



## Operation Manual

## M8300/M8400 Series

### Intelligent Electric Actuator



## Preface

Thank you for using M8300/M8400 Series Electric Actuator, please read this Manual carefully before installation and commissioning.

### ■ 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.

### ■ 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.

### ■ Special Cautions

- (1) Replace the oil plug on the top of the actuator with the air-vent screw plug accompanied in spare parts!
- (2) Put the cable through the lead collar accompanied in spare parts and tighten it!
- (3) Tighten the hood screw!

Shielded conductor is strongly suggested for connection!

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

# **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:  $-30^{\circ}\text{C}\sim+75^{\circ}\text{C}$ ; storage temperature:  $-10^{\circ}\text{C}\sim45^{\circ}\text{C}$ .
- 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**

The actuator is designed to drive the terminal control unit (valve and baffle etc) and has wide applications in industries such as electric power, metallurgy, petroleum, chemical industry, building materials, urban water supply and wastewater treatment. The following instructions shall be followed at the time of operation:

- The operators must wear special protective gloves to avoid injury at workplace caused by hot metal parts if the actuator is subject to high temperature environment.
- The actuator is designed to drive the units of baffle and valve when rotating. Misoperation will endanger the operators.
- Lubricant leaked at the time of oil replacement should be cleaned up in time to avoid accident. The used oil should be properly disposed of in accordance with the local adjustments where the user is located to prevent the water source from being polluted.
- Installation, configuration setup and electric connection of the actuator should be done only by qualified professional technicians.
- Do follow the safety instructions and standard operation procedures strictly. Cut off the power before working on any electronic component and do not drive the actuator with the hand-wheel without disconnecting power supply.

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## 1 Overview

M8300/M8400 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 4~20mA analog control and passive and active control of 24v.d.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, petroleum, chemical industry, building materials, urban water supply and wastewater treatment.

### 1.3 Types and Specifications

Table 1 Type and Specifications

Actuator	Output			Speed (r/min)	Travel without Shaft Sleeve (mm)	Flange (ISO5210)	Power (kW)	Current (A)
	Nominal Torque (Nm)	Minimum Protective Torque (Nm)	Maximum Protective Torque (Nm)					
M8410 M8310	50	28	70	36	190	F10	0.48	1.8
M8420 M8320	100	56	140	36	190	F10	0.85	2.9
M8430 M8330	200	100	250	36	190	F14	1.71	4.75
M8440 M8340	400	200	500	36	230	F16	2.5	7.3
M8450 M8350	600	300	750	36	230	F16	4.0	11.4

### 1.4 Application Ambient Conditions

The following ambient temperature is applicable according to oil types.

- Standard: -25°C~+70°C.
- Relative humidity: Not more than 95% (25°C);
- Atmospheric pressure: 86kPa~106kPa;
- No corrosive media in ambient environment;

### 1.5 Operation Conditions

- Voltage:  $380 \times (1 \pm 10\%)$  V.a.c.; (Optional: 415V.a.c. 3PH; -15%/+10%; )
- Frequency:  $50 \times (1 \pm 1\%)$  Hz; (Optional  $60 \times (1 \pm 1\%)$  Hz; )
- Harmonic content: less than 5%.

### 1.6 Impact on Environment and Energy

The actuator is a high energy consumption 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

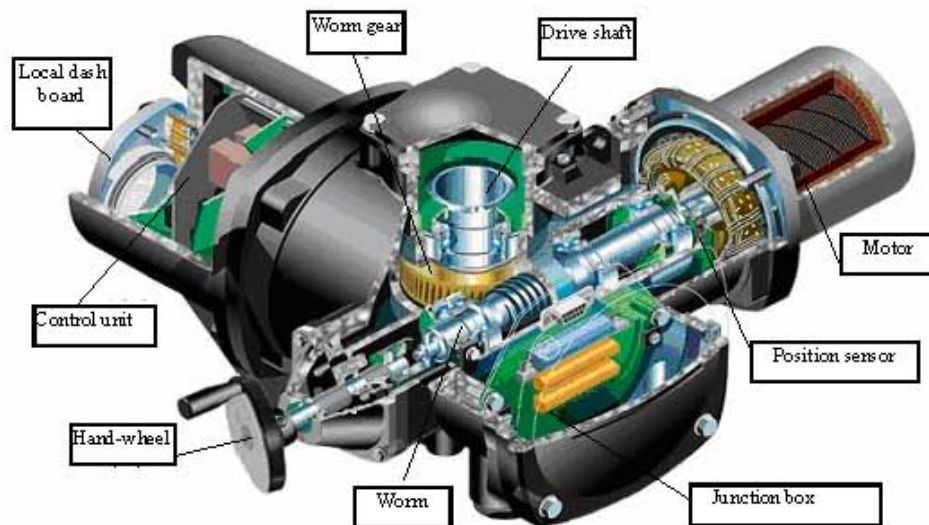


Fig. 1 Main Parts (sectional view)

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

Hand wheel: it is used for installation and commissioning, troubles shooting with manual and electric switch. If the hand wheel is impelled to the worm axis, and the control power cuts off the electric mode, manual operation can be done safely; if the force is not applied to the hand wheel, it can be reverted to the electric mode automatically.



## 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: S4 - 25%, 1200 times/h, based on IEC34.
- Protection ratings: IP67; IP68 available. IP43 for transportation and storage.
- Humidity: <95% average value (please use heater to avoid pulverization).
- Installation position: any position.
- Coating: 1K black lacquer coating of epoxy resin, stainless external bolt (excluding drain bolt).
- Electro Magnetic Capability (EMC): according to GB/T1726.2-1998~GB/T1726.5-1998.
- 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: +12V~+35V.
- Analog output (optional): 4~20mA position signal; load capacity: 500Ω (maximum); electrical isolation; short-circuit protection, increasing characteristic; temperature influence: ±0.1%/10K.
- Digital output: 4 standard output (A1-A4) and 3 options (A5-A7) free potentials; refer to wiring diagram for gilt convert contact, electrical isolation, free configuration: maximum voltage 250V a.c., Maximum current <5A, minimum current >1mA, overload protection and DTC/NO contact on terminal board.
- Basic error limit: ±1%.

The following standard configuration of the intelligence actuator is available unless otherwise specified.

Table 2 Standard Configuration

Function Description	Function Description and Parameters
Language	English
Protective torque	40% (two directions)
Operation mode	Click (the actuator is operated with given order)
Digital input 1	Actuator opened
Digital input 2	Actuator closed
Digital input 3	Manual/automatic switches
Digital input 4	Standby
Analog input	4~20mA (available in M8400 series, not available in M8300 series)
Analog output	4~20mA
Digital output 1	Preparation for operation
Digital output 2	Actuator warning
Digital output 3	Actuator at ALL-ON
Digital output 4	Actuator ALL-DOWN
Digital output 5	Open over torque warning
Digital output 6	Close over torque warning
Digital output 7	Local/Remote

Output contact is not reversed under standard configuration (normal open and close status of contact)

## 4. Installation and Commissioning

### 4.1 Equipment Foundation, Installation Conditions and Technical Requirements of Installation

- [Replace the oil drain plug on the uppermost part of the actuator with air-vent plug.](#)
- Take into consideration the convenient replacement of electric wiring and parts for easy operation during actuator installation.
- Prepare the necessary hex bolts, anti-loosing washers and the matching hex wrenches.

### 4.2 Installation Procedure, Method and Precautions

1. Ensure the correctness of the model and parameters of relevant fittings of the actuator before installation.
2. Completely clear greasy dirt on the surface of the mounting flange of the electric device and the surface of companion flange.
3. Install the multi-turn actuator to the required mating gearbox or the valve body.

4. Multi-turn electric actuator can be installed to any position of 90° (except the upward position of the actuator).
5. Ensure the even jointing of the socket and groove and the close contact of the fitted surface.
6. Fix the actuator to the gearbox or the flange of valve body with bolts and lock washers.
7. Tighten crossly the bolts; refer to Table 3 for tightening torques.

Table 3 Screw-in Torque of 8.8-level Screws

Screw Specification	M4	M5	M6	M8	M10	M12	M14	M16	M18	M20
Screw-in force N.m (steel and iron parts)	2.8	5.5	9.5	23	46	79	125	195	280	390
Screw-in force N.m (aluminum alloy)	2.3	4.9	8.3	20	40	69	109	173	233	334

8. Replace air plug screws with air-vent screws according to installation position after proper mechanical connection with valve body.
9. Never fix the rope or hooker to the hand wheel when lifting the actuator. If the multi-turn electric actuator is already installed on the worm-gear case or valve body, fix the rope or hooker to the worm-gear case or valve body but the electric actuator when lifting it.
10. Check the nameplate and wiring diagram of the motor before actuator wiring and implement wiring according to the electric wiring diagram (Fig. 2).
11. Electric implementing agencies(M8310/8410~30),when paired with the corner-type gearbox(with leverage A8005L~A8090L) , in order to prevent interference , prohibited according to the Fig.2c/Fig.2d with a ban " × " location of assembly ,in addition can be.
12. The handwheel and ventilation plug for replacement supplied by manufacturer are not installed before leaving factory. After installation the whole set, the supplied parts should be installed and displaced.
13. When user purchase the electric actuator (M8300/ 8400) without additional unit or second stage reducer, manufacturer should supply accessories: one piece of positioning ring (see fig 6 in page 14)is not installed when leaving factory. User must install it during connection.

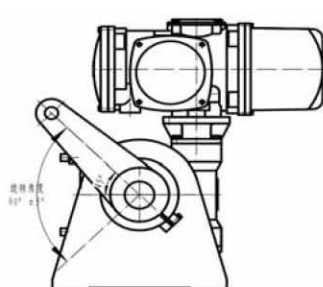


图2a

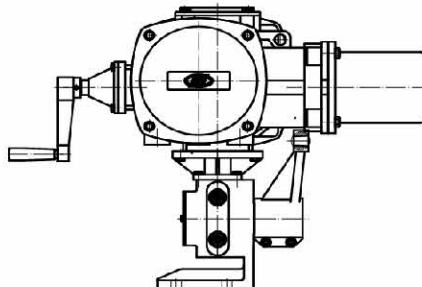


图2b

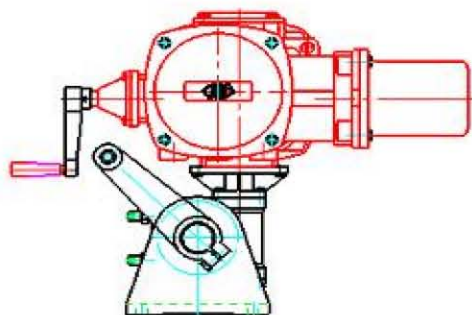


图2c

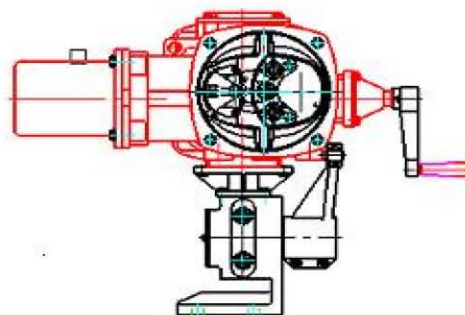


图2d



**Special note:** When electric actuator (M8310~M8330/M8410~M8430) combine with the corner-type gearbox(with lever A8005L~A8090L) , there is interference when output lever run to upper position , see Fig.2, (fig 2a-b) is standard combination position when leaving factory. For fig 2c and 2d of table 4 "×" shows interference happened in assembly, it's not recommended to adopt. Except standard installation position, user should estimate if there is interference of lever turning position when other combination position is used.

Table 4

No.	Model.	Installation		
		Fig. 2c	Fig. 2d	
			Lever on the left	Lever on the right
1	M8 <sup>3</sup> <sub>4</sub> 10+A8005L			
2	M8 <sup>3</sup> <sub>4</sub> 10+A8010L	×		
3	M8 <sup>3</sup> <sub>4</sub> 20+A8020L	×		
4	M8 <sup>3</sup> <sub>4</sub> 20+A8040L			×
5	M8 <sup>3</sup> <sub>4</sub> 30+A8040L			×
6	M8 <sup>3</sup> <sub>4</sub> 30+A8090L			×

Note: 1. Lever on the left or the right is depends on the situation of facing the lever and above the actuator.

2. Marking with "×" means not suitable to use combination collocation because of interference.

### 4.3 Electric connection

The down-lead assign of terminal connection see Fig.2. They direct connect to terminal row of the product's connection-box though cable.

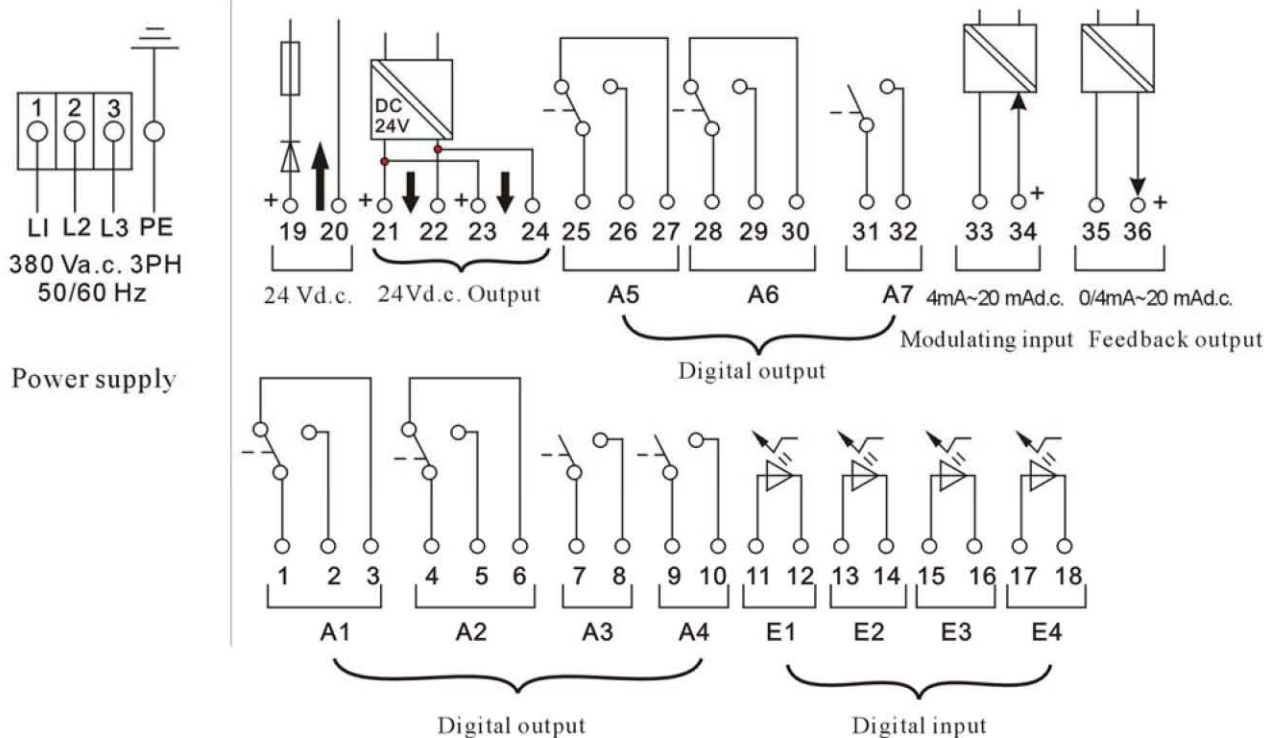


Fig 2a Wiring Diagram (Contact is not triggered.)

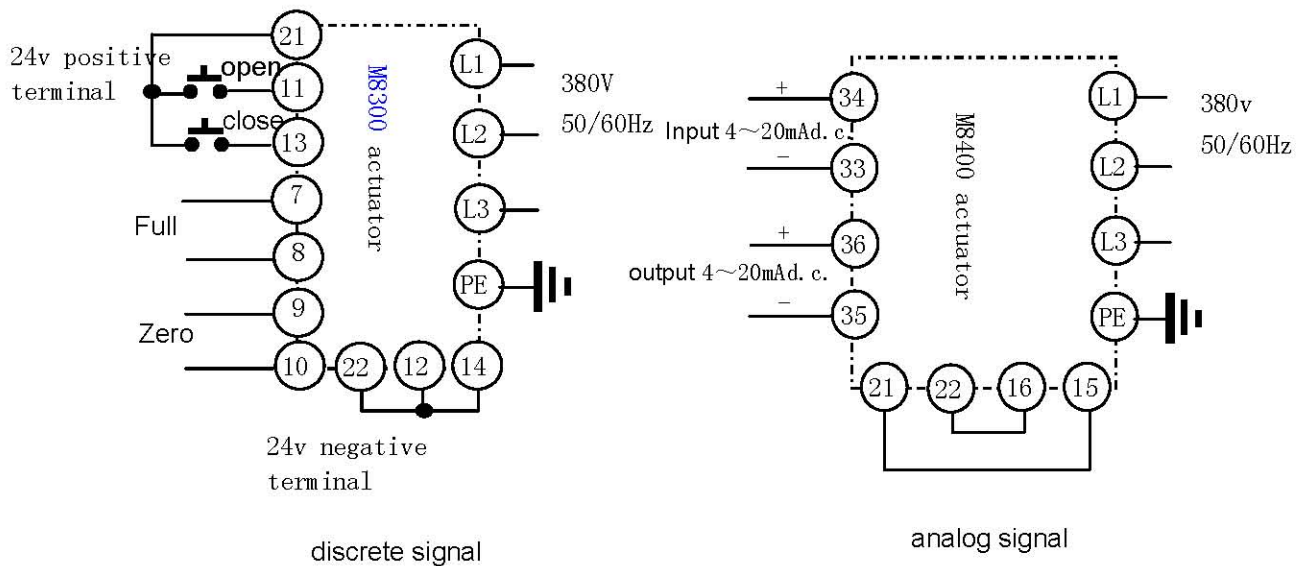


Fig 2b Recommended basic connection

#### 4.3.1 Wire diameter choice (contact connection)

Power cable:  $\leq 6\text{mm}^2$  hand wire or  $4\text{mm}^2$  soft wire

Signal cable:  $\leq 2.5\text{mm}^2$  hand wire or  $4\text{mm}^2$  soft wire

#### 4.3.2 The screw thread dimension of cable sealing entry.

	Standard (Metric)	Recommended the outer dimension of cable (mm)	Optional choose (PG)
Terminal (Standard)	2×M32×1.5	15-21	1×PG21 1×PG16 1×PG13.5
	1×M25×1.5	12-16	

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.

#### 4.3.3 Safety

Main power's insurance locate in filter board. It's specification is 3×16A (M8410-M8430) , or 3×25A (M8440/8450) ,  $\phi 6 \times 30$ ; ( (the same as M8300 series)

#### 4.4 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:

The following modes are available.

Remote-A/B: for 4 to 20mA remote control/remote binary control.

O/S: inoperable (unavailable).

Local: for local operation and setting on the Actuator Dash Board (including position setting, parameter setting, configuration and diagnosis).

- Button: (refer to Fig. 3 for function usages)

LCD display: for mixed display of operation mode and parameter letters and numbers

LED: green LED indicates "main power supply available" and the red one "Error".

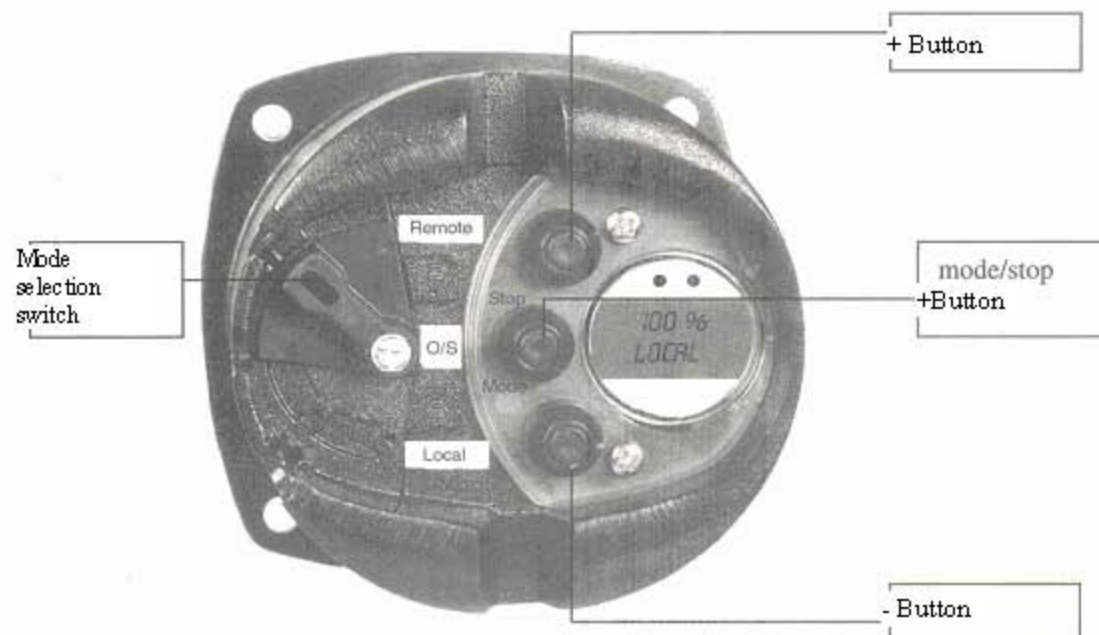


Fig. 3 Actuator Dash Board

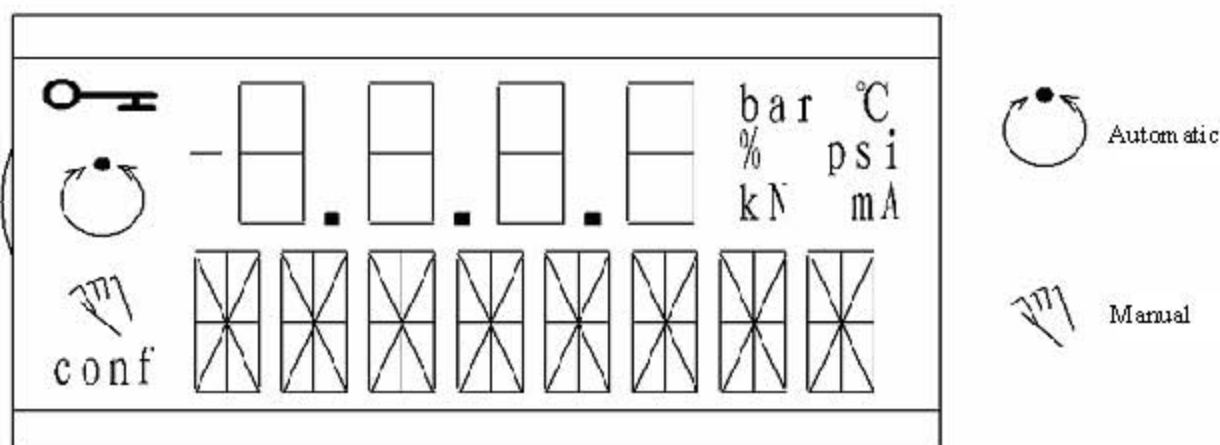


Fig. 4 Actuator LCD Monitor

#### 4.4.1 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 (See Fig. 3).

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.



#### 4.4.1.1 Setting

Main Menu			Notes
P1 SETUP			
	P1.1 ADJUST_C	-----	Adjustment of close terminal position
	P1.2 ADJUST_O	□□□□	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)

#### 4.4.1.2 Parameters

Main Menu			Notes
P2 PARAMETER	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.

#### 4.4.1.3 Diagnosis

Main Menu			Notes
P3 DIAGNOSIS	P3.1 ERR_ACTU	See 3.1	Error information
	P3.2 ALM_ACTU	See 3.2	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 $2.5 \times 10^4$ , 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 $2.5 \times 10^4$ , i.e. 250000.
	P3.9 TMAXPERM	0~999	Maximum start times per minute, unit: time

#### 4.4.1.4 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 NEARMALF	See 9.3	Latest error information
	P4.5 MALFTIME	See P3.8	Time from the latest error
	P4.6 NEARTEMP	0~999	Highest motor temperature in history
	P4.7 TEMPTIME	See P3.8	Time from the highest motor temperature
	P4.8 MAXCUR	A/D sampling value	Largest motor current in history
	P4.9 MCURTIME	See P3.8	Time from the largest motor current

#### 4.4.1.5 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.

#### 4.4.1.6 Output

Main Menu			Notes
P6 OUTPUT	P6.1 PASSWORD	60	Input the password “61” to enter the following menu
	P6. 2 (A1)	NO_SIGN	No adjustment signal
	P6. 3 (A2)	REMOTE	Actuator under remote mode
	P6. 4 (A3)	ADJUST_O	To All-ON position
	P6. 5 (A4)	POS_LOSE	Valve position less than -20% or over 120%
	P6. 6 (A5)	PLACE1_O	Valve position no less than the open position set
	P6. 7 (A6)	TORQUE_O	Open over torque

	P6. 8 (A7)	TORQUE_E	Any over torque of the open or close torques
		FAILURE	Actuator errors
		ADJUST_C	To the ALL-DOWN position
		PLACE2_C	Valve position no more than the close position set
		TORQUE_C	Close over torque
		TEMPER	Motor temperature over 100°C.
		BATTERY	Battery voltage less than 3.0v.
		ALARM	Actuator alarm

#### 4.4.1.7 Instancy

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

#### 4.4.2. 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.

#### 4.4.3 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.

#### 4.5 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.

#### 4.6 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**

- Put the selection switch in the position of “LOC” for local operation; press and release “OPEN” button for open operation, and press and release “CLOSE” button for close operation.
- Press “STOP” and “OPEN” button, or “STOP” and “CLOSE” button simultaneously for inching operation (or press “OPEN” and “CLOSE” after selecting inching mode);
- The system will in the remote operation when the mode selection switch is put in the position of “REMOTE”.
- Both local and remote operations fail when the selection switch is put in the position of “O/S”.

### **5.3 Monitor and Record during the Operation**

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

### **5.4 Halt Operation Procedure and Precautions**

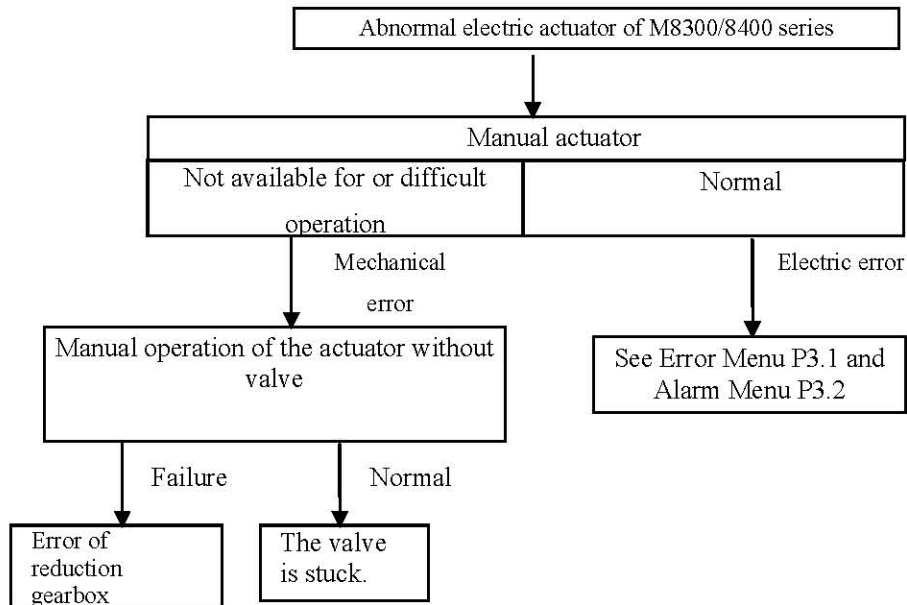
Operation procedure:

- 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 hand wheel in case of external AC 380v.	Release the hand wheel in case of external 380v AC.
POS-LOSE	Loss of valve position	Adjust the set values of close and open positions.
SET-POS	Count of the whole travel is less than 800 yards.	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.

## **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.

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 Routine Maintenance and Calibration**

1. Appearance visual check;
2. Regularly clean the actuator in case that the actuator is damaged as a result of local overheating caused by accumulated dust on the exterior surface;
3. Canopy should be put up to protect equipments against rain in the open area.
4. Examine regularly and make examination records.

### **7.2 Runtime Maintenance**

1. Check the tightness of fasteners (including screws);
2. Lubricate the connection part of the output torsion periodically;
3. Check whether the operation record meets the technical requirements and whether there is anything abnormal;
4. Check for oil leakage;
5. Check the connection of the power cord and signal wire.

### **7.3 Examination Period**

Generally, it is not necessary to carry out maintenance for the actuator (except the regular lubrication for the connection of output torsion) and a routine inspection every 3 months is necessary to check:

1. Whether specified technical parameters are met;
2. Whether the actuator works normally (vibration, noise etc.)
3. Whether there is any oil leakage;

Overhaul of the actuator should be carried out during the lubricant replacement and by the organizations armed with certain examination abilities.

### **7.4 Reduction Gearbox**

It is suggested that gasket ring and oil of reduction gearbox be replaced in the following period.

They should be replaced every 5 years when the average ambient temperature is no more than 40°C and replaced every 2 years when the average ambient temperature is no more than 60°C.

### **7.5 Motor**

Bearings and gasket rings of the shaft should be replaced in the following period due to high temperature and mechanical load during the phase conversion of the motor:

They should be replaced every 3 years when the average ambient temperature is no more than 40°C and replaced every 2 years when the average ambient temperature is no more than 60°C.

Maintenance in every other year is needed if the motor always bears load when reaching the end position.



## 8. Dimension and Weight

### 8.1. Actuator Outline and Installation Dimension

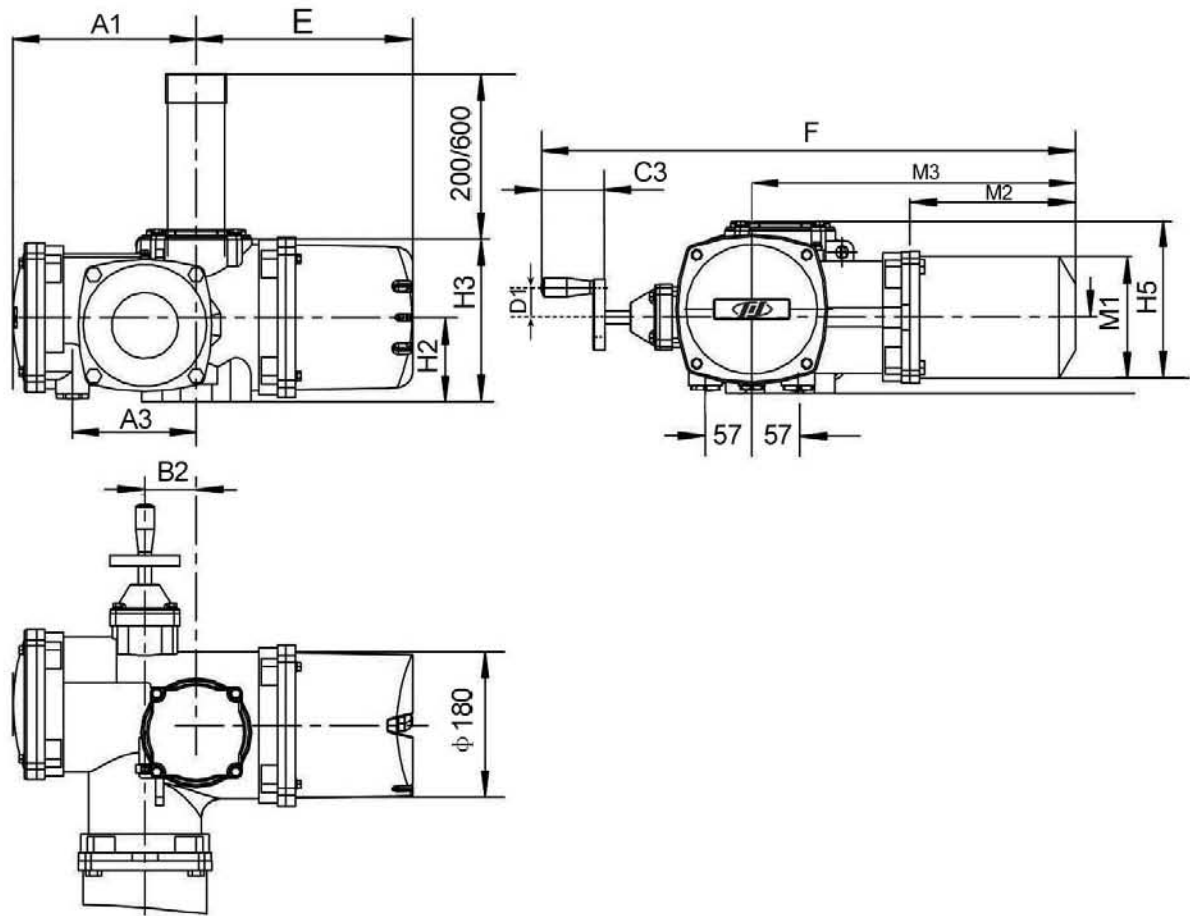


Fig. 5 Actuator Outline

Table 4 Actuator Installation Dimension

Model	M8410 /M8310	M8420 /M8320	M8430 /M8330	M8440 /M8340	M8450 /M8350
ISO5210	F10	F10	F14	F16	F16
A1	206	206	225	249	249
A3	133	133	152	169	169
B2	50	50	63	80	80
C3	69	69	81.5	82.5	82.5
D1	R60	R60	R100	R100	R100
E	253	253	266	297	297
F	541	569	644	672	768
H1	94.5	94.5	94.5	140	140
H2	104.5	104.5	104.5	148	148
H3	202	202	202	250	250
H5	214	214	214	223	223
M1	106	120	137	225	225
M2	133	161	191	310	310
M3	285	313	373	375	470

## 8.2 Dimension of Actuator Output Flange

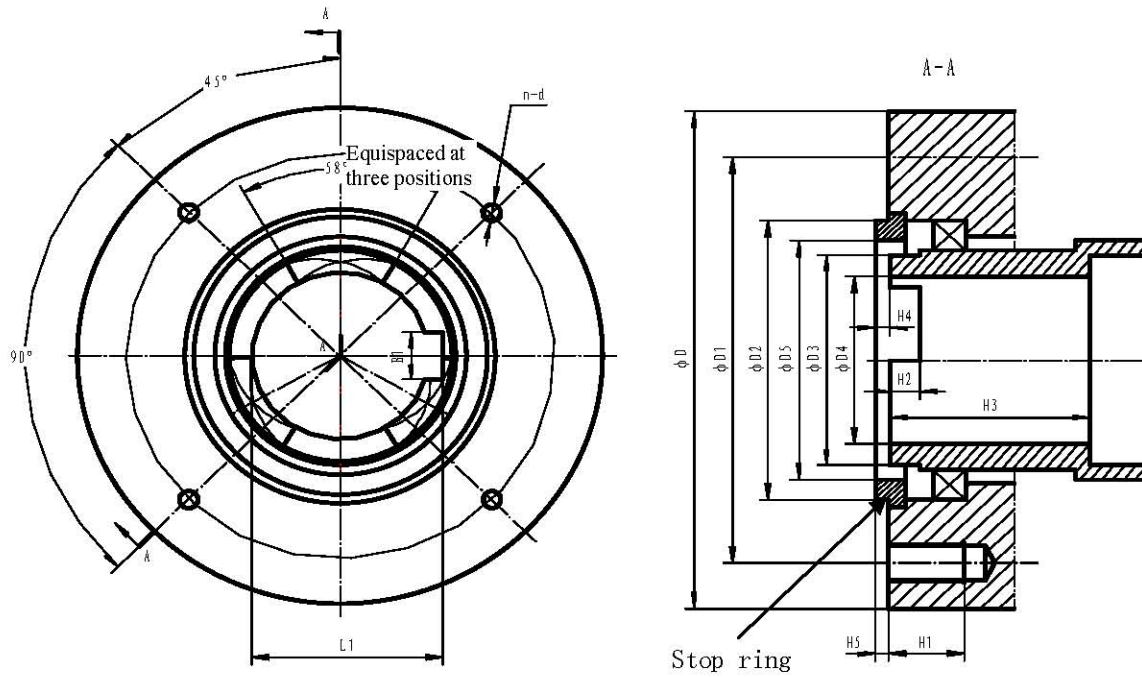


Fig. 6a) Connection Form (Three-jaw) and Dimension of M8450/M8350 and M8440/M540

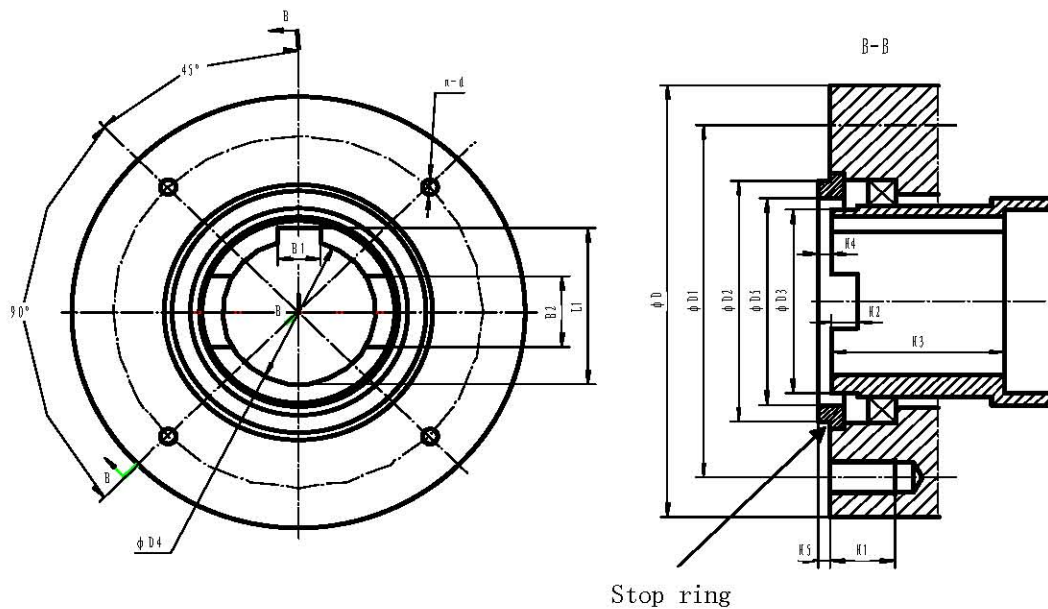


Fig. 6b) Connection Form (Two-slot) and Dimension of M8410/M8310, M8420/M8320 and M8430/M8330

### 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
M8310	F10	125	102	70	53	42	60	18	7	47.6	3.5	3	45.3	12	14	4-M10
M8410																
M8320																
M8420																
M8330	F14	175	140	100	74	60	88	22	8	53	4.1	3.6	64.4	18	20	4-M16
M8430																
M8340	F16	205	165	130	98	80	120	35	12	80	5	4	85.4	22	----	4-M20
M8440																
M8350																
M8450																

### 8.4 Angle Additional Gearbox

#### 8.4.1 Technical Data of Torque and Speed

Table 6 Technical Data of Torque and Speed

Actuator Model	Nominal Adjustment Torque Nm	Minimum Value of Output Protective Torque [Nm]	Maximum Value of Output Protective Torque [Nm]	Time Range of Whole Travel s/90°	Length of Torque Arm mm
M8410+A8005	250	300	450	21	160
M8410+A8010	500	360	900	30	200
M8410+A8020	800	420	1050	32	200
M8420+A8020	1200	720	1800	32	200
M8420+A8040	1600	810	2025	32	250
M8430+A8040	2500	1440	3600	32	250
M8430+A8090	4000	1800	4500	32	250
M8440+A8090	6000	3200	8000	32	250
M8440+A8160	8000	4800	12000	44	250
M8440+A8200	8000	4800	12000	43	500
M8450+A8200	12000	7200	18000	43	500
M8440+A8400+G6804	16000	16000	24000	85	500
M8450+A8400+G6804	24000	14400	36000	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.)

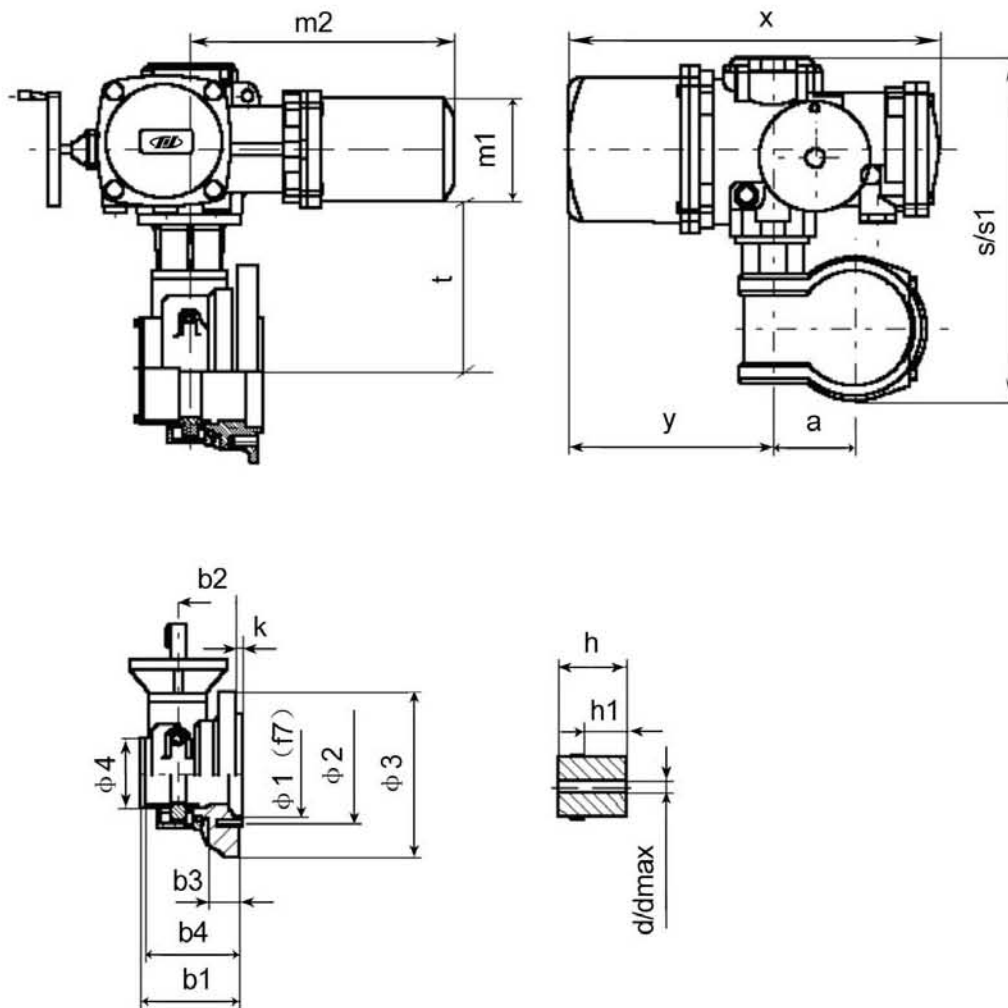


Fig. 7 Outline of Angle Electric Actuator (Coupled-type)

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

	A8005	A8010	A8020	A8040	A8090	A8160	A8200	A8400 (+G68)
a	52	68.5	93.5	114	150	160	250	250
b1	104	109	110	149	179	204	277	312
b2	55	62	62	83	96	117	160	166
b4	96	102	102	130	162	193	249	300
clf8	70	175	230	260	315	230	360	360
c2	102	310	255	300	355	298	405	405
c3	115	150	204	240	310	350	530	530
c4	80	95	137	158	195	220	250	250
d/dmax	20/30	20/40	35/75	35/80	54/105	54/105	54/105	54/105
h	81	80	104	104	133	158	235	260
h1	37	57	64.5	70	88	73	95	100
s/s1	385.5	431	487(698)	527(512)	(736)	884	(882)	1100
t	146	176.5	295.5	246	310	592	530	577
x	(M8410/M8310/M8420/M8320)=450				(M8430/M8330)=491			
y	(M8410/M8310/M8420/M8320)=253				(M8430/M8330)=266			
m1	(M8410/M8310)=106		(M8420/M8320)=120		(M8430/M8330)=137			
m2	(M8410/M8310)=285		(M8410/M8310)=313		(M8410/M8310)=350			

#### 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.)

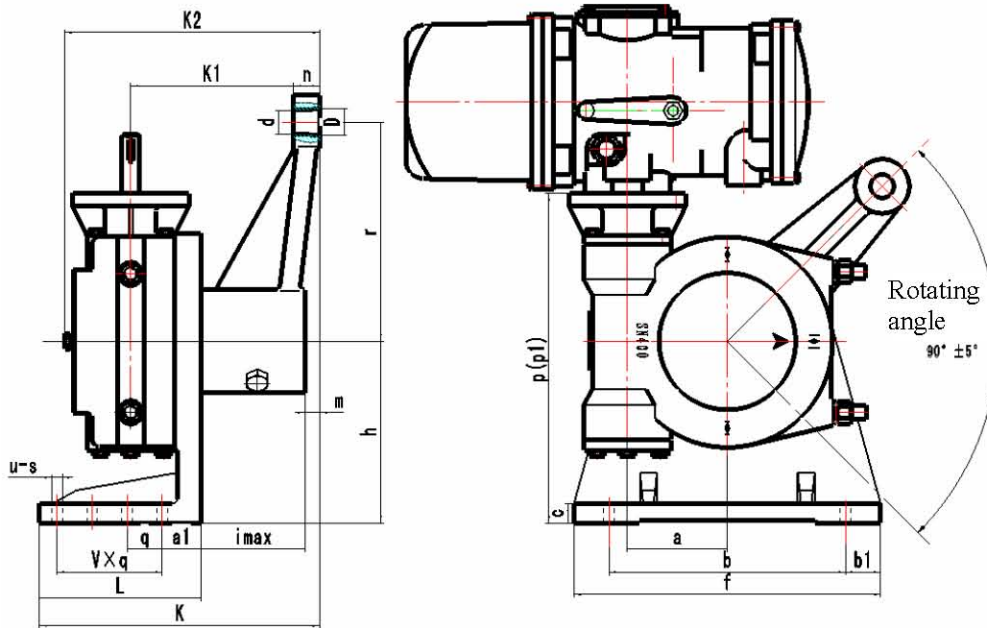


Fig. 8 Outline of Angle Electric Actuator with Lever

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

Dimension	A8005	A8010	A8020	A8040 (+G65)	A8090 (+G65)	A8160	A8200/A8250	A8400 +G68
$V \times q$	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	66	86	100	119	143	143	150	150
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
x	(M8410/M8310/M8420/M8320) = 450				(M8430/M8330) = 491			
y	(M8410/M8310/M8420/M8320) = 253				(M8430/M8330) = 266			
a	52	68.5	93.5	114	150	160	250	250

## 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] <sup>1)</sup>	Maximum Protective Thrust [kN] <sup>1)</sup>	Speed [mm/s]	Maximum Travel [mm]	Flange of the Valve Body	Transducer	Actuator
8	3.2	8	2.9	50, 100	F10	L8210	M8410/M8310
16	6.4	16	2.9	50, 100	F10	L8220	M8410/M8310
25	10	25	3.5	63, 125	F10	L8230	M8420/M8320
40	16	40	4.1	80, 160	F14	L8240	M8430/M8330

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

### 8.5.2 Outline and Installation Dimension

Dimension with flange

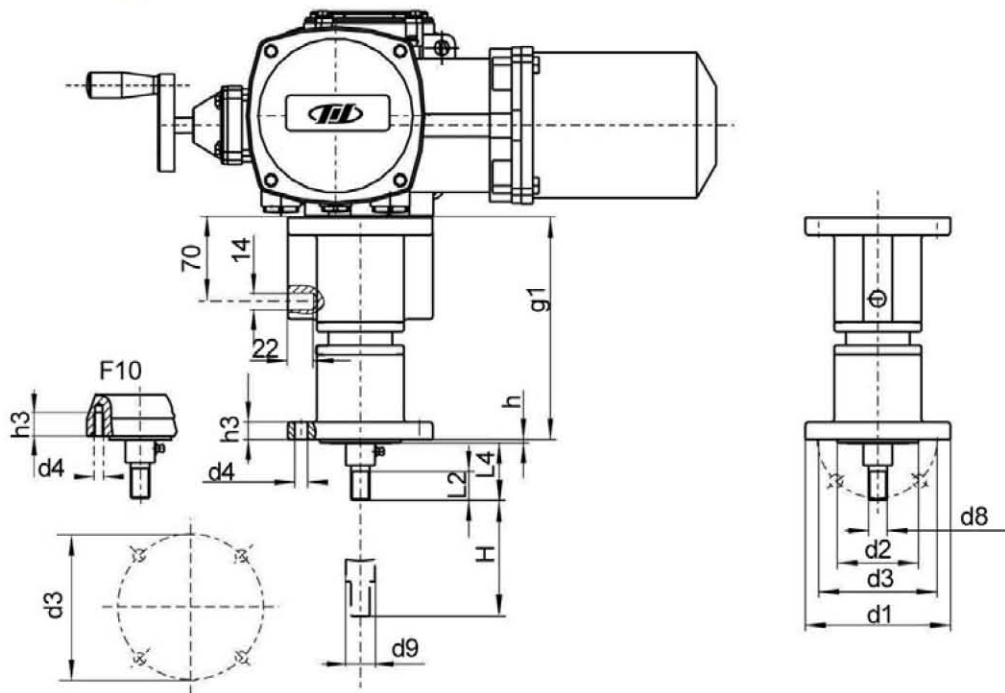


Fig. 9 Outline of Linear Actuator with Flange

Table 11 Installation Dimension of Linear Actuator with Flange

	L8210		L8220		L8230		L8240	
Flange of Valve Body	F10		F10		F10		F14	
Actuator	M8410/M8310		M8410/M8310		M8420/M8320		M8430/M8330	
Actuator Flange ISO5210	F10		F10		F10		F14	
Travel H	50	100	50	100	50	100	50	100
d1	125		125		125		175	
d2	70f8		70f8		70h7		100f8	
d3	102		102		102		140	
d4	11		11		11		18	
d8	M12×1.25		M16×1.5		M20×1.5		M36×3	
g1	191	241	191	241	191	241	191	241
h	3		3		3		4	
h3	15		15		15		18	
L2	20		25		30		55	
L4	44		49		54		74	

## 8.6 Multi-turn Additional Gearbox

### 8.6.1 Technical Data

Table 12 Technical Data for Multi-turn Additional Gearbox

Actuator	Gearbox	Output			Flange (JB 2920)	Power (kW)	Current (A)	Weight (Kg)
		Recommended Adjustment Torque (Nm)	Protective Torque (Nm)	Speed (r/min)				
M8450 M8350	G7010	900	600-1500	13	5	4.2	11.4	110
M8450 M8350	G7020	1800	1080-2500	7.5	7	4.2	11.4	135
M8450 M8350	G7030	2400	1500-3500	6	8	4.2	11.4	160

### 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
D	275	330	380
D1	235	285	340
D2	180	220	280
D3	82	98	118
D4	62	65	80
H	560	630	645
H1	25	30	35
H2	14	16	20
H3	2	3	3
H4	7	8	8
A	620	620	620
B	550	550	550
n-d	4-φ22	4-φ26	8-φ22

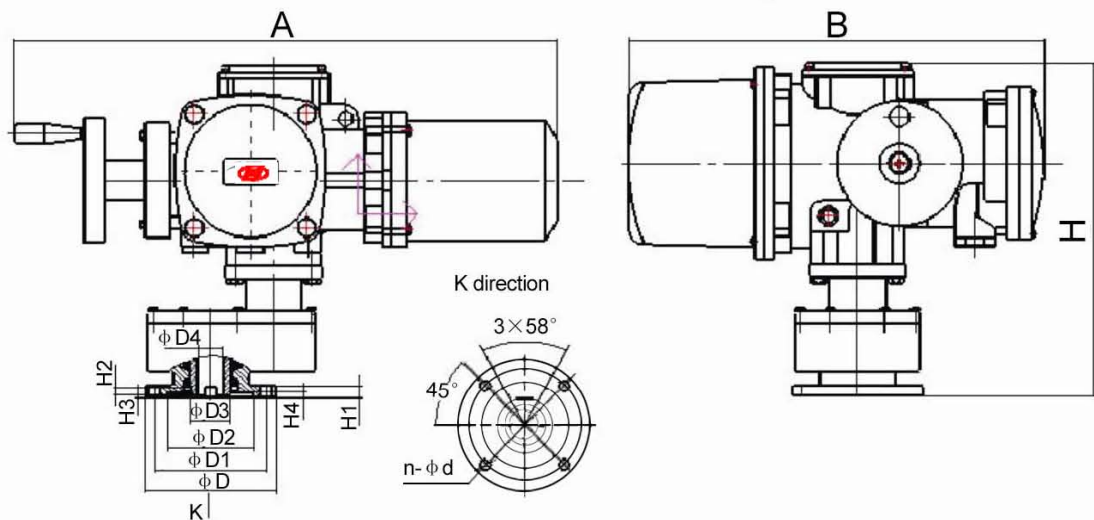


Fig. 10 Outline of Multi-turn Additional Gearbox