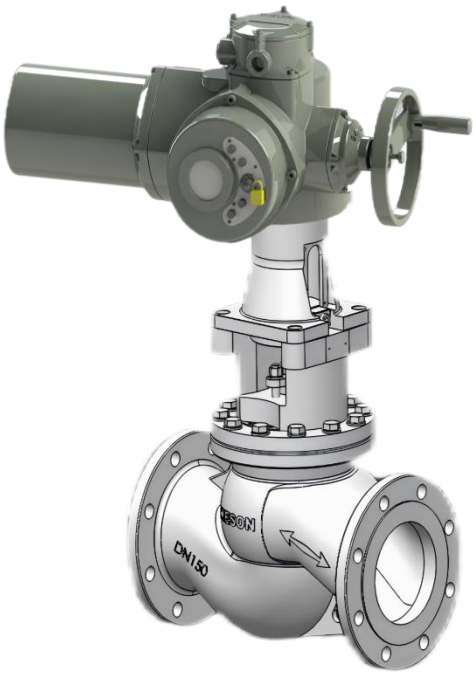
USER's MANUAL

FOR

SMT6 Serial Multi-turn Electric Actuator

Model:M60000 serial



ELTORQUE

Revision History

Revision #	Date	Author	Comment
1.0	2024/12/18	Gary Ku	Original Document

USER'S MANUAL

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1. General

The SMT6 series multi-turn electric actuators are specifically engineered for linear valve applications, including gate and globe valves. These actuators are exceptionally suited for a diverse array of maritime and onshore systems, encompassing sectors such as shipbuilding, power generation, petroleum, chemical processing, and water treatment. With the addition of a gearbox, these actuators can also effectively manage quarter-turn valves, including butterfly, ball, and plug valves.

Eltorque actuators offer a comprehensive suite of advantageous features:

- Precise real-time magnetic position control without mechanical limit switches, facilitating maintenance-free functionality.
- Minimal spare parts requirements, resulting in reduced lifetime costs.
- Simplified setup and commissioning process, leading to lower installation expenses.
- Dedicated alarms for over-torque and temperature conditions, enhancing operational safety.
- Robust implementation of CANbus ensuring a reliable serial connection.
- Self-locking capability that permits motor-driven movement while restricting movement from the gear side.
- Remote programming capability via CAN cable.
- Adjustable motor speed to accommodate varying closure time requirements.

1.1 Safety Notice and Instruction

In order to protect and ensure the safety of the product and the system controlled by the product, the product must be used in strict accordance with the safety-related instructions and precautions in this manual.

The user is responsible for ensuring that all maintenance, inspection and installation are carried out by authorized person who are thoroughly familiar with this instruction manual.

Failure to follow instructions for proper electrical wiring, storage, set-up and maintenance may cause serious injury, damage equipment, or void warranty.

Note is used to draw attention to important or helpful information.

Caution!	**A caution is used when there is a danger that the equipment is damaged if you do not follow the instructions.**

	**Warning is used to draw attention to information of very high importance, for example to avoid injuries to personnel.**

1.2 Technical Specification

Torque Range	100Nm ~ 3000Nm 4000Nm Up to 50,000Nm with gearbox
Motor Speed	18/24/36/48/72/144 rpm
Type of duty	Throttle type: S4 (30%) On/OFF type: S2 (15min)/380VAC, S2 (10min)/220VAC
Encapsulation	IP68 (5m/1h)
Operation temperature	-25～+55℃
Supply voltage AC	Three phase 380V AC 50Hz Single phase 220V AC 50Hz
Supply voltage DC	DC24V ±10%
Dead zone	0.3%～9.9%
Flange connection	Complies with ISO5210, JB2920
Coating	Epoxy polyester powder coating C2
Cable glands	2*NPT 3/4 (φ14-φ18)
Control interfaces	Digital / Analog / CANOpen / Profibus
Manual operation	Standard feature using hand wheel. Mechanical valve position indicator for On/Off type. Visual status indication by LCB and local control unit for throttle type.

1.3 Local control unit (LCU) Features

- Local opening and closing operation buttons.
- Local/remote knob with lockable lock.
- LED indicator for valve positioning.
- Configuration via menu in LCB to set open/close position, interface type.
- Password protection for setting authorization.
- 18 bits absolute encoder ensures accuracy valve position feedback.
- Power phase sequence detection, overheating and over torque protection.
- ESD operation.
- Infrared and Bluetooth controlled as optional.

1.4 Manual operation

In case of power failure, control system error or another fault preventing normal operation of the actuator, it can be operated manually without the need of additional tools:

1) Depress the red button ❶ along its axis.
2) Upon hearing a "click" sound, the handwheel is secured in position and set to manual mode.
3) Rotate clockwise to close the valve or counterclockwise to open it.
4) When the system is powered on, the handwheel remains fixed, with the handle retracted.

Fig. 1 Manual handwheel

1.5 SMT6 Ordering information

M6 XXXX . XXX . X X			
M7 XXXX			
SMT6 SMT7 serial	**Max.Torque**		
	0100 ~ 3000		

Interface

110 Digital without LCU
111 Digital with LCU
120 CAN without LCU
121 CAN with LCU
130 Analog without LCU
131 Analog with LCU
150 DualCAN without LCU
151 DualCAN with LCU
171 Profibus with LCU
181 Dual Profibus with

RPM

1 18rpm
2 24rpm
3 36rpm
4 48rpm
6 60rpm
7 72rpm
8 96rpm
C,D,E,F….
Special request

Power

1 110VAC
2 220VAC
3 380VAC
4 440VAC
5 110VAC
6 220VAC dual power
7 24VDC

LCU:	SMT6.011.01/02/03	Digital LCU
	SMT6.021.01/02/03	CANOpen LCU
	SMT6.031.01/02/03	Analog LCU
	SMT6.051.01/02/03	DualCAN LCU
	SMT6.071.01/02/03	Profibus LCU
	SMT6.081.01/02/03	Dual Profibus LCU

2. Technical Data

2.1 Technical data of 380V three-phase

Model	rpm	Max. Torque Nm	Power (kw)	Rated current A	Inrush current A
M60100	18	100	0.42	2.6	5.46
	24	100			
	36	80			
	48	70	0.5	2.82	5.92
	72	60			
	96	50	0.71	3.25	6.83
	144	40			
M60150	18	150	0.5	3	5.8
	24	150			
	36	100			
	48	90	0.84	3.2	6.72
	72	80			
	96	60	0.84	3.5	7.35
	144	50			
M60200	18	200	0.89	4.82	14.47
	24	200			
	36	200	1.49	4.99	14.98
	48	180			
	72	170			
	96	150	2.14	6.2	18.6
	144	100			
M60300	18	300	0.89	4.82	14.47
	24	300			
	36	280	1.49	4.99	14.98
	48	250			
	72	200			
	96	170	2.14	6.2	18.6
	144	120			
M60400	18	400	1.49	4.99	14.98
	24	400			
	36	350	1.78	5.17	15.5
	48	300			
	72	250			
	96	230	2.68	7.58	22.73
	144	150			
M60500	18	500	2.3	9.64	27
	24	500			

Model	rpm	Max. Torque Nm	Power (kw)	Rated current A	Inrush current A
	36	450			
	48	400	2.85	9.82	27.49
	72	350			
	96	300	3.35	12.4	34.72
	144	200			
M60600	18	600	2.85	9.82	27.49
	24	600			
	36	550			
	48	500	3.25	10.68	29.9
	72	400			
	96	320	4.77	13.78	38.58
	144	260			
M60800	18	800	2.85	9.82	27.49
	24	800			
	36	750			
	48	600	3.25	10.68	29.9
	72	500			
	96	350	4.77	15.71	43.98
	144	300			
M60900	18	900	3.25	12.18	26.8
	24	900			
	36	800	3.5	13.12	28.86
	48	700			
	72	550	5.5	20.62	45.36
	96	400			
	144	350			
M61000	18	1000	3.89	11.37	88
	24	1000			
	36	850	4.50	13.78	88
	48	700			
	72	650	6.91	24.11	90
	96	550			
	144	420			
M61500	18	1500	5.89	17.22	90
	24	1500			
	36	1300	7.77	22.73	90.93
	48	1000			
	72	900	9.42	27.56	99.2
	96	750			
	144	650			

Model	rpm	Max. Torque Nm	Power (kw)	Rated current A	Inrush current A
M62000	18	2000	7.77	22.73	90.93
	24	2000			
	36	1700	8.90	29.28	105.4
	48	1400			
	72	1200	12.57	37.89	136.4
	96	1000			
	144	850			
M63000	18	3000	9.42	29.28	105.4
	24	3000			
	36	2000	10.47	30.31	109.12
	48	1800			
	72	1600	16.75	48.22	173.6
	96	1450			
	144	1350			

2.2 Technical data of 220V single-phase

Model	rpm	Torque N·m	Capacitance μF	Power kW	Rated current A	Inrush current A
M60100	18	60	20	0.35	3.16	6.55
	24	60				
	36	50	30	0.4	3.56	7.12
	48	50				
	72	35	30	0.45	4.12	8.15
M60400	18	150	50	0.48	5.35	10.71
	24	150				
	36	130	60	0.6	5.95	11.9
	48	100				
	72	50	60	0.6	6.54	13.09
M60600	18	300	80	0.81	14.28	28.56
	24	250				
	36	200	80	1.1	14.87	29.75
	48	170				
	72	130	120	1.1	15.47	30.94

2.3 Technical data of DC 24V

Model	Speed r/min	Torque N·m	Power (kw)	Rated current A	Inrush current A
M60100 M60150	24	50	24	0.5	28
	24	70	24	0.58	32
	24	80	24	0.81	45
	24	100	24	0.83	46
	24	110	24	0.99	55
M60400	24	110	24	0.61	34
	24	120	24	0.68	38
	24	130	24	0.72	40
	24	150	24	0.9	50

3. storage and pre-installation

3.1 Receiving and unpacking

All Eltorque actuators are thoroughly finished and undergo functional testing before leaving the factory.

Firstly, verify that the nameplate data (model, serial number, nominal torque, nominal voltage range, protection degree, operating speed range, protection class, etc.) matches the expected specifications.

If the actuator is received separately from the valve, check the position of electric actuator is at the midpoint of its stroke. Ensure that all adjustments outlined in the Instruction and Operating Manual are performed. Inspect for any transport damage, particularly the local position indicator and display area glass if equipped with a Local Control Unit. Confirm that the installed accessories match those specified in the order.

If the actuator arrives pre-assembled with the valve, the electric end-of-travel settings should have been completed during assembly. However, it is advisable to verify that all required adjustments, as detailed in this User Manual, have been successfully made.

3.2 Storage Procedure

Indoor Storage

- Make sure the actuators are kept in a dry place, laid on a wooden pallet (not directly on the floor surface) and protected from dust.
- In very humid environments, a moisture absorbent desiccant packet should be introduced in the motor enclosure.

Outdoor Storage

- Make sure the actuators are protected from the direct action of weather agents (protection by a canvas tarp or similar). Environment temperature: - 20 °C to +70 °C.
- Place the actuators on a wooden pallet, or some raised plat form, so that they are not in direct contact with the ground, and protected from dust.
- In very humid environments, a moisture absorbent desiccant packet should be introduced in the motor enclosure.

4. Installation

4.1 Before Installation

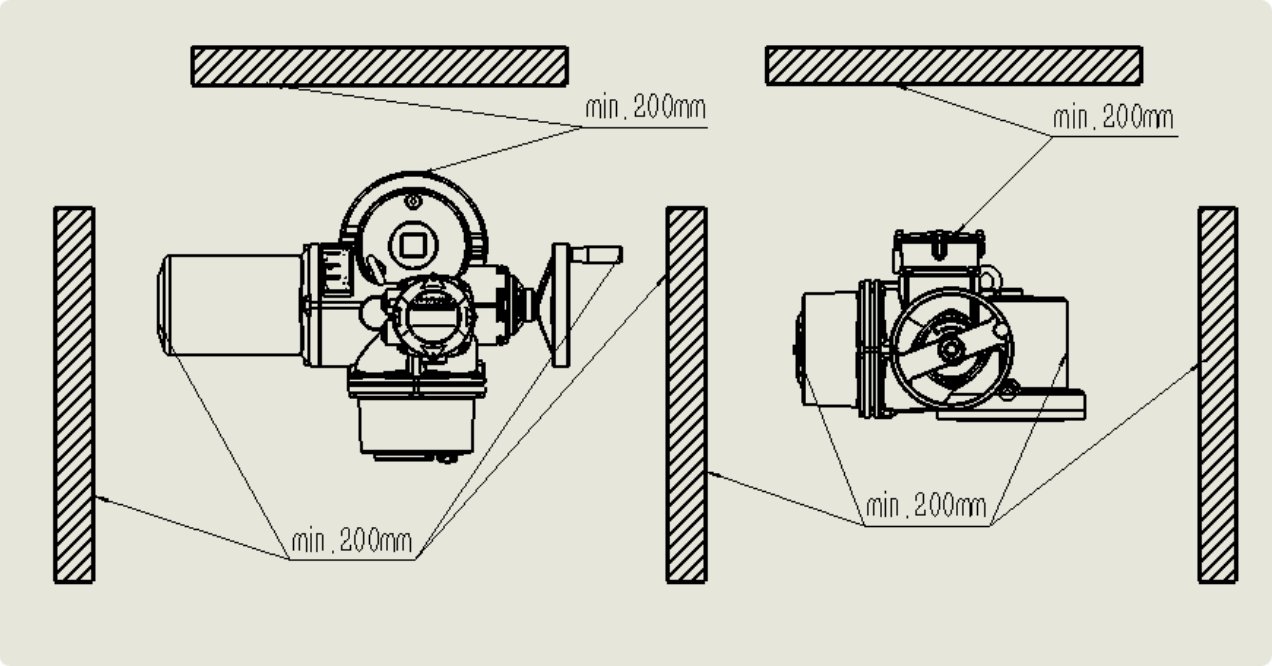
To assemble the actuator onto the valve, proceed as follows:

4.1.1. Verify that the dimensions of the valve flange and stem correspond with the actuator's coupling specifications.

4.1.2. Ensure that the electrical supply cables are appropriate for the actuator's power rating and compatible with the cable glands.

4.1.3. Gather the necessary tools for the assembly and configuration of the actuator controls.

4.1.4. Prior to affixing the actuator, confirm that there is adequate clearance for installation, maintenance, and manual operation in the vicinity.



4.2Installation of the actuator onto a valve

4.2.1. Install the actuator onto the valve, ensuring that the actuator's aperture aligns properly with the valve stem. This connection should be made smoothly without applying excessive force.

4.2.2. Once the valve stem is engaged with the actuator, utilize the handwheel to rotate the manual operation shaft, facilitating the alignment of the actuator's mounting holes with the valve stem.

4.2.3. The actuator can be powered on following the coupling of the actuator and valve to enable the operation of the valve stem through the actuator. Ensure that the valve is

not in a fully open or closed position to allow for accurate rotation.

Caution!

4.2.4. Ensure that the electric actuator is positioned at the midpoint of its stroke prior to initiating electrical operations. Upon receiving the command to either open or close the valve, the electric actuator should actuate in the corresponding direction. If the actuator moves in the opposite direction, immediately disconnect the power supply and interchange any two of the phase input cables.

4.2.5. Secure the actuator using the provided screws and washers, confirming that the screws are of appropriate length.

4.3 Electrical installation

Do not manually operate the actuator with devices other than the handwheel. Using handwheel only if the motor is at standstill.

4.3.1 Loosen top cover fastening screws, 4 pcs. Remove the top cover by pulling straight out. Make sure that top cover gasket does not fall out.

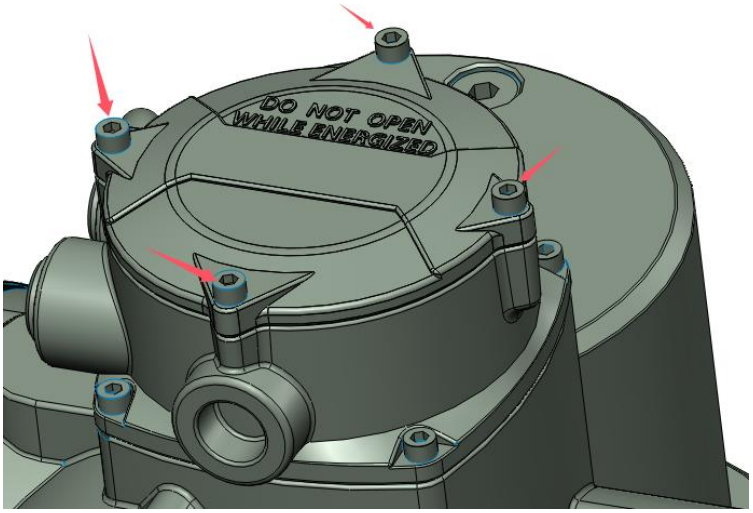


Fig. 2 Top cover

4.3.2 According to the wiring diagram, connect the power cable and signal cable in terminals shown as below:

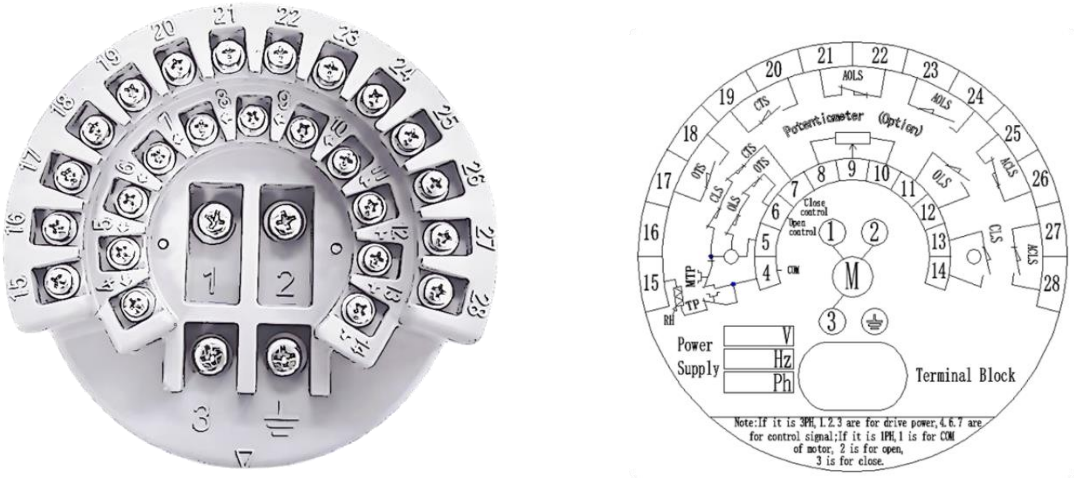


Fig. 3 Cable Connection Terminals

4.3.3 Install the power supply cables through the cable glands on the right side and connect them to the L, N and G/ PE terminals.

4.3.4 Install the control signal cables through the cable glands according to section 4.4

4.3.5 Earthing of product: For maximum personnel and equipment protection in maritime installations, Eltorque recommends that the earthing methodology follows "guidelines for earthing in maritime installations" published by The Norwegian Electrical Safety Directorate. Failing to do so may void the warranty. This guideline is available online.

4.4 Wiring Diagram

4.4.1 On/OFF Digital interface 380V AC

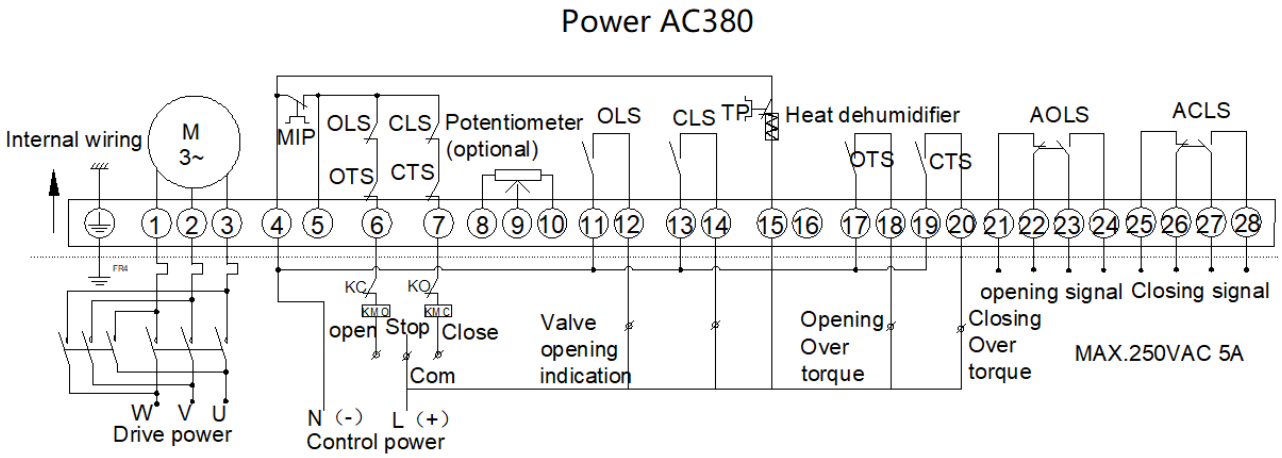


Fig. 4 380VAC electrical wiring diagram

Caution!

To prevent damage to the valve stem, when operating with a three-phase power supply, ensure that the electric actuator is positioned at the midpoint of its stroke prior to energizing the system. Upon receiving a command to either open or close the valve, the electric actuator must move in the corresponding direction. If this condition is not met, immediately disconnect the power supply and interchange any two of the phase input cables.

4.4.2 On/OFF Digital interface 220V AC

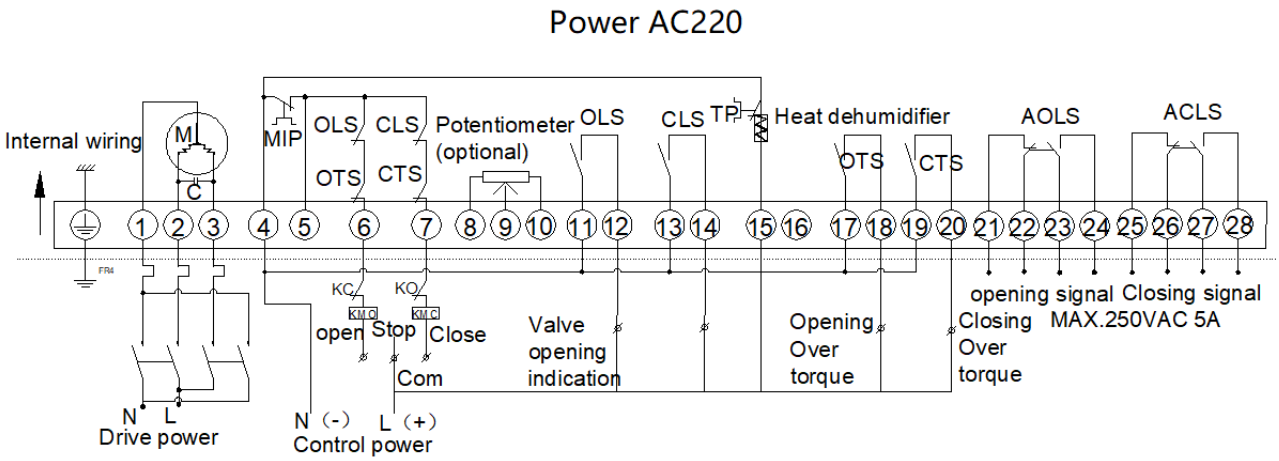


Fig 5 220VAC electrical wiring diagram

4.4.3 On/OFF Digital interface 24V DC

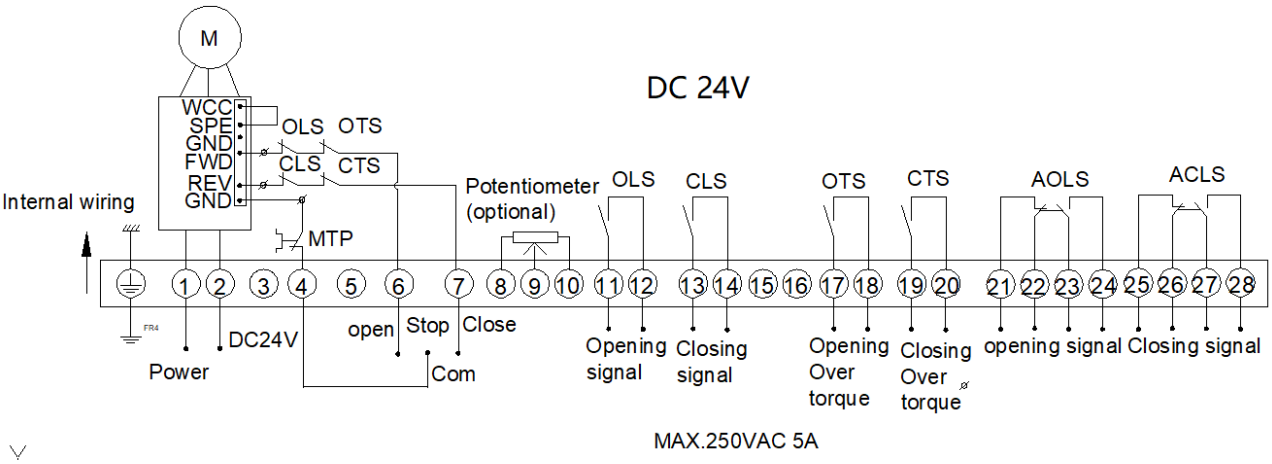


Fig 6 24VDC electrical wiring diagram

4.4.4 Digital Interface

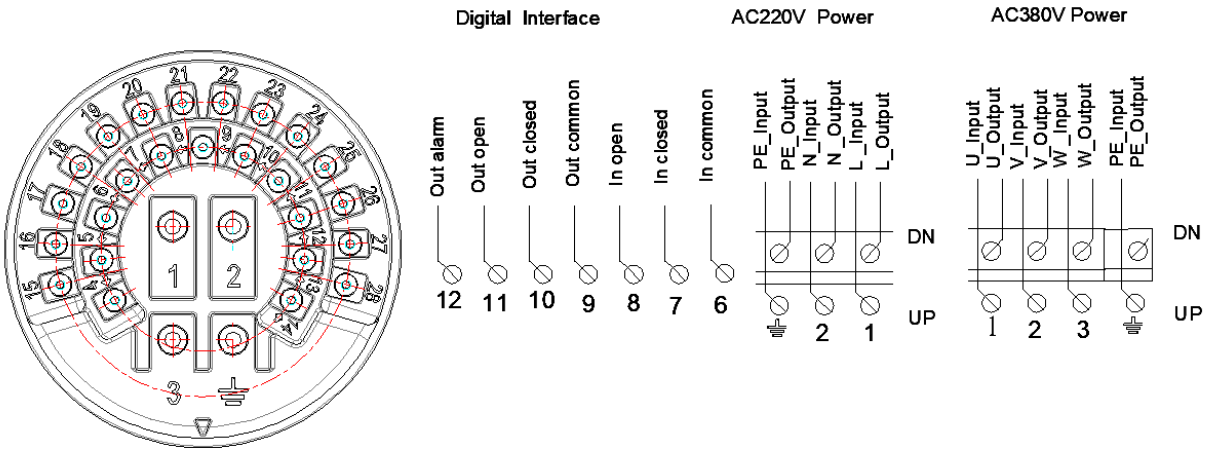


Fig 7 Digital wiring diagram

4.4.5 CAN interface

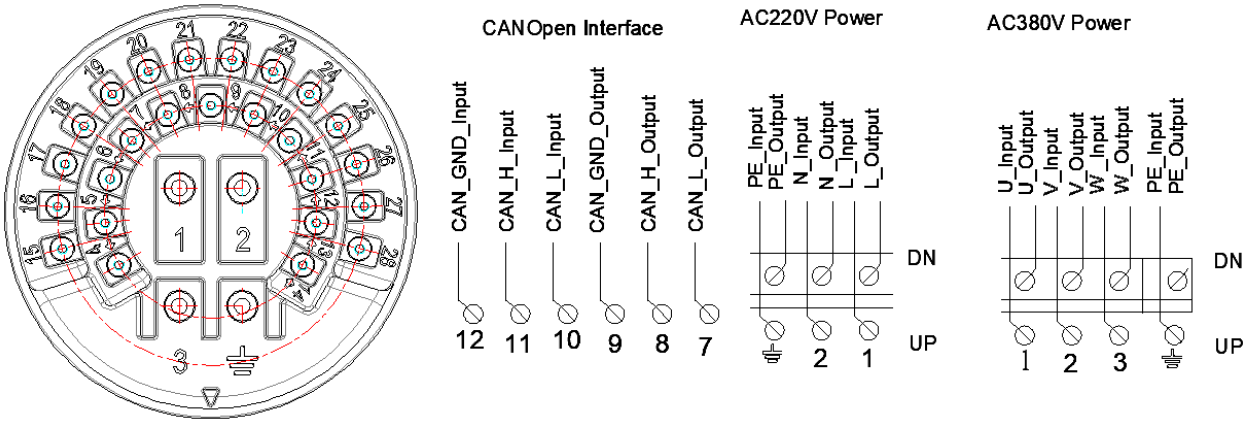


Fig 8 CANOpen with LCU wiring diagram

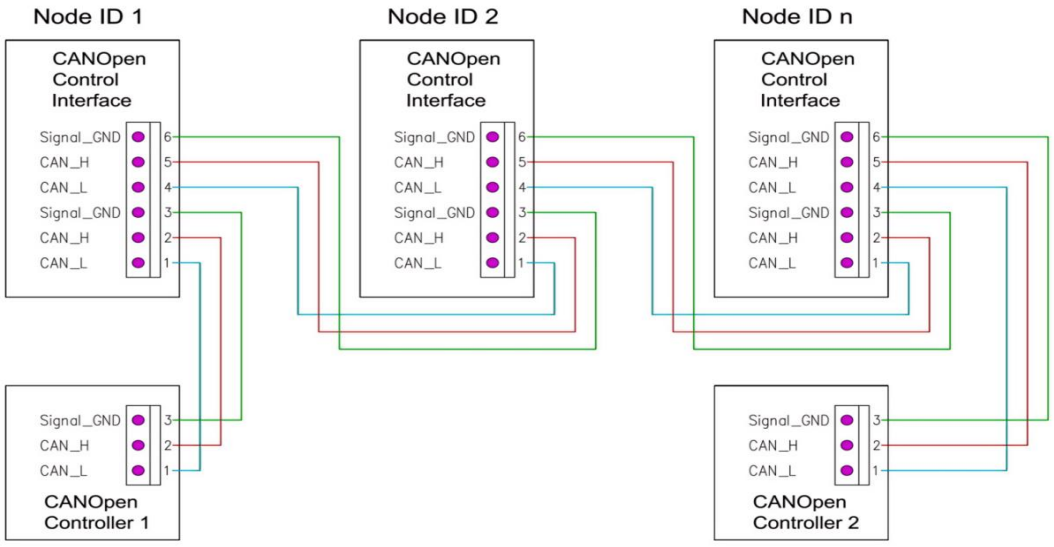


Fig 9 CANOpen Loop Connection Diagram

4.4.6 Analog interface

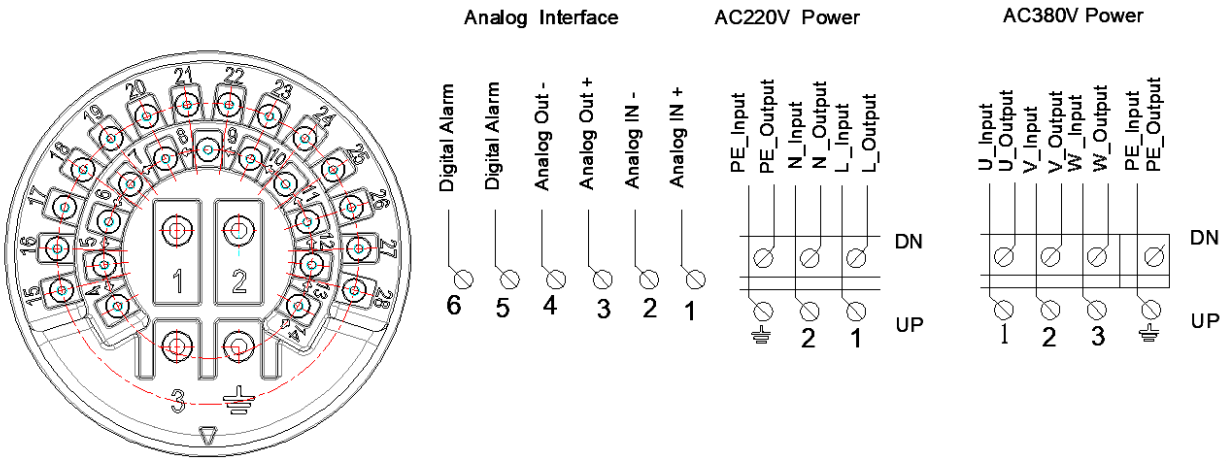


Fig 10 Analog wiring diagram

4.5 Dimension

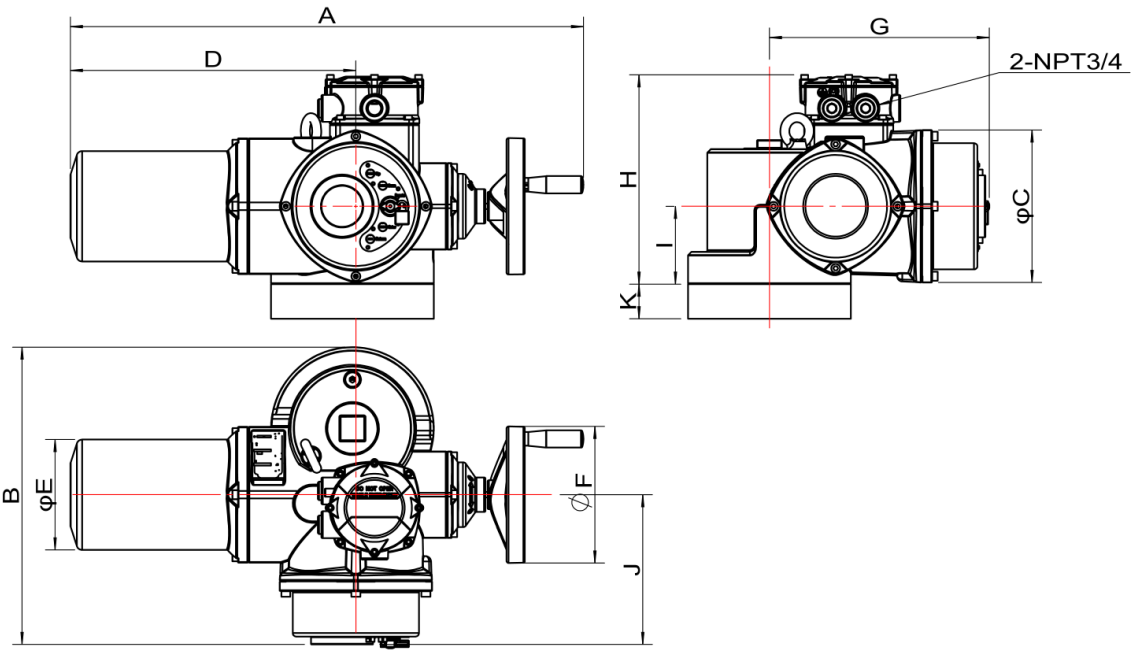


Fig 11 Dimensions of SMT with LCU

Model	A	B	ΦC	D	ΦE	ΦF	G	H	I	J	K		Weigh (kg)
											Z flange	T flange	
M60100 M60150	569	370	222	293	105	125	300	290	108	245	0	60	26
M60200 M60300 M60400	682	400	222	360	135	200	320	300	108	245	41	60	42
M60500 M60600 M60800 M60900	745	460	222	404	155	200	345	305	114	255	41	62	56
M61000 M61500 M62000 M63000	855	525	222	519	226	247	370	355	165	255	0	125	165

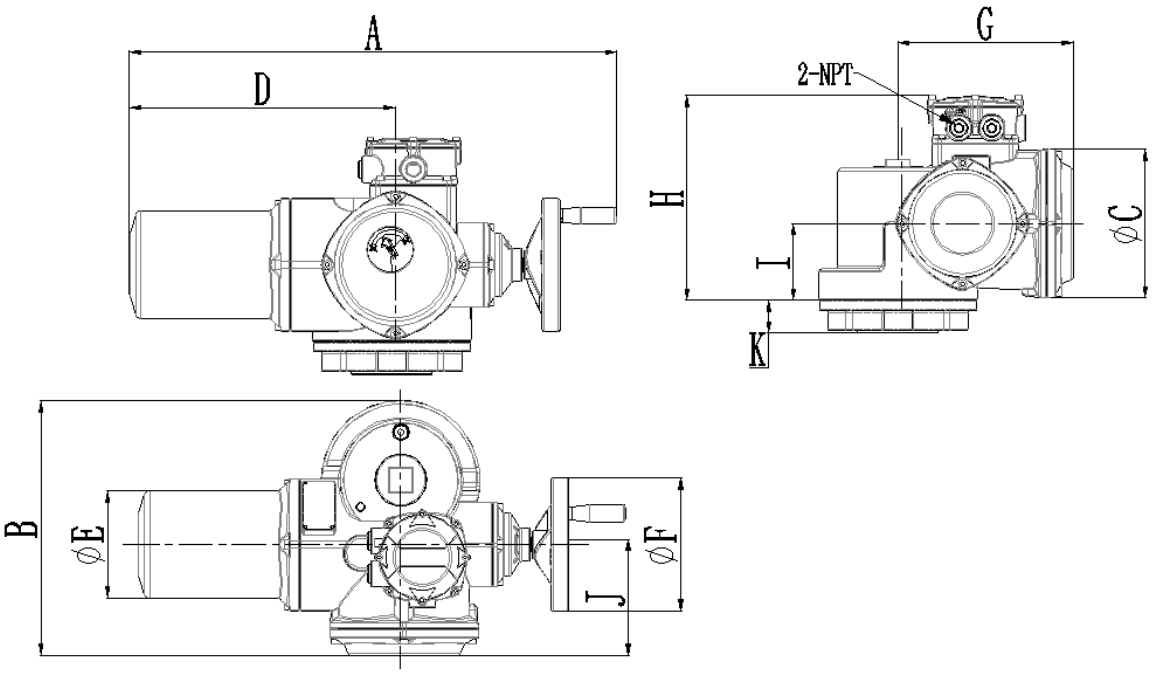


Fig 12 Dimensions of SMT without LCU

Model	A	B	ΦC	D	ΦE	ΦF	G	H	I	J	K		Weigh (kg)
											Z flange	T flange	
M60100 M60150	569	294	222	293	105	125	219	290	108	160	0	60	20
M60200 M60300 M60400	682	332	222	360	135	200	235	300	108	160	41	60	38
M60500 M60600 M60800 M60900	745	387	222	404	155	200	261	305	114	165	41	60	54
M61000 M61500 M62000 M63000	855	445	222	519	226	247	290	355	165	165	0	125	145

4.6 Actuator Outgoing Interface

4.6.1 Y-Type, JB2920 standard

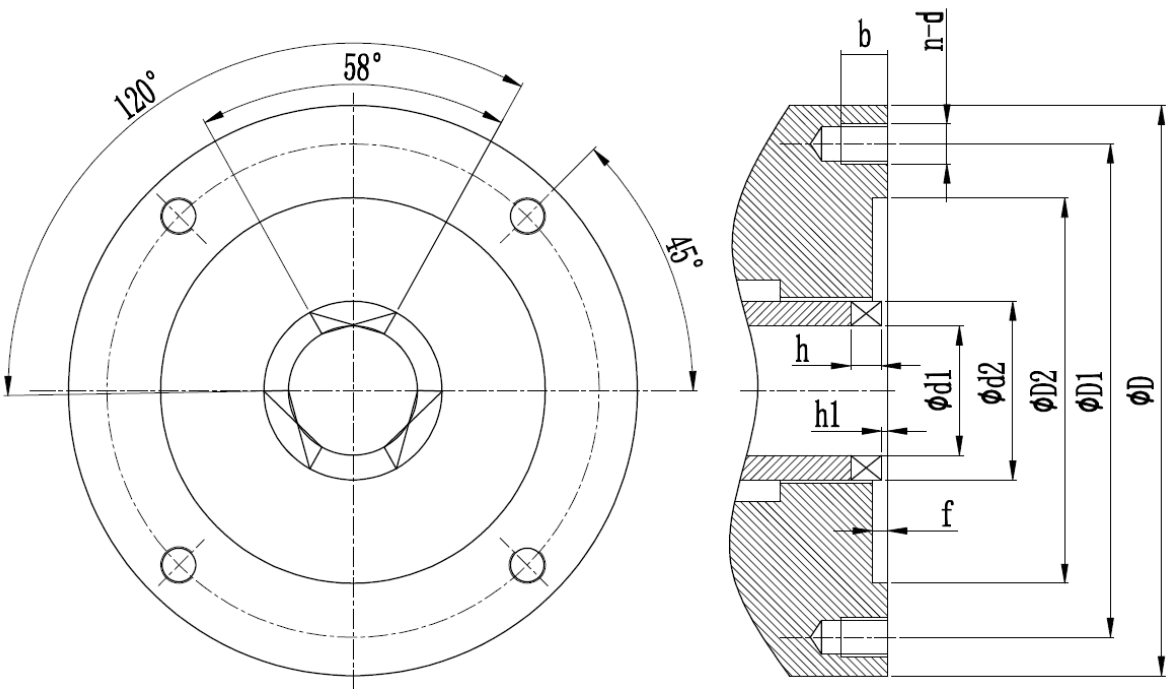


Fig 13 Outgoing interface Y-Type JB2920

Model	ΦD	ΦD1	ΦD2	Φd1	Φd2	f	h	h1	n-d	b
M60100 M60150	145	120	90	30	45	5	8	2	4-M10	20
M60200 M60300 M60400	185	160	125	42	58	5	10	2	4-M12	20
M60500 M60600 M60800 M60900	225	195	150	50	72	5	12	2	4-M16	25
M61000 M61500	275	235	180	62	82	5	14	2	4-M20	30
M62000 M63000	330	285	220	72	98	6	16	3	4-M24	35

4.6.2 C-type or T-type, ISO5210

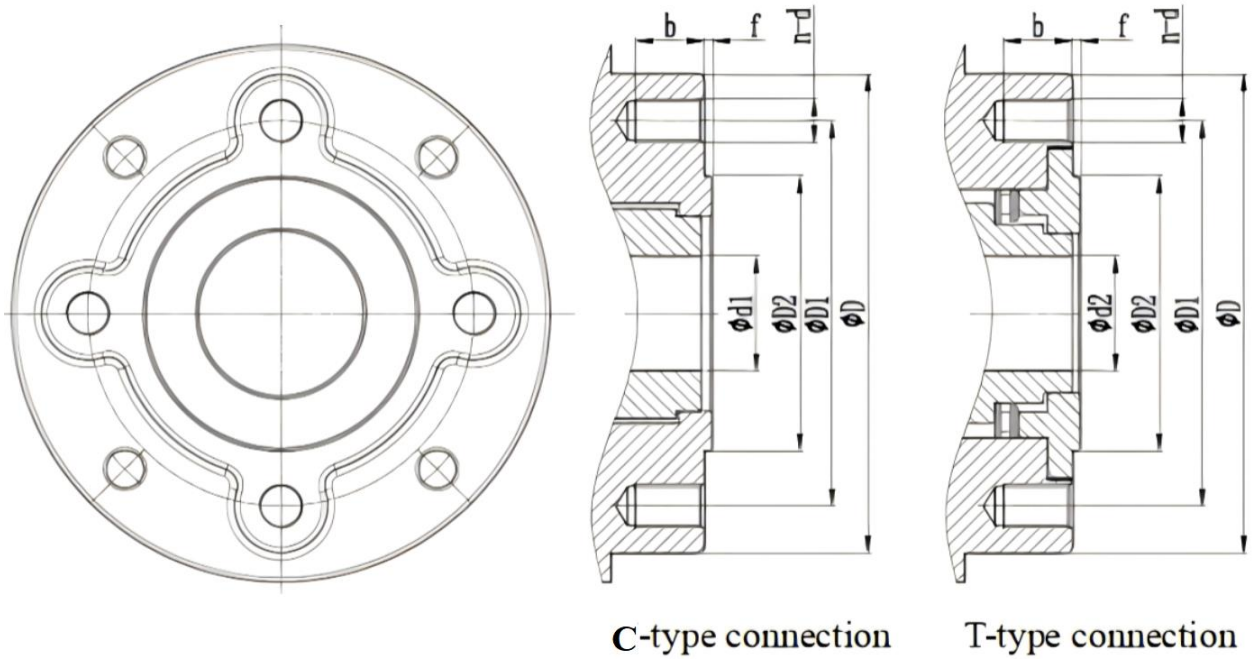


Fig 14 Outgoing interface C-Type or T-Type ISO5210

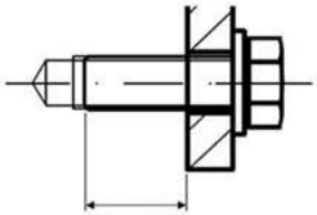
Model	Flange	ΦD	ΦD1	ΦD2	f	Φd1 (max)	Φd2 (max)	n-d	b
M60100 M60150	F10	120	102	70	3	30	Tr28	4-M10	15
M60200 M60300 M60400	F14	175	140	100	4	42	Tr40	4-M16	24
M60500 M60600 M60800 M60900	F16	205	165	130	5	50	Tr48	4-M20	30
M61000 M61500	F25	338	254	200	5	82	Tr80	8-M16	25
M62000 M63000	F30	338	298	230	5	82	Tr80	8-M20	30

4.7 Installation

The installation angle can range from 0 to 360 degrees. The configuration of this electric actuator does not impose specific operational principles; however, it is essential for the motor to be positioned horizontally, while the electrical enclosure should be aligned horizontally or oriented upwards. This configuration is advisable as it facilitates optimal lubrication, calibration, maintenance, and manual operation.

During the installation process, it is imperative to ensure adequate clearance for maintenance and inspection personnel to access and disassemble individual components. The axial play at the connection between the electric actuator and the valve must be maintained at a minimum of 1- 2 mm. The tensile strength of the connecting bolts should meet or higher grade recommended below.

Thread size	*Tightening torque. (Nm)*	*Min. thread engagement. (mm/in.)*	
M4	*3.4*	*NA*	
M5	*5.1*	*7.5/0.30*	
M6	*8.9*	*9/0.35*	
M8	*21.1*	*12/0.47*	
M10	*41.5*	*15/0.59*	
M12	*70.7*	*18/0.70*	
M16	*172.6*	*24/0.94*	
M20	*336.2*	*30/1.18*	



Min. thread engagement

For applications involving rising stem valves, it is crucial to verify that the valve stem extension is compatible with the length of the valve stem guide.

5. Operation Guide

5.1 ON/OFF model without LCU

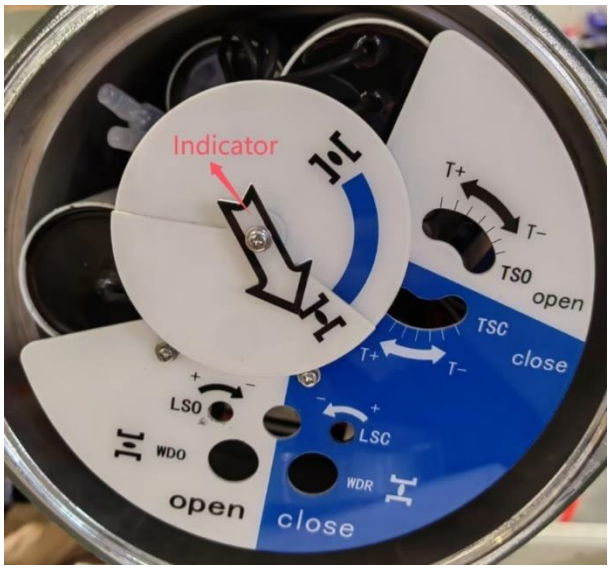


Fig 15 On/Off display panel

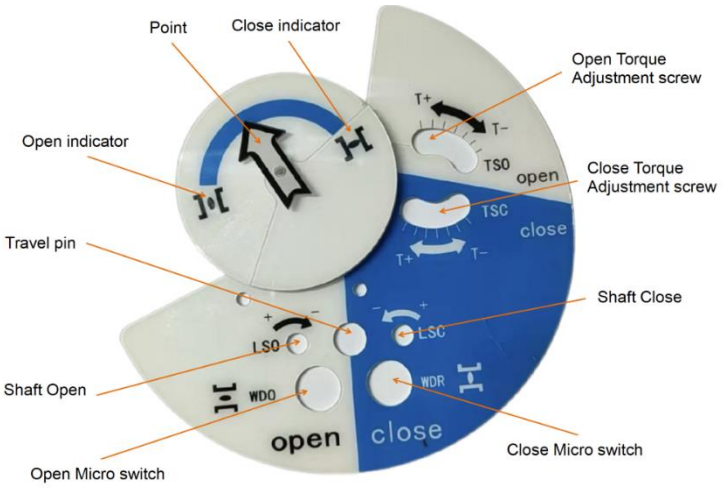


Fig 16 Panel indication

5.2 On/Off Model Stroke setting (Digital type without LCU)

The Stroke has been calibrated set to meet the valve traveling at the time of assemble with valve and typically does not require further adjustment.

In the event that the actuator is delivered separately from the valve, it is essential to perform a stroke calibration during the initial installation or reinstallation of the actuator. This calibration ensures accurate engagement or disengagement of the corresponding contacts when the valve is either fully opened or fully closed. The following outlines the procedure for this calibration:

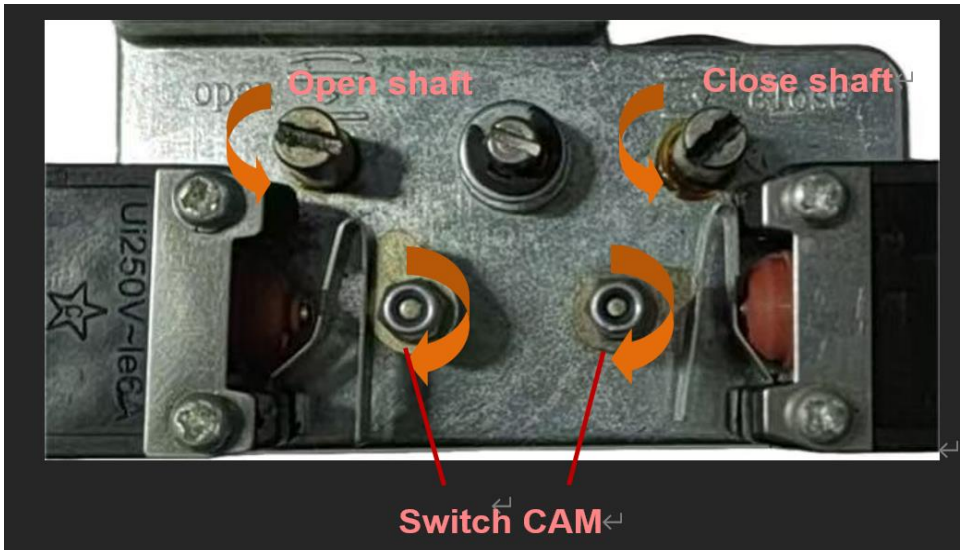


Fig 17 Open-Close Axis and contact switch Cam

5.2.1. Full Close Position Setting

- Execute a full manual closure of the valve
- Utilizing a flat-head screwdriver, apply pressure and perform a 90° rotation on the stroke ejector ① to secure its position.
- Rotate the LSC ② Close shaft counter clockwise to facilitate the clockwise rotation of the switch cam.
- Carry out a visual inspection through the WDR aperture to verify whether the switch cam has made contact with the metallic touchpoint.
- Turn stroke ejector ① back to initial position.

Fig 18 Stroke ejector

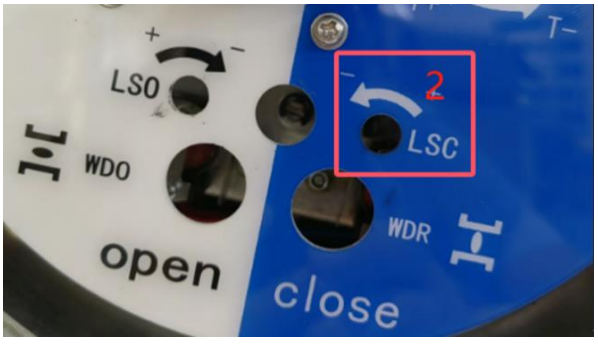


Fig 19 LSC Adjustment

5.2.2. Full Open Position Setting

- Execute a full manual open of the valve
- Utilizing a flat-head screwdriver, apply pressure and perform a 90° rotation on the stroke ejector ① to secure its position.
- Rotate the LSO ③ Open shaft counter clockwise to facilitate the clockwise rotation of the switch cam.
- Carry out a visual inspection through the WDO aperture to verify whether the switch cam has made contact with the metallic touchpoint.
- Turn stroke ejector ① back to initial position.

Fig 20 Stroke ejector

Fig 21 LSO Adjustment

5.2.3. Adjustment of positioning indicator

The positioning indicator has been calibrated set to meet the valve traveling at the time of assemble with valve in the factory and typically does not require further adjustment.

In the event that the actuator is delivered separately from the valve, it is essential to perform ad adjustment during the initial installation or reinstallation of the actuator.

The movement of the position indicator is determined by the gear assembly rotations beneath the indicator dial.

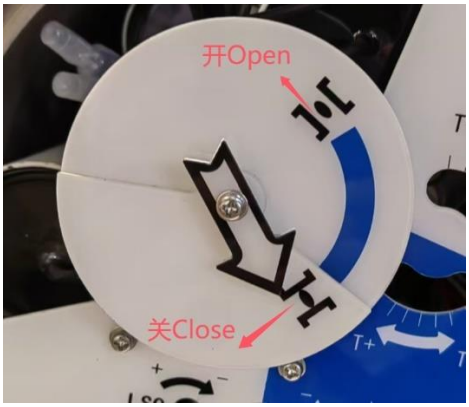


Fig 22 Positioning indicator dial

Fig 23 Gear of Turns

The following outlines the procedure for this adjustment:

- Check the turns of valves for full open/full close
- Utilizing a screw or by hand to move the gear of turns ④ to correspond position.

Fig 24 Adjustment of gear of turns

- There are a total of eight gear ratios, specifically calibrated to correspond with the varying rotations of the valve/actuator, as detailed in the table below.

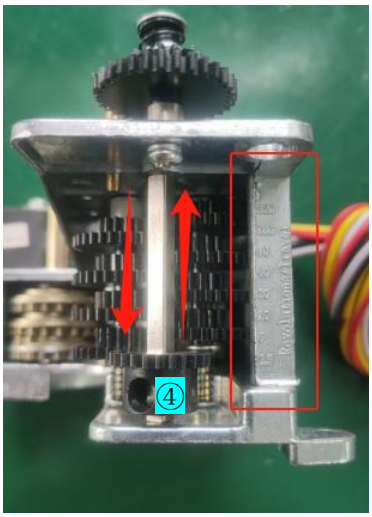


Fig 25 Gear Ratio

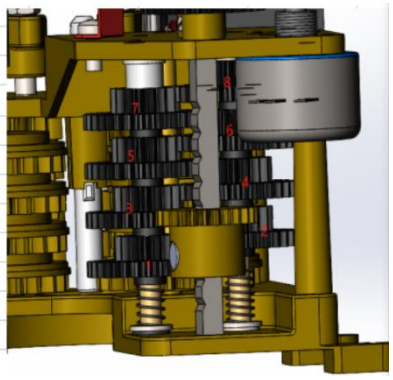


Fig 26 Gear level adjustment

Gear Level	Gear Ratio	Number of turns of valve			
		M60100	M60400	M60600	M63000
1	2.5	1.6	1.6	1.4	0.9
2	5	3	3	2.7	1.8
3	10	6	6	5	3
4	20	12	12	10	7
5	40	25	24	21	14
6	80	51	49	43	29
7	160			86	58
8	320			173	117

- Manually or electrically actuate the valve to open position and monitor the rotational direction of the potentiometer gear in relation to the indicator panel.
- Loosen the fastening screw and adjust the pointer to align with the opening position, then re-secure the screw.
- Rotate the potentiometer shaft towards the endpoint, following the observed rotational direction of the potentiometer gear, ensuring a slight margin remains.
- Manually or electrically actuate the valve to the fully closed position, keeping the opening pointer stationary, and adjust the close indicator disk to align the 'off' designation with the opening pointer.

5.2.4. Torque controller adjustment

The torque setting has been calibrated at the factory to meet user specifications and typically requires no further adjustment. Should a modification of the setting be necessary, the torque adjustment screw can be rotated in the direction of either tightening or loosening the cam to align with the desired scale. It is recommended to adjust the closing mechanism first, followed by the opening mechanism.

Note:

Prior to configuring the stroke of the actuator, it is essential to verify the position of the valve to prevent potential damage to the valve and associated components.

5.3 Local Control Unit

5.3.1. Buttons and indication lights

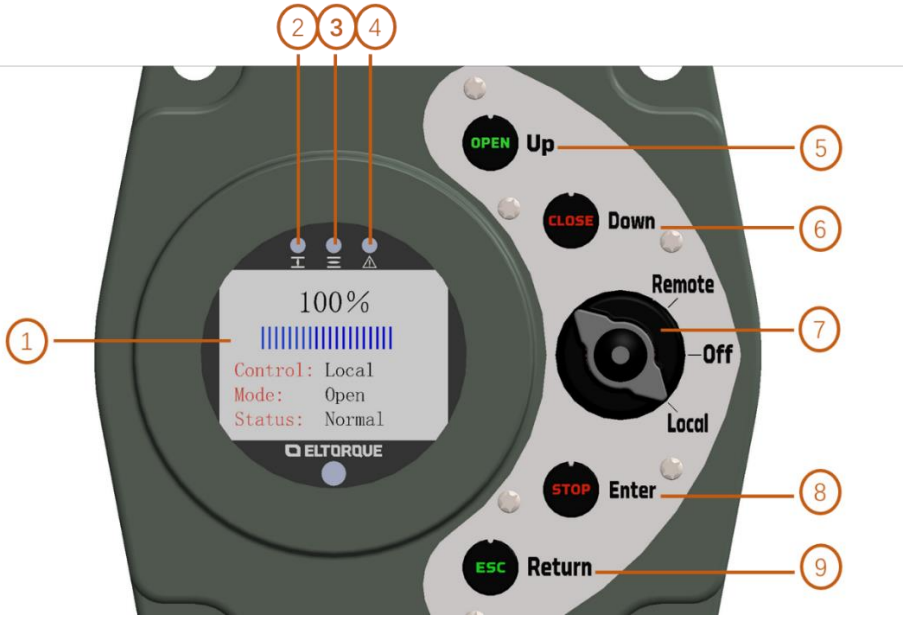


Fig 27 LCU

① Display: LCD screen

② Yellow indication light: When the valve close to position, yellow indication light on

③ Green indication light: When the valve open to position, green indication light on

④ Alarm indication light: When error or alarm happen, red indication light on, back to normal, red indication light off

⑤ OPEN/Up button

When the selector switch to Local， OPEN: valve opening operation

When the selector switch to Off， Up: Used to scroll up menus and change font sizes

⑥ Close/Down button

When the selector switch to Local，Close: valve closing operation

When the selector switch to Off, Down: Used to scroll down menus and change font sizes

⑧ STOP/Enter button

When the selector switch to Local, STOP: suspend process

When the selector switch to Off, Enter: Confirm selection

⑨ ESC/Return button

When the selector switch to Off, Return: return to the previous display.

⑦ Local/Remote switch

Remote: In remote operation mode, the actuator is inoperable via the press button ⑤⑥⑧⑨

Off: Configuration mode, menu navigation for display and setting is made via the press button ⑤⑥⑧⑨

Local: In local operation mode, the actuator can be operated using the press button ⑤⑥⑧⑨

5.3.2. Remote Control Unit (Option)

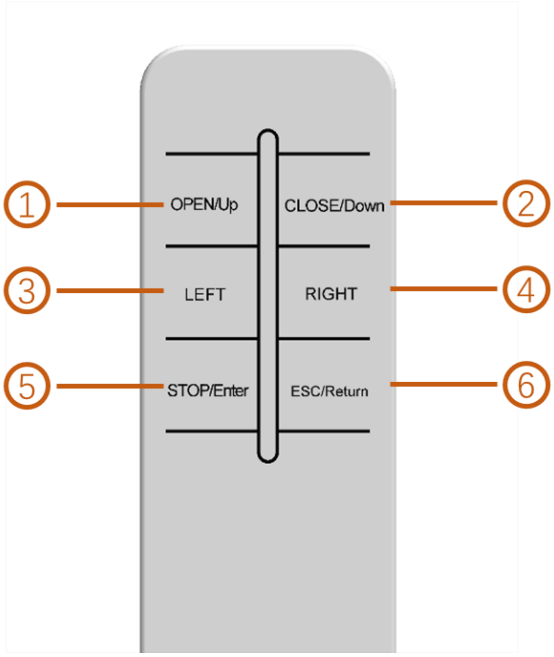


Fig 28 Remote Controller

The remote-control unit by ELTORQUE allows operation, configuration and parametrization of SQT/SMT serial actuators.

① OPEN/Up button
When the selector switch to Local; OPEN: valve opening operation.
When the selector switch to Off; Up: Used to scroll up menus and change font sizes

② Close/Down button
When the selector switch to Local; Close: valve closing operation.
When the selector switch to Off; Down: Used to scroll down menus and change font sizes

③ Left button
Use to scrolling left to select menu

④ Right button
Use to scrolling right to select menu

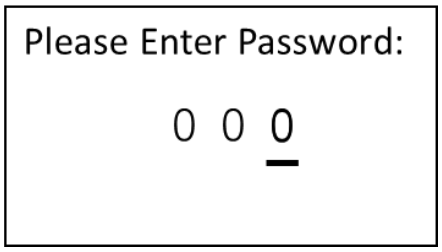
⑤ STOP/Enter button
When the selector switch to Local; STOP: suspend process
When the selector switch to Off; Enter: Confirm selection

⑥ ESC/Return button
When the selector switch to Off; Return: return to the previous display.

Note:
When using remote controller, the knob switch needs to turn to Off position enable all setting operations.

5.3.3. Password

There are 2 different passwords, basic password and advanced password.
Basic password: Use for configuration
Advanced password: Use for maintenance
Both passwords will be provided at the time of delivery.



- Password entry
- Press buttons OPEN/Up, CLOSE/Down to select figure 0 to 9.
- Confirm first digit of password by pressing button STOP/Enter.
- Repeat above step for all further digits.
- Confirm the last digit with STOP/Enter, access to next menu.
  If incorrect figure entry, please entry all 3 digits then the display indicates Password Fail, then enter password again.

5.3.4. Language

Changing language follows below procedure.

- Select knob to position Off
- Press button CLOSE/Down to select Language

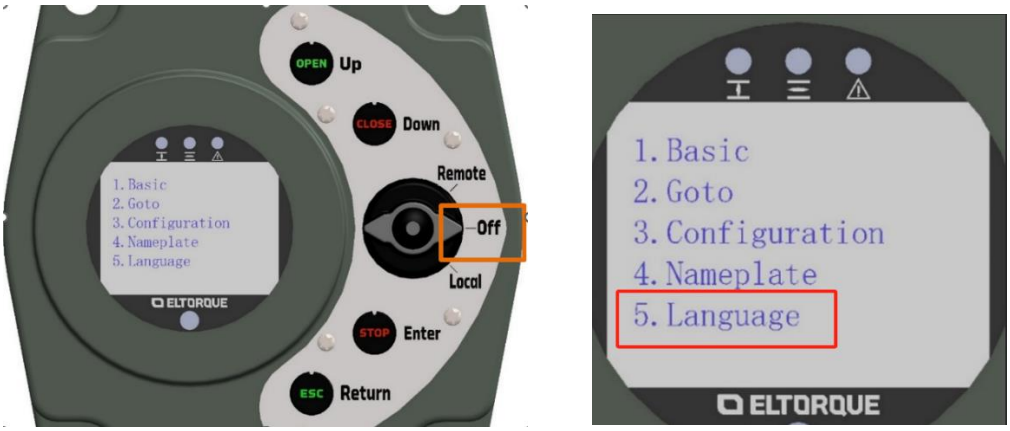


Fig 29 Language setting

- Press button STOP/Enter, display goes to next menu, select language
- Press button STOP/Enter to confirm selection
- Press button ESC/Return back to main menu.

5.3.5 Operate valve via local control unit

- Switch knob to position Local

Fig 30 Local operation

- Press the OPEN/Up button to initiate the command for opening the valve. When the valve reaches the fully open position, the bar graph will display 100%, and the indicator light will illuminate in GREEN.
- Press the CLOSE/Down button to command the closing of the valve. Once the valve is completely closed, the bar graph will show 0%, and the indicator light will turn YELLOW.
- Press the STOP/Enter button to halt the opening or closing process, with the display reflecting the current valve position as a percentage of its travel. You may then press the OPEN/Up or CLOSE/Down button to resume the valve operation.

6. Actuator Configuration

Before connecting power to the actuator, check that the voltages are correct and according to the indications on the nameplate. Wrong power supply could cause permanent damage to the electrical components. The configuration of the SMT serial actuator can be carried out through the local control unit panel. Following the procedures indicated as below.

After actuator installed with valve, open/close position must be configurated to make sure valve can be open/close properly.

The configuration must be done while the actuator is powered on. As a consequence, all configuration operations must be carried out by specifically qualified personnel.

6.1 Setting close position

(1) Rotate the knob to the Off position.
(2) Press the CLOSE/Down button to access the Configuration menu.
(3) Press the STOP/Enter button to proceed to the next menu and select Actuator Configuration.
(4) Press the STOP/Enter button again to navigate to the next menu and choose Set Close.
(5) Utilize the hand wheel to fully close the valve, ensuring it is completely shut.
(6) Input the basic password.
(7) Press the STOP/Enter button to confirm.
(8) Once the close position is set, press the ESC/Return button to return to the main menu.

Fig 31 Close configuration

6.2 Setting open position

(1) Rotate the knob to the Off position.
(2) Press the CLOSE/Down button to access the Configuration menu.
(3) Press the STOP/Enter button to proceed to the next menu and select Actuator Configuration.

(4) Press the STOP/Enter button again to navigate to the next menu and choose Set open.
(5) Utilize the hand wheel to desired open position.
(6) Input the basic password.
(7) Press the STOP/Enter button to confirm.
(8) Once the open position is set, press the ESC/Return button to return to the main menu.

Fig 32 Open configuration

6.3 Setting the valve opening timeout

(1) Set the knob to the Off position.
(2) Utilize the CLOSE/Down button to navigate to Configuration. Press the STOP/Enter button to proceed to the subsequent menu and select Advance.
(3) Press the STOP/Enter button again to advance to the next menu and choose Op TimeOut.
(4) Input the advanced password.
(5) Employ the OPEN/Up and CLOSE/Down buttons to modify the value.
(6) Press the STOP/Enter button to confirm the selected value. Then, press the ESC/Return button to return to the main menu.

Fig 33 Open Timeout setting

6.4 Remove mode

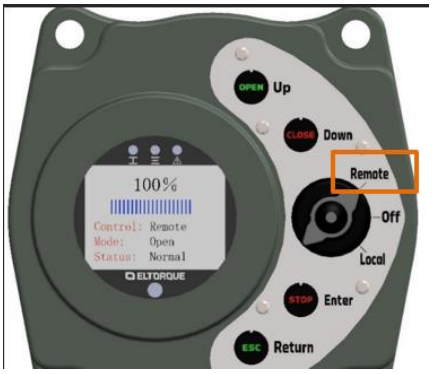


Fig 34 Remote mode

When knob set to remote position, the actuator can be remote controlled by control cabinet.

6.5 Analog signal calibration

The analog input utilizes a linear mapping relationship between 4-20mA and 0% -100%. By inputting different millionaire values, it represents different valve positions. The calculation method is as follows:

$$F = P \times S = P \times \frac{\pi \times D^2}{4} \times \eta_t \times 10^6$$

$$Position\ (\%) = \frac{current(mA) - 4}{16} * 100\%$$

$$current(mA) = Position(\%) * 16 + 4$$

To execute analog value calibration, it is necessary to set the "knob switch" to the "Off" position to access the "Setting Menu." From there, select "Configuration Information" and confirm your choice. Next, navigate to "Advanced Settings" to enter the submenu. Utilize the "Close/Down" button to locate the relevant analog value option. Calibration is required for four specific values, detailed as follows:

6.6.1. 4mA Input value calibration

(1) Set the switch to the Off position.
(2) Utilize the CLOSE/Down button to navigate to Configuration.
(3) Press the STOP/Enter button to advance to the next menu and select Advance.
(4) Press the STOP/Enter button again to proceed to the next menu and choose 4mA In.
(5) Input the advanced access code.
(6) Adjust the input value to 4mA using an analog signal device.
(7) Press the OPEN/Up button, followed by the CLOSE/Down button.
(8) Repeat the previous step.

(9) Press the STOP/Enter button to finalize the calibration process.

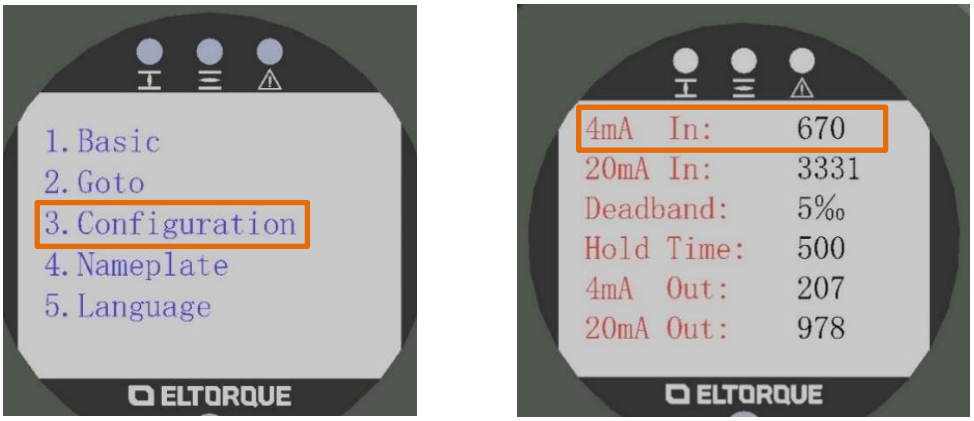


Fig 35 Analog input calibration

6.5.2. 20mA Input value calibration

The procedural steps involve the calibration of the 4mA calibration setting 6.5.1.

6.5.3. 4mA output value calibration

(1) Set the switch to the Off position.
(2) Utilize the CLOSE/Down button to navigate to Configuration.
(3) Press the STOP/Enter button to advance to the next menu and select Advance.
(4) Press the STOP/Enter button again to move to the subsequent menu and choose 20mA In.
(5) Input the advanced password.
(6) Adjust the output value to 20mA using an analog signal device.
(7) Press the OPEN/Up button, followed by the CLOSE/Down button.
(8) Repeat the previous step.
(9) Press the STOP/Enter button to finalize the calibration process.

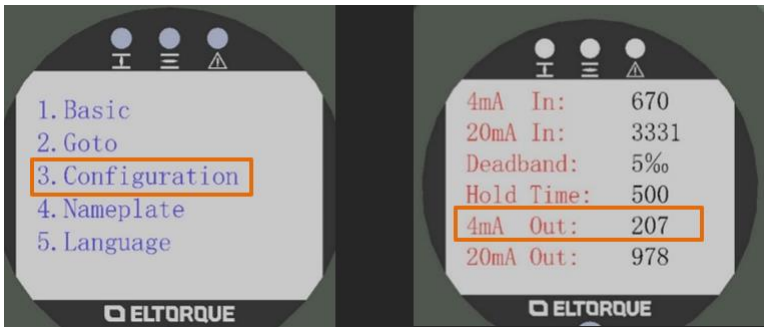


Fig 35 Analog output configuration

6.5.4. 20mA output value calibration

The procedural steps involve the calibration of the 4mA calibration setting 6.5.3.

6.6 CAN settings

6.6.1. CANopen system

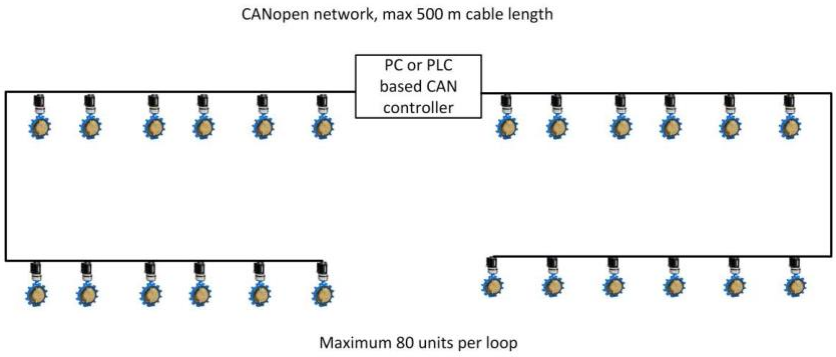


Fig 36 CANopen bus network

Note! Eltorque recommends a Max. of 80 nodes on 500m/1660 ft cable.

Note! For the Dual CAN configuration, Eltorque recommends no more than 75 nodes on 500m Hydraulic marine cable.

Cable requirements and recommendations for CANopen system

Cable parameter	Cable requirements and recommendations
Number of conductors	1(GND)+ twisted pair for CAN_H and CAN_L signals
Length related resistance /Cross section	Length related resistance; typical 70 mΩ/m Max 100 mΩ/m 70 mΩ/ 3ft 3.37 in Max 100 mΩ/3ft 3.37 in Normally equivalent to 0.5-1.5 mm^2/0.02 -0.06 in^2
Cable length (affects communication speed	Maximum 500 m/1650 ft.
Shield	EMC glands are not mandatory but are recommended incase the actuator is placed in conjunction with equipment emitting high levels of disturbance.
Termination resistor	Nominal 120 Ω Both ends of the signal loop must have the correct impedance.

6.6.2. Configuration

Node ID and baud rate can be set through the LCU. This procedure describes how to configurate node ID and baud rate:

- Node ID configuration
  (1) Set the switch to the Off position.
  (2) Utilize the CLOSE/Down button to navigate to Configuration.
  (3) Press the STOP/Enter button to proceed to the next menu, then select Advance.

(4) Again, press the STOP/Enter button to move to the subsequent menu and choose Node.
(5) Input the advanced password.
(6) Employ the OPEN/Up and CLOSE/Down buttons to modify the value.
(7) Confirm the selection by pressing the STOP/Enter button, then return to the main menu by pressing the ESC/Return button.

Fig 37 Node ID setting

- Baud rate configuration

(8) Set the switch to the Off position.
(9) Utilize the CLOSE/Down button to navigate to Configuration.
(10) Press the STOP/Enter button to proceed to the next menu, then select Advance.
(11) Again, press the STOP/Enter button to move to the subsequent menu and choose Baudrate.
(12) Input the advanced password.
(13) Employ the OPEN/Up and CLOSE/Down buttons to modify the value.
(14) Confirm the selection by pressing the STOP/Enter button, then return to the main menu by pressing the ESC/Return button.

Fig 38 Baud rate setting

Note! It is recommended to use a baud rate of 50 Kbit/s for single CAN, 20 Kbit/s for Dual CAN.

7 Service and Trouble shooting

7.1 Trouble shooting

Failure display	Description	Trouble shooting methods
No bus connection	CANBus not connected, bus address is xx	➢ Verify the integrity of the bus connections; if incorrect, rewire according to the schematic diagram. ➢ Ensure that the address and parameters of the host computer align with those of the actuator; if discrepancies exist, adjust the parameters on one side to achieve consistency.
Communication disconnection	The mainboard and display board are not connected	➢ Verify the integrity of the connection interfaces between the motherboard and the display module for potential poor contact or looseness; ➢ The motherboard may be compromised; ➢ The LCD display module may be faulty.
Signal loss	The control is set to the Remote state, and the remote analog signal level is below 2.5mA.	➢ Verify the integrity of the analog input circuitry and ascertain that the analog current is below 2.5 mA;
Closing over torque	The operational closing torque exceeds its specified rated value	➢ Has the torque setting in the primary menu been diminished? If yes, increase the setting; ➢ If the closing torque surpasses the specified rated torque, inspect for any obstructions interfering with the valve; ➢ The actuator's torque has been diminished;
Opening over torque	The operational opening torque exceeds its specified rated value	➢ Has the torque setting in the primary menu been diminished? If yes, adjust the value upward; ➢ If the closure torque surpasses the specified rated torque, verify for any obstructions impeding the valve; ➢ The actuator's torque output has been diminished;
Close or open direction blockage	Upon issuance of the command to terminate the operation, the status of the actuator remains static.	➢ The encoder may be improperly installed or experiencing gear slippage; ➢ The actuator might be immobilized, and the electronic torque function could be inoperative (potential obstruction of the electronic torque);
Closing/ Opening and obstruction of rotational	Upon the issuance of the command to terminate the operation, the state of the	➢ Failure of the AC contactor or solid-state relay; ➢ Induction motor malfunction; ➢ Damage to the main circuit board;

Failure display	Description	Trouble shooting methods
movement	actuator remains static	➢ Obstruction by other objects or a reduction in actuator torque.
Steering error	During rotation, a deviation in valve positioning is identified	➢ Access the calibration interface, activate the open signal to initiate counterclockwise rotation, then activate the close signal to initiate clockwise rotation, followed by recalibrating the downward stroke. ➢ Subsequently, interchange the two motor wires, align the rotational directions, and proceed to recalibrate the downward stroke.
Overheat protection	Motor overheating	➢ If the motor is overheated, stop and allow it to cool down.
No display	Hardware failure of the mainboard or display board	➢ Check if all the cable connections;

7.2 Service and Maintenance

The SMT series actuators are, in principle, maintenance-free. All bearings and gears are lifetime lubricated, and components are designed to last throughout the actuator's lifetime. However, it is recommended that the actuator is inspected regularly to reveal any damages caused by mechanical impact or corrosion.

Maintenance overview

- Inspection
- Lubrication
- Care and cleaning of anodizing

Inspection overview

- The actuators should be inspected yearly:
  - Check that the bolts connecting the actuator and valve are fastened according to the required torque.
  - Check that the top cover gasket and operation shaft are lubricated.
  - Check for corrosion or other physical damage
  - Check the glass windows, must not collide with hard objects
- Eltorque recommends that the unit is inspected for damage by Eltorque qualified personnel if the actuator has been submerged in seawater.

Lubrication

The top cover gasket and manual operation shaft seal should be lubricated if they appear to be dry. Use suitable silicone lubricants for O-rings, such as MOLYKOTE 55 O-RING grease or Super Lube silicone lubricating compound.

Eltorque AS

Julianus Holms Veg 34, 7041 Trondheim NORWAY
+47 748 55 520
project@eltorque.com
www.eltorque.com

Eltorque Automation (Xiamen) Ltd

No 168 Huizuo Rd Haicang District, Xiamen CHINA
+86 592 6039 000
sales.eax@eltorque.cn