

(Please read this Operation Manual carefully before using this product.)

SM-20

QT1~QT4/JS Electric Valve Actuator

Operation Manual

Tianjin Baili Ertong Machinery Co., Ltd.

(Former Tianjin No.2 Machinery Factory)

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1. Product Instruction

1.1 Summary

This series quarter-turn electric valve actuators are economic products which is innovated by our Company. This series is applied to control butterfly valve, ball valve, cock valve and other valves which are make 90° turns. Featured by small size, light weight, high efficiency, high reliable performance and good protective performance and with low noise, this product can be both remotely and locally controlled. This product can be widely used in petroleum, chemical, power plants, water treatment industry, paper-making industry and etc.

1.2 Technical Parameters

1.2.1 This product complies with GB/T 24923-2010 《Technical specifications of basic version electric valve actuators》 .

1.2.2 Power supply:

Standard:380V, 50Hz 3-phase 4-wire sineAC; 220V, 50Hz single-phase sineAC. (Non-standard power supply should be confirmed by ordering and should be referred to nameplate.)

1.2.3 This product is used outdoors and its protection degree is IP67(Should be notified if IP68 is needed.)

1.2.4 Ambient temperature: -20 ~ +60°C

1.2.5 Altitude: be up to 1000m

1.2.6 Ambient humidity: be up to 90% (25°C)

1.2.7 Without strong corrosive material in working environment

1.2.8 Non-explosive proof products should not be used in the environment with explosive gas.

1.2.9 Short-time duty and its rated time is 10 min.

1.2.10 Without strong vibration.

1.3 Main structure and functions

1.3.1 Motor

Standard: 380V, 50Hz 3-phase 4-wire sineAC; 220V, 50Hz single-phase sineAC. (Non-standard power supply should be confirmed by ordering and should be referred to nameplate.)

1.3.2 Reducer mechanism:

QT1-QT4 model: composes of high speed worm and gear reducer and low speed worm and gear. QT4/JS series: two stage worm gear reducing mechanism and a NGW planetary reduction gear.

1.3.3 Stroke control mechanism and position indication mechanism:

QT1-QT4 model: A cam shaft is directly educed from output shaft, making 90° turn. The limit cam also makes 90° turn for stroke control. Opening indicating plate having a common shaft with the cam so as to make 90° turn for valve position indication.

QT4/JS model: A cam shaft is direct educed from output shaft, making 270° turn. The limit cam also makes 270° turn for stroke control. Opening indicating plate having a common shaft with the cam makes 270° turn for valve position indication. The cam shaft from output shaft of reduction gear makes 90° turn.

An optional potentiometer for remote electrical signal output is normally not provided unless the user makes a requirement in his order.

1.3.4 Torque control mechanism:

It is used to control the electric actuator's torque value. It composes of open/close cams and micro switches.

1.3.5 Manual-electric switching and manual mechanism:

Semi-automatic, electric priority. Turn the manual handle to start manual operation. Manual handle will turn back in electric mode operation.

2. Product Mounting

2.1 Stem joint

Two kinds of stem joints are provided with electric actuator to user. One of the stem joints is connected with the end of output shaft by four screws(Fig.1) and the other is involute spline joint(Fig.2). The QT1-QT4 model can choose a joint of any two kinds, The QT4/JS model can only choose the joint shown in Fig.2.

2.1.1 Stem joint's connection (with four screws)

△ Remove stem joint: remove stem joint by using "L" spanner.

△ Process stem joint: process stem joint's hole and key slot according to the dimension of stem's diameter and key. The direction and position of keyslot should be in alignment with the direction of 1 of the 4 screw holes on the stem joint.

△ Refit stem joint.

△ Select keyslot's one direction. (There are four mounting positions for valve against electric actuator. User can select one of them.)

△ Check if the open/close direction of electric actuator accord with valve's open/close direction.

△ Insert stem joint into output shaft. Then, screw four fastening screws by using "L" spanner.

2.1.2 Involute spline joint

△ Remove spline joint. Then, process stem joint's hole and key slot according to the dimension of stem's diameter and key.

△ Insert the processed stem joint into output shaft according to the stem's keyslot's direction. if it does not fit, make a fine adjustment by turning the joint circumferentially for one tooth.

Stem joints are shown in the figure below:

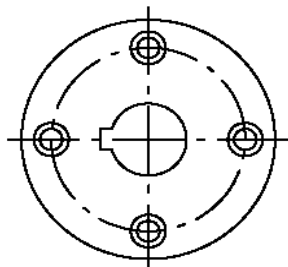


Fig.1

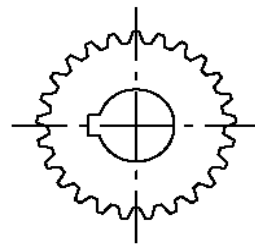


Fig.2

2.2 Connection between electric actuator and valve

Connecting flange shall accord with ISO5211, which ensure that electric actuator is correctly connected with valve. For detailed connection means, please refer to the Catalogue.

3. Electric wiring

3.1 Electric wiring steps for Standard type of electric actuator (non-explosion-proof type):

3.1.1 Remove the case: unscrew four screws on the case by using "L" spanner; remove the case

from the box and look for electric wiring diagram in the attachment bag.

3.1.2 Electric wiring: connect the cable with terminals according to electric wiring diagram. Don't forget about the two grounding connection (one is signed with P.E. in the wiring cavity; the other is in the middle of two limit screws outside the box case).

Confirm the power supply should be the same as the one on the nameplate!

After the electric wiring is finished, should firmly screw the case's screws and confirm the sealing between case and body, between inlet cable and inlet applicant are well done.

3.1.3 Inlet applicant: inlet applicant's sealing should be kept well in any working environment even it is not used. The electric actuator is entirely examined before delivery. It should be kept in a dry environment if mounting is not ready. Carefully take care of the sealing between inlet cable and inlet applicant after electric wiring is finished in case of the damage to product's sealing performance.

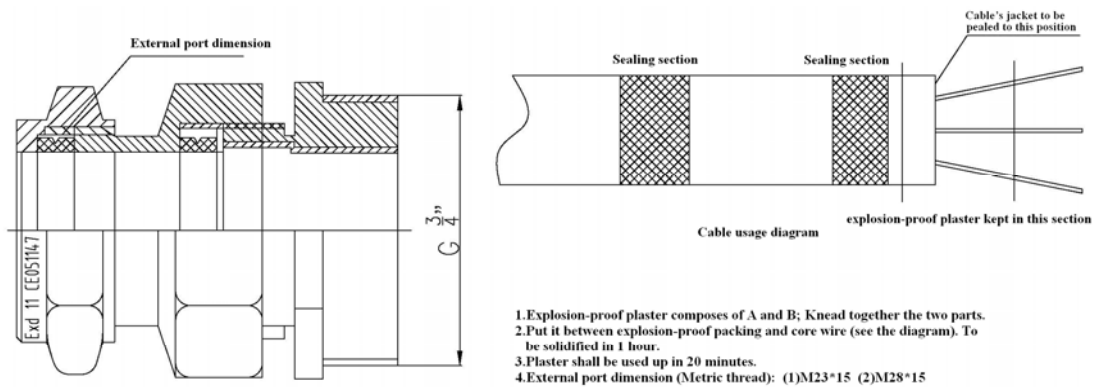
3.2 Electric wiring steps for explosion-proof type of product

3.2.1 Electric wiring steps for Standard explosion-proof type(Fig.3):

3.2.1.1 Remove gland nut in the stuffing box; then, put power cable and control cable separately through the stuffing box.

3.2.1.2 Connect cables with corresponding terminals according to Electric Wiring Diagram. Confirm the wiring is correct and reliable.

3.2.1.3 Pull the cable outwards gently to make sure the cable's jacket is in the stuffing box. The gap between cables and inner holes of the explosion stuffing box should be filled up with stuffing. Tighten the nut to compress the stuffing box to make it tightly combine with cable without looseness.



Explosion-proof stuffing box

Fig.3

3.2.2 Electric wiring of Integral explosion-proof type(Fig.4) :

3.2.2.1 Remove No.1 gland nut and then take No.2, No.3, and No.4. Now the gasket used for sealing is useless.

3.2.2.2 Open No.10, wiring box cover

3.2.2.3 Put power cable and control cable separately into No.1, No.2 and No.4. (No.2 sealing rubber, see the Fig.4)

3.2.2.4 Put one cable end to inlet hole of wiring box and connect each core with lug plate. Lug plate and core wire shall be firmly connected.

3.2.2.5 Connect each core wire with corresponding terminals according to the Electric schematic diagram.

3.2.2.6 Put each component on the cable into the inlet hole of the wiring box and pull outward the cable properly to make sure the cable's jacket is kept in sealing rubber plug.

3.2.2.7 Screw the gland nut firmly to make the sealing rubber plug to be compressed with cable's jacket. The cable's inner grounding core shall be connected to the inner grounding screw in the wiring box.

3.2.2.8 Make sure O-ring and port are clean before putting on the wiring box cover. Pay attention to screw the screws firmly to make sure the sealing performance.

Terminal board and its numbers

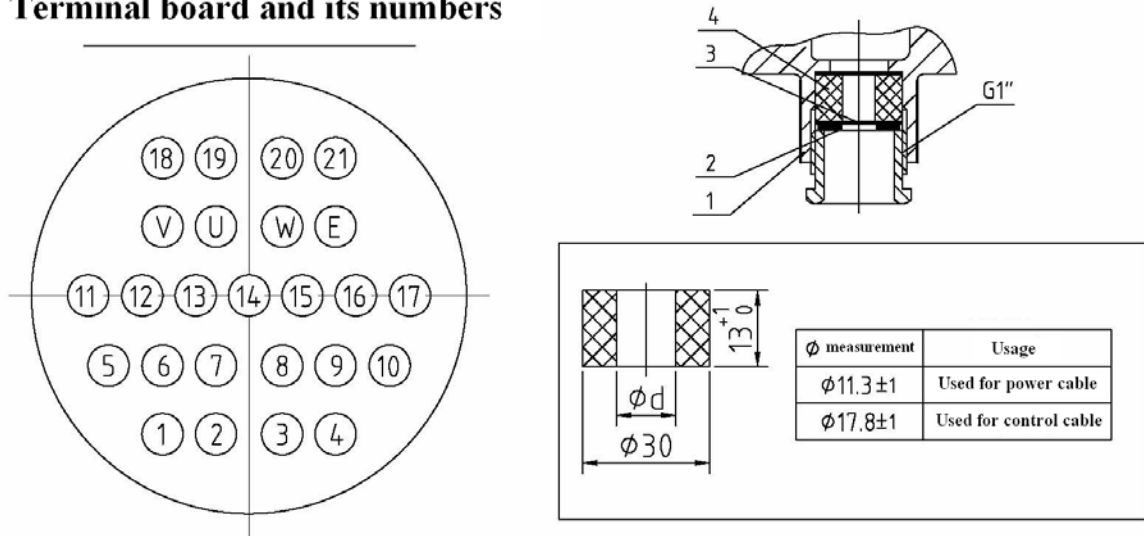


Fig.4

3.3 Cable shall be correctly mounted to prevent rain from going into the electric actuator.(The first two of Fig.5 connection ways are right.)

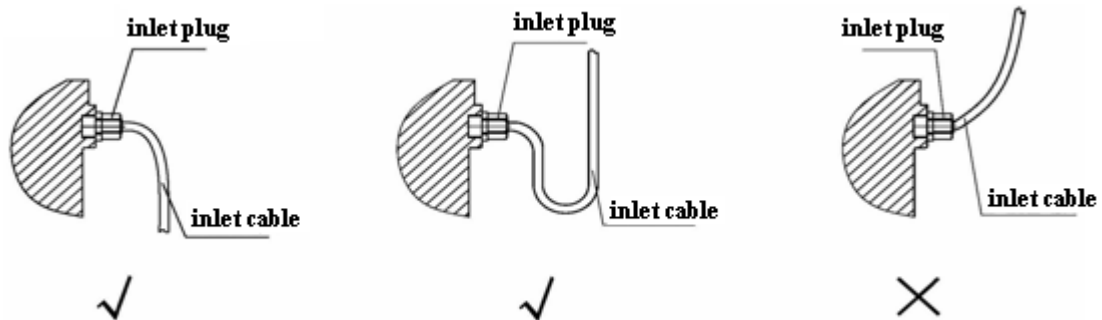


Fig.5

4. Product Debugging

4.1 Adjusting of the stroke limit switch

Notes for electric mode operation: at its first usage, to make sure whether the motor's rotation direction is correct. If it is incorrect, it would damage the electric actuator.(That is to say, should make sure motor's power sequence is correct.)

① At first, to turn the handwheel, to make the valve at the middle of "Open-Close" manually. Then, open or close it to check whether the electric actuator is operated in right direction.

- Output shaft turns clockwise (in the face of openness window): valve is closed.
- Output shaft turns counterclockwise (in the face of openness window): valve is open.

② If valve's rotating direction is opposite to the foregoing direction, operation must be stopped and re-check wiring situation (phase sequence connection between motor and power shall be rectified).

4.1.1 Setup for limit switch in Close Direction

To begin the adjustment after the foregoing steps are finished.

① To turn the Manual-electric switch handle to the manual operation mode, and to rotate handwheel clockwise until the valve is fully closed.

② To use L-spanner to unscrew the screw on the bottom cam(the limit switch in the close direction). See the diagram below.

③ To adjust cam to make it contact with bottom microswitch (hear clickety-clack), and then begin to screw the screw firmly.

④ Turn on the power; turn the "Open" button to get the valve operated in the open direction and then, to get the valve operated in close direction to examine if the Closing direction limit is correct. Repeat this action several times until requirement is met.

4.1.2 Setup for limit switch in Open Direction

① To turn the Manual-electric switch handle to the manual operation mode, and to rotate handwheel clockwise until the valve is fully open.

② To use L-spanner to unscrew the screw on the cam (the limit switch in the open direction). See the Fig.6 or Fig.7.

③ To adjust cam to make it contact with the upper microswitch (hear clickety-clack), and then begin to screw the screw firmly.

④ Turn on the power; turn the "Close" button to get the valve operated in the close direction and then, to get the valve operated in open direction to examine if the Open direction limit is correct. Repeat this action several times until requirement is met.

Electric actuator's open/close position shall comply with valve's open/close position after several times of adjustment.

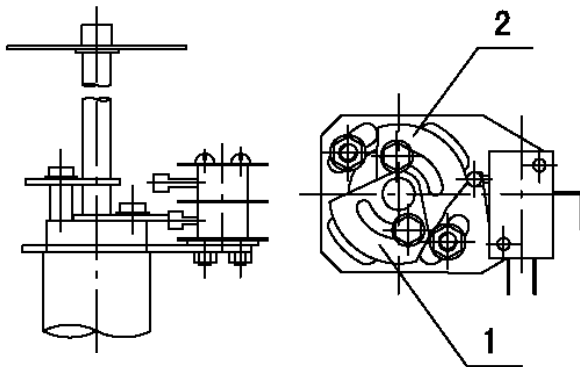


Fig.6 QT1-QT4 model

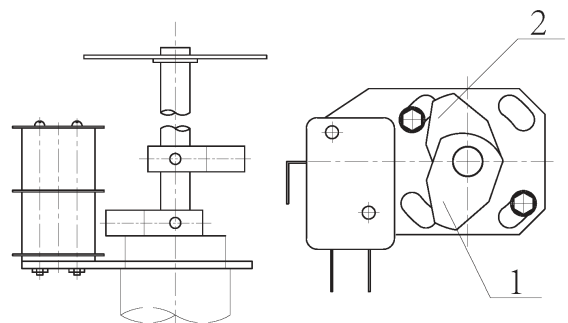


Fig.7 QT4/JS model

Note: No.1 Upper cam---used as open limit switch
 No.2 Bottom cam---used as close limit switch

4.1.3 Valve position indication:

See the Fig.8 or Fig.9 for openness window and the pointer, which show the valve's Open and Close position.

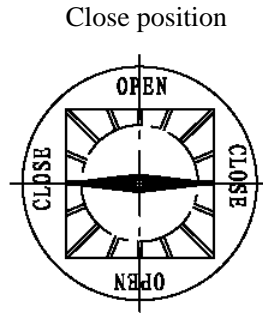
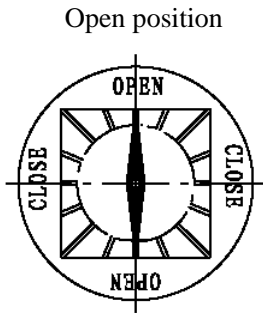


Fig.8 QT1-QT4 model

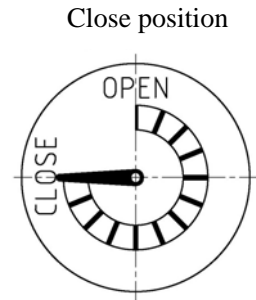
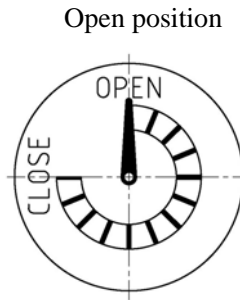


Fig.9 QT4/JS model

4.1.4 Mechanical limit bolt

① The two mechanical limit bolts on the electric actuator are needed to be adjusted and fastened before delivery. It suggested that user do not loosen it without special need.

② If adjustment of the stop screws cannot be avoided, you should firstly determine the position of the valve where the valve will be stopped by the screw. If the valve is closed by turning rightwards, the close-direction stop screw is on the right side and the open-direction stop screw on the left side (when the openness window on the case shield is upward, face to the stop screw and adjust the end face).

③ When an end position (or required position) of the valve is set, firstly, screw in the stop screw to make it contact with the end face of the segment worm gear, then turn back by 0.5-1 turn (to form a stroke limit or over-torque protection for safety), finally, fasten the loosened nut located on external end of the stop screw, thus adjustment of position limit has been finished.

4.1.5 Test of opening and closing operation

After the setting of open and close as well as mechanical position limit are checked, operate the valve by opening – closing and closing - opening for three times (use the “open” and “close” buttons on the controller, meanwhile check the open/close indication lamps).

4.2 Torque switch

Normally, torque switches are not need to be reset or readjusted, due to that products are set up before delivery to fulfill its rated torque value.

If torque switches have to be adjusted, please contact the manufacturer.

Warning: Special precise instrument is used to set up torque switches so that electric actuator and valve body can be protected. If torque switches have to be readjusted, user needs to contact the manufacturer in advance; if failing to do so, product’s performance will not be guaranteed.

4.3 Manual-electric switching mechanism

4.3.1 Manual operation: to turn the switching handle to manual operation (if can’t be turned, to deflect the handle through small angles), and after the manual operation position is settled down, open/close direction operation can start.

4.3.2 Electric operation: turn on the power and the motor can be powered on, so that the product goes into electric operation mode (switching handle resets automatically). That is, pushing the Open/Close button on the controller will let the electric actuator work electrically.

5. Additional instruction for explosion-proof product

5.1 Instruction for explosion-proof product

This series explosion-proof type is produced on the basis of GB3836.1-2010 《General Requirement for the Equipment Used in Explosive Environment, Part I》 and GB3836.2-2010

《The Equipment Protected by Explosion-proof Enclosure “d” Used in Explosive Environment, Part II》. Meanwhile, this series have been tested, experimented and finally verified by the national verified explosion-proof organization and get Conformity Certificate of Explosion-Proof.

The explosion-proof grade of this series explosion-proof type is Ex d II B T6 Gb. The sign “Ex” shows that the electric apparatus comply with the Explosion-proof Standard; “d” shows that the explosion-proof type is enclosure explosion-proof; II class represents that electric apparatus used in explosive gas environment except for gas made from coal; B is explosion-proof grade; T6 indicates that the permissible surface temperature is up to 85°C ; Gb is apparatus protection degree.

There are eight seating numbers of this series explosion-proof type valve electric actuator

5.2 Notes for usage and maintenance

5.2.1 Power must be cut off when actuator’s any cover is open.(please see the warning plate: “Forbid to open the box cover when the power is on.”)

5.2.2 Don’t hit the openness window glass with something hard.

5.2.3 Keep the nameplate and warning plate being fixed on actuator and the words on them should be recognized.

5.2.4 Don’t open the electric box cover outdoors in rainy day or windy day.

5.2.5 Keep the explosion-proof cover from being bumped or scratched during debugging and maintenance.

5.2.6 Apply anti-rust painting 204-1 after debugging or maintenance and before assembling.

5.2.7 Please notify the company to change the broken explosion-proof elements. The products cannot be powered on until it is renewed with qualified element.

5.2.8 Fastening screws on the explosion-proof cover should be reliably fixed and spring washer cannot be lost. Regular check for the vibration condition to see if it is reliable.

5.2.9 Apply 609 binder against explosion-proof screw in case of loosening.

5.2.10 Don’t lose O-ring and change a new one in case of it is broken.

5.2.11 The ground terminal shall be safely earthed.

5.2.12 The design service life of actuator is 8000 times.

5.2.13 According to the regulations on the recycling and treatment of waste electrical and electronic products, please comply with the relevant national regulations and properly dispose of waste products. Or call our after-sales service department for recycling. Tel: 022-26740033.

5.3 Notes for the electric schematic diagram and electric wiring

Electric schematic diagram is also supplied with Operation Manual to user. User shall refer to terminal board chart when connect wires. Joint head cannot be exposed or loosened so as to ensure an appropriate creep age distance. Explosion-proof sealing stuffing box shall be applied in the cable entry.

6. Troubleshooting and maintenance

6.1 Troubleshooting

6.1.1 Mechanical failure

- Drive the valve by using hand wheel after pulling manual-electric switching handle to check if manual-electric switching is sensitive and reliable or not.
- Check if action and indication of mechanical openness indication are correct.
- If the hand wheel can’t be turned or valve is blocked, remove and repair the valve.
- If the manual operation is normal and there is no interference, but the valve stem doesn’t function, check if connection of adaptor of valve stem is secure.

- If the valve can be driven by using hand wheel, check electrical troubles next.

6.1.2 Electrical troubles

Check action of the controller, and then action of the actuator.

- Check if main power supply, control power, relay, fuse, all indication lamps and switches are functional or not.
- If there is any trouble with control, check and determine if relevant parts should be replaced with new ones. If no problem is found with electric components, check the actuator next.
- Check motor, and replace it with new one in case of any problem.
- If trouble occurs with micro switch, replace relevant components with new ones.

6.2 Maintenance

Users are suggested to carry out routine overhaul twice every year or regular maintenance.

6.3 Quality insurance and technical support

One-year warranty period starts from the date of delivery. Our company offers technical support.

Instructions for order

Please state in detail when ordering:

- Torque (N.m) and rotation speed (r/min) required by valve
- Operating environment of product
- If controller is needed.
- Connecting dimension and type of connection
- Requirements on electric control
- Other special requirement

Special Cautions

In order to ensure the protective performance of the case of the whole electric actuator, users must strictly follow the requirements in the *Operation Manual* and in this *Special Cautions* while performing relevant operations when they set and service the actuators. If users failed to follow the regulations in the *Operation Instruction* and the *Special Cautions* while performing relevant operation and have resulted in fail-safe protection of the case of the electric actuators, the users shall bear the responsibility.

Before delivery all locations related to case protection of the products have been strictly inspected to ensure that the case is airtight. If users need to open the following locations for setting, service or any other reasons:

1. Case of control box
2. Case of connection box
3. Outlet jacket

After opening the above locations the users must ensure:

1. When performing setting, service or any other necessary operations, users shall ensure that the electric actuators will prevent the affect of rain, snow, hail, moisture, dust or other negative factors as the actuators have lost their original protective performance.
2. When covering the case or fastening outlet jacket upon completion of operation, users shall ensure that there will be no negative factors that may result in protective performance reduction in the cavities once opened, such as water, dust and serious moisture etc.
3. After completing operation and covering the case, users shall ensure all fastening screws, washers and spring washers on the case will be fastened without lost or loose parts, meanwhile, users shall ensure that there will be no damage on the rubber sealing rings that act as sealing parts between case and box contact locations and lime base grease will be applied before the case is fixed as original.
4. After the cable get out through outlet, users shall make sure that the gland nut will be fastened to ensure tightness. Teflon should be applied for thread sealing between gland nut and case, meanwhile, sealing gum (say 609) should be applied between cable and inner hole of gland nut.
5. After disassembly and reassembly of parts on some other locations, such as opening window or on-site button etc, for some reason, users shall make sure that there will be no adverse effect on the sealing result.

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Our Company reserves the right to amend this operation manual.