川仪股份
CYAC

Operation Manual

M Series Intelligent Electric Actuator

M85/86



Chongqing Chuanyi Automation Co., LTD. Actuator Filiale

V002510

Preface

Thank you for using M8500/M8600 series electric actuators. Please read through the Instruction Manual carefully before installation and debugging.

■ 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) It is forbidden to extract or copy part or all of the Instruction Manual without permission;

(4) The content of the Instruction Manual may be changed without prior notice; and

(5) 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 product. 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 product or the system controlled by the product, make sure such circuit is installed on the outside of the product. Please do not attempt to change the product or install such circuit in the product.

(3) When replacing spare parts or consumables of the product, please use the parts recommended by us.

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 during direct or indirect using process.

■ About Environmental Protection

To better protect the environment and human health, when installing, repairing and maintaining the product or upon expiration of the service life of the product, 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.

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

■ Special Warnings:

(1) After installation is complete, the oil plug at the highest point of the M86 series (Modulating Type) actuator must be replaced with the vent screw provided in the spare parts. The M85 series (On/Off Type) does not require this!

(2) The cables must thread through the outlet sleeve provided as spare parts and be tightened down tightly!

(3) The screws of the cable sleeve must be tightened!

(4) When installing the angular stroke electric actuator, please strictly match the close position of the valve with that of the electric actuator. It is strongly recommended to use shielded wires as connections!

We are not responsible for any loss due to noncompliance with the installation requirements of the product.

Table of Contents

1. Overview 1
2. Protection Class 1
3. Structural features and operating principle 2
   3.1. General structure and its operating principle and features 2
   3.2. Composition and Principle of Electrical Components 2
   3.3. Addtional gearbox 2
4. Actuator models 3
   4.1. General data 3
5. Lubrication 4
   5.1. Actuator 4
   5.2. Lubricating oil 4
   5.3. Additional gearbox 4
   5.4. Auxiliary output module(type A) 5
6. Electrical connection and debugging of actuator 5
   6.1. Electrical connection 5
   6.2. Wire diameter selection (contact connection) 9
   6.3. Thread size of cable sealing port 9
   6.4. Fuse 9
   6.5. Debugging procedures, methods and precautions 9
   6.6. Acceptance test items, methods and criteria after debugging 15
   6.7. Preparation before test run, test run start and test run 15
7. Use and operation 16
   7.1. Preparation and inspection before use 16
   7.2. Safety and safe protection, safety sign and its description before and during use ... 16
   7.3. Operating methods 16
   7.4. Monitoring and records during operation 16
   7.5. Operating procedures and precautions for shutdown 16
8. Trouble analysis and troubleshooting 17
9. Maintenance and repair 19
   9.1. Daily maintenance and servicing 19
10. Dimension & weight 20
   10.1. Appearance and installation size of actuator 20
   10.2. Appearance and installation size of angular stroke electric actuator (straight type) 21
   10.3. Appearance and installation size of angular stroke electric actuator with lever 22

Unpacking Check, Transportation and Storage

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; and
- After unpacking, 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.

2 Transportation and storage

- Transportation temperature: -30°C~+75°C; storage temperature: -10°C~45°C.
- Without special packaging, it should be placed in a dry indoor place to avoid condensation.
- 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.

3 Safety instructions

By design, the actuator is specialized equipment for driving final control elements (valves, dampers, etc.). Improper operation can pose dangers to personnel. Pay attention to the following during use:

- The installation, disassembly, commissioning, operation, and maintenance of the actuator must be performed by qualified professional technicians, while wearing necessary protective equipment such as safety helmets, safety harnesses, safety glasses, work clothes, insulating gloves, and safety shoes. In special circumstances, it must be carried out under the guidance of our company's professionals.
- After the actuator is installed, it is strictly forbidden to hang any items on the handwheel and the changeover lever.
- Manual operation must strictly comply with the handwheel operation instructions in this guide. It is prohibited to operate the changeover lever and handwheel while power is on.
- Before electric operation, ensure that the handwheel is fully pulled out and the clip is securely fastened to the handwheel shaft.
- When operating the actuator in high-temperature environments, operators must wear special protective gloves to prevent work accidents caused by heated metal parts.
- In hazardous areas, do not use conductive or thermally conductive objects to contact the actuator. Cut off the power, remove the actuator, and move it to a safe area for repair or maintenance.
- Lubricating oil spilled during oil change should be cleaned up promptly to avoid accidents.

- When opening the cover for operation, personnel must strictly follow safe operating procedures: cut off the power first, wait for 5 minutes before performing electronic component testing, replacement, and other operations.

1. Overview

The M8500/M8600 series frequency conversion electric actuators are specialized equipment for driving final control elements (valves, dampers, etc.).

This product uses a high-performance Digital Signal Controller (DSC) as the core, adopting advanced frequency conversion control technology to achieve ideal soft start and soft positioning control, reducing mechanical impact. It also has a series of self-diagnostic and self-protection functions such as over-torque and over-temperature, providing excellent protection for terminal control units like valves. Using frequency conversion control, the speed and output force (torque) during positioning can be flexibly adjusted, achieving high-precision positioning without overshoot. The starting current is close to the motor's rated current, which is one-fourth to one-eighth of the starting current of conventional on/off control, reducing impact on the drive components and the motor, resulting in high reliability.

According to user requirements, this product can also have infrared communication function or bus communication functions compliant with MODBUS, HART, PROFIBUS-DPV1, FF protocols, enabling digital communication control, quick setup, remote operation, fault diagnosis, and information collection for the product.

This product is widely used in industries such as power, metallurgy, petroleum, chemical, building materials, urban water supply, and wastewater treatment, in applications with high control requirements.

2. Protection Class

The actuator is supplied with a characteristic protection class of IP65. Once the cable glands are installed and cables are connected, it can ensure a protection class of IP67.



Figure 2.1 Main components

3. Structural features and operating principle

3.1. General structure and its operating principle and features

The actuator mainly consists of a frequency conversion motor, position sensor, worm gear, worm shaft, drive shaft, control unit, local operation panel, and handwheel.

The control unit receives 4~20mA or switch control signals and drives the motor to rotate. The motor drives the worm shaft, which in turn drives the worm gear to rotate the output shaft. The position sensor detects the displacement of the motor rotation and sends the valve position signal to the control unit. When the control unit detects that the position signal matches the position specified by the given control signal, it cuts off the motor power, and the self-locking characteristic of the worm gear and worm shaft stops the actuator.

3.2. Composition and Principle of Electrical Components

The electrical components of the actuator mainly include the terminal block, power filter board, CPU board, signal board, frequency conversion board, Hall sensor board, etc.

The terminal block provides external connections, including control signal input/output terminals, power terminals, lithium battery and its terminals, battery switch, etc., located inside the terminal box.

The power filter board is installed inside the operation panel cover, mainly composed of a power filter, fuses, and resistor-capacitor filter networks, completing power filtering to achieve EMI protection. The main power enters from the terminal block, passes through the power filter board, and then outputs to the frequency conversion board to power the entire unit.

The CPU board and signal board are located inside the operation panel cover, with the signal board on the back of the CPU board. The button switches and knobs on the operation panel operate the magnetic sensitive switches on the CPU board through magnetic components, achieving non-contact control. The CPU board mainly consists of a microcontroller, digital/analog input/output channels, operation switches, display, and other circuits, serving as the control core of the entire unit. Analog control signals are input to the CPU board via the signal board. Feedback signals are converted from digital to analog by the CPU board, outputting DC voltage to the signal board, which then performs photoelectric isolation and V/A conversion before outputting to the upper-level control system. The displacement of the output shaft is detected by the Hall displacement sensor, which outputs pulse signals to the CPU board for counting and conversion. Switch output relays 1~4 are on the CPU board, and switch output relays 5~7 are on the signal board.

The frequency conversion board is located inside the operation panel cover, directly mounted on the bottom of the housing. It mainly consists of a power transformer, main relay, IGBT module, and its control circuit. The transformer provides power for the entire unit. The IGBT module, controlled by the CPU board, performs AC-DC-AC conversion, realizing frequency conversion control of the motor.

3.3. Addtional gearbox

The actuator is equipped with an additional gearbox to output different torques. The data tag on the additional gearbox records relevant input torque, output torque/force and other information.

4. Actuator models

The basic models are shown in Figure 4.1:

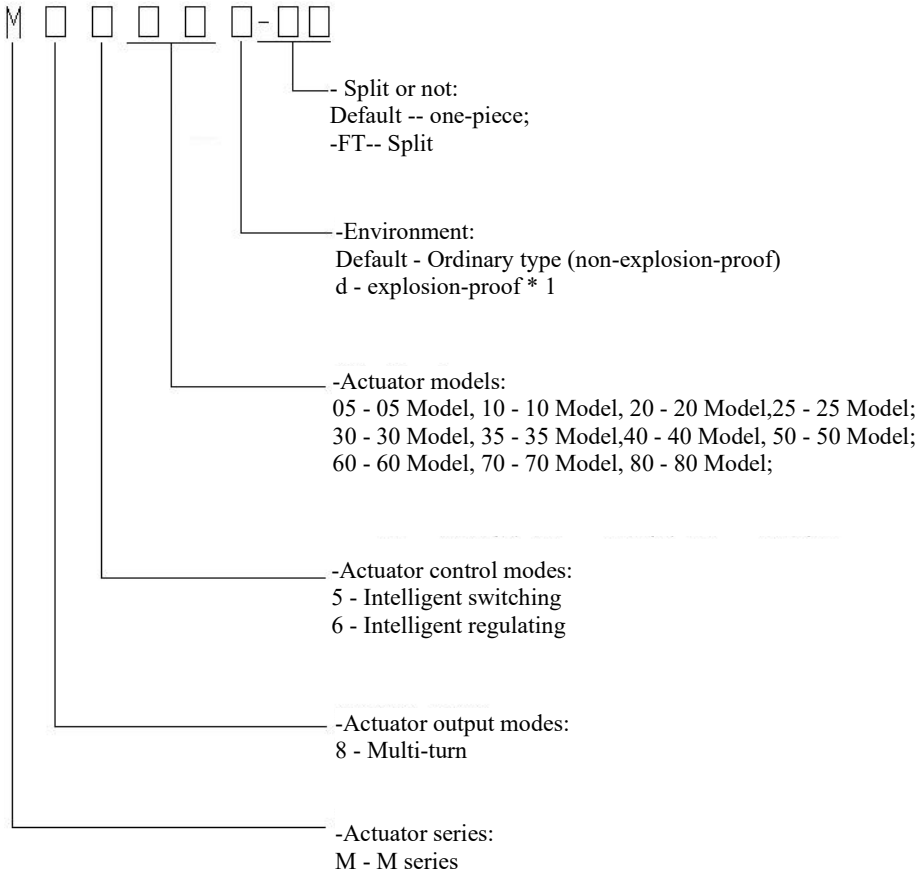


Figure 4.1 Basic models of M85/86 series

4.1. General data

Power Supply Voltage: 380 (-15% ~ +10%) V a.c. (Optional 400V a.c., 415V a.c., 440V a.c., 460V a.c., -15%/+10%);
Frequency: 50 × (±1%) Hz (Optional 60 × (±1%) Hz);
Harmonic Content: Less than 5%.
Note: The voltage and frequency of the actuator can be specified separately according to user requirements.
Voltage Output: 24V DC; Max. 15mA, with output short-circuit protection.
Motor Control: Three-phase frequency conversion control.
Duty Mode: S4------25%, 1200 times/hour, according to IEC 34.
Protection Class: IP66/IP67/IP68.
Humidity: <95% average (To avoid condensation, please use a heater)
Ambient Temperature: -25℃ ~ +70℃.
Installation Position: Any. However, avoid having the two oil drain plugs of the actuator on or near the same horizontal plane.
Electromagnetic Immunity (EMC): Radio-frequency electromagnetic field immunity test level 3, test results comply with clause 9 b of GB/T 17626.3-1998.
Electromagnetic Emissions (EMC): According to EMC product standard EN61800 Part 3.
Electrical Connection: See Part 6 for details.
Minimum Setting Pulse: 50ms complete pulse.

Controller Dead Band: 0.5%; (0.2%-10% adjustable).
Analog Input (Optional): 4mA-20mA d.c. (M86□□); Electrically isolated, input voltage not less than 10V.
Digital Inputs (E1-E4): 4 channels, opto-coupler isolated inputs, independent potential, freely configurable.
Digital 0: -3V ~ +5V or open circuit.
Digital 1: +12V ~ +35V.
Analog Output (Optional): 4mA ~ 20mA d.c. position signal; Load capacity, max. 500Ω; Electrically isolated.
Digital Outputs: Standard 4 (A1-A4): Optional 3 (A5-A7).
Among them, A3~A7 maximum output capacity is 5A, 220V a.c.; Other digital outputs maximum voltage not more than 50V, maximum current not more than 150 mA, minimum current >1mA. The default settings for each output content are shown in Table 1. They can be configured as other alarm outputs in the P6 menu OUTPUT switch output configuration as needed.

5. Lubrication

5.1. Actuator

The actuator requires oil lubrication. There are no restrictions regarding the installation position. The lubricating oil does not need to be replaced throughout the entire service life of the actuator.

When supplied, both oil drain holes are sealed with drain plugs. Once the actuator is installed in its position, to avoid increased internal pressure due to air expansion caused by operating heat, the M86 series (Modulating Type) actuator needs to have the top drain bolt replaced with the vent plug provided. The M85 series (On/Off Type) does not require this.

5.2. Lubricating oil

Table 5.1 Lubricating oil

Actuator	Oil quantity	Oil type	Temperature range
M8610/M8510	0.3L	Heavy-duty gear oil	-25℃～+70℃
M8620/M8520	0.3L		
M8630/M8530	0.4L		
M8640/M8540	0.8L		
M8650/M8550	0.8L		

5.3. Additional gearbox

Some actuators are connected to an additional gearbox to increase output torque or limit the operating angle. To extend its service life, it also needs lubrication.

5.3.1. Worm gear

It is recommended to replace the lubricating oil once every 6 years of operation.

5.3.2. Linear conversion nuit

It is recommended to replace the lubricating oil once every 4~6 years of operation.

5.4. Auxiliary output module(type A)

For rotary-to-linear conversion, the actuator can be equipped with a Type A auxiliary output module. The internal axial bearing is lubricated by grease in the module connection sleeve. It needs supplemental lubrication with oil every 2 months.

Use the same lubricating oil for the valve stem lubrication.

6. Electrical connection and debugging of actuator

6.1. Electrical connection

The external wiring terminals of the actuator are shown in Figure 6.1. Table 6.1 provides the terminal functions. The electrical wiring schematic is shown in Figure 6.2. Recommended wiring diagrams are shown in Figures 6.3~6.5. Electrical wiring is directly connected to the terminal block in the product's terminal box via cables. Grounding points are provided both inside the actuator's terminal chamber and on the housing. Grounding is an important measure to ensure operator safety and electromagnetic immunity. Please ensure reliable grounding during use.

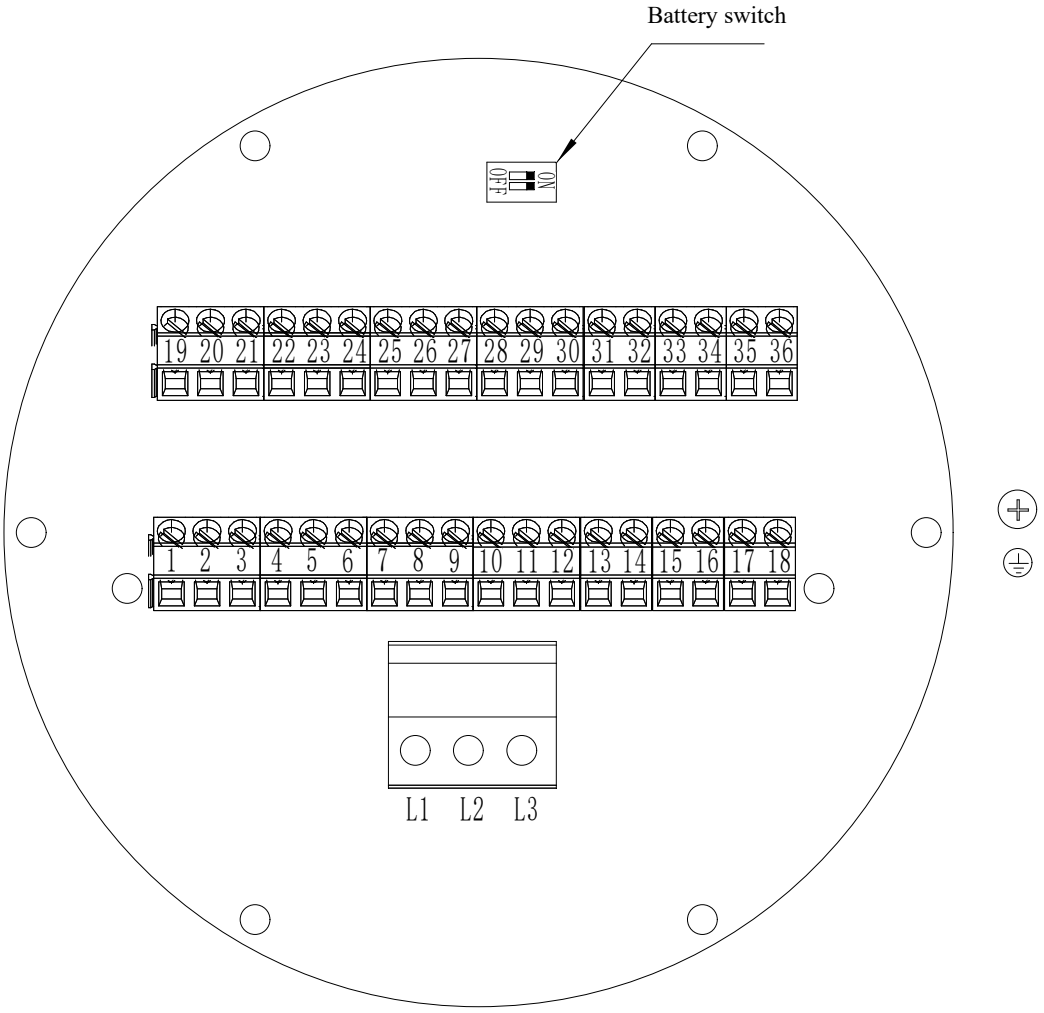


Figure 6.1 External wiring terminal

Table 6.1 Terminal functions

Function name	Terminal number	Function description	Remarks
Power supply	L1、L2、L3	Three-phase power supply (without phase sequence)	Standard configuration
Grounding	⏚	Protectively earthed	Standard configuration
Digital input 1 (E1)	11（+）、12（-）	Open the actuator	Standard configuration
Digital input 2 (E2)	13（+）、14（-）	Close the actuator	Standard configuration
Digital input 3 (E3)	15（+）、16（-）	Switch between remote analog control (24V) and remote switching value control (0V); ESD control input when ESD function is available	Standard configuration
Digital input 4 (E4)	17（+）、18（-）	Shut down the actuator	Standard configuration
Digital output 1 (A1)	1、2、3	Fault signal: terminal 1 is a common terminal. Normally, terminals 1 and 2 are connected; in case of fault (or power failure), terminals 1 and 3 are connected.	Standard configuration
Digital output 2 (A2)	4、5、6	Feedback signal in local/remote state: terminal 4 is a common terminal; when the actuator is set at Local (LOC) state, terminals 4 and 5 are connected; and when the actuator is set at Remote (REM) state, terminals 4 and 6 are connected.	Standard configuration
Digital output 3 (A3)	7、8	SLO signal; when the actuator is set to the fully open position, terminals 7 and 8 are connected.	Standard configuration
Digital output 4 (A4)	9、10	Fully-closed signal; when the actuator is set to the fully closed position, terminals 9 and 10 are connected.	Standard configuration
Digital output 5 (A5)	25、26、27	STO alarm signal; terminal 25 is a common terminal; in case of alarm, terminals 25 and 26 are connected.	**Optional**
Digital output 6 (A6)	28、29、30	STC alarm signal; terminal 28 is a common terminal; in case of alarm, terminals 28 and 29 are connected.	**Optional**
Digital output 7 (A7)	31、32	Alarm signal of actuator; terminals 31 and 32 are connected.	**Optional**
Regulating analog input	33（-）、34（+）	4mA-20mA d.c. input, applicable for M84 series and not applicable for M83 series	**Optional**
Feedback analog output	35（-）、36（+）	4mA-20mA d.c. output, applicable for M84 series and M83C series	**Optional**
24V d.c. output	21/23（+）、22/24（-）	The external output of the actuator is 24V d.c. to power supply interface, and the output current is ≤ 15mA.	Standard configuration

Note: Digital inputs A1-A4 are standard configurations and A5-A7 are optional configurations. All functions in the Table are **factory default configurations** for, users to configure A1-A7 as required.

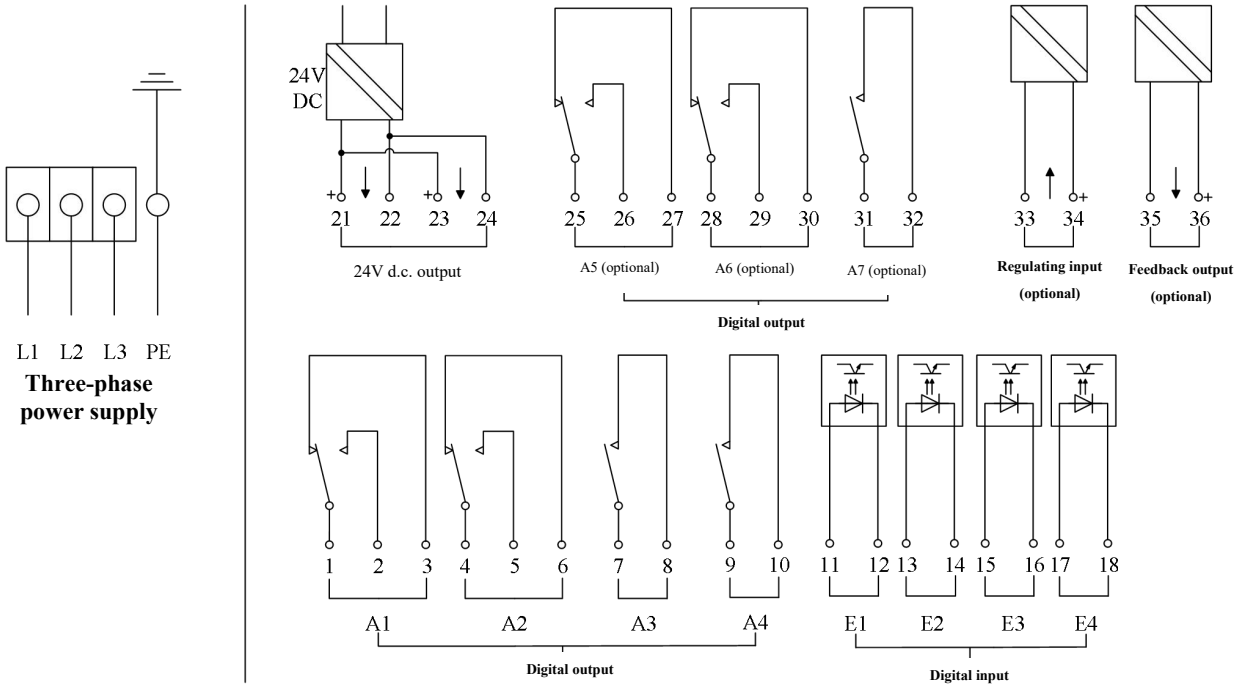


Figure 6.2 Electrical wiring diagram

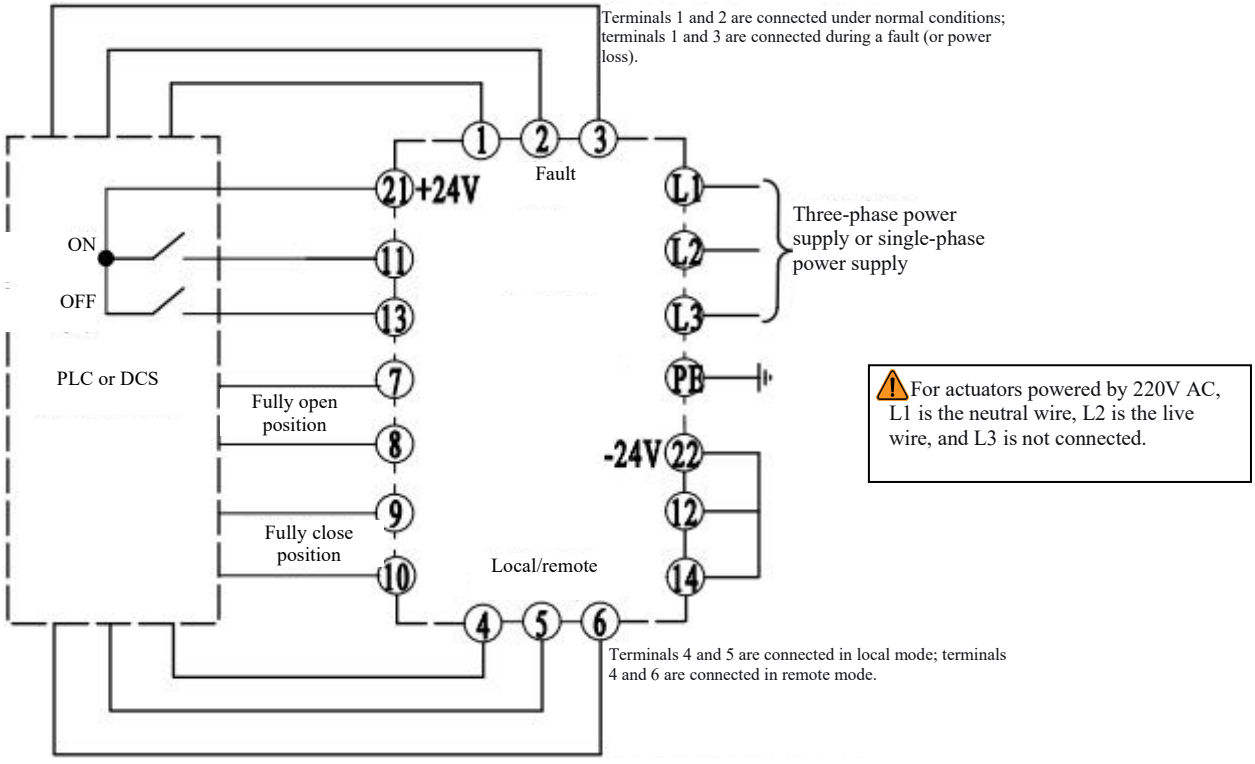


Figure 6.3 Switch signal control wiring diagram (passive)

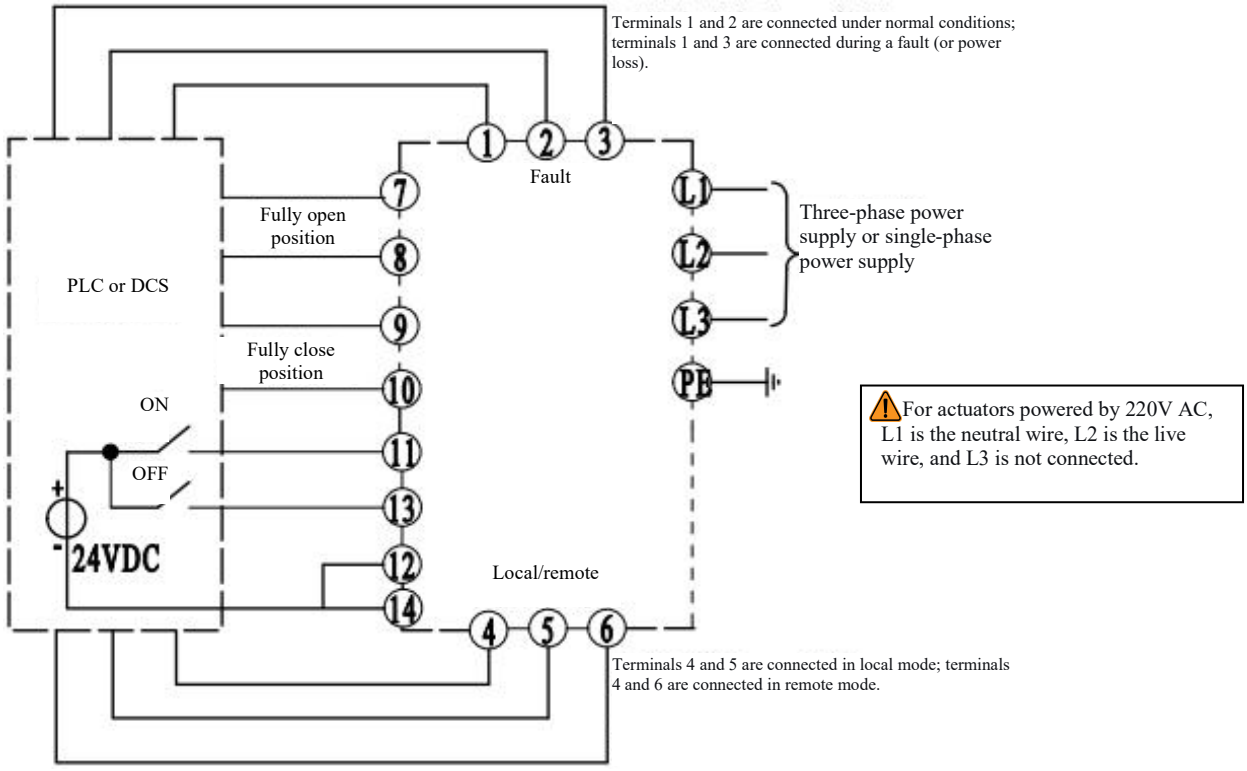


Figure 6.4 Switch signal control wiring diagram (active)

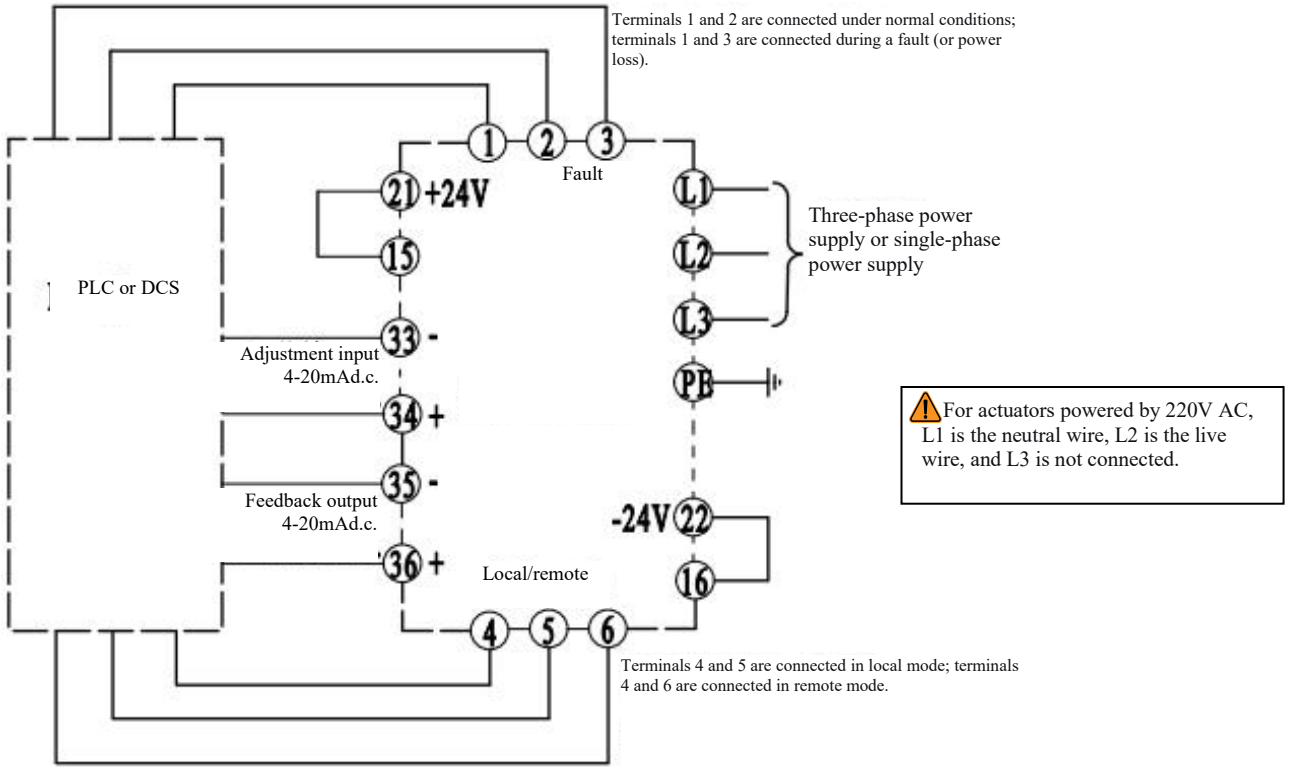


Figure 6.5 Analog signal control wiring diagram

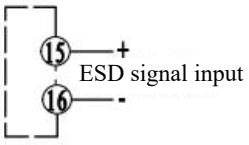


Figure6.6 ESD control wiring diagram

6.2. Wire diameter selection (contact connection)

Power cable: hard wire ≤ 6mm^2 or soft wire ≤ 4mm^2
Signal cable: hard wire or soft wire ≤ 2.5mm^2

6.3. Thread size of cable sealing port

Actuator model	Thread size of cable outlet hole (metric system)	Recommended outer diameter range of cable (mm)
M83/4/5/6	2×M32×1.5	16-22
	1×M40×1.5	22-32

Table 6.2 Thread size of actuator's cable sealing port

During transport, the threaded holes for the cable glands are covered with plugs. The protection class is ensured by the sealing of the cable entry points after field installation. Please be sure to use the cable glands provided with the product and use cables with suitable outer diameters. If necessary, apply sealant at the cable entry points to ensure the specified protection class is achieved.

6.4. Fuse

The main power supply fuse is on the filter board, with specification of 3×15A (M8610-M8630) or 3×25A (M8640/ 8650), φ6.3×32 (similarly applicable for M8500 series).

6.5. Debugging procedures, methods and precautions

The actuator is configured and adjusted (setting positions, setting parameters, configuration, diagnosis, etc.) via the local control panel. All setup work can be performed in the "Local Operation" state via the local control panel. The local control panel is installed on the electronic unit and contains the following components:

Mode Selector Switch,The following modes can be selected:
REM: Remote mode, for remote 4~20mA control (LCD displays "REMOTE-A") / remote switch control (LCD displays "REMOTE-B").
O/S: Inhibit mode, inhibits electric operation.
LOC: Local mode, for operation and setup via the operation panel.
↑ Button: Open valve or increase parameter setting value during menu setup.
↓ Button: Close valve or decrease parameter setting value during menu setup.
STOP/MODE Button: Long press to enter menu, short press to confirm or exit menu.
LCD Display: Alphanumeric display of operation mode and parameters.
LED Lights: Green light on indicates main power available; Red light on indicates actuator fault requiring attention.



Figure 6.7 Control panel

6. 5. 1. Operation and adjustment on control panel of the actuator

Before operating or adjusting via the local control panel, set the mode selector switch to the "LOC" position.

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

- P1 SETUP
- P2 PARAMETR Parameter Setting
- P3 DIAGNOSE Diagnosis
- P4 MACHINE Mechanical Data
- P5 CALIBRAT Calibration
- P6 OUTPUT Switch Output Configuration
- P7 INSTANCY Emergency Operation
- P8 COMM Communication

Each main menu can be broken down into one or more sub-menus. Use the "↑/↓" buttons to select within a peer menu group; Use long press or short press of the MODE/STOP button to enter or exit various menu levels.

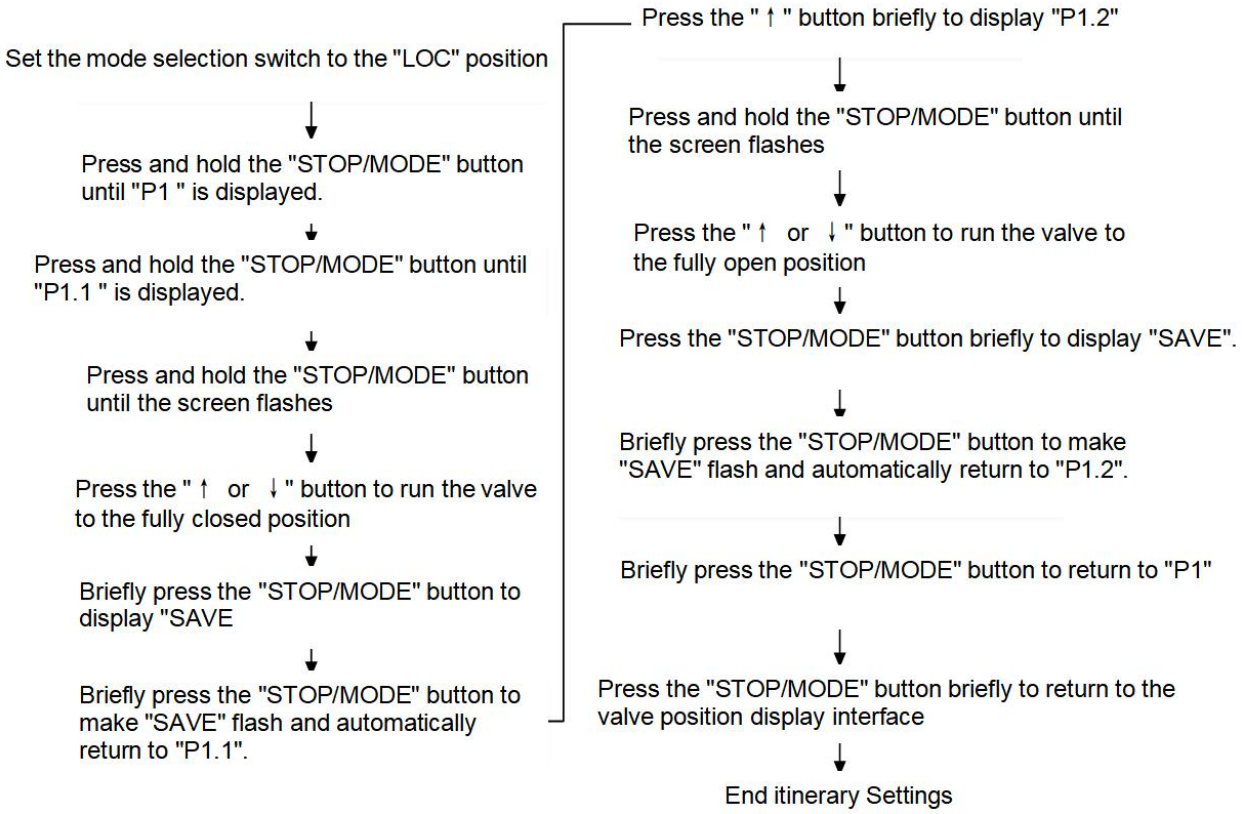


Figure 6.8 Actuator Stroke Setting Explanation

Please note: When setting the close and open positions of the actuator, the minimum stroke requirement must be met. When it is less than the minimum stroke, the screen displays "————" and cannot be saved; when "□□□□" is displayed, it can be saved.

6.5.2. Menu functions

6.5.2.1. Setup

Main menus			Note
P1 SETUP	P1.1 ADJUST-C	————	Adjust the closed terminal position
	P1.2 ADJUST_O	□□□□	Adjust the open terminal position
	P1.3 TORQUE-C	40%-100%	Closed protection torque (10% stepping)
	P1.4 TORQUE-O	40%-100%	Open protection torque (10% stepping)
	P1.5 ESD_REVS	0~1	ESD input signal reverse: 0 normal, 1 reverse
	P1.6 IN_REVS	0~1	Analog input signal reverse: 0 normal, 1 reverse
	P1.7 MOT_DIR		Motor direction (0 auto, 1 CW, 2 CCW)
	P1.8 SPEED_C	20～100%	Close speed (5% steps)

	P1.9 SPEED_O	20～100%	Open speed (5% steps)

6.5.2.2. Parameter

Main menus			Note
P2 PARAMETR	P2.1 SWITCH	INCHMODE	Local jog, Remote jog
		LOC_HOLD	Local self-maintained, Remote jog
		REM_HOLD	Local jog, Remote self-maintained
		HOLDMODE	Local self-maintained, Remote self-maintained
	P2.2 LIMIT_O	55% - 100%	Open limit range of 55%-100%
	P2.3 LIMIT_C	0%-45%	Close limit range of 0-45%
	P2.4 ALM_DEAL	HOLD OPEN CLOSE	Set the action to be performed when the signal is disconnected, and select “HOLD” for position holding, “ALL_ON” for full on position and “(ALL_OFF)” for full off position.
	P2.5 PLACE_O	50%～100%	Preset open alarm position; when the position is equal to or greater than the preset open position, an alarm signal is generated.
	P2.6 PLACE_C	0%～50%	Preset close alarm position; when the position is less than the preset close position, an alarm signal is generated.
	P2.7 TC_CTRL	ON OFF	Torque off setting; when setting to “ON”, torque off mode is used; and when off torque is greater than protection torque set in Menu P1.3, the actuator shuts down.
	P2.8 CTRL_PAR	NORMARL ESD_SWI ESD_ADJ	Control mode selection “NORMARL” remote control mode, which is determined by terminal 16 (regulating/switching value). “ESD_SWI” switching type control mode, under which terminal 16 is ESD control input end. “ESD_ADJ” regulating type control mode (4-20mA), under which terminal 16 is ESD control input end.
	P2.9 ESD_MODE	HOLD OPEN CLOSE	Set action to be performed when ESD emergency operation is valid, select “HOLD” for holding position, “OPEN” for full open position and “CLOSE” for full close position.

6.5.2.3. Diagnosis

Main menus			Note
P3 DIAGNOSE	P3.1 ERR_ACTU	As shown in Table 8.1 in Chapter 8	Fault description
	P3.2 ALM_ACTU	As shown in Table 8.2 in Chapter 8	Alarm information
	P3.3 HALLCODE	0～999	Hall sensor count value, for detecting condition of Hall sensor
	P3.4 INPUTPER	0%～100%	4~20mA analog input percentage
	P3.5 TEMP_MOT	－999～999	Motor temperature
	P3.6 BATTERY	0.0～9.9	Battery voltage

	P3.7 STARTIME	0~999; shown in scientific notation after > 999	Start times, unit: times. Shown in scientific notation; for instance, “2.5 4” indicates 2.5×10^4, i.e. 250000.
	P3.8 RUNTIME	0~999; shown in scientific notation after > 999	Running time, unit: h. Shown in scientific notation; for instance, “2.5 4” indicates 2.5×10^4, i.e. 25000.
	P3.9 TMAXPERM	0～999	Maximum start times per minute, unit: times.
	P3.10 MRUNTIME	0～999	Motor running time, unit: h.
	P3.11 NEARMALF	As shown in 3.1	Last fault information
	P3.12 NEARTEMP	0～999	Recorded maximum temperature of motor, unit: °C

6.5.2.4. Machine data

Main menus			Note
P4 MACHINE	P4.1 SW_VER	1.00～x.xx	CPU-VER，x.xx Main control CPU software version number
			SHOW-VER，x.xxDisplay software version number
			SIGL-VER，x.xxSignal software version number
	P4.2 HW_VER		Backup for future.
	P4.3 MOTOR	Model code	Actuator model
	P4.4 STTLIMIT	Default 100000 times	Start times maintenance limit is panel display value ×1000.
	P4.5 MRTLIMIT	2,500h by default	Motor running time maintenance limit; unit: hour
	P4.6 TIME_C	Close full stroke time	
	P4.7 TIME_O	Open full stroke time	
	P4.8 INTERV_C	Close interval speed setting	
	P4.9 INTERV_O	Open interval speed setting	

6.5.2.5. Calibrate

Main menus			Note
P5 CALIBRAT	P5.1 PASSWORD	50	Enter password “51” to enter the menu below
	P5.2 INPUT-Z		Set the calibrated input zero point value (4mA) by regulating signal Note: It will not be saved if deviation is more than 5%.
	P5.3 INPUT-F		Set the calibrated input full stroke value (20mA) by regulating signal Note: It will not be saved if deviation is more than 5%.
	P5.4 OUTPUT-Z	0%～100%	Set the zero point of the calibrated output valve position (4mA)
	P5.5 OUTPUT-F	0%～100%	Set the full stroke value of the calibrated output valve position (20mA)
	P5.6 POS_LOSE	0%～100%	Force to set the current position as setting position

	P5.7 TEMP_AD_1		For temperature calibration, press UP key to connect 1,670Ω (100°C), and press DWN key to connect 820Ω (0°C), and exit from MODE setting and save.
	P5.8 DEADBAND	0.4～5%	Set the dead band of actuator
	P5.9 CLEARDAT		Clear the recorded fault records

6.5.2.6. Output

Main menus			Note
P6 OUTPUT	P6.1 PASSWORD	60	Enter password “61” to enter the menu below
	P6.2(A1) P6.3(A2) P6.4(A3) P6.5(A4) P6.6(A5) P6.7(A6) P6.8(A7)	NO_SIGN	No adjusting signal.
		REMOTE	It means that the actuator is at remote state.
		ADJUST_O	It means the full open position.
		POS_LOSE	It means that the valve position is smaller than -20% or greater than 120%.
		PLACE1_O	It means that the valve position is greater than or equal to the set open position.
		TORQUE_O	It means STO.
		TORQUE_E	It means either STO or STC.
		FAILURE	It means that the actuator is faulted.
		ADJUST_C	It means the full close position.
		PLACE2_C	It means that the valve position is less than or equal to the set closed position.
		TORQUE_C	It means STC.
		TEMPER	It means that the motor temperature exceeds 100°C.
		BATTERY	Battery voltage is lower than 3.0V.
		ALARM	It means that the actuator gives an alarm.
		RUN-OPEN	It means that the actuator runs to open.
		RUNCLOSE	It means that the actuator runs to close.
		RUNNING	It means that the actuator is running.
		REDY	Actuator powered on

6.5.2.7. Emergency

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

6.5.2.8. Communication

P8 COMM	P8.1 COM_MODE	0~6	Bus mode setting, set bus type. For detailed settings, refer to the corresponding bus instruction manual.
	P8.2 COMMADDR	1~247	Set communication address.
	P8.3 REM_CTRL	0~3	"BUS-SW"，Bus switch "BUS-ADJ"，Bus position "TRAD-SW1"，Traditional switch "TRAD-ADJ"，Traditional position
	P8.4 FS_MODE	0~3	Failsafe mode. For detailed settings, refer to the corresponding bus instruction manual.
	P8.5	0~100%	Fault position, default 50%.

	FS_PLACE		
	P8.6 BAUDRATE	0～7	Baud rate setting, default 9600 bit/s. For detailed settings, refer to the corresponding bus instruction manual.
	P8.7 CHECKMOD	0～3	Parity setting. For detailed settings, refer to the corresponding bus instruction manual.
	P8.8 COMMADD2	1~247	Wireless communication address

6.5.3. Storage settings

First set new parameters with key "↑" or "↓" on the control panel of the actuator, then click key "STOP/MODE". The display will show a static "SAVE" if the parameters have been changed.

To cancel, the operator clicks key "↑" or "↓", "CANCEL" will be displayed, and then clicks the key "STOP/MODE" to return.

If the operator wants to save a new value, click key "STOP/MODE" until see the flashing "SAVE" sign which shows the saving process.

6.5.4. Alarm and fault

The intelligent actuator has powerful functions. After its diagnostic function is enabled, short messages will be displayed on the LCD. The alarm and fault information is detailed in Table 8.1 and Table 8.2.

Alarm definition: The alarm system will be automatically activated when the actuator operation reaches a critical condition, while the actuator continues operating. If the actuator keeps working at such condition, it will be forced to stop running automatically.

Alarm information: According to different operation modes selected, alarm information "LOCAL/ALARM", "0/S/ALARM", "REMOTE-A/ALARM", REMOTE-B/ALARM" will be shown on the LCD alternately. Please refer to Menu P3.2 for details. If several faults occur at the same time, faults will be displayed only instead of alarm.

Fault definition: The actuator will automatically display fault information in case of hardware/software fault or improper operation by the operator. The fault will endanger the safety of the operator or the actuator, so the power should be cut off.

Fault information: "LOCAL/FAILURE", "0/S/ FAILURE" or "REMOTE-A/FAILURE" and "REMOTE-B/FAILURE" will be displayed when the LCD flashes to indicate the fault information. See Menu P3.1 for details.

6.6. Acceptance test items, methods and criteria after debugging

Debugging acceptance: When debugging is finished, the valve shall be set to the full open or close position, with corresponding alarm output. After one entire stroke of each actuator at local and remote states, the valve shall be set to the pre-set open/close position, with corresponding alarm output.

6.7. Preparation before test run, test run start and test run

- Confirm if the mechanical and electrical connections are reliable.
- Confirm if the debugging has been completed and if the operations are valid.
- Start test run procedure.
- Enable test run.

7. Use and operation

7.1. Preparation and inspection before use

- Confirm that the actuator has been installed, debugged and accepted completely; and
- Confirm the operability of valves.

7.2. Safety and safe protection, safety sign and its description before and during use

- Read through the Manual carefully and understand the performances of the electric actuator before use;
- Potential hazards caused by non-human factors during operation should be considered, and rapid response measures must be in place.
- Prohibit operation by any other persons other than the operator; otherwise, it may cause adverse consequences.

7.3. Operating methods

- Local Electric Operation (Mode selector switch set to "LOC")

Jog Mode: Press and hold the "↑" or "↓" button, the actuator runs; release the "↑" or "↓" button, the actuator stops.

Self-Maintaining Mode: Briefly press the "↑" or "↓" button, the actuator will continue running to the fully open or fully closed position before stopping; to stop midway, briefly press the "STOP/MODE" button.

In local self-maintaining mode, please be cautious to prevent accidental contact with the "↑" or "↓" buttons, which could cause actuator movement.

- Remote Operation (Mode selector switch set to "REM")

Input remote control signals (discrete, analog, digital communication) to achieve remote control of the actuator.

7.4. Monitoring and records during operation

- Monitor and record the related data during operation.
- Record the details about device operation.
- Record the troubleshooting details.
- Make shift turnover records.

7.5. Operating procedures and precautions for shutdown

Operating procedures:

- Run the device to the required position before shutdown, and confirm that it is shutdown.
- Cut off power supply.
- Mark it.

Notes:

- Operate it by handwheel if electric operation is invalid.
- Keep shutdown records.

8. Trouble analysis and troubleshooting

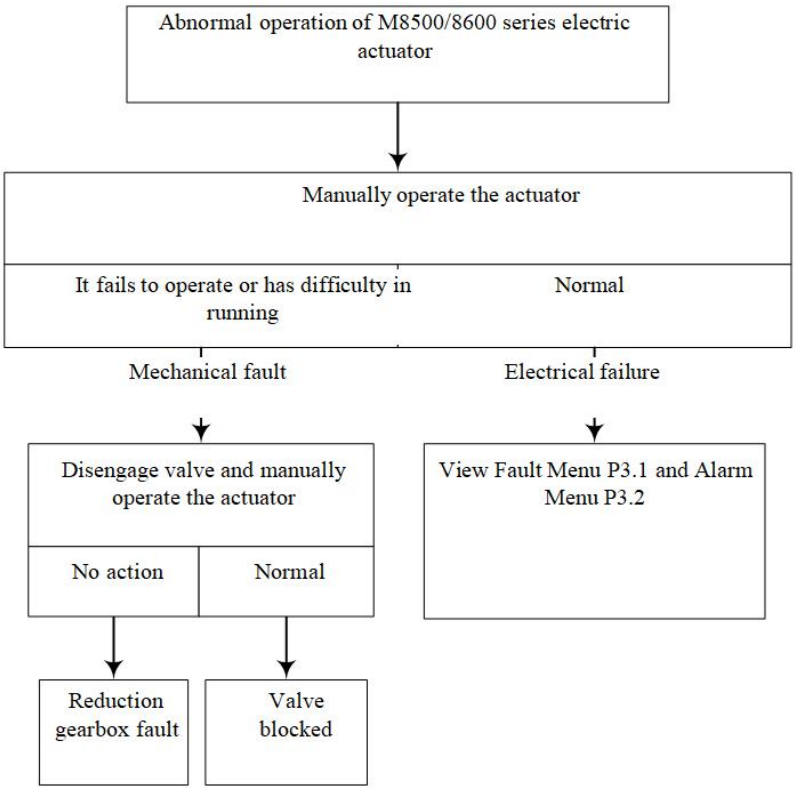


Table 8.1 Menu P3.2 alarm display text

Display Text	Alarm Description
BAT-LOW	Battery level low, must be replaced immediately.
TORQUE-0	Open direction torque alarm, load torque exceeds the set open direction alarm value.
TORQUE-C	Close direction torque alarm, load torque exceeds the set close direction alarm value.
TEMP-MOT	Motor temperature exceeded limit, motor has stopped due to reaching thermal protection value. Alarm will reset after motor cools down.
MAINTAIN	Maintenance required, motor running time exceeded limit.
NO_SIGN	Control signal wire break.

Table 8.2 Menu P3.1 fault display text

Display Text	Alarm Description
IGBT-ERR	IGBT module fault
PHASE	Power phase loss
TEMP-MOT	Motor temperature exceeds limit
HANDWHL	Handwheel engaged

END_POS	Actuator ran beyond end position
DIR_MOTR	Motor running direction error
POS_LOSE	Valve position lost
SET_POS	Switch position not set
TORQUE_E	Over-torque

9. Maintenance and repair

In order to ensure trouble-free operation, the checks in section 9.1 shall be carried out for the actuator regularly, and necessary safety measures shall be taken before check and maintenance for the actuator to ensure safe maintenance.

During the check and maintenance, the power supply of the primary circuit and each sub-circuit shall be cut off, and some live parts nearby shall also be isolated, if disassembling is required.

9.1. Daily maintenance and servicing

Table 9.1 Actuator servicing

S/N	Maintenance period	Maintenance contents	Maintenance standard
1	Weekly	Check whether the actuator gearbox leaks oil.	No oil leakage.
2		Check whether valve position indication is correct.	It shall be correct.
3		Check whether valve rod and drive shaft sleeve are clean and lubricated.	They shall be clean and lubricated.
4		Check whether housing of the actuator has damage, looseness or lost fastener.	They shall not be loose and damaged.
5		Check the exposed valve rod thread at flange connection.	It shall be protected with mechanical oil meeting requirements and provided
6	Monthly	Check whether the actuator has loose fastening bolts.	It shall have no loose fastening bolt.
7		Check whether incoming and outgoing wires have damaged seals.	They shall not be loose and damaged.
8		Check the local junction box.	No moisture, corrosion and looseness.
9		Check whether there is abnormal sound in opening and closing. Carry out maintenance, if necessary.	No abnormal sound.
10	Semi-annually	Check manual device of the valve; open and close the valve once.	It shall be opened flexibly and normally.
11		For control operation, check whether state signals (SLO signal and SLC signal) are normal.	The control is normal.
12		Check the LED.	It shall be normal.
13		Check if there is excessive dirt or stain on the actuator.	The actuator shall be neat, clear and visible.
14	Annually	Regularly calibrate actuator’s performance.	It shall be conforming.

10. Dimension & weight

The outline and installation dimensions of the actuator are subject to the production drawings.

10. 1. Appearance and installation size of actuator

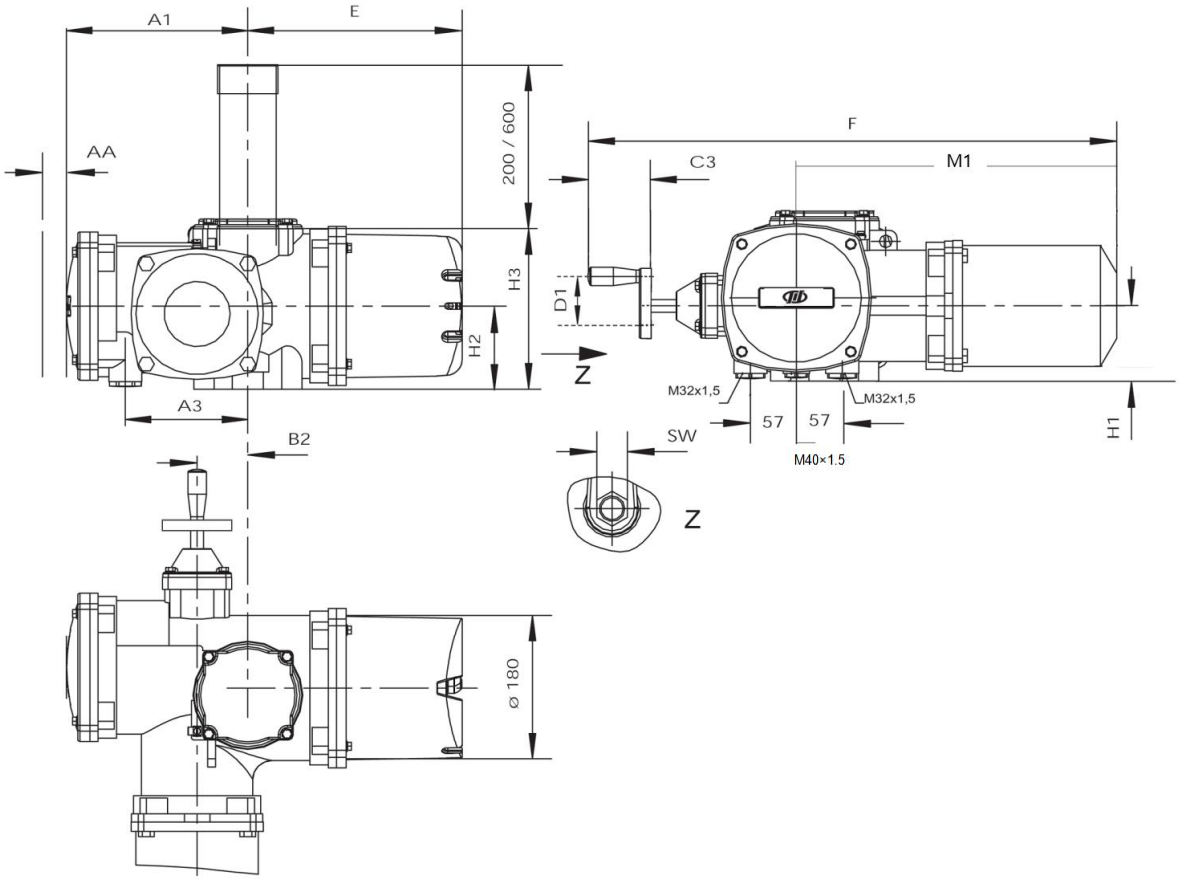


Figure 10.1 Actuator appearance

Table 10.1 Actuator installation size

model / parameter	M8□10	M8□20	M8□30	M8□40	M8□50
ISO5210	F10	F10	F14	F16	F16
A1	207	207	226	250	250
A3	133	133	152	169	169
B2	50	50	63	80	80
C3	99	99	99	82.5	82.5
D1	R99	R99	R99	R95	R95
E	253	253	266	294	294
F	574	598	665	768.5	768.5
H1	94.5	94.5	94.5	140	140
H2	104.5	104.5	104.5	148	148
H3	202	202	202	250	250
M1	285	313	373	375	470

10.2. Appearance and installation size of angular stroke electric actuator (straight type)

(Position pointer rotates clockwise when the handwheel is rotated clockwise.)

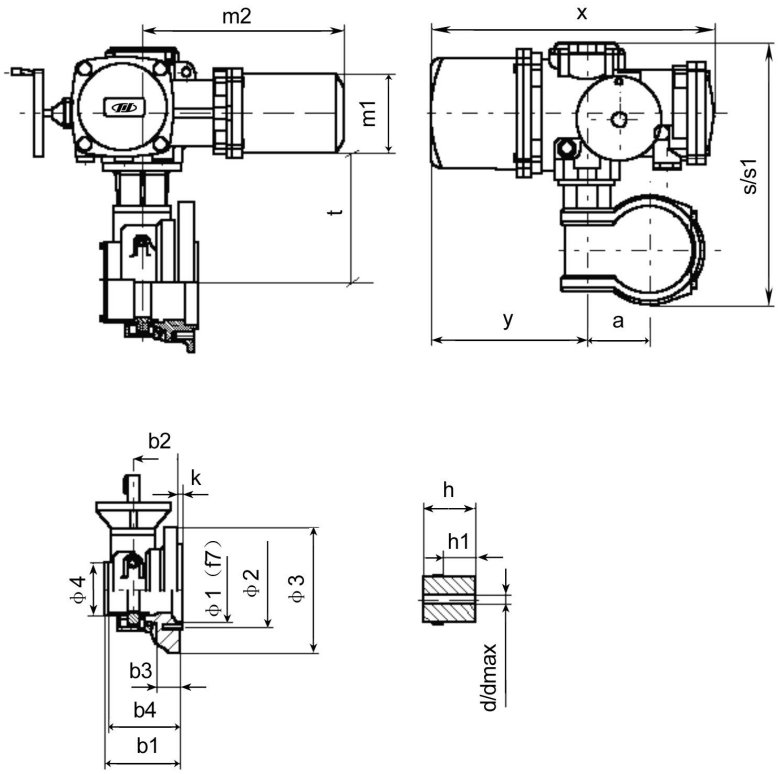


Figure 10.2 Appearance of angular stroke electric actuator (straight type)

Table 10.2 Installation size of angular stroke electric actuator (straight type)

	A8005	A8010	A8020	A8040 (+G65)	A8090 (+G65)	A8160	A8200	A8400 +G68
a	52	68.5	93.5	114	150	160	250	250
b1	100	108	142	151.5	175	198	266	309.5
b2	52	62	81	83	94	113	160	166.5
b3								
b4	96	104	133.5	138	166	193	260	298.5
Φ1(f7)	70	70		130	200	230	300	300
Φ2	102	102	140	165	254	298	406	406
Φ3	115	148	204	244	310	350	532	535
Φ4	80	95	136	159	196	220	265	288
k	3	3		4	4	4	5	5
d/dmax	20/30	20/40	35/75	35/80	54/105	54/105	54/115	60/150
h	81	81	104	130	133	158	235	260
h1	37	35	45.5	68	48	73	95	100
m1	（M8610/M8510）=106		（M8620/M8520）=120		（M8630/M8530）=137			
m2	（M8610/M8510）=285		（M8610/M8510）=313		（M8610/M8510）=350			
s/s1	385	431	487(698)	527(512)	(736)	(859)	(882)	1100
t	147	176.5	295.5	246	310	592	530	577
x	（M8610/M8510/M8620/M8520）=450				（M8630/M8530）=491			
y	（M8610/M8510/M8620/M8520）=253				（M8630/M8530）=266			

10.3. Appearance and installation size of angular stroke electric actuator with lever

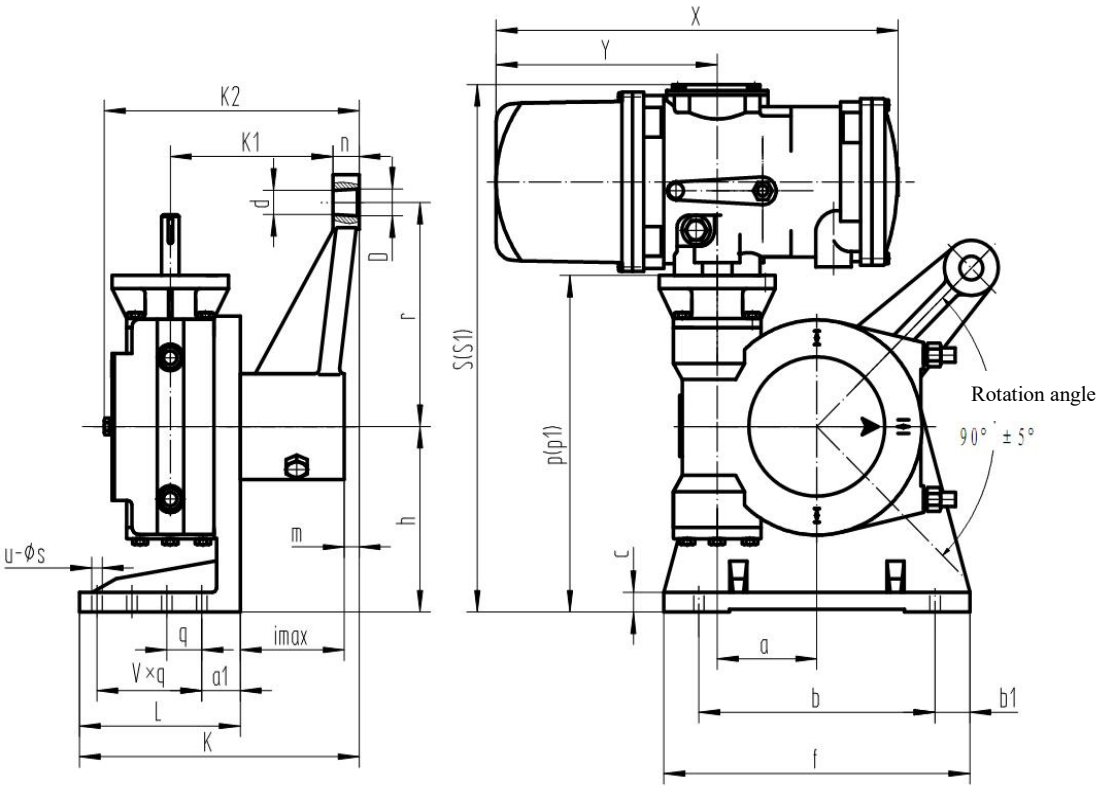


Figure 10.3 Appearance of angular stroke electric actuator with lever

Note: ① Connecting rod or lever may collide with the motor, so attention should be paid to avoid this as shown in the figure.

Table 10.3 Appearance and installation size of angular stroke electric actuator with lever

model	A8005	A8010	A8020	A8040 (＋G65)	A8090 (＋G65)	A8160	A8200/A8250	A8400 （＋G68）
V×q	1×70	1×80	1×94	1×102	2×80	2×80	3×70	3×70
a1	36	34	48	50	56	62	70	70
b	140	135	223	270	338	448	580	580
b1	20	52.5	36	40	36	36	25	25
c	15	15	25	23	24	30	30	30
f	180	240	295	350	410	520	630	630
d(h8)	Φ16.2	Φ19.8	Φ23.4	Φ26.6	Φ34	Φ34	Φ33.8	Φ33.8
D	Φ18	Φ22	Φ26	Φ30	Φ38	Φ38	Φ38	Φ38
h	107	134	170	200	235	250	310	350
i max	66	86	100	119	143	143	150	150
k	198	218	265	304	415	415	470	470
k1	98	124	133	176	191	206	248	243
k2	177.5	207.5	232	284.5	320	339	405	437
l	132	132	165	185	272	272	320	320
m	8	10	0	17	0	0	0	0
n	20.5	24	28	36	40	40	42	42
p(p1)	207	263.5	332	369.5(549.5)	462(618)	668	666(751)	915
r	160	200	200	250	250	250	500	500
s(s1)	420.5	477	546	583(764)	676(832)	882	880	1129
u-Φs	4-φ14	4-φ14	4-φ18	4-φ22	6-φ22	6-φ22	8-φ22	8-φ22

model	A8005	A8010	A8020	A8040 (＋G65)	A8090 (＋G65)	A8160	A8200/A8250	A8400 （＋G68）
x	（M8610/M8510/M8620/M8520）＝450				（M8630/M8530）＝491			
y	（M8610/M8510/M8620/M8520）＝253				（M8630/M8530）＝266			
a	52	68.5	93.5	114	150	160	250	250

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