川仪股份
CYAC

Operation Manual

M Series Intelligent Electric Actuator

M83/84



Chongqing Chuanyi Automation Co., LTD. Actuator Filiale

V002510

Preface

Thank you for using M8300/M8400 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:

(I) Substituted damaged and scrapped materials, such as coated metal parts and components, screws, nuts, 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.

■ Special Warnings:

(1) After installation, the oil plug at the highest point of the M4 Series (Modulating) actuator must be replaced with the vent screw provided in the spare parts! This is not required for the M3 Series (On-Off).

(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
1.1 Product characteristics 1
1.2 Application 1
1.3 Actuator models 1
1.4 Operating environment and conditions 2
1.5 Operating conditions 2
1.6 Impact on environment 2
2 Structural features and operating principle 3
2.1 General structure and its operating principle and features 3
2.2 Structure, functions and working principle of main parts or functional units 3
2.3 Functional structure between unit structures and its operating principle and features 3
2.4 Functional structure of auxiliary device and its operating principle and features 3
3 Technical features 4
3.1 Main performances and parameters 4
4 Electrical connection and debugging of actuator 4
4.1 Electrical connection 4
4.2 Wire diameter selection (contact connection) 8
4.3 Thread size of cable sealing port 8
4.4 Fuse 8
4.5 Debugging procedures, methods and precautions 8
4.6 Acceptance test items, methods and criteria after debugging 13
4.7 Preparation before test run, test run start and test run 13
5 Use and operation 13
5.1 Preparation and inspection before use 13
5.2 Safety and safe protection, safety sign and its description before and during use 13
5.3 Operating methods 14
5.4 Monitoring and records during operation 14
5.5 Operating procedures and precautions for shutdown 14
6 Trouble analysis and troubleshooting 15
7 Maintenance and repair 17
7.1 Daily maintenance and servicing 17
8.1 Appearance and installation size of actuator 18
8.2 Appearance and installation size of angular stroke electric actuator (straight type) 19
8.3 Appearance and installation size of angular stroke electric actuator with lever 20

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~55°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

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

- 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 such as safety helmets,safety lanyard, goggles, work clothes, insulating gloves and labor protection shoes should be worn. In case of special circumstances, it must be carried out under the guidance of our company's professionals.
- After the actuator is installed, it is strictly prohibited to hang any items on the handwheel and the switching rod.
- Manual operation must strictly follow the handwheel operation instructions in this guide. It is prohibited to operate the switching rod and handwheel while the power is on.
- Before electric operation, ensure that the handwheel is fully pulled out and the latch is securely latched onto the handwheel shaft.
- When operating the actuator in a high-temperature environment, the operator must wear special protective gloves to prevent work-related injuries caused by the heating of metal parts.
- In hazardous areas, it is strictly prohibited to use conductive or heat-conducting materials to come into contact with the actuator. The power supply should be cut off, the actuator removed and moved to a safe area for maintenance or repair.
- The lubricating oil that spills during the oil change process should be cleaned up in time to avoid accidents.
- When opening the cover, the operator must strictly follow the safety operation procedures: cut off the power supply first, and wait for 5 minutes before conducting operations such as electronic component inspection and replacement.

1 Overview

M8300/M8400 series electric actuators are multi-turn electric actuators with built-in intelligent controller. With worm gear and worm structure, its electric head can be equipped with additional gearbox to meet users' requirements for different torques.

1.1 Product characteristics

- Intelligent controller and soft start;
- Rich diagnostic information;
- Three-phase motor with a high driving force;
- Worm gear and gear transmission as main transmission;
- Rich display information on LCD;
- Simplicity and learnability;
- Mechanical waterproof switch which is safe and reliable;
- Both 4mA~20mA analog control and 24V d.c. switch control (active and passive).

1.2 Application

The actuator, a special device to drive terminal control cells (valve, baffle, etc.), is widely applied to intelligence metallurgy, petroleum, chemical, construction material, urban water supply, sewage treatment and other industries.

1.3 Actuator models

The basic models are shown in Figure 1.1:

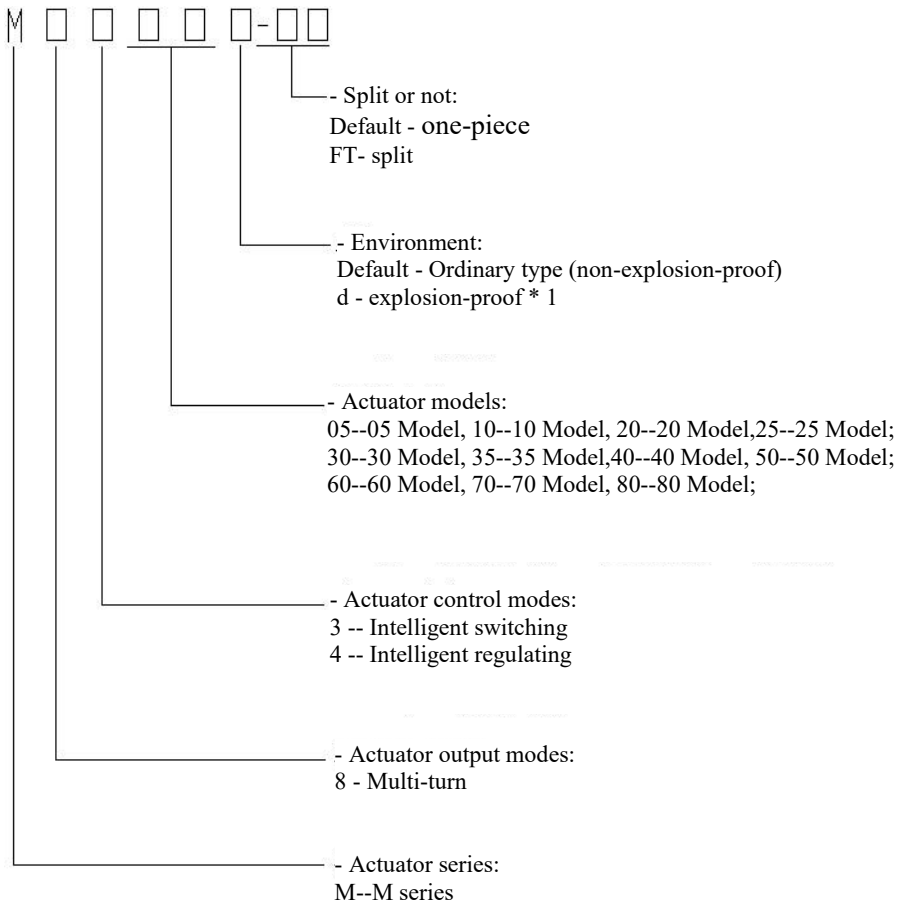


Figure 1.1 Basic models of M83/84 series

1.4 Operating environment and conditions

According to types of oil, ambient temperature is allowed within the ranges below.
Standard type: -25°C~+70°C (Please negotiate with the manufacturer for other operating conditions)

- Relative humidity: Not greater than 95% (25°C);
- Barometric pressure: 86kPa~106kPa;
- No corrosive medium in ambient environment;

1.5 Operating conditions

- Voltage: 380（-15%～10%）Va.c.（optional 400Va.c.、415Va.c.、440Va.c.、460Va.c.，-15%/+10%）;
- Frequency: 50×(±1%)Hz (optional 60×(±1%)Hz);
- Harmonic content: below 5%.

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

1.6 Impact on environment

As a clean product, the actuator discharges no harmful gas and liquid and has no adverse impact on environment.

2 Structural features and operating principle

2.1 General structure and its operating principle and features



Figure 2.1 Main components

The actuator is mainly composed of motor, position sensor, worm gear, worm, drive shaft, control unit, local operation panel and handwheel.

The control unit receives 4-20mA control signal or switching value and drives the motor to rotate. The motor drives worm and the worm drives the worm gear to make the output shaft rotate. The position sensor detects displacement of motor rotation and sends valve position signal to control unit. After detecting the position signal identical with the position specified by the given control signal, the control unit cuts off power supply of the motor and self-locking feature of the worm gear and worm keeps the actuator stopping operation.

The actuator is a mechatronic product that converts weak current signal to torque and displacement output and controls the valve opening.

2.2 Structure, functions and working principle of main parts or functional units

2.2.1 Electrical control unit

It is mainly composed of the electrical components including of CPU and control panels. CPU panel is responsible for processing given and feedback signals and the control panel for driving the motor.

2.2.2 Worm gear and worm component

It slows down transmission of the motor output shaft and generates mechanical self-locking.

2.2.3 Additional 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.

2.3 Functional structure between unit structures and its operating principle and features

External control signals are exerted to the electrical control unit through cables of the terminal compartment. The electrical control unit drives the motor to rotate through optoelectronic and transformer isolation measures. Rotation of the motor drives the worm gear and worm to rotate to drive the output shaft. It is the feature of weak current controlling strong current.

2.4 Functional structure of auxiliary device and its operating principle and features

Handwheel Assembly: This handwheel is used for manual operation during installation, commissioning, or troubleshooting. This mechanism also serves for manual-electric switching. When the handwheel is pushed in, it engages with the worm shaft, allowing for manual operation.

Before any manual operation, the mode selector switch must be set to "O/S" and the external power must be disconnected. Remove the handwheel latch, then push the handwheel inward along its axis before rotating it.

To restore electric operation, the handwheel must be fully pulled out. The latch must then be reinstalled on the handwheel shaft before power can be restored and electric operation can resume.

3 Technical features

3.1 Main performances and parameters

- Voltage output: 24V d.c., maximum 30mA, with input/output power short-circuited protection.
- Motor control: by silicon controlled rectifier.
- Operating mode: Regulating type S4-25%, 1,200 times/h; switching type S2-15min; according to IEC34.
- IP Grade: IP67; optional IP68. IP Grade during transportation and storage: IP43.
- Humidity: < 95% average (please use a heater to avoid atomization).
- Installation position: Any position.
- Electro magnetic compatibility (EMC): GB/T17626.2-2006 ~ GB/T17626.5-2008.
- Electrical connection: As detailed in section 4.1.
- Minimum set pulse controlled by switching value: Complete pulse of 200ms.
- Dead zone of controller: 0.4% (0.4%~5% adjustable).
- Analog input (optional): 4~20mA; electric isolation, 250Ω input resistance.
- Digital input (E1-E4): 4 optical coupling inputs, independent potential. Digit 0: -3V~+5V or open circuit. Digit 1: +12V~+35V.
- Analog output (optional): 4~20mA position signal; load capacity; maximum 500Ω; electrical isolation; temperature impact ±0.1%/10K.
- Digital output: 4 (A1-A4) standard ones, 3 (A5-A7) optional ones, free potential, silver conversion contact, electrical isolation, free configuration for use, maximum voltage 250V a.c., maximum current < 5A, minimum current > 1mA.
- Basic error: ±1％.

4 Electrical connection and debugging of actuator

4.1 Electrical connection

See Figure 4.1 for the external wiring terminal of the actuator, Table 4.1 for description of terminal functions, Table 4.2 for electrical wiring diagram and Tables 4.3-4.6 for recommended wiring diagram. The electrical wiring is connected directly to the terminal blocks of the junction box via cables. Grounding points are set in the wiring chamber and housing of the actuator, because grounding is an important measure to ensure the safety of the operator and protection against electromagnetic interference. Please be sure to ground the actuator reliably when using.

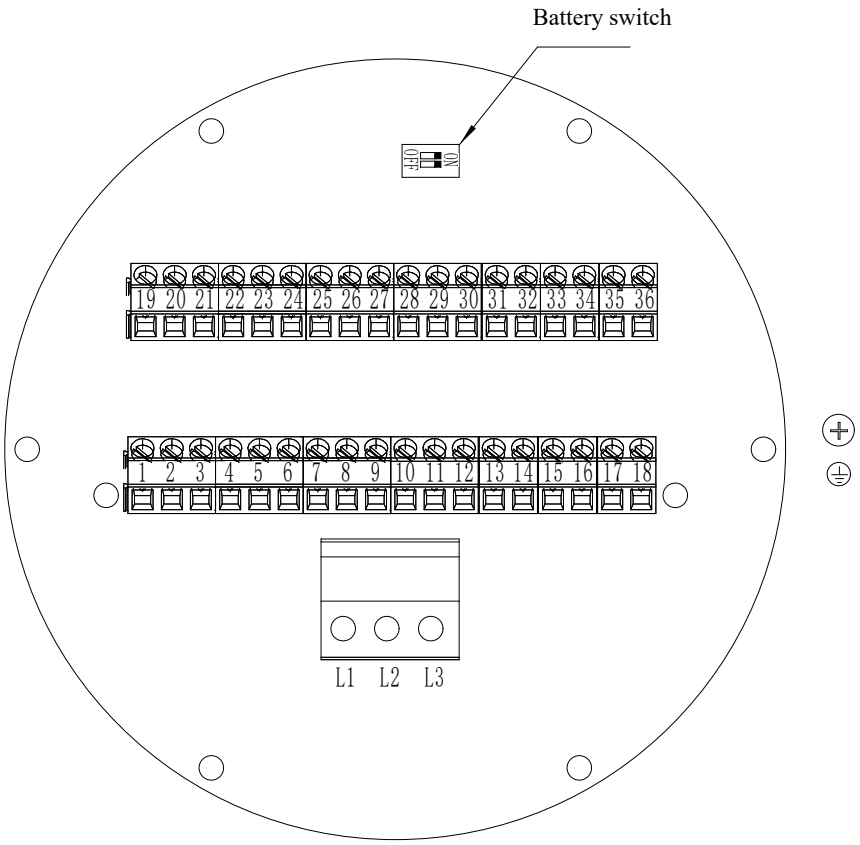


Figure 4.1 External wiring terminal

Table 4.1 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	25, 26, 27	STO alarm signal; terminal 25 is a common terminal;	**Optional**

(A5)		in case of alarm, terminals 25 and 26 are connected.	**configuration**
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 configuration**
Digital output 7 (A7)	31, 32	Alarm signal of actuator; terminals 31 and 32 are connected.	**Optional configuration**
Regulating analog input	33(-), 34(+)	4mA-20mA d.c. input, applicable for M84 series and not applicable for M83 series	**Optional configuration**
Feedback analog output	35(-), 36(+)	4mA-20mA d.c. output, applicable for M84 series and M83C series	**Optional configuration**
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 ≤ 30mA.	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.

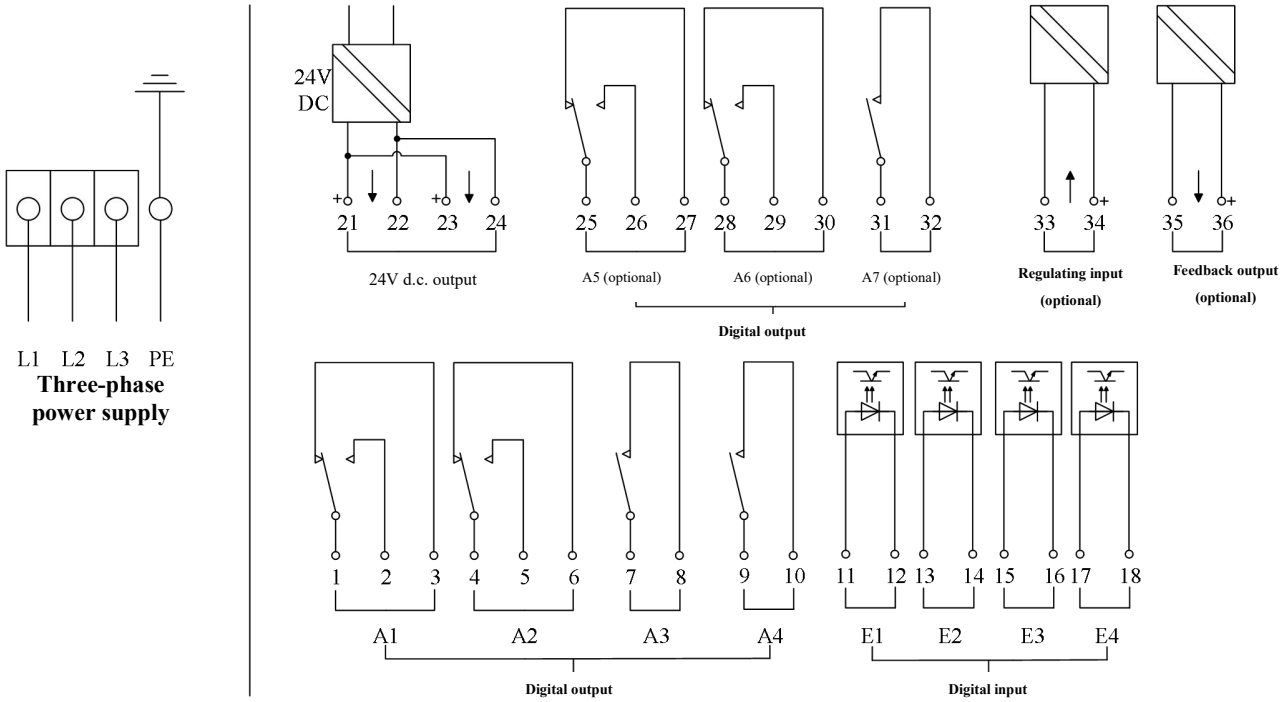


Figure 4.2 Electrical wiring diagram

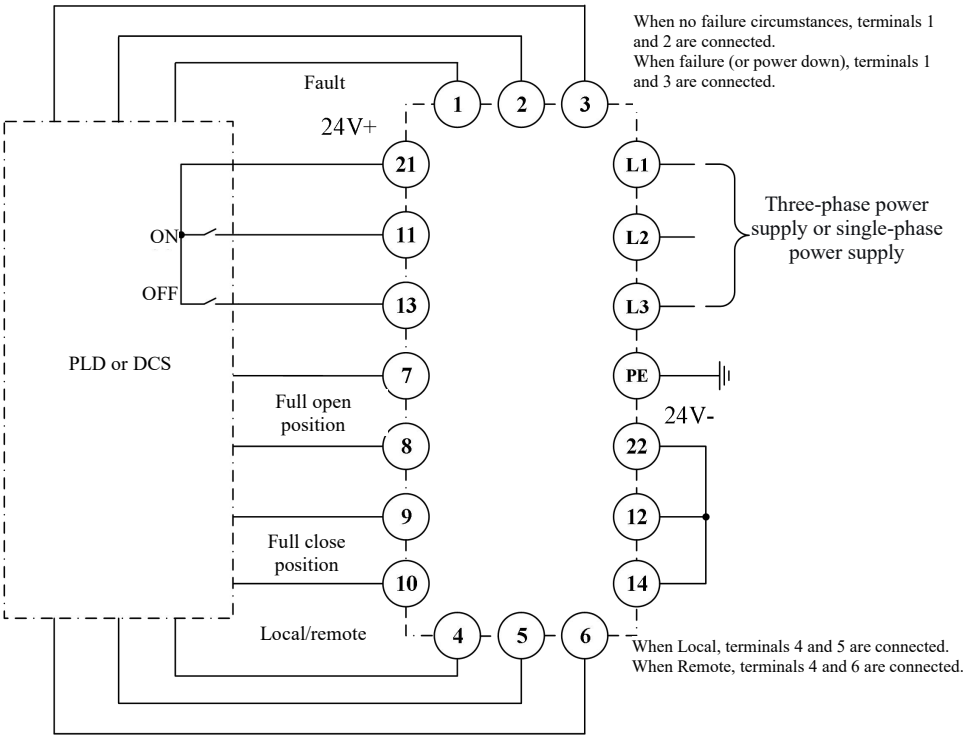


Figure 4.3 Switch signal control wiring diagram (passive)

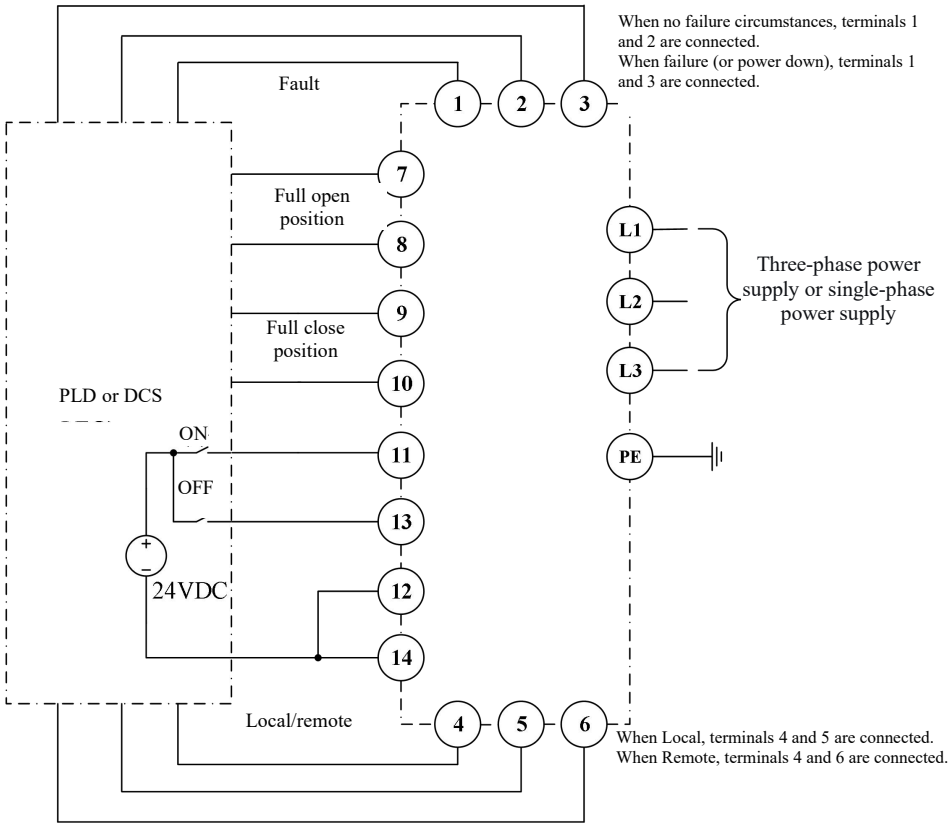


Figure 4.4 Switch signal control wiring diagram (active)

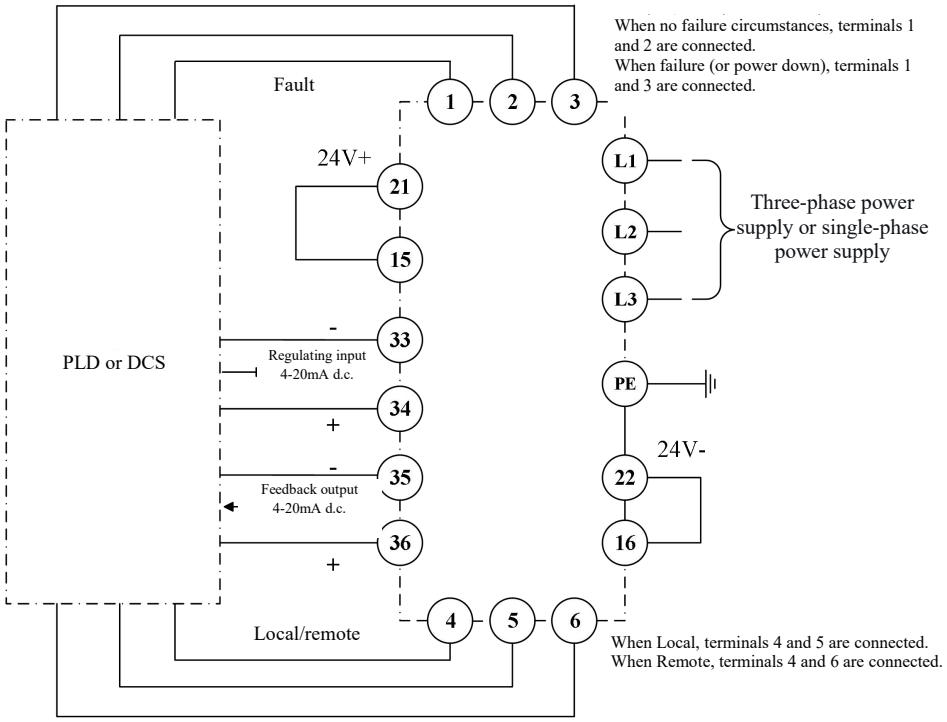


Figure 4.5 Analog signal control wiring diagram

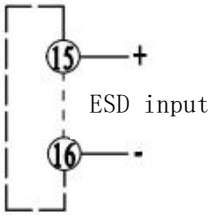


Figure 4.6 ESD signal control wiring diagram

4.2 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

4.3 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 4.2 Thread size of actuator's cable sealing port

The threaded holes of the cable sealing ports are covered with plugs during transportation. 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 product 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.

4.4 Fuse

The main power supply fuse is on the filter board, with specification of 3×15A (M8410-M8430) or 3×25A (M8440/ 8450), φ6×30 (similarly applicable for M8300 series).

4.5 Debugging procedures, methods and precautions

Adjust the configurations (setting position, setting parameters, configurations, diagnosis, etc.) through the local control panel. The entire setting can be performed at “local” state through the control panel of the actuator which is installed on the electronic unit and includes the following parts:

Mode selection switch:

The following modes can be selected:

REMOTE-A/B: for remote 4~20mA control (LCD shows “REMOTE-A”) / remote switching value control (LCD shows “REMOTE-B”).

O/S: Prohibited Mode. Electric operation is disabled.

LOC: Local Mode. Operation and settings are performed via the control panel.

↑ Button: Opens the valve or increases the parameter value during menu setup.

↓ Button: Closes the valve or decreases the parameter value during menu setup.

STOP/MODE Button: Press and hold to enter the menu; press briefly to confirm or exit the menu.

LCD Display: Shows alphanumeric characters for the operation mode and parameters.

LED Indicator: The green LED indicates main power available;The red LED indicates an actuator fault which requires attention.



Figure 4.7 Control panel

4.5.1 Operation and adjustment on control panel of the actuator

First set the mode selector switch to “LOC” position before operating or adjusting on control panel of the actuator.

There are 7 operation/adjustment main menus.

- Setting (P1)
- Parameter (P2)
- Diagnosis (P3)
- Actuator version (P4)
- Regulating (P5)
- Output (P6)
- Emergency (P7)

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

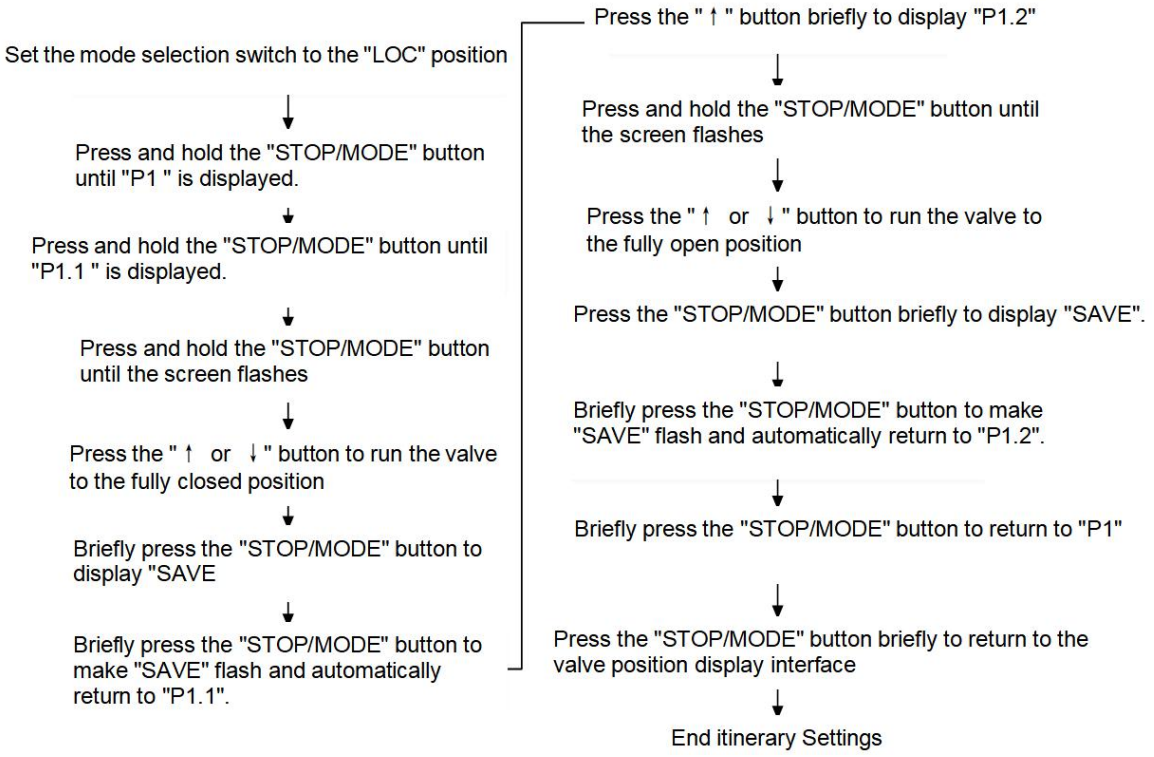


Figure 4.8 Actuator stroke setting instruction

Please note that when setting the closed and open positions of the actuator, the minimum stroke requirement must be met. If the stroke is less than the minimum, the screen will display "- - - -" and the settings cannot be saved. When "□□□□" is displayed, the settings can be saved.

4.5.1.1 Setting

Table 4.3 Menu functions

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	NORMAL REVERSE	ESD input active setting; "NORMAL": ESD active when energized, "REVERSE": ESD active when de-energized.
	P1.6 IN_REVS	NORMAL REVERSE	Direct/Reverse action setting; "NORMAL": direct action, 20mA corresponds to fully open, "REVERSE": reverse action, 20mA corresponds to fully closed.

4.5.1.2 Parameters

Main menus			Note
P2 PARAMETR	P2.1 SWITCH	HOLDMODE INCHMODE	Self-holding/inching
	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	HOLD	Set the action to be performed when the signal is disconnected, and select “HOLD” for position holding,

	ALM_DEAL	ALL_ON ALL_OFF	“ALL_ON” for full on position and “(ALL_OFF)” for full off position.
	P2.5 PLACE_O	5%~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.

4.5.1.3 Diagnosis

Main menus			Note
P3 DIAGNOSE	P3.1 ERR_ACTU	As shown in Table P3.1 in Chapter 6	Fault description
	P3.2 ALM_ACTU	As shown in Table P3.2 in Chapter 6	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 MALFTIME	As shown in P3.8	Duration from last malfunction to now
	P3.13 NEARTEMP	0~999	Recorded maximum temperature of motor, unit: °C
	P3.14 TEMPTIME	As shown in P3.8	Duration from recorded maximum temperature of motor to now
	P3.15 MAXCUR	A/D sampling value	Recorded maximum current of motor
	P3.16 MCURTIME	As shown in P3.8	Duration from recorded maximum temperature of motor to now

4.5.1.4 Actuator version

Main menus			Note
P4 MACHINE	P4.1 SW_VER	1.00~x.xx	Software version number; x.xx is the upgraded 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

4.5.1.5 Adjustment

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

4.5.1.6 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.

4.5.1.7 Emergency

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

4.5.2 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.

4.5.3 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 6.1 and Table 6.2.
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.

4.6 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 status 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 status output.

4.7 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.

5 Use and operation

5.1 Preparation and inspection before use

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

5.2 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;
- Consider the hazards caused by non-human factor during use process and prepare rapid countermeasures; and
- Prohibit operation by any other persons other than the operator; otherwise, it may cause adverse consequences.

5.3 Operating methods

- Local Electric Operation (Set the mode selector switch to "LOC")

Jog Mode: Press and hold the "↑" or "↓" button, and the actuator will run. Release the "↑" or "↓" button, and the actuator will stop running.

Maintained Mode: Briefly press the "↑" or "↓" button, and the actuator will continue to run until it reaches the fully open or fully closed position before stopping. To stop midway, briefly press the "STOP/MODE" button.

In local maintained mode, please exercise caution to prevent accidental contact with the "↑" or "↓" buttons, which could cause unintended actuator movement.

- Remote Operation (Set the mode selector switch to "REM")

By applying a remote control signal (discrete, analog, or digital communication), the actuator can be controlled remotely.

5.4 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.

5.5 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.

6 Trouble analysis and troubleshooting

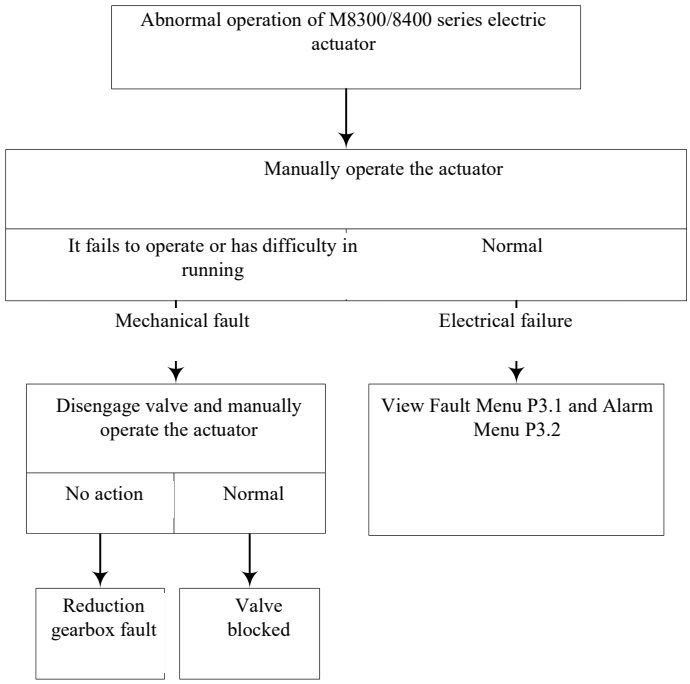


Table 6.1 Menu P3.1 fault display text

	Causes analysis	Troubleshooting methods
PHASE	Power supply has incorrect phase sequence detected.	Check the main power supply.
PHASE-0/1/2	Power supply is out of phase.	Check the main power supply.
TEMP-MOT	Go beyond motor temperature limit.	In case of out-of-limit, cut off power supply of the motor till that the temperature is below alarm value.
HANDWHL	Push in the handwheel.	Fully pull out the handwheel, then install the latch onto the handwheel shaft.
POS-LOSE	Valve position gets lost.	Adjust setting value of close and open positions.
SET-POS	The entire stroke count is below 800 code values.	Adjust setting value of close and open positions.
TORQUE-E	Actuator torque is greater than protection torque.	Drive the actuator reversely.
CUR-OVER	Motor has excessively high current.	Check whether the motor is out of phase or there is short circuit between its windings.
END-POS	Actuator runs to be beyond the terminal position, exceeding the limit (greater than 120% or smaller than -20%)	Restore the force from terminal control unit; and check accessories, manually operate the actuator to enter operation range or reposition the terminal.
RELAY	The actuator has incorrect operation direction.	Replace the control panel if it is faulted.

Table 6.2 Menu P3.2 alarm display text

	Causes analysis	Troubleshooting methods
BATRENEW	Low battery	Replace the battery.
BAT-EMPT	Low battery	Replace the battery.
TORQUE-O	It means the STO alarm, and that the load torque is greater than the selected STO alarm value.	Check the alarm value; whether the actuator, valve body and gearbox (if any) have increased friction force; and check whether the actuator works under the allowed ambient temperature (viscosity increasing).
TORQUE-C	It means the STC alarm, and that the load torque is greater than the selected STO alarm value.	

TEMP-MOT	Critical motor temperature	When reaching motor alarm temperature, the actuator will stop running till motor temperature drops to low enough.
IN-SIGN	It means no adjusting signal alarm, and that the signal is greater than 110% or smaller than -10% (adjusting signal is too high or too low).	Check the fault of signal board or input current.
MAINTAIN	It means that maintenance is required, and the motor start times or motor running times exceed the pre-set value.	After maintenance inspection of the actuator, increase pre-set maintenance value in Menu P4.

7 Maintenance and repair

In order to ensure trouble-free operation, the checks in section 7.1 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.

7.1 Daily maintenance and servicing

Table 7.1 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 with protective sleeve for protection.
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.

8 Appearance and installation size

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

8.1 Appearance and installation size of actuator

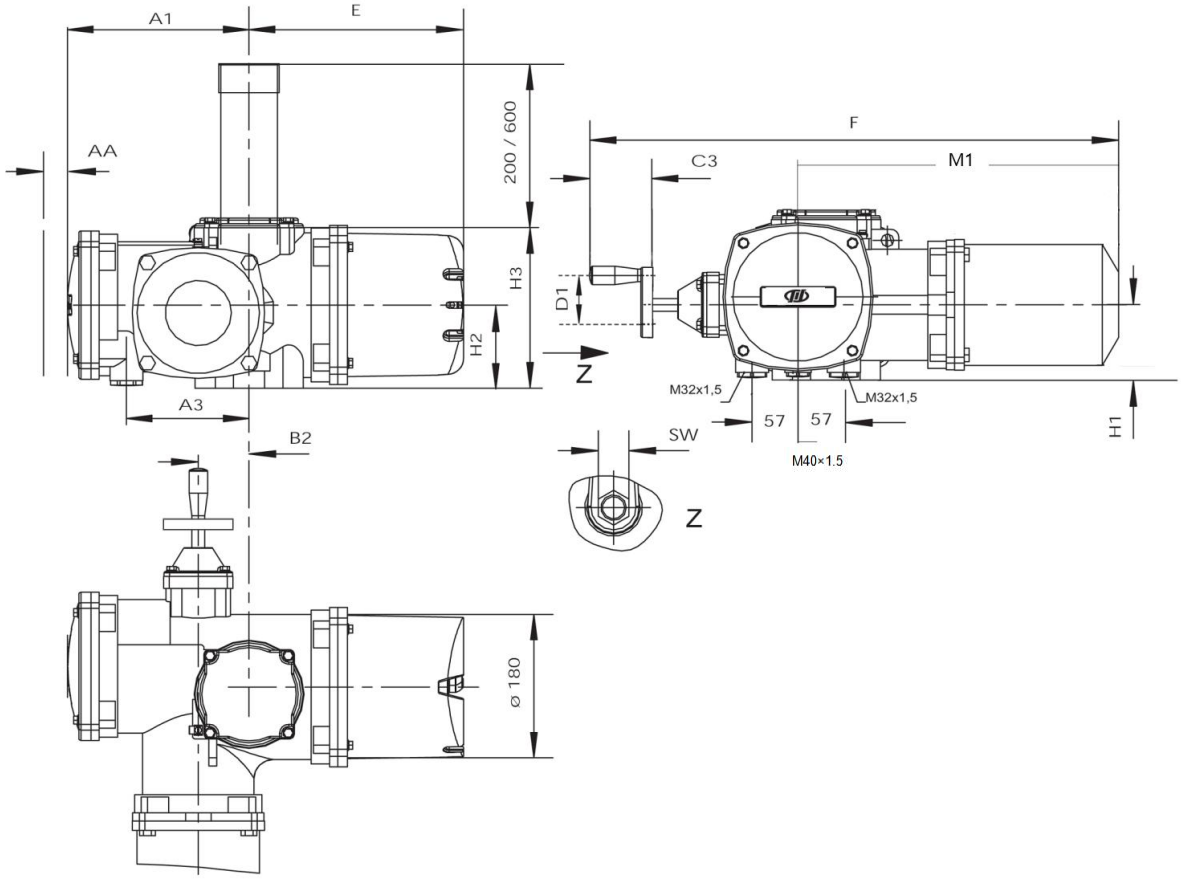


Figure 8.1 Actuator appearance

Table 8.1 Actuator installation size

Model / Parameter	M8□10	M8□20	M8□30	M8□40	M8□50	M8□60
ISO5210	F10	F10	F14	F16	F16	F16
A1	207	207	226	250	250	250
A3	133	133	152	169	169	169
B2	50	50	63	80	80	80
C3	99	99	99	82.5	82.5	82.5
D1	R99	R99	R99	R95	R95	R95
E	253	253	266	294	294	294
F	574	598	665	768.5	768.5	768.5
H1	94.5	94.5	94.5	140	140	140
H2	104.5	104.5	104.5	148	148	148
H3	202	202	202	250	250	250
M1	285	313	373	375	470	470

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

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

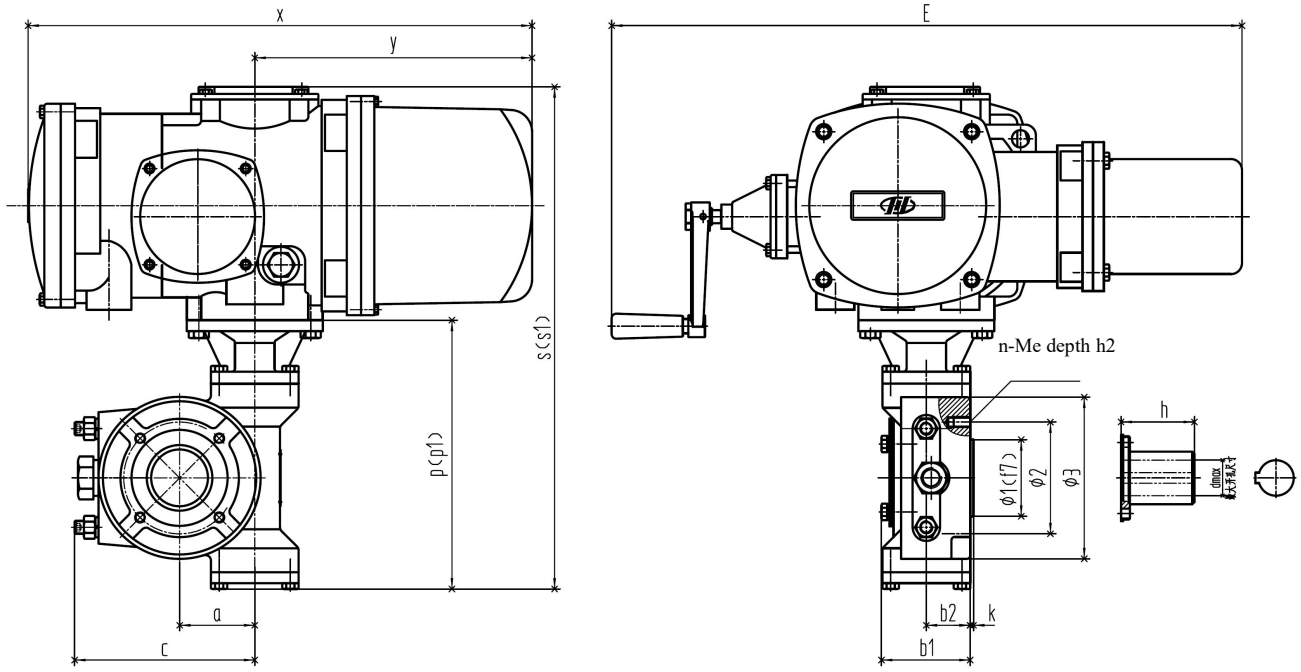


Figure 8.3 Appearance of angular stroke electric actuator (straight type)

Table 8.4 Installation size of angular stroke electric actuator (straight type) Unit: mm

Model	A8005	A8010	A8020	A8040	A8090 (+G6502)	A8160 A8161 A8162	A8250	A8400
a	52	68.5	85	101	150	160	200	250
c	140	165	199	245	330	400	480	570
b1	100	81	88	107	139.5	198	250	309.5
b2	52	40	46	57	62	113	144	166.5
n-Me depth h2	4-M10 depth 15	4-M10 depth 15	4-M16 depth 22	4-M20 depth 25	8-M16 depth 20	8-M20 depth 32	8-M30 depth 45	8-M36 depth 55
k	3	3	3	3	4	4	4	5
Ø1 (f7)	70	70	100	130	200	230	260	300
Ø2	102	102	140	165	254	298	356	406
Ø3	115	148	176	212	310	350	436	535
dmax	30	35	55	65	95	105	115	150
h	81	67	73	88	122	158	215	260
p (p1)	172	246	252	292	F14: 395 (531) F16: 399	589	640	830
s (s1)	386	460	466	506	F14: 609 (745) F16: 699	859	910	1100
E		M8□10=574	M8□20=598	M8□30=665	M8□40=769	M8□50=769		
x		M8□10=450	M8□20=120	M8□30=491	M8□40=544	M8□50=544		
y		M8□10=253	M8□20=253	M8□30=266	M8□40=294	M8□50=294		

8.3 Appearance and installation size of angular stroke electric actuator with lever

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

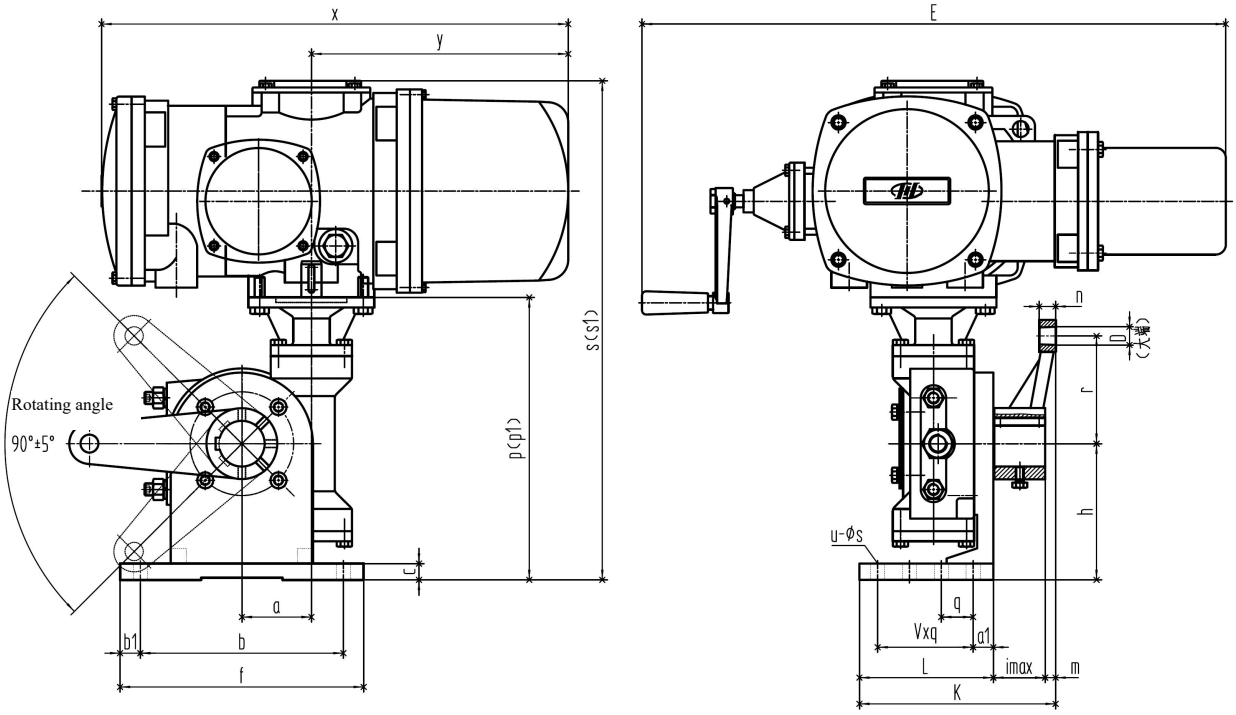


Figure 8.4 Appearance of angular stroke electric actuator with lever

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 8.5 Appearance and installation size of angular stroke electric actuator with lever Unit: mm

Model	A8005	A8010	A8020	A8040	A8090 (+G6502)	A8160 A8161 A8162	A8250	A8400
U-ØS	4-Ø14	4-Ø14	4-Ø18	4-Ø22	6-Ø22	6-Ø22	8-Ø22	8-Ø22
V×q	1×70	1×94	1×94	1×102	2×80	2×80	3×70	3×70
a1	36	20	30	50	56	62	70	70
imax	66	51	80	100	100	143	150	150
k	198	183	240	285	356	415	470	470
L	132	132	160	185	256	272	320	320
m	8	0	0	0	0	0	0	0
n	20.5	20	30	30	30	40	42	42
D 1: 10	Ø18	Ø22	Ø26	Ø30	Ø38	Ø38	Ø38	Ø38
r	160	150	200	250	250	250	500	500
h	107	134	163	200	235	250	310	350
f	180	240	290	330	400	520	630	630
b	140	200	223	270	338	448	580	580
b1	20	20	33.5	30	31	36	25	25
a	52	68.5	85	101	150	160	250	250
c	15	16	18	20	24	30	30	30
P (p1 with transition gear)	207	278	310	365	F14:462(618) F16:466	668	666	915
s (s1)	420.5	492	524	579	F14:678(832) F16:738	882	880	1129
E		M8□10=574	M8□20=598	M8□30=665	M8□40=769	M8□50=769	M8□60=769	
x		M8□10=450	M8□20=120	M8□30=491	M8□40=544	M8□50=544	M8□60=544	
y		M8□10=253	M8□20=253	M8□30=266	M8□40=294	M8□50=294	M8□60=294	

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