XFQ Intelligent Electric Device

For 90° Rotary Valves

User's Manual

Changzhou XIFAN Power Station Auxiliary Equipment Co., Ltd.

I. Introduction to the product

XFZQ series intelligent valve electric device is a new generation product based on the control technologies of overseas and domestic similar products, the control technology of 32-bit chip processor is the core technology for the development of the product. This product is an intelligent product integrating 24-bit absolute encoder, bus control, infrared remote control, liquid crystal display, magnetic control switch, etc., which are stable and reliable, the latest automatic control technologies and advanced manufacturing technologies.

Product features:

- Debugging can be conducted without opening cover. Knob setting and infrared remote control can be used for operation. The debugging is simple, the man-machine interface is intuitive.

- Use high-performance full-view LCD display screen, the display is stable and concise.

- The absolute encoder is used for stroke positioning, the setting is accurate. It has over-torque and electronic protection.

- It has automatic identification of phase sequence and phase failure protection.

- Fault self-diagnosis (for any fault, the fault point can be found through the LCD man-machine dialogue interface)

- It has the functions of instantaneous reversal protection, motor jamming protection. In case of motor overheating, the interface will show anomaly of motor.

- In case of failure during operation, it can ensure that the power motor is not burned.

- Realize automatic identification of remote control switch value and analog value (switch type is not available)

- Realize automatic identification of potentiometer signal and encoder signal

- The man-machine dialogue interface displays the input and feedback current values in real time

- 4-20mA feedback current automatically generates after the opening and closing positions are set

- With calibration of 4-20mA feedback current. Users can enter the fine adjustment function, to ensure that the feedback current is correct. (Infrared remote control)

- It has calibration function for collection of 4-20mA input current. It can realize calibration of low-frequency signal and high-frequency signal (infrared remote control operation)

- The range of sensitivity setting is wide (infrared remote control operation, optional accuracy 0.5%-10%, 10 means Automatic)

- Electrical isolation is conducted for inside of all input and output signals

- Users can enter the menu to set inching and self-hold operation

- It has the function of output of electronic stroke in place

- The completely imported magnetic switches are used for field control

- Through dialer, achieve the settings of "signal loss" open/closing, and the positive and negative action, motor alarm

- Bilingual menu in Chinese and English is used. (Selection of language)

- ESD emergency shutdown function.

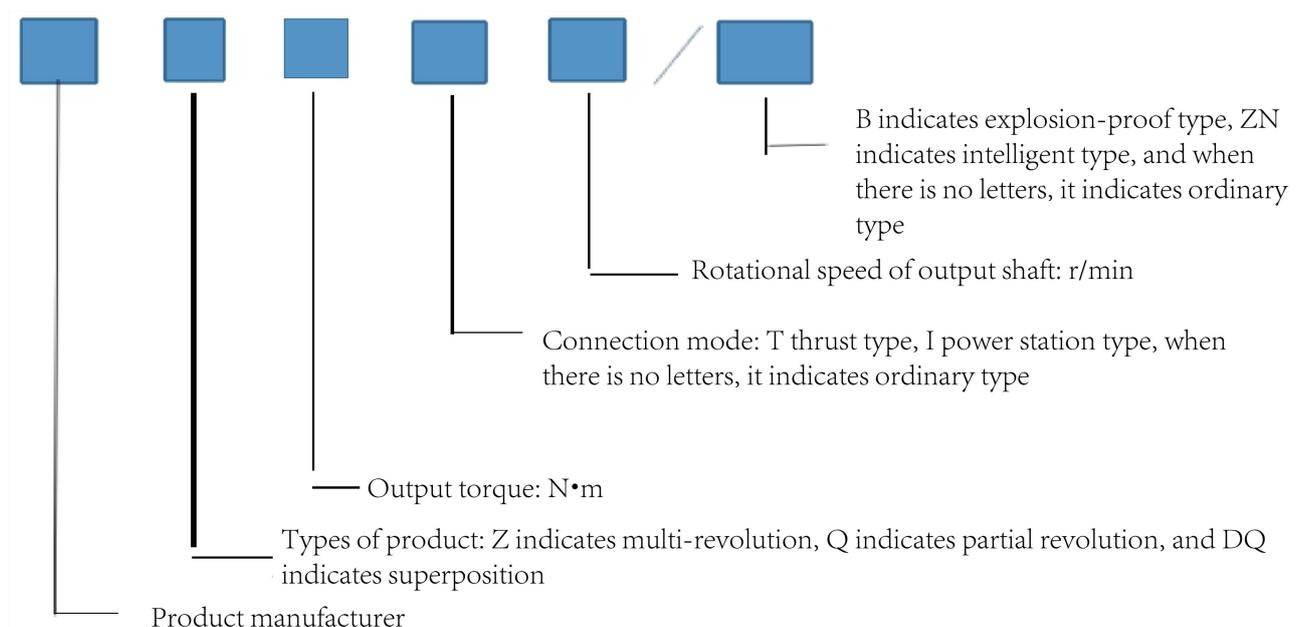- Standard ModbusRTU communication protocol

II. Main technical parameters

1. Power supply: AC380±10% V   50 ±10% HZ
   Optional power supply: AC380-660V   50 60HZ (Please specify it when ordering)

2. Working environment

2.1 Ambient temperature:-20 ~ 60°C Optional ambient temperature:-40 ~ 70°C

2.2 Relative humidity: ≤ 90% (25 °C)

2.3 Protection grade: IP55~68 is optional. (Please specify it when ordering)

2.4 Explosion-proof signs: EXdI, EXdIIBT4 and EXdibIICT4.

   It is applicable to the Zone 1 or Zone 2 dangerous places with Class IIB ~ IIC explosive combustible gas, and the temperature class is T1-T4 group.

3. The motor is short-term working system, rated running time is 15 minutes, and it adopts Class F insulation.

III. Model representation method

B indicates explosion-proof type, ZN indicates intelligent type, and when there is no letters, it indicates ordinary type

Rotational speed of output shaft: r/min

Connection mode: T thrust type, I power station type, when there is no letters, it indicates ordinary type

Output torque: N•m

Types of product: Z indicates multi-revolution, Q indicates partial revolution, and DQ indicates superposition

Product manufacturer

IV. Installation and disassembly

The valve electric actuator is allowed to be installed at any position, but note that the motor must be keep horizontal as far as possible. The recommended installation way: the cover of the electrical box is horizontal or vertical upward, so that it facilitates lubrication, debugging, maintenance and manual operation.

V. Matters:

The valve electric actuator is allowed to be installed at any position, but note that the motor must be keep horizontal as far as possible. And during installation, the buttons of the electrical box shall correspond. If there is any inconsistency, press the Stop button immediately, cut off the three-phase power supply and change any two phases of the three-phase power supply.
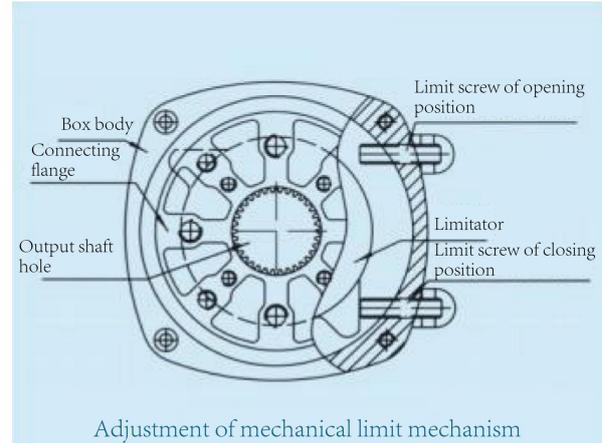
VI. Adjustments

1. Turn the handwheel to make the valve "fully closed", loosen the screws on the output shaft, turn the closing cam clockwise, to make it just press the closing microswitch, and then tighten the screws.

2. Turn the handwheel to make the valve "fully open", loosen the screws on the output shaft, turn the opening cam counterclockwise, to make it just press the opening microswitch, and then tighten the screw.

3. Open and close the valve manually or electrically, to check whether the opening or closing of the valve meets the requirements. If not, fine conduct fine adjustment according to the above steps until it meets the requirements.

Torque control mechanism   Stroke control and opening indication mechanism
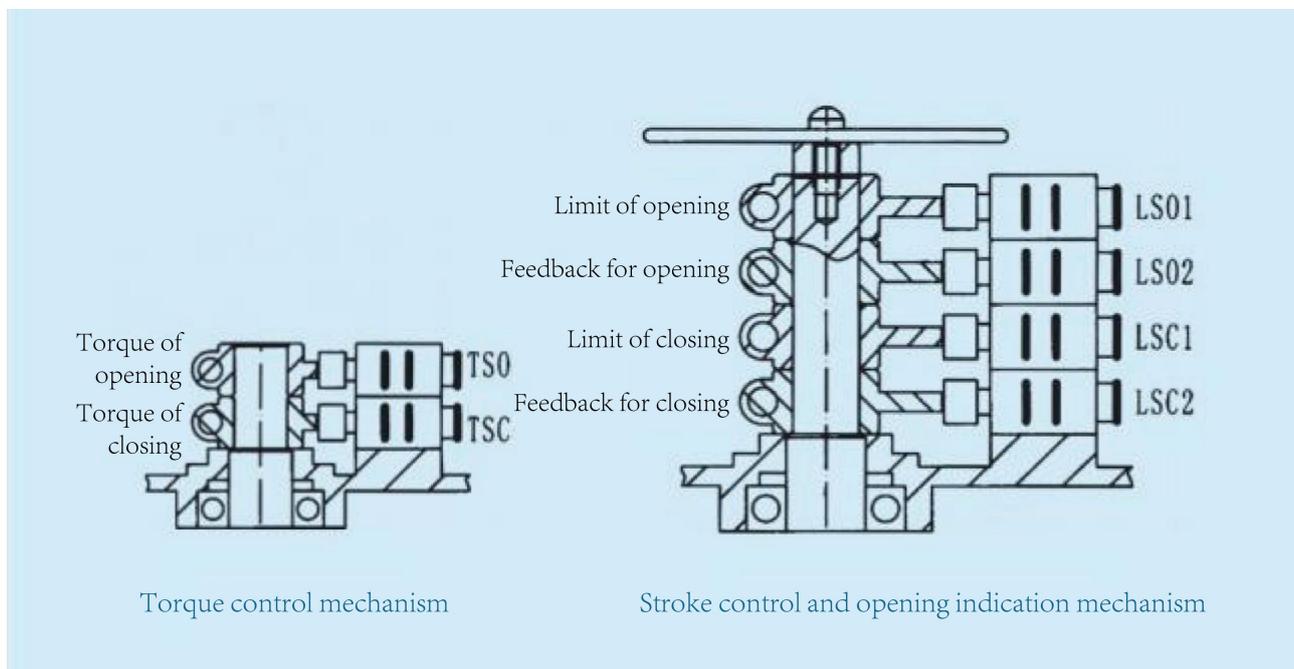
VII. Adjustment of mechanical limiting mechanism

The purpose of adjustment is to limit the switch elements of the valve (disc plate, valve ball, etc.) to the working stroke (generally 90°), ensure that they will not rotate at random.

Adjustment of mechanical limit mechanism

1. Make the valve in the "fully closed" position, and the position of screw and limitator is as shown in the figure. Screw the mechanical limit screw in the closed position until the top of the screw contacts the limitator, then return the screw for 1 ~ 2 turns, and then tighten the lock nut.

2. Make the valve in the "fully open" position, and according to the above method, adjust the mechanical limit screw which is in the Open position.

# VIII. Adjustment of torque control mechanism

The torque control mechanism has been adjusted to the maximum output torque specified on the product nameplate when leaving the factory, and users generally do not need to make adjustments.

IX. Faults and troubleshooting

S/N	Fault	Reason	Troubleshooting
1	The motor cannot rotate	1. The power cord is disconnected 2. Fault of control circuit 3. The stroke or torque mechanism does not work properly	1. Check the power cord 2. Troubleshoot the fault of the circuit 3. Troubleshoot the fault of stroke or torque mechanism
2	The direction of output shaft is not in conformity with regulations	The power cords are connected incorrectly	Change any two of the power cords
3	Motor has overheating	1. Continuous working hours are too long 2. The motor is not matched with the actuator 3. Phase failure	1. Stop running and cool the motor 2. Check the supporting situation 3. Check the power cords
4	The motor stops rotation during operation	1. The torque control works 2. Valve failure	1. Make adjustment to increase the setting torque 2. Check the valve

| S/N	Fault	Reason	Troubleshooting
5	When in place, the motor does not stop or the light does not light up	1. Stroke or torque mechanism has failure 2. The adjustment of stroke controller is improper	1. Check the stroke torque mechanism 2. Re-adjust the stroke mechanism

X. Dimensions for connection
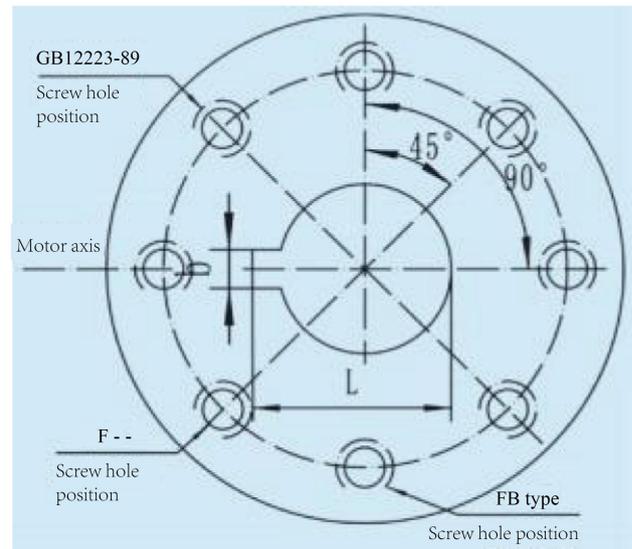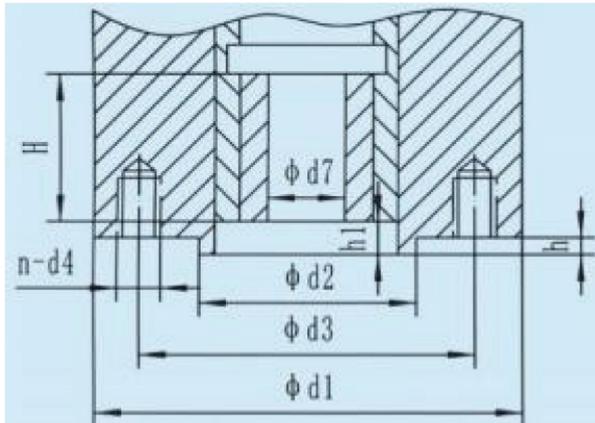
Model	Flange type		d1	d2	d3	n-d4	D7		H	h	h1
							Reserve	Max.			
Q05		FB1	77		57	4-M6	12. 7	12.7	35		
Q10		FB1	77		57	4-M6	15.9	15.9	35		
	F05			65	35	50	4-M6	8	18	35	3	2
Q15 Q20		FB2	92		70	4-M8	19	19	42		
	F07		90	55	70	4-M8	12	28	42	3	2
Q30 Q40		FB3	115		89	4-M12	22. 2	22.2	42		
	F10		125	70	102	4-M10	12	28	42	3	2
Q60		FB3	115		89	4-M12	28.6	28.6	50		
	F10		125	70	102	4-M10	15	38	50	3	2
Q120		FB4	140		108	4-M12	31. 7	31. 7	50		
	F12		150	85	125	4-M12	15	38	50	3	2
Q180		FB5	197		159	4-M16	33.3	33.3	60		
	F14		175	100	140	4-M16	20	38	60	3	3
Q300		FB5	197		159	4-M16	41.3	41.3	90		
Q500	F16		210	130	165	4-M20	20	60	90	3	3

| Model	Flange type	d1	d2	d3	n-d4	D7		H	h	h1
						Reserve	Max.			
Note: The above parameters are for routine goods supply, users can specify any special demands for products when ordering.										

XI. Parameter table

Model and specification	Output torque N/m	Output rotational speed r/min	Maximum stem diameter mm	Manual speed ratio	Power of motor W	Rated current A	Reference weight Kg
Q05	50	1	19	60	45	0.35	8.5
Q10	100	1	19	60	60	0.48	8.6
Q15	150	1	19	60	75	0.55	8.7
Q20	200	1	28	90	90	0.65	12.7
Q30	300	1	28	90	120	0.75	12.7
Q40	400	1	28	90	150	0.85	13
Q60	600	1	38	87	180	0.95	21
Q120	1200	1	38	87	250	1.3	21
Q180	1800	1	38	87	370	1.7	23
Q300	3000	0.5	55	348	370	1.7	35
Q500	5000	0.5	55	348	550	2.5	35
Note: The above parameters are for routine goods supply, users can specify any special demands for products when ordering.							

XII. Overall dimension
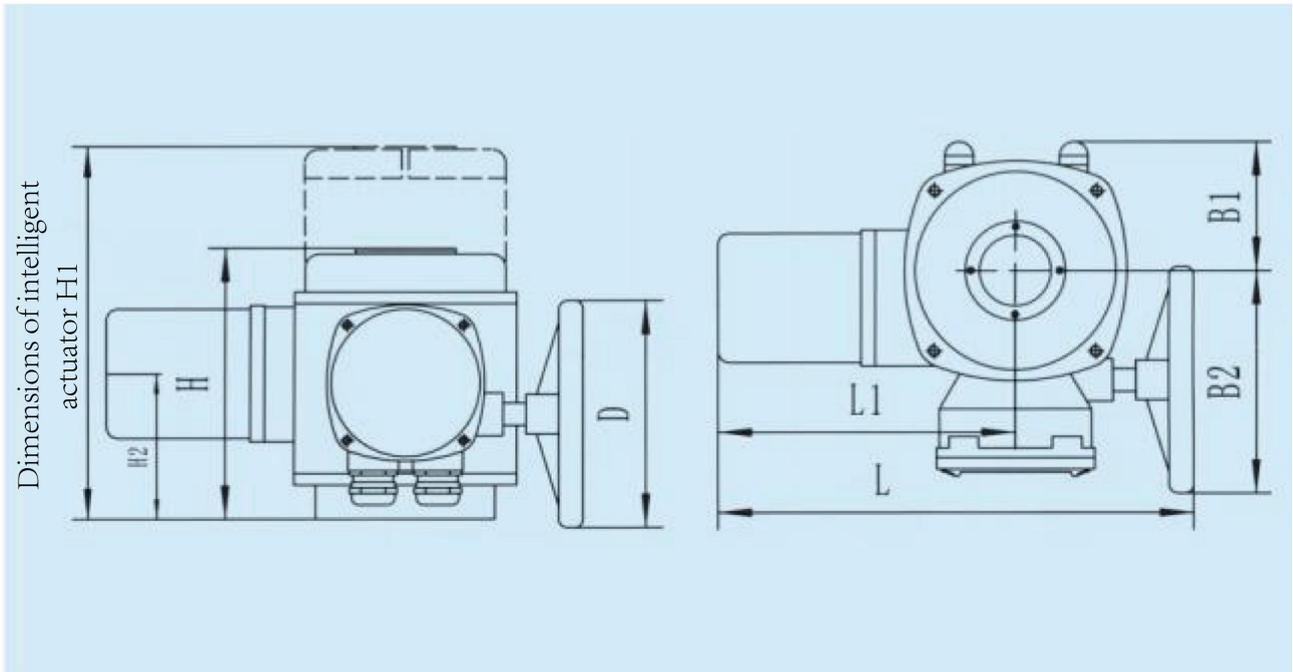
Model	Bl	B2	H	Hl	H2	L	Ll	D
Q05/15	68	114	156	270	73	250	157	140
Q20/40	91	157	191	273	103	332	208	160
Q60/180	143	203	227	309	126	424	232	250
Q300/500	143	203	291	373	190	424	232	250

XIII. Typical wiring diagram
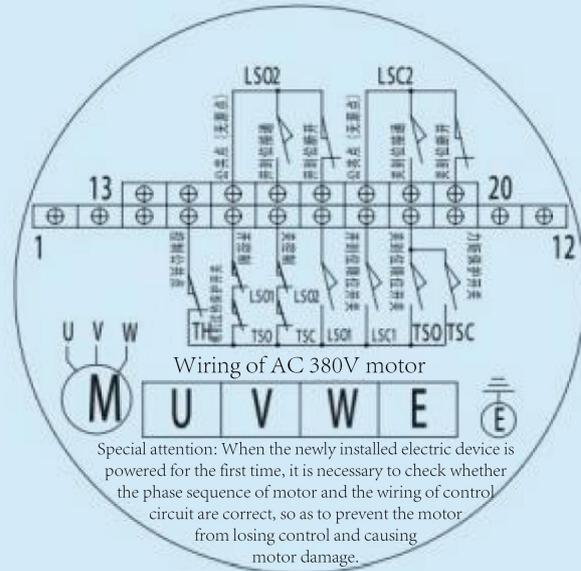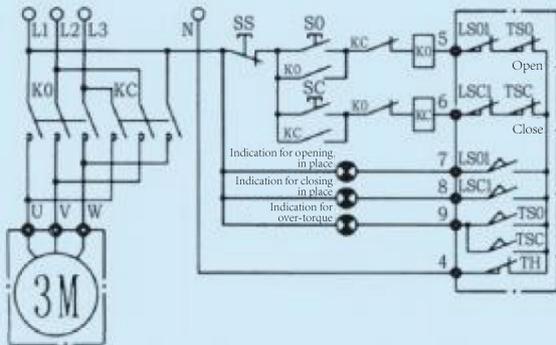
LSOI- limit switch of opening direction

TSC1- limit switch of closing direction

TSO- torque switch of opening direction

LSO- torque switch of opening direction

Wiring diagram of ordinary terminal

Note: 1. Inside of the dotted box is the internal wiring of the actuator, and outside of the box is for users' reference when wiring.

| No.4 control common terminal No.5 valve opening control line No.6 valve closing control line	**Warning!** No.4, No.5 and No.6 are main control lines, they must be connected correctly (otherwise, the control fails, the motor burns and the casing is damaged) No.4, No.5 and No.6 are "always closed" contacts		**Warning!** Wiring of 380V motor (during wiring of motor, the lines for forward and reverse rotation must be connected correctly) For each electric actuator, the lines for forward and reverse rotation may be inconsistent Each electric actuator needs to be calibrated, otherwise the control fails, the motor burns and the casing is damaged
Indication for No.7 opening in place Indication for No.8 closing in place Indication for No.9 over-torque		Passive feedback	Close after No.15 and No.16 open in place Disconnect after No.15 and No.17 open in place Close after No.18 and No.19 close in place Disconnect after No.18 and No.20 close in place
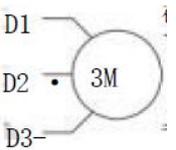
Torque control mechanism
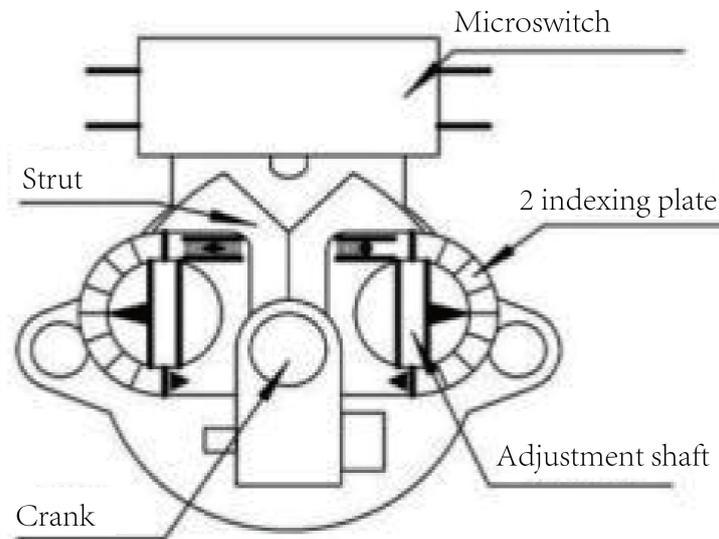
Figure 2.1 Torque control mechanism

Working principle of torque control:

When the output bearing encounter resistance, the worm with combination of worm and worm gear will generate axial displacement, which will drive the crank in the worm shaft slot to cause change in rotation angle, and the gap distance between the opening or closing control cam and the microswitch will be reduced to press the control switch and cut off the power supply of the motor.

Stroke control mechanism

The intelligent stroke control is achieved through the following process: the 24-bit absolute encoder on the transmission mechanism is driven by the large bevel gear on the output shaft to count and memorize each code value in the stroke, and the code value of one revolution of the absolute encoder is 4096. The rotation angle number for rotation per index on the output shaft has a corresponding code value.

Working principle of stroke control

When the valve electric device is adjusted to open position, with the displacement of rotation angle of the output shaft, the transmission mechanism drives the absolute encoder to rotate, the code value of each index is detected and fed back to the central processing unit, and the storage memory is conducted. When the "full opening position" point of the valve is confirmed, at this time, the code value where the absolute encoder stays is the positioning value of the full opening position, it is confirmed by the central processing unit and the storage memory is conducted. The principle of closing position is the same. After the valve opening position and closing position are confirmed, the central processing unit memorizes and stores the code values of the full opening position and full closing position points. When the control instruction Open or Close is given, as the valve moves close to the positioning point, the central processing unit obtains the code value fedback by absolute encoder, so that it can make judgment and send out the instruction to ensure the accuracy of the

opening position and closing position. The code values of the "fully open" point and the "fully closed" point are relative code value intervals.

XIV. Function of module and menu

I. The basic settings

II. Feedback settings

III. The bus setting

IV. Debugging diagnosis

V. Options of system

Basic settings

(1) Adjustment of closing position:

(2) Adjustment of opening position: Confirmation of closing position----Confirmation of current position*****.

(3) Setting of dead zone: Confirmation of open position----Confirmation of current position*****.

(4) Action position in case of signal loss: Adjustment of dead zone-----setting value: 030%

(5) Field control: Position holding in case of signal loss----holding the position, fully opening and fully closing.

(6) Two-line control: Field control-inching and holding.

(7) ESD settings: Open in case of low-frequency signal, close in case of high-frequency signal, open in case of high-frequency signal, close in case of low-frequency signal. ESD settings----Open and close.

(8) Remote manual: Remote manual-----two-line and one key, three-line and two key, four-line and three key.

Feedback setting

(1) Fine adjustment of low end: 4mA fine adjustment Output value: 0360 is corrected to 0400 and confirmed.

(2) Fine adjustment of high end: 20mA fine adjustment Output value: 1817 is corrected to 1998 and confirmed.

(3) Calibration of low-frequency signal: Voltage (V) 0.00 Original value (V) 0.39.

(4) Calibration of high-frequency signal: Voltage (V) 0.00 Original value (V) 1.99.

(5) Braking mode: Automatic braking Manual braking

(6) Brake adjustment: Distance of automatic braking: Open position of encoder Close position of encoder

Distance of manual braking: Open position of encoder   Close position of encoder

(7) Setting of middle position: (This function is not available)

Middle 1 setting 0250% Middle 2 setting 0500% Middle 3 setting 0750%

Bus setting (optional for users)

(1) Bus address: Group address: Original address 003 New address 005

Intra-group address: Original address 003 New address 005

(2) Bus rate: 1200   2400 4800   9600   19200   38400

(3) Parity check: No check   Odd check   Even check

(4) Data bit: 8-bit   9-bit

(5) Stop bit: 1-bit   2-bit

Debugging diagnosis

(1) Field debugging quantity: bit counter: encoder 00000

Stroke option: Electronic stroke Mechanical stroke

Power supply option: AC 50HZ AC 60HZ

Power supply mode: Automatic phase Fixed phase A Fixed phase B

Motor direction: Automatic direction Fixed direction

Automatic stroke: Automatic calibration: Ineffective stall Effective

stall Automatic setting: Effective stroke Effective stall Phase test:

(2) Output switching value: (no middle output point)

Stroke switching value: Stroke 00% ON (Stroke 25% OFF Stroke

50% OFF Stroke 75% OFF) Stroke 100% OFF

Remote switching value: Channel 1 OFF

Alarm switching value: Channel 1 ON

Photocouple switching value: Channel 1 OFF

Phase sequence relay: Channel 1 OFF Channel 2 OFF

(3) Input switching value:

Torque switching value: open stroke limit: ON open torque: ON

closing stroke limit: ON closing torque: ON

Remote input value: Remote holding: ON ESD input: ON Remote

close: ON Remote open: ON

Leakage of electricity: ON

Phase sequence of three-phase electricity:

Position of bit counter: Position of bit counting encoder: 00000

(4) Output analog:

Current analog:

Feedback current: Current test 0360 Current (mA) 4.00 Ratio (%) 4.00

Backlight analog:

(5) Input analog: Position of bit counter: Position of bit counting encoder: 00000
Source of high-frequency and low-frequency signals: Channel 1 0010 Ratio: 0000%

System options

(1) Screen contrast: adjustment of height and minuent

(2) Display direction: Positive direction Reverse direction

(3) Language choice: Simplified Chinese Engligh

(4) Program No.: No.: Ver: 1.0. 3

(5) Factory setting: actuator of electric valve

(6) Restart system: restart the control system.

The debugging of this intelligent electric device can be conducted without opening the cover. And the torque is mechanical torque. Before leaving the factory, the overload torques of opening and closing directions have been set on the torque test bench; the torque of opening direction is 1.2 times of the rated torque in the nameplate, the torque of closing direction is 0.7 time of the rated torque in the nameplate, Users do not need to adjust the torque.

XV. Parameter setting and debugging method

Functions of knobs: Black knob, the closing /open key, is the selection key in the menu, through the key, users can choose the items up and down; red knob, a field key, is confirmation key; the remote control key is the return function key.

Turn the black and red knobs to the position state shown in the figure. Turn the black knob towards the closing direction, make it reach the closed position, release it after 10 seconds. The screen enters the menu options as shown in Figure 1 below

(1) Adjustment of valve closing stroke
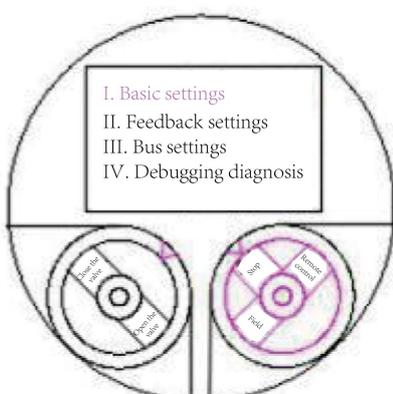

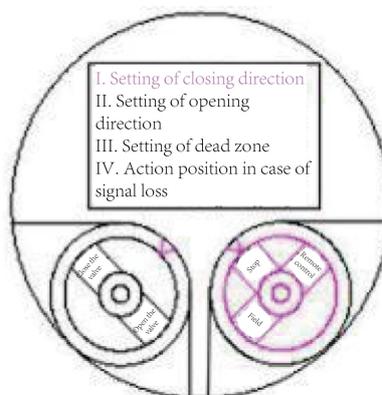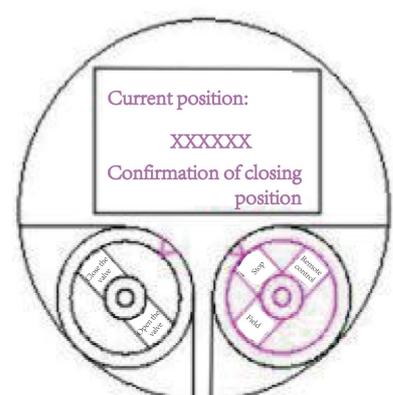Figure (1)   Figure (2)   Figure (3)

In the basic setting state, rotate the right red knob, make it reach the field state position, and then reset it to the original position. Enter the setting of closing direction as shown in Figure (2). Then rotate the right red knob, make it reach the field state position, and then reset it to the original position. Enter the setting of closing direction valve position as shown in Figure (3). Then rotate the right red knob to make it reach the field state position, turn the black knob to the closing direction state position, the actuator runs towards the closing position. When the valve reaches the "fully closing" state, release the black knob, then rotate the right red knob to make it turn to stop state from the field state, and then rotate the red knob to the field state position and reset it to the original position. At this time, the closing position of the valve is confirmed.
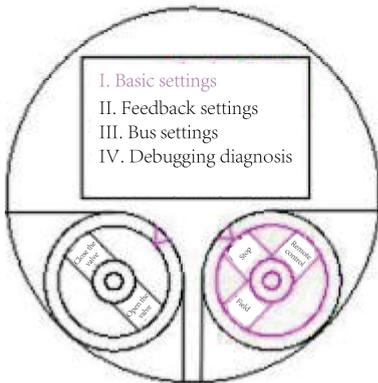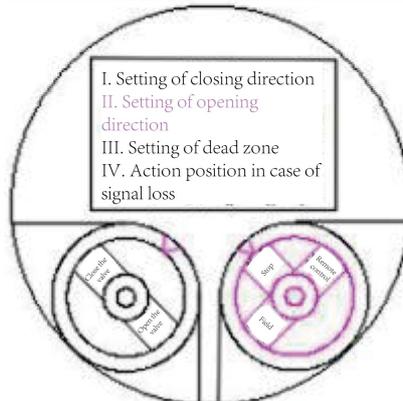
(2) Adjustment of valve opening stroke

I. Basic settings
II. Feedback settings
III. Bus settings
IV. Debugging diagnosis

Figure (1)

I. Setting of closing direction
II. Setting of opening direction
III. Setting of dead zone
IV. Action position in case of signal loss

Figure (4)

Current position:
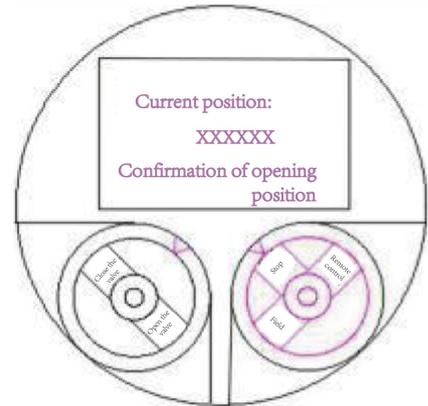XXXXXX
Confirmation of opening position

Figure (5)

Turn the black knob towards the closing direction, until it reaches the state of the closing direction, enter the setting of open direction, as shown in Figure (4). Then rotate the right red knob, make it reach the field state position, and then reset it to the original position. Enter the setting of open direction valve position as shown in Figure (5). Then rotate the right red knob to make it reach the field state position, turn the black knob to the open direction state position, the actuator runs towards the open position. When the valve reaches the "fully open" state, release the black knob, then rotate the right red knob to make it turn to stop state from the field state, and then rotate the red knob to the field state position and reset it to the original position. At this time, the open position of the valve is confirmed.

After open position and closing position of switch type actuator is set, 4-20mA will automatically generate, are set. The deviation of feedback signal can be corrected in Feedback settings.
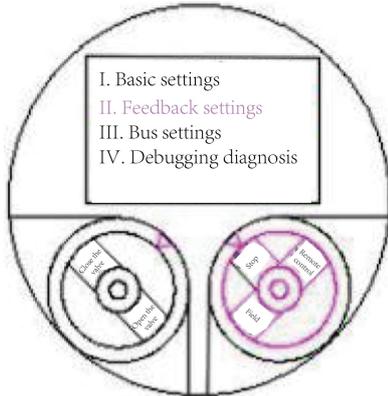
Feedback setting

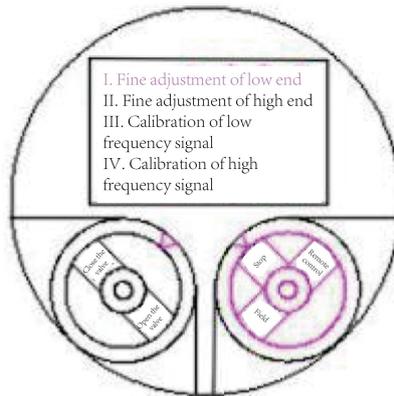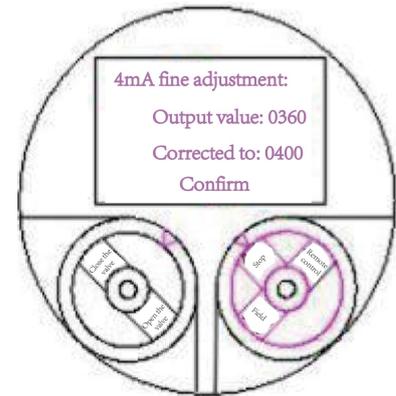|		
I. Basic settings	I. Fine adjustment of low end	4mA fine adjustment:
II. Feedback settings	II. Fine adjustment of high end	Output value: 0360
III. Bus settings	III. Calibration of low frequency signal	Corrected to: 0400
IV. Debugging diagnosis	IV. Calibration of high frequency signal	Confirm
Figure (6)	Figure (7)	Figure (8)

In the basic setting state, turn the black knob to the closing direction state towards the closing direction, and then reset it, enter the feedback setting, as shown in Figure (6), then turn the red knob to the field state position, and then reset it to the original position, enter the fine adjustment of low end, as shown in Figure (7). Turn the red knob to the field state position and then reset it to the original position, enter the output value of the fine adjustment of low end, as shown in Figure (8). The output value can be increased or decreased by using the closing and open keys on the black knob, and correct it to obtain the standard value. Then turn the red knob to the field state position and then reset it to the original position, conduct confirmation. After fine adjustment of low end is completed, the method for fine adjustment of high end is the same.
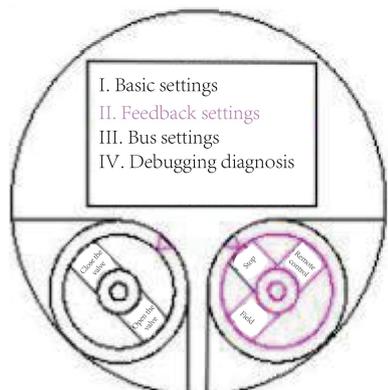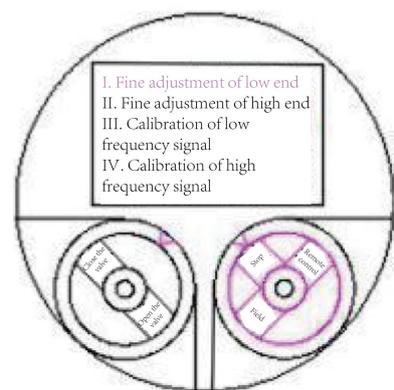

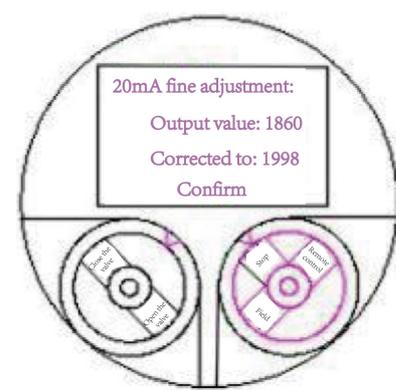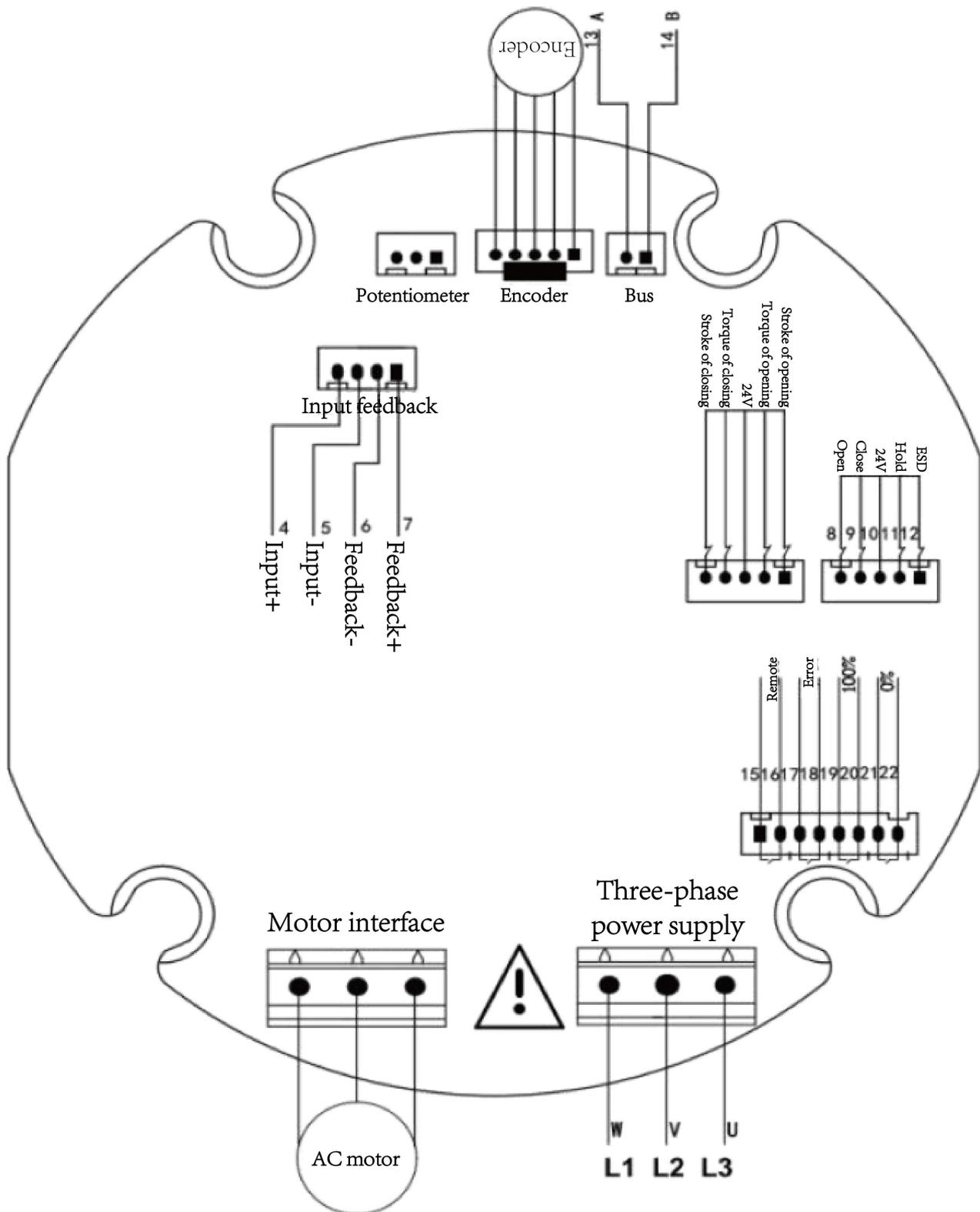|		
I. Basic settings	I. Fine adjustment of low end	20mA fine adjustment:
II. Feedback settings	II. Fine adjustment of high end	Output value: 1860
III. Bus settings	III. Calibration of low frequency signal	Corrected to: 1998
IV. Debugging diagnosis	IV. Calibration of high frequency signal	Confirm
Figure (6)	Figure (9)	Figure (10)

For regulating actuators, when it needs to conduct calibration of input signal, low and high-frequency signals, the calibration method is the same as that of feedback signal.

I. Basic settings
II. Feedback settings
III. Bus settings
IV. Debugging diagnosis

I. Fine adjustment of low end
II. Fine adjustment of high end
III. Calibration of low frequency signal
IV. Calibration of high frequency signal

I. Fine adjustment of low end
II. Fine adjustment of high end
III. Calibration of low frequency signal
IV. Calibration of high frequency signal
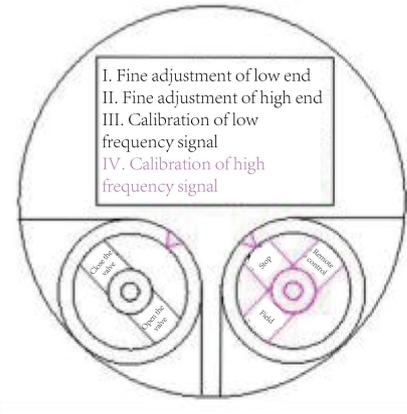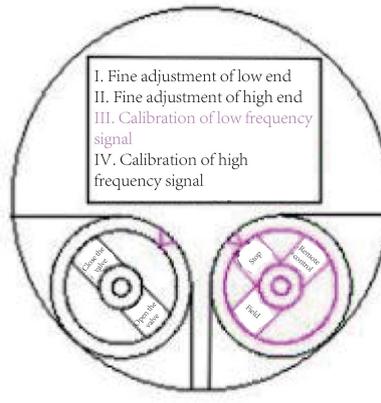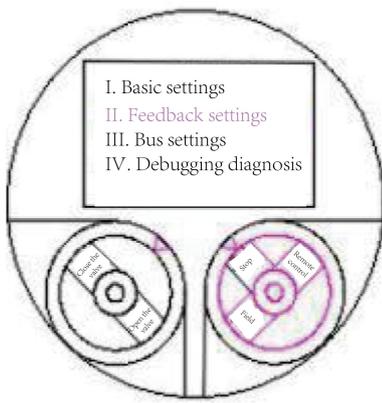
Other function items can be set through the selection key of black knob and the function confirmation key of red knob. This Manual does not describe them detailedly separately.

Electrical connection diagram of 380V, Q/Z intelligent actuator

Encoder

13 A

14 B

Potentiometer   Encoder   Bus

Input feedback

4 | Input+
5 | Input-
6 | Feedback-
7 | Feedback+

Stroke of opening
Torque of closing
Torque of opening
24V
Stroke of opening
Torque of opening
Stroke of closing
Stroke of closing

Open
Close
24V
Hold
ESD

8 9 10 11 12

Remote   Error   100%   0%

15 16 17 18 19 20 21 22

Motor interface

Three-phase
power supply

AC motor

W   V   U

L1 L2 L3

Remote holding short-circuit is self-holding; disconnection is for inching.

Calibration of open position and closing position requires calibration of two points when the actuator acts.

Diagram of connecting terminal of XFZQ intelligent regulating actuator, switch type electric actuator

U	V	W	4	5	6	7	8	9	10	11	12
			Input Positive electrode	Input Negative electrode	Feedback Negative electrode	Feedback Positive electrode	Remote Open valve	Remote Close valve	24V positive electrode	Hold	ESD

13	14	15	16	17	18	19	20	21	22	23	24
Positive electrode of bus	Negative electrode of bus	Remote contact		Fault alarm		Opening in place 100%		Closing in place 0%			

Note: (1) Wiring mode of regulating actuator

4, 5, 4-20mA input contacts.

6, 7, 4-20mA feedback contacts.

10, 12, valve closing contacts in case of emergency.

15, 16 remote status contacts.

17, 18 fault, over-torque alarm contacts.

19, 20 valve opening in place 100% contacts.

21, 22 valve closing in place 0% contacts.

(2) Wiring mode of switch type actuator:

6, 7, 4-20mA feedback contacts.

8, 10, open the valve remotely. (Inching) 8, 10, 11 (hold the line connection).

9, 10, close the valve remotely. (Inching) 9, 10, 11 (hold the line connection).

10, 12, valve closing contacts in case of emergency.

15, 16 remote status contacts.

17, 18 fault, over-torque alarm contacts.

19, 20 valve opening in place 100% contacts.

21, 22 valve closing in place 0% contacts.

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