Operation Manual

M Series Intelligent Electric Actuator

M0(d)



Chongqing Chuanyi Automation Co., LTD. Actuator Filiale

V002511

Preface

■ About this Operation Manual

(1) This 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 product operation before operation;
(3) This Instruction Manual endeavors to provide a comprehensive description of the product's functions, but our factory makes no guarantee that these functions will meet the user's specific applications.
(4) It is forbidden to extract or copy part or all of the Instruction Manual without permission;
(5) The content of this Instruction Manual may be changed without prior notice; and
(6) We have endeavored to ensure its 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 product. We are not responsible for any bad consequence due to non-compliance with the Instruction Manual.
(2) If any independent protective unit or safety circuit is going to be installed on the product or the system controlled the product, make sure such circuit is installed on the outside of the product. Please do not attempt to change this product or install such circuit in this product.
(3) When replacing spare parts or consumables of the product, please use the parts recommended by us.
(4) After all covers are installed, screws must be tightened!
(5) For standard actuators, a metal waterproof cable gland of size M25×1.5 is recommended; select a cable with a matching outer diameter and strongly prefer shielded conductors.
For explosion-proof actuators, always use the cable entry fitting supplied with the product; refer to Section 3.4 of the manual for details.

■ Disclaimer for the Product

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

■ Environmental Protection Item

In command for better protect the environment and human health, when users install, repair and maintain the product or the lifetime of product is over, please observe national / regional laws and regulations, properly handle the material generated by recycling the actuators. Deliver them to the local manufacturers with the state-recognized recycling qualification. The type of waste materials include:

(I) Substituted damaged and scrap materials, such as coated metal parts, screws, nuts and batteries, cables and other rubber and plastic parts;
(II) Waste lubricants and lubricants spilled during use;
(III) Waste circuit boards and electronic components; and
(IV) Other waste materials.

If you have any question, please contact with our after-sale staff.

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Unpacking Check, Transportation and Storage，Safe precautions

1 Unpacking check

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

- Check whether the actuator is damaged during transportation.
- 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 lists.

2 Transportation and storage

- Transportation and storage temperature: -10℃ to +55℃. To avoid shortened service life, the storage temperature should not regularly exceed 40℃.
- Without special packaging, it should be placed in a dry indoor place to avoid condensation.
- It must have proper package and desiccant which shall 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, the quality assurance will be lost, so our company will not be responsible for replacement or free maintenance.

3 Safe precautions

According to the design purpose, the actuator is a dedicated device that drives terminal control units (such as valves, baffles, etc.). Improper operation may pose dangers to the operators themselves. Therefore, the following points must be noted during use:When operating the actuator under high temperature environment, operator must wear special protective gloves to avoid personal injury resulted from heating of metal parts.

- The installation, disassembly, commissioning, operation and maintenance of the actuator must be carried out by qualified professional technicians. At the same time, necessary protective equipment must be worn, including safety helmets, goggles, work clothes, insulated gloves, labor protection shoes, etc. In case of special circumstances, the work must be conducted under the guidance of professional personnel from our company.
- After the actuator is installed, it is strictly prohibited to hang any items on the

handwheel and handwheel clutch.

- Manual operations must strictly follow the operating instructions and the handwheel operation guidelines in this manual; it is prohibited to drive the actuator with the handwheel while the device is energized.
- Before electric operation, ensure that the handwheel clutch is completely reset (moved all the way away from the handwheel).
- When the actuator is operated in a high-temperature environment, operators must wear special protective gloves to prevent work-related accidents caused by the heating of metal components.
- In hazardous areas, it is forbidden to contact the actuator with conductive or heat-conductive objects. The power supply should be cut off, and the actuator should be removed and moved to a safe area for maintenance or upkeep.
- The lubricating oil spilled during the oil change process should be cleaned up in a timely manner to avoid accidents.
- When performing operations with the cover opened, operators must strictly abide by the safety operation procedures: first cut off the power supply, and after 5 minutes, operations such as inspection and replacement of electronic components can be carried out.

Disclaimer: Except as mentioned in the separately provided warranty certificate, our factory makes no warranties regarding the product.

Environmental Protection: The relevant waste materials generated by the product should be properly handled and recycled.

1.Overview

1.1Product characteristics

M03/04(d) series intelligent electric actuators are execution unit instruments with an integrated servo controller that outputs angular stroke, primarily used to control rotary regulating mechanisms such as butterfly valves, ball valves, plug valves, and dampers, enabling automatic process control, and widely applied in pipeline fluid control systems in industries such as electricity, metallurgy, petrochemicals, light industry, and waste water treatment.

They are controlled by 4～20mAd.c. signals from an upper-level control units, or passive switch signals, and output angle ranging 0～90° and corresponding torque, drive the opening and closing of rotary regulating mechanisms. They have advantages including small size, lightweight, powerful functionality, user-friendly operation, compact structure, stable and reliable performance, high precision, and excellent sensitivity.

1.2Actuator models

The basic models are shown in Figure 1.1:

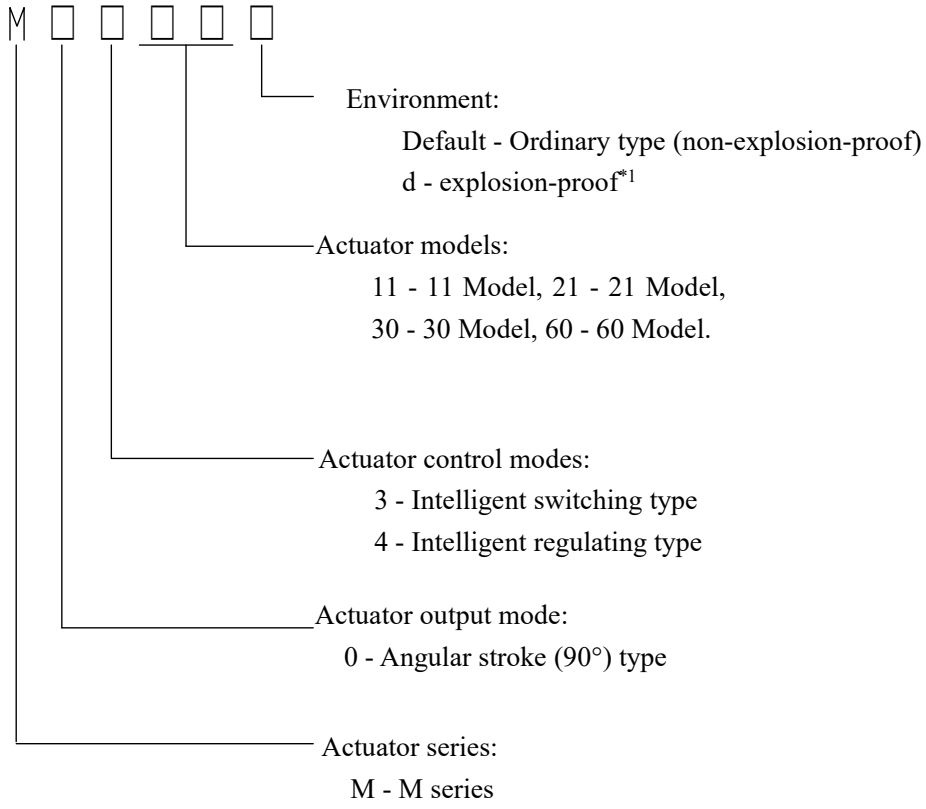


Figure 1.1 Basic Models of M03/04(d) Series Actuator

1.3 Explosion-proof types and specifications

The types and specifications of explosion-proof actuators are listed in Table 1.

Table **1**

Actuator Model	Output torque （Nm）	Stroke time （s/90°）	Maximum shaft diameter(mm)	Connecting flange （ISO5211 ）	Motor power (W)	Rated current(A)		Handwheel turns （r）	Weight (Kg)
						220V	380V		
M0□11-(d)□	100	28	φ22	F07/F10	40	0.9	0.3	11	22.5
M0□21-(d)□	200	28	φ22	F07/F10	40	0.9	0.3	11	22.5
M0□30-(d)□	300	34	φ35	F10/F12	60	1	0.6	13.5	32
M0□60-(d)□	600	34	φ35	F10/F12	90	1.7	0.7	13.5	33

Model Code Explanation:
The first “□” in the model denotes the control signal:
3 = contact-free switching control
4 = 4 – 20 mA d.c. analogue signal control
The second “□” denotes the supply voltage:
S = 220 V, 50 Hz single-phase
(blank) = 380 V, 50 Hz three-phase
c = on/off type with 4 – 20 mA feedback
The two intermediate digits indicate the output torque (see Table 1).
The suffix “d” identifies an explosion-proof (Ex db IIB T4 Gb or Ex db IIC T4 Gb) actuator.

1.4 Main Technical Parameters

1. Input Signal: **M03(d) Series:** Active 24Vd.c. or passive switch signals, including 3 types of signals: running to open, running to closed, and self-holding stop. Active when at high level or connected, with a high level of 18~30V and low level of -2V~+2V. The minimum continuous pulse width for switching signals is 50ms. The operating modes includes inching or self-holding mode.
   M04(d) Series: In addition to the same switching input signals as the M03 series, it also accepts controls from analog signals ranging 4~20mAd.c.
2. Output Signal:
   a. passive switching value, including fault alarm, remote / local state, fully open position, and fully closed position. Connected with input and disconnected without output. Capacity: 250V, 5Aa.c.;
   b. Optional analog output: 4~20mAd.c., with load capacity of 0~750Ω.
3. .Positioning accuracy: ±1% F.S.;
4. .Dead band: (0.4%~10％) F.S.;
5. Motor working mode: S4;
6. Power Supply: Three phase 380V ±10%, 50Hz ±1%, or single phase 220V ±10%, 50Hz ±1%; harmonic content: less than 5%;

Note: The voltage and frequency of the actuator can be specified separately as required by the user.

7. Operating environment and conditions:
   Ambient temperature: -25℃~+70℃(Explosion-proof type ambient temperature: －40℃ to + 70℃); relative humidity: not greater than 95%; barometric pressure: 86kPa~106kPa;
8. Explosion-proof marking: Ex db IIB T4 Gb or Ex db IIC T4 Gb (explosion-proof actuator).

1.5 Referenced Documents

The following documents are normatively referenced in this text and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 3836.1-2021 Explosive atmospheres Part 1: Equipment General requirements

GB/T 3836.2-2021 Explosive atmospheres Part 2: Equipment protected by flameproof enclosures "d"

GB/T 4208－2017 Degrees of protection provided by enclosure (IP Code)

GB/T 26155.1 — 2010 Intelligent Electric Actuators for Industrial Process Measurement and Control Systems Part 1: General Technical Requirements

GB/T 26155.2—2012 Intelligent Electric Actuators for Industrial-Process M easurement and Control Systems Part 2: Methods of Performance Evaluation

GB/T 28270－2012 Intelligent Electric Valve Actuator

JB/T 8219-2016 Ordinary and Intelligent Electric Actuators for Industrial-Process Control Systems

ISO 5211：2017 Industrial valves — Attachment of part-turn actuators

No corrosive medium or combustibles & explosives in ambient environment.

2. Structural Features and Operating Principle

2.1 General structure and its operating principle and features

Mechanical operating principle: the motor drives a helical gear, which engages with the clutch to drive the worm gear and a secondary helical gear pair, ultimately completing the external transmission output.

Basic features: The output is partial rotatory type, with a compact structure and lightweight design.

Housing: it is made of high-quality aluminum alloy, it is lightweight and high-strength. The surface is coated with paint for enhanced corrosion resistance.

Motor: it is inductive motor with high torque and low inertia. It also features a built-in overheat protector to prevent motor damage from overheating.

Manual mechanism clutch system: rotate the handwheel arm with your hand to move the clutch handle. After the clutch handle is released, it automatically resets to the electric position. Electric and manual operations are mutually exclusive.

Stroke switch: it is used to control the actuating range of the actuator. A simple adjustment mechanism allows for easy setting of the stroke switch’s position.

Position self-locking: the actuator has a self-locking function, so motor braking or other braking methods are not required.

Position indicator: the position indicator is installed on the output central shaft, synchronized with the actuator's output, allowing for direct observation of the movement position.

Connection and installation: the output mounting flange size conforms to the ISO5211 international standard. The drive shaft sleeve can be removed and processed as needed, highly adaptable. The actuator can be installed both vertically and horizontally.

Wiring terminals: they are designed with compact and reasonable layout, vibration-resistant, and wired securely.

2.2 Operating principle of electric control unit

The working principle of the electrical control unit is shown in Figure 2.1. With the MPU microprocessor as the core, it receives three control switching value inputs, drives the motor to rotate through the solid-state switch, thereby driving the opening and closing of the valve. Only one of the three control switching value inputs can be active at the same time; if two or more are active

simultaneously, the instructions will be considered invalid. The valve position is collected by a high-reliable conductive plastic potentiometer, which is then converted into a digital signal via A/D. The motor's direction of motion is determined based on the control signal and the current valve position. When it is in the specified valve position, it sends the corresponding switching value output contact signal. The stroke switch limits the rotational limit position of the output shaft, and the torque switch (optional for the user) limits the output torque. When the set position or torque is reached or exceeded, the motor current will be cut off to protect the load and the product itself.

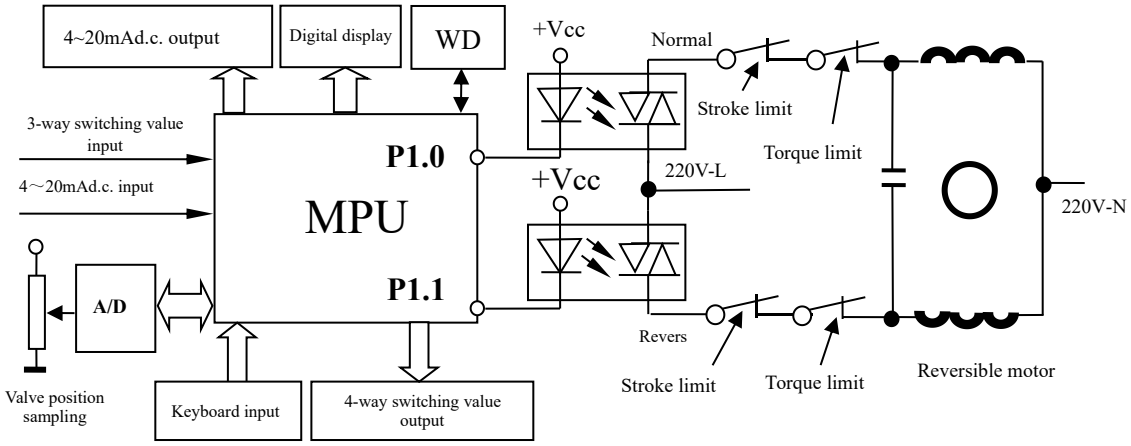
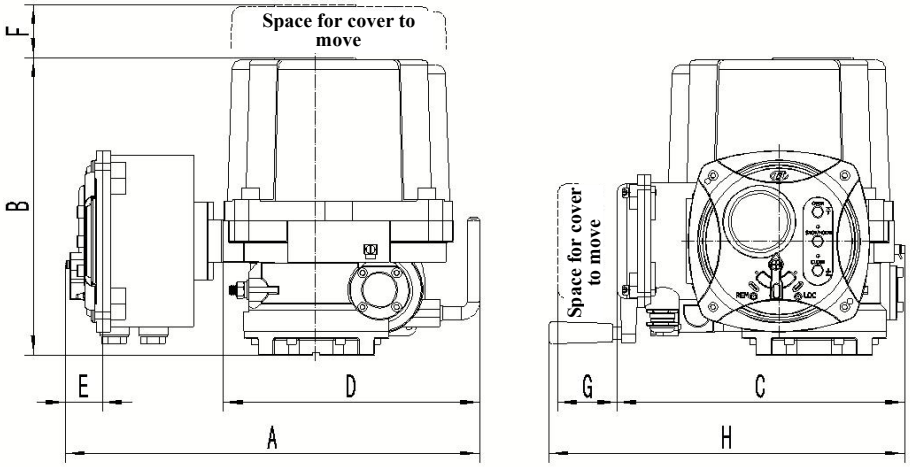


Figure 2.1 Principle of Electric Control

3. Installation and External Wiring

3.1 Straight type external size

The actuator's external size and installation size are subject to the production drawings.

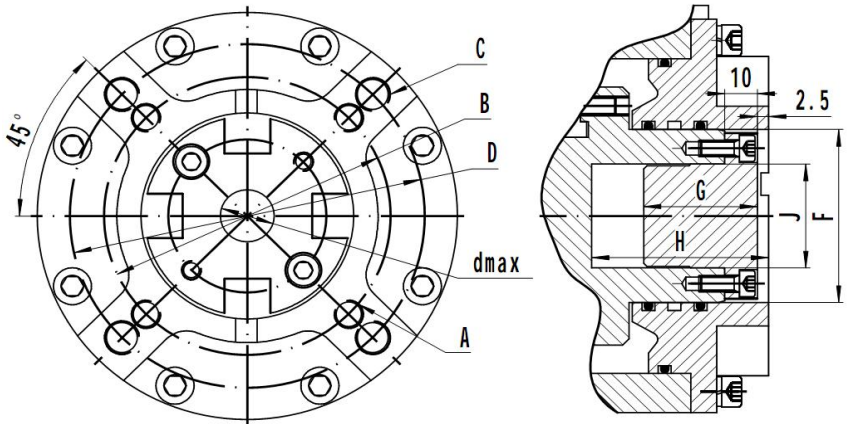


Model	A	B	C	D	E	F	G	H
M0□11/21-□	400	269	320	235	36	160	120	365
M0□30/60-□	430	309	335	265	36	180	120	410

Figure 3.1 Straight Type External Size

3.2 Size of connection flange

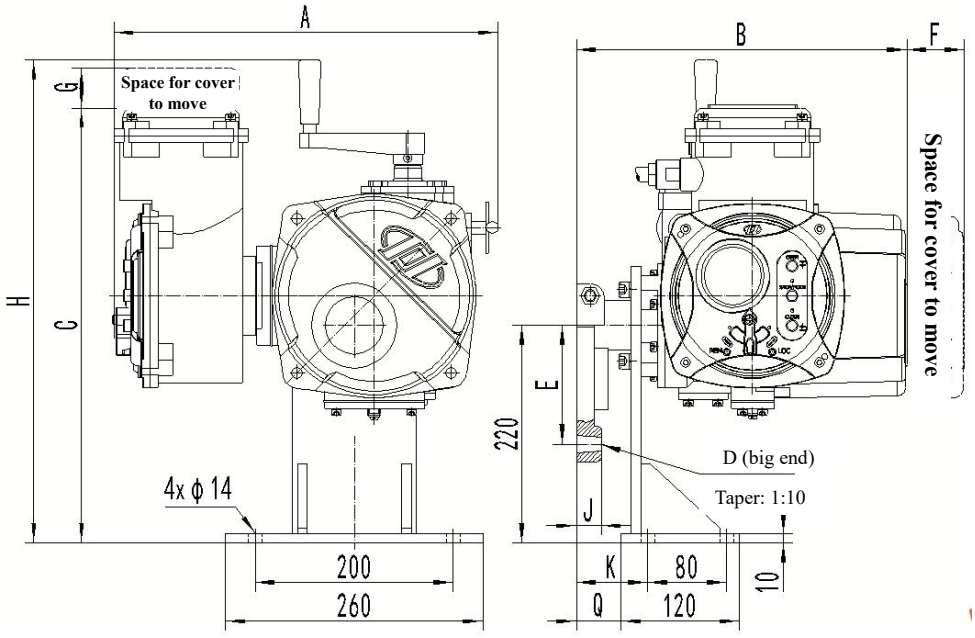
Connection flange: The actuator is designed with a flange that conforms to the ISO5211 standard, ensuring compatibility with ball valves or butterfly valves. According to the torque requirements transmitted by the actuator, the flange standard that matches the actuator is F07 to F12. See Figure 3.2.
The actuator's output shaft connector is detachable **(using M5 hexagon screws)**, and its center can be processed to a hole of required size based on user's valve connection size. If the user does not provide the required dimensions in advance, the user is responsible for processing the connection hole. The maximum size of the center hole should not exceed the dmax specified in the table.



Model	A	B	C	D	F	G	H	J	d_{max}
M0□11/21-□	4×M8	Φ70(F07)	4×M10	Φ102(F10)	Φ55	35	52	Φ33	Φ22
M0□30/60-□	4×M10	Φ102(F10)	4×M12	Φ125(F12)	Φ75	41	65	Φ48	Φ36

Figure 3.2 Size of Connection Flange

3.3 Lever type external size



Model	A	B	C	D	E	F	G	H	J	K	Q
M0□11/21-□	400	335	420	Φ18H7	120	160	120	488	20	72	45
M0□30/60-□	430	375	425	Φ22H7	150	180	120	505	22	82	55

Figure 3.3 Lever type External Size

3.4 External wiring for actuator

(1) Wire diameter selected

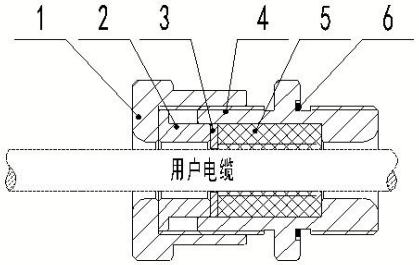
Power cable: hard wire or soft wire 1.0~1.5mm^2

Signal cable: hard wire or soft wire 0.25~1.0mm^2

The threaded size for installation of cable entrance bushing is 2-M25×1.5, and the recommended cable outer diameter is 10~14mm(Explosion-proof type recommended cable outer diameter: ø10 – ø19 mm).

During transport the cable entry threads are sealed with blanking plugs; the final degree of protection and explosion-proof performance is achieved only after proper on-site cable sealing. To obtain the required protection rating, standard actuators should be fitted with the metal watertight cable gland shown in Fig. 3.4-a (M25 × 1.5) and a cable of suitable outside diameter; tighten the gland nut after installation.Explosion-proof actuators must use only the cable entry device supplied with the unit (Fig. 3.4-b) together with a correctly sized cable; tighten compression nut 1 firmly to ensure the specified protection and explosion-proof rating.Cable entries must not face upwards.





①Compression nut ②Pressure ring ③Washer
④Cable entry bush ⑤Rubber ring ⑥O-ring

(a) Metal waterproof cable gland (b) Sectional view of cable entry bush

Figure3.4 Cable entry device

(2) External wiring

See Figure 3.5 for the external wiring terminal of the actuator, Figure 3.6 for electrical wiring diagram and Figures 3.7~3.9 for recommended basic wiring.

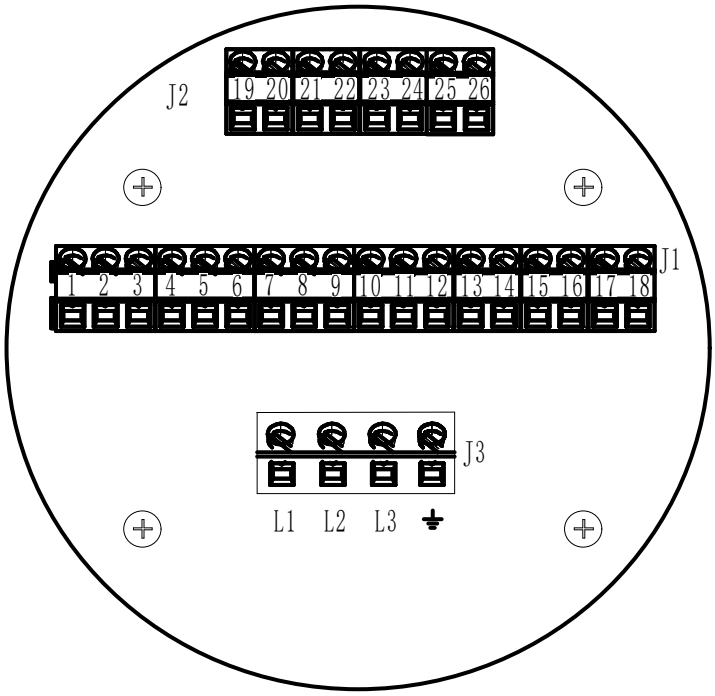


Figure 3.5 External Wiring Terminal

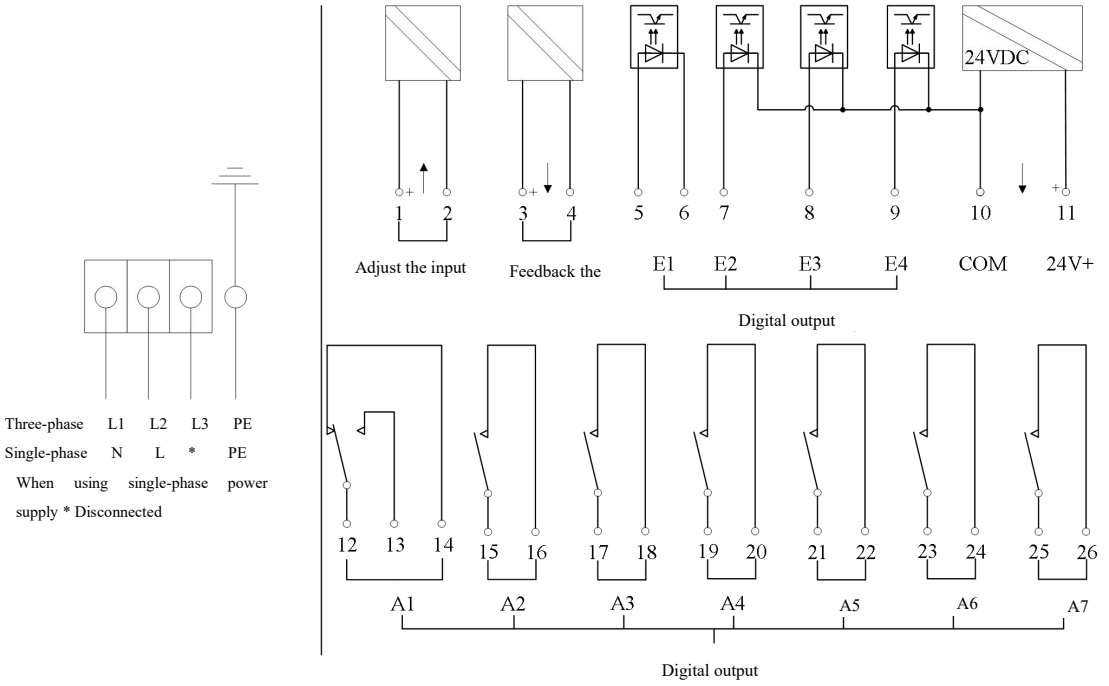


Figure 3.6 Electrical Wiring Diagram

Table 3.1 Terminal Functions

Function Name	Terminal No.	Function Description	Remark
Power supply	L1, L2, L3	Three-phase power supply (without phase sequence); When using single-phase power supply, L1 is N, L2 is L, and L3 is disconnected.	Standard
Grounding	⏚	Grounding protection	Standard
Adjust the analog input	1 (+), 2 (-)	4~20mAd.c. input	Standard
Feedback analog output	3 (+), 4 (-)	4~20mAd.c. output	Standard

Digital output 1 (E1)	5 (+), 6 (-)	For switching between the adjustment type control and switch type control, when terminals 5 and 6 are connected to 24V, it operates in adjustment type control mode; otherwise, it operates in switch type control mode. **(It can also be used as an ESD control command, but the ESD function needs to be set in the menu)**	Standard
Digital output 2 (E2)	7 (+)	Open command of actuator	Standard
Digital output 3 (E3)	8 (+)	Open command of actuator	Standard
Digital output 4 (E4)	9 (+)	Stop command of actuator	Standard
Common terminal (COM)	10 (+)	24Vd.c. Negative common terminal	Standard
24Vd.c. output	11 (+)	Power interface of actuator external output 24Vd.c.	Standard
Digital output (A1)	12, 13, 14	Fault feedback signal In case of fault, terminals 12 and 14 are connected ; in normal case, terminals 12 and 14 are disconnected;	Standard
Digital output (A2)	15, 16	Feedback Signal in local/remote status When the actuator is at Local, terminals 15 and 16 are disconnected; when the actuator is at Remote, terminals 15 and 16 are connected	Standard
Digital output (A3)	17, 18	SLO position signal When the valve is in the full On position, terminals 17 and 18 are connected, and when it is in other positions, the two terminals are disconnected	Standard
Digital output (A4)	19, 20	SLC position signal When the valve is in the full close position, terminals 19 and 20 are connected, and when it is in other positions, the two terminals are disconnected	Standard
Digital output (A5)	21, 22	Open over torque signal; in case of open over torque, terminals 21 and 22 are connected	**Optional**
Digital output (A6)	23, 24	Close over torque signal; in case of close over torque, terminals 23 and 24 are connected	**Optional**
Digital output (A7)	25, 26	Operating signal. When the actuator is operating, terminals 25 and 26 are connected	**Optional**

Note: Digital outputs A5, A6, A7 are **optional functions**, can be selected by users as needed when ordering.

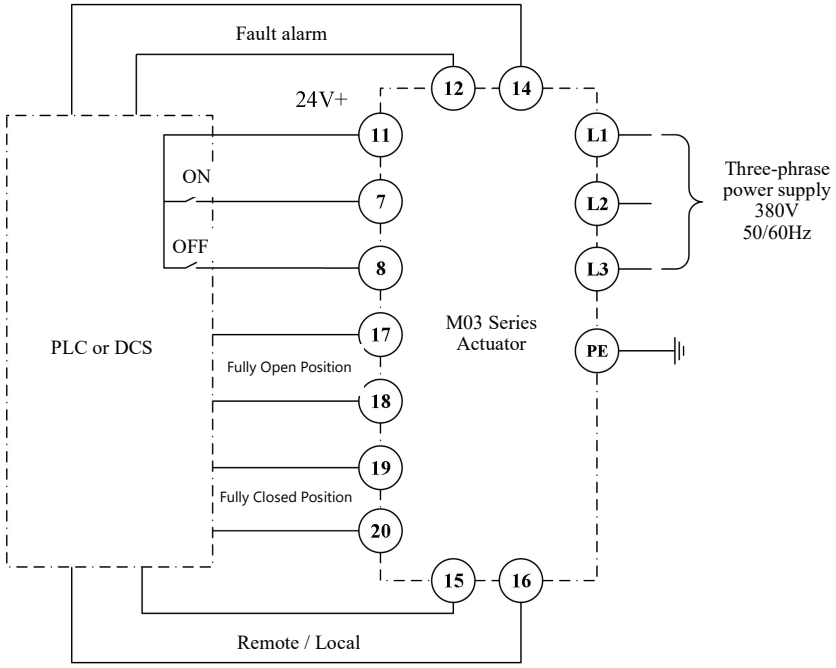


Figure 3.7 Switch Signal Control Wiring Diagram (Passive)

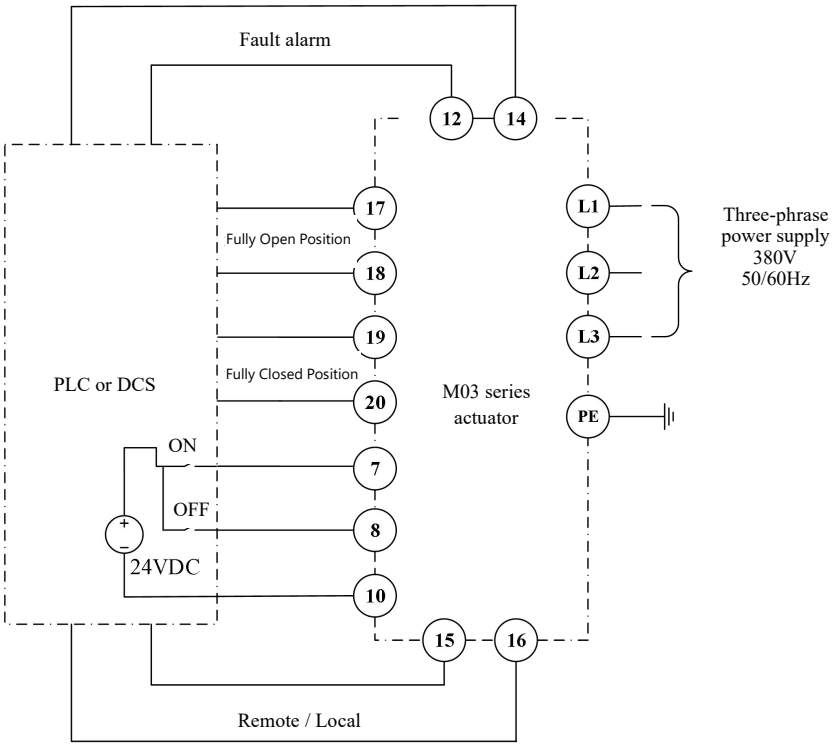


Figure 3.8 Switch Signal Control Wiring Diagram (Active)

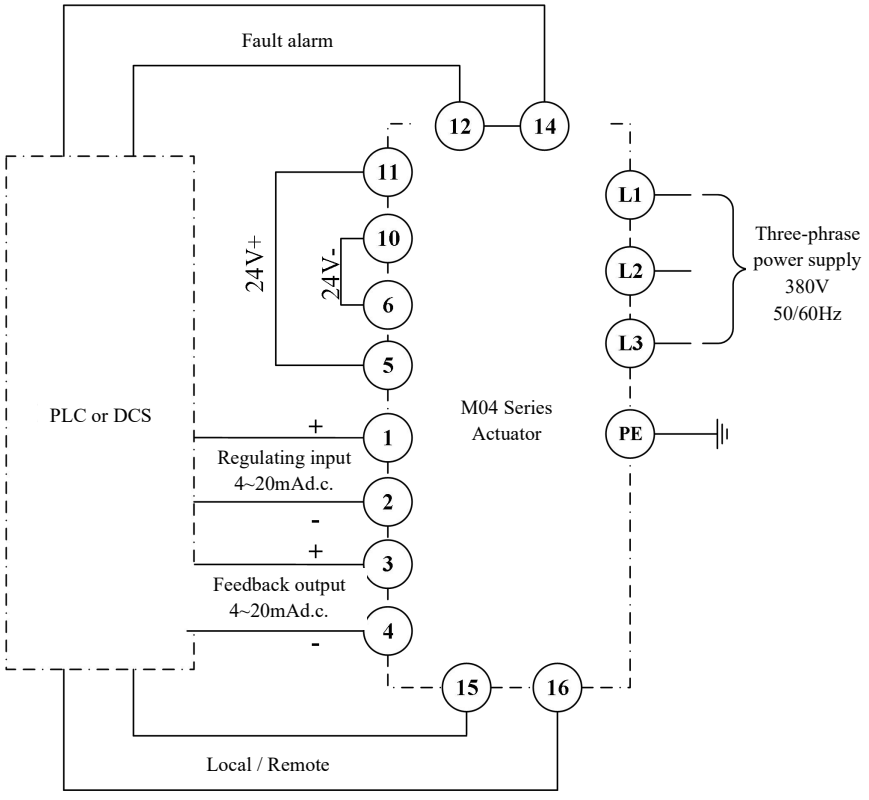


Figure 3.9 Switch Signal Control

3.5 Adjustment of limit switches and torque switches

The circuit principle of the actuator is shown in Figure 2.1. The switch is normally conductive. Once the switch is activated, the current to the motor in the corresponding direction will be cut off, and the motor will stop running.

(1) Adjustment of limit switches:

The cam on the potentiometer drive shaft is used to drive the limit switch. By adjusting the cam, the rotation range of the output shaft can be limited, as shown in Figure 3.10:

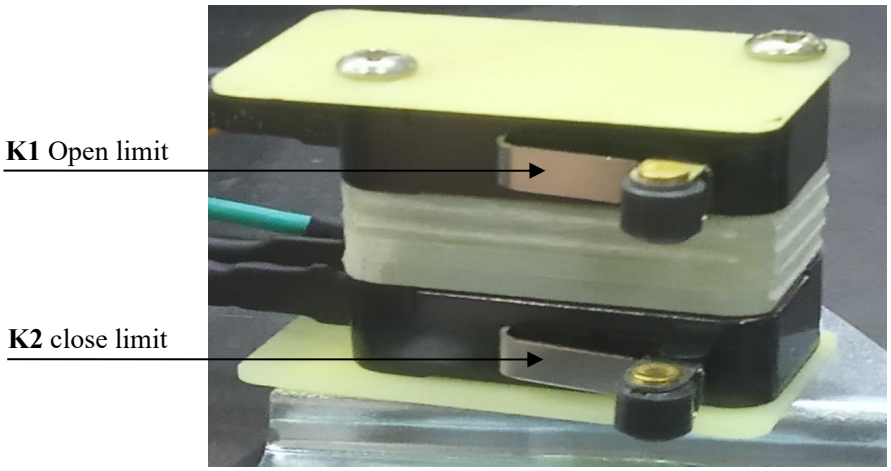


Figure 3.10 Stroke Limit Adjustment Diagram

(2) Adjustment of torque switch:

Our standard actuator is equipped with no mechanical torque switches, but it can be optionally installed by the user. When mechanical torque switches are installed, the torque has been preset according to the contract requirements when leaving the factory, and should not be readjusted unless absolutely necessary. If adjustment is required, it must be done with caution. The torque is generally set at 1.2 times the rated value. The closer the cam is to the micro-switch, the smaller the cut-off torque; the further the cam is away from the micro-switch, the larger the cut-off torque. Reducing the cut-off torque may prevent normal startup, while exceeding the set range may damage the motor or actuator or valve. See Figure 3.11 for torque adjustment procedures.

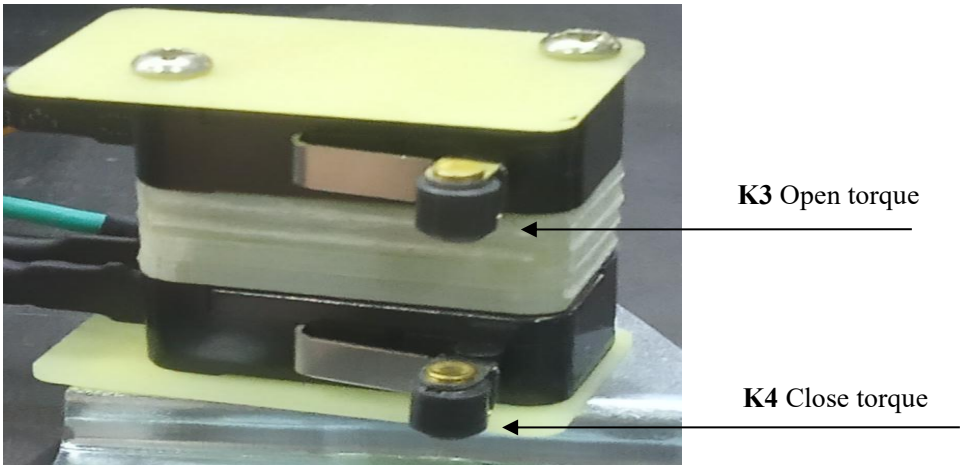
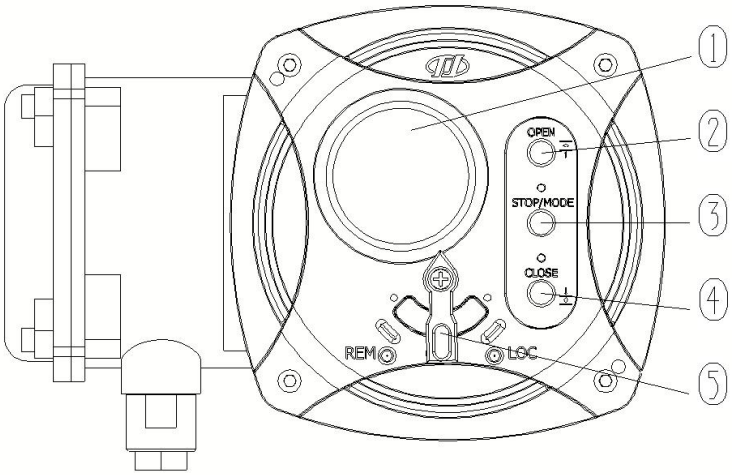


Figure 3.11 Adjustment of Torque Switches

4. Parameter Setting and Operation

4.1 Definitions of operation buttons

The functions of the control panel are shown in Figure 4.1:



① display window ② Open (Increase) button ③ Stop (Mode / Setting / Confirm) button
④ Close (Decrease) button ⑤ Remote / Local rotary selection button

Figure 4.1 Control Panel Diagram

The actuator’ s operating mode is set by the mode selector switch and offers three basic positio ns: Local (LOC), Remote (REM) and Out-of-Service (O/S). In LOC the valve can be opened/cl osed manually and parameters can be adjusted. REM provides two sub-modes—remote on/off co ntrol and remote 4‑20 mA d.c. analogue control—selected by digital input 1. When on/off cont rol is active, the actuator is operated by digital inputs 2 and 3.
Parameter settings and modifications for the actuator are conducted using the three buttons (OPEN, MODE, CLOSE) on the panel. If the electrical cover is opened, the three push-button switches (SK, MK, XK) on the controller’s circuit board can be used instead. These buttons correspond to the OPEN, MODE, and CLOSE buttons on the panel. The mode selection is achieved through a jumper on the circuit board. The jumper has three positions: JRE for remote, JOS for out of service, and JLOC for local. The jumper should be set to JLOC, and when the electrical cover is installed, the jumper should be set to JOS.
Function description for OPEN, MODE, and CLOSE (corresponding to increase, mode, and decrease buttons respectively):
MODE button: In LOC mode, press and hold the MODE button for 5 seconds to enter the menu. Click the MODE button to choose to save or exit ,and hold the MODE button to exit the menu.
OPEN and CLOSE buttons: In Remote mode, the open button displays current fault and alarm information(no change in display when there is no fault or alarm),and the close button display the software version number. In Local mode, press OPEN to increase the valve position, and press CLOSE to decrease the valve position. In setting mode, they are used to increase or decrease the set parameter value.

4.2 Requirements for displayed information

Parameters are displayed through the display screen, as shown in Figure 4.2.

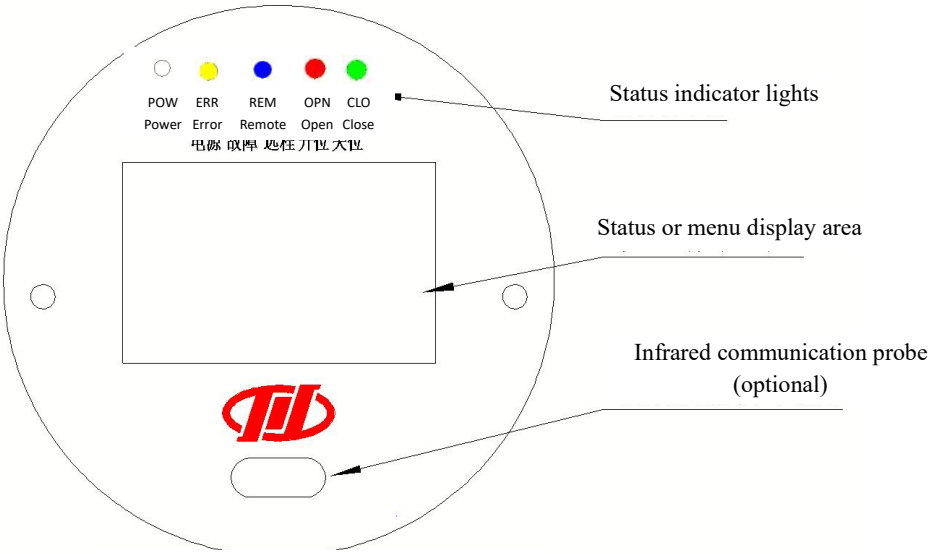


Figure 4.2 Display Screen Diagram

4.2.1 Status indicator lights

The status indicator lights are located directly above the display. Different colors represent different states of the actuator. From left to right, the indicator colors are white, yellow, blue, red, and green. Their functions are described below.

White：Power indicator. Steady on: power present; off: no power.

Yellow：Fault indicator. Steady on: fault present; off: no fault.

Blue：Remote indicator. Steady on: remote (conventional control); flashing: remote (bus control); off: local.

Red：Open-position indicator. fully open; flashing: opening; off: non-fully-open position.

Green：Close-position indicator. fully closed; flashing: closing; off: non-fully-closed position.

4.2.2 Display screen

The display screen shows the valve position, remote / local mode, fault alarm, software version number, menu interface, parameter setting interface, etc. The specific content displayed in Remote (REM) and Local (LOC) modes is as follows:

1. Remote mode
   (1) In switching control mode, the current valve position (in percentage) is displayed in the upper row, and “Remote” is displayed in the lower row;
   (2) In analog control mode, the current valve position (in percentage) is displayed in the upper row, and the target valve position (in percentage) is displayed in the lower row;
   (3) When the increase button is pressed and if there is a fault or more, the messages will be displayed in sequence in the lower row; When the decrease button is pressed, the software version number is displayed in the lower row.
2. Local mode
   (1) When operating in local mode, the current valve position (in percentage) is displayed in the upper row, and “local” is displayed in the lower row;
   (2) When setting in local mode, the screen displays menu information and set parameters or numbers

4.3Menu settings

Before operating or adjusting via the local control panel, set the mode selection switch to the "LOC" position (see Figure 4.1).

The operation/adjustment menu is divided into 8 main menus:

- Stroke setting (P1)
- Parameter setting (P2)
- Diagnosis (P3)
- Actuator’s parameters (P4)
- Calibration (P5)

- Digital output (P6)
- Emergency (P7)
- Communication (P8)

Each main menu can be divided into one or more sub-menus. Press buttons "↑" or "↓" to select between menus at same level. Press and hold or click the “STOP/MODE" button allows you to enter or exit menus at all levels.

Setting of zero and full positions

The zero and full positions of the actuator’s output shaft have been pre-set at the factory and generally do not need to be reset after installation. If the adjustment range of the on-site actuator’s output shaft is different from the factory-set range, or if the on-site operation method is different from the factory-set one, such adjustment range and operating method can be reset in the menu.

At the factory, the actuator is operated as follows: when facing the valve position indicator, rotate counterclockwise to increase the valve position. If there is no need to change such operating direction, the actuator should be operated to the CLOSE position during installation and then aligned with the mechanical zero position of the regulating mechanism. If the operating direction needs to be reversed (i.e., rotate clockwise to open the valve), the actuator should be operated to the OPEN position during installation and then aligned with the mechanical zero position of the regulating mechanism.

When setting the zero or full position in the menu, the display screen shows the A/D conversion output value of the current valve position sampling, **which generally ranges between 200 and 3900**. There must be a certain difference between the zero position and full position. When the difference exceeds the **minimum allowed value [800]**, the display screen will show “Save Allowed” in the lower row. Click the "STOP/MODE" button, it will prompt to save the settings. If the difference is smaller than the minimum allowed value, the display screen will show “Save Prohibited” in the lower row. Click the "STOP/MODE" button to exit directly to the previous menu. The setting of zero and full positions are performed in menus P1.1 and P1.2.

The zero position should be set near the limit of the mechanical rotation range of the output shaft, but maintaining a small gap from the mechanical stop. First operate it to the limit, then reverse it slightly. When the upper row’s sampling value changes continuously, it can be set as the zero position.

In local mode, operate the valve to the CLOSE position and adjust the close stroke switch until it just activates. Then, operate the valve to the OPEN position and adjust the open stroke switch until it just activates.

4.3.1 Stroke setting

Main menu			Notes
P1 Basic Setup	P1.1 Fully Close	11-4084	Adjust the close terminal position. **It cannot be saved beyond this range** The difference between the zero position and the full position must be greater than [800].
	P1.2 Fully open	11-4084	Adjust the open terminal position. **It cannot be saved beyond this range** The difference between the zero position and the full position must be greater than [800].
	P1.3 Stall Time	2s-20s	It means stalling time
	P1.4 Alarm Pos C	0%-50%	Preset close alarm output The menu is used with relay configuration 18-19 of P6
	P1.5 Alarm Pos O	50%-100%	Preset open alarm output The menu is used with relay configuration 20-21 of P6
	P1.6 Sig Invert	Normal Reverse	Normal: 4mA indicates 0% valve position, 20mA indicates 100% valve position. Reverse: 4mA indicates 100% valve position, 20mA indicates 0% valve position.

4.3.2 Parameter settings

Main menu			Notes
P2 Parm Setup	P2.1 Lo Control	Self-holding Inching	Local switching input characteristics
	P2.2 Re Control	Self-holding Inching	Remote switching input characteristics
	P2.3 Open Limit	55%-100%	Open limit range of 55%-100% This menu setting is effective, and the actuator will stop at the set value.
	P2.4 Close Limit	0%-45%	Close limit range of 0-45% This menu setting is active, and the actuator will stop at the set value.
	P2.5 Fault Handle	HOLD / ALL ON / ALL OFF	In case of regulating type, **adjust** the action to be performed when **the signal is disconnected**
	P2.6 ESD Active	high level low level	ESD working active level
	P2.7 ESD Mode	Normal Switch type Adjust type	Normal (no ESD function): terminals 5 and 6 are for switching between switching type/regulating type. Switching / regulating type: terminals 5 and 6 are for ESD control instructions, set on-site to either switching type or regulating type.
	P2.8 ESD Pos	HOLD / ALL ON / ALL OFF	Actions to be performed when ESD emergency operation is active: (Active when set to switching type or regulating type in P2.7 menu)
	P2.9 Language Set	Chinese English	Set the display language

4.3.3 Diagnosis

Main menu			Notes
P3 Diagnostics	P3.1 Fail Info	See Table4.1	Fault information
	P3.2 Stroke Info	0～4095	Display potentiometer values at zero and full positions
	P3.3 Clear fault		Clear fault alarm

4.3.4 Actuator's parameters

Main menu			Notes
P4 System Info	P4.1 Version Info		View the software version number

4.3. 5 Calibration

Main menu			Notes
P5 Calibration	P5.1 Password	50	Enter password "51" to enter the menu below
	P5.2 Input-4mA	570-630	Set the calibrated input zero point value (4mA) by analog signal Note: It will not be saved if deviation is greater than 5%.
	P5.3	2850-3150	Set the calibrated input full point value

	Input-20mA		(20mA) by analog signal Note: It will not be saved if deviation is greater than 5%.
	P5.4 Output-4mA	200-600	Set the feedback value of calibrated output valve position zero point (4mA)
	P5.5 Output-20mA	1700-2300	Set the feedback value of calibrated output valve position full point (20mA)
	P5.6 DeadBand	0.4%-10%	The smaller the dead zone, the higher the positioning accuracy, but less stable.

4.3.6 Digital output

Main menu			Notes
P6 Output Config	P6.1 Password	60	Enter password "61" to enter the menu below
	P6.2 A1 Function	Fault alarm 0	0: When the state is true, the relay is disconnected 1: When the state is true, the relay is connected Configuration settings are shown in Table 4.2.
	P6.3 A2 Function	Remote active 1	
	P6.4 A3 Function	SLO position 1	
	P6.5 A4 Function	SLC position 1	
	P6.6 A5 Function	Open stalling 1	
	P6.7 A6 Function6	Close stalling 1	
	P6.8 A7 Function	Running 1	

4.3.7 Emergency

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

4.3.8 Communication

Main menu			Notes
P8 Communication	P8.1 Bus Address	1-126	Infrared / HART / Modbus / Profibus Address required to be set
	P8.2 Remote Mode	Traditional Bus switch Bus regulation	Traditional control: in remote mode, control via terminals 5 and 6 Bus switch: in remote mode, the bus command is switching type Bus regulation: in remote mode, the bus command is regulating type
	P8.3 Bus Baudrate	1200bps-115200bps	Used for Modbus bus (active when Modbus is selected in 8.4)
	P8.4 Bus Mode	Traditional / profibus / modbus / encrypted / Hart/ FF / Profinet	Set bus type

4.3.9 Storage Settings

First, set new parameters with buttons "↑" or "↓" on the control panel of the actuator, and then click the button "STOP/MODE". If the parameters have been modified, the display will show a static "Confirmation". To cancel, click the button "↑" or "↓", "Cancel" will be displayed, and then click

the button “STOP/MODE” to return. To save a new value, click the button “STOP/MODE”. The flashing “Saving” symbol indicates that the parameters modified have been successfully saved, while the flashing “Save Failed” symbol indicates that the parameters modified failed to be saved.

Table 4.1 Fault Alarm Information

Upper display	Lower display	Fault Causes and Countermeasures
Displaying the current fault S/N 01~13	**PC**	The difference between the input signal and feedback signal exceeds 105%
	FOFF	The potentiometer code value is too low or the A/D converter is faulty.
	FOVE	Valve position percentage is greater than 120% or less than -20%.
	AOFF	No regulating signal or the A/D converter is faulty.
	AOVE	The regulating signal is too high or the A/D converter is faulty.
	CLIN	P2.4 Limit value is > 0 and the limit has been reached.
	OLIN	P2.3 Limit value is < 100 and the limit has been reached.
	ELIN	Check the limit switch and its plug connections.
	CSTA	The actuator is mechanically jammed or the load exceeds the limit in close position, or the motor is faulty.
	OSTA	The actuator is mechanically jammed or the load exceeds the limit in open position, or the motor is faulty.
	EEP	Reset the parameters or send the actuator to factory for repair.
	ADC	The potentiometer code value is too high or the AD converter is faulty.
	DIRE	The relay is faulty or there is a wiring error in the motor.

Table 4.2 Switching Value Output

Upper display	Lower display	Description
0	**FaultAlarm 0**	Disconnected in case of fault alarm
1	**FaultAlarm 1**	Connected in case of fault alarm
2	**RemoteEff 0**	Disconnected in remote state
3	**RemoteEff 1**	Connected in remote state
4	**Open Pos 0**	Disconnected in full open position
5	**Open Pos 1**	Connected in full open position
6	**Close Pos 0**	Disconnected in full close position
7	**Close Pos 1**	Connected in full close position
8	**Opening 0**	Disconnected when running to open
9	**Opening 1**	Connected when running to open
10	**Closing 0**	Disconnected when running to closed
11	**Closing 1**	Connected when running to closed
12	**Running 0**	Disconnected when running
13	**Running 1**	Connected when running
14	**AOFF 0**	Disconnected in case of no adjusting signal input
15	**AOFF 1**	Connected in case of no adjusting signal input
16	**FOVE 0**	Disconnected when the valve position is smaller than -20% or greater than 120%
17	**FOVE 1**	Connected when the valve position is smaller than -20% or greater than 120%
18	**Preset-C 0**	Disconnected when the valve position is smaller than or equal to set close position
19	**Preset-C 1**	Connected when the valve position is smaller than or

Upper display	Lower display	Description
		equal to set close position
20	Preset-O 0	Disconnected when the valve position is greater than or equal to set open position
21	Preset-O 1	Connected when the valve position is greater than or equal to set close position
22	Open stall 0	Disconnected in case of open stalling
23	Open stall 1	Connected in case of open stalling
24	Close stall 0	Disconnected in case of close stalling
25	Close stall 1	Connected in case of close stalling
26	Stall 0	Disconnected when stalling in either open or close position
27	Stall 1	Connected when stalling in either open or close position
28	Ready 0	Disconnected when actuator's power on self-test is completed
29	Ready 1	Connected when actuator's power on self-test is completed

Note: Any output relay can be configured to any state as shown in the table above.

4.4 Acceptance Test after installation and debugging

After installation and debugging, check:

1. Whether the actuator is installed securely: shake the mounting bracket and actuator by hand to check for any wobbliness. Check the screws on the cover with a screwdriver to ensure they are properly tightened. Check whether the rocker arm and connection points are securely installed.
2. Whether the actuator operates accurately: power on the installed actuator and send signals to it, and observe whether it operates as expected. Check if the valve can be opened or close to as required.

5. Use and Operation

Please recheck whether the actuator is installed reliably according to the method specified in section 4.4 above before using it, and test the system control signals to be connected to ensure they are within the actuator's input signal range. Check whether the power supply voltage is consistent with that marked on the nameplate.

The operator must have received training on the actuator's basic functions, passed the relevant exam and been awarded the operation certificate before being authorized to operate the actuator. Unauthorized personnel are strictly prohibited from operating the actuator without approval.

When operating the actuator in high-temperature environments, operators must wear special protective gloves to prevent injuries caused by heated metal components. Do not operate the handwheel when the actuator is powered on, or grip the handwheel with hands to avoid damages to the machine or personal injury.

When replacing the grease inside the box, first clean the gears and box with kerosene, dry them, and then add the new grease. Only use the grease model recommended by our factory. After completing the replacement of grease, wipe the surrounding areas clean to avoid polluting the environment.

When the actuator is operating, the operator must strictly follow safety procedures: first disconnect the signal, then cut off the power supply, and finally open the cover to perform adjustments or maintenance. This prevents the actuator from inadvertently starting the actuator due to operator negligence.

The operator must strictly comply with the relevant rules and regulations for instrument control, follow the equipment handover procedures, and maintain detailed records of equipment operation, faults, and handling during their shifts.

Operating steps for the actuator:

1. **Before the actuator is powered on the first time, Rotate the handwheel clutch clockwise and turn the handwheell to set the valve position indicator's pointer to the middle position, then power it on for debugging.**
2. When operating in local mode, switch the working condition knob to the "LOC" position. In inching mode: press the button "OPEN" to increase the valve opening, or press the button "CLOSE" to decrease the valve opening. In self-holding mode: press the button "OPEN" to increase the valve opening and stop until it is fully open, or press the button "CLOSE" to

decrease the valve opening and stop until it is fully closed. If pressing the button “MODE/STOP” during operation, it will stop immediately at the current position. The upper part of the display will show the current valve position value;

3. When operating in remote mode, switch the working condition knob to the “REM” position. Control the opening or closing of the valve by the 4-20mAd.c. signal or the switching value input signal provided by the upper-level control unit.
4. For menu settings, please refer to section 4.3 of this Manual.
5. When operating the handwheel of the actuator, the mode selection switch must be set to "O/S" and the external power supply disconnected first. Then, rotate the handwheel clutch clockwise, and subsequently turn the handwheel. After the operation is completed, move the handwheel clutch all the way away from the handwheel to reset it.
6. Solutions for emergency: in case of an emergency, immediately disconnect the signal and power off, then rotate the handwheel.

6. Fault Analysis and Troubleshooting

The electrical components of the actuator feature a fault self-diagnosis function, which can identify fault causes and provide solutions based on the alarm information, as shown in Table 4.1. General fault diagnosis can be carried out following the flowchart as shown in Figure 6.1.

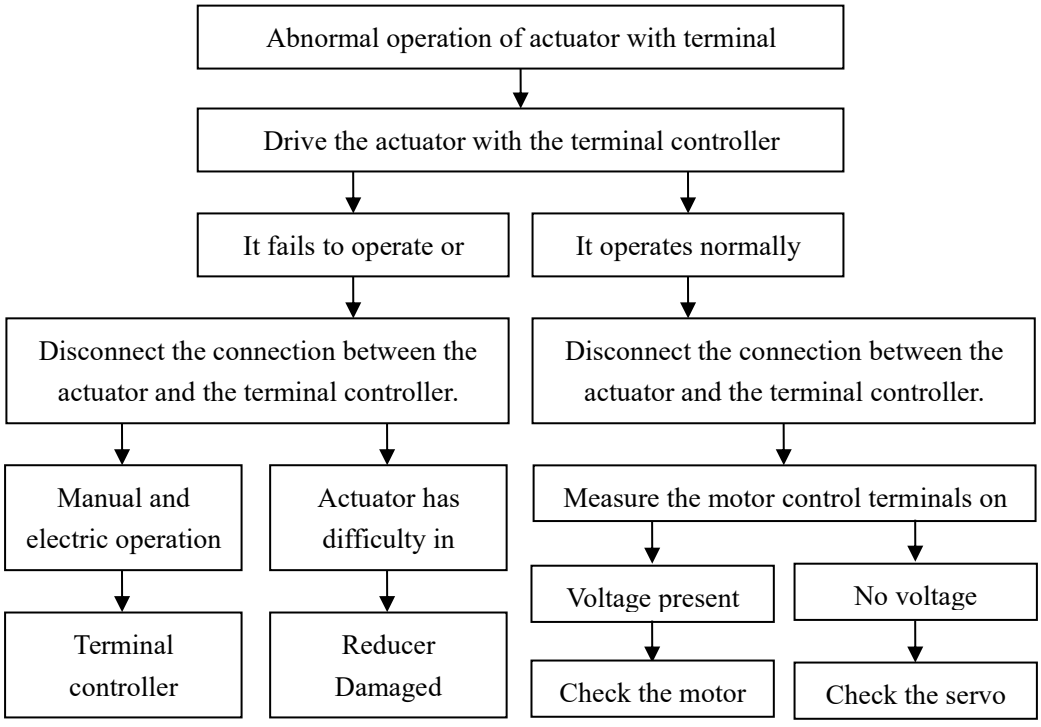


Figure 6.1 Fault Diagnosis Flowchart

7. Safety Precautions and Troubleshooting

7.1Safety precautions

The operating environment should be free of corrosive gases.

The power supply must be grounded well, with a grounding resistance of ≤2Ω;

When operating the handwheel, switch it to the “LOC” mode and confirm that the motor is not running before turning the handwheel. Pressing buttons is strictly prohibited when operating the handwheel to avoid injury!

7.2 Troubleshooting procedures and methods in case of malfunction

If the actuator or terminal controller fails to operate or operates abnormally, first disconnect the signal and power off, and then check the actuator following the flowchart in Figure 6.1.

8. Maintenance and Repair

8.1 Daily maintenance, repair and Calibration

Visual check of the appearance of actuator;

Check whether the screws are tightened;

Check if the reading in the display window is consistent with the control signal input.

Observe whether the display shows any alarms; in case of alarm, find out the cause.

Observe whether the valve position displayed is consistent with the set mechanical position, and calibrate regularly.

The reducer's mechanical structure is lubricated with lubricating grease (general grease: Great Wall molybdenum disulfide lithium-based Grease No. 3 Q/SH303 357-2004; Low-temperature type grease: extreme pressure high-temperature lithium grease No. 2) during operating. It is recommended to replace the lubricating grease every 2 or 3 years to extend the service life of the actuator.

9. Transportation and Storage

Transport and storage temperature: – 10℃ to +55℃. To avoid shortening the service life, the storage temperature should not exceed 40℃for prolonged periods.

Unless supplied in special packaging, the unit must be kept in a dry indoor location to prevent condensation.

When transported or stored in humid or corrosive atmospheres, suitable packaging with desiccant is required; check the desiccant regularly to ensure it remains effective.

10. Unpacking and inspection

Each actuator has undergone rigorous inspection before shipment to guarantee product quality.

Before opening the package, the customer must confirm that the "open here" direction on the carton matches the orientation marked on the shipping label. Only then proceed to unpack and perform the following checks:

Inspect the actuator for any damage sustained during transport.

Verify that the actuator model printed on the carton and the unit itself agree with the packing list; ensure all items listed are present.

If any discrepancy or damage is found, contact the supplier immediately.

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