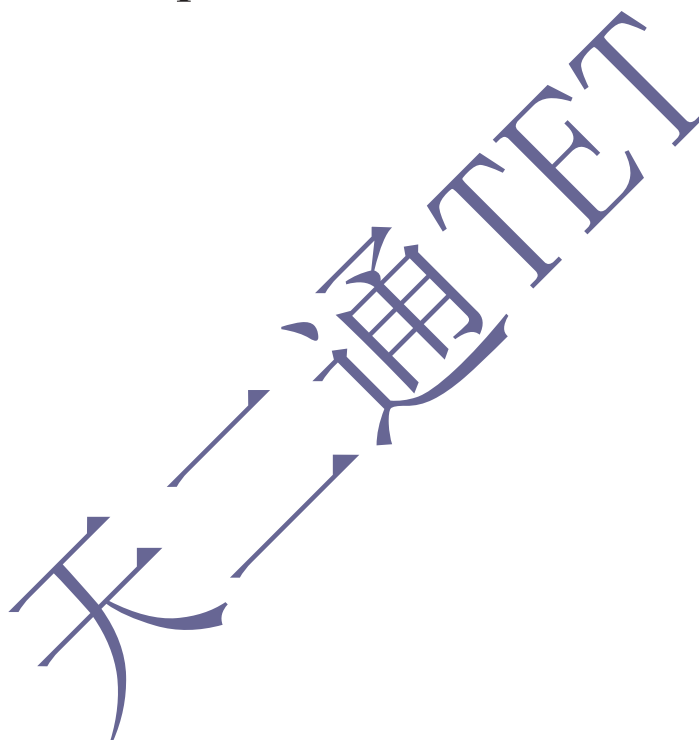


(Please read this Operation Manual carefully before using this product)

NQB1 、 NQB2  
Quarter-turn electric valve actuator  
Operation Manual



**TIANJIN BAILI ERTONG MACHINERY CO., LTD.**

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# 1.Product instruction

## 1.1 Summary

NQB1, NQB2 standard type of quarter-turn electric valve actuators and NQB1.IN, NQB2.IN integral type of quarter-turn electric valve actuators (hereinafter referred to as “Electric actuator”) are the two models with small torque value in NQB detached series. This series is developed from QB1, QB2. Thus, the performance of this series has improved comparing with that of QB1, QB2. This series can operate with ball valve, butterfly valve and other kinds whose discs can only rotate 90°so as to control valve to open or close. In this case, pipe system automation control can be achieved. Both single unit control and collective-remote control can be realized. Remote electric control and manual operation, electric operation on site can also be realized. This series can be largely applied in pipe and valve industrial field.

This Operation Manual is applied to Standard type and Integral type of electric actuator. Additional instruction is offered if there is special function of electric actuator (eg. Explosion-proof type of electric actuator). This Operation Manual, together with some Additional Instruction, can help to ensure that product mounting, debugging and maintenance are dealt in right ways.

Please refer to Fig.1-Fig.4 for product outline. For the dimension of the flange coupling with valve, the dimension of driving shaft’s whole and key: refer to the Catalogue of the manufacturer. (Notify the specific technical parameters when ordering.) Please refer to product’s nameplate for driving output power of the electric actuator (Output speed, torque, etc.)

## 1.2 Basic technical parameters

1.2.1 This product complies with GB/T 24923 《Technical Conditions of General Type of Electric Actuator》

1.2.2 Power supply: 3-phase sineAC,380V,50Hz(400V、50Hz, 415V、50Hz or 220V、50Hz can also be provided)

1.2.3 This series is used outdoors. Enclosure protection grade: IP67

1.2.4 Ambient temperature: -20℃~60℃

1.2.5 Altitude: be up to 1000m

1.2.6 Relative humidity: be up to 90%(at 25℃)

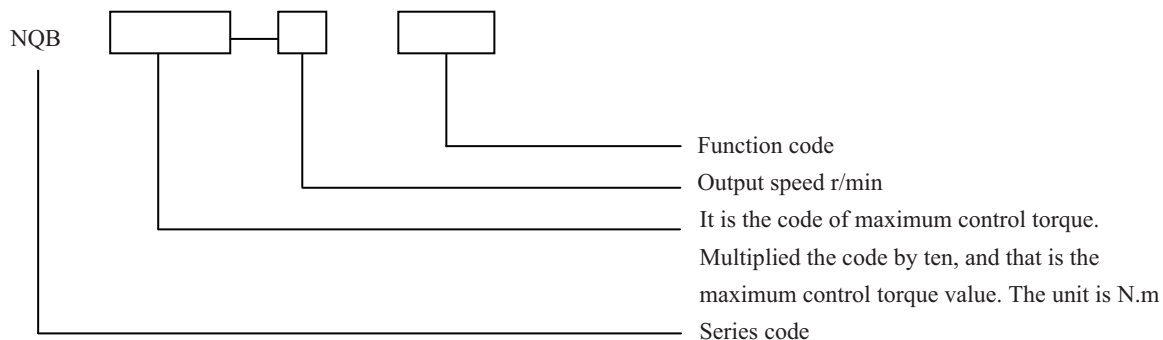
1.2.7 Without any strong corrosive material in working environment

1.2.8 Standard type and Integral type of electric actuator shall not be used in the environment where there is explosive mixed gas

1.2.9 Without any strong vibration

1.2.10 Short-time duty. Rated time: 10mins

## 1.3 Meaning of the product type



## 1.4 Major components and function

1.4.1 Motor: Input power supply of electric actuator. YDF specialized motor for electric valve. Technical parameters comply with related national regulations. Its torque performance complies with valve's loading performance.

1.4.2 Reducer: NQB1 and NQB1.IN applies one stage spur gear pair and two stages worm gear pair. For NQB2 and NQB2.IN, NGW planetary reducer is added to the lower part of NQB1 and NQB1.IN. The range of output speed of the above products is wide and the output shaft has a good self-locking function.

1.4.3 Stroke control and position indication mechanism: they are used to control valve's end position and they send electric contact signal of position to control room. They can indicate valve's position on site and send consecutive electric signal of the position to control room. This mechanism composes of stroke cam, micro switch, dial and potentiometer. Adjustment against this mechanism shall be made after electric actuator is combined with valve.

1.4.4 Torque control mechanism: it is used to protect electric actuator and valve when overload at the valve side happened. Torque signal comes from the axial displacement generated when the axial force on the worm compresses the disc spring. The torque switch is composed of cam and micro switch. User does not need to re-adjust this mechanism since it has been set up before factory delivery.

1.4.5 Manual/Electrical switching handle and manual mechanism: Used for the manual operation under the repair, commissioning and emergency state. Adoption of semi-automatic electrical priority mode, the operation method is to push the switching handle arm and hold its position to complete the Manual/Electrical switching handle, rotate the handle to carry out manual operation; release the switching handle arm after the manual operation, this mechanism will return to the electrical position (When pushing the switching handle arm, the handle may be rotated properly to make the internal mechanism engaged).

1.4.6 Mechanical limit mechanism: used to restrain the limit position of the output shaft. Since it has been adjusted before factory delivery, it should not be loosened at will in case of over-adjustment disengage the worm segment and worm. The mechanical limit of NQB2 and NQB2IN is on NGW planetary reducer.

1.4.7 Spline joint: used to connect valve worm and output shaft of electric actuator. This can be easily taken out and be processed according to the dimension of worm's hole and key, which is beneficial for the mount and dismantle for the valve against electric actuator.

1.4.8 Integral controller: for the integral type of this product (NQB1.IN, NQB2.IN), the integral controller is a part of the main product body. There is AC contactor and other electric components in this controller. There are switching buttons, control buttons, and valve position signal on the product's body cap.

1.4.9 Sealing wire plug: used for the introduction of power cable and control cable. It can ensure the sealing performance of the electric wiring of electric actuator. The input sealing wiring plug of the standard type product is on the main body of actuator. For the integral type, it is in the integral controller. For the explosion-proof type and integral, explosion-proof type of electric actuator, the sealing input wire plug is in the wiring box.

1.4.10 Wiring terminal board: used to connect the wires with power cable and control cable. For the standard type of product, the wiring terminal board is in the stroke and torque control cavity; for the integral type of product, it is in the wiring cavity which is at the back of integral controller.

## 2. Product mounting

### 2.1 Mounting position of electric actuator

Electric actuator can be mounted at any position, but the following two positions are better.

2.1.1 Vertical: the flange connected with the valve is parallel to the floor. That is, the center

axis of output shaft is vertical with the floor.

2.1.2 Side: the central axis of output shaft is parallel to the floor. It is much better if axis of motor is parallel to the floor at that time.

## 2.2 The connection between electric actuator with the valve

2.2.1 Take the spline joint out of the driving shaft and get it properly connected with valve (if no requirement of the dimension of the inner hole and key is made while placing order, processing shall be made by user).

2.2.2 Check up the valve's position (end position is the best), and if the valve's position is different from the driving shaft's position, to manually operate the electric actuator to get the valve's position same as that of driving shaft. (The position of the driving shaft can be seen from the dial)

2.2.3 To install the electric actuator with valve, making the flange hole of the two to be aligned with each other. To make electric actuator to be fastened with valve through bolts. The depth of the threaded section on the bolts shall comply with standard requirement (after the electric actuator is well adjusted, the dwell pin can be placed between the valve and the electric actuator).

## 3. Electric wiring

Electric schematic diagram and electric wiring

The Operation Manual is attached with an Electric schematic diagram which is applied for the electric actuator. Wire numbers and terminal numbers are marked on the diagram which could be used by user to connect wire.

### 3.1 Electric wiring for Standard type (see Fig.1)

Remove the "the control box cover 1" and "sealing plug 2"; put the power cable and control cable through the two G1" sealing wire inlet plugs (provided by user) which are matched with thread holes of "Case 4"; put the cable into the control cavity of the electric actuator. Connect the core of cables with "connection wiring terminal board 3", and wiring should be reliable and shall not be exposed. Pull the cable outwards in a proper amount to ensure it will not interfere with other operating components in the cavity. Rotate the input sealing wire plug into the thread hole of the case body; firmly screw the gland nut on the sealing wire plug so as to ensure the sealing performance of controller.

### 3.2 Electric wiring for Integral type of electric actuator (see Fig.2)

Remove the "Control case 2" and "Wiring case 3"; unscrew the thread plug and the inner sealing plug of "Sealing inlet wiring plug 4". Put power cable and control cable through the sealing inlet wire plug and pull them into "Integral controller's case 1". Connect cable's core wire with "Wire connecting terminal 5" according to Electric Schematic Diagram and Terminal Number Table. The wires shall be reliable and cannot be exposed to the outside. Rotate and tighten the thread plug on the "Sealing inlet wire plug 4" against cables, ensuring the sealing of the controller.

### 3.3 Electric wiring for Explosion-proof type and Integral explosion-proof type (see Fig.3, 4)

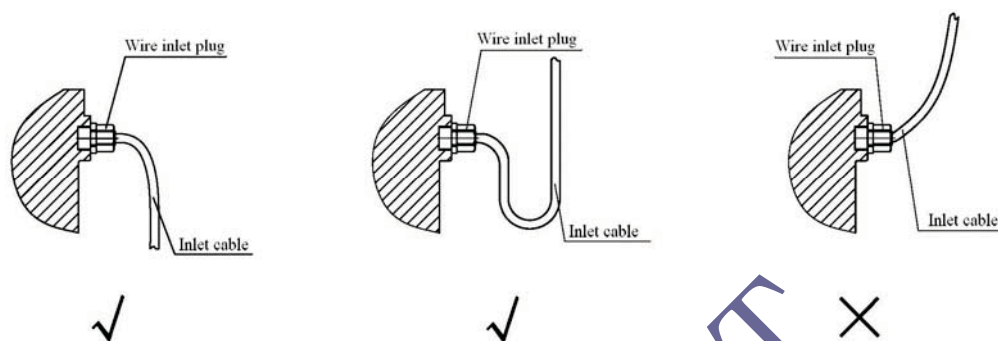
2-G1" sealing plug is applied at the inlet wire port for the Explosion-proof type and Integral explosion-proof type. Remove "Wiring box case 1" and "Sealing plug 2" before wiring; put the power cable and control cable through explosion-proof sealing inlet wire plug (provided by user) which is matched with thread holes of "Wiring box 3". Connect cable's core wire with "Explosion-proof terminal board 4" according to Electric Schematic Diagram and Terminal Number Table. The wires shall be reliable and cannot be exposed to the outside. Rotate and tighten the thread plug on the "Sealing inlet wire plug" against cables, ensuring the sealing of the controller.

Note: 1. The sealing plug shall be sealed properly in any working environment, even the product is not working. This product has been strictly examined before factory delivery. The product shall

be kept in dry environment if it cannot be mounted immediately. Don't remove the sealing plug before finishing connecting the wire so as to prevent the sealing performance from being damaged.

2. The internal grounding and external grounding of the electric actuator shall be fastened and reliable.

3. Cable shall be correctly connected to avoid the rain leaking into the electric actuator (the first two connection patterns are right in the following picture.)



## 4. Product debugging

### 4.1 Adjustment

▲ The torque control mechanism has been tested and standardized before factory delivery. The output torque complies with the maximum control torque shown on the nameplate, so users do not need to re-adjust. Besides, the two mechanical limit screws on the product body have been adjusted and fastened. Don't loosen it even in special case.

▲ The cams and dials of the drive shaft, stroke control and position indication mechanism are normally set at the "CLOSE" position, it is unnecessary to change the position of the dial in order to be easy for observation when carrying out installation and commissioning.

▲ The potentiometer gear and the potentiometer shaft are under loosened state, preventing the potentiometer from being damaged during commissioning.

▲ The cam on top of the stroke control mechanism is used to control "open" of the valve, and the cam on the bottom is used to control "close" of the valve.

The adjustment of stroke control and position indication mechanism:

4.1.1 Operate the valve manually to the neutral position.

4.1.2 Start the electric actuator; confirm that movement direction of the valve matches to the control when it is electrically controlled. If there is any error, change the phase sequence of the power supply (this operation is not required for the integral type electric actuator equipped with automatic phase changing function).

4.1.3 Manually operate the valve to "CLOSE" position; loosen the screw on the "CLOSE" stroke cam; rotate the cam in the direction of closing the valve to make it touch the roller and contact of the corresponding micro switch. When "click" from the micro switch is heard, the screw on the cam can be tightened properly.

4.1.4 Manually operates the valve towards the open direction, causing the "CLOSE" stroke cam to disengage from the roller and probe of the micro switch. And then, operate the valve towards the close direction of the valve electrically to inspect the correctness of the valve "CLOSE" position adjustment. If the control is correct and the action is sensitive, the adjustment is acceptable. At this time, tighten the screw on the cam of "CLOSE" stroke reliably, no looseness is allowed. If there is error with the valve "CLOSE" position, adjust the cam finely, and repeat the inspection of the adjustment correctness until it is OK.

4.1.5 Operate the valve to "OPEN" position manually; loosen the screw on the "OPEN" stroke

cam; rotate the cam in the direction of opening the valve to make it touch with the roller and contact of the corresponding INCH switch, when a “click” sound from the action of the micro switch is heard, the screw on the cam can be tightened properly (the procedures below are same as these in 4.1.4, pay attention to the different attention).

4.1.6 One stroke of opening and closing should be applied to the valve electrically to confirm the correctness of the control, and inspect the reliability of the tightening screw on the open and close stroke cam. (Above adjustment refers to the adjustment of valve opening and closing stroke)

4.1.7 Dial adjustment: At either end position of the valve, loosen the screw on the dial so that the position corresponding to the end position of valve can align with the "reference mark" on “stroke and position indicating mechanism”, and then tighten the screw.

4.1.8 The adjustment of potentiometer: At either end position of the valve, push the potentiometer gear upwards to cause it disengage from the sector gear. Tighten the screw on the potentiometer gear slightly; rotate the potentiometer to the position of corresponding valve (return the potentiometer a little when it rotates to the end position). Loosen the tightening screw on the potentiometer gear and cause it engage with the sector gear, then secure the tightening screw.

Attention should be paid to the relationship between the rotation direction of the potentiometer during operation and the rotation direction of the output shaft. Otherwise, it would be damaged.

4.1.9 The adjustment of mechanical limit screw: if it becomes necessary to adjust the mechanical limit screw, first is to make clear the valve positions that are restrained by either of two screws. When the rotation direction of the valve is standard (“CLOSE” when rotating right-hand), the screw closer to the nameplate of the electric actuator is “OPEN” limit, and “CLOSE” limit for the other one.

After the end position of the valve is decided, adjust the screw inwards to make it contact with the limit section on the drive shaft first, and then rotate it back by 0.5 to 1 turns.

At last, tighten the retention screw (or nut) at outside, this completes the adjustment of mechanical limit.

Note: The limit screw is not allowed to retract too much, otherwise it will make the sector gear of the drive shaft disengaged from the worm easily.

## 4.2 Comprehensive performance inspection

4.2.1 Operate the valve to open and close for a stroke manually; observe the operation condition of the stroke control and position indication mechanism, and observe the MANUAL/ELECTRICAL switching handle and the performance of manual mechanism.

4.2.2 Operate the valve to its full close position electrically. The stroke control mechanism should be sensitive and meet the requirement for sealing of the valve. At this time, the indicating lamp for the controller should be lit up, and the pointer of the opening meter should be located at “0” position.

4.2.3 Operate the valve to its full open position electrically. The stroke control mechanism should be sensitive and meet the requirement for open of the valve. At this time, the “OPEN” indicating lamp for the controller should be lit up, and the pointer of the opening meter should be located at “100%” position.

The electrical valve can be put into operation only after all above inspections are passed.

## 5. Additional instruction for explosion-proof type

### 5.1 Summary

NQB1Ex, NQB2Ex explosion-proof quarter-turn electric valve actuator and NQB1INEx, NQB2INEx integral explosion-proof quarter-turn electric valve actuator are of explosion-proof structure. This product is produced on the basis of GB/T 3836.1《Explosive atmospheres— Part 1: Equipment—General requirements》and GB/T 3836.2《Explosive atmospheres—Part 2: Equipment protection by flameproof enclosures “d” 》.

NQB1Ex、NQB2Ex、NQB1INEx、NQB2INEx explosion-proof quarter-turn valve electric

actuator(hereinafter referred to as NQBEx Explosion-proof Electric Actuator ) 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 NQBEx explosion-proof type is Ex db IIB T4 Gb.

The meaning of the alphabet and number in this explosion-proof sign: “Ex” shows that the electric apparatus comply with the Explosion-proof Standard; “db” 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; IIB represents that the gas is ethylene; T4 indicates that the permissible surface temperature is 135°C. “Gb” is the protection grade of apparatus.

The above-mentioned product with that explosion-proof sign is applied to use in IIA and IIB factory. Inflammable gas and steam whose temperature class is T1-T4. (Please refer to GB/T 3836.1 and GB/T 3836.2 during product choosing so as to ensure correct usage).

Two sets of Operation Manual, provided with other attached documents, are General type of electric actuator operation manual and this explosion-proof type of electric actuator operation manual. Please refer to the General type operation manual for technical parameters, overall structures and functions, adjustment means. Please refer to this part instruction for the explosion-proof performance, wiring procedure and usage notice. For the explosion-proof certificate No. And technical serial No., please refer to product's nameplate.

For the outline dimension, flange dimension connected with valve and the position and dimension of inlet wire position of explosion-proof wiring box please refer to the catalogue from our Company.

## 5.2 Notice for usage and maintenance

Refer to Fig.1 for the structure

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 explosion-proof case from being hit.

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

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

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

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

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

5.2.9 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.

5.2.10 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.

## 5.3 Electric schematic diagram and explosion-proof terminal board

The electric schematic diagram of explosion-proof type is the same as which is shown in the General Type of Product Operation Manual. Projecting numbers and alphabets are printed on the explosion-proof terminal board. The wiring numbers and terminal numbers are on this diagram. User could refer to it for wiring.



#### 5.4 Notes for electric wiring

Lug plate shall be applied for wiring. Screw M4 is used for power cable; screw M3 is used for control cables. Wires shall not be loosened or exposed to outside. Bend all the plastic protection jackets of the lug plate in the same direction to ensure a proper creep age distance and leakage distance. Check if there is any conductive body left in the wiring case after electric wiring.

#### 5.5 Others

Remove “wiring box case1” after electric wiring is finished, and to examine and adjust the product according to General Type of Product Operation Manual. Make sure that each part has been adjusted well before installing and fastening the “wiring box case1” .

### 6. Precautions

6.1 The tightening screws of the control box cover should be tightened reliably after adjustment; the sealing ring should not be missed in order to assure the outdoor performance of the product.

6.2 The inner chamber of the speed reduction mechanism has been filled with special gear grease (EP-2) before delivery, and it is not necessary to be replaced in normal condition. The user should carry out regular inspection according to the actual operating condition to determine whether to replace or replenish.

6.3 After this product is removed from the valve for repairing or replacing the lubrication grease, the stroke control and position indication mechanism should be inspected and adjusted. The torque control mechanism should be inspected and calibrated if necessary, making it be in accordance to the requirement.

6.4 When using in the environment with much bigger vibration, the tightening parts at various locations should be examined in regular interval to see whether they are loosened or not.

6.5 The sealing condition of the control chamber should be checked regularly when operating outdoor.

6.6 When the number of times for operating this product is very small, the power-on operation should be carried out regularly under the condition that the working environment allows.

6.7 The thin and weak locations as control box cover, glass of indication window and so on should not be impacted.

6.8 The grounding of the product should be reliable.

6.9 The design service life of actuator is 8000 times.

6.10 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.

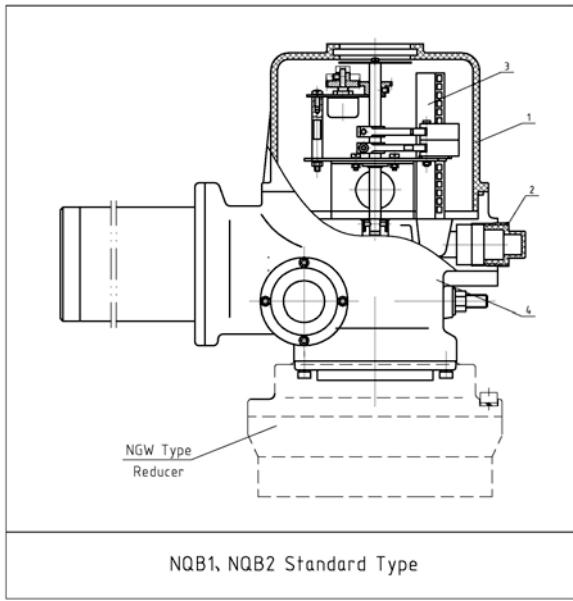


Fig.1

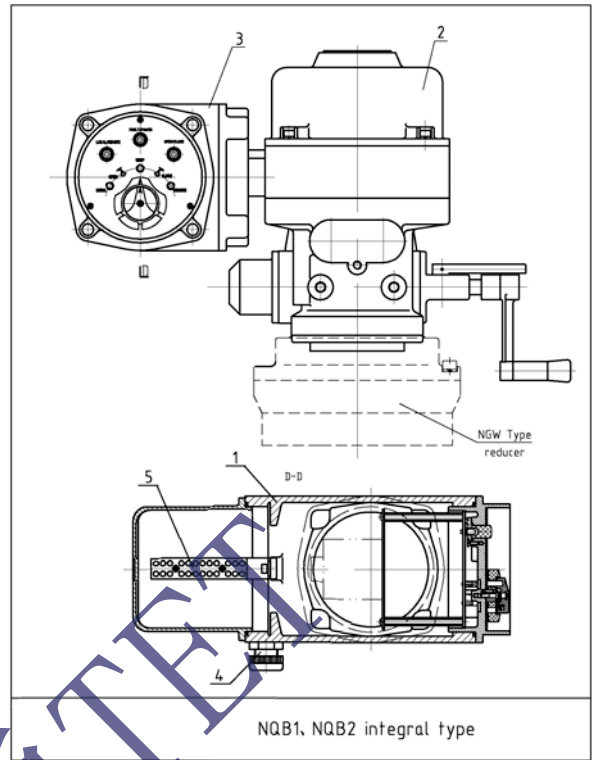


Fig.3

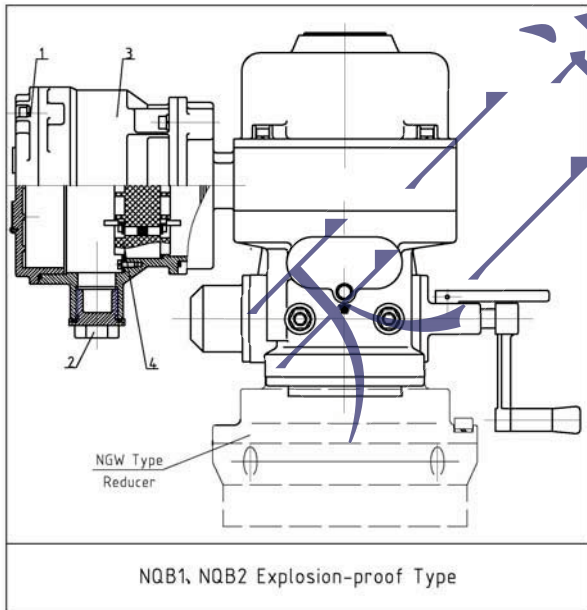


Fig.2

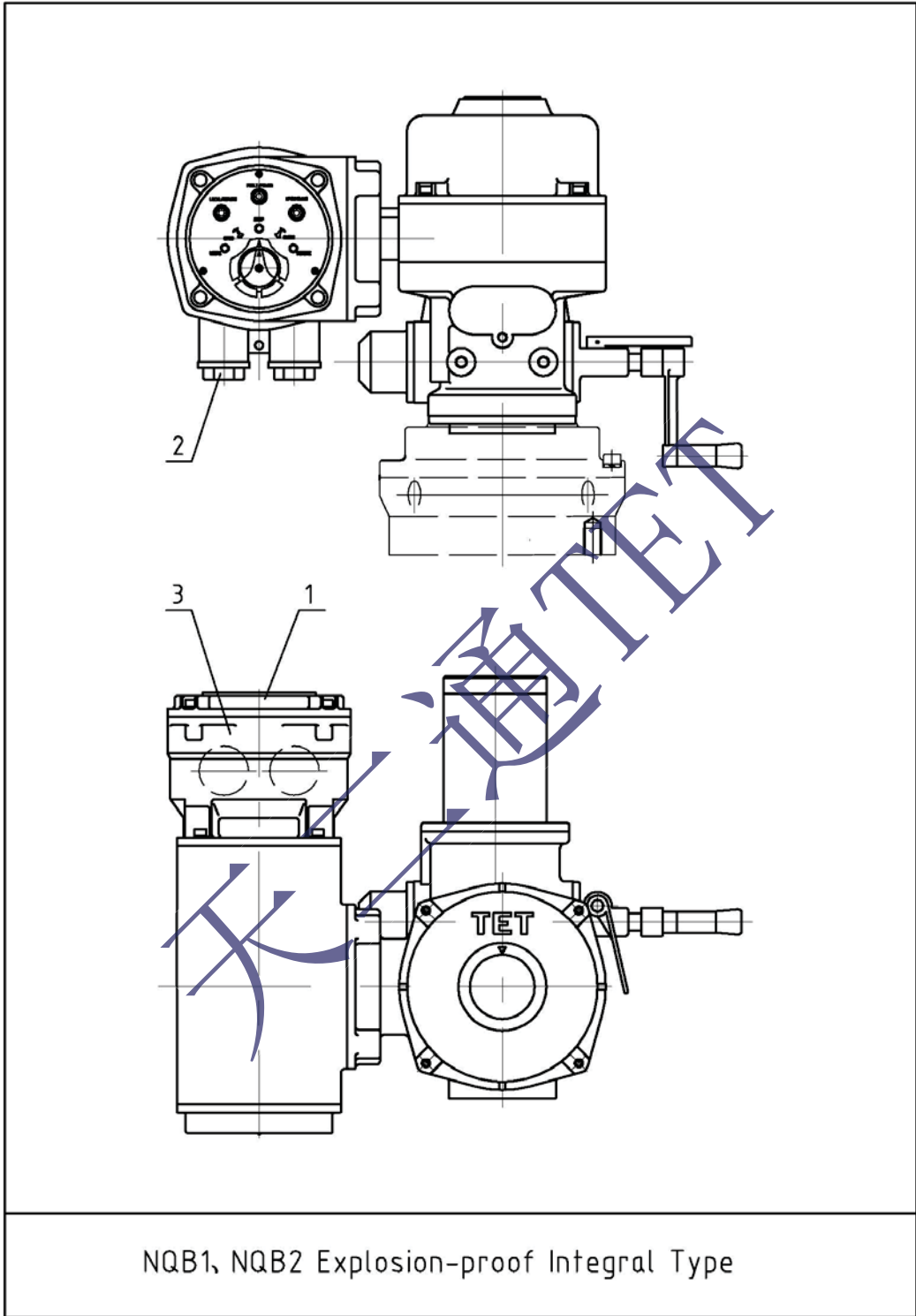
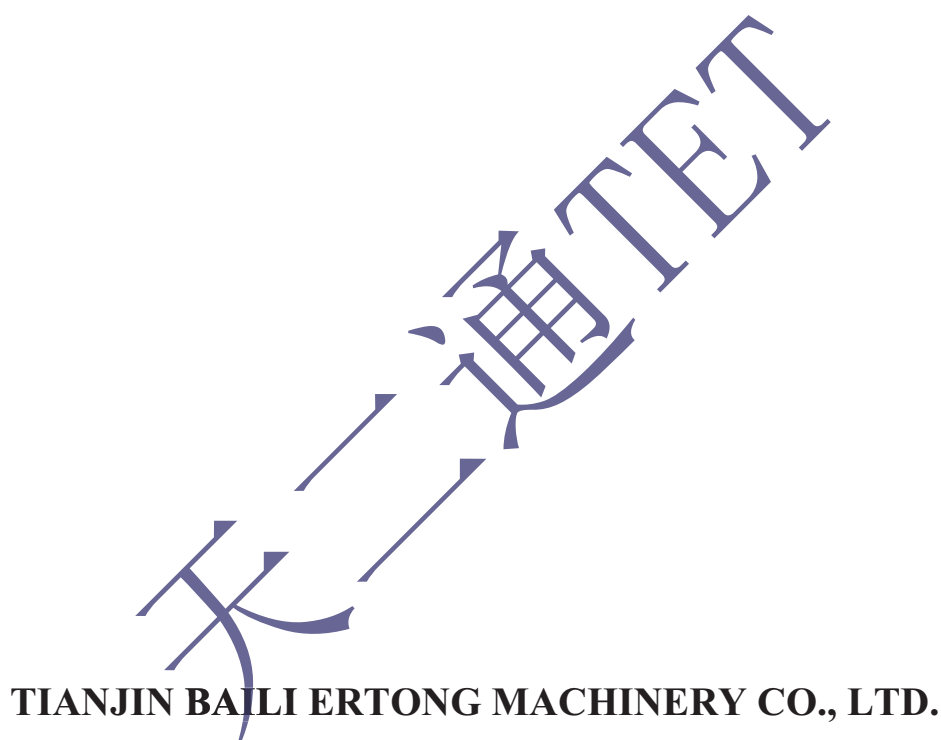


Fig.4

### **Notices when ordering:**

- ▲ The user should provide a complete product model.
- ▲ It should be notified when the rotation direction of the valve is nonstandard. As the manual rotation direction of the electric actuator is “CLOSE” when rotating right-hand under the condition that there is no special requirement, and the wiring of the stroke and torque mechanism relate with the direction of rotation.
- ▲ The required flange size, threaded hole size and their positions should be specified.
- ▲ Whether the hole for stem is required or not should be clarified.
- ▲ Specify whether there is a special requirement or not, such as explosion-proof.
- ▲ Introduce the operation condition in brief.
- ▲ The controller should be specified separately when placing an order.



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Our Company reserves the right to amend this operation manual.