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**SCHWARZ<sup>®</sup>**

*New motion starts here*

# SCHWARZ ACTUATOR

## Operation manual

For SM-SC series



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## 1. Safety instructions

### Standards/directives

SCHWARZ products are designed and manufactured in compliance with recognized standards and directives. This is certified in a Declaration of Incorporation and an EC Declaration of Conformity.

The end user or the contractor must ensure that all legal requirements, directives, guidelines, national regulations and recommendations with respect to assembly, electrical connection, commissioning and operation are met at the place of installation.

### Safety instructions/warnings

All personnel working with this device must be familiar with the safety and warning instructions in this manual and observe the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or property damage.

### Qualification of staff

Assembly, electrical connection, commissioning, operation, and maintenance must be carried out exclusively by suitably qualified personnel having been authorised by the end user or contractor of the plant only. Prior to working on this product, the staff must have thoroughly read and understood these instructions and, furthermore, know and observe officially recognised rules regarding occupational health and safety.

### Commissioning

Prior to commissioning, it is important to check that all settings meet the requirements of the application. Incorrect settings might present a danger to the application, e.g. cause damage to the valve or the installation. The manufacturer will not be held liable for any consequential damage. Such risk lies entirely with the user.

### Operation

Prerequisites for safe and smooth operation:

- Correct transport, proper storage, mounting and installation, as well as careful commissioning.
- Only operate the device if it is in perfect condition while observing these instructions.
- Immediately report any faults and damage and allow for corrective measures.
- Observe recognised rules for occupational health and safety.
- Observe the national regulations.
- During operation, the housing warms up and surface temperatures  $> 60 \text{ }^\circ \text{C}$  may occur. To prevent possible burns, we recommend checking the surface temperature using an appropriate thermometer and wearing protective gloves, if required, prior to working on the device.

### Protective measures

The end user or the contractor are responsible for implementing required protective measures on site, such as enclosures, barriers, or personal protective equipment for the staff.

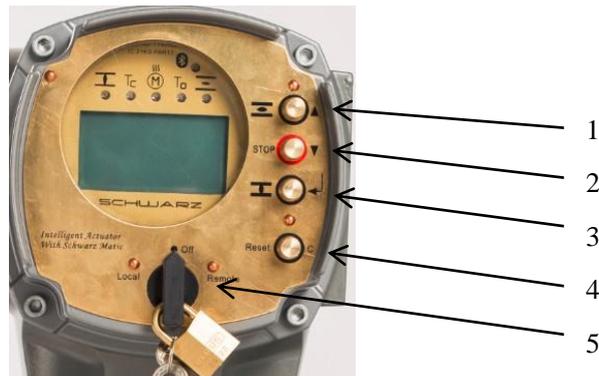
### Maintenance

To ensure safe device operation, the maintenance instructions included in this manual must be observed. Any device modification requires prior consent of the manufacturer.

## 2. Operation

### 2.1 Push buttons description

2.1.1 The push buttons to be as controls (the selector switch 5 point to local)



- [1] Push button for operation command in direction OPEN
- [2] Push button STOP
- [3] Push button for operation command in direction CLOSE
- [4] Push button RESET
- [5] Selector switch

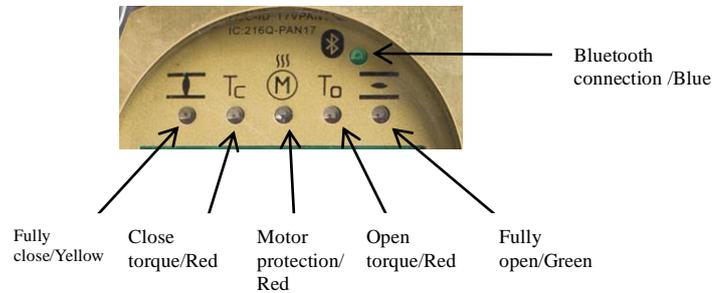
2.1.2 The push button to be as menu navigation (The selector switch 5 point to off)

- [1-4] Push buttons or navigation support
- [5] Selector switch
- [6] Display

Push buttons	Navigation support on display	Functions
[1] ▲	Up ▲	Change screen/selection Change values Enter figures from 0 to 9
[2] ▼	Down ▼	Change screen/selection Change values Enter figures from 0 to 9
[3] ↵	Ok Save Edit Details	Confirm selection Save Enter <Edit> menu Display more details
[4] C	Esc	Cancel process Return to previous display

## 2.2 Indication LEDs description

**LED test** When switching on the power supply, all LEDs on the local controls illuminate for approx. 1 second. This optical feedback indicates that the voltage supply is connected to the controls and all LEDs are operable. (the below color is default)



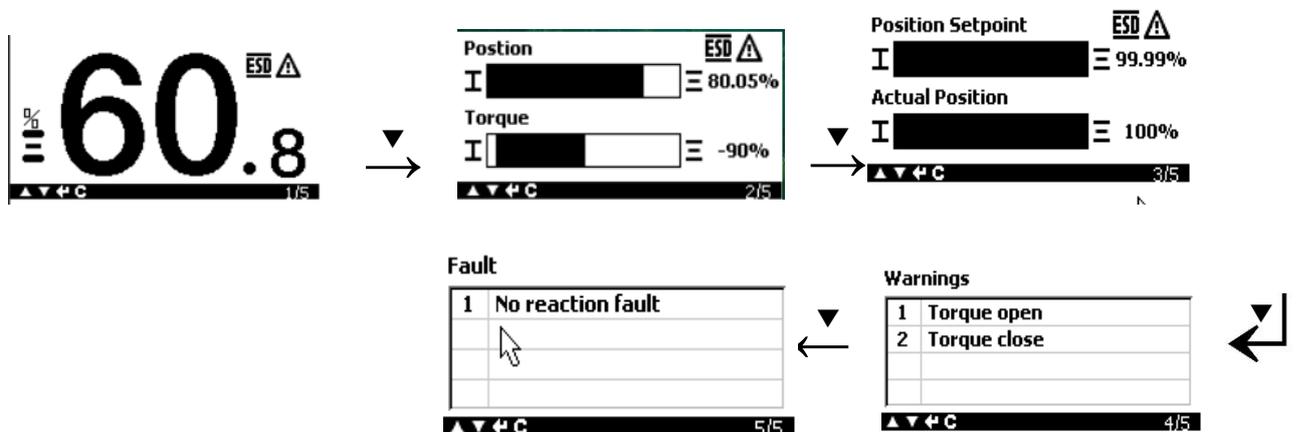
## 2.3 Display screen description

2.3.1 Start: When the power is on, the display screen enters the boot state for about 6 seconds. The soft version display as below:

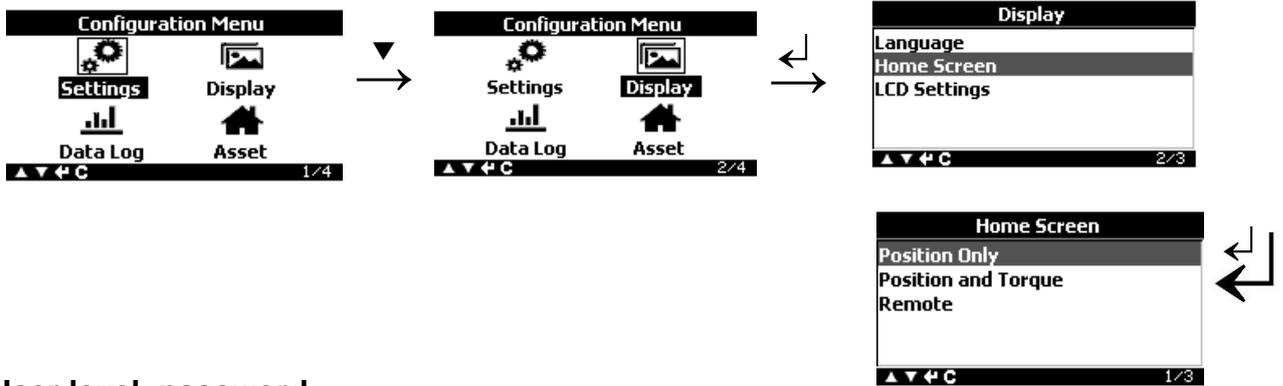


### 2.3.2 Status toggled

When the actuator is in non-debug state, the selector switch points to off, using ▲ and ▼ make the screen switch over.



2.3.3 When the actuator is in debug state, if no any operation in 5 minutes, the screen returns to home page automatically, the home page is configurable.



## 2.4 User level, password

2.4.1 User level: A specific password is assigned to each user level and permits different actions.

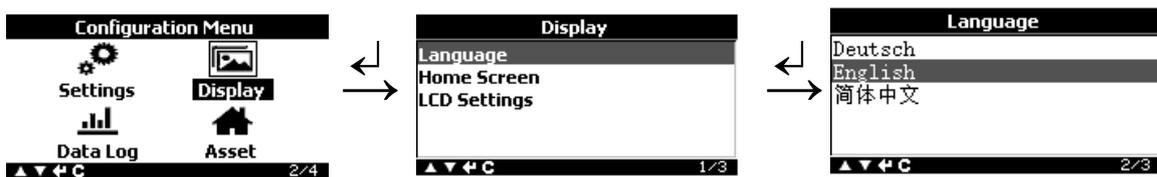
There are 3 different code classes: Operator, Maintenance and Specialist.

2.4.2 Password entry

Display indicates: Password 0\*\*\*

1. Use push buttons Up ▲ Down ▼ to select figures 0 to 9.
  2. Confirm first digit of password via push button Ok.
  3. Repeat steps 1 and 2 for all further digits.
- ➔ Having confirmed the last digit with OK, access to all parameters within one user level is possible if the password entry is correct.

2.5 The languages are German, English and Chinese as standards. Other languages other than the three need to declare in advance.



## 3. Operation

### 3.1 Local operation

Notice

#### Valve damage due to incorrect basic setting!

Prior to electrical operation of the actuator, the basic settings i.e. type of seating, torque and limit switching have to be completed.

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### 3.1.1 Manual operation

For purposes of setting and commissioning, in case of motor failure or power failure, the actuator may be operated manually. Manual operation is engaged by an internal change-over mechanism.

#### 3.1.1.1 Manual operation: engage

Notice

#### **Damage at the motor coupling due to faulty operation!**

Engage manual operation only during motor standstill.

1. Press push button

2. Turn handwheel in desired direction.

To close the valve, turn handwheel clockwise:

➔ Drive shaft (valve) turns clockwise in direction CLOSE



#### 3.1.1.2 Manual operation: disengage

Manual operation is automatically disengaged when motor is started again. The handwheel does not rotate during motor operation.

## 3.2 Motor operation

Perform all commissioning settings and the test run prior to motor operation

### 3.2.1 Local actuator operation

Local actuator operation is performed using the push buttons of the local controls of the SC. Set selector switch [5] to position **Local control** (LOCAL).

➔ The actuator can now be operated using the push buttons [1 – 3].

- Run actuator in direction OPEN: Press push button [1].

- Stop actuator: Press push button STOP [2].

- Run actuator in direction CLOSE: Press push button [3].

**Information** OPEN - CLOSE operation commands can be given either in push-to-run or in self retaining operation mode. In self-retaining mode, the actuator runs to the defined end position after pressing the button, unless another command has been received beforehand. For further information, please refer to Manual (Operation and setting).

### 3.2.2 Actuator operation from remote

→ Set selector switch to position **Remote control (REMOTE)**.

Now, it is possible to operate the actuator via remote control, via operation commands (OPEN, STOP, CLOSE) or analogue setpoints (e.g. 4 – 20 mA).

**Information** For actuators equipped with a positioner, it is possible to select between **open-close control** (Remote OPEN-CLOSE) and **setpoint control** (remote SETPOINT). Selection is made via MODE input, e.g. based on a 24 V DC signal (refer to wiring diagram).

## 4. Commissioning (Basic settings)

1). Set selector switch to position **0** (off).

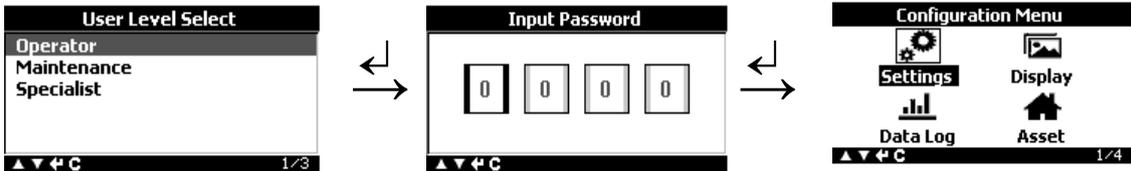
**Information:** The selector switch is not a mains switch. When positioned to **0** (OFF), the actuator cannot be operated. The controls' power supply is maintained.

2). Switch on the power.

**Information:** Please consider the heat-up time for ambient temperatures below  $-20^{\circ}\text{C}$ .

3). Perform basic settings.

Press C for about 3 seconds, the user level interface displayed.



### 4.1 Type of seating: set

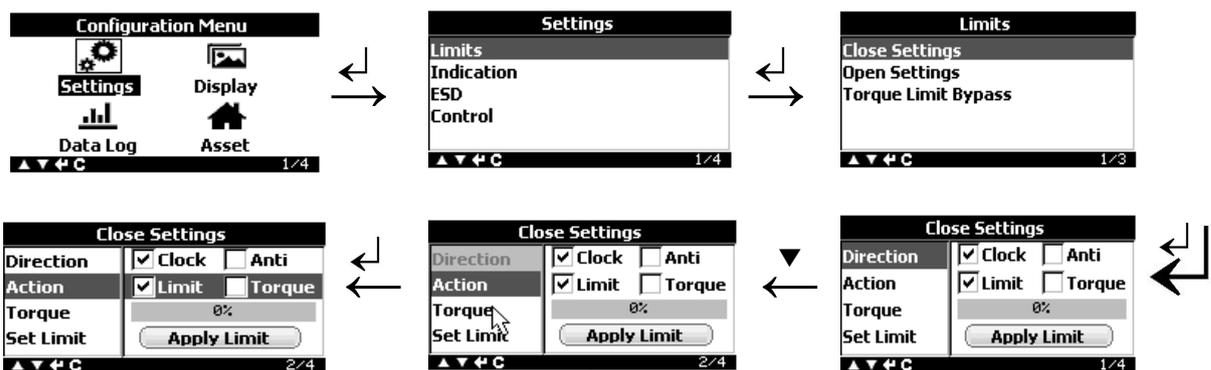
Notice

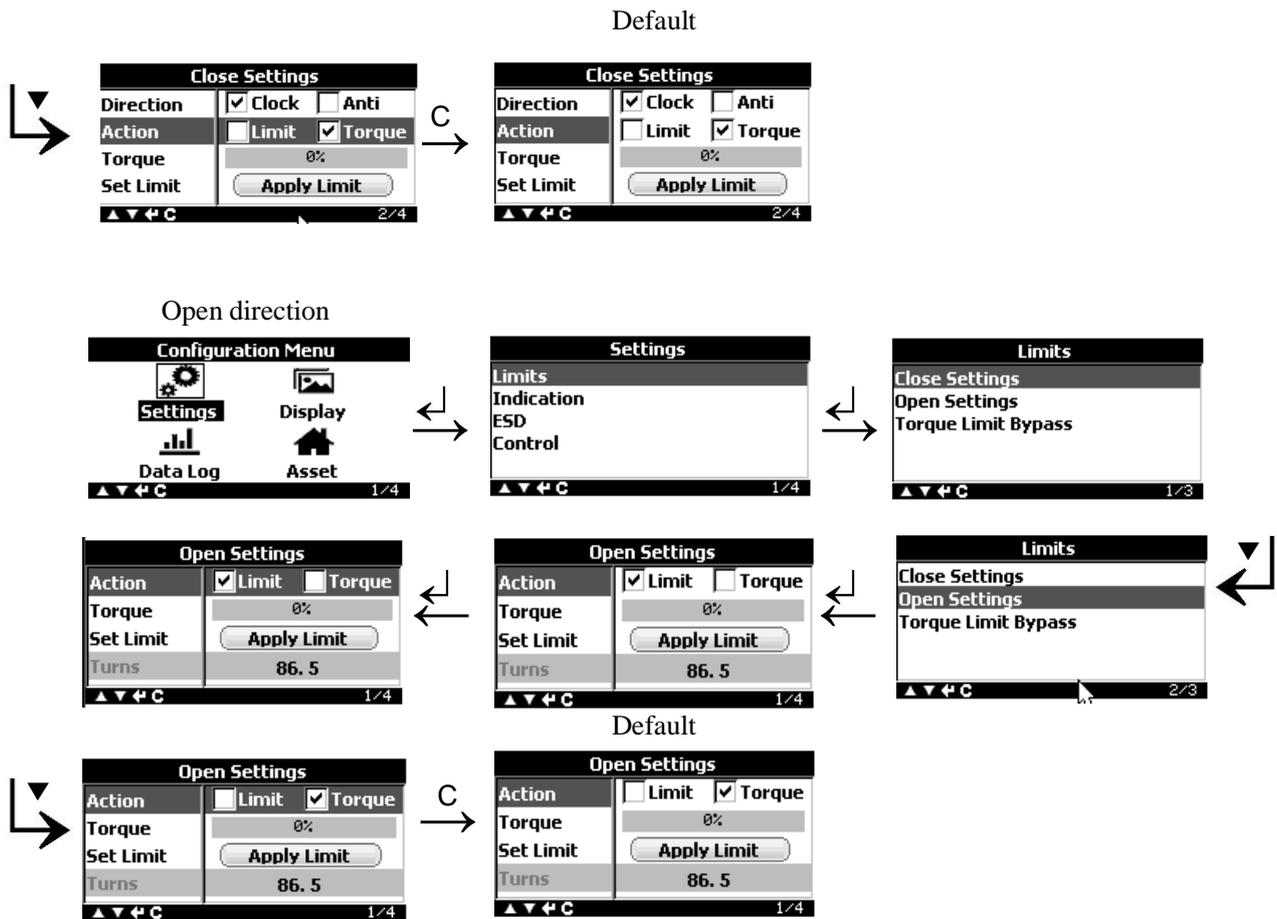
#### Valve damage due to incorrect setting!

The type of seating must suit the valve.

Only change the setting with prior consent of the valve manufacturer.

Close direction





## 4.2 Torque switching: set

Once the set torque is reached, the torque switches will be tripped (overload protection of the valve)

**Information** The torque switches may also trip during manual operation.

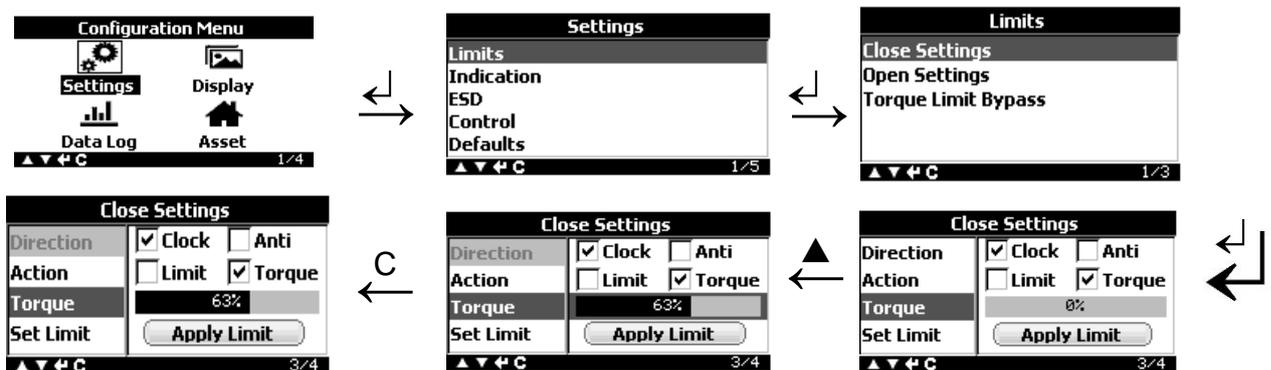
Notice

**Valve damage due to excessive tripping torque limit setting!**

→ The tripping torque must suit the valve.

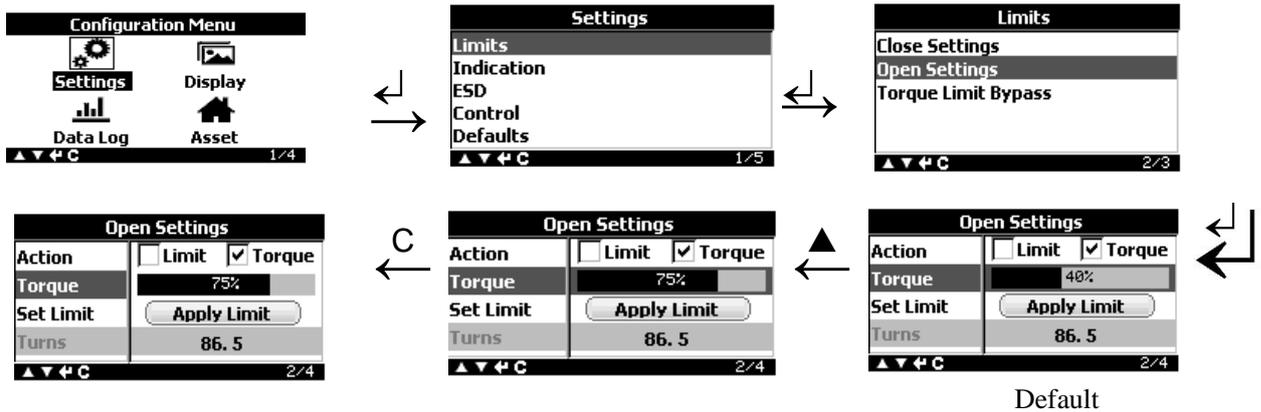
→ Only change the setting with the consent of the valve manufacturer.

Close direction



Default

### Open direction



### 4.3 Limit switching: set

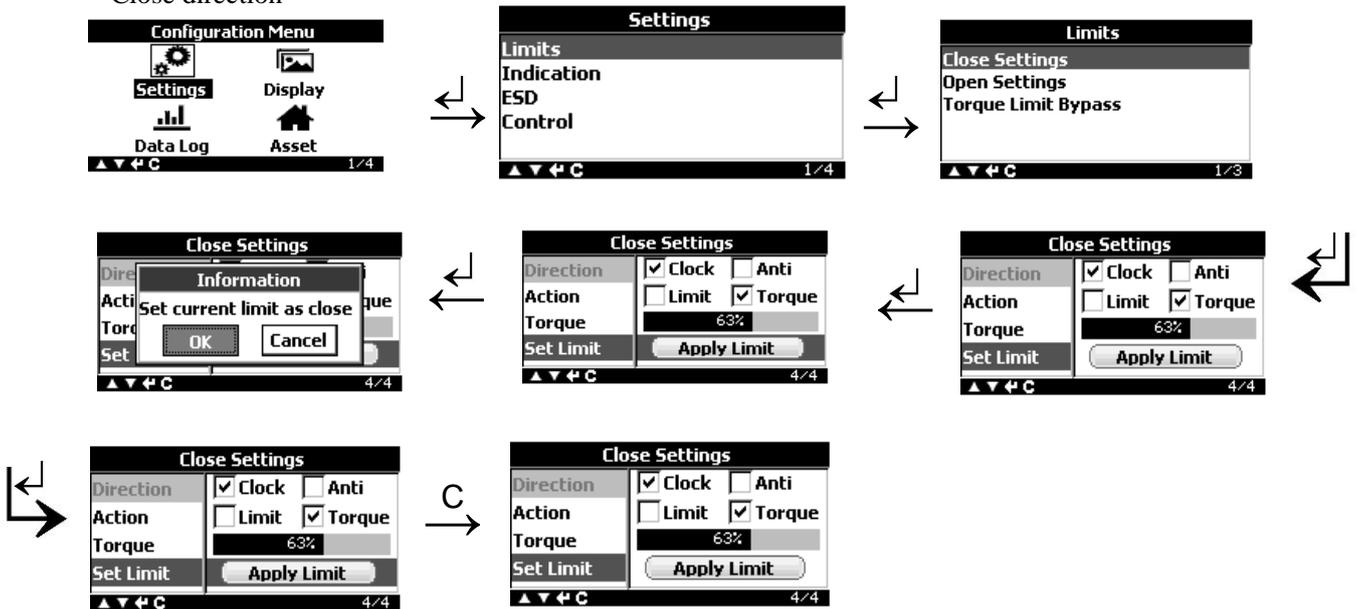
#### Notice

**Valve damage at valve/gearbox due to incorrect setting!**

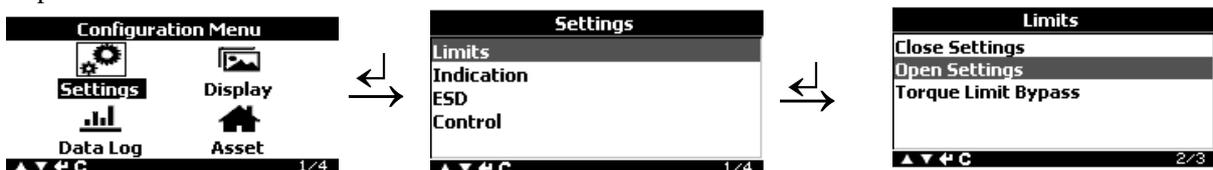
→ When setting with motor operation: Stop actuator **before** reaching end of travel (press push button **STOP**).

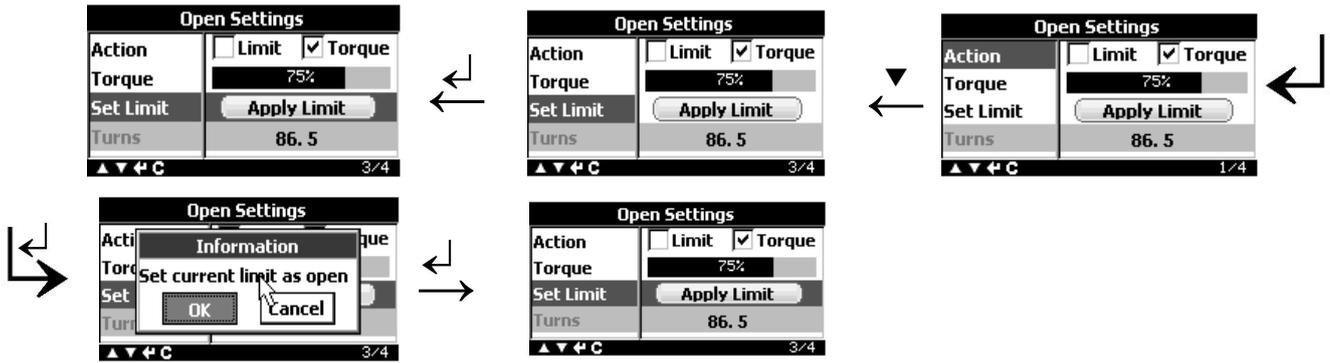
→ Allow for overrun when selecting limit seating.

### Close direction



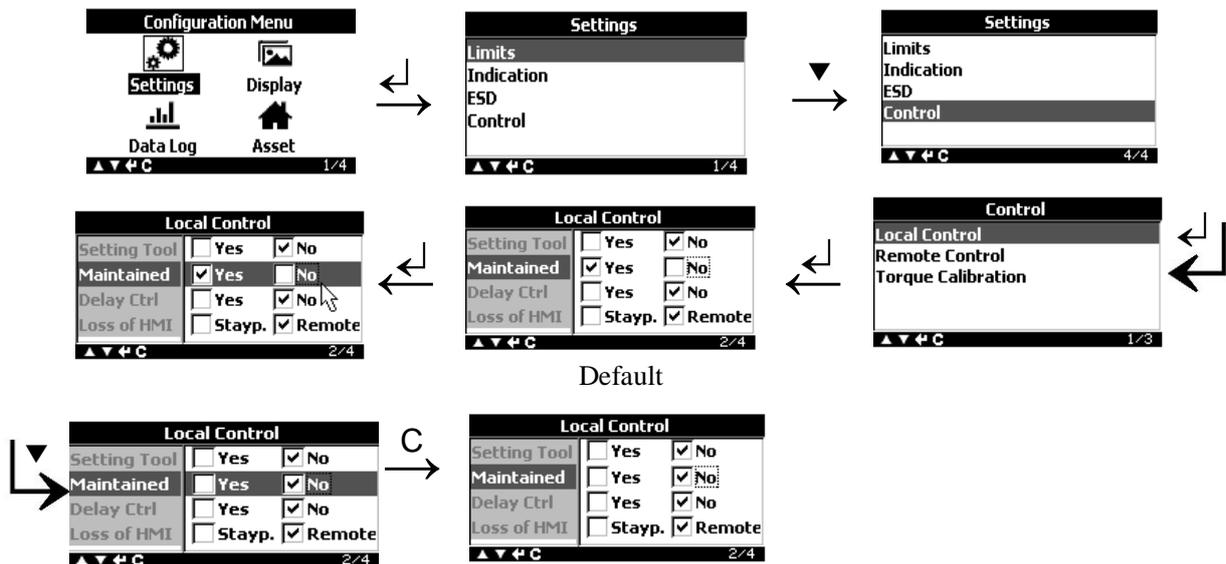
### Open direction



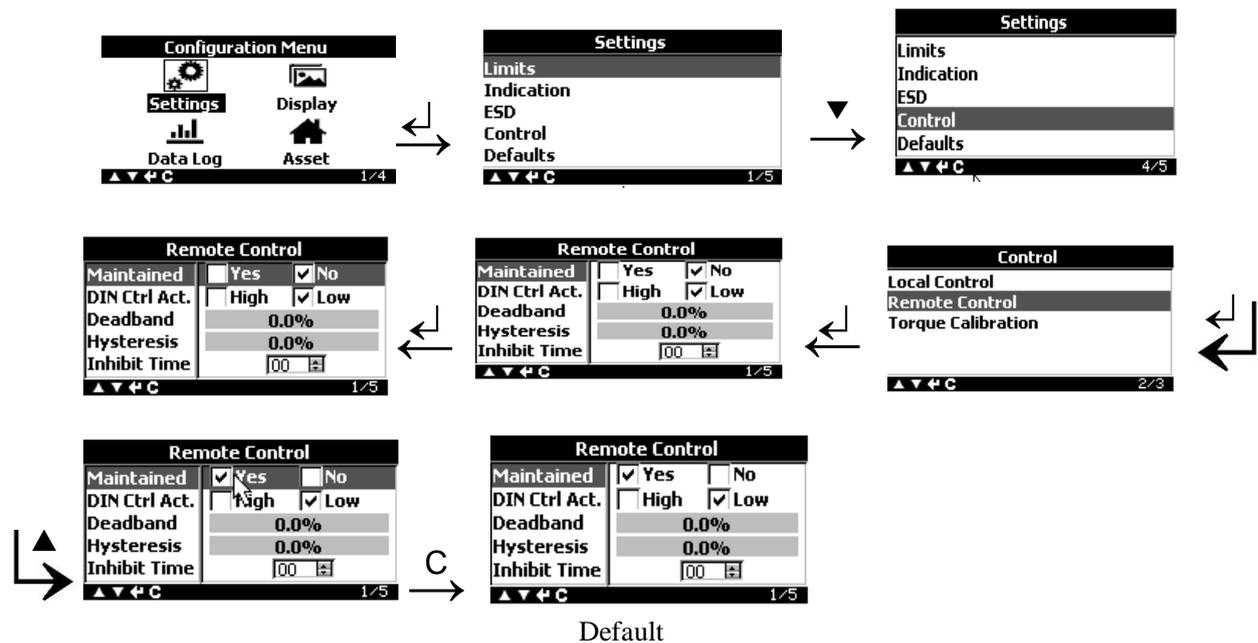


## 5. Commissioning (Extended settings)

### 5.1 Local control: retaining or on-off mode



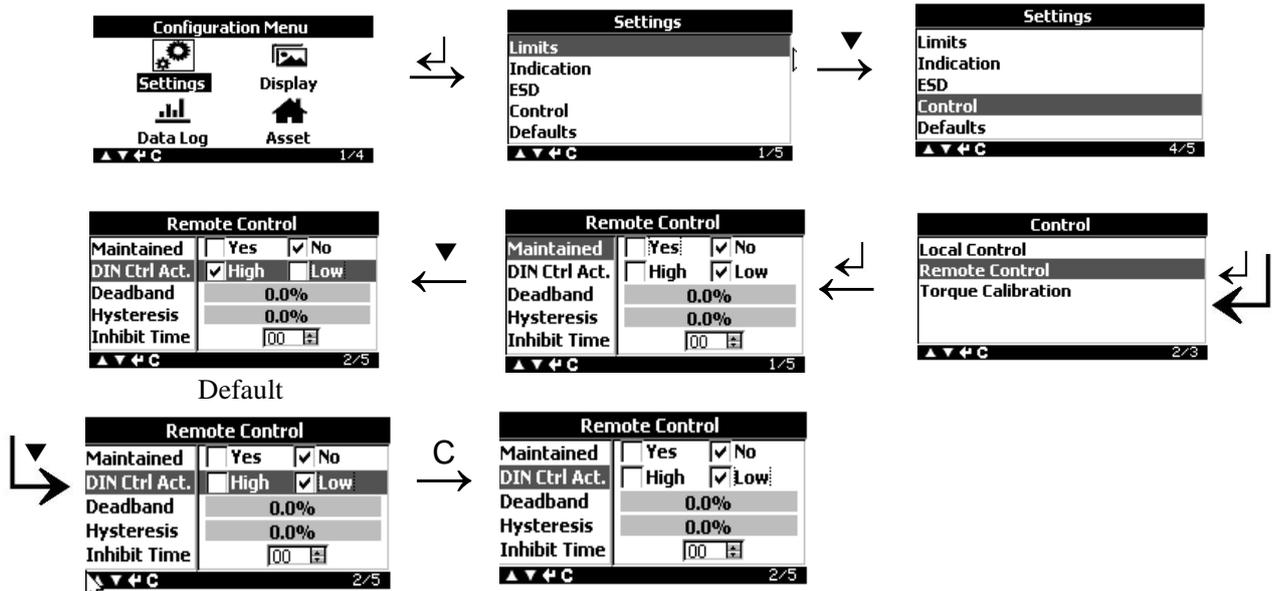
### 5.2 remote contact control: maintenance or on-off mode



### 5.3 For modulating duty, to switch over from contact control to analogue control

High effective: It is in contact control mode when the mode voltage is high (it is in analogue control mode when the mode voltage is low)

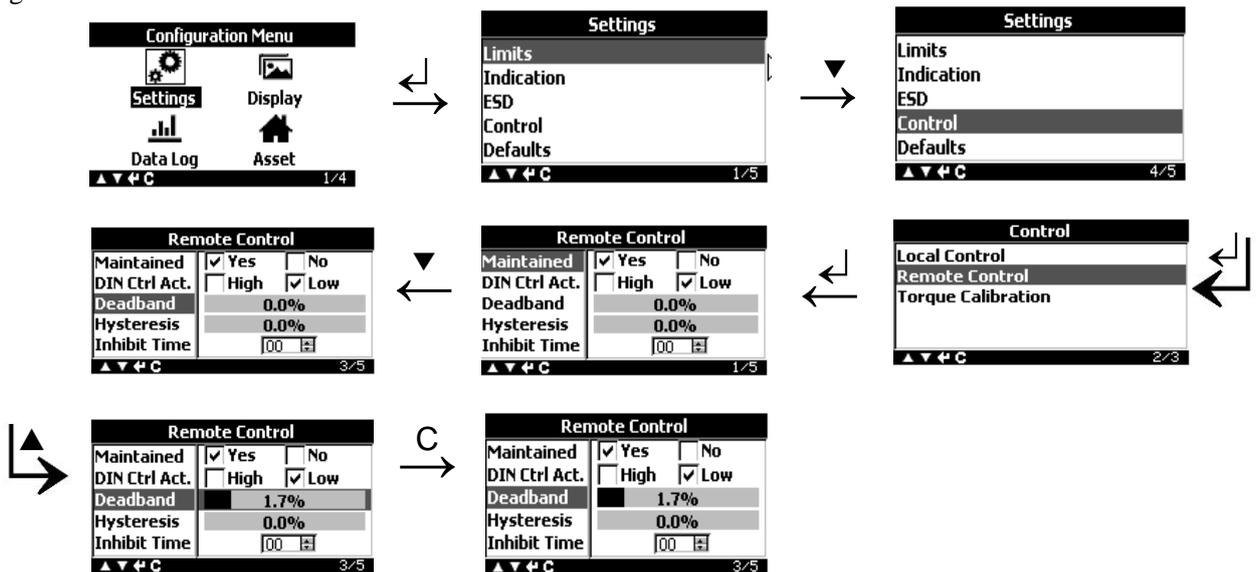
Low effective: It is in contact control mode when the mode voltage is low (it is in analogue control mode when the mode voltage is high)



### 5.4 For modulating duty, dead band setting

**Information** Adaptive mode is highly recommended. It is no need to set the dead band if the actuator is in adaptive mode. The below is only to introduce the way of dead band setting.

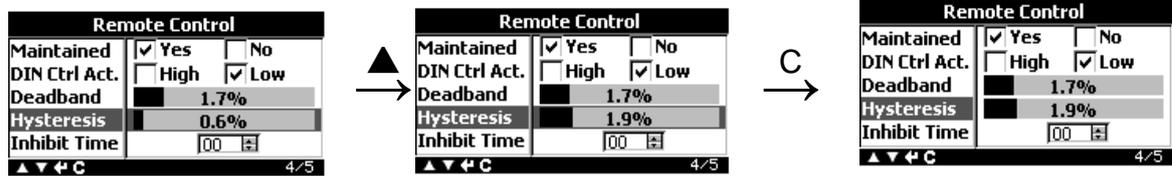
The speed and stroke should be considered when dead band is set. For high speed or short stroke actuators. The dead band cannot be too small otherwise a continuous over turn will happen. This is forbidden. The dead band range is from 0.25% to 10%.



## 5.5 The hysteresis (inner dead band) setting.

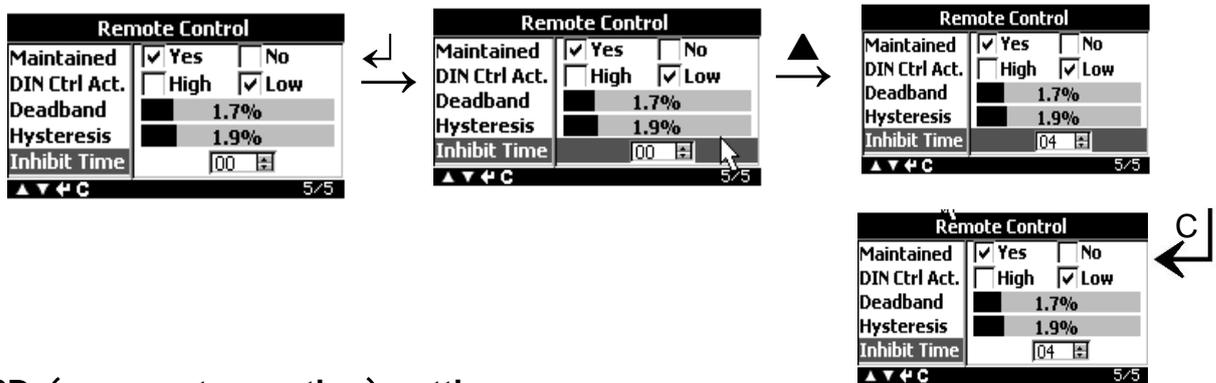
Notice

It is forbidden the inner dead band is bigger than the dead band.



## 5.6 Inhibit time setting:

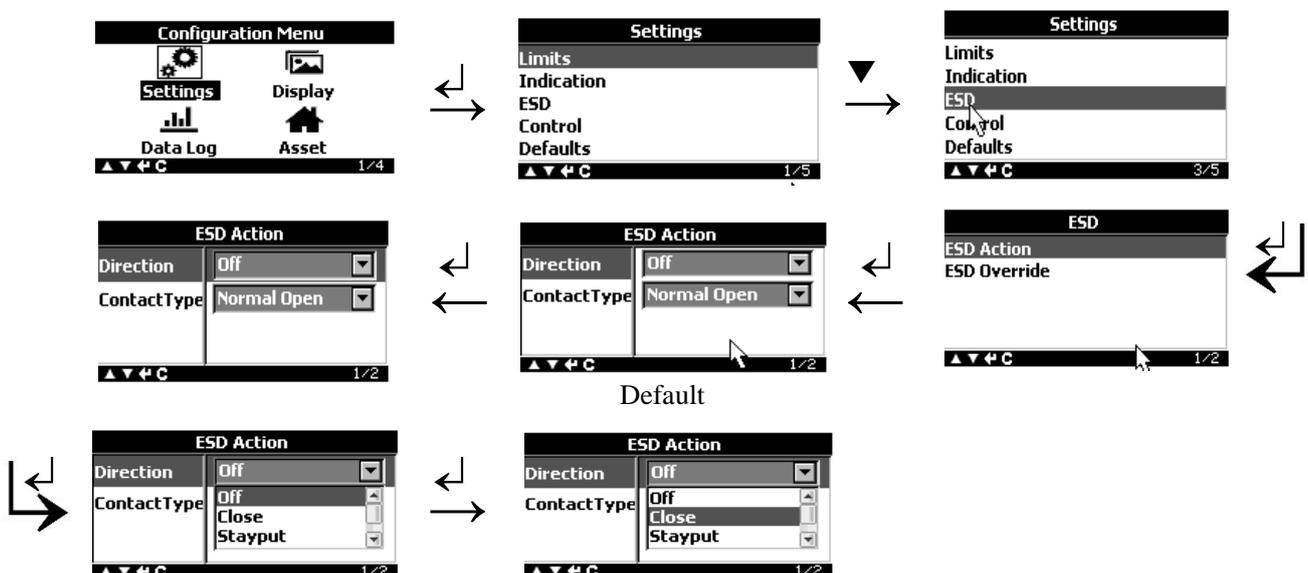
**Information** When the actuator is during the inhibit time, it does not react to the command. The inhibit time is adjustable from 0 to 10 seconds.



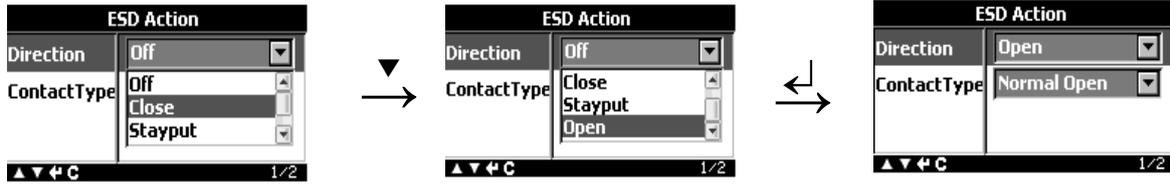
## 5.7 ESD (emergent operation) setting

### 5.7.1 ESD active

ESD close



### ESD open



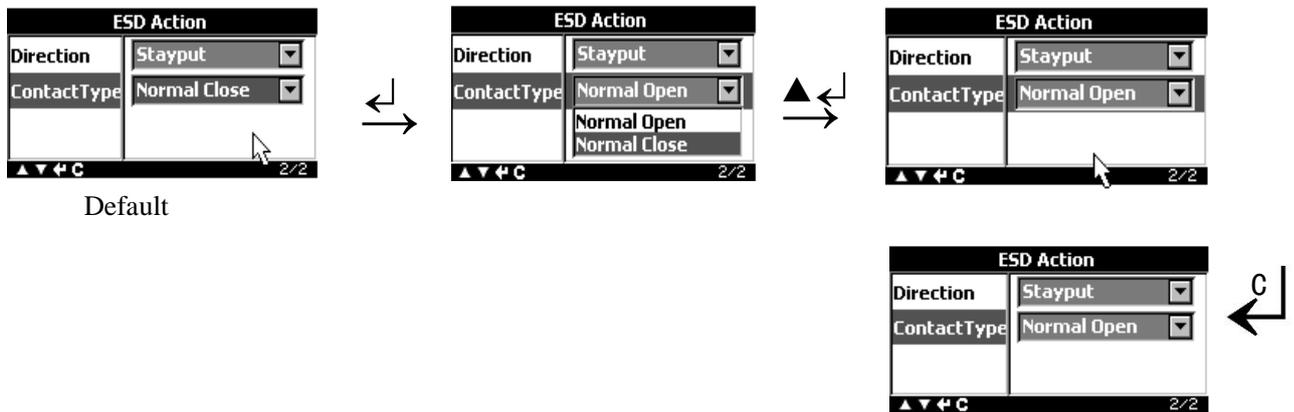
Default

### ESD stayput



Default

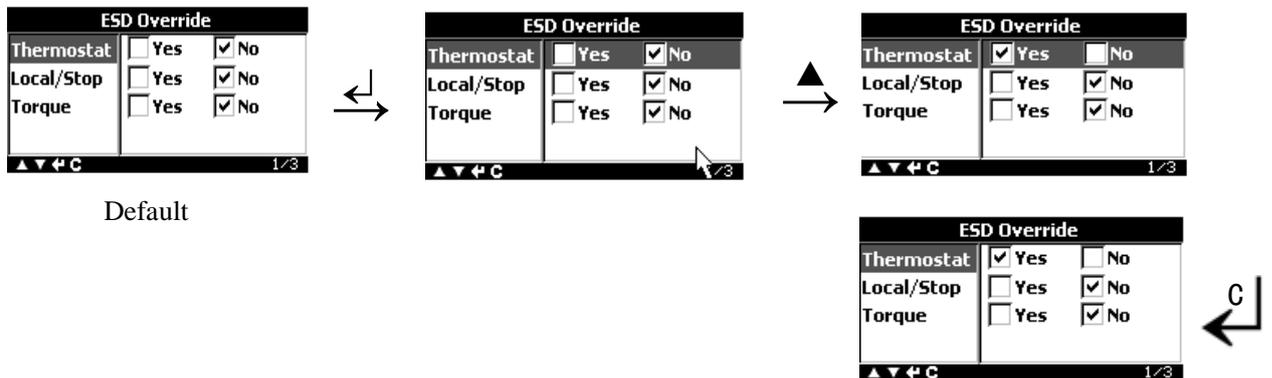
## 5.7.2 ESD contact type



Default

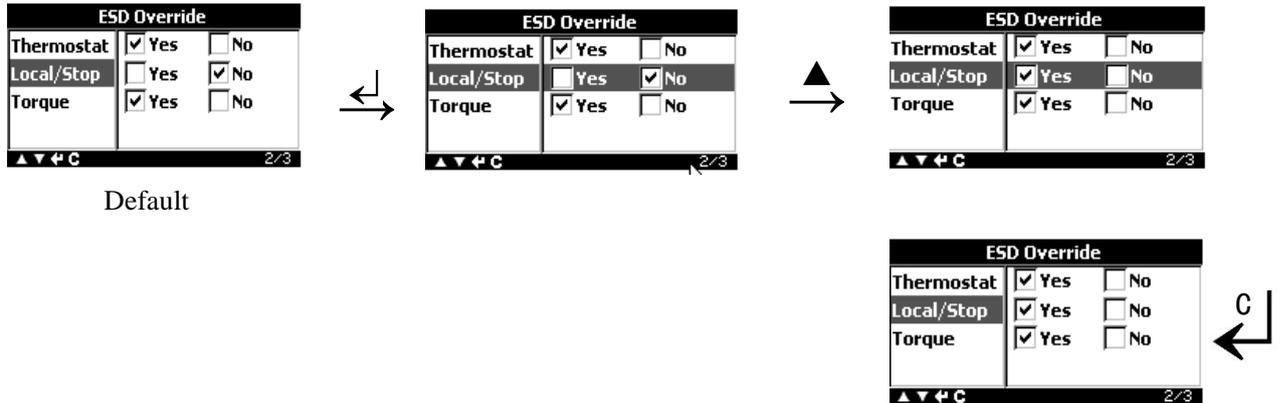
## 5.7.3 ESD overriding

Thermo overriding means ESD command is executed even if the motor thermal switch is active.

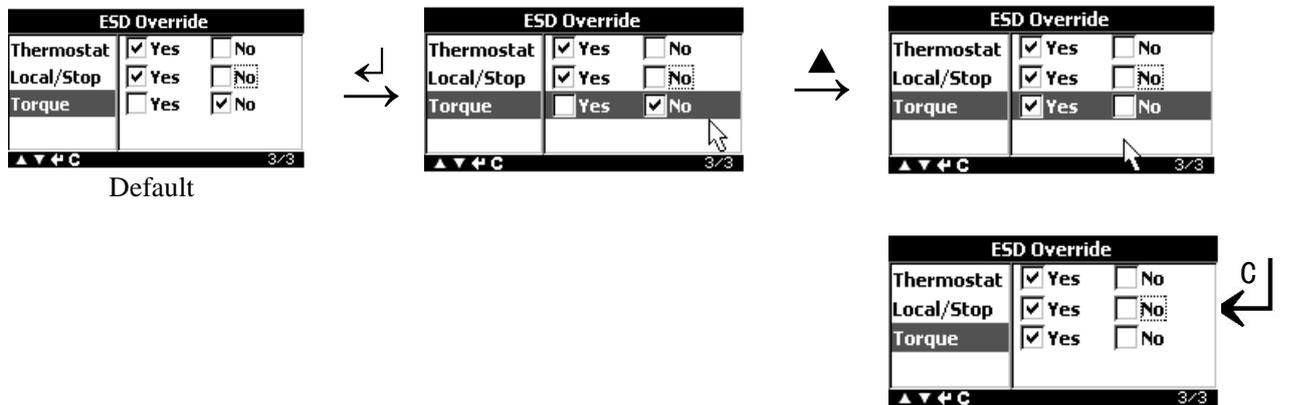


Default

Local/remote overriding means ESD command is executed even if the selector switch does not point to remote.



Torque overriding means ESD command is executed even if the torque switches is tripped.



## 5.8 Output contacts programmed

Signal definition:

Signal 1=Fault

Signal 2=Fully close

Signal 3=Fully open

Signal 4=Selector switch is in remote position

Signal 5=Torque fault close

Signal 6=Torque fault open

Signal 7=Closing

Signal 8=Opening

Signal 9=Motor thermo protected

Default:

S1=Fault

S2=Fully close

S3=Fully open

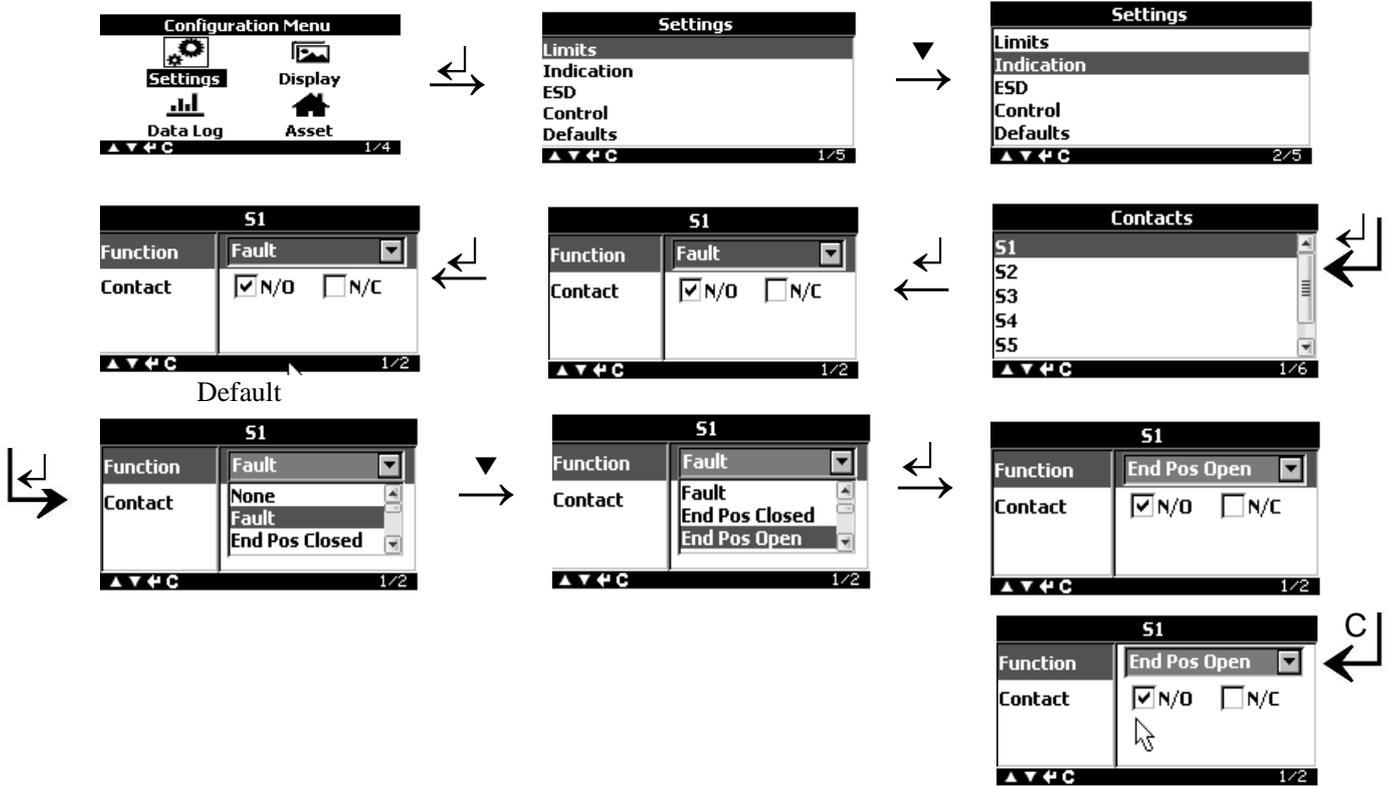
S4=Selector switch is in remote position

S5= Torque fault close

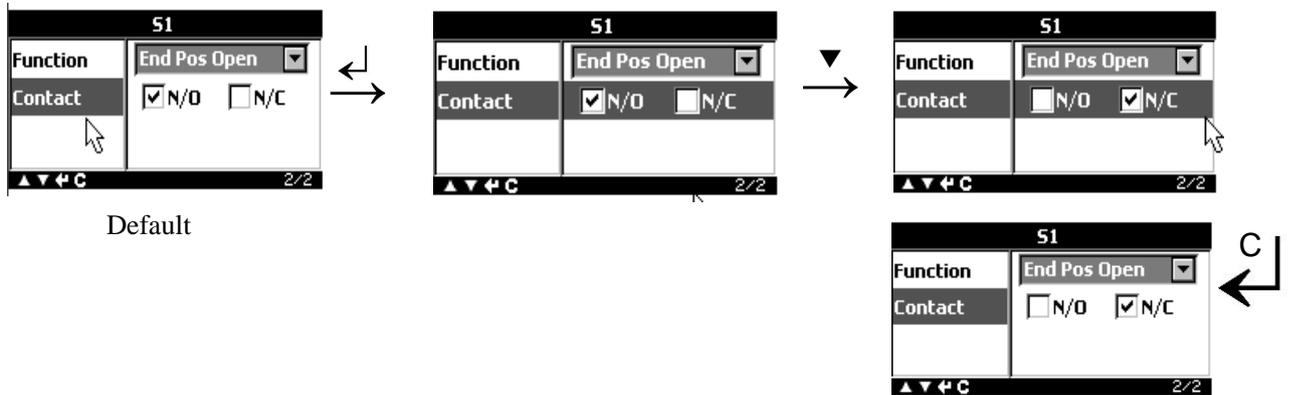
S6= Torque fault open

By programming, signal 1-9 can be allocated to S1-S6. For S1-S6, NO or NC mode can be selected.

E. g.: S1 is programmed from fault to fully open:



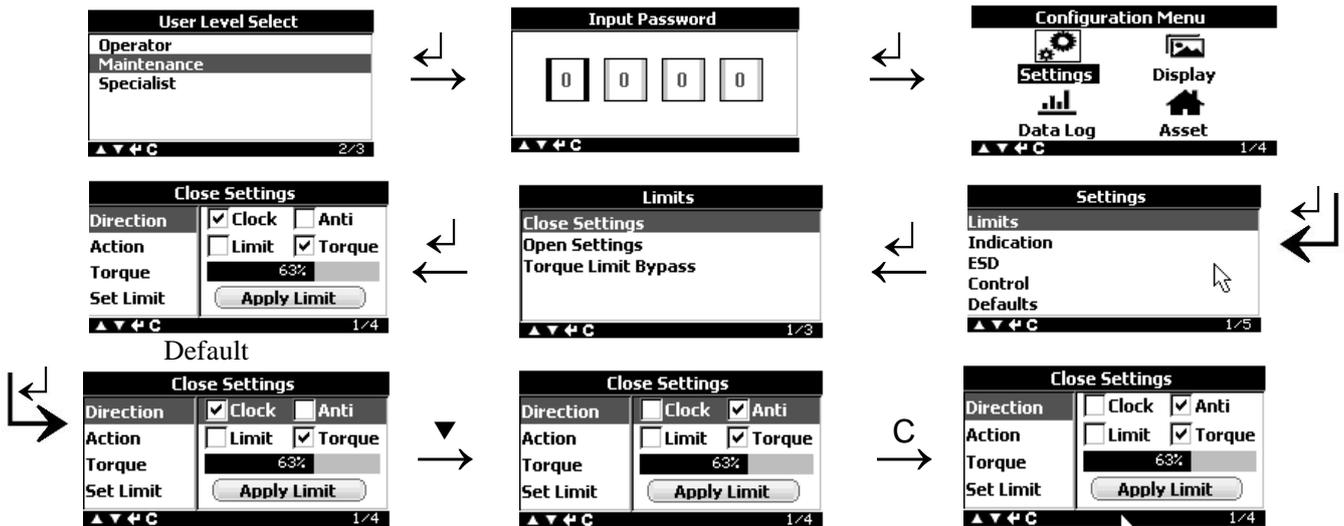
E. g.: S1 contact form is programmed from No to NC:



## 6. Commissioning (professional settings)

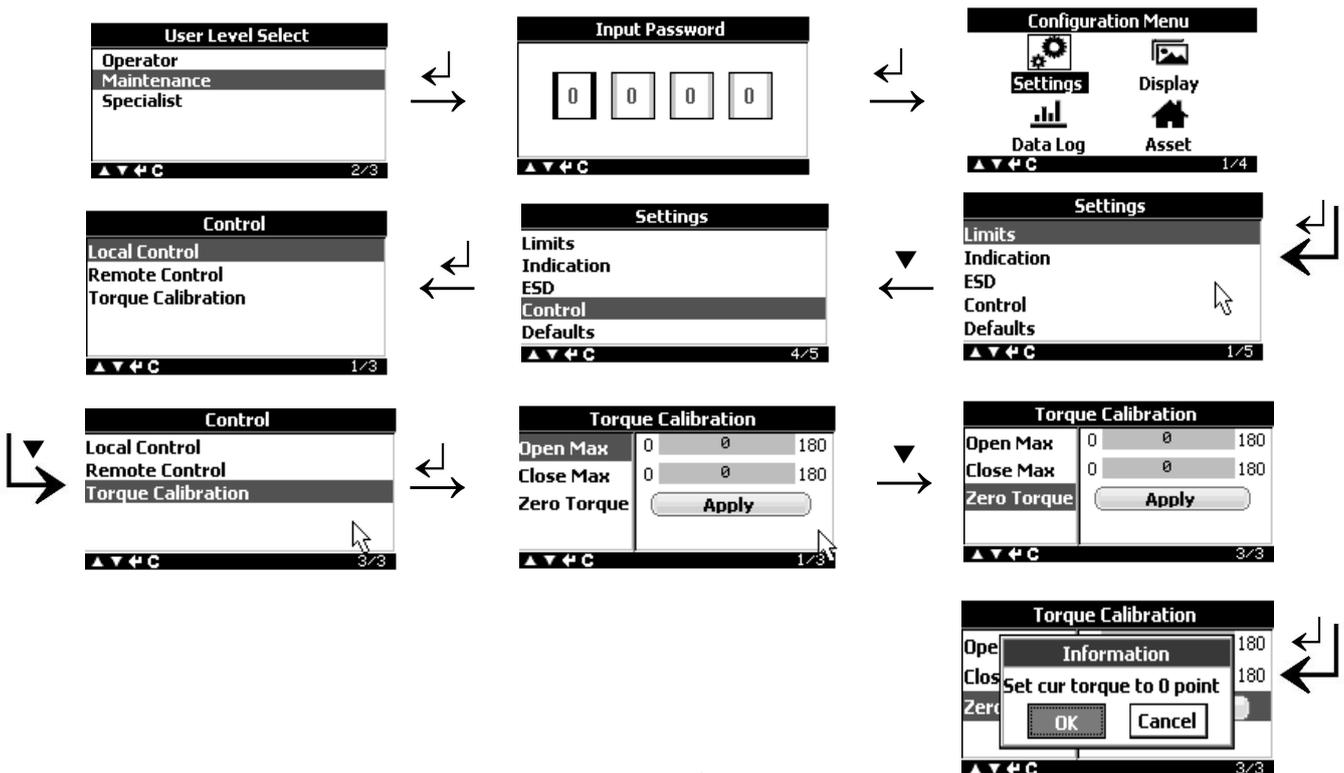
You need to ask your supplier or SCHWARZ for a password.

### 6.1. Counter-clockwise function



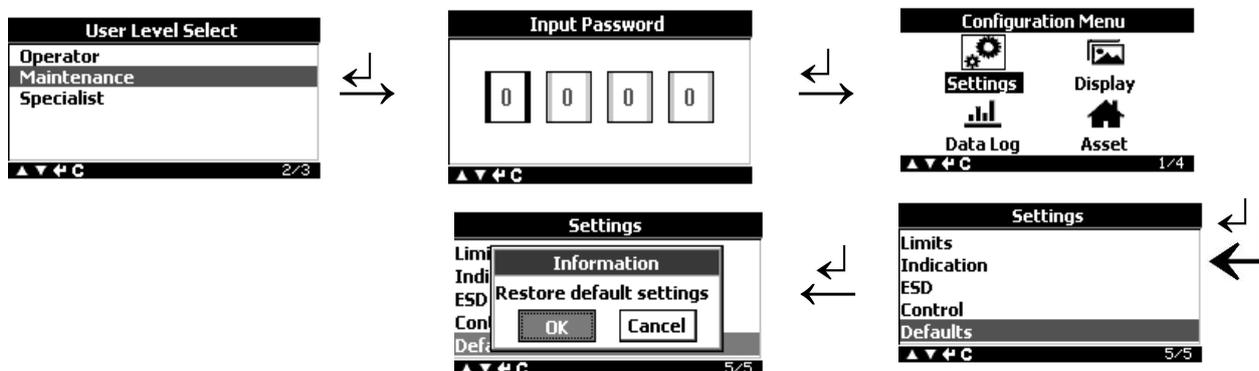
### 6.2 Torque zero calibration

Torque zero calibration is completed before delivery. The actuator needs to be re-calibrated after a new encoder replaced. Ensure the real mechanical torque is zero, make the measuring torque zero.



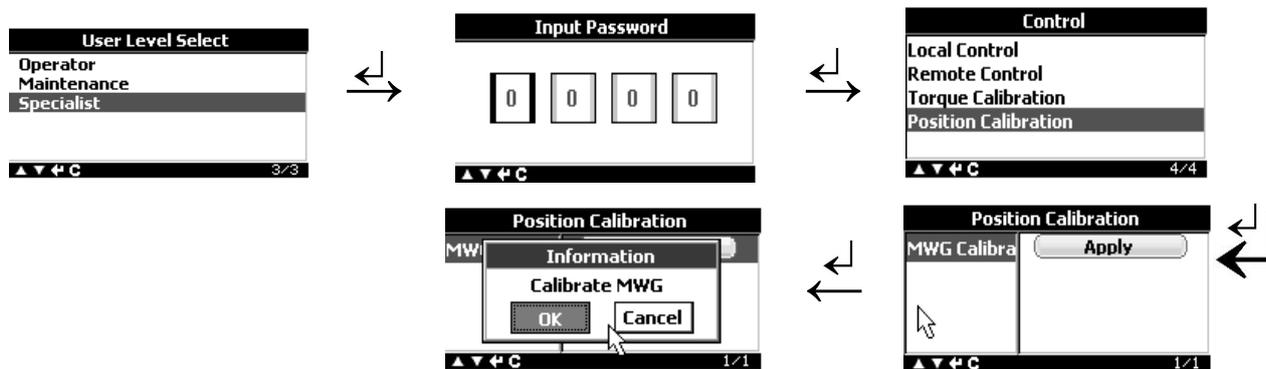
### 6.3 Factory reset

If there is an adjustment error, you can use the restore factory setting method to solve it



### 6.4 Position zero calibration

Position zero calibration is completed before delivery. The actuator needs to be re-calibrated after a new encoder replaced.



## 7. Corrective action

**7.1 Warning:** No red display screen occurs when the actuator is in warning state.

Item	Description	The reason and remedy
Warning 1	Torque close or open switch tripped	Check whether the actuator is jammed, type selection is properly. Enlarge the torque value in the case of permission.
Warning 2	Remote command signal wrong	Remote command signal is not detected. Check whether the opencircuit happens, whether the command is in correct range.

Warning 3	Low battery	The battery is exhausted. Change the battery located in the HIM board.
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**7.2 Fault:** When the actuator display fault, red screen disappears. The actuator cannot be electrically operated till the fault is eliminated.

Item	Description	Possible causes and remedy
Fault 1	MWG not connected Logic board not connected	CAN connection problem. Check can connection both from MWG to logic board and logic board to HMI board.
Fault 2	Motor thermo protection	The motor temperature is too high. Possibly caused by frequent start-up or a high ambient temperature. Examine the start-up number and ambient temperature. It recovers when the motor temperature falls to 120° C.
Fault 3	Stall. No reaction.	Position remains while the actuator is electrically starting for 10S, no reaction fault displayed. Examine mechanical jam problem. The fault display disappears in one minute.
Fault 4	Wrong configuration	Caused by wrong configuration. E.g. hysteresis > outer dead band. Examine the configurations or restore default setting (maintenance code is needed)
Fault 5	Phase failure	Lacking phase. Examine the main power.

### 7.3 Fuses

The fuses are located in the power supply board.



SM-SC

F1/F2	Primary fuses on power supply unit	6×30mm	1AT 500V
F3	Inner 24VDC power	5×20mm	2.0AT 250V
F4	Inner 24VAC power	5×20mm	1.5AT 250V

## 8. Servicing and maintenance

### Notice

#### Damage caused by inappropriate maintenance!

Servicing and maintenance must be carried out exclusively by suitably qualified personnel having been authorised by the end user or the contractor of the plant.

Only perform servicing and maintenance tasks when the device is switched off.

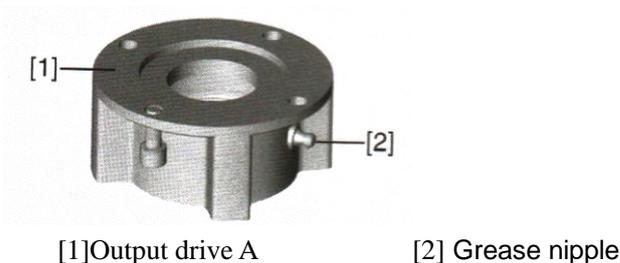
**Service** SCHWARZ offers extensive service such as servicing and maintenance as well as customer product training. For the relevant contact addresses, please refer to <Addresses> in this document or to the Internet ([www.schwarz-tech.com](http://www.schwarz-tech.com)).

### 8.1 Preventive measures for servicing and safe operation

The following measures are required to ensure safe device operation: **Every 6 months after commissioning and then every year.**

- Carry out visual inspection: Cable entries, cable glands, blanking plugs, etc. have to be checked for correct tightness and sealing. Consider torques according to manufacturer's details.
- Check fastening screws between actuator and gearbox/valve for tightness. If required, fasten screws while applying the fastening torques as indicated in chapter <Assembly>.
- When rarely operated: Perform test run.
- For devices with output drive A: Press in Lithium soap EP multi-purpose grease on mineral oil base at the grease nipple with a grease gun.
- Lubrication of the valve stem must be done separately.

Output drive A



Grease quantities for bearing of output drive A

Output drive	SM07/KZC12	SM10/KZC20	SM20/KZC25	SM50/KZC35
Quantity [g]	1.5	2	3	5

For enclosure protection IP 68

After submersion:

- Check actuator.
- In case of ingress of water, locate leaks and repair, dry device correctly and check for proper function.

### 8.2 Maintenance

- Lubrication**
- In the factory, the gear housing is filled with grease.
  - Grease change is performed during maintenance

- 
- Generally after 4 to 6 years for modulating duty.
  - Generally after 6 to 8 years if operated frequently (open-close duty).
  - Generally after 10 to 12 years if operated rarely (open-close duty).
  - We recommend exchanging the seals when changing the grease.
  - No additional lubrication of the gear housing is required during operation.

### **8.3 Disposal and recycling**

Our devices have a long lifetime. However, they have to be replaced at one point in time. The devices have a modular design and may, therefore, easily be separated and sorted according to materials used, i.e.:

- electronic scrap
- various metals
- plastics
- greases and oils

The following generally applies:

- Greases and oils are hazardous to water and must not be released into the environment.
- Arrange for controlled waste disposal of the disassembled material or for separate recycling according to materials.
- Observe the national regulations for waste disposal.

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**SCHWARZ<sup>®</sup>**

*New motion starts here*

SCHWARZ Actuator GmbH  
Hahnenkleer Str. 56, 38685 Lautenthal  
Tel: 49-5325-9569127 Fax:49-5325-9569128

[www.schwarz-tech.com](http://www.schwarz-tech.com)