Z—TYPE

Valve's electric actuator

User's Guide

CVV Valve Co., Ltd.

Ⅰ. Summary

The multi-turn vale electric actuator , generally known as z-type , can be utilized on linear-action valve such as gate valve ,diaphragm valve , check valve and water valve . Used to open , close or modulate valves . The actuator is indispensable for the remote control , centralized control or self-control of the valves . This versatile deice features small size , light weight , reliable performance , advanced control system and ease of maintenance ; which allows for a wide range of use in many industries like petroleum and chemical industries, power stations , water treatment and paper-making industries . In terms of working environment , the equipment can be classified into four types ： DZW(The outdoor type) ; DZB(The explosion-proof type) ; DZZ(The integral type) ; DZT(The integrated-requlating type) .

The performance of this product conforms to the stipulation of JB/T8528-1997"General valve Electric Actuator Technical conditions" Its explosion-proof performance conforms to the stipulations of 6B3836 .1-2000 "Electrical Apparatus for Explosive Gas Atmospheres Part 1 ： General Requirements",GB3836.2-2000"Electrical Apparatus for Explosive Gas Atmosphere's Part 2 : Flameproof Enclosured and JB/T8529-1997" Explosion-proof valve Electric Actuator Technical Conditions"

Ⅱ. Working Conditions and Technical Data

1. Power Source : The is three-phase AC.
   380V (special orders 220V or 660V) , 50HZ (special orders 60HZ); The control line is 220v , 50HZ (Special orders 60HZ) ; Remote control is 24V DC.
2. Ambient Temperature：-20℃～ +60℃ (special orders-60℃ ～+80℃).
3. Relative Humidity：≤90% (when 25℃).
4. Surrounding Mediums: The outdoor type is used for environment free of combustible, explosive and corrosive mediums ; The explosion-proof products include dⅠ and dⅡBT4 ; dⅠ is suitable for the wording face of the coal mine where no excavating undertaken; and dⅡBT4 can be applied in the factories , where the explosive gases mixture meets the requirements for the Environment (ⅡA, ⅡB T1-T4).
5. Protection Class : IP55 - Ip67 for the outdoor type and explosion-proof type.
6. Operation Rule: Only 10 minutes at a stretch (special orders 30 minutes)

Technical Data of Z-type series sheet1

Model Number	Rated Torque (N.m)	Max Control Torque (N.m)	Min Control Torque (N.m)	Max Slem mm	Max Turn r	Manual Ratio i	Output Torque (r/min)	Motor		Weight kg
								Power kw	PowerCurrent A	
Z5	50	75	≤25	28	50	1:1	18	0.18	0.83	28
Z10	100	150	≤50	28	50	1:1	18	0.25	1.03	61
							24	0.25	1.03	
Z15	150	225	≤75	28	50	1:1	18	0.37	1.38	63
							24	0.37	1.38	
Z20	200	300	≤100	40	50	1:1	18	0.37	1.38	63
							24	0.55	2.2	
Z30	300	450	≤150	40	50	1:1	18	0.55	2.2	65
Z45	450	675	≤225	48	120	1:1	24	1.1	4	110
							36	1.5	4.12	
Z60	600	900	≤300	48	120	1:1	24	1.5	4.12	112
							36	2.2	5.25	
Z90	900	1350	≤450	60	120	1:1	24	2.2	5.25	139
							36	3	7.9	
Z120	1200	1800	≤600	60	120	1:1	24	3	7.9	142
Z180	1800	2160	≤900	70	150	25:1	24	4	8.87	261
							36	5.5	12.05	
Z250	2500	3000	≤1250	70	150	25:1	24	5.5	12.05	264
Z350	3500	4200	≤1750	75	150	13:1	18	7.5	15.6	430
Z500	5000	6000	≤2500	75	150	13:1	18	11	20.5	440

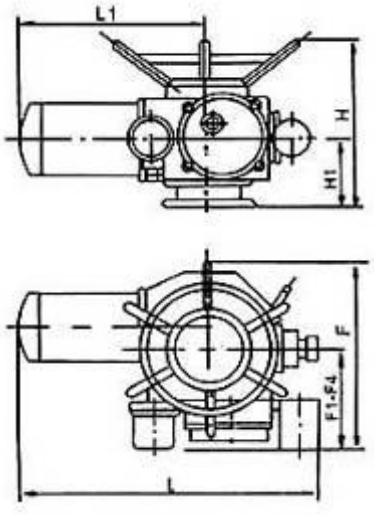
Note:we provide the electric actuators of other rotational speeds according to the use's requirements.

Ⅲ、Outline and Connection Dimension

Outline dimension see Picture 1 and Sheet 2

Sheet 2 Outline Dimension

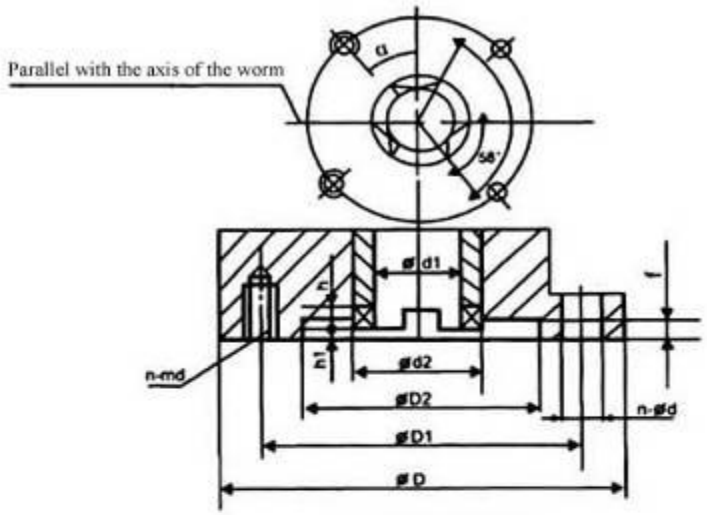
Model Number	H	H1	L	L1	F	F1	F2	F3
Z5	235	87	410	225	375	330	155	200
Z10/15	235	87	410	225	375	330	155	200
Z20/30	255	105	510	320	427	382	165	210
Z45/60	310	130	725	357	487	371	169	279
Z90/120	320	140	740	362	534	424	172	282
Z180/250	585	250	870	564	710	322	380	415
Z350/500	649	252	1162	764	710	408	456	415



Picture 1 Outline drawing.

Note:F1 are the outdoor type,F2 are the expiosion – proof type, F3 are the integral type.

2、types and sizes of connection see picture 2and sheet 3



Pidture 2 : Connection dimension drawing

Sheet 3 : Connection dimension

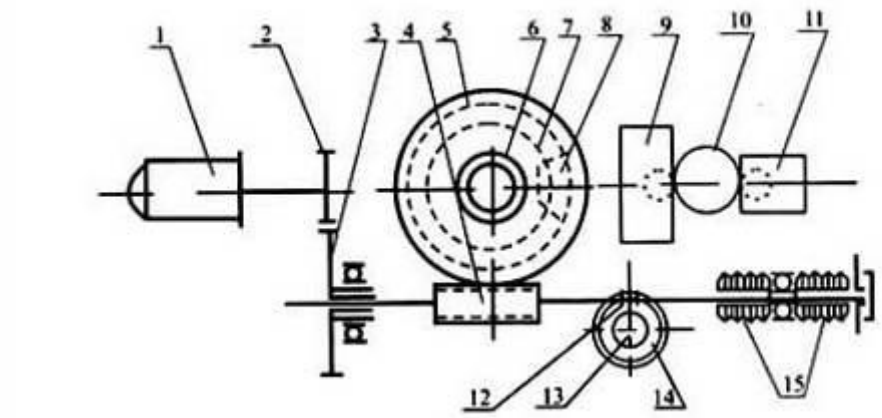
Model Number	Torque Type JB2920											
	Flanged Number	D	D1	D2 (H9)	h1	f	h	d1	d2·	d	n	a
Z5/10 /15	2	145	120	90	2	4	8	30	45	M10	4	45°
	2I	115	95	75			6	26	39	M8		
Z20/30	3	185	160	125			10	42	58	M12		
	3I	145	120	90			8	30	45	M10		
Z45/60	4	225	195	150		5	12	50	72	Φ18		
Z90/120	5	275	235	180			14	62	82	Φ22		
	5I	230	195	150			12	50	72	Φ18		
Z180/250	7	330	285	220			16	72	98	Φ26		
Z350/500	8	380	340	280			20	80	118	Φ22	8	22.5°

Note : (I) show's the connection dimensions of the power stations.

Ⅳ. Components.

Z-type electric actuator consists of motor , speed reducer , moment of force control apparatus, traveling control apparatus , opening indicator , manual-electrical changing mechanism ,hand wheel and electrical part . The outdoor type utilizes the incorporate round rim and O-ring to seal; while the seal design of the explosion –proof type is the same as that of the outdoor type but an explosion-proof face is addied to the explosion-proof type in addition to the same seal design . The explosion-proof junction box and three –phase motor which specially designed to the outdoor type , corrosion and explosion-proof the electrical valve of

series YBDF. See picture 3 about its transmission principle:

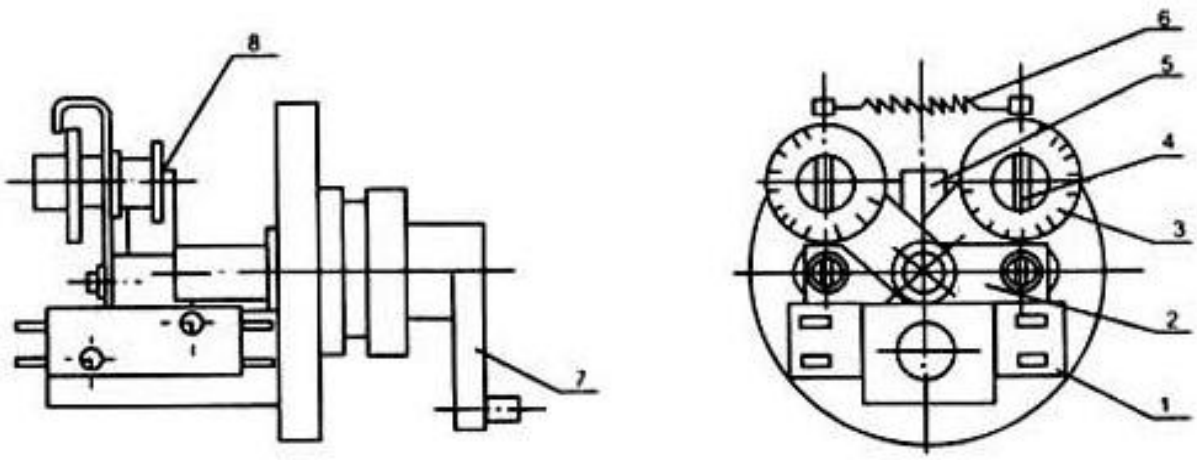


1. Motor 2.3 . Spur Gear. 4. Worm 5 .Worm gear. 6. Output Shaft. 7. 8 Bevel Gear 9. Travelling Control Apparatus. 10 .Middle Gear 11. Opening Indictor 12. Worm Round Grave 13. Crank 14. Torque Control Apparatus. 15 .Butterfly Spring .

1.1 Motor : The outdoor type utilizes the YDF-type motor and the explosion-proof type adopts the YBDF-type three-phase as ynchronous motor which specially designed for the valve.

1.2 Speed reducer : Speed reducer is composed of a pair of spur gears and worm gear pairs .The motive force of the motor transfers from speed reducer to the output shaft.

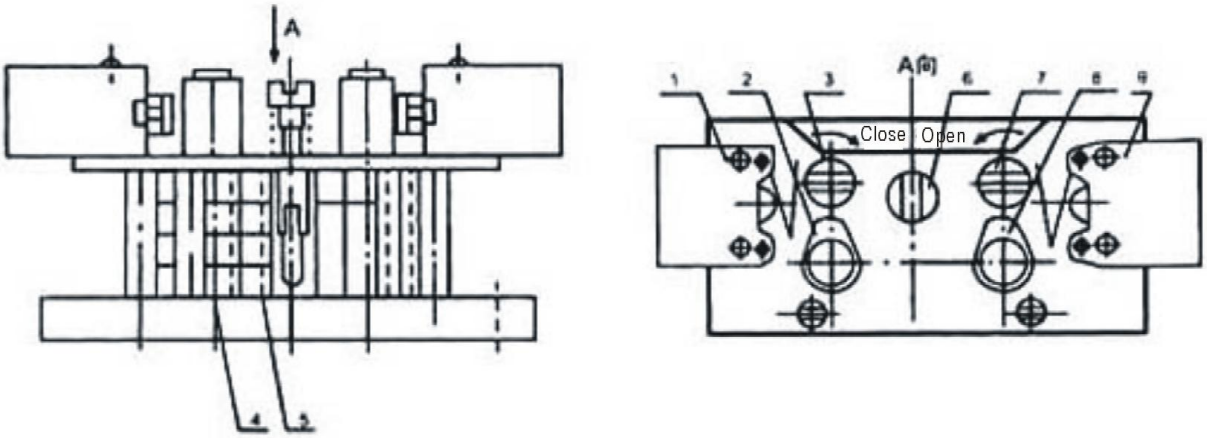
1.3 Torque control apparatus : Torque control apparatus is a commonly used part for the z-series , its components see Picture 4. When a certain amount of torque is applied to the output shaft , the worm will rotate and move to drive the crank which in turn causes the block collision to press the cam and raise the support will lift until the microswitch disconnects the power source and stops the motor so as to control the output and protect the valve .



1. Microswitch 2. Support 3. Calibrated Dial 4. Adjustment Shaft 5. Block Collision 6. Extension Spring 7. Crank 8.Cam

Picture 4: Torque control apparatus

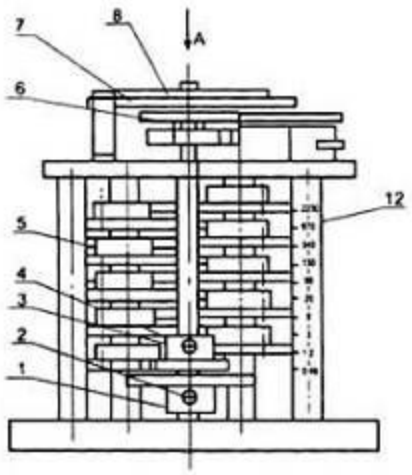
1.4 travelling control apparatus: traveling control apparatus utilizes the same principle as the decimal counter with a high precision. It is also the commonly used part for the Z-series (see picture 5).Its working principle is as follows :A pair of big and small bevel gears in the speed reducer box drive the active small gear (z=8),and drive the counter to work. If the counter has been adjusted according to the closed /opening position of the valve, then when the counter reaches the preset point , the cam will turn 1/4-turn and force the microswitch to cut off the power source and stop the at this time, thereby controlling the revolutions number

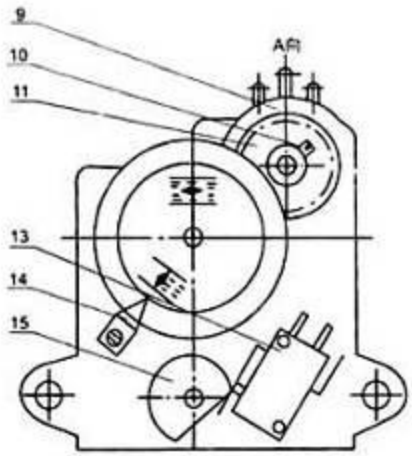


1.Close Microswitch 2.Close Cam 3.Closed Adjustment Shaft 4.Idle Wheel 5.Counting Gear 6.Roof Bar 7.Opening Adjustment Shaft 8.Opening Cam 9.Knife Microswitch

Picture 5:Travelling Control Apparatus

1.5.Opening indicator: opening indicator is also a commonly used part for z-series. see picture 6.started by the unit gear of the counter , input gear slow down and turn the indictor dial to indicate the close/opening of the valve. The potentiometer rotor turns as the indicator dial rotates ,which enables the opening indication of remote transmission , the opening indicator is equipped with a microswitch and cam, the rotational cam periodically causes the microswith to act during the operation of the actuator , its frequency being one 1 tow actions for one turn of the output shaft, which provides the flash signal .

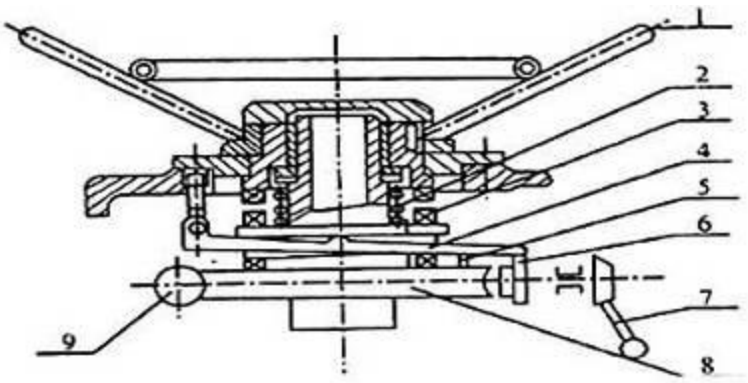




1. Input Gear 2. Fixing Screw 3. Fixing Screw 4. Revolutions Adjustment Gear 5. Step Gear
6. Opening Gear 7.Closed Indicator Dial 8.Opening Indicator Dial 9. Potentiometer 10. Fixing Screw
11. Potentiometer Gear 12. Revolutions Signal 13. Flash Switch 14. Pointer 15. Flash Cam

Picture 6 : Machinery-type Opening Indicator

1.6 manual – electrical changing mechanism : manual – electrical changing mechanism is a semi-automatic system , which consists of handle ,cam, frame work ,vertical bar, middle clutch, pressed spring and so on, see picture7,when the hand wheel is used for operation, first push the transfer handle in the manual direction and cause the cam to turn with the handle shaft, lift the framework the idle clutch and in turn so to press the pressed spring. The idle clutch disengages from the worm gear and meshes with the hand wheel when the handle is pushed to a certain position, then the acting force of the hand wheel transfers to the output shaft to reach the manual state. when the frame work rises to a certain height, the vertical bar will erect on the surface of worm gear by the torsion spring force, which supports the framework so as to keep the idle clutch from falling down, release the handle when it is pushed to the manual position and the use the hand wheel to operate. The vertical bar falls down as the motor drives the rotation of the worm gear, the idle clutch moves to the worm gear by the pressed spring force and meshes with the worm gear, there by reaching the electrical state



1、Handwheel
2、Pressed Spring
3、Idle Clutch
4、Frame work
5、Vertical Bar
6、Cam
7、Transfer Handle
8、Worm Gear
9、Worm

Picture 7 Manual-electrical Changing Mechanism

The electrical parts of the integral and regulating types:

1. Infrared Remote Controller

The remote controller operation uses six keys: opening valve, closing valve, setting, switching, adding and subtracting, and its operation method is basically the same as the field operation setting method. On-site on-off valve operation with valve opening, valve closing key, parameter setting with setting (confirmation), plus, minus 3 keys.

- Set (confirm) confirmation parameters or enter the lower menu
- Switch to clear fault information or enter specific menus
- Decrease/adjust the current parameter
- Add/Adjust Current Parameters
- Close the valve and send the valve closing command to the actuator
- Open the valve to send the valve opening command to the actuator

2. Operating instruction

The red knob is the mode button: switch between “Local” / “Stop” / “Remote”. Save or determine the parameters (from "Stop" to "Local") and exit (from "Stop" to "Remote") when setting the status.
The black knob is the operation button: open or close the valve in the “Local” mode. Add or subtract settings in the setting state.

3. Data Settings &Debug

3.1. Common Settings

3.1.1. Travel Settings

3.1.1.1. Full close

figure 4

Turn Mode-knob to the "stop" state. Keep Operation-knob turned "colse" for 3 seconds until the "Fully Close" "Travel" "Set" character starts to flash on the LCD and then release Operation-knob. The data displayed at this time is the last closed full value. Rotate Mode-knob to the "Local" state, and when the "Fully Close" character begins to flash, it indicates that it has entered Fully Close Set (Figure 4). Operate the actuator to the fully closed position with the Mode-knob. Rotate Mode-knob to the "Stop" state, and then rotate back to the "Local" state to determine

"FullyClose". In the process of setting, if Mode-knob is rotated from “Stop” to “Remote”, the stroke setting will be directly exited.

3.1.1.2. Fully Open

Turn Mode-knob to the "Stop" state. Operation-knob is turned "Open" for 3 seconds until the LCD displays "Fully Open", "Travel", "Set", and Operation-knob is released. At this time, the last full open data is displayed. Rotate Mode-knob to the "Local" state, and when the "Fully Open" character begins to flash, it indicates that the full open setting is entered (see Figure 5). The actuator is moved to the fully open position by the Operation-knob knob, then the Mode-knob is rotated to the "Stop" state, and then rotated back to the "Local" state for the opening position determination. If you rotate Mode-knob from "Stop" to "Remote", you will exit the trip setting directly.

figure 5

3.1.2. Feedback current adjustment

Turn the Mode-knob to the "Stop" state. Leave the Operation-knob to "colse" for 8 seconds until the "4mA" "Output" and "Current Set" characters start to flash on the LCD and then release the Operation-knob. Turn the Mode-knob to the "Local" state. When the “Current Set” character starts flashing on the screen, it indicates that the 4 mA feedback current fine adjustment setting (see Figure 5). If the current feedback is not 4 mA, you can adjust the current current to 4 mA through the remote control or knob. Mode-knob rotates to “Stop” and returns to “Local” to save 4ma data. At the same time, it enters 20mA feedback current fine adjustment (Figure 12). The setting method is the same as above. If Mode-knob is rotated from “Stop” to “ Remote" exits the setting state directly.

figure 12

3.1.3. ControlMode

Turn the Mode-knob to the "Stop" state. Leave the Operation-knob screwed to "Open" for 8 seconds until the "Data" "Set" character begins to flash on the LCD before releasing the Operation-knob. At this time, the LCD displays “Adjust Type” or “On-Off Type”, which means entering the control mode setting (Figure 3).

The user can modify the control mode according to the actual usage. After the selection is complete, rotate the Mode-knob to “Stop” and then back to “Local”. The screen displays the input screen (Figure 6). If you enter a Order, you can enter the system's advanced menu. You can also exit the menu by turning the Mode-knob from "Stop" to "Remote".

figure 3

3.2. Advanced Settings (On-Off type)

3.2.1. ESD Settings

If you enter the order "111", the system enters the ESD setting. You can change this parameter to: "Reset", "Fully Open", "Fully Close". The number shown in Figure 8 is one tenth of the total number of actuators. After confirming, go to “Figure 7 Relay Mode”.

figure 8

3.2.2. Relay Mode

You can modify the relay function to: "Local/Remote" "error" "FullyOpen" "FullyClose" "Openoverride" "Closeoverride". The number on the display is the relay number. After confirming the parameters, proceed to the next relay configuration. When the parameters of the four relays are set, the system enters the main operation screen. The default settings are: 1—“Local/Remote”, 2—“error”, 3—“Openoverride”, 4—“Closeoverride”.

figure 7

3.2.3. Remote control signal

If you enter the password "211", the system enters the remote control signal setting (Figure 16). According to the site conditions, this parameter can be set to:
"F0" (the actuator will run when it receives the signal and will stop if there is no signal),
F1—(The actuator will run when it receives the signal until it reaches the fully open or fully closed position)
F2—(The actuator receives the signal and OPEN, if there is no signal, it will be CLOSE)
F3—(The actuator receives the signal and CLOSE, if there is no signal, it OPEN)
After confirming the selection, save the parameters and return to the main operation screen. You can also exit the menu by turning Mode-knob from “Stop” to “Remote”.

figure 16

3.3. Advanced Settings (Adjust type)

3.3.1. Sensitivity Settings

If you have selected the “Adjust Type” before, enter the order 211 on the Figure 6. After confirming, enter the Sensitivity Set (Figure 13). After setting the confirmation, save the parameters and enter the inertia quantity display screen, then press the confirmation key. Enter the current input calibration setting. If you press the "BACK" button, you will exit the setting directly.

figure 13

3.3.2. Input Current Set

After entering the current input calibration setting, the “Current set” character on the LCD will flash continuously. If you press the "OPEN" or "CLOSE" button for 3 seconds, the "Current set" will no longer flash. The 4 mA current can only be calibrated when the “Current set” is not flashing (Figure 19). When calibrating the current, input the corresponding current to the actuator according to the current data shown in the figure. If the current given is not much different from the current to be calibrated then the “mA” symbol is always displayed. Pressing the ENTER button will save the parameter. If the difference is large, it will flash. Pressing the confirmation key will not be saved. Enter the 20mA current calibration screen while saving the parameters (Figure 20). The 20 mA calibration method is the same as above.

figure 19

figure 20

3.3.3. ESD settings (operation method is the same as 3.2.1)

3.3.4. Signal lost

In the adjus mode, after the ESD is set, it will enter the analog loss message setting (Figure 9), which can be set to: "Reset", "Fully Open", "Fully Close". Select the parameters as needed. After confirming, the parameters will be saved and enter the "Input Signal Settings".
The default parameter is "Reset"

3.3.5. Input Signal Settings

figure 10

After entering Figure 10, "Action" flashes. This parameter can be set to: "Action", "Reaction" .
Action: Input 4mA current signal, the corresponding valve opening is 0%.
Reaction: Input 20mA current signal, the corresponding valve opening is 0%.
After confirmation, the parameters will be saved and the "Rely mode" will be entered.
Default parameter: Action

3.3.6. Relay Mode(operation method is the same as 3.2.2)

3.4. Advanced Settings (BUS type)

3.4.1. Address

figure 18

If you have selected the “BUS Type” before, enter the order 211 on the Figu 6, and the station number setting is entered after the determination. After setting the confirmation, save it and enter the sensitivity setting screen. If you press the "BACK" button, you will exit the setting directly.

3.4.2. Sensitivity Settings(operation method is the same as 3.3.1)

3.4.3. ESD settings (operation method is the same as 3.2.1)

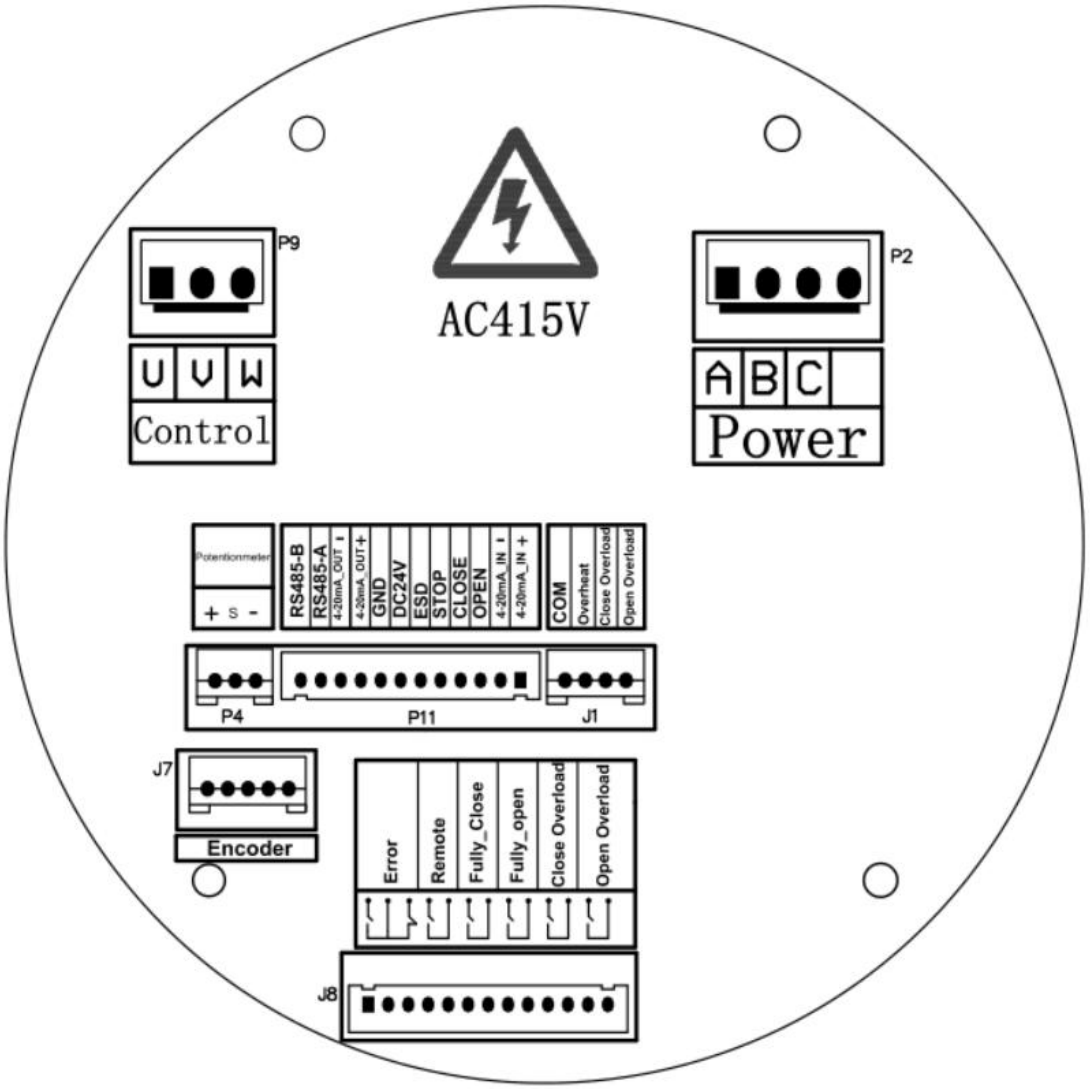
3.4.4. Relay Mode(operation method is the same as 3.2.2)

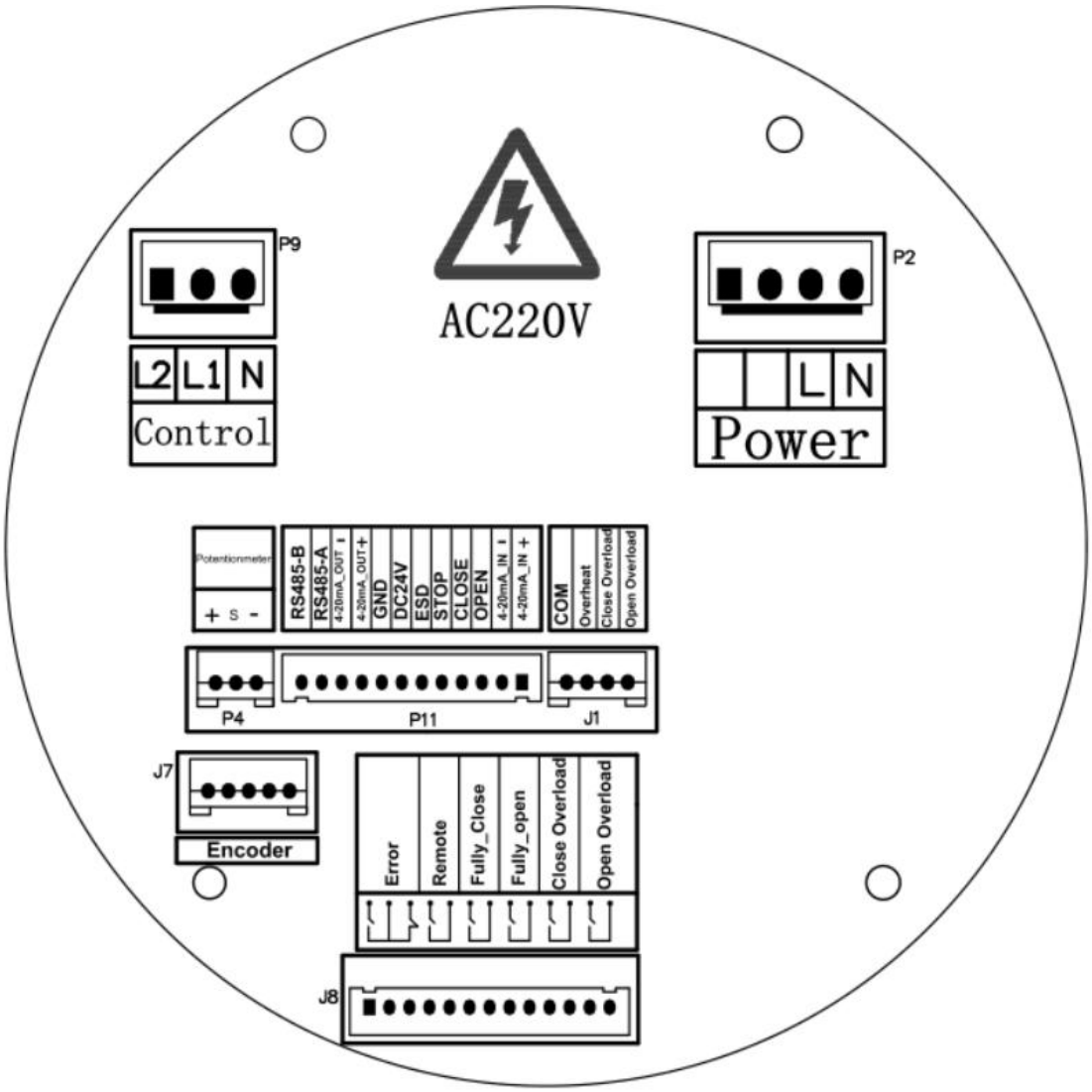
4. Problem and Solution

Problem	Solution
LCD and LED are not	1. The power cable is not connected or the voltage is too low. 2.

displayed	The connection cable inside the module is loose. 4. The circuit is broken.
Both Local and remote control do not operate	1, fault protection 2, the motor is broken or stuck 3, the circuit is broken
Local work normally remote control does not work	1. The remote control signal is given an abnormality. 2. The knob board is bad or not in the distance. 3. The circuit is broken.
Local does not work but the remote control works normally.	1. The knob board is broken or not in the field mode. 2. The operation button is not in place. 3. The circuit is broken.
Can OPen not close, or can close can not be open	1. The torque line is connected incorrectly or open circuit 2. The motor is broken or blocked or the wiring is wrong. 3. The circuit is broken.
No control signal is energized	1. The control signal actually has or loses the signal action. 2. Sets the two-wire control. 3. The circuit is broken.
The middle position can move to the limit without moving	1. The torque switch is reversed. 2. The motor is broken or the wiring is open. 3. The circuit is broken.
Action direction	1. The motor wiring is reversed. 2. The valve position is reversed. 3. The positive and negative effects are reversed. 4. The signal is reversed.
No output current or sometimes no	1. Wrong wiring or poor contact 2. Potentiometer or encoder failure 3. Circuit is broken
Feedback current is too small or constant	1. The encoder is faulty or not well meshed with the transmission gear. 2. The calibration is wrong. 3. The circuit is broken.
Remote control does not respond	1. The battery voltage is low or incorrectly installed. 2. The remote control is not aligned with the display window. 3. The remote control is broken.
Display failure and "Input" "Phase-Lack" flash	1. The input power supply is out of phase or the terminal is not tightened. 2. The circuit board is broken.
Show "Erorr" and "Phase-Lack" flash	1, the output phase loss 2, the motor is broken 3, the motor is not connected well 4, the circuit board is broken
Show "Erorr" and "Overheat" flash	1. The motor is overheated or blocked or broken. 2. The motor temperature sensor is broken. 3. The circuit is broken.
Show "Erorr" and "Open Override" or "Close Override" flash	1. The actuator is selected to be small, the starting torque is insufficient. 2. The torque line is not connected. 3. The stroke setting is incorrect. 4. The stall or the motor is broken. 5. The circuit is broken.
Normal operation but the valve position is unchanged	1. The potentiometer or encoder is broken. 2. The potentiometer or encoder line is loose. 3. The circuit is broken.
After the valve is in place, the electric motor does not stop.	1. The stroke setting is wrong. 2. The potentiometer or encoder is abnormal. 3. The circuit is broken.
Show "signal lost"	1, 4-20mA signal source is abnormal 2, wiring error or loose 3, the circuit is broken

5. wiring diagram




P9
L2
L1
N
Control
AC220V
P2
L
N
Power
Potentiometer
+ S -
RS485-B
RS485-A
4-20mA_OUT -
4-20mA_OUT+
GND
DC24V
ESD
STOP
CLOSE
OPEN
4-20mA_IN -
4-20mA_IN +
COM
Overheat
Close Overload
Open Overload
P4
P11
J1
J7
Encoder
Error
Remote
Fully_Close
Fully_open
Close Overload
Open Overload
J8

Tag Number	Harness line number	define	type	Tag Number	Harness line number	define	type
P2 PowerIn	A/L	A/L		J8 Relay OUT	23	Close orque	normally open
	B/N	B/N			22	CloseTorque	COM
	C	C			21	OPen orque	normally open
					20	OPenTorque	COM
P11 Current Input	10	+	4—20mA		19	FullyOpen	normally open
	9	-			18	Fully Open	COM
P11 Current Feedback	1	+	4—20mA		17	FullyClose	normally open
	2	-			16	FullyClose	COM
P11 ESD	4	ESD	normally open		15	Remote	COM
	5				14	Remote	normally open
P11 Remote-ON -OFF	3	GND			13	Error	normally open
	6	Stop	normally open		12	Error	COM
	8	OPEN	normally open		11	Error	normally close
	7	CLOSE	normally open	P11 RS485BUS	A	RS485 A	
	4	DC24V			B	RS485 B	