

QC/XY One-piece Valve Electric Actuators

(Please read the instruction manual carefully before using the actuator)

Instruction Manual

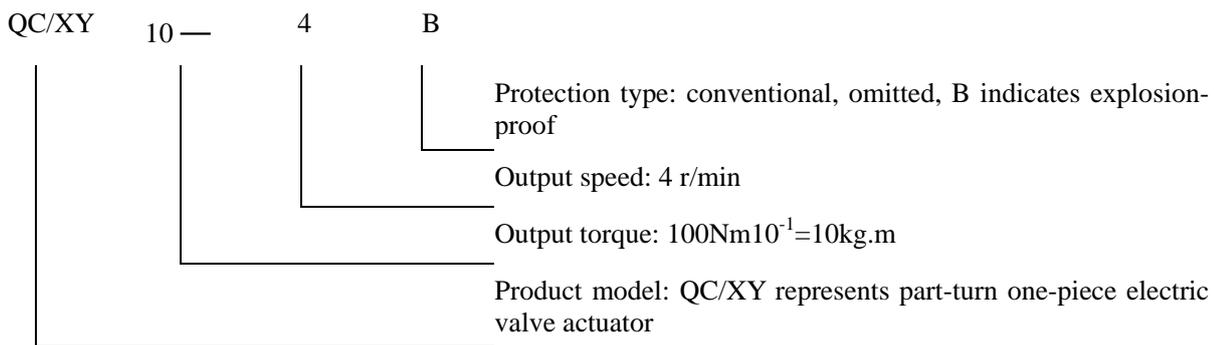
Huangshan Liangye Valve Co., Ltd.

1. Outline

1.1 QC/XY electric actuator is an electric actuator for part-turn rotary one-piece valve, it is another new product recently developed by our company and a local control equipment which is very important for process control. It is suitable for use with part-turn valves and similar equipment such as butterfly valve, ball valve, plug valve, etc., non-intrusive quick setting and local control or remote control of it can be achieved through a local touch screen, and switchover between remote switching value control and 4~20mA analog control can be realized according to the local requirements. It is widely used in such sectors as of electric power, metallurgy, petroleum, chemical engineering, food, textile, paper-making, pharmacy, water works, fuel gas, sewage treatment, etc.

The technical performance of the product complies with the provisions of the Chinese national standard GB/T24923-2010 "Technical specifications of basic version electric valve actuators" and GB/T24922-2010 "Technical specifications of explosion-proof version electric valve actuators" .

1.2 Model designation



1.3 Main functions

- 1.3.1 On-off/regulation integration, control mode can be set on site according to the need;
- 1.3.2 Local operation and debugging can be realized through man-machine interface;
- 1.3.3 Stroke can be set on site;
- 1.3.4 4~20mA valve position output signal can be calibrated on site;
- 1.3.5 Analog 4~20mA control signal can be calibrated on site;
- 1.3.6 Dead zone (sensitivity) can be set on site.
- 1.3.7 Remote/local control can be switched;
- 1.3.8 Operating status information can be displayed on the man-machine interface;
- 1.3.9 Not less than four channel switching status signal output
- 1.3.10 Can diagnose the abnormal condition (loss of phase, over-torque, potentiometer fault, etc.) arising in the operation process by itself;
- 1.3.11 Has the function of automatic phase sequence recognition and memory of valve position upon power failure.

2. Main technical parameters

Power supply: 3-phase 380V AC $\pm 10\%$; 50Hz $\pm 1\%$

Single-phase 220V AC -15% ~ +10%; 50Hz $\pm 1\%$

Input signal: DC4~20mA; passive dry contact.

Output signal: DC4~20mA;

- A set of close-in-position output contacts;
- A set of open-in-position output contacts;
- A set of over-torque output contacts;
- A set of remote control output contacts;
- A set of potentiometer fault output contacts.

Capacity of output contact: 250VAC/5A

Load impedance of output current: $\leq 750 \Omega$;

Short-time duty system, its time limit is 10 minutes;

Shock-proof: can withstand 10Hz frequency, and acceleration is 0.5g (g is the gravitational acceleration);

Output torque and output speed: refer to Table 1;

Protection grade: IP54 or IP67

Explosion-proof mark: EX dIIBT4 or EX dIICT4.

Ambient temperature: -20°C ~ +60°C, optional ambient temperature: -30~70°C.

3. Table of performance parameters of QC/XY series part-turn electric valve actuators

Model	Specifications		Nominal torque (Nm)	Output speed (r/min)	Motor power (kW)
	Conventional type	Explosion-proof type			
QC/XY5	QC/XY5-1	QC/XY5-1 B	50	1	0.03
	QC/XY5-2	QC/XY5-2 B		2	0.03
	QC/XY5-4	QC/XY5-4 B		4	0.03
QC/XY10	QC/XY10-1	QC/XY10-1 B	100	1	0.03
	QC/XY10-2	QC/XY10-2 B		2	0.06
	QC/XY10-4	QC/XY10-4 B		4	0.12
QC/XY20	QC/XY20-1	QC/XY20-1 B	200	1	0.06
	QC/XY20-2	QC/XY20-2 B		2	0.12
	QC/XY20-4	QC/XY20-4 B		4	0.18
QC/XY30	QC/XY30-1	QC/XY30-1 B	300	1	0.09
	QC/XY30-2	QC/XY30-2 B		2	0.18
	QC/XY30-4	QC/XY30-4 B		4	0.25
QC/XY60	QC/XY60-0.5	QC/XY60-0.5 B	600	0.5	0.12
	QC/XY60-1	QC/XY60-1 B		1	0.18
	QC/XY60-2	QC/XY60-2 B		2	0.25
	QC/XY60-4	QC/XY60-4B		4	0.37
QC/XY90	QC/XY90-0.5	QC/XY90-0.5B	900	0.5	0.18
	QC/XY90-1	QC/XY90-1 B		1	0.25
	QC/XY90-2	QC/XY90-2 B		2	0.37
QC/XY120	QC/XY120-0.5	QC/XY120-0.5B	1200	0.5	0.18
	QC/XY120-1	QC/XY120-1 B		1	0.18
	QC/XY120-2	QC/XY120-2 B		2	0.37
	QC/XY120-4	QC/XY120-4B		4	0.75
QC/XY250	QC/XY250-0.5	QC/XY250-0.5B	2500	0.5	0.25
	QC/XY250-1	QC/XY250-1B		1	0.37
	QC/XY250-2	QC/XY250-2B		2	0.55
	QC/XY250-4	QC/XY250-4 B		4	0.75
QC/XY500	QC/XY500-0.5	QC/XY500-0.5 B	5000	0.5	0.37
	QC/XY500-1	QC/XY500-1 B		1	0.55
QC/XY1000	QC/XY1 000-0.2	QC/XY1 000-0.2 B	10000	0.2	0.37
	QC/XY1 000-0.4	QC/XY1 000-0.4 B		0.4	0.75
QC/XY1500	QC/XY1 500-0.2	QC/XY1 500-0.2 B	15000	0.2	0.55
	QC/XY1 500-0.4	QC/XY1 500-0.4 B		0.2	1.10

- Notes: 1. The starting current of the motor is about 2 times the rated current and the max. torque is about 1.1 times the nominal torque.
 2. The motor powers in the table are the data for reference and need to be set up according to need.
 3. The nominal torques in the table are applicable to on-off type valve actuators, and shall be halved when used for regulating type.

4. Construction

QC/XY electric actuator consists of dedicated motor, reducing mechanism, position sensor, torque control mechanism, functional control unit, manual operating mechanism, mechanical limit mechanism, etc., see Fig. 1 for its transmission principle.

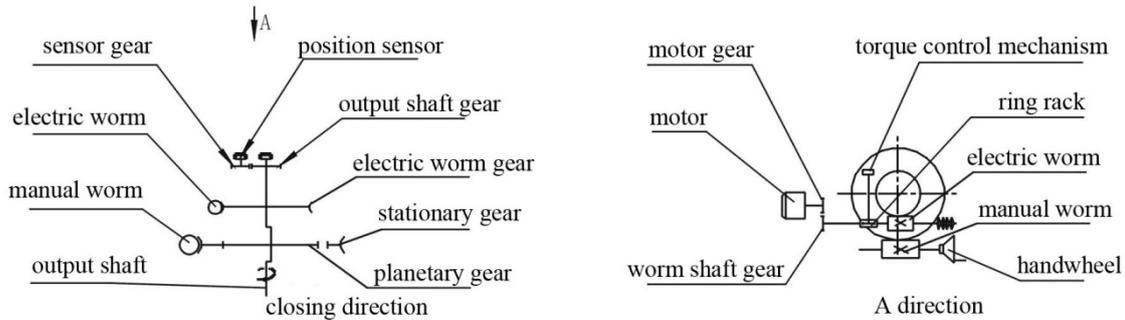


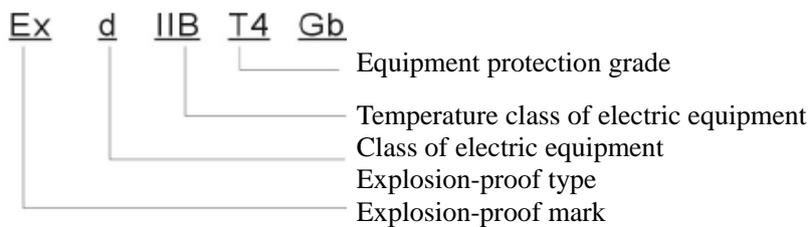
Fig. 1 Mechanical transmission diagram

5. The explosion-proof essential points for explosion-proof valve actuator are as follows:

5.1 QC/XY series explosion-proof intelligent valve actuator (hereinafter called the actuator for short) can have the complete explosion-proof construction only when it is assembled with dedicated motor for YBDF series explosion-proof electric valves, and its explosion-proof performance complies with the provisions of GB 3836.2. The explosion-proof mark of explosion-proof valve actuator is Exd II BT4Gb and Exd II CT4Gb, it is used with part-turn valves like ball valve, butterfly valve, etc., and is suitable for use in the place where there is explosive mixture composed of combustible gas in Class A and B, Group T1, T2, T3 and T4, Category II.

5.2 On the conspicuous place of the nameplate and enclosure of the electric actuator, there is the explosion-proof mark ExdIIBT4 Gb or Exd II CT4Gb.

Its designation is as follows:



5.3 In the structural design of electric actuator, adequate consideration has been given to the safety tenet that the explosion of explosive mixture due to certain cause won't cause explosion of explosive mixture outside the actuator when the explosive mixture intrudes into the actuator.

5.3.1 Each component and part of the explosion-proof enclosure of the actuator, after finish machining, must undergo water pressure test at a test pressure not less than 1MPa (Class C: 1.5 MPa) for a duration of not less than 10s, the acceptable test result is no drip, no damage.

5.3.2 Parameters of explosion-proof mating face mechanism:

5.3.2.1 The explosion-proof mating face constituting the explosion-proof enclosure of the actuator complies with the provisions of Chapter 5 in GB 3836.2, see Fig. 2 for explosion-explosion construction.

5.3.2.2 The max. allowable value of surface roughness Ra of the explosion-proof mating face is taken as 6.3μm.

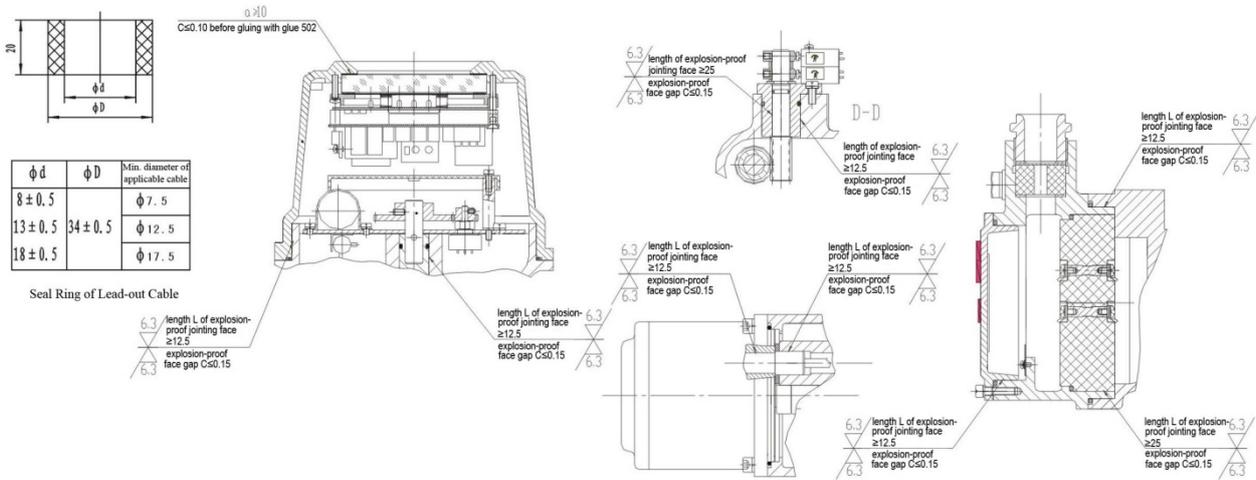
5.3.3 During the normal operation of the actuator, the surface temperature on its enclosure should not exceed 130°C (thermometer method).

5.4 In order to guarantee the explosion-proof performance of the explosion-proof enclosure, the fastening bolts for connection must be provided with lock washer to prevent looseness or drop-off of the bolts, after the bolts are fastened through the bolt holes, excess threads must be reserved, after the bolts are fastened into the non-through threaded holes, and the thickness around and at the bottom of the non-through threaded holes on the enclosure must not be less

than 3mm.

5.5 The cable led into the junction box of the actuator is divided into three specifications, i.e. $\phi 7.5$, $\phi 12.5$ and $\phi 17.5$, corresponding to three kinds of elastomeric seal ring $\phi 8$, $\phi 13$ and $\phi 18$ used at the wire inlet, respectively (see Fig. 2). If the cable is not led into the wire inlet, the wire inlet needs to be provided with steel closure plate to prevent formation of a through hole to the outside.

Fig.2 Diagram of explosion-



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of construction and seal rings

5.6 When the power is switched on, the sentence "Do not open the cover under voltage" on the cover of junction box must be marked.

5.7 The glass of observation window must be subjected to impact test according to the standard GB3836.1 and its rubber seal thickness ≤ 0.10 mm and the width of rubber seal surface should not be less than 10mm.

5.8 The terminal block inside the junction box is made of Grade II tracking-proof insulating material, and the electric clearance between the conducting parts with different potential must not be less than 6mm and the creepage distance must not be less than 10mm.

5.9 The purpose of grounding of the actuator is an important measure to prevent spark due to electric leakage and ensure safety. An external grounding bolt is provided at the conspicuous location on the enclosure of actuator body, and an internal grounding bolt is provided inside the junction box and the grounding mark "≡" is provided nearby the grounding bolt.

5.10 The cables are led into the actuator through an entry for power line and an entry for control line.

5.11 The transparent protection shield of the touch screen cannot be removed, and the actuator cannot be operated with the touch screen, only can be allowed to be operated with the remote controller when operation on site.

6. Use and Adjustment

6.1 Installation

There are no principle requirements for the installation style of this actuator, but the motor should stay in horizontal state, and the electric box cover should be horizontal or vertical upward state to facilitate lubrication, debugging, maintenance and manual operation. During the installation the space required for the servicing and inspection person to disassemble components and parts should be guaranteed. During the installation, disassembly and debugging, make sure not to damage the sealing face, the seal and the explosion-proof face of the explosion-proof actuator (see Fig. 2), and apply anti-rust oil on the explosion-proof face.

If the actuator has been installed on the valve and transported to the site, then the installation and debugging work may have already been finished. The working person should recheck if the connection on each mechanical location (inlet flange and valve body) becomes loose, etc., and can carry out electric connection after finishing the inspection.

If the valve actuator is supplied separately from the valve, then check if any component is damaged during the transport; check if all the contents on the nameplate comply with the requirements; and confirm that all the components listed on the packing list have been received.

Be sure to thoroughly clean the mounting flange surface of the valve and valve actuator before installation. Remove the oil stain on the surface because transmission torque requires friction. Check if the output shaft and flange of the valve actuator match with the valve, and make electric connection after the actuator is connected with the valve.

6.2 Manual operation

QC/XY series valve actuator is a fully automatic switchover mechanism, in case of needs for manual operation, the operator only needs to turn the handwheel to fulfill valve opening and closing. When electric operation is needed, the

actuator can be electrically operated directly, they are two independent transmission systems.

6.3 Adjustment of torque control mechanism:

See Fig. 3 for the construction of torque control mechanism.

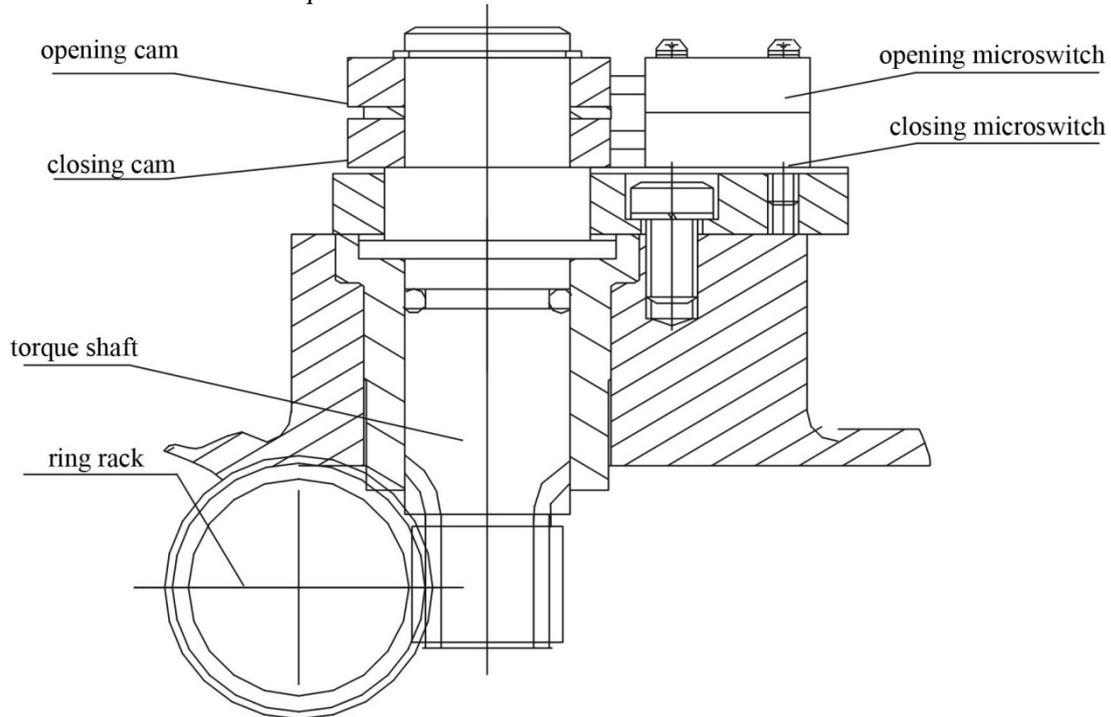
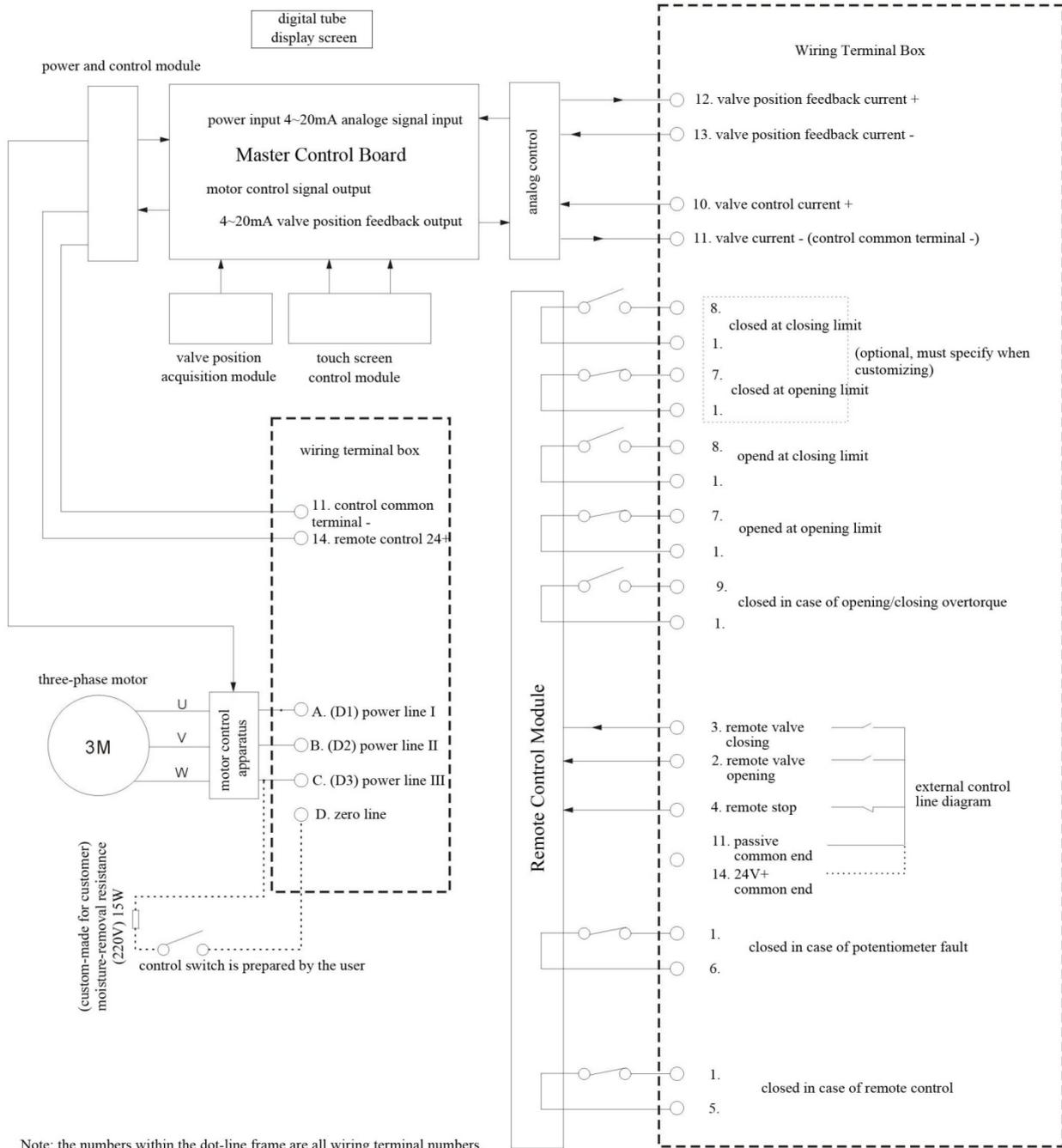


Fig. 3 Torque control mechanism

The torque control mechanism has already been adjusted according to the ordering requirements before the actuator leaves the factory and has been filled on the product conformity certificate therefore there is no need to adjust it again generally. If it needs to be adjusted, just loosen the cam set screw, slightly turn the opening and closing cams, and then fasten the set screws. During the adjustment, if the opening cam rotates counterclockwise, then the opening torque becomes big from small, if the closing cam rotates clockwise, then the closing torque becomes big from small. First adjust the closing direction, and then adjust the opening direction.

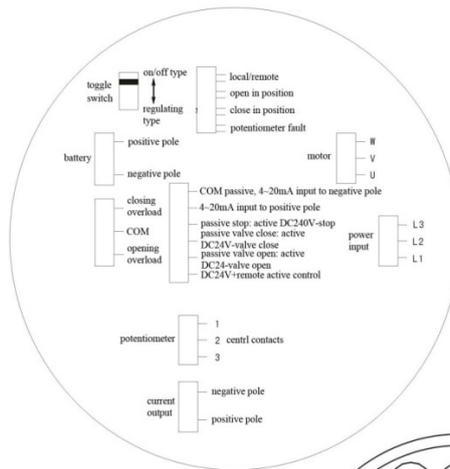
6.4 Electric connection

6.4.1 Schematic diagram for electric control

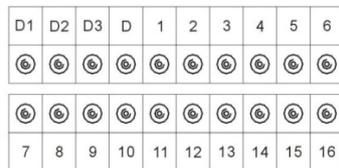


Electric schematic diagram

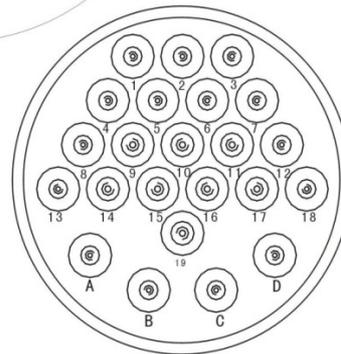
6.4.2 Electric wiring diagram of three-phase module (internal)



6.4.3 Wiring diagram



Conventional Type



Explosion-proof Type

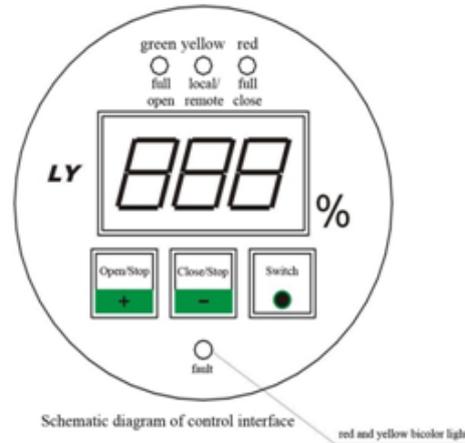
Meaning of wiring terminals

Wiring terminal No.	Meaning of wiring terminal	Wiring terminal No.	Meaning of wiring terminal
A (D1)	Input terminal 1 of AC power supply	9	Overtorque output terminal
B (D2)	Input terminal 1 of AC power supply	10	Remote 4~20mA control signal input terminal +
C (D3)	Input terminal 1 of AC power supply	11	Remote passive control common end: remote 4~20mA control signal input -.
D	Zero line	12	Output current: 4~20mA
1	Common end of passive output signal	13	Output current -: 4~20mA
2	Remote passive valve-open control terminal: DC24V-remote active valve-open control terminal	14	+DC24V remote active control common end
3	Remote passive valve-close control terminal: DC24V-remote active valve-close control terminal	15	
4	Remote passive stop control terminal: DC24V-remote active stop control terminal	16	
5	Remote control output terminal	17	
6	Potentiometer fault output terminal	18	
7	Open-in-position output terminal	19	
8	Close-in-position output terminal		

Wiring should be made against above table and the diagram according to the selected control mode.

6.6 Control interface

6.6.1 The schematic diagram of the control interface is as follows:



Schematic diagram of control interface

6.6.2 Definition of indicator lights

Green light: it flashes in the process of valve opening, and it normally lit when the valve is opened in position; and it flashes in the process of stroke setting in opening direction.

Yellow light: it goes out in case of local control, and is normally lit in case of remote control; and flashes during the setting of operating parameters.

Red light: it flashes in the process of valve closing, and it normally lit when the valve is closed in position; and it flashes in the process of stroke setting in closing direction.

Bicolor light: the overtorque yellow light flashes; the potentiometer fault red light flashes; the yellow light is normally lit when a phase of the three-phase power supply is lost, and no power is supplied to the entire actuator when any of other two phases is lost.

6.6.3 Definition of keys on the touch screen (The explosion-proof actuator only can be allowed to operate with the remote controller)



= Opening motion: the motion in opening direction stops; Increase; Coordinated with switching.



= Closing motion: the motion in closing direction stops; Decrease; Coordinated with switching.



= Switching, Confirming.

Notes: 1. Switchover can be made between the local operation and remote operation by pushing Switch key.

2. In case of local operation, hold the Open or Close keys for more than 3s and then release it, then the actuator is in linkage mode; and if the key is released within 3s, then the actuator is in inching mode.

6.6.4 Definition of pushbuttons for hand-held remote controller

"Open Valve" = opening motion: the motion in opening direction stops.

"Close Valve" = closing motion: the motion in closing direction stops.

"Set" = confirm key

"Switch" = switching of setting state

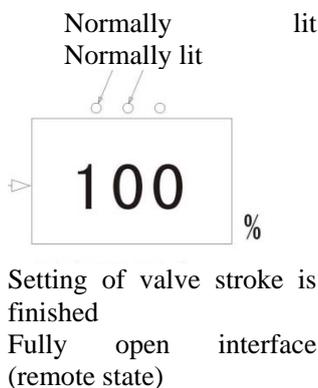
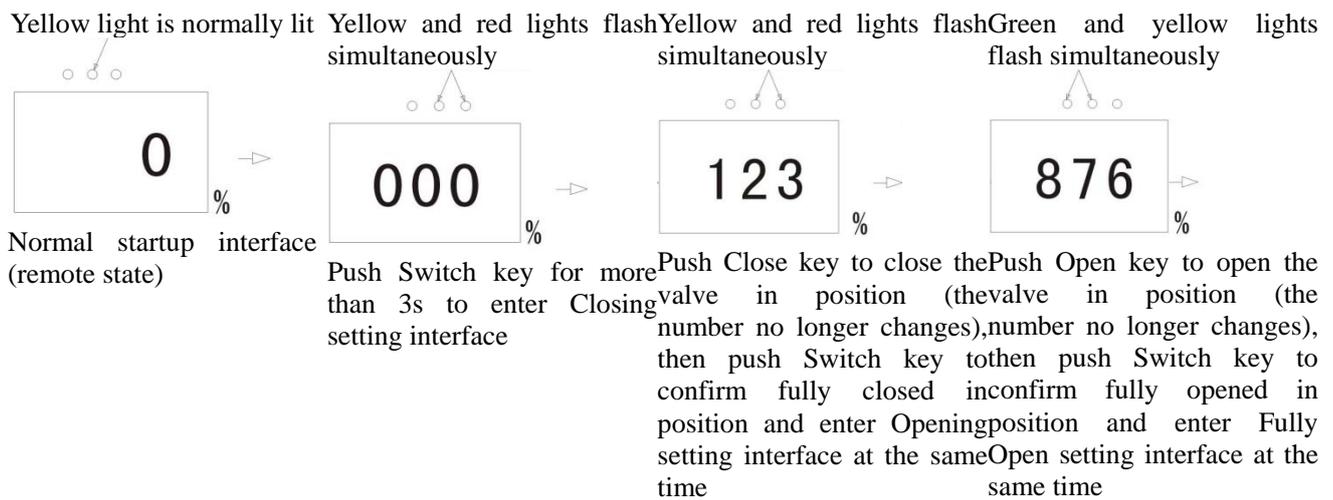
"←" = Decrease key; Select key

"→" = Increase key; Select key

6.6 Setting of operating parameters

6.6.1 Stroke setting

Remove the transparent protection shield and switch on the power supply, the operating procedure is as follows:



- Notes: 1. The local state enters stroke setting, and displays fully open interface as local state (yellow light goes out).
 2. The change in number from fully closed position to fully opened position must fall within the range of 0~1000 (should not go beyond zero point), otherwise, the stroke should be set again after the power supply is switched off.

6.6.2 Setting of 4~20mA output

The setting of 4~20mA output can be made after stroke setting is finished. The specific operation is as follows:

In remote state (the yellow light is normally lit at the upper middle of the display screen), first hold the Switch key (the yellow light goes out), meanwhile hold Close key, after 4mA calibration appears on the display screen, observe the externally connected ammeter, push Open or Close key (Increase or Decrease) to change the current value, after confirming 4mA current, push Switch to confirm 4mA output value, meanwhile the screen enters 20mA calibration, likewise, push Open key or Close key (Increase or Decrease) to change the current value, after confirming 20mA current, push Switch key to confirm 20mA output value, meanwhile the screen exits current calibration state and returns to original screen.

6.6.3 Calibration of 4~20mA (the toggle switch on the main board must be turned to the position for regulation type)

In remote state (the yellow light at upper middle of the screen is normally lit), hold Switch key (the yellow light goes out), meanwhile, hold Open key, several seconds later, the screen enters 4mA current input interface, when seeing that the number 4 is flashing on the interface, enter 4mA current and see whether the number 4 is flashing, if it is not flashing, this proves that 4mA input current has been calibrated well. After finishing calibration of 4mA, push Switch key to enter 20mA calibration interface, likewise, enter 20mA current and make it flash no longer, and after finishing the calibration, push Switch key to enter dead zone (sensitivity) setting interface.

6.6.4 Setting of dead zone (sensitivity)

After the screen exits 4~20mA input calibration interface, it enters setting interface of dead zone whose setting range is 0.5%~3.5%, push Open key or Close key (Increase or Decrease) to change the percent value, after confirming the percent of the dead zone, push Switch key to exit the setting interface of dead zone, meanwhile, returns to remote control interface.

7. Precautions

7.1 The installation, debugging and maintenance of the actuator must be performed by qualified personnel. It is prohibited to remove the electric box cover in an explosive environment, before opening the electric box cover, you must cut off the power; the digital tube window for opening display should not be impacted by a hard object, and it is not allowed to open the sealing location of electric box cover, motor, etc. outdoors in overcast and rainy days. After inspection and servicing, you must cover and fasten the electric box cover, motor and other sealing locations in order

to prevent ingress of rainwater and moisture, causing failure of electric components and rusting of parts. Upon initial electric operation after installation or re-installation, you must make the valve stay at the middle position and check its open and close direction, you must perform debugging item by item according to the debugging requirements, and you can put it into service only after checking every component is in normal conditions.

7.2 The storage position of the actuator should be on a wooden board or on a raised platform. Try to store the actuator in indoor dry environment, if it is stored outdoors in open air, cover it with waterproof cloth or similar object.

7.3 When making adjustment to the actuator, the continuous debugging time should not be too long because the continuous running time allowed by the dedicated motor is 10 minutes in order to prevent overheating of the motor.

7.4 Before you use it, you must measure all the current-carrying parts and enclosure resistance with a 500V megameter, and their values should not be lower than $1M\Omega$, otherwise, related component should be dried until the insulating resistance reaches the specified value.

7.5 When it is used in a place with high vibrating frequency, you should regularly check if any fastener becomes loose.

7.6 You must make the following checks before installing the explosion-proof valve actuator, if they are not complied with, then it is not allowed to be used.

7.6.1 Presence of explosion-proof mark and explosion-proof conformity certificate number.

7.6.2 All fasteners have been fastened and every component and part of the explosion-proof enclosure has been connected properly.

7.6.3 All the explosion-proof parts have no cracks and defects that affect explosion-proof performance, the areas not disassembled may not be checked.

7.7 Precautions when connecting the actuator with cables:

7.7.1 After the cable passing through the seal ring of the junction box is fastened with a gland, it should be ensured there is no gap between the seal ring and the cable, the material of seal ring should pass heat resistance and cold resistance tests; and the seal ring should be replaced with the same specification and same material when it deteriorates due to aging.

7.7.2 When making wiring, the cable should be welded with terminal lug and should be fastened on the terminal block after the insulating sheath is put on it in order to ensure good contact and electric clearance requirements.

7.7.3 The grounding inside and outside should be reliable.

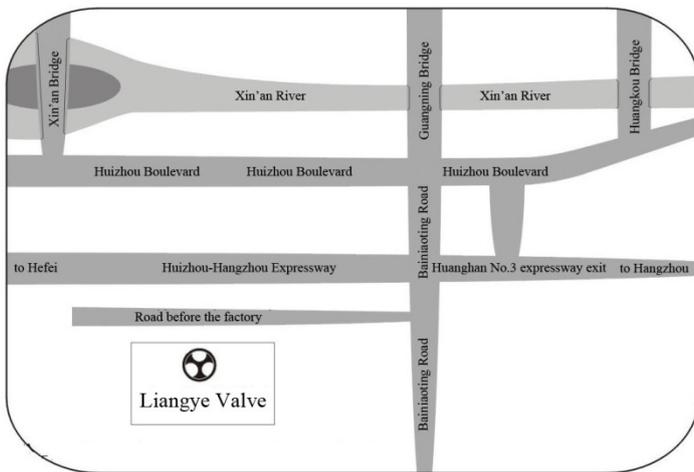
7.7.4 After finishing the wiring, check if there is no foreign matter inside the junction box, and after confirming there is no foreign matter, switch on the power to conduct test run and observe there is no abnormal phenomenon, then the actuator can be used.

7.8 When disassembling the actuator, be careful to protect the explosion-proof face, and during the assembly, all the machined faces should be coated with industrial Vaseline, coat 204-1 antirust oil on the explosion-proof face, all the explosion-proof faces should not have damage and rust, otherwise they will lose the explosion-proof performance.

7.9 When the valve is seldom used, a system for regular startup and inspection of the actuator should be developed.

7.10 When the ambient temperature of the actuator is below -10°C or the air is moist, switch on the power supply of moisture-removal resistance, and when the ambient temperature is above -10°C or the air is dry, please switch off the power supply of moisture-removal resistance.

7.11 After finishing the adjustment or local operation, please mount a transparent protective cover in order to prevent misoperation due to water accumulation on the glass surface.



Note: our company is about 500m away from the outlet "Huangshan 3" of Huizhou-Hangzhou Expressway

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