

(Read this manual carefully before using the products)

SM-14

OPERATION MANUAL

XZA Series Electric Actuators



Production Permit
XK06-014-00436

Tianjin Baili Ertong Machinery Co., Ltd.

Contents

1. Overview.....	1
2. Applicable operating environment.....	1
3. Product structure.....	2
4. Installation.....	2
5. Electric Wiring.....	2
6. Debugging.....	5
7. Electrical setting for the integral type of electric actuator.....	8
8. How to select priority control mode for valve closing end position.....	9
9. Operation inspection after setting.....	10
10. Notes for use.....	10

1. Overview

XZA series multi-turn type electric valve actuators(hereafter referred to “electric actuator” for short) are used to drive and control globe valve, gate valve and diaphragm valve whose discs make straight-line motion during valve opening or closing.

Having combined with reduction mechanism, the series of electric actuators can be used to drive and control ball valve, butterfly valve etc, whose discs make ninety degree turns during valve opening or closing.

XZA series can be divided into five different seating number types and they are XZA2, XZA3, XZA4, XZA5, and XZA6. Also, XZA series can be divided into basic type, basic integral type, explosion-proof type and explosion-proof with integral type. Take the case of XZA2—basic type: XZA2, integral type: XZA2 IN, explosion-proof type: XZA2 Ex, explosion-proof with integral type: XZA2 Ex. IN.

This series can be controlled remotely, electrically (operation via control room) or can be operated electrically or manually on site. If there are some other special requirements on electric actuators, such as automatic regulation and special protection etc, we will provide users with relevant instructions to introduce the method of application and cautions for special parts of the products.

XZA series explosion-proof type is produced on the basis of GB3836.1-2010 《Explosive atmospheres— Part 1: Equipment— General requirements》 and GB3836.2-2010 《Explosive atmospheres— Part 2: Equipment protection by flameproof enclosures “d”》. 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 XZA explosion-proof type is Ex d II B T4 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; II B represents that the gas is ethylene; T4 indicates that the permissible surface temperature is 135℃; Gb is apparatus protection degree.

Please refer to this operation manual if user applies XZA series electric actuator, including the basic type, integral type, explosion-proof type and explosion-proof integral type

If users need to know technical parameters of the products, as well as the dimensions and pattern of the connection platform, please refer to the relevant product catalog of our company.

2. Applicable operating environment

2.1 This product is in accordance with GB/T24923-2010 Technical Conditions of Basic Type of Electric Actuator, and GB/T24922-2010 Technical Conditions of Explosion-proof Type of Electric Actuator

2.2 Power supply: 380V, 50Hz, 3-phase 4-wire system, sine AC; 380V, 50Hz, 3-phase 3-wire system, sine AC (For special voltage and frequency, please refer to product’s

nameplate and contract.)

2.3 Protection class: IP67

2.4 Ambient temperature: $-20\sim+60^{\circ}\text{C}$

2.5 Relative humidity: be up to 90% (when at 25°C)

2.6 Altitude: be up to 1000m

2.7 Short-time duty: 10mins (rated time)

2.8 Applicable working environment: for basic type, no severe vibration and no strong corrosive medium and explosive mixed gas in the operating environment; for explosion-proof type, no strong corrosive medium.

2.9 Electric port: for basic type, total number of $M33\times 1.5$ is 2;

for explosion-proof type, total number of , $M33\times 1.5$ on XZA2 is 2.

G1 1/4 " on XZA 3~6 is 2.

3. Product structure

3.1 Special motor: YDF or YBDF motor used for electric valve actuator

3.2 Main drive reduction mechanism: worm pair drive mechanism

3.3 Torque control mechanism: mechanical itching switch

3.4 Stroke control mechanism: mechanical counter gear drive mechanism

3.5 Position indication mechanism: mechanical gear drive mechanism

3.6 Manual/electric switching mechanism: electric mechanism is a priority; Electrical mechanism will be reset after manual operation.

3.7 Local control mechanism: please notify us if users intend to order local control mechanism; for the basic type and explosion-proof type of XZA series, local control mechanism is mechanical buttons on the control box cover; for the integral basic type and explosion-proof integral type of XZA series, the local control mechanism is knob switch on the side of the electric wiring box cover.

For the controller of the electric valve actuator, controller is a controlling part which is separated from valve electric actuator. The controller is often set indoors. Please notify us if users need to order. For structure and function of the controller please see separate instructions for the controller.

4. Installation

4.1 Installation pattern: There are two installation patterns for electric actuator with valve: vertical installation (The output shaft of the electric actuator is vertical to the ground) and horizontal installation (Both output shaft of the electric actuator and shaft of the motor are parallel to the ground). Horizontal installation is preferred.

4.2 Method of combination/connection with valve: Align the jaw of output shaft of electric actuator with the driven valve stem's jaw, and insert teeth of output shaft of electric actuator into teeth of nut of valve stem and check the mesh. If the mesh is correct fasten flange screws. You may use in-seam screw to ensure a sound connection of flange.

5. Electric Wiring

Note: Installation personnel must have the electrician safe operation permits and

must operate according to relevant stipulation. Please read this operation manual carefully before installation. Controlling lines and power lines should be separately put in the grooves. The output controlling signal lines should apply shield cables and the shielding layer should be single-end earthed.

5.1 Wiring means of basic type: (basic integral type is the same.)

5.1.1 Open connection box or case of control box with terminal board.

5.1.2 Remove various parts of sealing structure as shown in figure 2. Pull the power cable and control cable through separate sealing holes and lead the cable ends into connection cavity.

5.1.3 Connect core wires to the corresponding terminals according to electric control schematic diagram and comparison table for terminal number and wire number on schematic diagram. The wire connection should be sound with no bareness.

5.1.4 The grounding core wire of the cable should be connected to grounding screw or retaining screw for terminal board support inside connection box.

5.1.5 Properly pull the cables out and do not leave too much cable inside connection box or control box. The cables should be tied up to avoid touching moving parts.

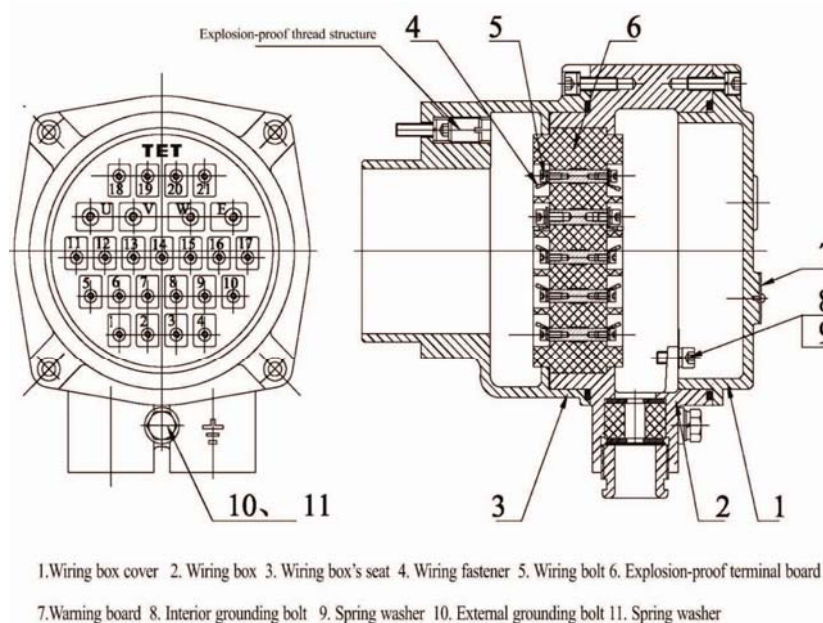


Fig.1

5.1.6 Push parts of sealing structure into the hole where they are held. Fasten the nut to press rubber sealing ring to make it closely combine with cable sheath, so as to ensure soundness of cable and tightness of the control cavity. If the tightness is not satisfied, sealing gum or rubber sealant should be applied.

5.2 Wiring procedure of the explosion-proof type: (Integral, explosion-proof type is the same.)

5.2.1 Please open No.1 “Wiring box cover” (Fig.1) and remove No.11,12,13,14(Fig.2)

5.2.2 Please select appropriate sealing gasket's inner diameter according to the cable's outer diameter.

5.2.3 Please remove No.13 “solid plate” and pull the cable through No.11 “gland nut” and successively through No.12, 14, 12.

5.2.4 Please connect cable core wire with the wiring fastener on the terminal board.

5.2.5 According to the wiring number of electric schematic diagram, connect the core wire which with fasteners with the terminal boards correctly. Fasten each gland bolt.

5.2.6 The grounding core wire should be connected with interior grounding bolt. External grounding core wire should be reliably connected with the actuator’s grounding bolt or the inlet wire port.

5.2.7 After confirmation of the correctness of the cable wiring, pull the parts (No.12,14,12,11) successively into wiring box. After adjusting cable’s position (small part of the cable which is put in the wiring box is preferred.) Fasten the gland nut.(There are two inlet wiring ports, one of which is used for power cable and the other is used for control cable.)

5.2.8 Put on the wiring box cover and fasten the gland bolt.

Till now, wiring is finished.

5.3 Cautions:

5.3.1 User must cut off power when open connection box or front case shield of the electric actuator.

5.3.2 You are not allowed to open case shield outdoors in a rainy day to prevent electrical parts from moisture.

5.3.3 Apart from the operation manual, an electric schematic diagram is also provided in the attached documents. Users should strictly wire according to terminal board.

The connecting plug should not be bare and loosen so as to make sure a reasonable creep age distance and leakage length.

5.3.4 If No.14 “sealing ring” in Fig.3 is broken, user could ask the factory for a new one or manufacture by you according to Fig.2.

This should comply with the following technical requirements:

Tensile strength: 70kg/cm²

Elongation: Above 350%

Hardness: Shore hardness 45-55

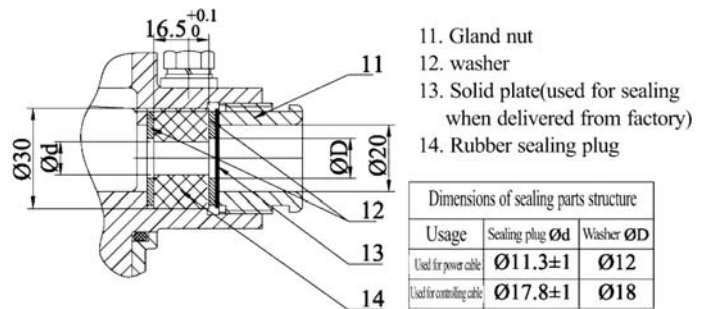


Fig.2

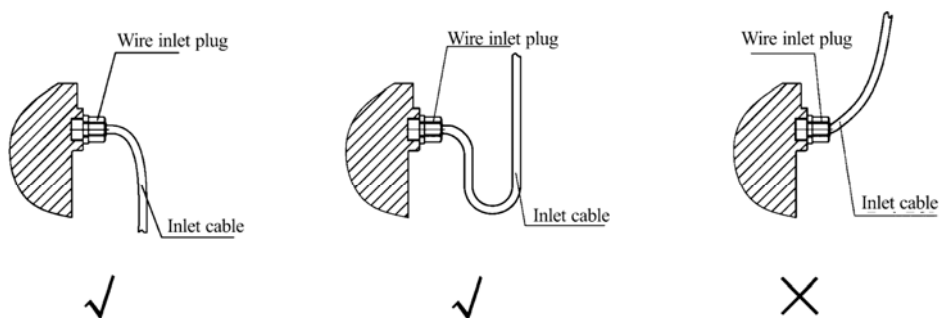


Fig.3

5.3.5 Cable should be set up correctly to avoid the rain leaking into the electric actuator (In Fig.3, the first two connection patterns are right.)

6. Debugging

Cautions before debugging:

★The maximum control torque had been set up and sealed off with torque plate for the products before delivery. There is no need for users to make any adjustment of torque control mechanism.

★To facilitate user's adjustment, the stroke control mechanism and position indication mechanism are normally set to the following state before delivery:

- a. The central gear in the driven units should align with the counter's gear.
- b. The potentiometer pinion in position indication mechanism and final pinion of selective gears are in demising state.
- c. Openness pointer is in middle position on the scale.

6.1 Primary stroke adjustment

Manually operate the valve to make it be in an optional position of the whole stroke. Turn on the power and operate the electric actuator for a short time to check, in the itching type, if the rotating direction is the same as the valve. If not, change and correct the phase sequence of power before performing the following adjustment.

a. Operate the valve manually to a point where there is only one thread distance from the closing position.

b. Rotate the counter rod 90° to let it be unscrewed, so as to make the central gear to disengage and one-digit gear of counter from the engaging state.

c. Clockwise turn closing adjustment shaft of counter to make cam touch closing microswitch (a click is heard).

d. Unscrew the carrier rod of the counter 90° to make the central gear and one-digit gear of the counter be in proper meshing state. (Turn the adjustment shaft a little to check for the meshing, if the meshing is correct the adjustment shaft will not rotate.)

Now the closing position has been primarily adjusted.

e. Manually operate the valve to full open position. (Note: Do not screw down the carrier rod of the counter in the process.)

f. In the full open position of the valve set down the carrier rod of counter, make central gear throw out of mesh with one-digit gear of the counter.

g. Turn the opening adjustment shaft of counter counterclockwise to make cam touch opening microswitch (a click is heard).

h. Unscrew the carrier rod of the counter 90° to make the central gear and one-digit gear of the counter be in proper meshing state. (Turn the adjustment shaft a little to check for the meshing, if the meshing is correct the adjustment shaft will not rotate.)

Now the closing position has been primarily adjusted.

6.2 Precise stroke adjustment

If, when the valve is electrically operated, the stroke switch controlled end point position (full closing or full opening) of the valve is unsatisfactory, precise adjustment should be performed to get perfect position precision. The way of precise adjustment is to adjust the cam action in a little delay for incomplete opening or closing or to

adjust the cam action in a little advance for a little excess opening or closing.

Precise adjustment of full closing position:

- a. If valve closing is incomplete, you should, based on the primary adjustment, manually operate the valve properly to complete closing position. Then set down the carrier rod of counter, make central gear throw out of mesh with one-digit gear of the counter. (Now, closing cam still presses on microswitch.) First turn closing adjustment shaft anti-clockwise to make closing cam leave microswitch, then turn closing adjustment shaft clockwise to make closing cam press on microswitch. Afterwards, turn and lift carrier rod of counter to check the meshing of central gear with one-place gear of counter. If the meshing is proper, end the adjustment.
- b. After valve is closed, torque control switch has acted in advance and closing cam of stroke switch has not yet pressed on microswitch. In this case, stroke switch action lags behind torque switch action. If you do not want torque switch to act, you can manually operate valve to make it properly move to opening direction on the premise of ensuring valve closing requirement. Then set down carrier rod of counter to make central gear throw out of mesh with one-digit gear of the counter. (Now, closing cam does not press on microswitch.) And then turn closing adjustment shaft clockwise to make closing cam press on microswitch. Afterwards, turn and lift carrier rod of counter to check the meshing of central gear with one-place gear of counter. If the meshing is proper, end the adjustment.

6.3 Considerations before and after setting counter

- Before setting first check if the cam is in the position shown in figure4 and if the carrier rod has been screwed down.
- When performing item e of 6.1 Primary stroke adjustment, if the valve has not been opened completely but cam has pressed on microswitch, you should stop manual operation, set down carrier rod and turn opening adjustment shaft of counter clockwise to make cam return to the position shown in figure4. And then, according to the adjustment amount, go on turning the shaft for more turns clockwise, so as to provide the counter enough adjustment amount. Now turn and lift carrier rod again and go on with item e.
- Upon completion of stroke adjustment, turn and lift carrier rod of counter and confirm the adjustment. Otherwise, once the electric actuator is in electric mode, the counter will be out of action; the stroke control will go wrong; the electric actuator will get into dangerous condition.

Stroke and position indication mechanism

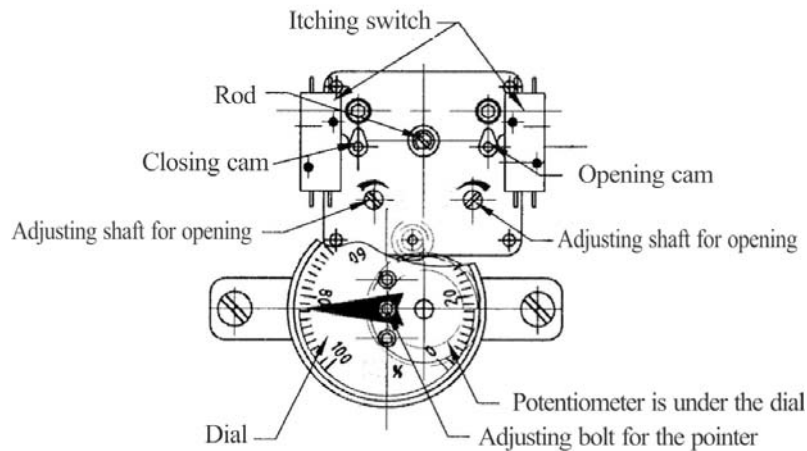


Fig.4

6.4 Adjustment for position indication mechanism

a. Setting for the pointer: close the valve before adjusting the stroke mechanism. Now loosen the fastening screw on pointer and turn the pointer at 0 on the scale, and then fasten the screw.

b. Potentiometer position setting: when the valve is closed, fasten the fastening screw on potentiometer gear. With potentiometer gear threw out of mesh with final pinion, turn the potentiometer until it reaches the end position corresponding to the valve (The direction must be correct.) and return a little. Loosen the fastening screw on potentiometer gear, push the gear to make it mesh with the final pinion and fasten the fastening screw on potentiometer gear. Now the setting of position indication mechanism is completed.

The setting of the above two steps can also be performed together with the setting of stroke control.

★ Cautions

Pay attention to the determination of potentiometer rotation direction, as wrong rotation direction will damage the part. When facing the pointer, the rotation direction (for opening or closing) of potentiometer should be the same as that of the pointer (for opening or closing).

6.5 About the local control mechanism

★ For basic type and explosion-proof type of electric actuator, the local control mechanism is mechanical buttons which are on the control box cover. When local control is needed, user needs to switch the control mode to local control and then, push the open or close button according to user's need. Push any button successively, the electric actuator would operate the opening process or closing process; when user leaves his grip on the button, button will automatically back again and actuator will also stop operating. (Please switch control mode into remote control while local control is finished.)

★ For the integral type and explosion-proof, integral type of electric actuator, its local control mechanism is knobs on the side of electric wiring box. Please refer to 7.2.4 for operating methods.

7. Electrical setting for the integral type of electric actuator

XZA series include basic integral type and explosion-proof integral type.

7.1 Features:

7.1.1 Identify the phase sequence automatically; open-phase protection

7.1.2 DC24V is applied in remote control

7.1.3 A convenient, flexible wiring methods for users

7.1.4 The switch of the local control buttons applies Hall element, and it is applied with a blind design which is of a high tightness.

7.1.5 Five dry contacts indicate working condition of the actuator, which provides convenience for DCS System's control on the actuator.

7.1.6 Set up the actuator's supervisory relay in order to provide a comprehensive failure signal for DCS System.

7.1.7 Automatically setting for the valve's output current from zero to full(this is applied for those which with output current and those adjusting type)

7.1.8 Switch knob could be locked by ordinary padlock, if needed, in case of human's mal-operation.

7.2 Debugging

7.2.1 Please make a reference to the electric schematic diagram in the attachment.

7.2.2 "Power/Malfunction" indicator on the local control buttons shows green light after power is on.

7.2.3 Please make a reference to "6 Debugging" to adjust the stroke control mechanism and position indication mechanism.

7.2.4 Local control and adjustment (Please refer to the attached electric schematic diagram)

Turn the change over button to the "local"(shown in Fig.5, the bigger button on the bottom of the indicator box is change over button; on the top is the switch button). "Local/Remote" button's indicator is red, which means the electric actuator is locally operated.

Turn the switch button counterclockwise, and then the actuator will begin to operate. "Valve opening/valve closing" button's indicator flashes red light. The actuator will operate in the valve's opening direction until the valve stops. "Valve opening/valve closing" button's indicator is red. There is a dry contact closure (fully open dry contact) between "Dry contact common port" and "Fully open".....

Turn the switch button clockwise and then the actuator will operate in the closing direction. "Valve opening/valve closing" button's indicator is green. There is a dry contact closure (fully closed dry contact) between "dry contact common port" and "fully closed"...

While the actuator is operating, maybe due to a jammed valve or some other reasons, over-torque is happened and then, the actuator will be protected and stop working. There is dry contact closure (passive output torque contact) between "dry

contact common port” and “over-torque”. “Power/Malfunction” button’s indicator is red; at the same time, a corresponding indicator should flash (flashing frequency is lower than that of when the actuator’s operating). Supervisory relay is set in the integral type of actuator. The supervisory relay would be excited when actuator is normally working. The supervisory relay would be de-energized(non-excited state) when some thing just happened and influenced actuator(change button is turned to “stop” or, when power is off, loss of phase, motor has over-current or over-heated).

7.2.5 Control and adjustment for remote switch valve

Turn the change over button to “Remote” and then “Local/Remote” button’s indicator is green; the actuator is remotely controlled. There is a dry contact closure (dry contact in remote control) between “Dry contact common port” and “Remote”. Select a proper wiring method from the attachment according to the remote control electric schematic diagram. A corresponding indicator is flashing when actuator is working.

7.2.6 Control and adjustment for analog signal input (applied for the adjustment type of actuator)

Connect the ampere meter with the port of current of valve position “O+” and “O-”in order to supervise valve’s position output. Short-circuit the remote analog control (eg. Electric schematic diagram zq3e, No.5) and control common port (eg. Electric schematic diagram zq3e, No.6) and then, connect the analog control signal, which is from remote control system, (4-20mA) with input current port of the actuator “I+” and “I-”. Adjust the input control current from 4mA to 20mA. The actuator starts from the input tracking signal of closure position and stops at the fully open position. Meanwhile, the valve position signal changes with 4~20mA. On the contrary, when the input control signal changes from 20~4mA, the actuator starts from input tracking signal of open position to the fully closed position, with the output valve position signal changing from 20mA to 4mA. Under the control of analog signal, ...three conditions: 1. ...2. Stopped at the fully open position. 3. Stopped at fully closed position. Factory default is ... No.2 and 3 can be provided as user required.

8. How to select priority control mode for valve closing end position

Both stroke control and torque control can control valve closing. Take one as priority control and the other as protective control. Select different priority control mode for different types of valve. For wedge gate valve and cut-off valve etc, it is recommended to take torque control as priority control and stroke control as secondary protective control. While for general flat or parallel gate valve, it is recommended to take stroke control as priority control and torque control as secondary protective control.

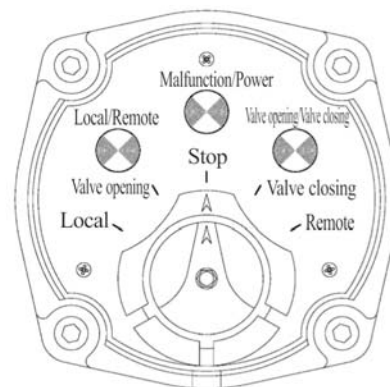


Fig.5

9. Operation inspection after setting

After completion of setting, the electric actuators can not be used until they passed the following inspections.

9.1 After valve is closed electrically to the position, the control mechanism can normally cut off the power and ensure the sealing requirement of the valve. After the valve is set to the fully open position, the power can be cut off precisely and reliably.

9.2 Position indication mechanism can properly show the operation condition of the valve.

9.3 Manual switching mechanism should work reliably and electrical reset is flexible and reliable. Before manual operation, push on the switch hand and rotate handwheel until the switch hand is turned to the right place, which means manual/electrical switch is finished. Rotate the handwheel if manual operation is needed. Under the electrical mode, the switch hand will automatically turn to the electrical position.

Note: The switch hand is forbidden to turn from manual operation position to electrically operation position in case of damaging the actuator.

10. Notes for use

10.1 Don't hit the openness window glass and glass crack is forbidden.

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

10.3 Don't open the electric box cover outdoors in rainy day or windy day.

10.4 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.")

10.5 Please check power's phase sequence before debugging the product. Wiring should be correctly operated.

10.6 The product's explosion-proof cover cannot be knocked or scratched during maintenance or debugging.

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

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

10.9 Forbid to turn the switch hand strongly to the last position after using the manual/electrical handwheel, in case that the actuator would be damaged.

10.10 Fasten the screws on the control box cover and wiring box cover after product debugging. After some strong vibration, please make regular check to make sure whether it is reliable. Sealing structure cannot be damaged at the same time. Tightness should be confirmed.

10.11 Don't dismantle at will or adjust any irrelevant part of the product.

10.12 If the product is seldom used, please make a regular electrical check if working condition is permitted.

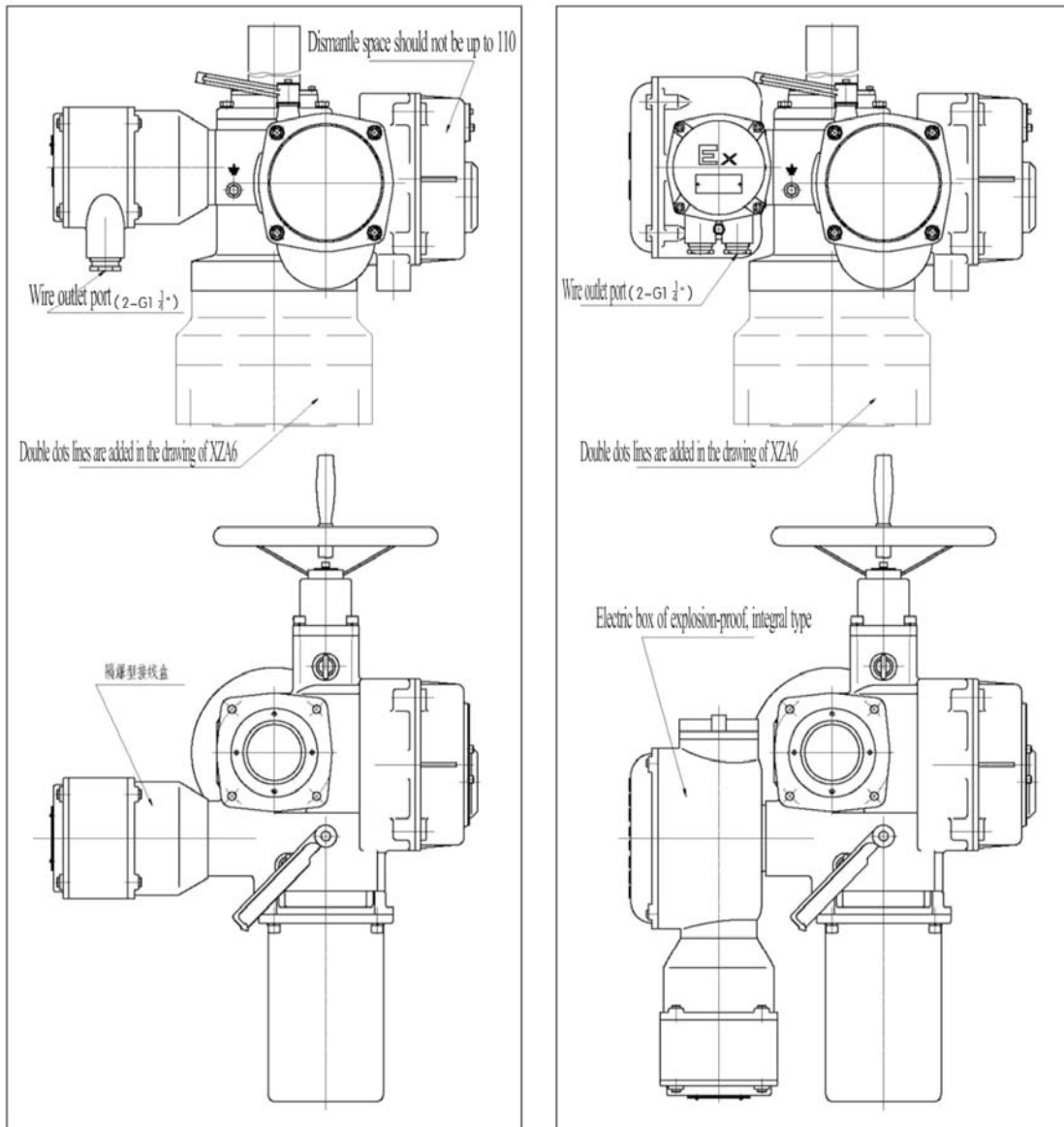
10.13 The eyebolts on the electric actuator are only for lifting the actuator. Do not lift the actuator with valve via the eyebolts.

10.14 After service-disassembly of the product both torque control mechanism and stroke control mechanism should be re-calibrated and set.

10.15 Special lubrication had been added to the electric actuators before delivery. If change is needed, specialized lubrication is recommended.

10.16 Grounding screw should be properly connected.

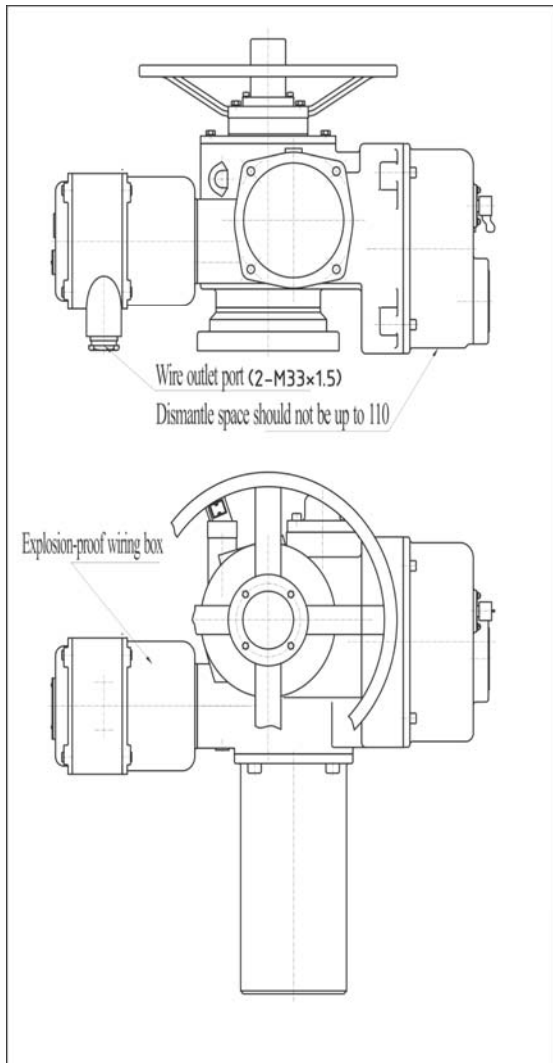
11. Outline drawing of XZA explosion-proof type



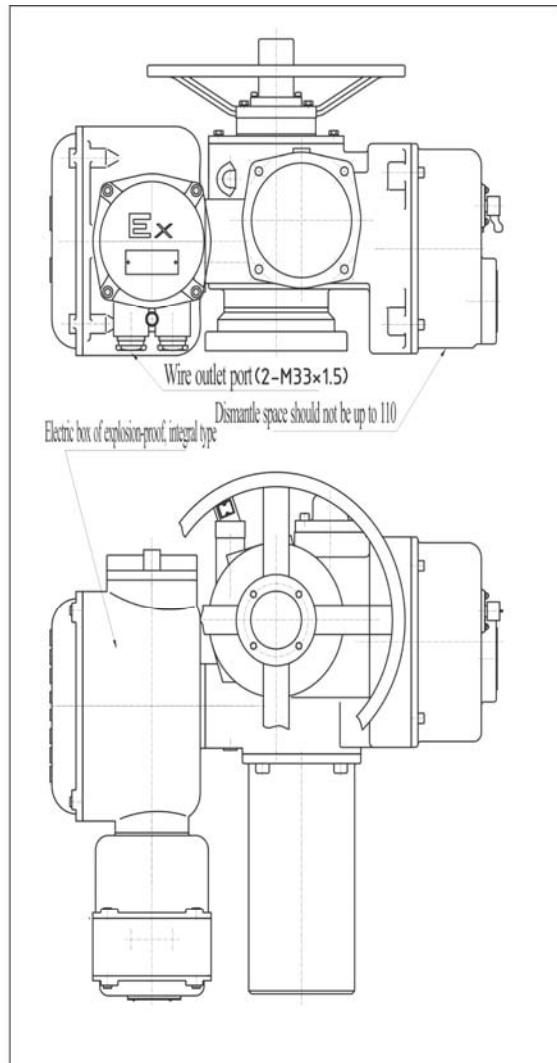
Outline drawing of XZA3~6Ex(Left)

Outline drawing of XZA3~6Ex(Right)

Fig.7



Outline drawing of XZA2 Ex (Left)



Outline drawing of XZA2Ex.IN

Fig.6

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 Manual* 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:

Case of control box

Case of connection box

At places where wire comes in and goes out, it must be ensured that:

1. There is no affect of adverse elements such as rain, snow, hail, damp and dust, etc. as the electric actuator will lose original protection function in the above conditions.
2. At the end of operation, replace the cover. When fastening the clamp nuts at wire inlet and outlet, make sure that no adverse elements (such as severe damp, water and dust, etc.) that could weaken protective performance left in the inner space.
3. In the course of mounting covers, make sure that rubber seal rings are not damaged and fasteners are securely screwed down without any omission.
4. After cable comes out of connecting sleeve, securely fasten the clamp nuts, and the gap between clamp nuts and box must be sealed by winding with sealing tape, and meanwhile sealant (such as 609) or rubber dough must be applied between cable and clamp nuts.
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.

Tianjin Baili Ertong Machinery Co., Ltd.

Address: No.180 Hanghai Road, Airport Economic Area, Tianjin

Tel:86 22 26750325, 84911766, 26750311, 26750320

Fax:86 22 26330054, 26750339, 26770821

Zip code: 300300

<http://www.tet.cn>

Email: scb@tet.cn

Our Company reserves the right to amend this operation manual.