Operation Manual

M series intelligent electric actuator

M83/84d



Chongqing Chuanyi Automation Co., LTD. Actuator Filiale

V002510

Preface

Thank you for using M83/M84d Series Electric Actuator, please read this Manual carefully before installation and commissioning.

(1) About this Operation Manual

1) This Operation Manual will be delivered to and used by end user. Please keep it carefully;
2) Please read this Operation Manual carefully to understand fully the method of product operation before operation;
3) Extracting or copying part of or the whole Operation Manual is forbidden without permission;
4) The content of this Operation Manual may be changed without prior notice;
5) We have endeavored to ensure its correctness during the preparation of this Operation Manual. Any mistake or omission, please contact with Marketing Department.

(2) Safety Cautions

(1) In order to protect and ensure safety of this product and the system controlled thereby, follow the safety instruction and cautions in this Operation Manual when using the product. We are not responsible for any bad consequence due to noncompliance with the Manual.

(2) If any independent protective unit or safety circuit is going to be installed on the product or the system controlled thereby, make sure such equipments are 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 our factory.

■ 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.

■ Environmental Protection Item

In order 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:

(1) Substituted damaged and scrap materials, such as coated metal parts, screws, nuts and batteries, cables and other rubber and plastic parts.
(2) Waste lubricants and lubricants spilled during use.
(3) Waste circuit boards and electronic components.
(4) Other waste materials.

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

■ Special Cautions

------ To insure the operation pressure inside to release and no lubricant leaking occurs:

（1）After installation is completed, the oil plug screw at the highest point of the M84d series (adjustable type) actuator must be replaced with the vent screw provided in the spare parts! The M83d series (switching type) is not required.

------ To insure product reaching the stated protection and protect inside structure from the damage because of sealing:

（2）Put the cable through the lead collar accompanied in spare parts and tighten it!

（3）Tighten the hood screw after installation and adjustment!

（4）Forbidden to open explosion-proof cavity in electricity, open the explosion-proof cavity after power off for 5 minutes.

（5）Do not damage cover and explosion-proof combination surface during installation and maintenance. Tighten concerned screws after maintenance.

（6）It's forbidden to change spare parts randomly. If it's necessary to change, please use our appointed spare parts.

（7）When installing Angle Electric Actuator, please match the valve's off position strictly with the electric actuator's off position.

Any losses due to noncompliance of installation requirement are not within warranty scope.

Table of Content

1 OVERVIEW 1

1.1 Product Features 1
1.2 Application 1
1.3 Types and Specifications 1
1.4 Application Ambient Conditions 2
1.5 Operation Conditions 2
1.6 Impact on Environment 2

2 STRUCTURE FEATURES AND OPERATION PRINCIPLE 2

2.1 Overall Structure, Operation Principle and Features 2
2.2 Structure, Function and Operation Principle of Main Parts and Functional Units 2
2.3 Functional Structure, Operation Principle, and Operation Features of the Structural Units 3
2.4 Functional Structure, Operation Principle and Features of Auxiliary Device 3

3 TECHNICAL FEATURES 3

3.1 Main Features and Parameters 3

4 INSTALLATION AND COMMISSIONING 3

4.1 Electric connection 3
4.2 Wiring 7
4.3 Commissioning Procedure, Method and Precautions 7
4.4 Test Items, Methods and Criteria for Acceptance after Installation and Commissioning 11
4.5 Preparations before Trial Operation, Start of Trial Operation and Trial Operation 11

5 APPLICATION AND OPERATION 12

5.1 Preparations and Check before Application 12
5.2 Safety before and in the Application, Safety Protection, Safety Sign and Instructions 12
5.3 Operation Method 12
5.4 Monitor and Record during the Operation 12
5.5 Halt Operation Procedure and Precautions 12

6 TROUBLE SHOOTING 13

7 MAINTENANCE AND REPAIR 14

7.1 Daily maintenance 14
7.2 Battery pack 14

8 DIMENSION AND WEIGHT 15

8.1 Actuator Outline and Installation Dimension 15
8.2 Dimension of Actuator Output Flange 16
8.3 Actuator Connection Form and Dimension 17
8.4 Angle Additional Gearbox 17
8.5 Linear Additional Gearbox 20
8.6 Multi-turn Additional Gearbox 21

Instruction to Out-of-box Inspection, Transportation and Storage

1 Out-of-box Inspection

Each actuator was inspected strictly to ensure product quality before leaving factory. Please make the following inspections when opening the actuator package:

- Check whether the actuator is damaged in transportation.
- Check whether the actuator model conforms to that printed on the outside package and whether the actual items in the package conform to the packing list.

2 Transportation and Storage

- Transportation temperature: -30°C~+75°C; storage temperature: -10°C~55°C.
- Place the actuator in indoor and dry environment to avoid condensation in case of no special package.
- Appropriate package and desiccant must be provided for transportation or storage under environment of humidity or corrosive gases**;** check the desiccant regularly for effectiveness.

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 ropes, 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.

Manual operation must strictly follow the handwheel operation instructions in this guide. It is prohibited to operate the handwheel while the power is on.

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

M83/M84d series product is the multi-turn electric actuator with embedded intelligent controller. Worm gear and worm are used for electric actuator, to which the gearbox can be added to satisfy users' different torque requirements.

1.1 Product Features

- Intelligent control and flexible starting;
- Providing with rich diagnostic information;
- Driven by three-phase motor with large driving force;
- Worm gear and worm for main drive;
- LCD display with abundant information;
- Simple operation and easy to learn;
- Safe and reliable with mechanical waterproof switch;
- Available for 4 mA ~20mA analog control and passive and active control of 24Vd.c. binary signal.

1.2 Application

The intelligent actuator is designed to drive the terminal control unit (valve and baffle etc) and has wide applications in industries such as electric power, metallurgy, and petroleum, chemical industry, building materials, urban water supply and wastewater treatment.

1.3 Types and Specifications

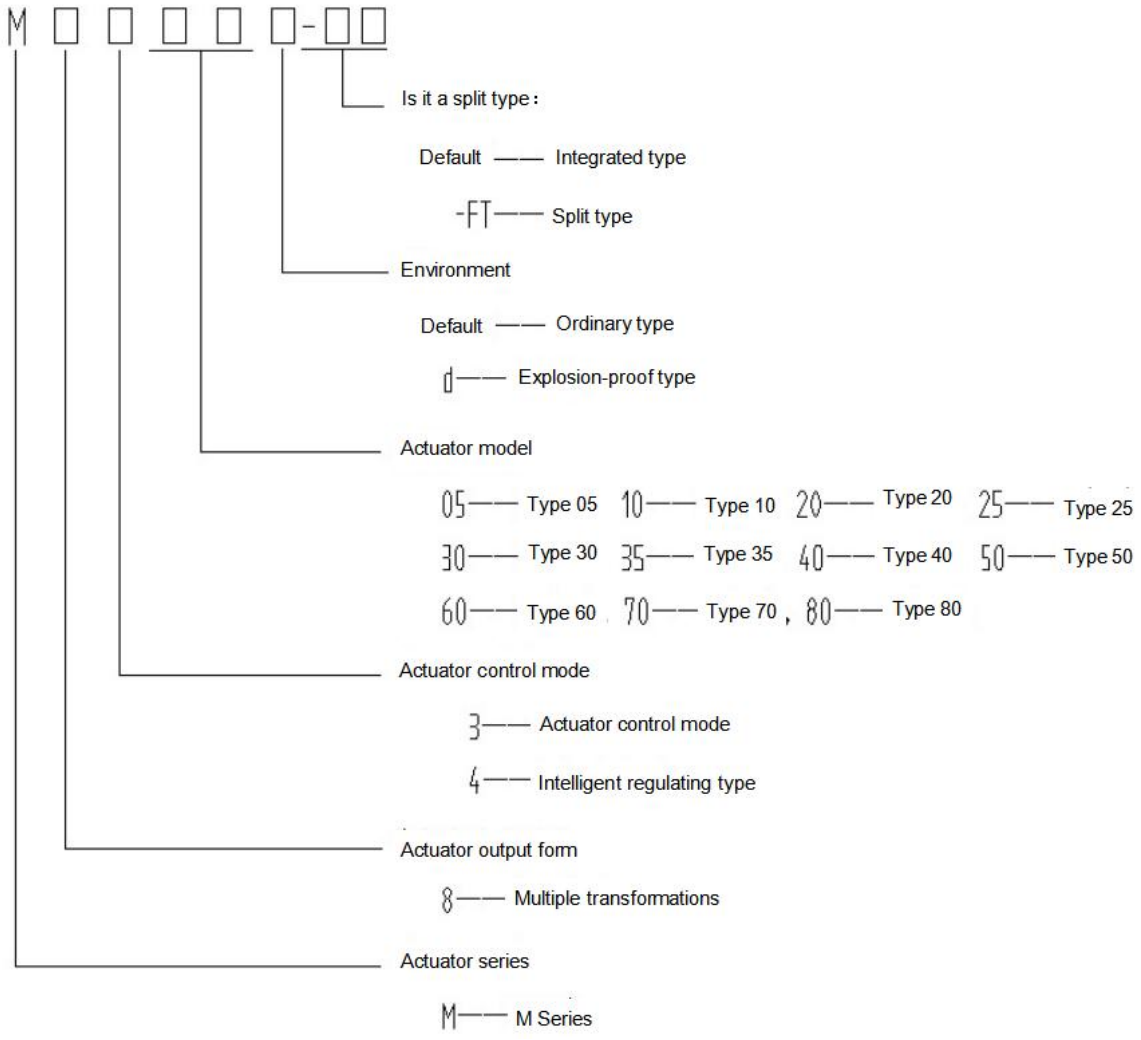


Fig. 1.1 Basic Model Format of M83/84d series actuator

1.4 Application Ambient Conditions

The following ambient temperature is applicable according to oil types.

- Standard: -40°C~+70°C. Other using conditions should be agreed between the purchaser and the manufacturer.
- Relative humidity: Not more than 95% (25°C);
- Atmospheric pressure: 86kPa~106kPa;
- No corrosive media in ambient environment;

1.5 Operation 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: less than 5%.

1.6 Impact on Environment

The actuator is a clean product without hazardous gas and liquid, and no pollution to the environment.

2 Structure Features and Operation Principle

2.1 Overall Structure, Operation Principle and Features



Fig. 2.1 Main Parts (sectional view)

The actuator mainly consists of motor, position sensor, worm gear, worm, drive shaft, control unit, local operation panel, and hand-wheel.

The control units adopt 4~20mA control signal or binary signal to drive the motor, driving the worm which drives the worm gear and the output shaft. The position sensor will check the motor displacement, and send the threshold signal to the control panel. If the control panel monitors that the position signal corresponds with the position specified by control signal, the power supply for the motor will be cut off and the actuator will be stopped by the worm gear and worm through the self-locking features.

The actuator is an electromechanical product to convert weak signal into torque output in the S4 operation mode.

2.2 Structure, Function and Operation Principle of Main Parts and Functional Units

2.2.1 Electric control unit

The electric control unit consists of CPU board, dash board, and electric parts. CPU board is used to handle the given signal and feedback signal. The dash board is used to drive the motor.

2.2.2 Worm gear and worm

This part can slowdown the drive speed of the output shaft of the motor and cause a mechanical self-locking.

2.2.3 Additional gearbox

The additional gearbox is provided for outputting of different torques of the actuator. Relevant information such as input torque and output torque/force are recorded in the data marks on the additional gearbox.

2.3 Functional Structure, Operation Principle, and Operation Features of the Structural Units

The external control signal is applied to the electric control unit through the cable of junction box. Electric control unit uses photoelectric isolation and transformer isolation to drive the motor, and then drive the worm gear and worm, and the output shaft, which is the feature of weak current controlling strong current.

2.4 Functional Structure, Operation Principle and Features of Auxiliary Device

Handwheel component: It is used when manual operation is required for installation, commissioning, and troubleshooting, etc. This handwheel mechanism is also capable of switching between manual and electric operation. When the handwheel is pushed forward, it engages to the worm shaft and can be operated manually.

Before manual operation, the mode selection switch must be set to "O/S" and the external power supply disconnected. Remove the handwheel clamp and push the handwheel along the axial direction before turning it. When it is necessary to resume electric operation, the handwheel must be fully pulled out, and then the clamp should be installed on the handwheel shaft before power can be restored and electric operation can be carried out.

3 Technical Features

3.1 Main Features and Parameters

- Voltage output: DC 24V; maximum: 30mA, with input/output short-circuit protection.
- Motor control: thyristor controlled.
- Working mode:Modulating type S4 - 25%, 1200 times/h, On-off type S2—15min;based on IEC34.
- Protection ratings:IP66/IP67/IP68.
- Explosion Proof: ExdⅡBT4 Gb or ExdⅡCT4 Gb.
- Humidity: <95% average value (please use heater to avoid pulverization).
- Installation position: any position.
- Coating: 1K black lacquer coating of epoxy resin, （Special ambient surface coating anti-corrosion paint,） stainless external bolt (excluding drain bolt).
- Electro Magnetic Capability (EMC): according to GB/T17626.2～GB/T17626.5。
- Electric connection: refer to Part 4.3 for details.
- Minimum selected pulse of binary signal control: 200ms complete pulse.
- Dead-zone of controller: 0.4%; (0.4 ~ 5% adjustable).
- Analog input (optional): 4 ~ 20mA; electrical isolation, 250Ω input resistance, and increasing characteristic.
- Digital input (E1-E4): 4-channel optical coupling isolation input, independent electric potential, and free configuration. Digit 0: -3~+5V or open circuit. Digit 1: +15V~+30V.
- Analog output (optional): 4~20mA position signal; load capacity: 500Ω (maximum); electrical isolation.
- Digital output: 4 standard output (A1-A4) and 3 options (A5-A7); electrical isolation, free configuration: maximum voltage 250Va.c., Maximum current <5A, minimum current >1mA, overload protection and DTC/NO contact on terminal board.
- Basic error limit: ±1%.

4 Installation and Commissioning

4.1 Electric connection

The external wiring terminal of the actuator is shown in Figure 4.1, table 4.1 is the functional description of the terminals, the electrical wiring schematic diagram is shown in Figure 4.2, and the recommended wiring diagram is shown in Figure 4.3 ~ 4.6. There are ground points in the wiring cavity and the enclosure, the ground connection is a very important way to protect the operator and anti-electromagnetic interference. Before using, please make sure that there is a reliable ground connection.

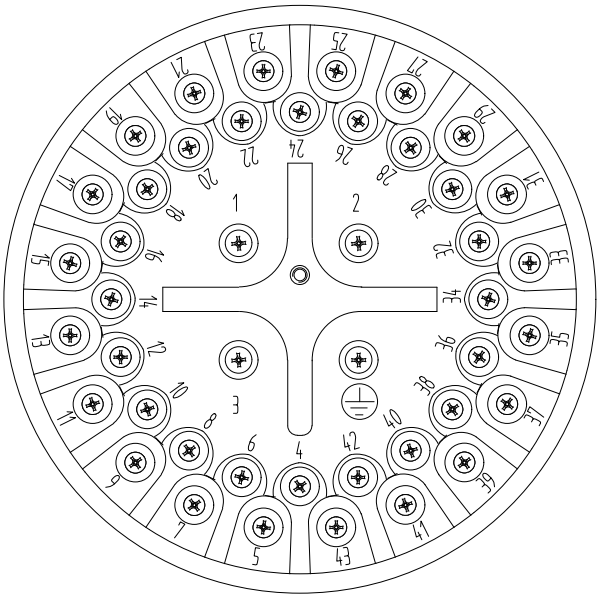


Fig.3.1 The external wiring terminal of the actuator

Table4.1 Terminal function

Function Name	Terminal number	Function description	Remarks
Power Supply	1、2、3	Three-phase power supply (no phase sequence).	standard
Grounding	⏚	Ground protection.	standard
Digital input 1（E1）	14（+）	actuator opening instruction.	standard
Digital input 2（E2）	15（+）	actuator closing instruction.	standard
Digital input 3（E3）	16（+）、20（-）	Remote analog control (24V)/remote switch control (0V) switching; When the ESD function is available, it is the ESD control input	standard
Digital input 4（E4）	17（+）	The actuator is stopped	standard
Common point（COM）	18（-）	The common negative terminal of the open instruction, close instruction, and stop instruction	standard
Digital output 1（A1）	4、5、6	For fault signal, terminal 4 is the common terminal. In normal time, terminals 4 and 5 are on, while in case of failure (or power loss), terminals 4 and 6 are on.	standard
Digital output 2（A2）	7、8、9	Local/Remote state feedback signal; terminal 7 is the common end; when the actuator is in Local, terminals 7 and 8 are on; when the actuator is in Remote, terminals 7 and 9 are on.	standard
Digital output 3（A3）	10、11	Open in place signal, when the actuator is in full open position, terminals 10 and 11 are on.	standard
Digital output 4（A4）	12、13	Close in place signal, When the actuator is in the fully closed position, terminals 12 and 13 are on.	standard
Digital output 5（A5）	25、26、27	Open over-torque alarm signal, terminal 25 is the common end, and terminals 25 and 26 are connected when alarming.	**optional**
Digital output 6（A6）	28、29、30	Turn off the over-torque alarm signal, terminal 28 is the common end, and terminals 28 and 29 are connected	**optional**

		when alarming.	
Digital output 7（A7）	31、32	Operation signal of actuator, terminals 31 and 32 are switched on during normal operation.	**optional**
Adjust the analog input	33（-）、34（+）	4 mA ~ 20 mad. c. input, M84d series configuration, M83d series not.	**optional**
Feedback analog output	35（-）、36（+）	4 mA~ 20mad.c. The output, M84d, M83dC series configuration	**optional**
24Vd.c. output	21/23（+）、22/24（-）	External output of actuator 24Vd.c. Power interface, output current ≤ 30mA.	standard

Note: Digital output A1-A4 output is standard configuration, A5-A7 is optional when ordering, all functions in the table are factory

The default configuration allows the user to configure A1-A7 as needed.

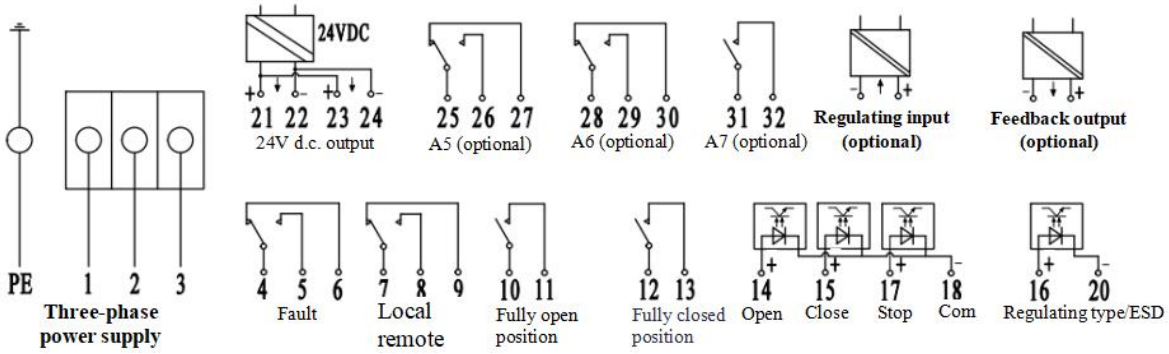


Figure 4.2. The electrical wiring schematic diagram

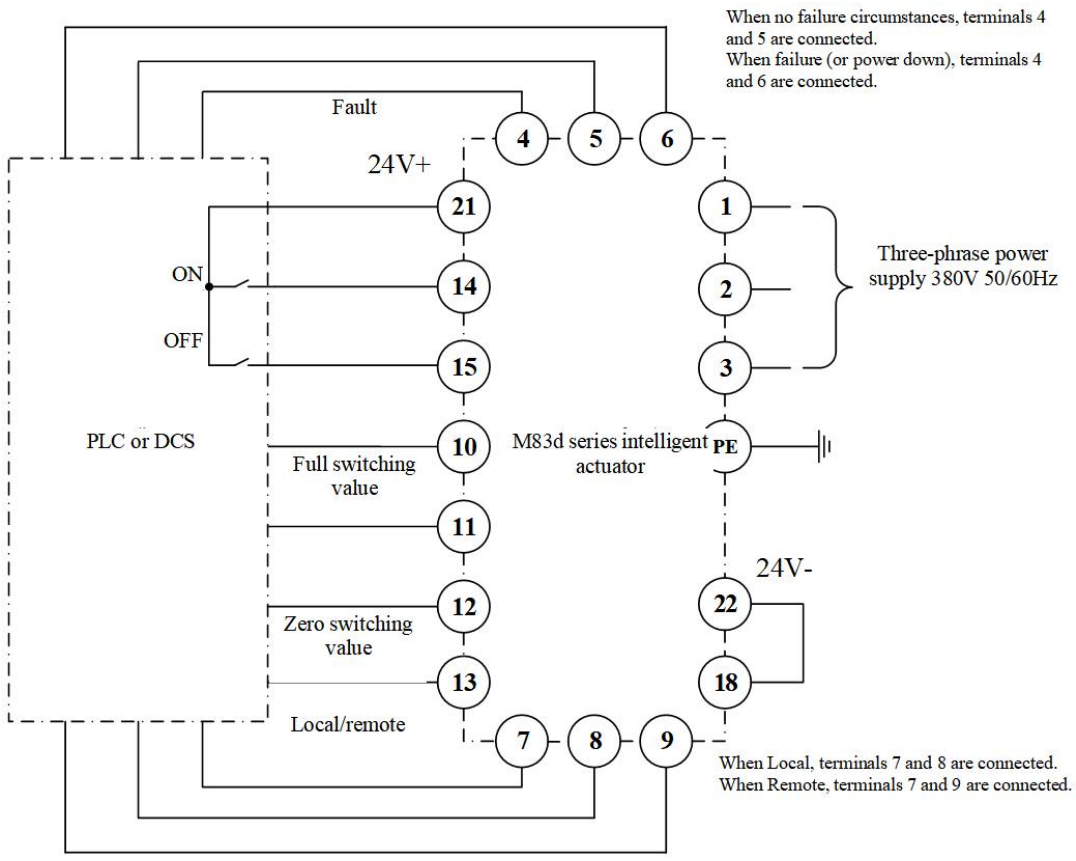


Figure 4.3. Switching Signal control wiring diagram (passive wiring mode)

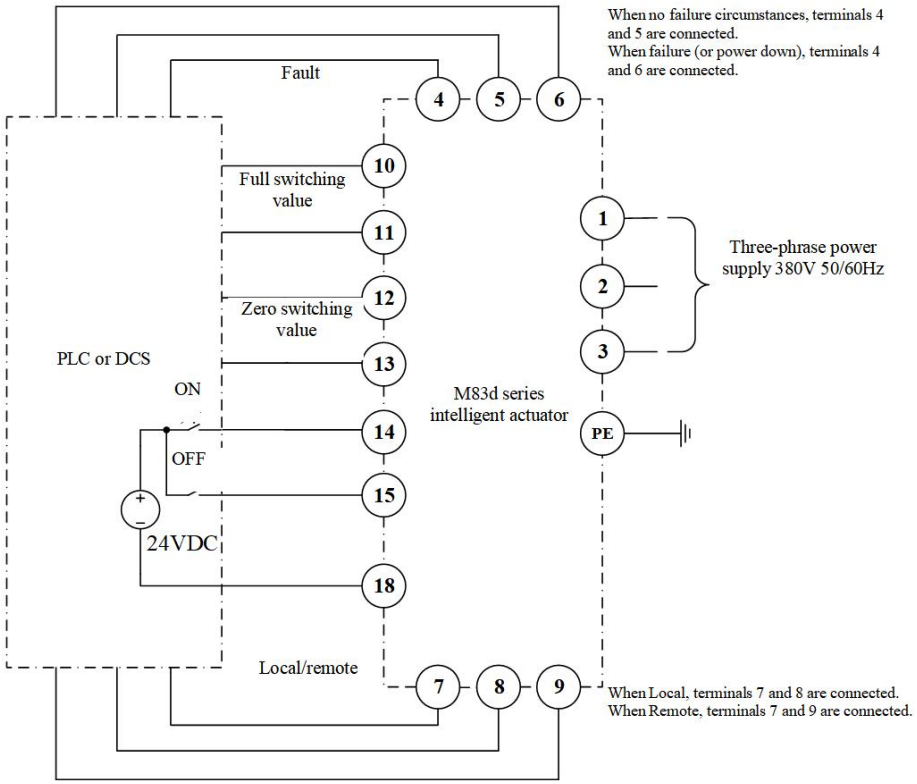


Figure 4.4. Switching Signal control wiring diagram (active wiring mode)

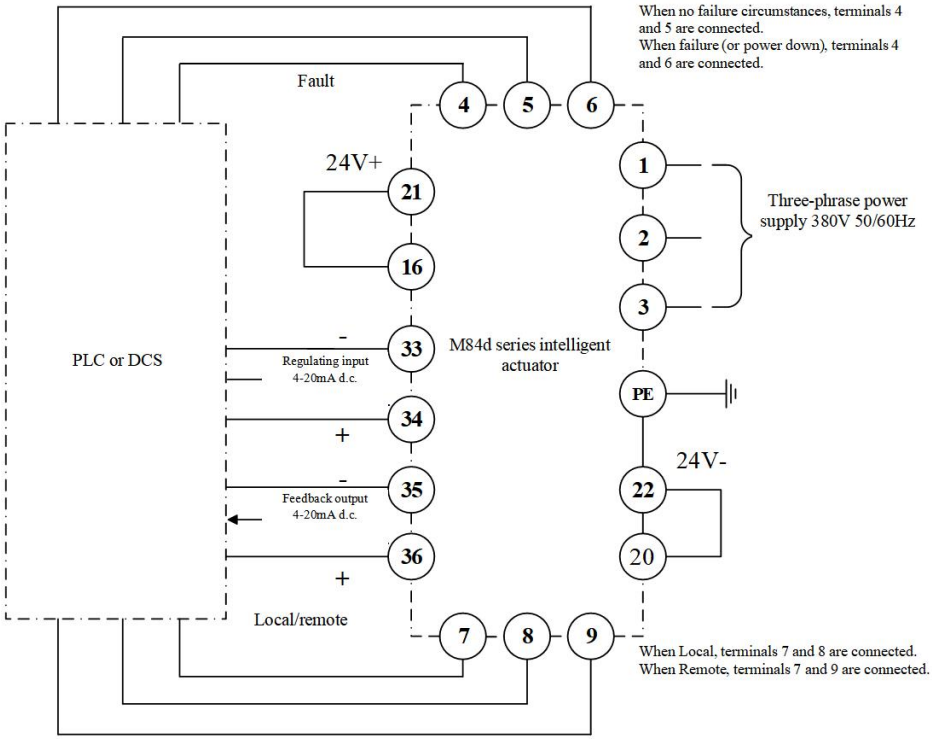


Figure 4.5. Analog signal control wiring diagram

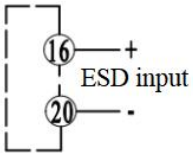


Figure 4.6. ESD Signal control wiring diagram

4.2 Wiring

4.2.1 Wire diameter choice (contact connection)

Power cable: ≤6mm2 hand wire or 4mm2 soft wire
Signal cable: ≤2.5mm^2 hand wire or 4mm^2 soft wire

4.2.2 The screw thread dimension of cable sealing entry.

Terminal	Standard（Metric）	Recommended the outer dimension of cable（mm）
Standard	2×M32×1.5	10-19
Optional	1×M25×1.5	

During transportation, the screw thread hole of cable's sealing entry was covered with plug screw. The grade of protect was ensured by the sealing of cable entry. Please use enter-cover that collocated random allocation and collocate fit cable of outer dimension. If necessary, you can smear sealant in cable's entrance to ensure specified protection degree.

4.2.3 Safety

Main power's insurance locate in filter board. It's specification is 3×16A（M8410-M8430），or3×25A（M8440/8450），φ6×30；（（the same as M8300 series）

4.3 Commissioning Procedure, Method and Precautions

The actuator adjusts the visualization through the Actuator Dash Board (such as location setting, parameter setting, configuration and diagnosis).The whole setting can be carried out in the "Local Operation" state of the Actuator Dash Board. Installed in the electric unit, the Actuator Dash Board contains the following parts:
Mode selection switch
REM: REMOTE mode, used for REMOTE 4-20mA control (LCD display "Remote-a")/remote switch quantity control (LCD display "remote-B")
O/S: Prohibited mode, electric operation prohibited.
LOC: Local mode, operated and set through the operation panel.
↑ Button: Increase the parameter setting value when opening the valve or setting the menu.
↓ Button: To close the valve or reduce the parameter setting value during menu Settings.
STOP/MODE button: Long press to enter the menu, short press to confirm or exit the menu.
LED: A green LED indicates "Main power available", while a red LED shows "Fault".

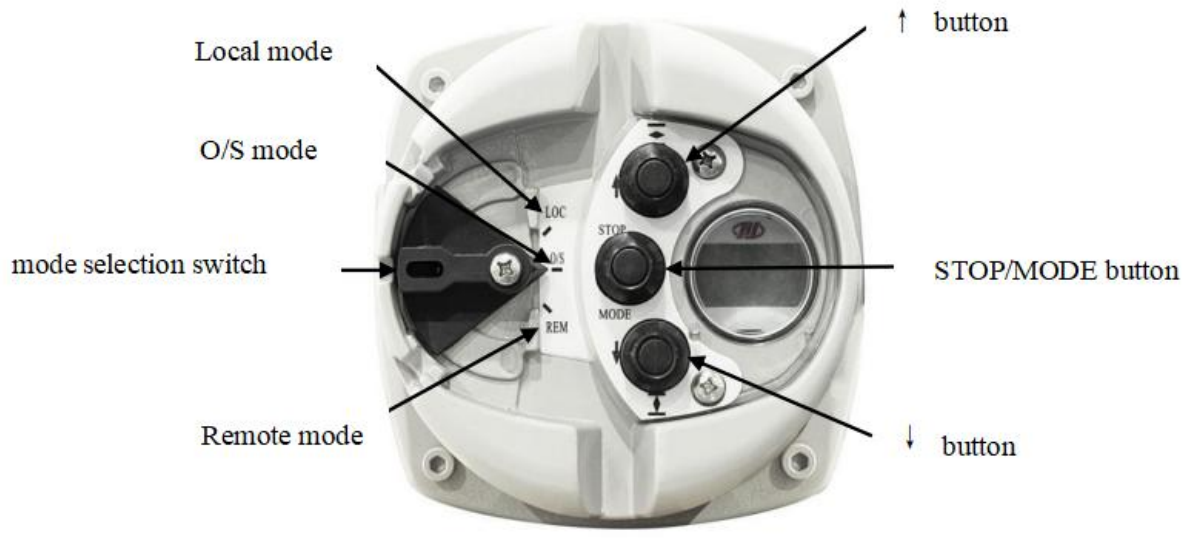


Fig. 4.7Actuator Dash Board

4.3.1 Operation and Adjustment on Actuator Dash Board

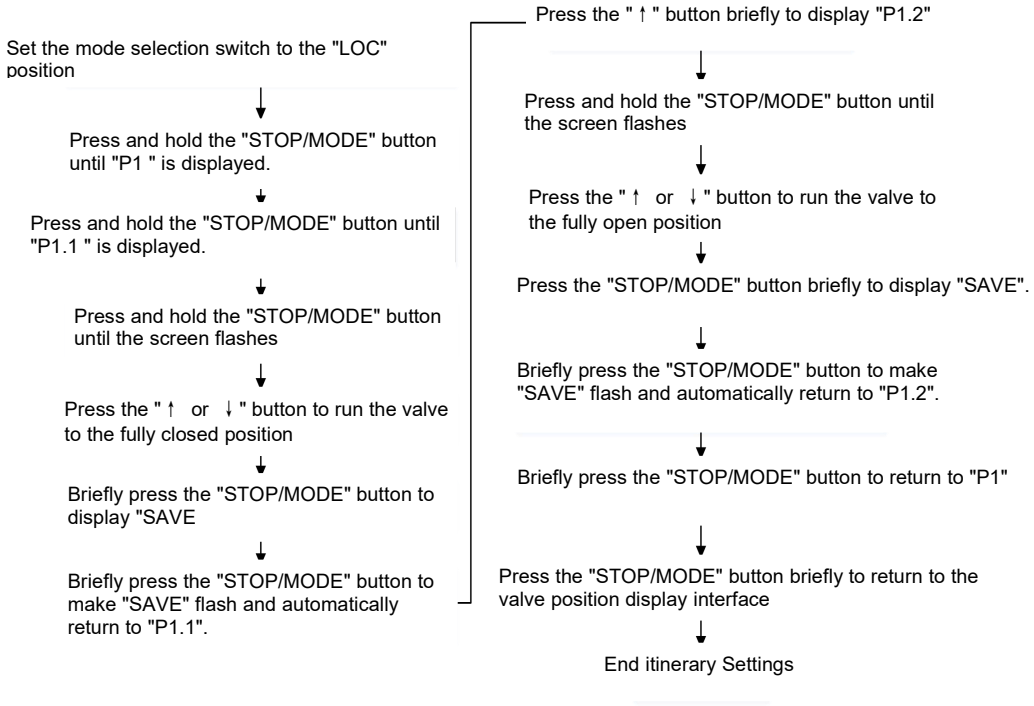
Put the mode selection switch to the “Local” position before the operation or adjustment on Actuator Dash Board .

Operation/Adjustment menu consists of 7 main menus:

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

Each main menu consists of one submenu or several submenus. Selection in the menu of the same level is done with +/- button; press and hold or click mode/stop button to enter or exit from menus of different levels.

Set the operation range of (P1.1+P1.2) before driving the actuator. During the setting, 4 lines like “————” will be displayed on the monitor when the actuator is within the minimum adjustable range. Lines will become “□□□□” if the minimum adjustable range of the actuator is exceeded.



4.3.1.1 Setting

Main Menu			Notes
P1 SETUP			
	P1.1 ADJUST_C	———— or □□□□	Adjustment of close terminal position
	P1.2 ADJUST_O	———— or □□□□	Adjustment of open terminal position
	P1.3 TORQUE-C	40%-100%	Close protective torque (10% stepping)
	P1.4 TORQUE-O	40%-100%	Open protective torque (10% stepping)
	P1.5 ESD_REVS	NORMAL REVERSE	ESD input is valid; ESD is valid when "NORMAL" is on power; ESD is valid when "REVERSE" is off power.
	P1.6 IN_REVS	NORMAL REVERSE	Positive and negative settings; "NORMAL" positive 20mA corresponds to full switching; "REVERSE" negative 20mA corresponds to full switching.

4.3.1.2 Parameters

Main Menu	Notes

P2 PARAMETR	P2.1 SWITCH	HOLDMODE INCHMODE	Self-holding/inching.
	P2.2 LIMIT_O	55% - 100%	The range of open limits within 55% to 100%.
	P2.3 LIMIT_C	0%-45%	The range of the close limits within 0% to 45%.
	P2.4 ALM_DEAL	HOLD ALL_ON ALL_OFF	Choose “HOLD”, “ALL_ON” and “ALL_DOWN” for the actions in case of signal breakage.
	P2.5 PLACE_O	50%~100%	Preset the open alarm position; the alarm signal occurs when the position is no less than the open position preset.
	P2.6 PLACE_C	0%~50%	Preset the close alarm position; the alarm signal occurs when the position is less than the open position preset.
	P2.7 TC_CTRL	ON OFF	The torque shut-off setting, when it is “ON”, it is in torque shut-off mode. The actuator will stop when the shut-off torque is higher than the protection torque which setting in the Menu P1.3.
	P2.8 CTRL_PAR	NORMARL ESD_SWI ESD_ADJ	Control mode selection The remote control mode of "NORMARL" is determined by terminal 16 (adjusting/switching quantity). "ESD_SWI" switch control mode, terminal 16 for ESD control input. "ESD_ADJ" adjustable control mode (4-20mA), terminal 16 for ESD control input.
	P2.9 ESD_MODE	HOLD OPEN CLOSE	Set the action to be executed when ESD emergency operation is valid. Choose "HOLD" to reserve, OPEN to turn on and CLOSE to turn off.

4.3.1.3 Diagnosis

Main Menu			Notes
P3 DIAGNOSE	P3.1 ERR_ACTU	See chapter 6 tableP3.1	Error information
	P3.2 ALM_ACTU	See chapter 6 tableP3.2	Alarm information
	P3.3 HALLCODE	0~999	Count value of Hall sensor is used to detect the performance of Hall sensor.
	P3.4 INPUTPER	0%~100%	Percentage of 4~ 20mA analog input
	P3.5 TEMP_MOT	- 999~999	Motor temperature
	P3.6 BATTERY	0.0~9.9	Battery voltage
	P3.7 STARTIME	0~999. Runtime displayed in scientific notation for those larger than 999.	Times of start, unit: time display in scientific notation, for example “2.5 4” means 2.5×10^4, i.e. 250000.
	P3.8 RUNTIME	0~999. Runtime displayed in scientific notation for those larger than 999.	Runtime, unit: hour. Display in scientific notation, for example “2.5 4” means 2.5×10^4, i.e. 25000.
	P3.9 TMAXPERM	0~999	Maximum start times per minute, unit: time
	P3.10 TMAXPERM	0～9999	Max. startup times per minute, unit: times.
	P3.11 NEARMALF	See 3.1	Latest failure information

	P3.12 MALFTIME	See P3.8	Time from latest failure to now
	P3.13 NEARTEMP	0～999	Historical highest temperature of motor unit: ℃
	P3.14 TEMPTIME	See P3.8	Time from historical max. temperature of motor to now
	P3.15 MAXCUR	A/D sampling value	Historical max. power supply of motor
	P3.16 MCURTIME	See P3.8	Time from historical max. power supply of motor to now

4.3.1.4 Actuator Version

Main Menu			Notes
P4 MACHINE	P4.1 SW_VER	1.00~x.xx	Software version No., x.xx is the version No. of the upgraded software.
	P4.2 HW_VER		For further setting, reserved.
	P4.3 MOTOR	M8410~M8450	Actuator model
	P4.4 STTLIMIT	Default 100000 times	Maitenance limitation of startup times is display value of panel ×1000.
	P4.5 MRTLIMIT	Default 2500H	Mainenance limitation of motor operation time unit: H

4.3.1.5 Adjustment

Main Menu			Notes
P5 CALIBRAT	P5.1 PASSWORD	50	Input the password “51” to enter the following menu
	P5.2 INPUT-Z		Set, calibrate and input zero point by adjustment signal (4mA). Notes: save unavailable in case of deviation over 5%.
	P5.3 INPUT-F		Set, calibrate and input full travel value by adjustment signal (20mA). Notes: save unavailable in case of deviation over 5%.
	P5.4 OUTPUT-Z	0%~100%	Set, calibrate and output zero point of valve position (4mA).
	P5.5 OUTPUT-F	0%~100%	Set, calibrate and output full travel value of valve position (20mA).
	P5.6 POS_LOSE	0%~100%	Setting current position as the previous position set.
	P5.7 TEMP_AD_1		Temperature calibration, press UP key to switch to 1670Ω (100°C), DWN key to 820Ω (0°C) and MODE key to exit and save.
	P5.8 DEADBAND	0.4~5%	Actuator dead zone setting.

4.3.1.6 Output

Main Menu			Notes
P6 OUTPUT	P6.1 PASSWORD	60	Input the password “61” to enter the following menu
	P6.2 (A1) P6.3 (A2) P6.4 (A3) P6.5 (A4) P6.6 (A5) P6.7 (A6) P6.8 (A7)	NO_SIGN	No adjustment signal
		REMOTE	Actuator under remote state
		ADJUST_O	End position OPEN
		POS_LOSE	Valve position less than -20% or over 120%
		PLACE1_O	Position intermediate contact OPEN active. Valve position no less than the open position set
		TORQUE_O	Torque fault OPEN
		TORQUE_E	Torque fault OPEN or CLOSED

		FAILURE	Sum fault (A fault has occurred)
		ADJUST_C	End position CLOSED
		PLACE2_C	Position intermediate contact CLOSE active. Valve position no more than the close position set
		TORQUE_C	Torque fault CLOSED
		TEMPER	Motor temperature over 100°C.
		BATTERY	Battery voltage less than 3.0v.
		ALARM	Actuator alarm
		RUN_OPEN	Running OPEN
		RUNCLOSE	Running CLOSED
		RUNNING	Running

4.3.1.7 Instancy

Main Menu			Notes
P7 INSTANCY	P7.1 INSTANCY		The actuator is forced to run beyond the terminal position through this menu.

4.3.2. Storage Setting

Set new parameters with "↑" or "↓" button on the monitor and then press the "mode/stop" button. The static "SAVE" will be displayed on the monitor if the parameters have been changed. Click "+" or "-" button to cancel and click "STOP/MODE" button to return.

Click "STOP/MODE" button to store new value. The flashing "SAVE" indicates the storage process.

4.3.3 Alarm and Error

Intelligent actuator is powerful; after the diagnosis function is started, short messages will be displayed through LCD; information of alarm and errors is described in detail in Table 9 and Table 10.

Definition of alarm: the alarm system will start automatically when the actuator reaches the critical condition; and the actuator is still working at this time. The actuator will be forced to stop working if it is always in this state.

Alarm information: according to the different selections of working modes, alarm information of LOCAL/ALARM, 0/S/ALARM, REMOTE-A/ALARM and REMOTE-B/ALARM will flash alternatively on the LCD monitor. See detailed information in P3.2 of the main menu. The LCD monitor will only display the errors but not make alarm display if several errors occur simultaneously.

Definition of error: The actuator will display error information automatically in case of errors in the hardware or software or improper operation by the operators. Cut off the power supply if the errors harm the operators or the safety of the actuator.

Error information: indication error information of LOCAL/FAILURE, 0/S/FAILURE or REMOTE-A/FAILURE will flash alternatively on the LCD. REMOTE-B/FAILURE indicates error information. See P3.1 Menu for the detailed information.

4.4 Test Items, Methods and Criteria for Acceptance after Installation and Commissioning

- Installation acceptance: the mechanical joints should be stable and reliable; check whether the tightness meets the requirements if there are sealing requirements and whether the oil plug in the upper part of the actuator has been replaced with air-vent oil plug. Electrical connection should be connected according to the manual and system requirements; there should be no short circuit or open circuit at the connection joints; connection should be normal and sealed and the casing should be connected to the ground reliably.
- Commissioning acceptance: the valve should be in the position of ALL-ON or "ALL-DOWN" with relevant alarm output when the commissioning is completed. The valve should be in the preset position of "ON" or "DOWN" with relevant alarm output after the actuator is operated by both "LOCAL" and "REMOTE" for a whole travel respectively.

4.5 Preparations before Trial Operation, Start of Trial Operation and Trial Operation

- Make sure mechanical and electric connections are properly connected.
- Make sure that the actuator is commissioned and all the operations are effective.
- Start the trial operation procedure.

- Trial operation.

5 Application and Operation

5.1 Preparations and Check before Application

Make sure that the actuator has been installed and commissioned and should be accepted;
Make sure that the valve is operable;

5.2 Safety before and in the Application, Safety Protection, Safety Sign and Instructions

- The manual has been carefully read and the performance of the electric actuator has been understood before the application;
- Danger caused by non-human factors should be taken into consideration and there should be quick response measures during the application;
- The actuator is only for the application of operators or bad consequences will be caused.

5.3 Operation Method

- To operate on-site, please set the selector switch to "LOC"
- Point operation mode: Press the " ↑ or ↓ " button, and the actuator will run. Release the " ↑ or ↓ " button to stop the actuator from running.
- Self-holding 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 halfway, please briefly press the "STOP/MODE" button.

In local self-holding mode, please be careful not to accidentally touch the " ↑ or ↓ " button, which may cause the actuator to act.

- When the selector switch is set to "REM", remote control signals (switch quantity, analog quantity, digital communication) can be input to achieve remote control of the actuator.
- When the selector switch is set to "O/S", both local and remote control fail.

5.4 Monitor and Record during the Operation

- Monitor and record relevant data during the operation.
- Record equipment operation.
- Record error handling.
- Make handover records.

5.5 Halt Operation Procedure and Precautions

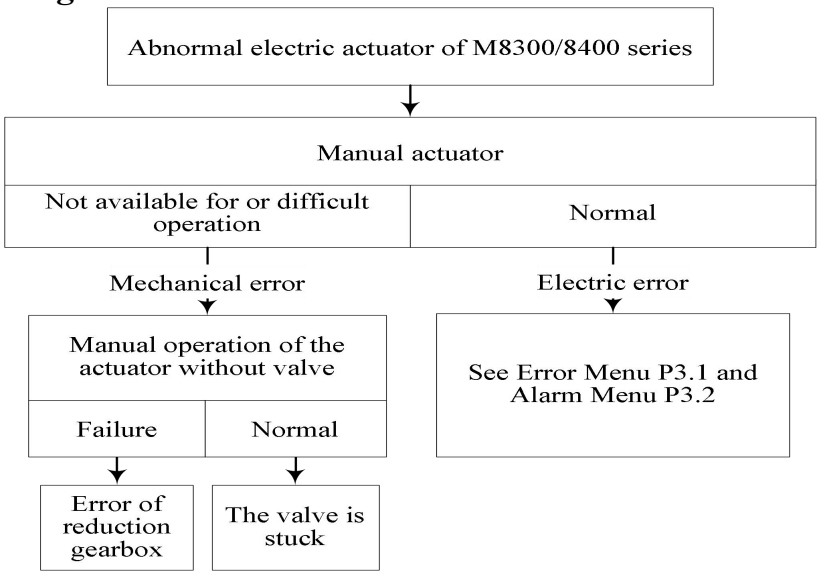
Operation procedure:

- Run the equipment to the position required and confirm such condition prior to halt.
- Cut off power supply.
- Make clear marks.

Precautions:

- Operate with hand wheel if electric operation fails.
- Make halt records.

6 Trouble Shooting



P3.1 Error Texts Displayed in Menu

	Analysis	Trouble Shooting
PHASE	Wrong detection of power phase	Check the main power.
PHASE-0/1/2	Power phase loss	Check the main power.
TEMP-MOT	Beyond the motor temperature limitation	Cut off motor power supply until the temperature is below the alarm limit.
HANDWHL	Push the handwheel in	Pull out the handwheel completely and then install the clamp onto the handwheel shaft.
POS-LOSE	Loss of valve position	Adjust the set values of close and open positions.
SET-POS	The entire stroke count is less than the allowable minimum code value	Adjust the set values of close and open positions.
TORQUE-E	Actuator torque is over the protective torque.	Reverse drive the actuator.
CUR-OVER	Excess motor current	Check the motor for phase loss or turn-to-turn short circuit of the motor.
END-POS	The actuator runs beyond the terminal position i.e. position beyond the limitation (over 120% or less than -20%).	Re-store the force from terminal control unit, check accessories, and make the actuator run into the operation range through manual operation or adjust terminal position again.
RELAY	Incorrect operation direction of the actuator	Dash board error, replace it.

P3.2 Alarm Texts Displayed in Menu

	Analysis	Trouble Shooting
BATRENEW	Low battery	Replace the battery.
BAT-EMPT	Low battery	Replace the battery.
TORQUE-O	Open torque alarms and load torque is over the selected open alarm value.	Check the alarm value; check the actuator, valve body and gear box (if it is applied) for the increase of friction; whether the actuator is working in the allowed ambient temperature (oil viscosity increases).
TORQUE-C	Close torque alarms and load torque is over the selected close alarm value.	
TEMP-MOT	Critical motor temperature	Once it reaches the alarm motor temperature, the actuator will stop operation until the motor temperature is low enough.
IN-SIGN	No adjustment signal alarms and signal is over 110% or less than -10% (write signal is too large while read signal is too small).	Check the signal board for errors or input current.
MAINTAIN	Need maintenance. A maintenance limit has been exceeded.	Increase the default maintenance value in P4 menu after the maintenance check of the

		actuator

7 Maintenance and Repair

Actuator should undergo the following check items every year to ensure the operation without errors and necessary safety measures should be taken before the check, maintenance of the actuator to ensure the smooth and safe maintenance process.

If you need to disassemble the actuator during the check and maintenance, power supply to the main circuit and sub circuits should be cut off and some charged parts around should be isolated.

7.1 Daily maintenance

	Maintenance period	**Maintenance contents**	**Maintenance criterion**
1	Every week	Inspect the oil leakage of the actuator's gearbox	No oil leaking
2		Inspect the valve position indication	Correct indication
3		Inspect thecleaning and lubrication of the stem and axle sleeve	Clean and lubricate
4		Inspect the housing of the actuator	No looseness, no damage
5		Inspect the stem thread of the uncovering flange joint	Using the requiring machine oil and protection sleeve to guarantee
6	Every month	Inspect the fastening bolt of the actuators	No looseness
7		Inspect the seal of the in and out wire	No looseness, no damage
8		Inspect the junction box	No moisture, no corrosion, no loose
9		Inspect the sound of the Open and close action,Maintenance if necessary	No abnormal sound
10	Half year	Inspect the manual devices of the valve ,Open and close the valve one time	Flexible, normally open
11		Inspect the open in place and the close in place signal	Normal control
12		Inspect the display	Normal display
13		Not too much dirty and dust on the actuator	Keep the actuator clean and visible
20	Every year	Regular performance check	Qualified

7.2 Battery pack

Do not replace battery in hazardous environment;The battery pack consists of a lithium thionyl chloride (Li-SOCL2) battery (nominal voltage 3.6V, nominal capacity 2.6Ah, produced by SAFT). The replacement period of the battery components is generally not more than 5 years. Ambient temperature and field operating conditions may affect battery life.

8 Dimension and Weight

8.1 Actuator Outline and Installation Dimension

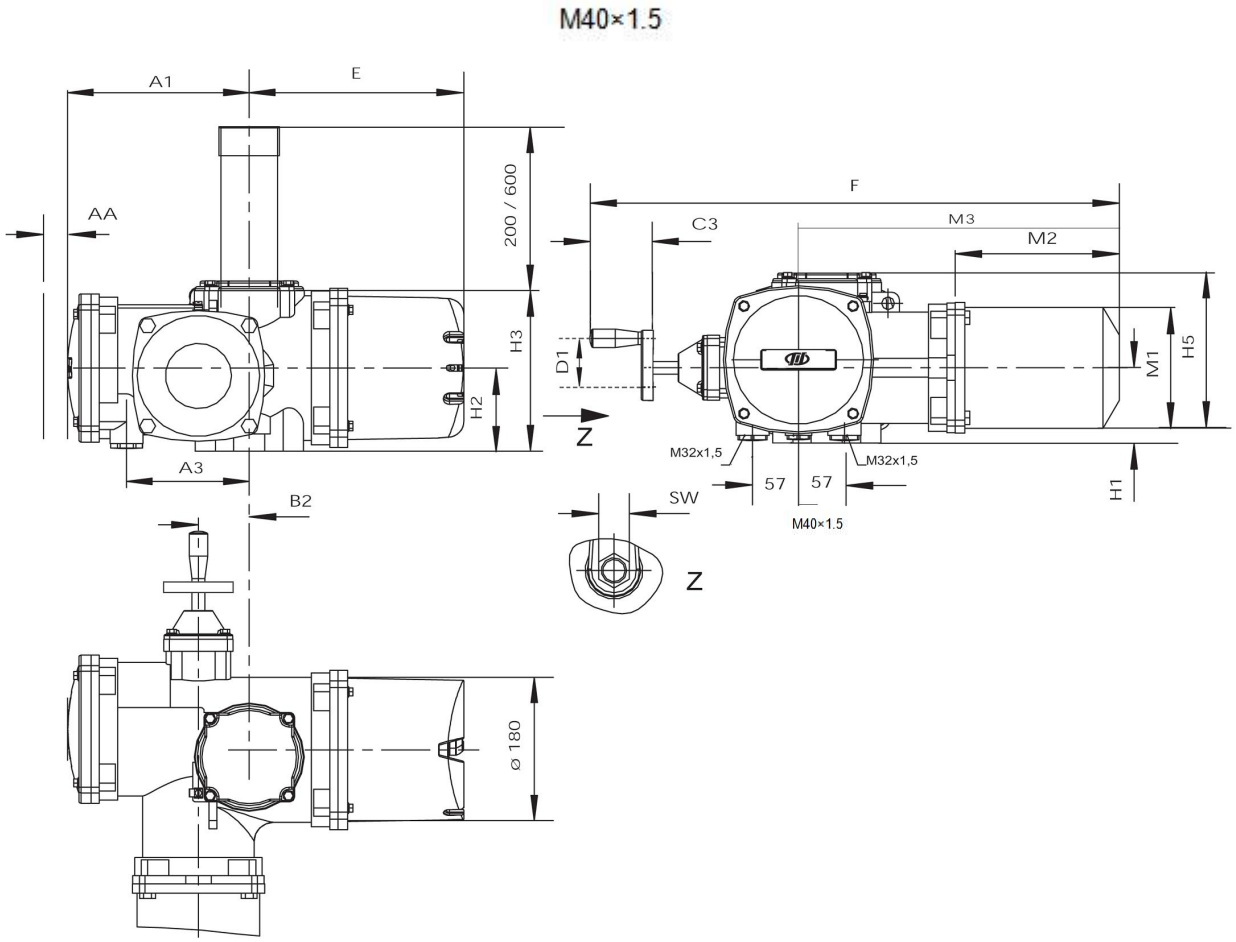
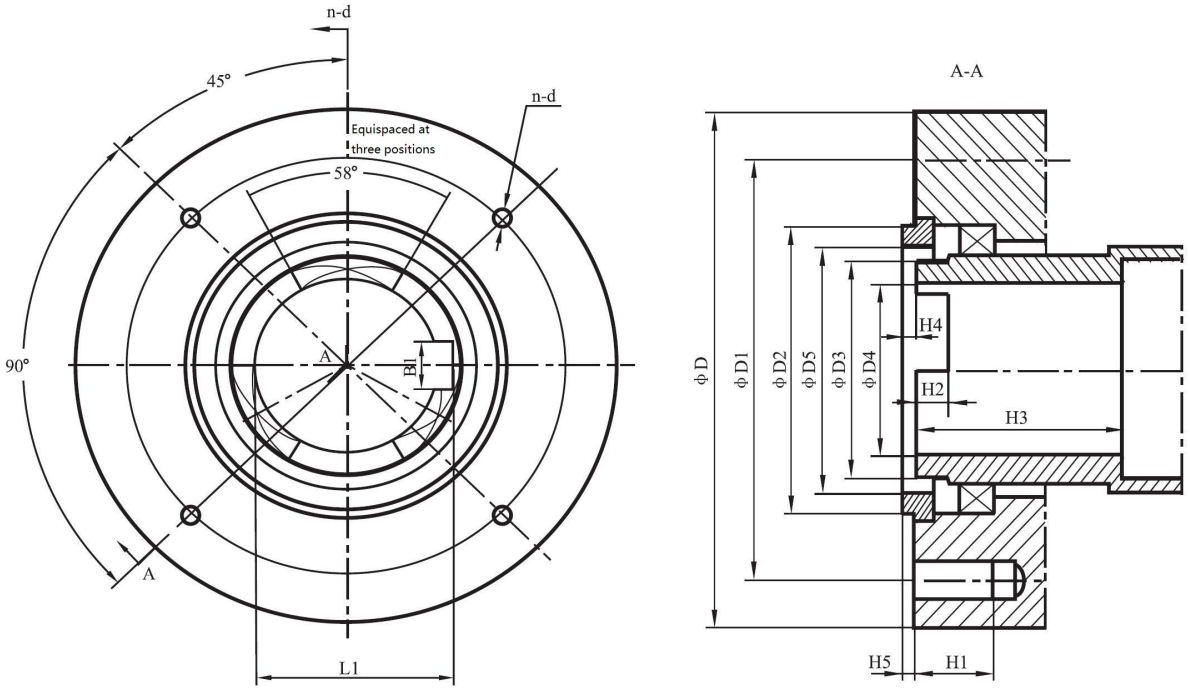


Fig. 6 Actuator Outline

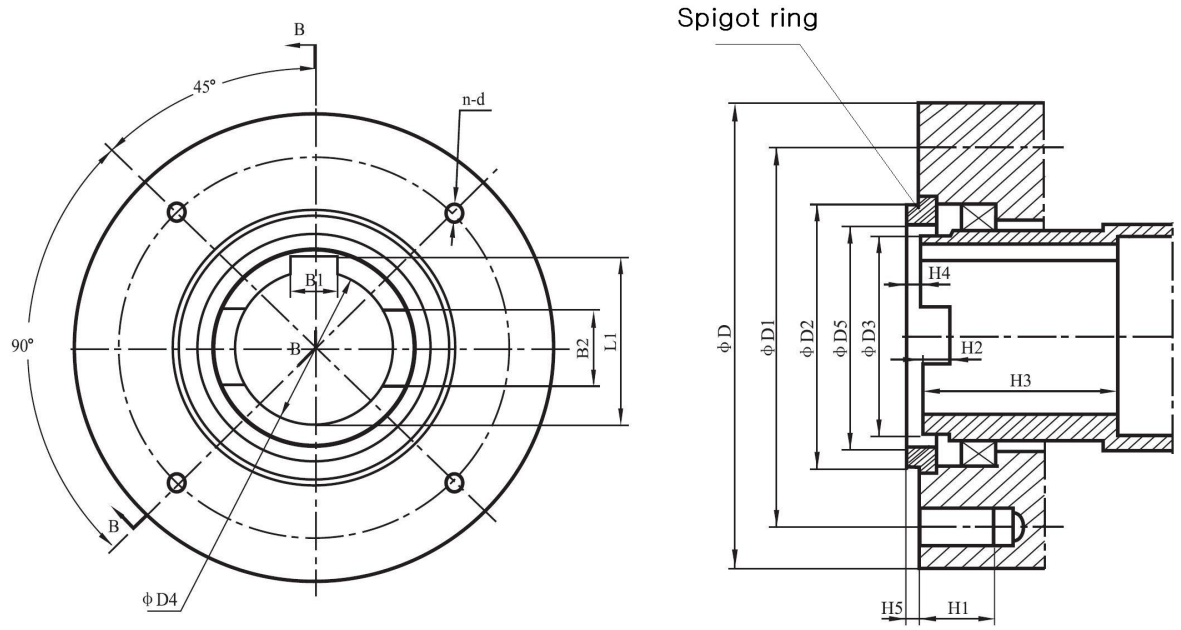
Table 4 Actuator Installation Dimension

Model / Parameter	M8□10d	M8□20d	M8□30d	M8□40d	M8□50d	M8360d
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
H5	214	214	214	270	270	270
M1	Φ105	Φ120	Φ140	Φ225	Φ225	Φ225
M2	136	160	200	300	300	300
M3	285	313	373	375	470	470

8.2 Dimension of Actuator Output Flange



Connection Form (Three-jaw) and Dimension of M8450/M8350 and M8440/M540



Form (Two-slot) and Dimension of M8410/M8310, M8420/M8320 and M8430/M8330

Fig. 7 Form (Three-jaw、Two-slot) and Dimension

8.3 Actuator Connection Form and Dimension

Table 5 Actuator Connection Form and Dimension mm

Actuator Model	Code of Connecting Flange	D	D1	D2	D3	D4	D5	H1	H2	H3	H4	H5	L1	B1	B2	n-d
M8□10d	F10	125	102	70	53	42	60	18	7	47.6	3.5	3	45.3	12	14	4-M10
M8□20d																
M8□30d	F14	175	140	100	74	60	88	22	8	53	4.1	3.6	64.4	18	20	4-M16
M8□40d	F16	205	165	130	98	80	120	35	12	80	5	4	85.4	22	—	4-M20
M8□50d																
M8360d																

8.4 Angle Additional Gearbox

8.4.1 Technical Data of Torque and Speed

Table 6 Technical Data of Torque and Speed

Actuator Model	Gearbox Model	Nominal Adjustment Torque [Nm]	Maximum Value of Output Protective Torque [Nm]	Time Range of Whole Travel [s/90°]	Length of Torque Arm [mm]
M8□10d	A8005	300	450	21	160
M8□10d	A8010	600	900	30	200
M8□10d	A8020	1200	1500	32	200
M8□20d	A8020	1600	1800	32	200
M8□20d	A8040	2200	2800	32	250
M8□30d	A8040	2800	3600	32	250
M8□30d	A8090	5000	6000	32	250
M8□30d	A8090+G6502	6000	8000	64	250
M8□30d	A8161	8000	10000	68	250
M8□30d	A8162	12000	15000	88	250
M8□40d	A8090	6000	8000	32	250
M8□40d	A8160	10000	15000	42	250
M8□40d	A8250	18000	22000	68	500
M8□40d	A8400	20000	26000	85	500
M8□50d	A8250	20000	25000	68	500
M8□50d	A8400	30000	35000	85	500

Notes: 1) The stepping length is set as 10% when the actuator protective torque falls within 40% to 100%.

8.4.2 General Data

Table 7 General Data

	A8005	A8010	A8020	A8040	A8090	A8160	A8200	A8400	A8400+G6804
Actuator Flange (ISO5210)	F10	F10	F10	F10/F14	F14/F16	F25/F30/F35	F16	F16	F16
Flange of the Valve Body (ISO5211)	F10	F10	F14	F16	F25	F25/F30/F35	F40	F40	F40
Maximum Dimension of the Valve Rod [mm]	43	40	75	80	105	105	115	150	150
Weight [kg]	20	12(24)	27(45)	38(68)	72(138)	209	290	418	418

8.4.3 Outline and Installation Dimension of Angle Electric Actuator (Coupled-type)

(The position handle turns to the right when the hand wheel is right turned.)

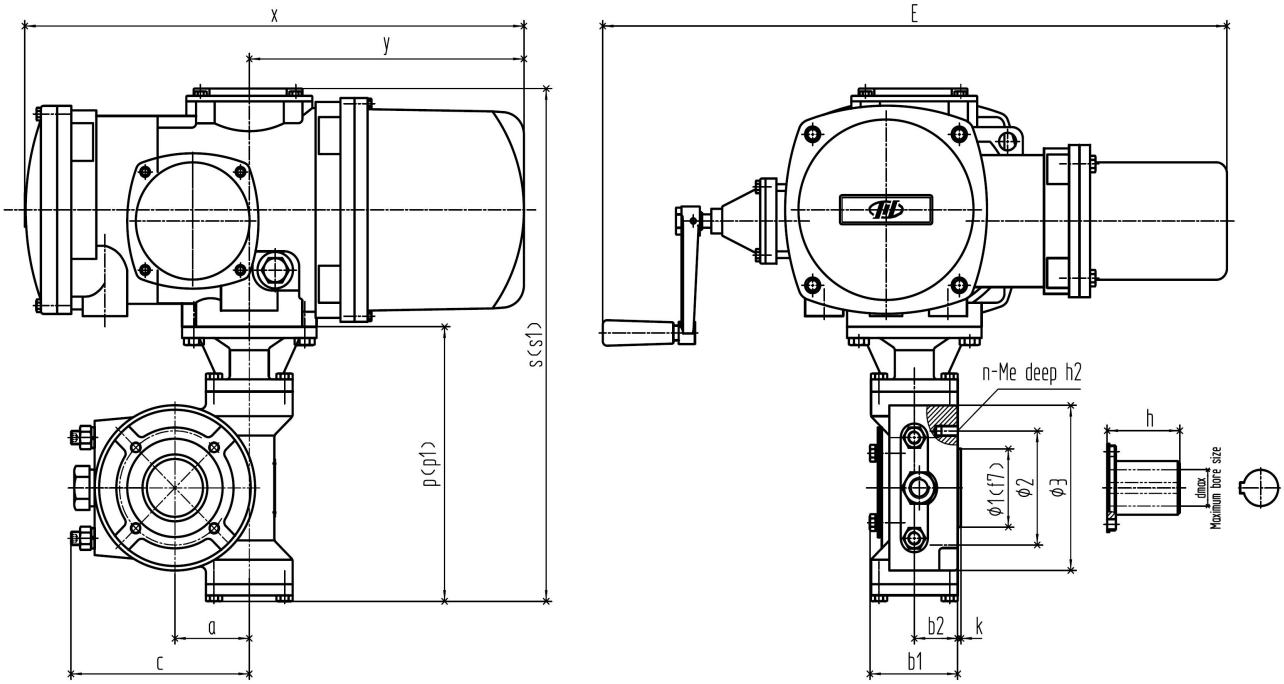


Fig. 8 Outline of Angle Electric Actuator (Coupled-type)

Table 8 Installation Dimension of Angle Electric Actuator (Coupled-type)

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 deep h2	4-M10 deep 15	4-M10 deep 15	4-M16 deep 22	4-M20 deep 25	8-M16 deep 20	8-M20 deep 32	8-M30 deep 45	8-M36 deep 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			

8.4.4 Outline and Installation Dimension of Angle Electric Actuator with Lever

(The position handle turns to the right when the hand wheel is right turned.)

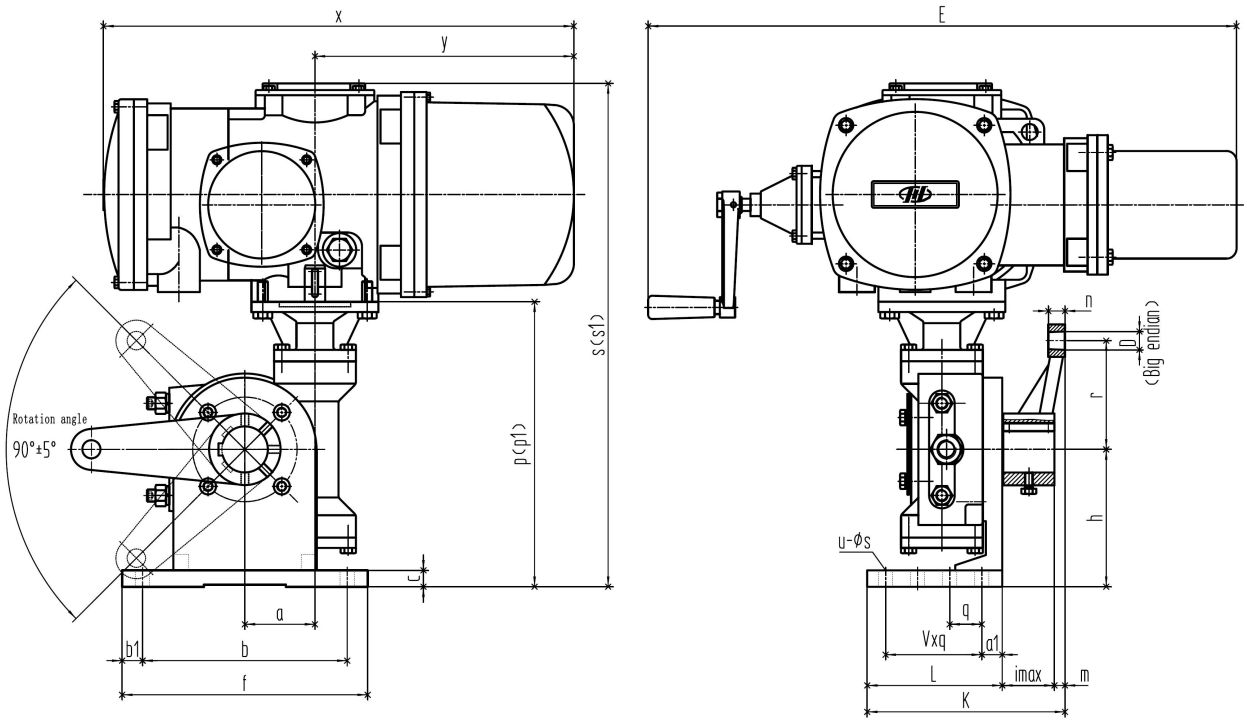


Fig. 9 Outline of Angle Electric Actuator with Lever

Notes: ① As shown in the figure, the connecting rod or lever may collide with the motor, which can be avoided through adjustment.

Table 9 Installation Dimension of Angle Electric Actuator with Lever

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 Have 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	

8.5 Linear Additional Gearbox

8.5.1 Technical Data of Thrust and Speed

Table 10 Technical Data of Thrust and Speed for Linear Actuator

Maximum Working Thrust [kN]	Minimum Protective Thrust [kN][1)]	Maximum Protective Thrust [kN][1)]	Speed [mm/s]	Maximum Travel [mm]	Flange of the Valve Body	Transducer	Actuator
8	3.2	8	2.9	50, 100	F10	L8210	M8□10d
16	6.4	16	2.9	50, 100	F10	L8220	M8□20d
25	10	25	3.5	63, 125	F10	L8230	M8□20d
40	16	40	4.1	60,100, 160	F14	L8240	M8□30d

Notes: 1) Actuator stepping is set as 10%.

8.5.2 Outline and Installation Dimension

Dimension with flange

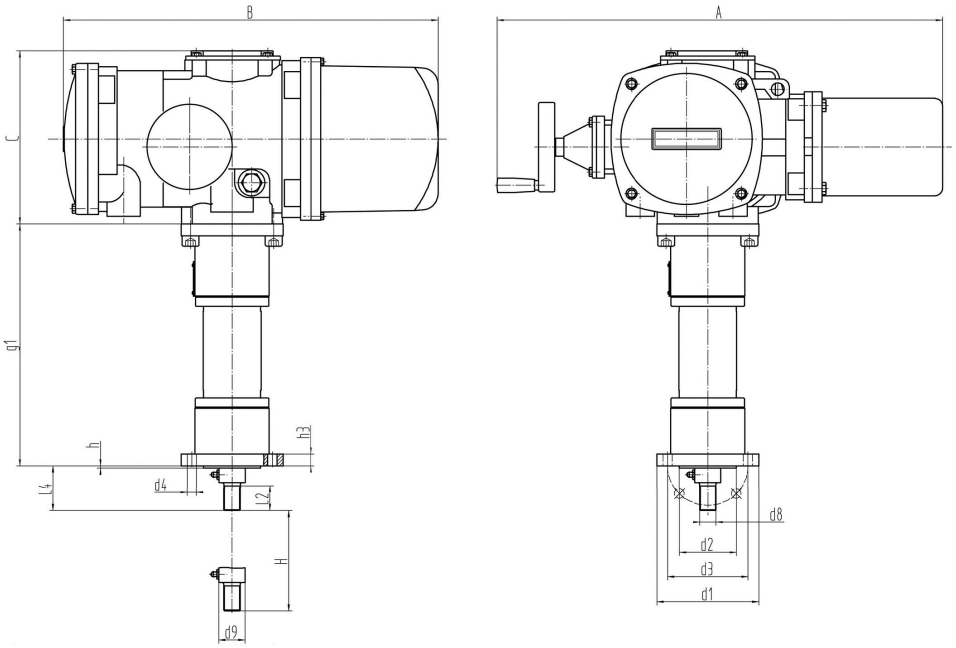


Fig. 10 Outline of Linear Actuator with Flange

Table 11 Installation Dimension of Linear Actuator with Flange

	L8210		L8220		L8230		L8240		
Valve flange	F10		F10		F10		F14		
actuator	M8410d/M8310d		M8420d/M8320d		M8420d/M8320d		M8430d/M8330d		
Actuator flange ISO5210	F10		F10		F10		F14		
stroke H	50	100	50	100	63	125	60	100	160
d1	125		125		125		175		
d2	70f8		70f8		70h7		100f8		
d3	102		102		102		104		
d4	11		11		11		18		
d8	M12×1.25		M16×1.5		M20×1.5		M36×3		
g1	191	241	191	241	234	296	293	273	
h	3		3		3		4		
h3	15		15		15		18		
L2	20		25		30		55		
L4	44		49		54		74		
D9	20		20		32		50		
A	574		598		598		665		
B	460		460		460		492		
C	202		202		202		202		

Weight (kg)	8	8.5	8	8.5	12	13	23.6	26	29

8.6 Multi-turn Additional Gearbox

8.6.1 Technical Data

Table 12 Technical Data for Multi-turn Additional Gearbox

Actuator	Gearbox	Decelerate ratio	Output		Flange (JB 2920)	Power (kW)	Current (A)	Weight (Kg)
			Recommended Adjustment Torque (Nm)	Speed (r/min)				
M8□50d	G7010	2	1200	18	5	5	10.5	110
M8□50d	G7020	3	1800	12	7	5	10.5	135
M8□50d	G7030	6	3000	6	8	5	10.5	160
M8□50d	G7040	8.7	4500	4	8	5	10.5	190
M8360d	G7010	1.5	1200	24	5	5.2	12	110
M8360d	G7020	2	1800	18	7	5.2	12	135

8.6.2 Outline and Installation Connection Dimension

Table13 Outline and Dimension of Installation and Connection for Multi-turn Additional Gearbox

Actuator Model	M84(3)50 +G7010	M84(3)50 +G7020	M84(3)50 +G7030	M84(3)50 +G7040
D	275	330	380	380
D1	235	285	340	340
D2	180	220	280	280
D3	82	98	118	118
D4	62	65	80	80
H	560	630	645	676
H1	25	30	35	35
H2	14	16	20	20
H3	2	3	3	3
H4	7	8	8	8
A	620	620	620	751
B	550	550	550	550
n-d	4-Φ22	4-Φ26	8-Φ22	8-Φ22

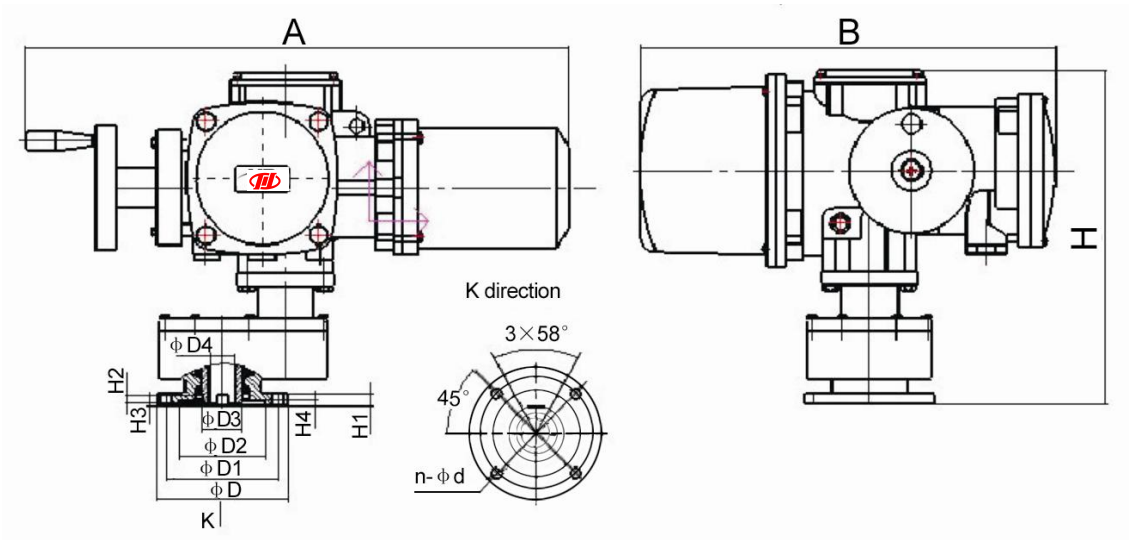


Fig. 11 Outline of Multi-turn Additional Gearbox

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