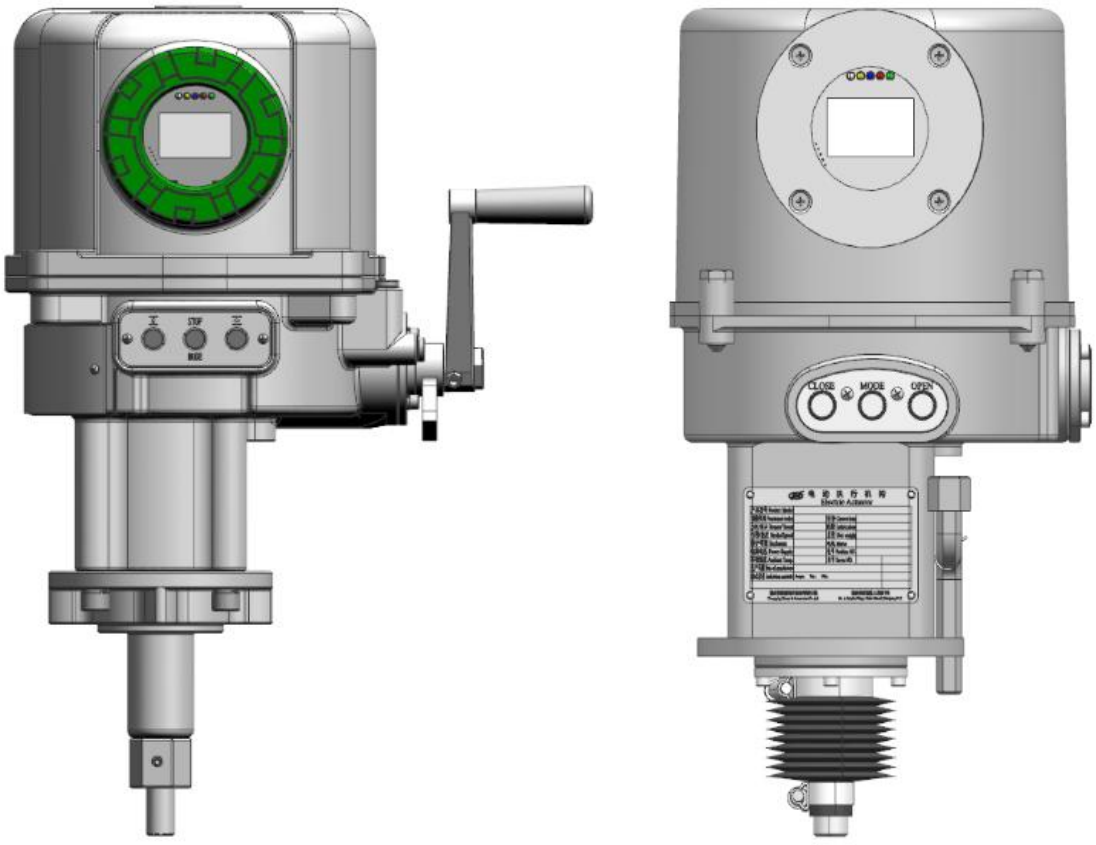
川仪股份
CYAC

Operation Manual

M Series Intelligent Electric Actuator

M1(d)



Chongqing Chuanyi Automation Co., LTD. Actuator Filiale

V002510

Preface

Thank you for using our products. Please read through the Instruction Manual carefully before using the actuator.

■ About the Instruction Manual

(1) The Instruction Manual shall be delivered to and used by end users. Please keep it carefully;
(2) Please read through the Instruction Manual carefully to fully understand the method of operation before operation;
(3) The Instruction Manual strives to give a full account of the functions of the actuator, but we do not guarantee that these functions will meet the special needs of users;
(4) It is forbidden to extract or copy part or all of the Instruction Manual without permission;
(5) The content of the Instruction Manual may be changed without prior notice; and
(6) We have endeavored to ensure the correctness of the Instruction Manual during the preparation process. If any mistake or omission, please contact with our Marketing Department.

■ Safety Cautions

(1) To protect and ensure safety of the product and the system controlled by the product, follow the safety instructions and cautions in the Instruction Manual when using the actuator. We are not responsible for any bad consequence due to noncompliance with the Instruction Manual.
(2) If any independent protective unit or safety circuit is going to be installed on the actuator or the system controlled by the actuator, make sure such circuit is installed on the outside of the actuator. Please do not attempt to change the actuator or install such circuit in the actuator.
(3) When replacing spare parts or consumables of the actuator, please use those recommended by us.
(4) The screws must be tightened after cover caps are installed.

■ Disclaimer for the Actuator

(1) We don't provide any guarantee except for those mentioned in the Warranty otherwise provided; and
(2) We are not responsible for compensation of any losses to the concerned party caused by unpredictable flaw during direct or indirect using process.

■ About Environmental Protection

To better protect the environment and human health, when installing, repairing and maintaining the actuator or upon expiration of the service life of the actuator, please observe national/regional laws and regulations, properly dispose of the waste materials generated by recycling the actuators, and deliver them to the local manufacturers with the state-recognized recycling qualification. Such waste materials include:

(1) Substituted damaged and scrapped materials, such as coated metal parts and components, screws, nuts, batteries, cables and other rubber and plastic parts;
(2) Waste lubricants and lubricants spilled during use;
(3) Waste circuit boards and electronic components; and
(4) Other waste materials.
(5) If you have any question, please contact with our after-sale staff.

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Unpacking Check, Transportation and Storage

■ Unpacking Check

Each actuator will be checked comprehensively before leaving factory to ensure its quality. After unpacking the actuator, please carry out the following checks immediately:

(1) Check whether the actuator is damaged during transportation; and

(2) Check whether the specifications of the actuator are the same as the printed data on the outer packing case, and whether the actual packing is consistent with the packing list.

■ Transportation and Storage

(1) Transportation and storage temperature: -30°C~+50°C; to prevent the service life from being shortened, the storage temperature should not frequently exceed 40°C.

(2) Without special packaging, it should be placed in a dry indoor place to avoid condensation.

(3) It must have proper package and desiccant which should be checked for validity regularly when it is transported or stored in the environment with moisture and corrosive gas.

Note: If the electric actuator is damaged due to poor storage, it will be out of the warranty policy and we will not be responsible for replacement or maintenance for free.

■ Safety Instructions

According to the design purpose, the actuator is a specialized device for driving terminal control units (valves, baffles, etc.). Improper operation can pose a danger to the operator. When using it, attention should be paid to:

(1) The installation, disassembly, debugging, operation, and maintenance of the actuator must be completed by qualified professional technicians, while wearing necessary protective equipment such as safety helmets, goggles, work clothes, insulated gloves, and safety shoes. If there are special circumstances, they must be carried out under the guidance of our professional personnel.

(2) After the installation of the actuator is completed, it is strictly prohibited to hang any objects on the handwheel.

(3) Manual operation must strictly comply with the handwheel operation instructions in Chapter 5 of this manual. It is prohibited to operate the handwheel under live conditions.

(4) Before electric operation, the standard type must ensure that no objects are present in the handwheel drive hole, while the explosion-proof type should fully remove the handwheel and securely fasten the clamp onto the handwheel shaft;

(5) When operating the actuator in a high-temperature environment, operators must wear specialized protective gloves to prevent work-related accidents caused by metal component heating.

(6) In hazardous areas, it is prohibited to use conductive or heat-conducting materials to contact the actuator. The power should be cut off, the actuator should be removed and moved to a safe area for repair or maintenance.

(7) The lubricating oil that spills during the oil change process should be cleaned up in a timely manner to avoid accidents.

(8) When opening the lid, the operator must strictly follow the safety operating procedures: cut off the power first, and only perform electronic component testing, replacement, and other operations after 5 minutes.

1 Overview

1.1 Actuator Characteristics

M13/14(d) series straight stroke explosion-proof electric actuators are execution units that are matched with various straight stroke valves, achieving automatic control of the process, widely used in pipeline fluid control systems in industries such as power industry, metallurgic industry, petrochemical industry, light industry and sewage treatment industry.

The M13/14 (d) series linear intelligent electric actuators are divided into ordinary and explosion-proof types. The main standards followed by explosion-proof products are:

M13/14d Series Intelligent Electric Actuator (Q/CY 121-2024)

Explosive Atmospheres - Part 1: Equipment - General Requirements (GB/T 3836.1-2021)

Explosive Atmospheres - Part 2: Equipment Protection by Flameproof Enclosure “d” (GB/T 3836.2-2021)

Explosive Atmospheres - Part 31: Equipment Dust Ignition Protection by Enclosure “t” (GB/T 3836.31-2021)

Degrees of Protection Provided by Enclosures (IP Code) (GB/T 4208-2017)

The actuator is under control of passive switch signals from the upper control unit or analog signals ranging from 4mA to 20mA d.c., outputs linear displacement and corresponding driving force, and adjusts the opening degree of valves.

The actuator has the advantages of small size, light weight, powerful functions, built-in servo amplifier, easy operation, compact structure, stable and reliable operation and high accuracy.

1.2 Types and Specifications

The basic model format of the electric actuator is shown in Figure 1.1：

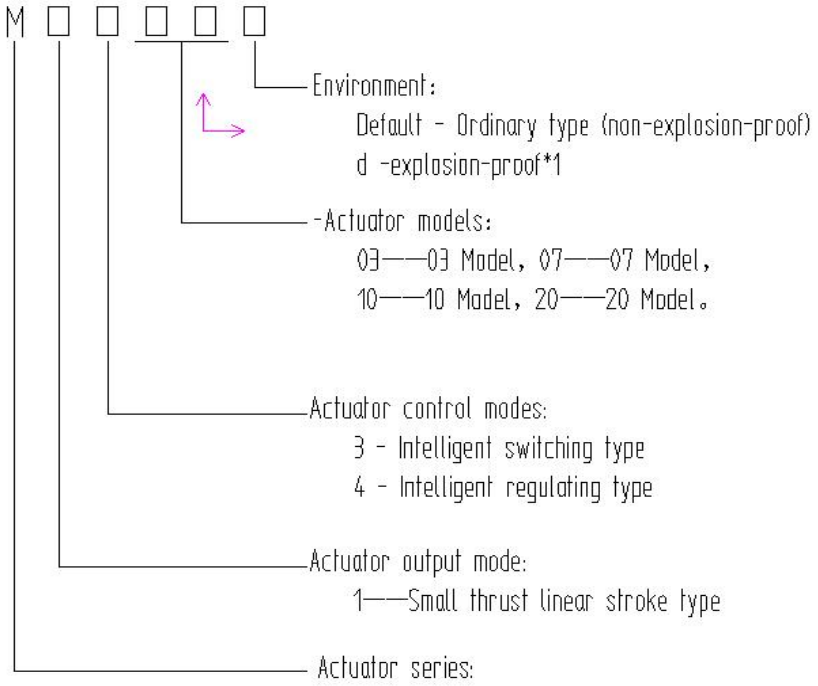


Figure 1.1 The basic type of the M13/14(d) series electric actuator

1.3 Main Technical Parameters

(1) Input control command signals

- Switch control command: 4 passive switch signals, corresponding to the commands: Switch, Open, Close and Stop. There are two operation modes for selection: inching mode or self-holding mode. The command “Stop” is only valid in the self-holding mode; and the minimum pulse width for switch value operation is 100ms.
- Regulating control signal: analog signal 4mA~20mA d.c.; input resistance 250Ω;

(2) Output valve position analog signal: analog signal 4mA~20mA d.c.; load capacity 500Ω.

(3) Output passive switch signal:

Output ON indicates a conducting state, while output OFF indicates a non-conducting state;
Capacity: 250V, 5A a.c.;
The default settings include four passive switch signals: Fault, Local, Fully Open, and Fully Closed;
A maximum of seven terminals can be optionally configured. Please refer to Figure 3.4 and Table 3.3 for terminal schematic diagram and functions;

(4) Positioning accuracy: ±1% F.S.

(5) Display mode: LCD display, supporting Chinese/English switching, with display functions such as operating parameters, menu display, advanced settings, and fault self diagnosis.

(6) Motor operating mode: S4.

(7) IP Grade: IP66/IP67/IP68.

(8) Power supply:

- Three-phase 380V±10%; Power frequency: 50Hz±1%; harmonic content: less than 5%;
- Single-phase 220V±10%; Power frequency: 50Hz±1%; harmonic content: less than 5%;
- DC 24V±10%.

Note: The voltage and frequency of the actuator can be specified separately according to user needs.

(9) Operating environment and conditions:

- Ambient temperature: -25℃~+70℃ (ordinary type); -40℃~+70℃ (explosion-proof type);
- Relative humidity: not more than 95%;
- Barometric pressure: 86kPa~106kPa;
- No corrosive medium or flammable and explosive in ambient environment.

2 Structural Features and Operating Principle

2.1 General Structure and Operating Principle and Features

The actuator is driven by a single-phase or three-phase gear reduction motor through gear reduction to drive the trapezoidal screw nut mechanism with self-locking performance, and convert it into the required linear displacement output. The displacement of the output shaft is detected by a potentiometer, and the intelligent control unit drives the motor to operate according to control instructions, achieving accurate positioning.

The actuator has two modes: remote control and local control. In remote mode, the actuator is controlled by remote control signals. In local mode, the actuator can be driven by local keys or the

manual crank. The remote mode and local mode are switched between each other via the key MODE.

2.2 Operating Principle of Electrical Control Unit

The operating schematic diagram of the electrical control unit is shown in Figure 2.1. With the microprocessor unit (MPU) as core, it receives analog signals or switch value control signal input from the upper control unit, drives the motor to rotate through a solid-state switch, and drives the valve to open or close. The valve position is collected through a highly reliable conductive plastic potentiometer and converted into a digital signal through A/D converter. The direction of motor action is determined based on the control signal and current valve position. When the specified valve position is reached, the corresponding analog position signal or switch output contact signal is output.

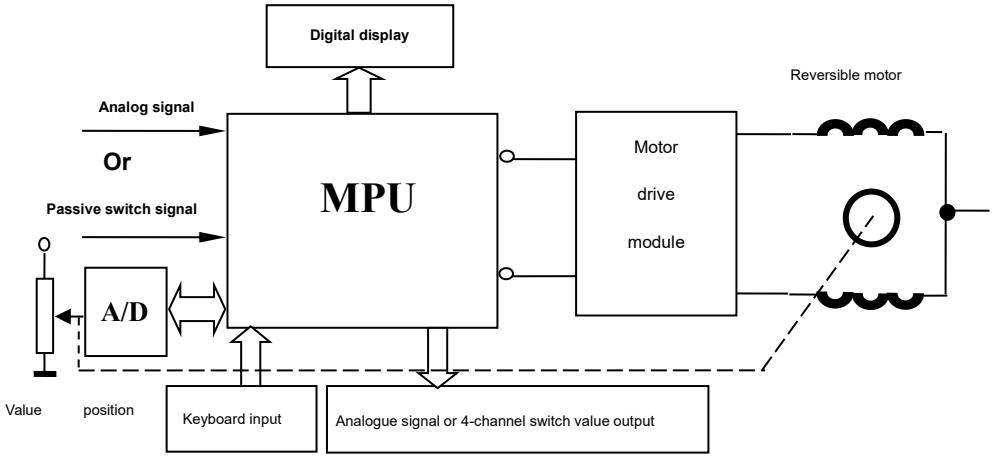


Figure 2.1 Operating schematic diagram of the electrical control unit

3 Installation and External Wiring

3.1 Appearance and Installation Size

The appearance and installation size of the actuator are shown in Figure 3.1 and Table 3.1.

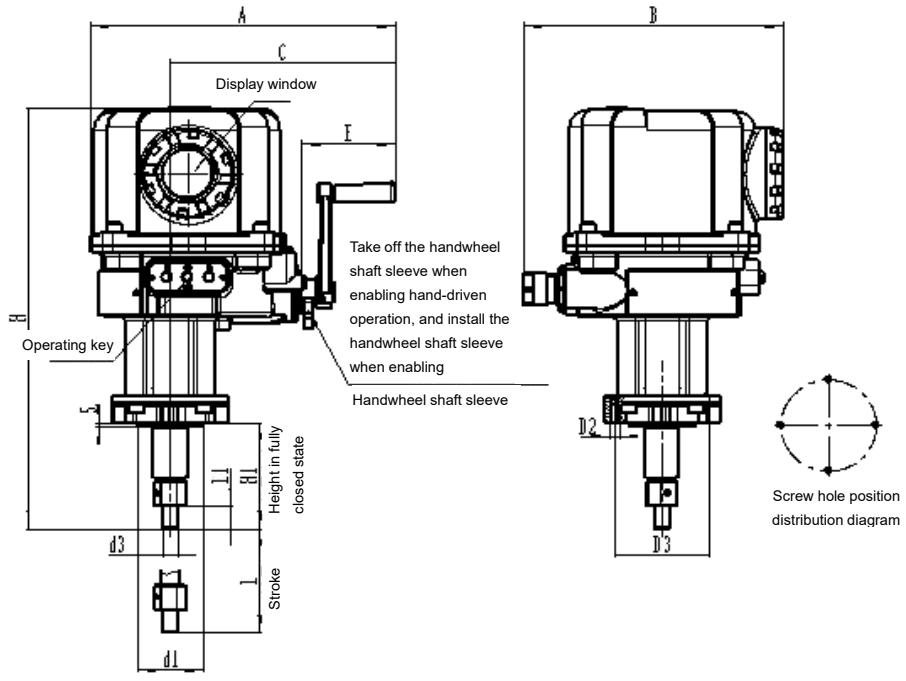


Figure 3 .1 Explosion proof appearance and installation dimensions

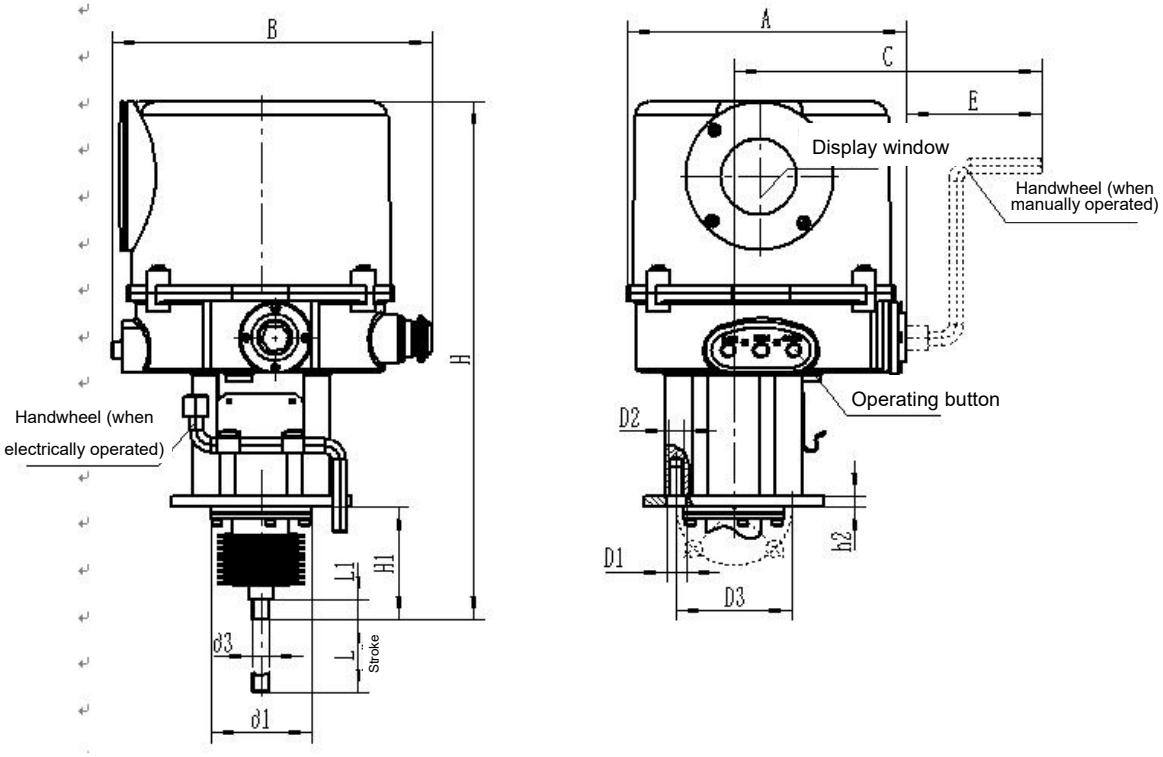


Figure 3.2 Ordinary appearance and installation dimensions

Table 3.1 Appearance and installation size of M13/14d series actuators

Model	A	B	C	E	H	H1	h2	D1	D2	D3 (Φ)	d1 (Φ)	d3	L1	L
M1□03d(S)-□□	326.5	276.5	240.5	100	471	119	/	/	4×M10	102	70	M16×1.5	25	10-60 optional
M1□07d(S)-□□	326.5	276.5	240.5	100	471	119	/	/	4×M10	102	70	M16×1.5	25	10-60 optional
M1□10d(S)-□□	326.5	276.5	240.5	100	471	119	/	/	4×M10	102	70	M16×1.5	25	10-60 optional
M1□20d(S)-□□	397	302.5	293	131	626	180	/	/	4×M10	102	70	M20×1.5	30	10-100 optional
M1□03(S)-□□	193.5	223	215	95	361	78.5	8	4×Φ12	4×M10	102	70	M16×1.5	25	10-60 optional
M1□07(S)-□□	193.5	223	215	95	361	78.5	8	4×Φ12	4×M10	102	70	M16×1.5	25	10-60

														optional
M1□10(S)-□□	193.5	223	215	95	366	78.5	8	4×Φ12	4×M10	102	70	M16×1.5	25	10-60 optional
M1□20(S)-□□	227	249	233	95	535	134.5	10	4×Φ12	4×M10	102	70	M20×1.5	30	10-100 optional

3.2 External Wiring of Actuator

(1) Wire Diameter Selection

Power cable: hard wire or soft wire 1.0mm^2~4mm^2

Signal cable: hard wire or soft wire 0.25mm^2~1.5mm^2

It is strongly recommended to use shielded wires as connections!

(2) Cable Entry Device

Explosion-proof cable entry device: the IP grade is ensured by cable inlet seal after its installation on site. Please use the cable sleeve equipped for the actuator in factory and configure the cable with an appropriate outer diameter. Apply sealant to the cable entrances, if necessary, to ensure to reach a specified IP grade. For the explosion-proof actuator, please use the cables with an outer diameter matching with the explosion-proof cable entry device.

When users purchase an explosion-proof cable entry device that matches with cable interface, the explosion-proof cable entry device must have a seal structure and explosion-proof certificate and production permit from a state-recognized testing authority. And outer diameter of the cable shall match with the explosion-proof cable entry device; otherwise we will not responsible for any safety accident caused by the explosion-proof cable entry device. The thread size and wire diameter of the actuator's cable outlet hole are required as follows.

Table 3.2 Standard cable outlet hole size and recommended diameter range

Thread size of cable outlet hole (metric system)	Our recommended diameter range for the explosion-proof cable entry device
M25×1.5	10~19mm
M32×1.5	16~22mm
M40×1.5	22~32mm

(3) External Wiring

See Figure 3.3for the external wiring diagram of the actuator, Table 3.3 for description of terminal functions, and Figure 3.4~3.6 for recommended basic wiring diagram.

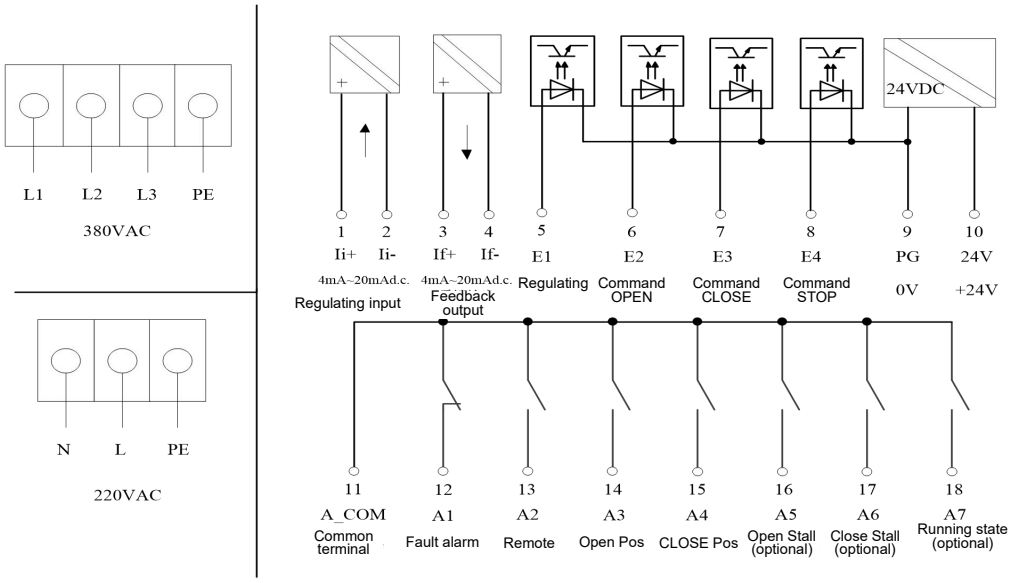


Figure 3.3 External wiring diagram of the actuator

Table 3.3 Description of terminal functions

Terminal number	Function name	Function description	Remarks
L1, L2, L3	Power supply	Three-phase power supply (without phase sequence)	380V
N, L		Single-phase power supply	220V
⏚	Grounding	Grounding protection	Standard configuration
1(+), 2(-)	Regulating analog input	Regulating command input 4~20mA d.c.	Standard configuration
3(+), 4(-)	Feedback analog output	Position feedback output 4~20mA d.c.	Standard configuration
5 (+)	Digital input 1 (E1)	Regulating type control selection terminal when terminals 5 and 10 are connected (also the ESD command input terminal)	Standard configuration
6 (+)	Digital input 2 (E2)	Command OPEN; the actuator operates in open direction when terminals 6 and 10 are connected in remote mode	Standard configuration
7 (+)	Digital input 3 (E3)	Command CLOSE; the actuator operates in close direction when terminals 7 and 10 are connected in remote mode	Standard configuration
8 (+)	Digital input 4 (E4)	Command STOP; the actuator stops operating when terminals 8 and 10 are connected in remote mode	Standard configuration
9	Common terminal (PG)	Common negative terminal 24V d.c., namely command common negative terminal	Standard configuration
10	24V d.c. output	External output of the actuator 24V d.c. to power supply interface	Standard configuration
11	Digital output (A_COM)	Digital output common terminal	Standard configuration
12	Digital output (A1)	Fault alarm signal; terminals 11 and 12 are connected in case of a fault	Standard configuration
13	Digital output (A2)	Remote state feedback signal; terminals 11 and 13 are connected when the actuator is in remote mode	Standard configuration
14	Digital output (A3)	Open Pos signal; when the actuator is set to the fully open position, terminals 11 and 14 are connected	Standard configuration
15	Digital output (A4)	Close Possignal; when actuator is set to the fully closed position, terminals 11 and 15 are connected.	Standard configuration
16	Digital output (A5)	Open Stall signal; when the actuator is in Open Stall position, terminals 11 and 16 are connected	**Optional configuration**
17	Digital output (A6)	Close Stall signal; when the actuator is in Close Stall position, terminals 11 and 17 are connected	**Optional configuration**
18	Digital output (A7)	Alarm signal; terminals 11 and 18 are connected in case of an alarm	**Optional configuration**

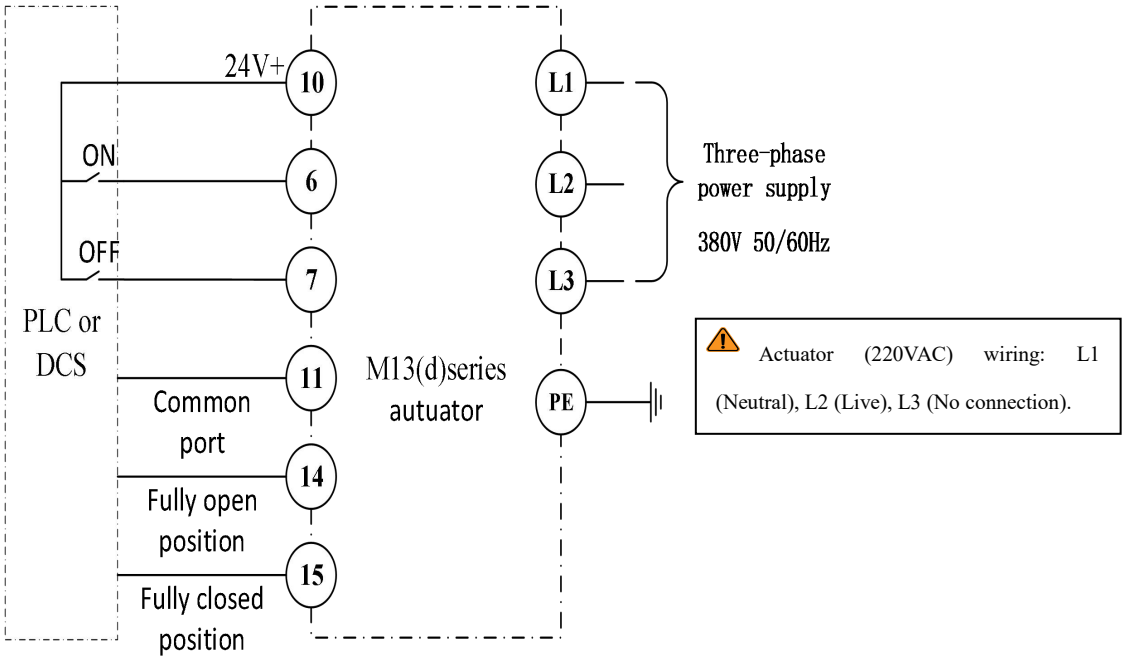


Figure 3.4 Recommended wiring (switch-type passive wiring)

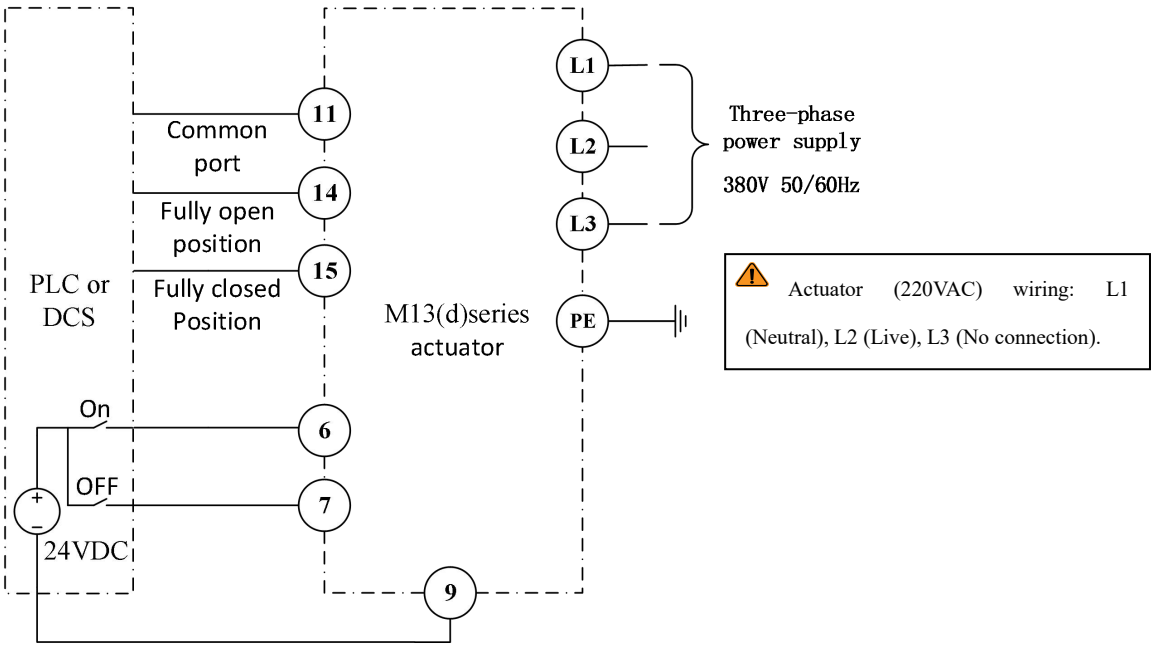


Figure 3.5 Recommended wiring (switch-type active wiring)

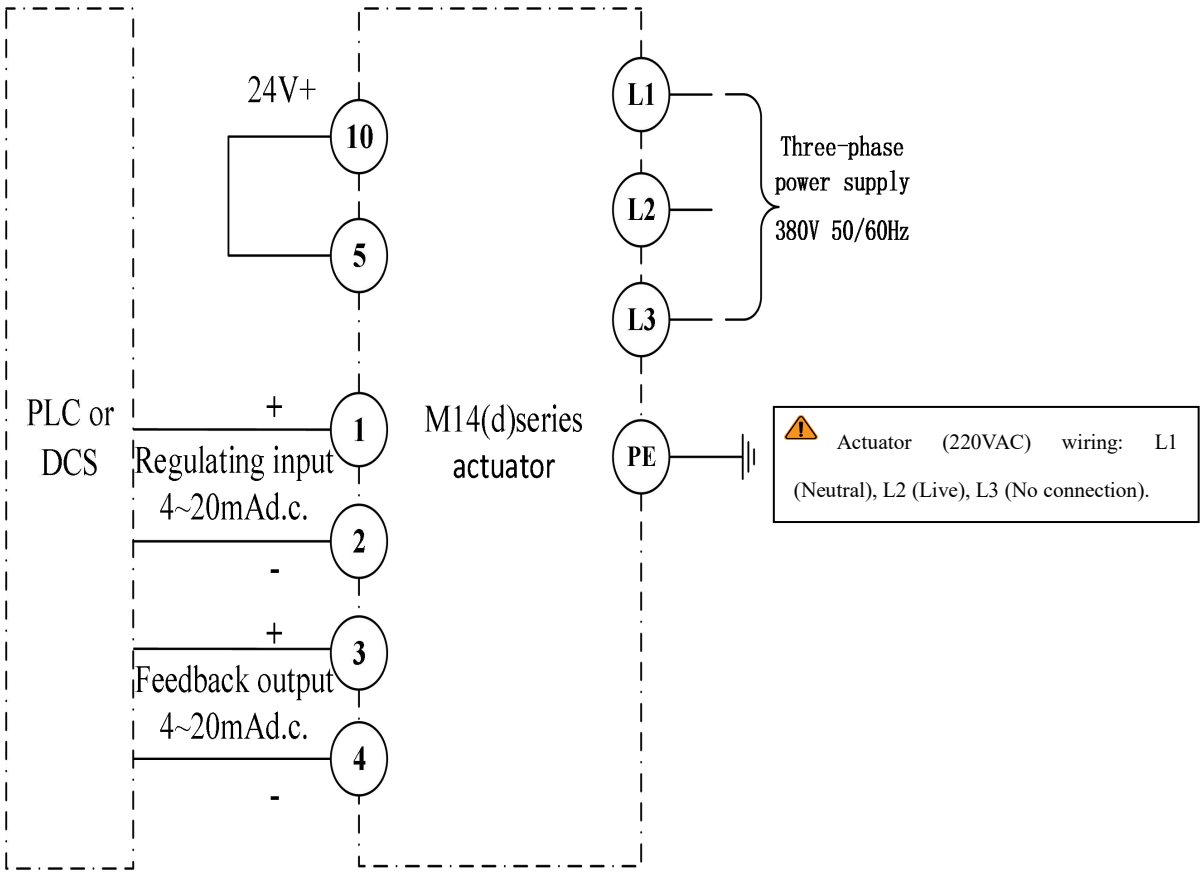


Figure 3.6 Recommended wiring (regulating-type)

4 Parameter Setup and Operation

4.1 Definition of Keys

The diagram of display operation panel is shown in Figure 4.1.

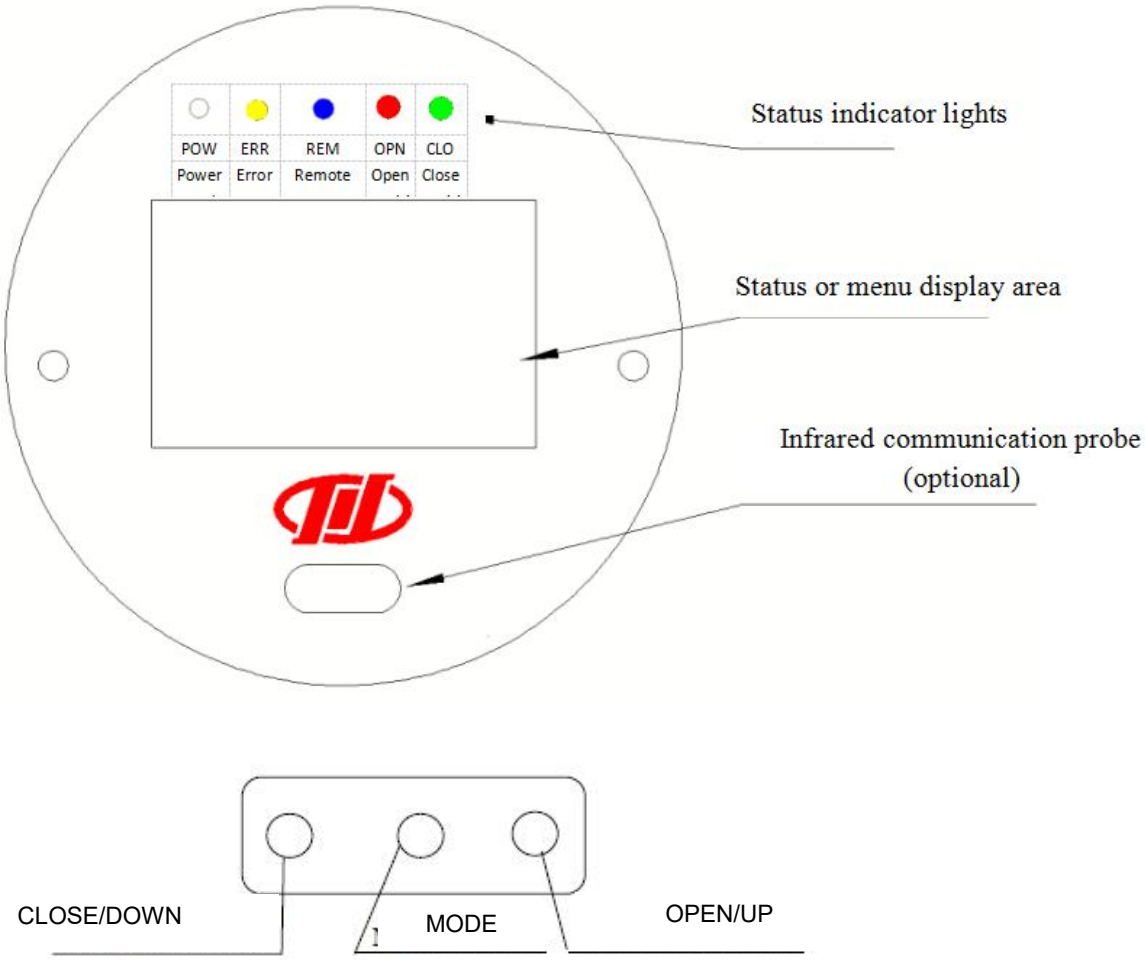


Figure 4.1 Diagram of display operation panel

There are three keys on the display operation panel, namely OPEN, MODE, and CLOSE.

The actuator has two operating modes, namely local (LOC) and remote (REM), which can be switched via the key MODE. In local state, the switch valve can be manually operated and settings can also be accessed. Remote operating conditions include remote switch control and remote analog signal 4-20mA d.c. control, and both of them can be switched via switch input E1. In remote switch control condition, the opening and closing of the actuator are controlled by switch inputs E2 and E3.

The actuator's parameters can be set and modified via the keys OPEN, MODE, and CLOSE on the panel. If the electrical cover is opened, the three switches on the controller circuit board, labeled SK, MK, and XK, can be used instead. These switches correspond to the keys OPEN, MODE, and CLOSE on the panel.

The functions of the keys OPEN, MODE, and CLOSE (which correspond to the key UP, MODE, and DOWN respectively) are as follows:

MODE: In LOC mode, press and hold the key MODE for 5 seconds to enter the setting interface. In the menu settings, touch the key MODE to save or cancel the current setting, and press and hold to exit the current menu.

OPEN and CLOSE: In REM mode, these keys are inactive. In local mode, press OPEN to increase the valve position, and press CLOSE to decrease it. In settings mode, these keys are used to switch between different menus or to increase or decrease parameter values.

However, it is strictly prohibited to open the lid and conduct electrical debugging in environments containing explosive media.

4.2 Regulations for Display Information

Parameters are displayed on the display screen as shown in Figure 4.1.

4.2.1 State Indicators

The state indicators are located directly above the display screen. Each color represents a state of the actuator, with green, red, yellow, blue, and white indicators arranged from left to right, and their functions as follows:

Green: closed position indicator. If it is constantly on, it indicates that the actuator is in the fully closed position; while if it is flashing, it indicates that it is moving towards the closed position.

Red: open position indicator. If it is constantly on, it indicates that the actuator is in the fully open position; while if it is flashing, it indicates that it is moving towards the open position.

Yellow: fault indicator. If it is constantly on, it indicates the existence of a fault; while if it is constantly off, it indicates no fault.

Blue: remote indicator. If it is constantly on, it indicates the remote state; while if it is constantly off, it indicates the local state.

White: power supply indicator. If it is constantly on, it indicates a power supply; while if it is constantly off, it indicates no power supply.

4.2.2 Display Screen

The display screen displays the valve position, remote/local state, fault alarm, software version, menu interface, Parm Setup s, and more. In remote (REM) and local (LOC) modes, the specific display contents are defined as follows:

1. Remote mode

   (1) During switch value control, the upper row displays the current valve position (at a percentage), and the lower row displays “Remote”.

   (2) During analog value control, the upper row displays the current valve position (at a percentage), and the lower row displays the targeted valve position (at a percentage).

   (3) When the key UP is pressed, if there is a fault, the lower row displays a fault message; and when the key DOWN is pressed, the lower row displays the software version.

2. Local mode

   (1) During local operation, the upper row displays the current valve position (at a percentage), and the lower row displays “Local”.

   (2) During local setting, the display screen displays the menu information and setting parameters or numbers.

4.3 Menu Settings

Before operating or adjusting via the local control panel, if it is in “Remote” mode, first touch the key “STOP/MODE” to switch to “Local” mode.

There are 8 operation/adjustment main menus:

- P1: Basic Setup
- P2: Parm Setup
- P3: Diagnosis
- P4: System Info
- P5: Calibration
- P6: Output Config
- P7: Emergency
- P8: Communication

Each main menu can be divided into one or more sub-menus. Use the key “OPEN” or “CLOSE” to select at the same level of menus; press and hold or click the key “STOP/MODE” to enter or exit each

level menu.

Setting of Zero Position and Full Position

The zero position and full position of the actuator output shaft are preset at the factory and generally do not require re-setting after installation. If the adjustment range of the actuator differs from the factory-set output shaft range, or if the action mode is inconsistent, the operator can enter the menu to reset the settings.

At the factory, the actuator is set with the valve position pointer indicating zero as the closed position.

During the zero position or full position setting menu operation, the display screen displays the A/D converter output value of the current valve position sampling, which should typically vary between 200 and 3,900. There must be a certain difference between the zero position and the full position. When this difference is greater than the minimum allowable value **[800]**, the value displayed in the upper row will not flash. Click the key “STOP/MODE” to prompt for saving. If this difference is less than the minimum allowable value, click the key “STOP/MODE” to exit directly to the upper-level menu. The zero position and full position settings are done in menus P1.1 and P1.2.

4.3.1 Stroke Setting

Main menus			Note
P1 Basic Setup	P1.1 Fully Close	11-4084	Adjustment of the closed direction terminal position, **which cannot be saved if the range is exceeded,The difference between the zero position and the full position must be greater than [800].**
	P1.2 Fully open	11-4084	Adjustment of the open direction terminal position, **which cannot be saved if the range is exceeded,The difference between the zero position and the full position must be greater than [800].**
	P1.3 Stall Time	2s-20s	Stall time
	P1.4 Alarm Pos C	0%-50%	Presetting of closed direction alarm output
	P1.5 Alarm Pos O	50%-100%	Presetting of open direction alarm output
	P1.6 Sig Invert	Normal Reverse	Normal: 4mA indicates 0% valve position, and 20mA indicates 100% valve position Reverse: 4mA indicates 100% valve position, and 20mA indicates 0% valve position
	P1.7 Motor DirSet	clockwise Counterclockwise Automatic:	The default setting for 220Vac and 380Vac is automatic If automatic setting still fails to recognize successfully, please check whether the driver board matches the power supply.

4.3.2 Parm Setup

Main menus			Note
P2 Parm Setup	P2.1 Lo Control	Self-holding Inching	The characteristics of local switch value input

	P2.2 Re Control	Self-holding Inching	The characteristics of remote switch value input
	P2.3 Open Limit	55%-100%	Open direction limit range of 55%-100%
	P2.4 Close Limit	0%-45%	Closed direction limit range of 0-45%
	P2.5 Fault Handle	Holding / fully open / fully closed	When the adjustment disconnection is effective, the action to be executed (adjustment type is effective)
	P2.6 ESD active	Active high level Active low Level	ESD enabling condition: enabling with or without input
	P2.7 ESD mode	Conventional Switching-type Regulating-type	ESD control mode: Conventional (without ESD), switching-type or regulating-type
	P2.8 ESD Pos	Holding / fully open / fully closed	Setting the action for which ESD is enabled
	P2.9 Language set	Chinese/English	setting display language

4.3.3 Diagnosis

Main menus			Note
P3 Diagnosis	P3.1 Fail Info	See Table 4.1	Fault description
	P3.2 Stroke Info	0~4095	Display potentiometer value at zero and full positions
	P3.3 Clear Fault		Clear the fault alarm
	P3.4 Restore Data		If the menu storage parameters are incorrect, this option can be used to restore the factory settings for data recovery. Turn off the power once and enter this menu operation again.

4.3.4 System Info

Main menus			Note
P4 System Info	P4.1 Version Info		Software version number review

4.3.5 Calibration

Main menus			Note
P5 Calibrate	P5.1 Password	50	Enter password “51” to enter the menu below
	P5.2 Input-4mA	499~1022	Set the calibrated input zero point value (4mA) by analog signal Note: It will not be saved if deviation is more than 5%.
	P5.3 Input-20mA	2999~3822	Set the calibrated input full point value (20mA) by analog signal Note: It will not be saved if deviation is more than 5%.
	P5.4 Output-4mA	250-550	Set the zero point feedback value of the calibrated output valve position (4mA)
	P5.5 Output-20mA	1850-2150	Set the full point feedback value of the calibrated output valve position (20mA)

	P5.6 DeadBand	0.4%~10%	The smaller the dead band, the more accurately it will be positioned, but the less stable it will be.

4.3.6 Digital Output

Main menus			Note
P6 Digital output	P6.1 Password	60	Enter password “61” to enter the menu below
	P6.2 A1 Function	Fault alarm 1	0: it is disconnected when the state is true 1: it is connected when the state is true The configuration is shown in Table 4.2.
	P6.3 A2 Function	Remote enabled 1	
	P6.4 A3 Function	Open Pos 1	
	P6.5 A4 Function	Close Pos1	
	P6.6 A5 Function	Open Stall 1	
	P6.7 A 6 Function	Close Stall 1	
	P6.8 A7 Function	Running state 1	
	P6.9 A3A4 switching	Normal/magnetic retention	This menu is for switching between regular relays and magnetic holding relays.

4.3.7 Emergency

Main menus			Note
P7 Emergency	P7.1 INST		Actuator can be driven over terminal position by force in the menu.

4.3.8 Communication

Main menus			Note
P8 Communication	P8.1 Bus Address	1~126	Infrared/HART/Modbus/Profibus Address needs to be set
	P8.2 Remote Mode	Bus switch Bus regulation traditional control	Bus switch: In remote mode, the bus command is switch type Bus regulation: In remote mode, the bus command is of regulating type Traditional control: Control through terminal 5 in remote mode
	P8.3 Bus Baudrate	1200bps~115200bps	only for Modbus
	P8.4 Bus Mode	traditional /profibus/Modbus/encryption /Hart/FF/Profinet	Set bus type

Storage Settings

First set new parameters with the key “OPEN” or “CLOSE” on the control panel of the actuator, then click the key “STOP/MODE”. The display screen will display a static “Yes” if the parameters have been changed. To cancel, click the key “OPEN” or “CLOSE”, “No” will be displayed, and then click the key “STOP/MODE” to return. To save a new value, click the key “STOP/MODE”. A flashing “Saving” means

that the parameter change has been successfully saved, while a flashing “Saving Failed” means that the parameter change has not been saved successfully.

Table 4.1 Fault alarm information

Displayed above	Displayed below	Fault causes and countermeasures
Display the current fault serial number 01~13	Deviation alarm	The difference between the input signal and the feedback signal is more than the allowable value
	Pot offline	AD converter is damaged
	Pot over	AD converter is damaged, and sensor potentiometer is damaged
	Adjust low	Adjustment signal fault occurs, and AD converter is damaged
	Adjust over	Adjustment signal fault occurs, and AD converter is damaged
	Close Limit	Reach the close direction setting limit point
	Open Limit	Reach the open direction setting limit point
	Mech. switch	Check the limit switches and their plug wires
	Close Stall	Mechanical jam or overloading occurs in the close direction, and the motor is damaged
	Open Stall	Mechanical jam or overloading occurs in the open direction, and the motor is damaged
	Memory error	Reset parameters or return to the factory for maintenance
	ADC Error	Potentiometer is disconnected or damaged
	Dire Error	Relay is damaged (for 380V)

Table 4.2 Switch value output

Displayed below	Displayed above	Notes
0	Fault alarm 0	It is disconnected in case of a fault alarm
1	Fault alarm 1	It is connected in case of a fault alarm
2	Remote enabled 0	It is disconnected in remote state
3	Remote enabled 1	It is connected in remote state
4	Open Pos 0	It is disconnected at the fully open position
5	Open Pos 1	It is connected at the fully open position
6	Close Pos0	It is disconnected at the fully closed position
7	Close Pos1	It is connected at the fully closed position
8	Opening state 0	It is disconnected during running in open direction
9	Opening state 1	It is connected during running in open direction
10	Closing state 0	It is disconnected during running in close direction
11	Closing state 1	It is connected during running in close direction
12	Running state 0	It is disconnected during running
13	Running state 1	It is connected during running
14	Adjust low 0	It is disconnected when no adjusting signal input
15	Adjust low 1	It is connected when no adjusting signal input
16	Pot over 0	It is disconnected when the valve position is smaller than -20% or greater than 120%
17	Pot over 1	It is connected when the valve position is smaller than -20% or greater than 120%
18	Preset-C 0	It is disconnected when the valve position is less than or equal to the set closed position
19	Preset-C 1	It is connected when the valve position is less than or equal to the set closed position
20	Preset-O 0	It is disconnected when the valve position is greater than or equal to the set open position
21	Preset-O 1	It is connected when the valve position is greater than or

Displayed below	Displayed above	Notes
		equal to the set open position
22	Open Stall 0	It is disconnected during Open Stall
23	Open Stall 1	It is connected during Open Stall
24	Close Stall 0	It is disconnected during Close Stall
25	Close Stall 1	It is connected during Close Stall
26	Stall 0	It is disconnected during open or Close Stall
27	Stall 1	It is connected during open or Close Stall
28	Ready 0	When the actuator completes the power on self-test, disconnect it
29	Ready 1	When the actuator completes the power on self-test, connect it

Note: Any relay output can be configured as the switch value in the above table.

4.4 Valve Position Setting and Adjustment

The position of the output shaft of the actuator is set to zero at the lowest position and full at the highest position when it leaves the factory. If this direction does not need to be changed, the actuator should be operated to the CLOSE position during installation, and then aligned and connected with the mechanical zero position (fully closed) of the adjustment mechanism.

If the adjustment range of the on-site adjustment mechanism is inconsistent with the set range of the output shaft of the factory product, or the mode of action is inconsistent, you can enter the menu to reset.

The zero and full position settings of the executing mechanism are described as follows:

(1) Before the first power on, shake the handwheel to make the valve position indicator pointer in the middle position of the stroke, and then power on for debugging.

(2) After checking the correct wiring, turn on the power and press the mode key to enter the local working condition.

(3) After long pressing the mode key in the local operating conditions to enter the menu, enter the P1.1 zero position setting menu.

(4) Tap the increase or decrease key to rotate the output shaft to the desired mechanical zero position (fully closed position), and press the MODE key briefly to prompt saving. again

Enter the P1.2 full open settings menu

(5) Stop the output shaft when it reaches the desired mechanical full position by pressing the increase or decrease key, and press the MODE key briefly to prompt save.

When setting the mechanical position mentioned above, the A/D conversion output value of the current valve position sampling is displayed on the menu, with a range of 0 to

4095. When setting, there should be room at both ends. The zero full position code value should generally vary between 200 and 3900, and the difference between zero and full positions should not be less than 800 code values.

The factory setting is upward as the positive direction. If you need to change the positive direction, simply reset it according to the above method without changing the electrical system

Wiring.

4.5 Acceptance Tests after Installation and Debugging

After installation and debugging, conduct acceptance from the following aspects:

1. Fastness of the actuator after installed: shake the mounting bracket and actuator by hand to see if they are still shaky; check the screws on the cover with a screwdriver to see if all screws are tightened; and check if the rocker arm and connection are installed firmly; and

2. Correctness of actuator action: apply power and signal to the installed actuator, observe whether the actuator operates in the expected adjustment mode, and whether the valve can be closed or opened to meet requirements.

5 Use and Operation

Before using the installed actuator, check the installation reliability according to the method specified in section 4.4, and test the system control signal to be connected to ensure it is within the signal input range of the actuator, and the working power supply is in line with that specified on the nameplate of the actuator.

Operators must have received training on the basic equipment operation function, have passed the exam, and be qualified for operating with an operation certificate. Any persons on other posts are not allowed to operate the actuator without approval.

When operating the actuator under high temperature environment, operator must wear special protective gloves to avoid personal injury resulted from hot metal parts. Never operate the handwheel or hold the hand shaft with hands while the actuator is powered to avoid machine damage or personal injury!

When replacing the grease inside the box, please wash the gears and box with kerosene first, and dry them before adding the grease. Please use the grease model specified by our factory. After the grease is replaced, please clean the surrounding area to prevent polluting the environment.

When operating the actuator, the operator must abide by the safety operating procedures: shut off the signal first and power off before adjusting and repairing to prevent recklessly starting up the actuator due to operator's negligence.

Operators must abide by the relevant rules and regulations on instrument control, as well as regulations for shifting of duty, and keep detailed records of equipment operation, faults and handling during the shift.

Operation steps:

(1) Before the first power on, rotate the handwheel to make the pointer of valve position indicator in the middle of the stroke, and then power on for debugging.

(2) When operating the actuator locally, click the key MODE to switch it to local mode, press OPEN to operate in the direction of increasing valve position, and press CLOSE to operate in the direction of decreasing valve position. If it is in self-holding mode, press CLOSE in the fully open position, it will stop until automatically running to the fully closed position, and press OPEN in the fully closed position, it will stop until automatically running to the fully open position. The current valve position value will be displayed on the upper part of the display screen.

(3) Please refer to section 4.3 of the Manual for menu settings.

(4) When operating the actuator remotely, click the key MODE to switch it to remote mode, and operate the valve switch by the analog signal or switch input signal from the upper computer.

(5) ***When manually operating the actuator, the operating condition should be switched to local mode first, and the motor should be confirmed not to be running before proceeding. It is strictly prohibited to operate the buttons during manual operation!***

① **Explosion proof manual operation instructions:** The handwheel sleeve should be removed, and the handwheel should be pushed inward while rotating it to drive the actuator to run in the open or close direction; After the operation is completed, the handwheel should be pulled out and the handwheel shaft sleeve should be installed into the handwheel component to avoid unnecessary injury caused by the rotation of the handwheel during electric operation.

② **Normal manual operation instructions:** As an accessory, the crank should be clamped on the elastic card of the actuator. When manually operating, remove the crank, insert it into the manual drive hole on the side of the actuator body, and shake the crank to drive the actuator to run in the open or close direction; After the operation is completed, the crankshaft should be removed and placed back in its original position for the next operation.

(6) Emergency handling: in case of emergency, please immediately cut off the signal and power off before manually operating the actuator; and
(7) Operators should read through and follow the regulations on safety precautions in Chapter 6 of the Instruction Manual.

6 Safety Precautions and Troubleshooting

6.1 Safety Precautions

(1) The usage environment should meet relevant explosion-proof standards, and the surrounding environment should be without corrosive gas;
(2) Close the relevant electrical chamber covers and tighten them before powering on. It is strictly prohibited to open the covers when it is live. The covers should not be opened until it has been powered off for 5 minutes!
(3) During the installation of the box cover, there should be no defects such as bumps or scratches on the explosion-proof surface, and fasteners with a yield stress of ≥ 640MPa must be used.
(4) Products with 220V and 380V AC power supply have strong current in internal circuits, so be careful and avoid electric shock when opening the cover for maintenance!
(5) The power supply should be well-grounded, with a grounding resistance of ≤ 2Ω;
(6) When operating the actuator with a handwheel, switch it to local mode and confirm that the motor is not running before rotating the handwheel. Never pressing keys when operating the handwheel to avoid injury!
(7) The installation, configuration setting and electrical connection of the actuator can only be conducted by qualified professionals.

6.2 Troubleshooting Procedures and Methods

When the actuator or terminal controller is not working or working abnormally, cut off the signal and power off first, and then check the actuator according to the process in Figure 7.1.

7 Trouble Analysis and Troubleshooting

The electrical parts of the actuator have the function of fault self-diagnosis. Some fault causes and solutions can be identified based on the alarm information as shown in Table 4.1. Generally, fault diagnosis can be carried out as shown in Figure 7.1.

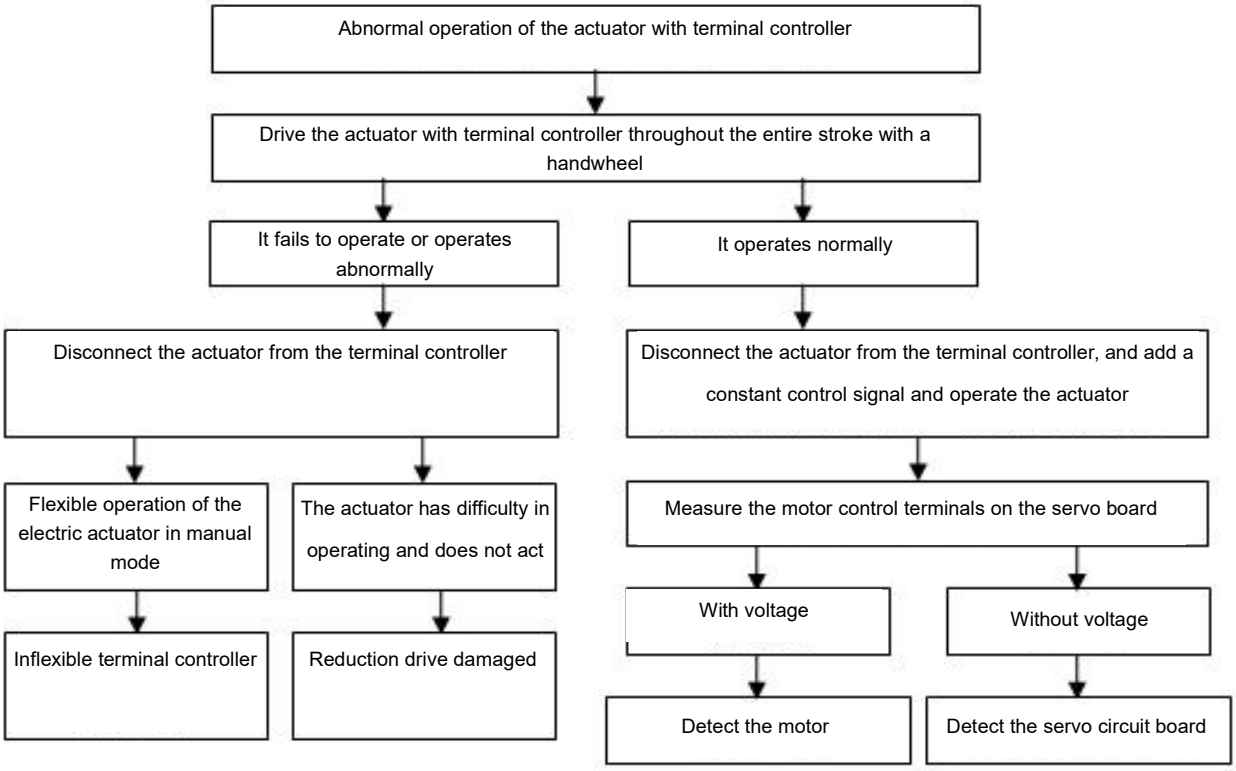


Figure 7.1 Troubleshooting process

8 Service and Maintenance

Daily Maintenance, Service, and Calibration

Visual inspection of appearance;
Check whether screws are tightened;
Check whether the display window reading is consistent with the input of the control signal;
Observe whether there is an alarm indication on the display, and identify the cause when there is an alarm indication;
Observe whether the valve position displayed is consistent with the set mechanical position and calibrate it regularly.

The operation of the mechanical structure of the reducer relies on lubricating grease (ordinary lubricating grease: General Machinery Grease (standard)/Mobile Beacon 325 (low temperature); Explosion proof grease: Omala S2G 320 (standard)/Mobile SHC 630PL 5GL (low temperature). It is recommended to replace the grease every 2-3 years to extend the service life of the actuator.

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