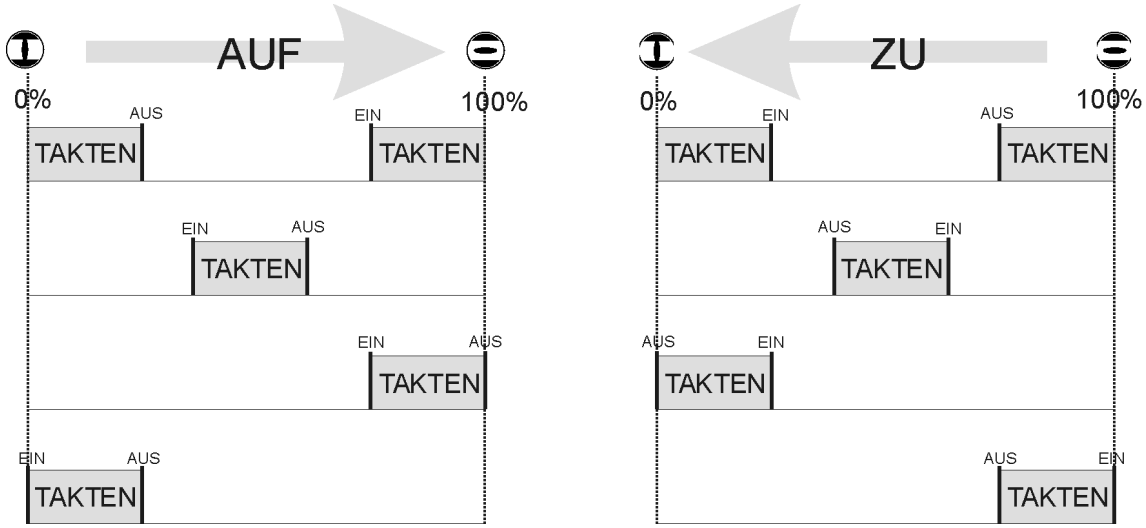

Figure 67

NOTE: It is important to ensure that the mode of operation is not exceeded!
The running info on the actuator (see section 6.2.2, page 20) only flashes while the drive is running, i.e. during the break, no flash!

7.12 Parameter group: Positioner (optional)

The positioner SR option is used to control the electric actuator by means of a set point input 0/4...20 mA signal. The SR helps control the position of the actuator, i.e. the positioner ensures that the actual value and thus the position of the actuator matches the desired set point.

	Menu item	Sub-menu item	poss. setting	Notes / comments
P13.1	Positioner	Function	off	Positioner disabled
			1: Position	mA input for the position setpoint
			2: Pos. valvechar.	mA input for the position setpoint, taking into account the valve characteristic
P13.2	Positioner	Begin (at 0%)	0...20.5 mA {4.0 mA}	mA value of the setpoint for the CLOSED (0%) position
P13.3	Positioner	End (at 100%)	0...20.5 mA {20.0 mA}	mA value of the setpoint for the OPEN (100%) position
P13.4	Positioner	Dead band	0.1...10.0% {1.0%}	Tolerance range for the control deviation (set point position – actual position) where no adjustment occurs. The deadband should not be set too low to prevent actuator oscillation.
P13.5	Positioner	Gain	1...100% {100%}	The gain (gradient) affects the positioning close to the target position. The smaller the gain selected (e.g. 20%), the earlier the actuator starts reducing its speed in case of speed variable actuators on approaching the target position. In case of actuators with fixed speed (reversing starters), the speed reduction is done by pulsing (also see params P13.9 and P13.10). This leads to better positioning (smaller reachable deadband). A 100% setting disables this gradient.
P13.6	Positioner	Live zero detect.	Ignore	The setpoint monitoring (monitoring the setpoint to below approximately 2 mA = loss of signal) is disabled.
			1: Stop	Actuator stops on signal failure.
			2: Open	On signal failure, actuator moves the OPEN position.
			3: Close	Actuator moves on signal failure to the CLOSED position.
			4: Emerg.pos.	On signal failure, the actuator moves the defined emergency position (see parameter P13.7).
			5: Emerg. PID	reserved for future use

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	Menu item	Sub-menu item	poss. setting	Notes / comments
P13.7	Positioner	Emergency pos.	0. . . 100% {50,0%}	Determination of the emergency position (Can also be set in the menu P8.5)
P13.8	Positioner	Calib. setpoint	-10% . . . +10%	Calibration value for the mA setpoint. Calibration process: By applying 20 mA on the setpoint input, this parameter is corrected until the readout matches 20 mA.
P13.9	Positioner	Min. impulse	{0,2 s}	Variable speed actuators (Actusmart CM and Smartcon CSC FU): Without function Fixed speed actuators (Smartcon CSC): Minimum activation time of the reversing contactors. For very small activation times (<0.3. . . 0.5 s), the motor will be switched off during start-up process, which significantly increases mechanical wear on reversing contactors. With frequent periods of very small activation times (restless loop, small dead zone, clocking near to the target value), we therefore recommend electronic reversing contactors.
P13.10	Positioner	Period	{2.0 s}	Variable speed actuators (Actusmart CM and Smartcon CSC FU): Without function Fixed speed actuators (Smartcon CSC): This parameter is only relevant in Step mode when approaching the target position (parameter gain smaller than 100%) and determines the period of a run / pause cycle.
P13.11	Positioner	Begin pos. (a0)	0.0. . . 25.0% {2.0%}	Smallest controllable position other than the end position CLOSED. The range 0% . . . a0 will be just passed through. Use the parameter a0 to define the beginning of the allowable control range of the valve (e.g., blind spot for ball segment valves, etc.).
P13.12	Positioner	End pos. (e0)	75.0. . . 100.0% {98.0%}	Largest controllable position other than the end position OPEN. The area e0 . . . 100% is just passed through. Use the parameter e0 to define the end of the allowable control range of the valve.
P13.13	Positioner	Begin setp. (a1)	0.0. . . 25.0% {2.0%}	Below this value, the end position CLOSED is controlled. In the range 0% . . . a1 cannot be controlled (end position tolerance). The initial setpoint a1 is associated with a small hysteresis (1/4 of the deadband).
P13.14	Positioner	End setp. (e1)	75.0. . . 100.0% {98,0%}	Above this value, the end position OPEN is controlled. The range e1. . . 100% cannot be controlled (end position tolerance). The final setpoint e1 is associated with a small hysteresis (1/4 of the deadband).
P13.15	Positioner	Calib.setpoint offset	-10% . . . +10%	Calibration of zero for the input setpoint. 1% = 0.2 mA

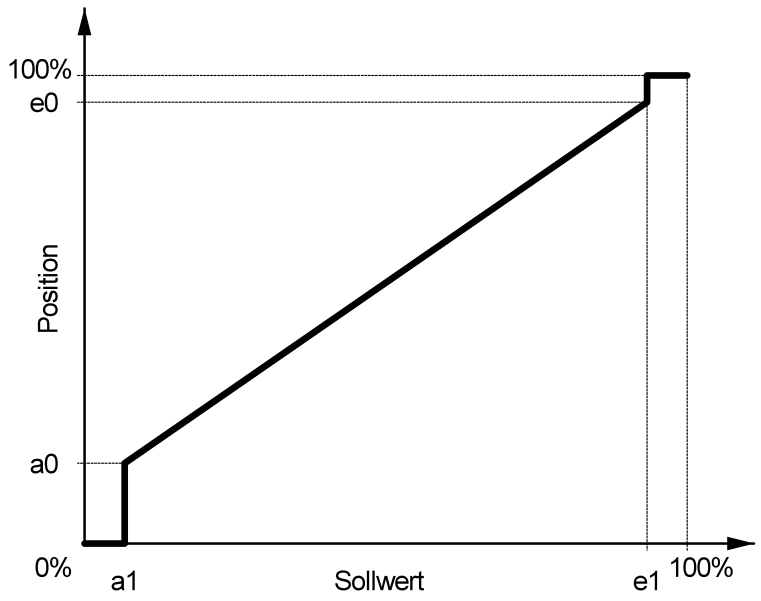

Figure 68: *Assigning the position to the setpoint*

7.13 Parameter group: PID controller (optional)

The optional PID controller is used for controlling an external actual value (process variable) to a setpoint using 0/4. . . 20 mA signal by readjusting the actuator.

	Menu item	Sub-menu item	poss. setting	Notes / comments
P14.1	PID-controller	Function	0: disabled	PID controller disabled
			1: Position	The output of the PID controller corresponds to the position setpoint of the actuator. The positioning (tracking of the actual position to the setpoint) is done by the positioner (see section 7.12).
			2: Speed	The output of the PID controller corresponds to the speed of the actuator (speed mode is only possible for Actusmart CM and Smartcon CSC FU!). There is no adjustment with the positioner.[4)]
			3: Speed	The output of the PID controller corresponds to the change of the position setpoint (speed) of the actuator. The positioning (tracking of the actual position to the setpoint) is done by the positioner (see section 7.12). Hence a control mode similar to the Speed mode (see Setting 2, above) is possible also for actuators with constant speed.[5)]
P14.2	PID-controller	External Setpoint	0: fixed	The PID controller uses an internal, fixed setpoint (see param P14.3).
			1: external	The PID controller uses the external setpoint. Adjust this setpoint with the params P13.2 and P13.3 (see section 7.12).
P14.3	PID-controller	Fixed setpoint	0. . . 100%	Specification of the internal fixed setpoint
P14.4	PID-controller	Start (at 0%)	0. . . 20.5 mA	mA value at 0% of the external actual value
P14.5	PID-controller	End (at 100%)	0. . . 20.5 mA	mA value at 100% of the external actual value
P14.6	PID-controller	Gain (P)	-50.0. . . +50.0	Gain (proportional value) of the PID-controller. A negative value reverses the effective direction of the PID-controller, e.g.: Positive gain: The actuator opens when the desired value is greater than the external actual value. Negative gain: The actuator closes when the desired value is greater than the external actual value.

continued on next page

[4)] from firmware 1.338
[5)] from firmware 1.338

continued from previous page

	Menu item	Sub-menu item	poss. setting	Notes / comments
P14.7	PID-controller	Reset time (I)	0. . . 100.0 s	The shorter the reset time (integral time, integral value), the stronger the effect of the integral component of the PID-controller. Values below 1.0 will disable the integral component.
P14.8	PID-controller	Lead time (D)	0. . . 100.0 s	The larger the lead time (differential/derivative value), the stronger the effect of the dervative component of the PID-controller. To reduce the influence of noise, a first-order lag element with 1 sec time constant is added (DT_1) .
P14.9	PID-controller	Offset	-200. . . +200%	The offset value will be added to the output value of the PID controller.
P14.12	PID-controller	Live zero detect.	0: Ignore	The monitoring of the external actual value is disabled.
			1: Stop	Actuator stops on signal failure of external. actual value
			2: Open	On signal failure of external actual values, actuator moves to the OPEN position.
			3: Closed	On signal failure of external actual values, actuator moves to the CLOSED position.
			4: Emergency position	On signal failure of external actual values, actuator moves to the EMERGENCY position (see param P13.7).
			5: Emergency PID	reserved for future use
P14.13	PID-controller	Calibration of ext. actual value	-10.0. . . +10.0%	Calibration process: By applying 20 mA to the external actual value input, this parameter is corrected until the readout matches 20 mA.
P14.14	PID-controller	Process begin	-32768. . . +32767	Mantissa of the real process variable (begin of external actual value)
P14.15	PID-controller	Process end	-32768. . . +32767	Mantissa of the real process variable (end of external actual value)
P14.16	PID-controller	Process comma shift	-3. . . +3	Position of the comma for process begin/end (P14.14, P14.15), e.g.: mantissa = 200, comma shift = -2/2, process value = 2.00/20000
P14.17	PID-controller	Process unit	—	Unit of the real process variable
P14.18	PID-controller	Dead band	0.1. . . 10.0% {1.0%}	Tolerance range for the control deviation (set point – external actual value) where no adjustment occurs. [6)]

7.14 Parametergruppe: Bus-Systems (Option)

The manuals for the Bus-Systems are available in the download area on our homepage
www.schiebel-actuators.com under the tab **Quality & Service**

7.15 Parameter group: Characteristic curves (optional)

With this option, customers can enable travel-dependent torque, speed and valve characteristic curves.

7.15.1 Torque characteristic

With this characteristic curve, torque limits already set under menu item **P2-torque** (see section 7.2, page 27) can be further **reduced** depending on travel. Characteristics can be configured via the SMARTTOOL software (see Figure 69, page 40).

[6)] from firmware 1.340

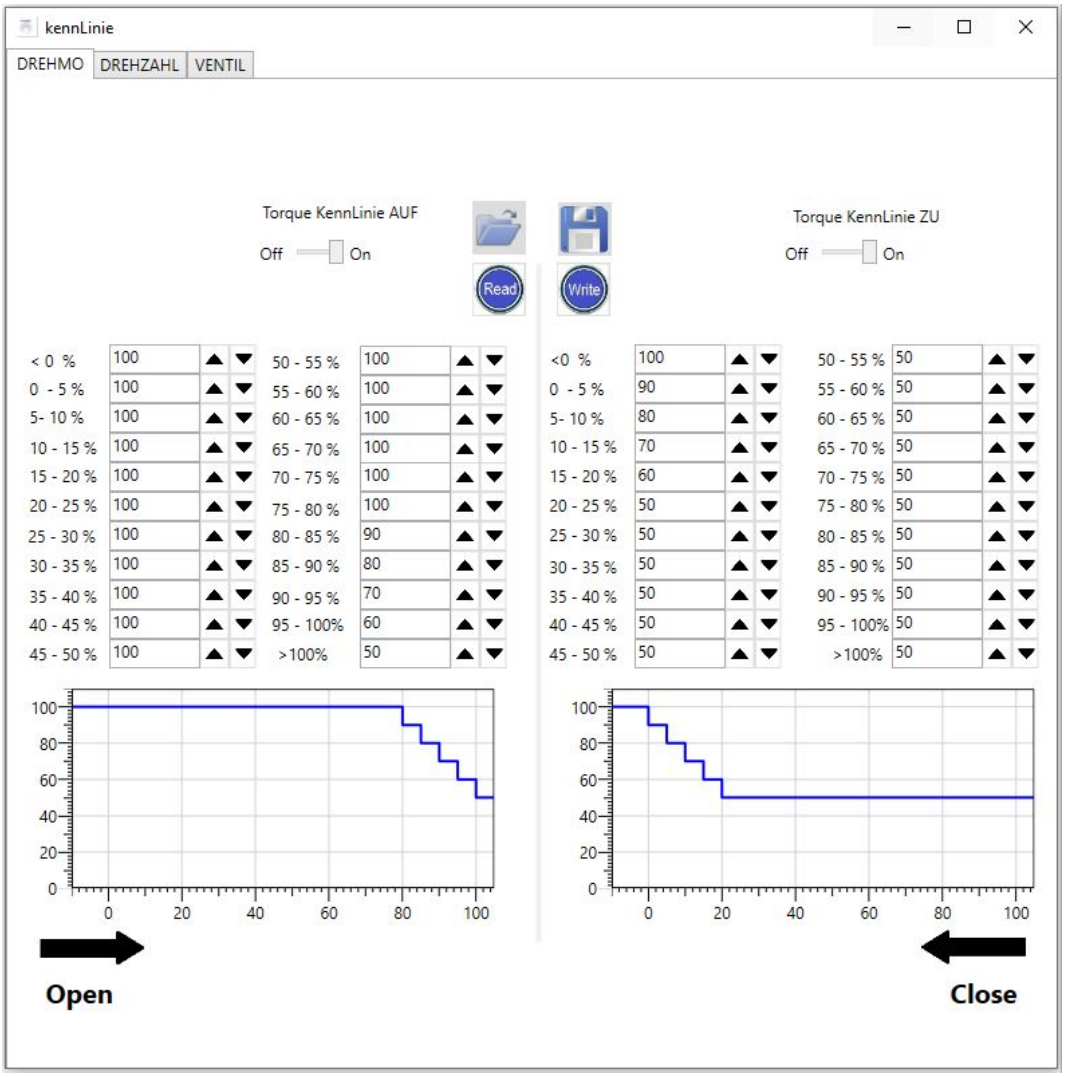

Figure 69: *Torque characteristic*

	Menu item	Sub-menu item	poss. setting	Notes / comments
P17.1	Characteristic	Torque Open	0: Off	The torque characteristic curve is disabled for the OPEN direction.
			1: On	The torque characteristic curve is enabled for the OPEN direction.
			2: Local + Remote only	The torque characteristic curve is enabled for the OPEN direction only in LOCAL and REMOTE mode (while disabled in the EMERGENCY mode).
P17.2	Characteristic	Torque Closed	0: Off	The torque characteristic curve is disabled for the CLOSED direction.
			1: On	The torque characteristic curve is enabled for the CLOSED direction.
			2: Local + Remote only	The torque characteristic curve is enabled for the CLOSED direction only in LOCAL and REMOTE mode (while disabled in the EMERGENCY mode).

7.15.2 Speed characteristic

With this characteristic curve, speed limits already set under menu item **P4-speed** (see section 7.3, page 28) can be further **reduced** depending on travel. Characteristics can be configured via the SMARTTOOL software (see Figure 70, page 41).

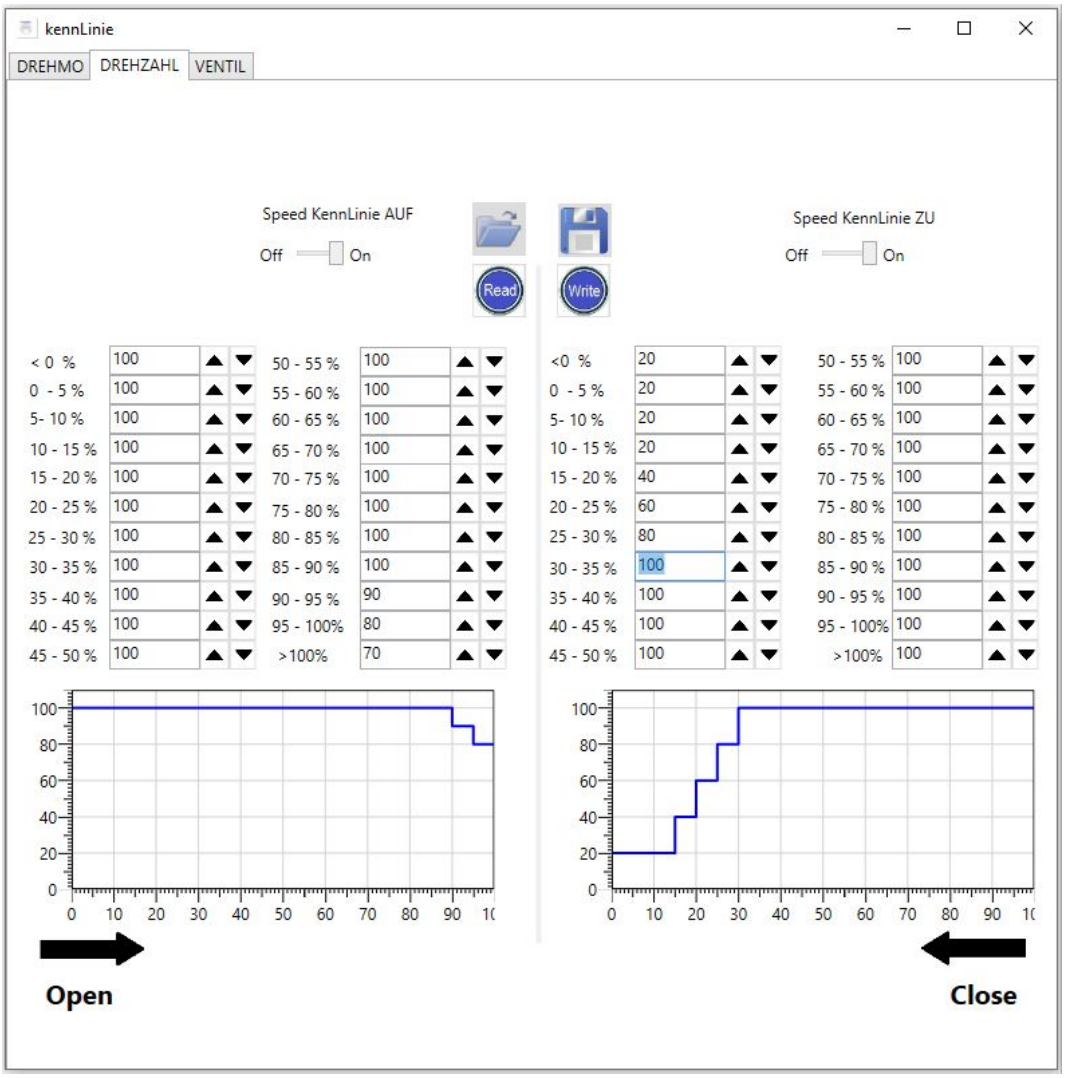

Figure 70: *Speed characteristic*

	Menu item	Sub-menu item	poss. setting	Notes / comments
P17.3	Characteristic	Speed Open	0: Off	The speed characteristic curve is disabled for the OPEN direction.
			1: On	The speed characteristic curve is enabled for the OPEN direction.
P17.4	Characteristic	Speed Closed	0: Off	The speed characteristic curve is disabled for the CLOSED direction.
			1: On	The speed characteristic curve is enabled for the CLOSED direction.

7.15.3 Valve characteristic

With this characteristic curve the mapping between the actuator position and the setpoint of the valve can be adjusted. Hence it is possible to compensate and linearize the gerneral nonlinear characteristic curves of valves. Characteristics can be configured via the SMARTTOOL software (see Figure 71, page 42).

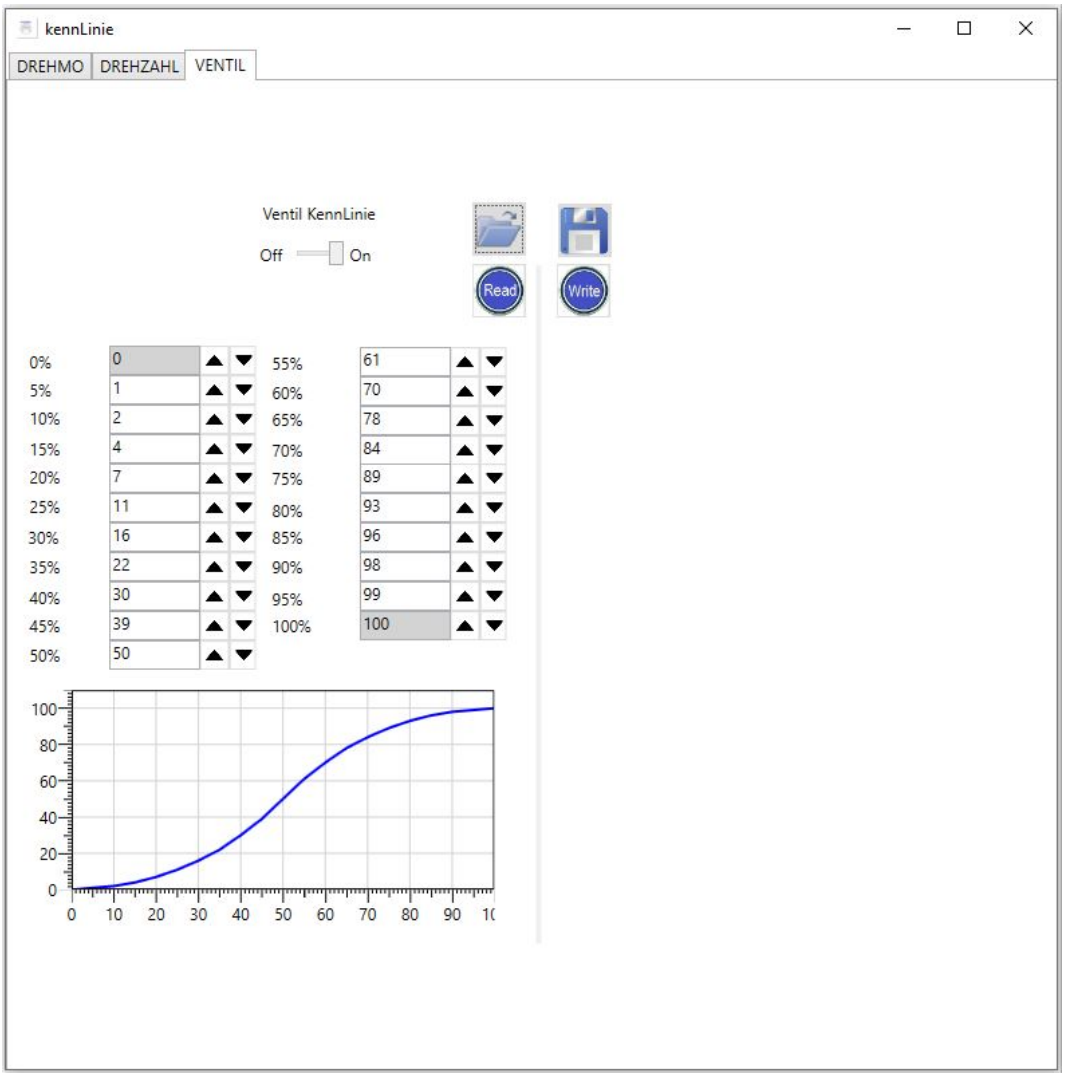

Figure 71: *Valve characteristic*

	Menu item	Sub-menu item	poss. setting	Notes / comments
P17.5	Characteristic	Valve	0: Off	The valve characteristic curve is disabled.
			1: user defined	The valve characteristic curve is enabled as configured in the SMARTTOOL.

7.16 Parameter group: Identification (optional)

This option allows entering further custom-identification parameters.

	Menu item	Sub-menu item	poss. setting	Notes / comments
P18.1	Identification	PPS number	15 digits	Used to enter a PPS number. This is displayed in the bottom line. CAUTION: Param P20.5 must be set to 0.

7.17 Parameter group: System parameters (locked)

Used for actuator configuration and not available for customers.

7.18 Parameter group: Miscellaneous

	Menu item	Sub-menu item	poss. setting	Notes / comment
P20.1	Miscellaneous	Language	0: German	Defines the menu language
			1: English	
			2: Russian	

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	Menu item	Sub-menu item	poss. setting	Notes / comments
			3: Czech	
			4: Spanish	
			5: French	
			6: Italian	
			7: Danish	
			8: Hungarian	
			9: Turkish	
			10: Greek	
			11: Polish	
			12: Serbian	
			13: Croatian	
P20.2	Miscellaneous	Smartcode		Enables additional features by entering a Smartcode
P20.3	Miscellaneous	Restore para	0:	no action
			1: Custpara -	By saving this setting, all parameters except the end positions are reset to the customer parameters.
			2: Custpara +	By saving this setting, all parameters are reset to the customer parameters.
			3: Backuppara -	By saving this setting, all parameters except the end positions are reset to the factory settings.
			4: Backuppara +	By saving this setting, all parameters are reset to the factory settings.
P20.4	Miscellaneous	Backup para	0:	no action
			1: Custpara	By saving this setting, the currently set parameters are adopted as customer parameters.
P20.5	Miscellaneous	Info line	0...31	The fourth line of the display shows various diagnostic values.
P20.6	Miscellaneous	Infrared	0: Off	The infrared connection is disabled.
			1: Infrarot	The infrared connection is active for about 3 minutes unless communication is detected.
			2: Bluetooth	The Bluetooth connection is active for about 3 minutes unless communication is detected.
			3: Infrarot+	The infrared connection is activated.
			4: Bluetooth+	The Bluetooth connection is activated.
P20.7	Miscellaneous	Menu style	0...2	different menu styles
P20.11	Miscellaneous	Daylight saving time	0: off	Normal time is activated
			1: on	Daylight saving time is activated.
			2: auto	The actuator switches automatically between Daylight saving time and Normal time.

8 Status area

The status area presents current process and diagnostic data. There data is read-only. To access the status area, move the control switch in the direction where the selector switch should be in the neutral position or in the remote position.
The status area is divided into 2 sub-areas:

- Status
- History

8.1 Status

8.1.1 Status – Bin. Outputs

Display of binary outputs: The display shows output control as opposed to output status, i.e. the supply of the binary outputs is ignored. A switched output is represented by 1.

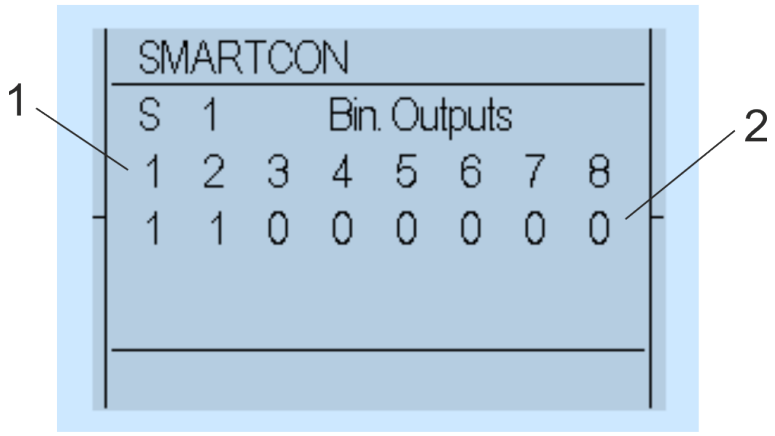


Figure 72: *1. . . Output Number, 2. . . Signal (0 = LOW; 1 = HIGH*

8.1.2 Status – Bin. Inputs

Display of binary inputs: A set input is represented by 1.

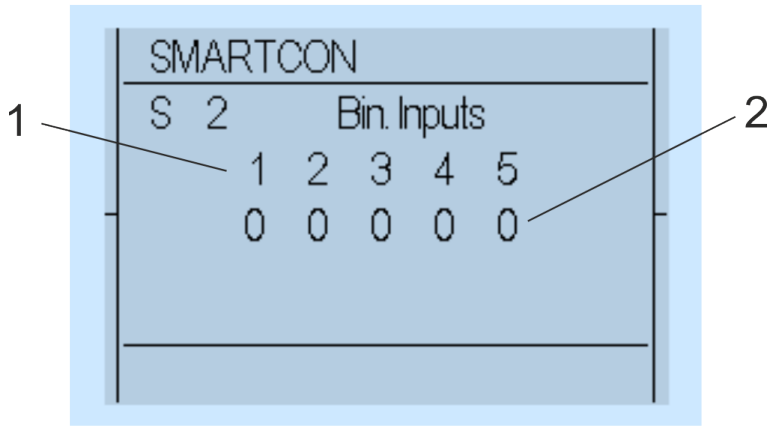


Figure 73: *1. . . Input number, 2. . . Signal (0 = LOW; 1 = HIGH)*

8.1.3 Status – Analogue values

Display of analogue values: Input 1 (In1) is used by the positioner as the setpoint; Input 2 (In2) serves as an external value for the optional PID controler. In the analogue output (out), only the control signal is shown, regardless of whether the output current actually flows or not (interruption of the current loop).

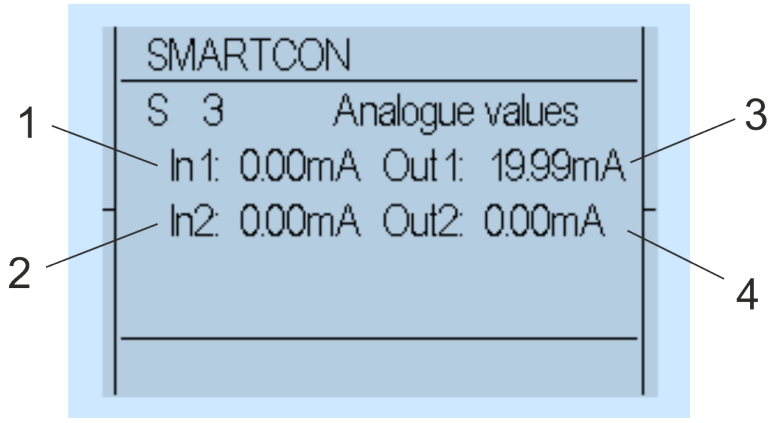


Figure 74: *1. . . Input 1, 2. . . Input 2, 3. . . Output, 4. . . all values in mA*

8.1.4 Status – Absolute values

This is used for the mechanical pre-adjustment of the position unit. (see section 5.3, page 13)

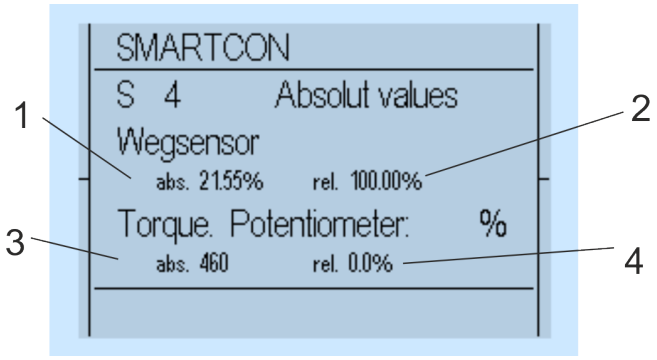


Figure 75: *1. . . absolute value of the position unit, 2. . . value for the torque unit (is factory adjusted)*

8.1.5 Status – Firmware

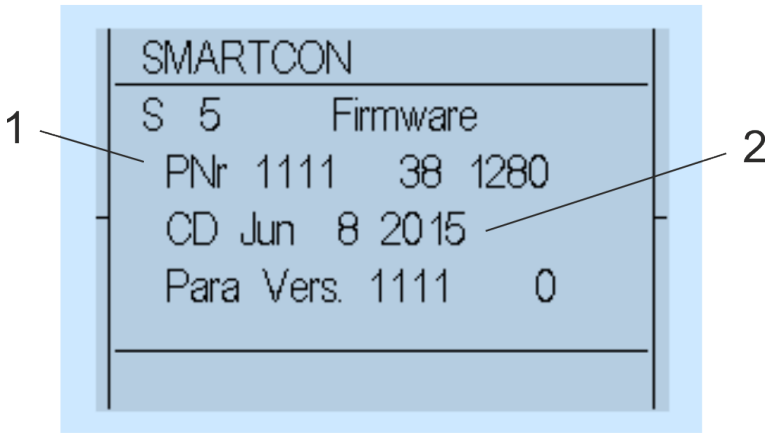


Figure 76: *1. . . Firmware, 2. . . Firmware date*

8.1.6 Status – Serial number

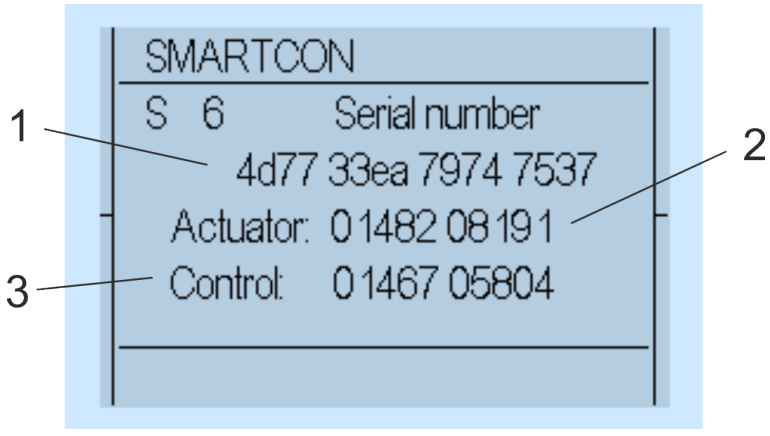


Figure 77: *1. . . serial number of the control unit, 2. . . Serial number of the actuator, 3. . . Serial number of electronics*

8.1.7 Status - meter readings

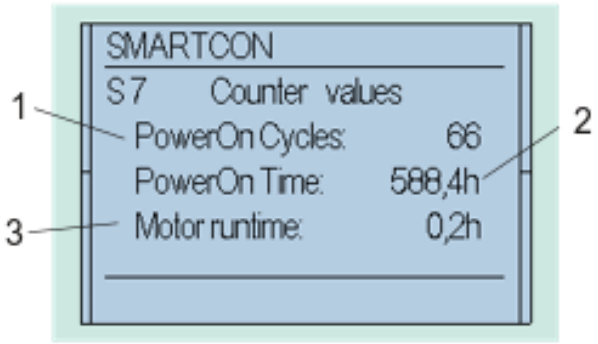


Figure 78: *1. . . power-on cycles, 2. . . operating hours, 3. . . engine duration*

8.2 History

History shows the last 20 history entries. In addition to the plain text entry, the time since the last history entry is also provided.
Please note that the actuator can only calculate time if energised. For error analysis, please refer to section 12.1, page 48.

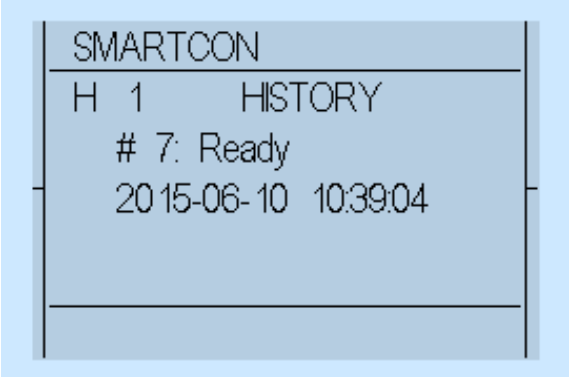


Figure 79: *History*

9 Infrared connection

For easier communication and better visualization of the menu options, the unit provides an infrared port for connection to a PC.
The required hardware (connection cable to the PC's RS-232 or USB connectors) and the corresponding software are available as options.
The SMARTTOOL software, in addition to communication with the actuator, allows the management of multiple actuators to transfer the configuration to different actuators.
This approach can greatly simplify operation.
Please refer to the SMARTTOOL software operating instructions manual for further information.

During operation, it must be ensured that the IR interface surface is protected from strong disturbances -which may otherwise compromise the communication.
Before mounting the infrared adapter, clean the surface of the infrared interface with a damp cloth.

When the infrared interface is enabled, it is indicated by Light-emitting Diode L5 (see Figure 80 section 6.2.2, page 20).The infrared interface can be enabled in the menu item P20.6.

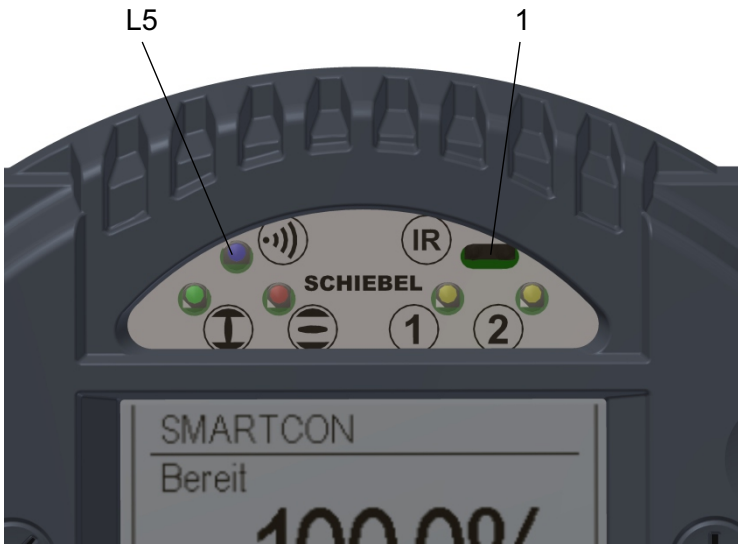


Figure 80: *1. . . Infrared connection*

10 Bluetooth Link

In addition to the infrared interface, it is also possible to configure the Control System using a Bluetooth interface.
Software required for Android equipment is available as an option.
In addition to communication with the actuator, the Android software also enables management of multiple actuators, allowing easy transfer of parameter sets to various actuators.
This approach can simplify commissioning significantly.

When the Bluetooth interface is enabled, this is indicated by the light-emitting diode L5 (see Figure 80 or capter 6.2.2, page 20). The Bluetooth interface can be enabled in menu item P20.6.

11 Maintenance

Maintenance work on open actuators may only be conducted if these are de-energized. Reconnection during maintenance is strictly prohibited.
Work on the electrical system or equipment must be carried out only in accordance with electrical regulations by a qualified electrician himself or by specially instructed personnel under the control and supervision of a qualified electrician.

Actuators are ready for use after installation. By default, the actuator is delivered filled with grease.
On-going monitoring:

- Beware of increased running noise. During long downtime periods, operate the actuator at least every 3 months.
- For actuators with output types A, B and C according to DIN 3210-A, B1, B2 and C according to DIN ISO 5210, re-lubricate at least every 6 months on existing grease fittings (see section 15.3, page 51)

Actuators are designed for installation in any position (see section 2.5, page 5). Therefore, the main body is not equipped with a level indication or a drain plug.
The replacement of the lubricant from the main body must be performed via the handwheel.

Every approx. 10,000-20,000 hours (about 5 years - section 15, page 50), depending on the workload, you must:

- Change oil/grease
- Replace seals

Check all roller bearings and the worm-wheel assembly and replace if necessary.
Check our lubricants table for recommended oils and greases. (15, page 50)

Check the cable glands at regular intervals (annually) for tightness of the cables and retighten if necessary.

If the visual inspection (eg. dust or water penetration) indicates that the effectiveness of the Sealing elements of the cable entry has suffered damage or aging, such elements have to be replaced preferably by using the original spare parts from the manufacturer of the equipment or through cable entries of comparable quality as well as the same ex- or IP protection class.

12 Troubleshooting

The electrical actuation is inhibited by the actuator, if an error occurs. Upon warning or error, The bottom line of the display will show the corresponding, plain text description. This event will also be entered into the history (see section 8.2, page 46).

12.1 Error list

CAUTION: Each error has a unique error number. Each error also has its separate "OK" message in the history after the fault has gone.

Error	Description
#3: Mot. temp. warn. #19: Mot. temp. warn. OK	The motor temperature is in the critical range although the actuator remains fully functional.
#4: Mot. temp. trip. #20: Mot. temp. OK	Overtemp in motor, fault on Basis or BLDC, On Basis: loss of main power (3x400V) or cable break between CSC and motor; on BLDC: cable break between BLDC and motor.
#5: Phase sequ. error #6: Phase sequ. OK	Cause on Basis: Active phase sequence detection on single phase actuators, loss of main power while connected to external 24 VDC auxiliary voltage, or loss of phase L2.
#7: Ready	Written to the history after all errors are gone.
#8: Power On	Is written to the history after power on the actuator, even if there are some errors.
#9: Power supply error #21: Power supply OK	No power supply to the power electronics (when the controller is powered from the auxiliary power input). Defect of power electronics – please contact the manufacturer.
#11: Failsafe error #12: Failsafe OK	Communication error between Failsafe board and Logic, loss of external 24 V Failsafe Voltage, or overtemp. on Failsafe brake.
#13: Manual override #14: Manual override off	Manual override on Failsafe activate (visible in status S4), cable/switch broken.
#17: Travel error #18: Travel OK	The travel unit is outside the permitted range (potentiometer fault on Basis), cable broken, or multiturnsensor calibration lost on CM – please contact the manufacturer.
#22: Torque error #23: Torque OK	Potentiometer fault on Basis, or cable broken.
#24: Bus error #25: Bus OK	No communication with the optional bus system.
#26: Bus Watchdog #27: Bus Watchdog OK	Watchdog for bus communication has reacted.
#28: Undervoltage> Warning #29: Voltage OK	The input voltage is below the regular voltage range, but motor operation is still possible.
#32: Internal Comm.L> error #33 Internal Comm.L> OK	Communication error between Logik and Basis/BLDC, cable broken between boards, or board defect.
#34: Internal Comm.D> error #35: Internal Comm.D> OK	Communication error between Display and Logik, cable broken between boards, boards defect, or firmware update on Logik not properly done.
#36: Failsafe not ready #37: Failsafe ready	Failsafe voltage OK and Failsafe not initialized (LUS not tensioned).
#38: Battery low #39: Battery OK	Battery on Display board is empty, loss of time/date or counter values possible.
#44: Inverter error Para #45 Inverter OK Para	BLDC parameter error.
#46: Analog Input 1 Failure #47: Analog Input 1 OK	SRG active, Positioner live zero detection activated, no setpoint value recognized.
#48: Analog Input 2 Failure #49: Analog Input 2 OK	Ext. setpoint active, Ext. setpoint live zero detection activated, no Ext. setpoint value recognized

Error	Description
#56: Internal Comm.E> error #57: Internal Comm.E> OK	Communication error between Logik and Failsafe (external connection) – please contact the manufacturer.
#58: Undervoltage> Warning	The input voltage is too low. The motor is switched off, until the input voltage is in the regular voltage range.
#59: Undervoltage> Switchoff	The input voltage dropped below the lower threshold multiple times. The motor is turned off for 5 minutes. This error can be acknowledged by switching the selector switch to OFF or by turning the actuator off and on.
#60: Overvoltage> Warning	The input voltage is over the regular voltage range, but motor operation is still possible.

Errors in case of special types

Error	Description
#30: Oil level low #31: Oil level OK	Binary input on Basis board or switch faulty.
#40: Oil pressure low #41: Oil pressure OK	Analog input (4. . . 20 mA) on Basis board faulty.
#42: Motor protection #43 Motor protection OK	Binary input on Basis board or switch faulty.

13 Fuses

Depending on the version of the SMARTCON control unit, there are fuses located in the terminal area, the dimension of the fuse is indicated next to the fuse holder.

Figure 81: *1. . . Connection compartment*

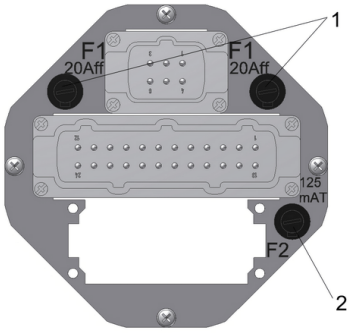


Figure 82: *size 1, electronic reversing starters (1. . . main fuses, 2. . . control fuse)*

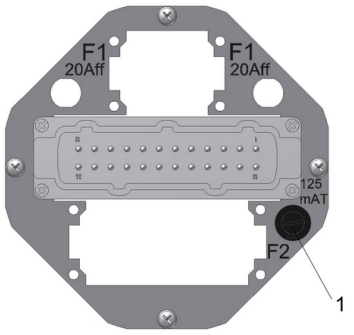


Figure 83: *size 2 (1. . . control fuse)*

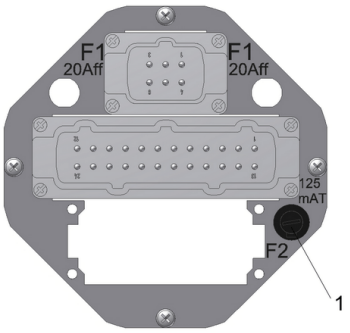


Figure 84: *size 1, up to 440VAC (1... control fuse)*

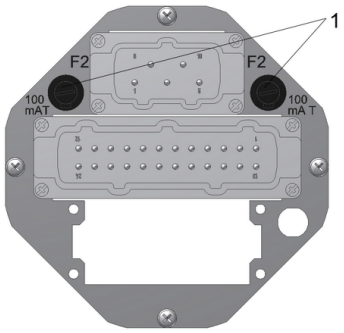


Figure 85: *size 1, larger than 440VAC (1... control fuse)*

fuse F1: main fuse before the electronic reversing starter (eW, see Figure 82)			
power of the motor	value	Recommended Type	Spare part designation
up to 1,5kW	20A FF (2 pcs)	G-fuse, brand SIBA, type 195100, ceramic 6,3 x 32mm; 20AFF,very fast acting, 500V, $I^2t = 46A^2$	C606d
3kW	12,5A T (2 pcs)	G-fuse, brand SIBA, type 189140, ceramic 6,3 x 32mm; 12,5AT; time lag, 500V, $I^2t = 1300A^2s$	C606e
fuse F2: control fuse before the control transformer			
supplyvoltage	value	Recommended Type	Spare part designation
≤ 440VAC	125mA T	G-fuse, brand SIBA, type 189140, ceramic 6,3 x 32mm; 125mA; time lag, 500V, $I^2t = 0,08A^2s$	C606g
> 440VAC	100mA T (2 Stück)	G-fuse, brand SIBA, type 189140, ceramic 6,3 x 32mm; 100mA; time lag, 500V, $I^2t = 0,05A^2s$	C606f

Actuators which are suitable for operation in explosive atmosphere, no fuses are located in the connection compartment! The control fuse is installed in the flameproof area of SMARTCON control unit and is not accessible to the user!

The logic board of the controller cover (see Figure 86, page 50) features two miniature fuses for the control lines

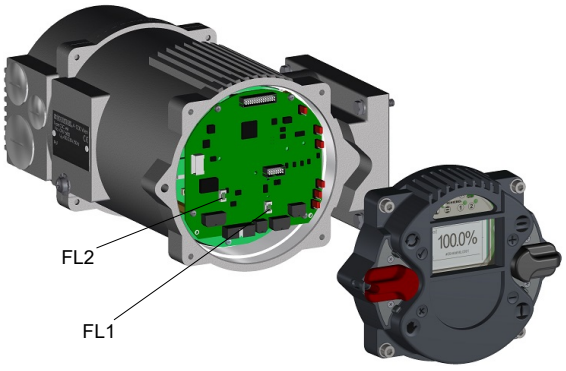


Figure 86: *FL1... Fuse for auxiliary supply, FL2... Fuse for the binary outputs*

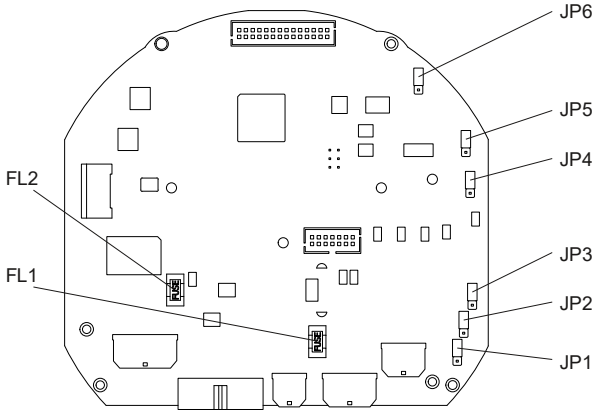


Figure 87: *Logic-Board*

Fuses on the logic board			
Fuse	Value	Manufacturer	List of spare parts
FL1	1AT	Littelfuse 454 NANO² Slo-Blo®träge	FUSE-F1
FL2	4AT	Littelfuse 454 NANO² Slo-Blo®träge	FUSE-F2

14 Spare parts

When ordering spare parts, please provide us with the serial number of the (see section 2.2, page 4). Check the separate break-down image and separate list of spare parts.

15 Recommendations of Lubricants (for all manufactures)

Please note, that safety precautions such as the use of personal protective equipment (PPA) may have to be followed! Please consult the safety datasheet (in section 8) of the product in question.

15.1 Main Casing

15.1.1 Application temperature from -35°C to +100°C

Lubricating grease DIN 51826 - GP 00 P-30

i.e. High pressure (EP), complex grease on Li soap basis:

work penetration 0.1 mm:	355 - 430
Dripping temperature:	about 200°C
NLGI grade:	00
Acid-free, not or only marginally reacting with water	

15.1.2 Application temperature from -50 to +100 °C

Lubricating oil CLP DIN 51517-3

i.e. fully synthetic high-performance industrial gear oil based on poly alpha olefins (PAOs):

Viscosity class:	ISO VG 68
Pour point:	<-55°C
Compatibility with conventional coatings and sealants	

15.1.3 Application temperature from -60 to +100 °C

Lubricating oil CLP DIN 51517-3

i.e. fully synthetic high-performance industrial gear oil based on poly alpha olefins (PAOs):

Viscosity class:	min ISO VG 32
Pour point:	<-60°C
Compatibility with conventional coatings and sealants	

15.2 Spur Gears (actuator size AB8 - AB80)

Lubricating grease DIN 51825 - KPF -1/2 G-20

i.e. High-graphite, bitumen-free permanent lubricant with outstanding EP properties:

Work penetration 0.1mm:	265 - 340.
Observe operating temperature range!	

15.3 Output Drive Type A and Spindle Drive (Linear Actuators) plus Failsafe units

Lubricating grease DIN 51825-K(P) R -40

i.e. Water-repellent complex grease based on Al-soap with high resistance to acids and alkalis:

Ambient temperature:	-40 to +85 °C
Worked penetration 0,1 mm:	310-340
Dripping point:	approximately 260 °C
NLGI-Class:	1
acid-free, not or only slightly reactive with water	
Observe operating temperature range!	

15.4 Precision Components

Lubricating grease (or spray) DIN 58396- S1

i.e. High-creeping, water-displacing, low-viscosity grease chemically neutral to copper and plastics:

Work penetration 0.1mm:	175 - 385
Dripping temperature:	over 150°C
Evaporation loss:	max. 1%
Water resistance:	Evaluation grade DIN 51807-1-40
Observe operating temperature range!	

15.5 Basic Lubricant Service Interval

On actuator maintenance, the old grease must be removed completely and replaced by a new one.

The service interval for Schiebel actuators is 10 years from the date of delivery by Fa. SCHIEBEL Antriebstechnik Gesellschaft m.b.H, A-1230 Vienna
The functionality and operating life of the lubricants is, however, dependent upon operational conditions. It may be necessary to take reduction factors into account.

Operational condition(s)	Definition	Reduction Factor(Multiplier)
On-period (OP)	(Total of motor running time)	
Extremely high OP	over 1,250 hours/year	0,5
High OP	over 500 hours/year	0,7
Extremely low OP	less than 0.5 hours/year	0,8
Ambient temperature	(Permanent or long-term)	
Extremely changing	between -10 and +50°C	0,5
Extremely high	over +50°C	0,7
Extremely low	below -25°C	0,9
Output speed	(at main shaft of actuator)	
High revolution	over 80 rev./min	0,8
Utilization factor	(with respect to nominal performance)	
Very high	over 90%	0,8
High	between 80 and 90%	0,9

Example:
Extremely low OP + extremely low ambient temperature + high revolution + utilization factor 87%
⇒0.8 x 0.9 x 0.8 x 0.9 = 0.51 reduction factor.
Lubricant maintenance interval ⇒ 10 years x 0.51 = 5.1 years (62 months).

WARNING: A thusly calculated maintenance interval does not apply to the maintenance of the output type A (threaded bushing), nor to the maintenance of the linear and spindle actuator units. These must be regularly re-greased (at least once every six months) at the lubricating nipples (see section 15.3, page 51)!

During actuator maintenance, the old lubricants must be thoroughly removed and replaced by fresh ones. **No mixing of different makes of lubricant is permitted!**

The quantities needed for lubricant service can be seen from the table below.

15.6 Lubricant Requirements

Type of actuator	Main gear	Spur gears	Output form A (Threaded bushing)	Output form B (Plug bushing)	Output form C (Claw coupling)
AB3/5	1kg (1l oil)	—	5cm^3	3cm^3	3cm^3
AB8	1kg (1l oil)	1cm^3	5cm^3	3cm^3	3cm^3
AB18	1kg (1l oil)	1cm^3	8cm^3	5cm^3	5cm^3
AB40/80	1,5kg (1,5l oil)	1,5cm^3	9cm^3	6cm^3	6cm^3
AB100/200	3,5kg (3,5l oil)	1,5 kg (1,5l oil)	23cm^3	20cm^3	20cm^3

When lubricating precision components, such quantities of lubricant are to be used as to ensure fine moistening of the sliding surfaces.

16 Training

Warning: Should problems arise on site in connection with assembly or adjustment, please contact the SCHIEBEL Antriebstechnik Gesellschaft m.b.H, Josef-Benc Gasse 4, A-1230 Vienna,
Telephone +43 (1) 66 108 or by internet www.schiebel-actuators.com, in order to avoid any incorrect operations or damage to the actuators. The Schiebel Company recommends to recruit only qualified personnel for assembly of Schiebel actuators. Upon special request by the ordering party, personnel can be trained on the premises of the Schiebel Company according to the operations listed in the instructions for use.

SEC-EINBAUERKLAERUNG-ENGLISH-V2.01-2018.04.24

17 Original Declaration of Incorporation of Partly Completed Machinery

According Machinery Directive 2006/42/EC, (Annex II, sub. B)

The maufacturer, the company:

SCHIEBEL Antriebstechnik Gesellschaft m.b.H.
Josef-Benc-Gasse 4
A-1230 Vienna

hereby declares that the partly completed machinery described below:
Electric actuators series:
AB **rAB** **exAB** **exrAB**

with optional additional components:
Smartcon CSC **Smartcon exCSC**

the following basic requirements of the Machinery Directive (2006/42/EC) are applied and fulfilled:

Annex I,	articles	1.1.2, 1.1.3, 1.1.5; 1.2.1, 1.2.1, 1.2.2, 1.2.6; 1.3.1, 1.3.2, 1.3.7; 1.5.1; 1.6.3; 1.7.1, 1.7.3, 1.7.4

The following European harmonized standards have been applied:
EN12100:2010
EN ISO 5210:1996 EN ISO 5211:2001 DIN 3358:1982

The relevant technical documentation for partly completed machinery referred to in Annex VII, Part B has been prepared. The manufactor commits to submitting the documents for the incomplete machine the competent national authority electronically upon request.

For the preparation of the technical documents is authorized:
Head of mechanical Engineering
Schiebel Antriebstechnik Gesellschaft m.b.H.
Josef-Benc-Gasse 4
A-1230 Vienna

This partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive 2006/42/EC, where appropriate.

The electric actuators as partly completed machinery is in conformity with the relevant regulations of the EU directives:
Directive 2014/30/EU ("'EMV-Directive"')
Directive 2014/35/EU ("'Low voltage directive"')
Directive 2014/34/EU ("'ATEX-Directive"') for correspondingly marked devices

The corresponding separate EC Declarations of Conformity are valid.

Vienna, den **14.12.2016** .....
(location) (date) (Klaus Schiebel, general manager)

SEC-KF-ENGLISH-V2.04-2019.04.30

18 Declaration of Conformity

(EMV- and Low voltage-directive)

The producer:

SCHIEBEL Antriebstechnik Gesellschaft m.b.H.
Josef-Benc-Gasse 4
A-1230 Wien

herewith confirms, that the equipment

electric actuators with control unit and following types

(r)AB ... CSC

meets the requirement of the EC-directive:

2014/30/EU („EMV-directive“)

in consideration of the respective operating instructions, and the fulfilment of the Directive has been demonstrated by the following standards:

EN 61000-6-2:2005 **EN 61000-6-3:2007-01 + A1:2011-03**

and are also consistent with the EC-directive:

2014/35/EU („Low-voltage-directive“)

in consideration of the respective operating instructions, and the fulfilment of the Directive has been demonstrated by the following standards:

IEC 60204-1:2005 + A1:2008 **EN 60529:1991 + A1:2000**

Vienna, (location) **14.12.2016** (date) ..... (Klaus Schiebel, general manager)

SEC-KF-ENGLISH-V2.04-2019.04.30

19 Declaration of Conformity

(Ex-, EMV- and Low voltage-directive)

The producer:

SCHIEBEL Antriebstechnik Gesellschaft m.b.H.
Josef-Benc-Gasse 4
A-1230 Wien

herewith confirms, that the equipment

Description	Type	Marking	Certificate-No.
Electric Actuator	ex (r) AB	Ⓔx II2G Ex db eb II C T4(T6) Gb	FTZU03ATEX0328X
Control Unit	CSCex	Ⓔx II2G Ex db eb II C T4(T6) Gb	TÜV-A04ATEX0009X
Control Unit	CSCexFU	Ⓔx II2G Ex db eb II B T4(T6)	TÜV-A08ATEX0006
Flameproof Induction Motor	D(.).()FUY63/..-	Ⓔx II2G Ex db II C T4 Gb	FTZU03ATEX0330X
Flameproof Induction Motor	D(.).()FUY80/..-	Ⓔx II2G Ex db II C T4 Gb	FTZU03ATEX0333X
Flameproof Induction Motor	ex DKF .. .X. ..	Ⓔx II2G Ex db II C T4 Gb	TÜV-A03ATEX0016X
Microswitch	d 515U	Ⓔx II2G Ex db II C Gb	FTZU03ATEX0332U
Flameproof Potentiometer	dP1 / dP2	Ⓔx II2G Ex db II C Gb	FTZU03ATEX0387U
Flameproof capacitor	dK .	Ⓔx II2G Ex db II B Gb	FTZU07ATEX0009U

meets the requirement of the EC-directive:

2014/34/EU
EC-Directive for Operation of Equipment in Potentially Explosive Atmospheres

and complies with the following harmonised standards in the version valid at sigature date:

EN60079-0:2014	Electrical apparatus for explosive gas atmospheres – General requirements
EN60079-1:2014	Electrical apparatus for explosive gas atmospheres – Flameproof enclosures "d"
EN60079-7:2016	Electrical apparatus for explosive gas atmospheres – Increased safety "'e"
EN60079-11:2012	Electrical apparatus for explosive gas atmospheres – Intrinsic safety "'i"

Following notified bodies certificate the conform design of the equipment:

FTZU	CZ-716 07 Ostrava Radvanice	NB 1026: Quality system FTZU03ATEXQ019, Type examination certificates
TÜV Austria Services GMBH	A-1230 Wien	NB 0408: Type examination certificates

Furthermore they consistent with the EC-directive:

2014/30/EU („EMV-directive“)

in consideration of the respective operating instructions, and the fulfilment of the Directive has been demonstrated by the following standards:

EN 61000-6-2:2005 **EN 61000-6-3:2007-01 + A1:2011-03**

and are also consistent with the EC-directive:

2014/35/EU („Low-voltage-directive“)

in consideration of the respective operating instructions, and the fulfilment of the Directive has been demonstrated by the following standards:

IEC 60204-1:2005 + A1:2008 **EN 60529:1991 + A1:2000**

Vienna, **25.03.2019** .....
(location) (date) (Klaus Schiebel, general manager)

20 Technical data

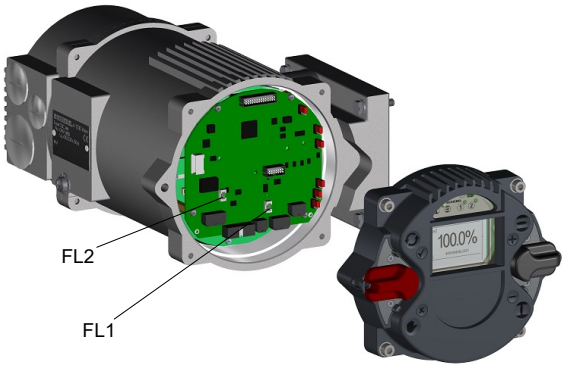


Figure 88: *Control unit*

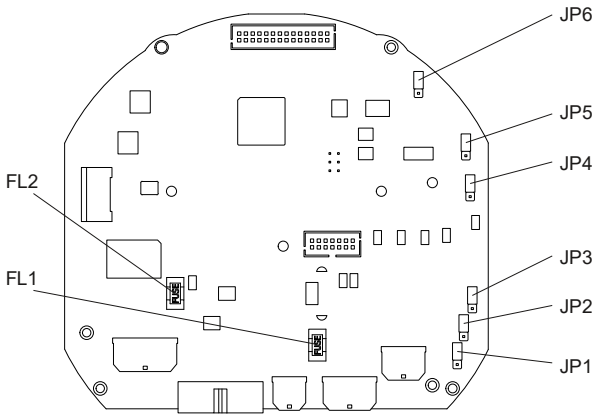


Figure 89: *Logic-board*

20.1 Binary outputs

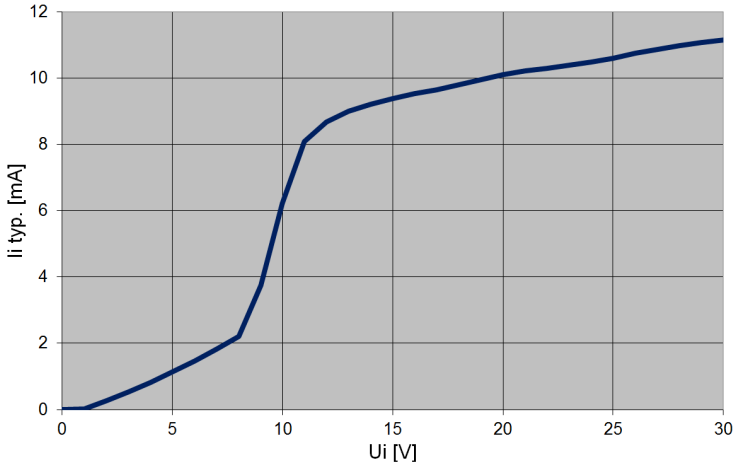
Count: 8
Power supply: . . . . . 24 VDC nominal
range: 11. . . 35 VDC
(either from internal or external)
Max voltage drop at set output: . . . . . 1 V
Output voltage at non-set output: . . . . . <1 V
Maximum current per output: . . . . . 500 mA (short circuit proof)
Maximum permissible total current for all outputs: . . . . . 4 A
Fuse (Fuse FL2, see Figure 89, page 57): . . . . . 4 A slow
(Littelfuse 454 NANO^2 Slo-Blo®)

Binary outputs with external supply are separated from other controllers via optocouplers.

20.2 Binary inputs

Count: 5
Nominal voltage: . . . . . 24 VDC
towards common ground
Voltage for input set: . . . . . >10 V (8.5 V typ.)
Voltage for input not set: . . . . . <7 V (8.5 V typ.)
Maximum voltage: . . . . . 30 VDC
Current consumtion at 24 VDC: . . . . . 10.5 mA typ.

Binary inputs are separated from other controllers via optocouplers.



Ui . . . Input voltage
Ii . . . Input current

Figure 90: *Binary inputs, input characteristic*

Jumpers JP1 . . . JP3 can be used to interconnect the binary inputs to groups with separate earths:

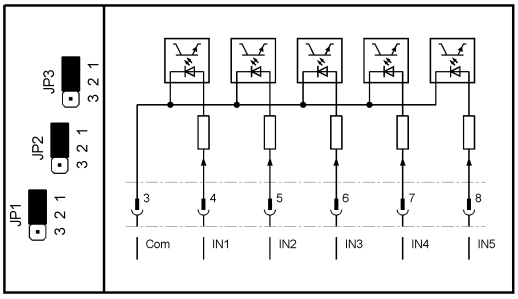


Figure 91: *5 inputs with same common*

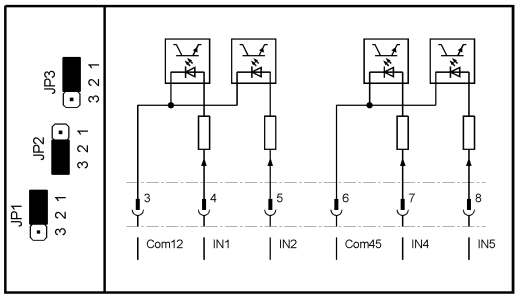


Figure 92: *2 separated groups of 2 inputs with same ground*
Input IN3 is disabled.

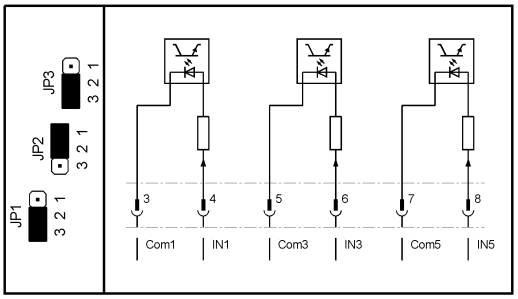


Figure 93: *3 separated inputs*
Inputs IN2 and IN4 are disabled.

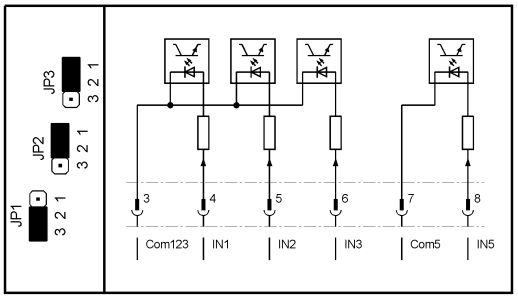


Figure 94: *3 inputs with same common and 1 separated input.*
Input IN4 is disabled.

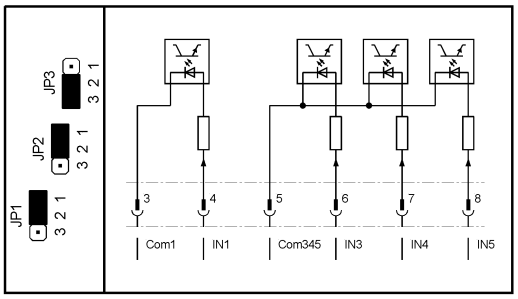


Figure 95: *1 separated input and 3 inputs with same common.*
Input IN2 is disabled.

Examples:

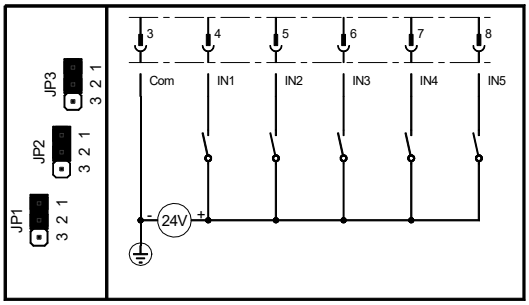


Figure 96: *5 inputs with common = "-" using external 24V*

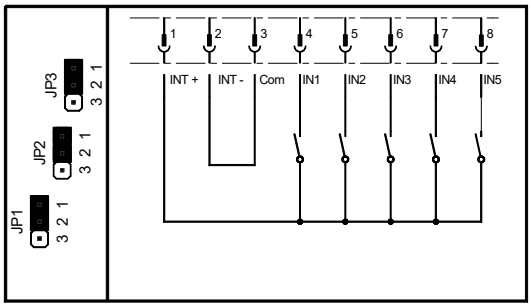


Figure 97: *5 inputs with common = "-" using internal 24V (e.g. for dry contacts)*

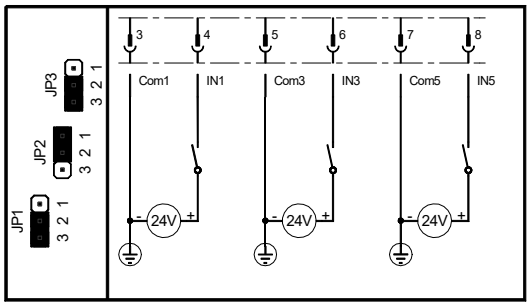


Figure 98: *3 separated inputs using 3 separated external 24V*

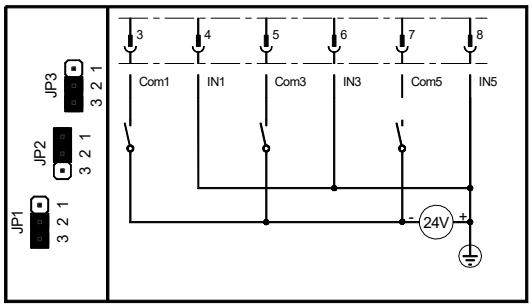


Figure 99: *3 separated inputs with common = "+" using external 24V*

20.3 Analog inputs

Input 1: setpoint value

Current range: . . . . . 0. . . 25 mA
Resolution: . . . . . 14 bit
Accuracy: 0.5%
Input resistance: . . . . . 60 Ω

Analog input 1 is electrically isolated from the rest of the electronic system.

Input 2: External actual value (only in combination with PID controller)

Current range: . . . . . 0. . . 20.8 mA
Resolution: . . . . . 12 bit
Accuracy: 0.5%
Input resistance: . . . . . 120 Ω

Jumper JP6 can be used to switch analog input 2 from a passive input (default) to an input with internal 24 V power supply (for 4. . . 20 mA, two-wire transmitters).

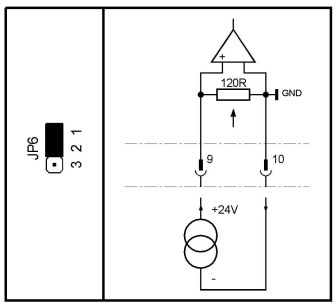


Figure 100: *Passive input (default)*

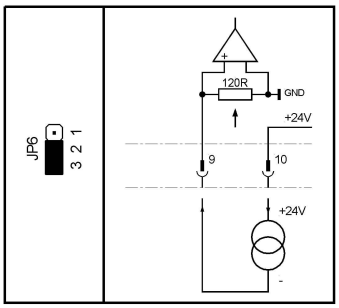


Figure 101: *Input with internal suppy (active input)*

IMPORTANT: The analog input 2 is referenced to common of the electronic system and the auxiliary power supply (see section 20.5).

20.4 Analog output

Current range: . . . . . 0. . . 20.8 mA
Resolution: . . . . . 12 bit
Accuracy: 0.5%
Max load: . . . . . 600 Ω

The analog output is galvanically isolated from the rest of the electronic system.
Jumper JP4 can be used to switch the analog output from an active power source (default) to a current sink, allowing the output to simulate a 4. . . 20 mA, two-wire transmitter.

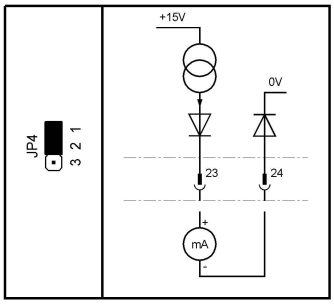


Figure 102: *Current source*

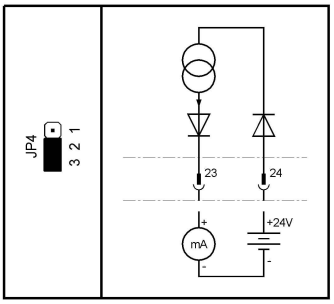


Figure 103: *Current sink*

Ground potential is the potential of the control unit and the auxiliary supply (see chapter 20.5).

20.5 Auxiliary voltage input and output

Input voltage range (auxiliary voltage input): ..... 20...30 VDC
Maximum current consumption (auxiliary voltage input): .....500 mA
Maximum current consumption in power-save mode ..... 120 mA
(auxiliary voltage input):
Output voltage (auxiliary voltage output): ..... typ. 23 V
Maximum output current (auxiliary voltage output): .....200 mA
Resistance of common ground vs. earth: ..... typ. 330 kΩ
Resistance of common ground vs. earth (floating version):.....> 10 MΩ
Capacitance of common ground vs. earth: .....typ. 100 nF
Maximum allowed voltage of common ground vs. earth: ..... max. 40 Vs
Fuse (Fuse FL1, see picture 89, page 57): .....1 A slow
(Littelfuse 454 NANO^2 Slo-Blo®)

Ground potential is the common ground of the controller and the analog inputs and outputs.
The auxiliary voltage output can be set in menu P6.5 (see section 7.5, page 28).

The power-save mode is defined as follows:

- No power supply (the controller is powered exclusively through the 24 V auxiliary voltage input).
- The backlight of the LCD display switches off automatically.
- No additional hardware options included (Profibus Interface, DeviceNet interface, relay board, etc...).
- Binary outputs and the mA output are not enabled; when activating, the respective currents must be added to the total current consumption.

20.6 Mechanical reversing starter

By default all phases of the motor are switched by a mechanical reversing contactor. The mechanical reversing contactor is both electrically and mechanically interlocked to prevent unintented cross circuits.
Depending on the engine size results in the following assignments:

size	Typ	power of the motor (with 400V 3-phase current)	
		open-loop control (operational mode S2)	closed-loop control (operational mode S4)
mW4	K09	3kW	1,5kW
mW5	K12	5,5kW	3kW
mW7	D18	7,5kW	5,5kW
mW11	D25	11kW	7,5kW
mW22	D38	22kW	11kW

The mechanical life (switching cycles) of the reversing starter can be roughly estimated with the help of the following diagram and the rated current (motor current):

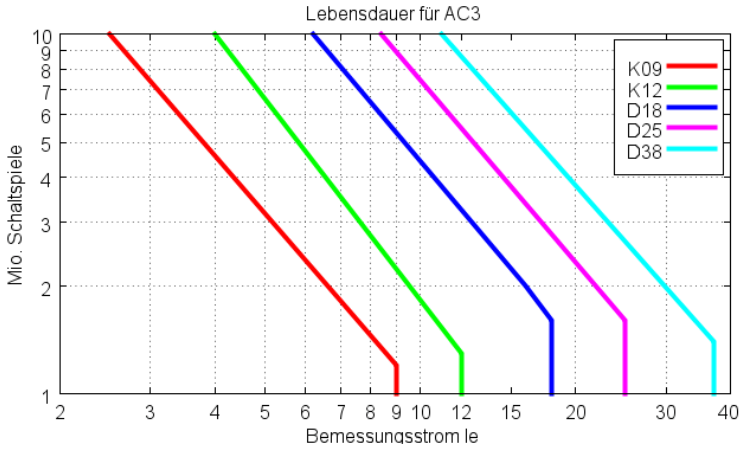


Figure 104

IMPORTANT: These values apply to utilization category AC-3 (switching off during motor run) and not to utilization category AC-4 (inching)! With AC-4, stressing by the high breaking current is substantially higher, so the service life is considerably shorter. For this reason, inching (switch-off during motor start-up) should be avoided with mechanical reversing contactors.

20.7 Electronical reversing starter

Optionally, the motor of the actuator is controlled by an electronic reversing contactor (thyristors). The electronic reversing contactor switches two of the three motor phases. The control of the two directions of rotation is locked by hardware in the electronic reversing contactor. Compared to conventional mechanical contactors there is no mechanical wear through contact burning; in case of electronic reversing starters this feature increases the life and reliability of modulating actuators with high switching frequency.

Attention: The third phase is not switched in the electronic reversing contactor and is therefore constantly on the motor winding.

voltage range: ..... 48...480Vrms
current range: ..... 0,1...50Arms
transient overvoltage: 720Vpk
max. I^2t of the fuse: ..... 2320A^2s
lock time when changing direction:: ..... min. 100msec

20.8 Micro switch

Standard switch

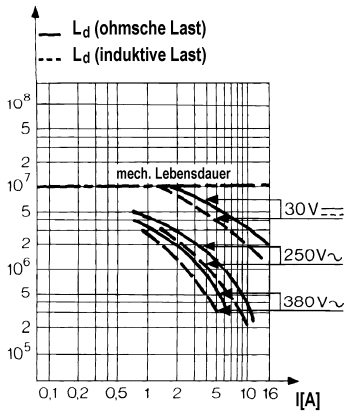


Figure 105: *Load capacity diagram (83106)*

Mech. serice life L_d ..... 10^7 switching cycles
Permissible ambient temp ..... -20...+85°C
Special models ..... -40...+125°C

Flashing switch and Explosion-proof micro-switch:

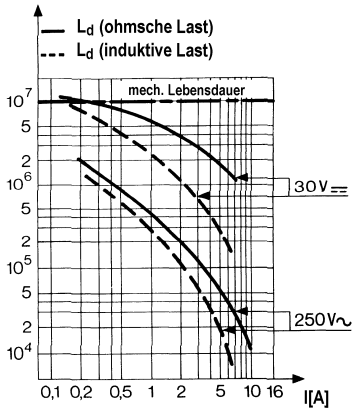


Figure 106: *Load capacity diagram (83133)*

Mech. service life L_d ..... 10^7 switching cycles
Permissible ambient temp ..... -20...+125°C

For the ohmic load capacity, cosφ=1 shall apply. The inductive load capacity given is cosφ=0,8 and/or L/R=5ms.

WARNING: the maximum switching current for micro switches with gold-plated contacts is 40 mA a voltage of 24 V (ohmic load). If switching currents are too high, the goldplating will be destroyed.

20.9 Power supply

The internal supply of the SMARTCON control unit is made via the power connection. At 3-phase current a neutral phase is not required. The following table shows the possible different voltage ranges of the control.

voltage (3-phase, standard range): ..... **3 x 380, 400, 415, 440 VAC +/-10%**
voltage (3-phase, on request): ..... 3 x 110, 115, 120 VAC +/-10%
voltage (3-phase, on request): ..... 3 x 220, 230, 240 VAC +/-10%
voltage (3-phase, on request): ..... 3 x 460, 480, 500, 525 VAC +/-10%
voltage (3-phase, on request): ..... 3 x 575, 660, 690 VAC +/-10%
voltage (single-phase, on request): ..... 110, 115, 120 VAC +/-10%
voltage (single-phase, on request): ..... 220, 230, 240 VAC +/-10%
frequency: ..... 50/60Hz, +/-3Hz
idle power consumption: ..... max. 24W

For the supply voltage of the complete system (control unit and actuator) also the motor voltage must still be considered (see actuator data and name plate)!

20.10 Connections

Size 1 (mechanical reversing starter mW4, mW5, mW7K and electronical reversing starter):

Power / motor: ..... **till 440V:** Industrial plug with 6 pins, screw connection
16A, max. 2,5mm^2 , AWG14
from 460V: Industrial plug with 3+2 pins, screw connection
16A, max. 2,5mm^2 , AWG14
Control signals: ..... Industrial plug with 24 pins, screw connection
16A, max. 2,5mm^2, AWG14
optional crimp contacts are available

Size 2 (mechanic reversing starters mW7, mW11 and mW22):
Power / motor: ..... Industrial plug with 4 pins, screw connection
80A, 1,5...16mm^2
Control signals: ..... Industrial plug with 24 pins, screw connection
16A, max. 2,5mm^2, AWG14
optional crimp contacts for the control unit are available

Explosion-proof version:
Power / motor: ..... terminals with screw connection
16A, 0,5...4mm^2, AWG20...AWG12
Control signals: ..... terminals with screw connection
4A, 0,5...2,5mm^2, AWG20...AWG14

20.11 Miscellaneous

Ambient temperature:
On/Off Actuators: ..... -25 to +70°C
Modulating actuators: ..... -25 to +60°C
explosion-proof version: ..... -20 to +40°C (acc. EN60079-0)
protection class:
standard actuators, size 1 1: IP67
standard actuators, size 2: IP65
explosion-proof version: IP65
colour: ..... RAL7030 (other colors on request)

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