



# EA 20 SERIES ELECTRIC ACTUATORS





## Attention

1.  No manual operation is allowed when it is energized.
2. The actuator is internally provided with overheat protection device, when the motor exceeds the temperature of 125°C , the overheat protection device will switch off the motor power automatically.
3. It is necessary to additionally install the leakage protection device before it is put into operation.
4. Please confirm the input voltage and all connections.
5. It is not allowed to put the power lines for two or more sets of actuators in series or in parallel, otherwise it will cause movement out of control and motor over temperature rising due to the interference of condensers from each other.
6. It is necessary to have sealing treatment of water-proof cable end at the inlet side according to the Instruction Manual, otherwise the actuator will be damaged by water or dirt coming from outside.
7.  The servo controller must be wired and adjusted according to the Instruction Manual for the sake of it not being damaged.
8. The service personnel for installation and adjustment must be qualified for the operation.
9. It is prohibited to operate the actuator under overload condition.
10. The manufacturer will not be responsible to the improper changes and maintenance on the actuator.



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## Application Field



Paper-making



Automation for building



Water treatment



Smelting



Electric Power



Petroleum-chemical

**For the following process control, SMART Series electric actuator is your ideal choice:**

- Butterfly valve, ball valve, plug valve and other rotating-type valves
- Automation and computer-controlled system
- The industrial process control devices for flow, temperature, liquid level and pressure
- The mechanically positioned rotation

SMART series electric actuator is widely used in the industrial field, such as petroleum, chemical, electric power, smelting, and energy, building materials, pharmaceutical, paper-making, water treatment, brewage, food process, shipbuilding and the automation system for the building.



Electric butterfly valve











Full-function/super-light regulator valve

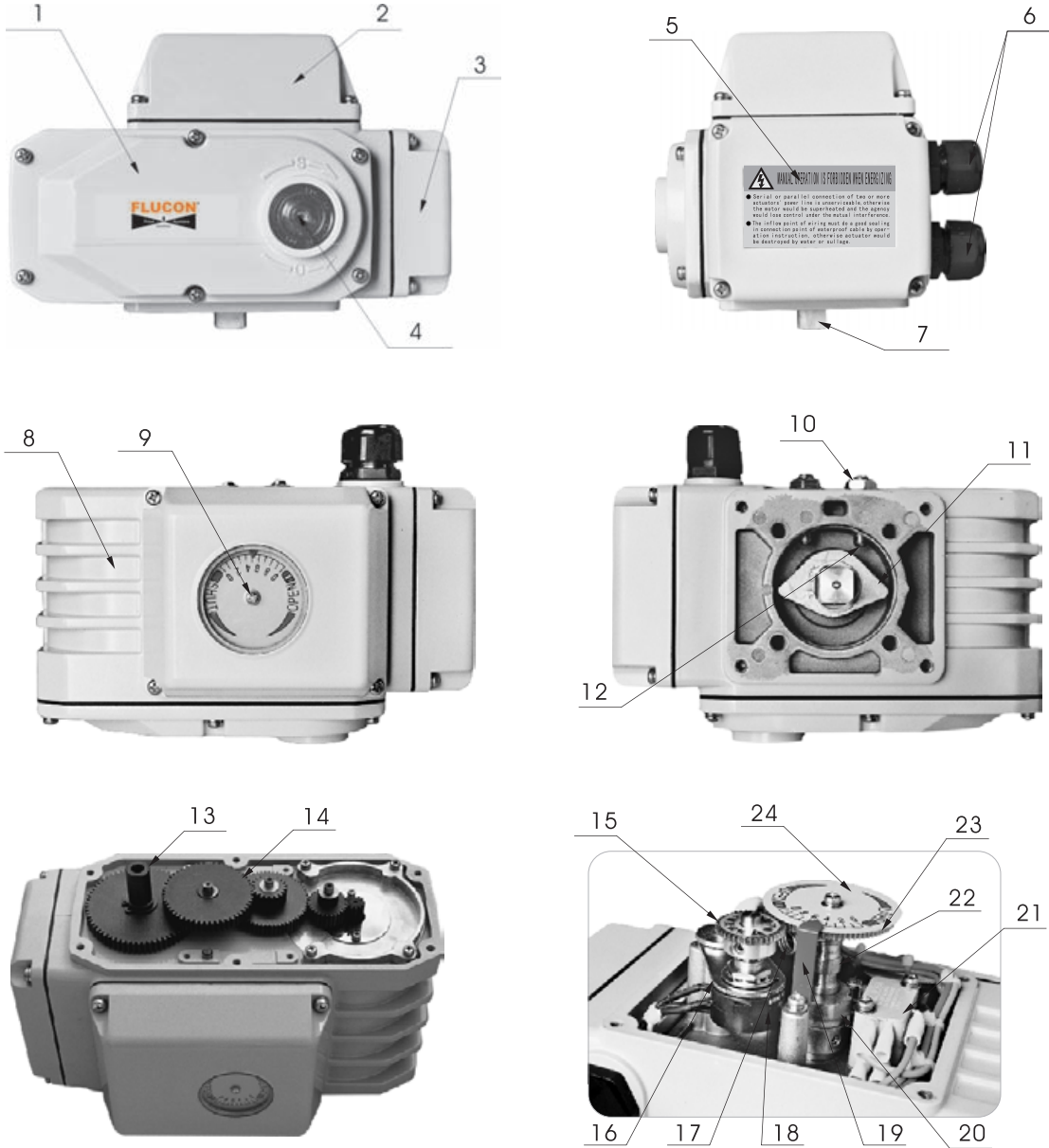


Electric ball valve

## Characteristics of Mechanism

 <p style="text-align: right;">1</p>	 <p style="text-align: right;">2</p>	 <p style="text-align: right;">3</p>
<p>① Motor for the actuator is required to have high-start-up torque, so the actuator is capable to start up with full load whenever the valve is at the opening, closing and any intermediate positions. This is due to the working characteristic of valve. At the same time, the smaller rotation inertia is required for the motor due to the adjustment of the flow (opening range). The motor for SMART Series Electric Actuator is designed for such special requirement.</p> <p>② It is made of the alloy steel, which is machined by CNC after heat treatment, featuring the high strength, good wear resistance and the long-term-fatigue load impact.</p> <p>③ Each set of product is attached with a crank when ex-works. When it is necessary to have manual operation, insert the crank directly to the manual operation port to drive valve. The crank shall be kept separately in another place, when it is not in use.</p>	 <p style="text-align: right;">4</p>	
<p>④ Due to the working characteristic of valve, the output shaft for actuator is required to operate under the conditions of long-time and high torque and the frequently changing of rotation direction. The traditional connection of key and pin between the output shaft and worm wheel can hardly meet the requirement of the operating conditions. The problem has been thoroughly solved by the integral construction between the output shaft and worm wheel, which is adopted in SMART Series Electric Actuator.</p> <p>⑤ Covers are tightened to the box body by the stainless steel screw. When dismantling the cover, the screw on the cover will not drop out in order to avoid missing.</p> <p>⑥ The stainless steel bolt and stopper for the limit of mechanical travel can be used for exact adjustment of actuator to a specific angle. For convenient adjustment, the bolt is located outside, and the stainless-steel nut can ensure it to be positioned after adjustment. The travel termination is set to Angle 0-90° before ex-work. However any angle can also be set.</p>	 <p style="text-align: right;">5</p>	
<p>⑦ The starting angle of valve can be clearly indicated through the simple design  <span style="color: red;">●</span> Indicates the full close position of valve. <span style="color: red;">●</span> Indicates the full open position of valve.          The intermediate scale indicates the opening percentage of valve. The glass lens is stiffened with special treatment. The plastic lens, which is poor in performance for anti-aging and easily deformed by temperature, has been rejected.</p> <p>⑧ Whole imported high quality elements are the reliable guarantee of long term and stable operation of actuator.</p>	 <p style="text-align: right;">6</p>	
 <p style="text-align: right;">8</p>	 <p style="text-align: right;">7</p>	

## NAMES OF COMPONENTS



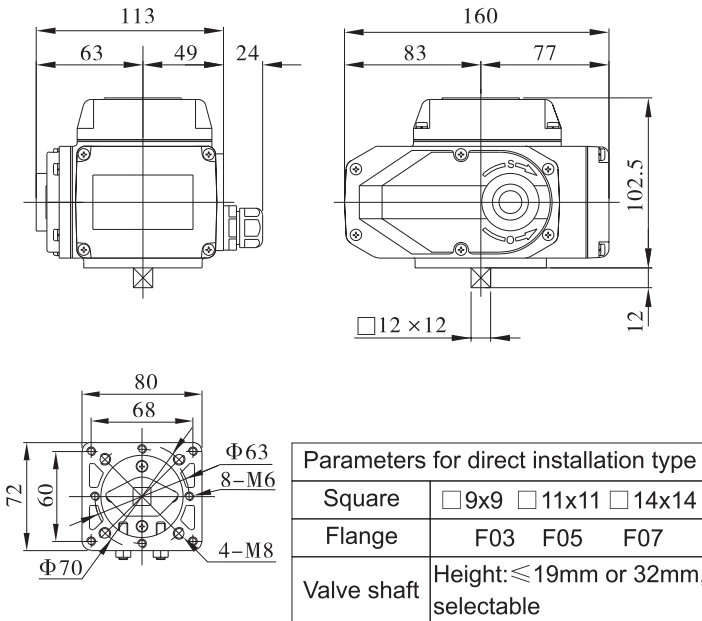
1	Cover of Driving Side	2	Cover for Electric Elements	3	Cover for Junction Box	4	Manual Operation Port
5	Warning Label	6	Water-proof Cable Connector	7	Output Shaft	8	Casing
9	Position Indicator	10	Lock Nut	11	Dog for Mechanical Limit	12	Adjusting Screw
13	Worm Shaft	14	Reducing Gear Group	15	Gear for Potentiometer	16	Mounting Plate for Potentiometer
17	Tension Spring	18	Potentiometer	19	Pointer	20	Travel Dog
21	Micro-switch	22	Auxiliary Shaft	23	Gear for Position	24	Scale Plate

S (SHUT) Direction of arrow (clockwise) represents close.  
 O (OPEN) Direction of arrow (anti-clockwise) represents open.

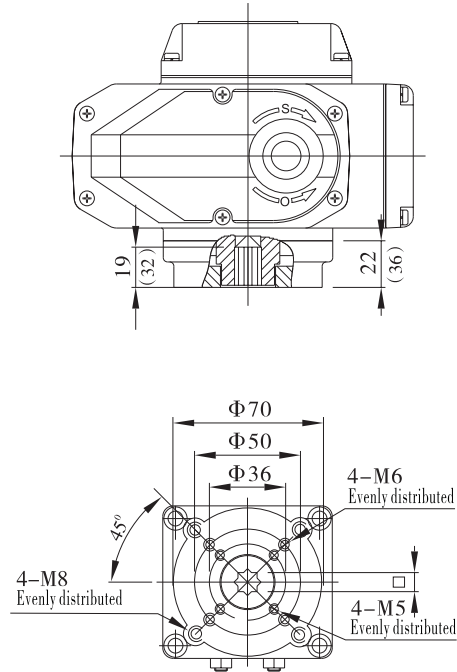


## OVERALL DIMENSIONS AND PERFORMANCE PARAMETERS of SMART-05

**Standard type**



**Direct installation type**

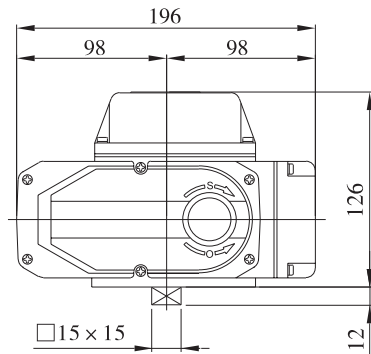
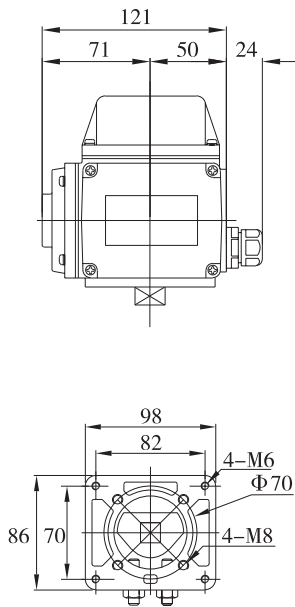


Parameters	Type	SMART-05				
	Power	DC24V	AC24V	AC110V	AC380V	AC220V
Performance						
Motor Power		13W	10W	10W	6W	10W
Rated Current		1.28A	1.50A	0.24A	0.07A	0.16A
Standard Time/Torque		20S/50Nm				
Optional Time/Torque		4S/20Nm 10S/30Nm			4S/20Nm 10S/30Nm 60S/50Nm	
Turning Angle		0~360° Adjustable				
Available Control Circuit		Types of A\B\C\D\E\F\G\H				
Total Weight		2.0kg				
Insulation Resistance		DC 24V/AC24V: 100 MΩ/250VDC AC110V/220V/380V: 100 MΩ/500VDC				
Voltage-withstand Class		DC24V/AC24V: 500VAC 1 Minute、AC110V/220V: 1500VAC 1Minute、AC380V: 1800VAC 1 Minute				
Protection Class		IP67				
Installation Angle		360°, at any angle				
Electric Interface		G1/2 Water-proof Cable Connector				
Ambient Temperature		-30°C~+60°C				
Optional Function		● Over-torque Protection ● Heater for eliminating moisture				

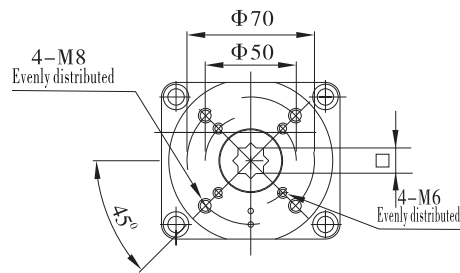
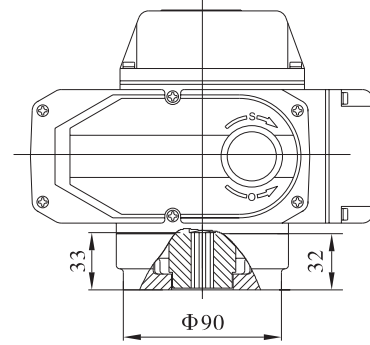


## OVERALL DIMENSIONS AND PERFORMANCE PARAMETERS of SMART-10

### Standard type



### Direct installation type



Parameters for direct installation type	
Square	□ 9x9 □ 11x11 □ 14x14
Flange	F05 F07
Valve shaft	Height ≤ 32mm

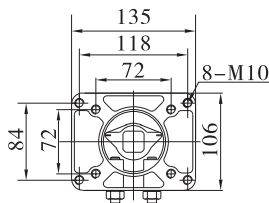
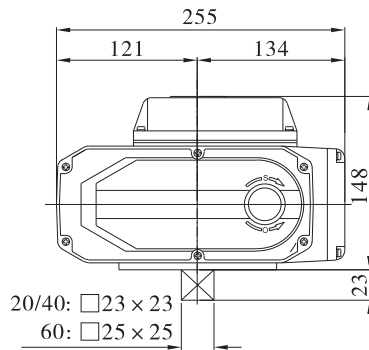
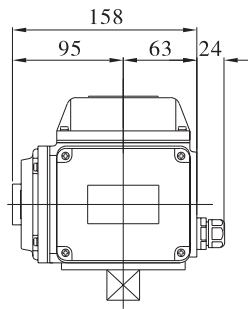
Type Parameters Power Performance	SMART-10				
	DC24V	AC24V	AC110V	AC380V	AC220V
Motor Power	25W	25W	25W	15W	25W
Rated Current	2.03A	2.12A	0.57A	0.10A	0.35A
Standard Time/Torque	30S/100Nm				
Optional Time/Torque	15S/50Nm				15S/50Nm 60S/100Nm
Turning Angle	0~360° Adjustable				
Available Control Circuit	Types of A B C D E F G H				
Total Weight	3.0kg				
Insulation Resistance	DC 24V/AC24V: 100 MΩ/250VDC AC110V/220V/380V: 100 MΩ/500VDC				
Voltage-withstand Class	DC24V/AC24V: 500VAC 1 Minute、AC110V/220V: 1500VAC 1Minute、AC380V: 1800VAC 1 Minute				
Protection Class	IP67				
Installation Angle	360°, at any angle				
Electric Interface	G1/2 Water-proof Cable Connector				
Ambient Temperature	-30℃~+60℃				
Optional Function	●Over-torque Protection ●Heater for eliminating moisture				



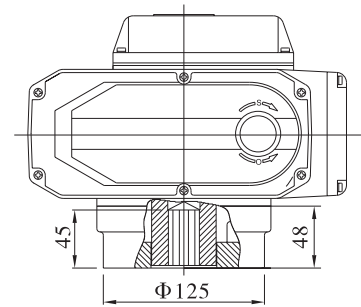


## OVERALL DIMENSIONS AND PERFORMANCE PARAMETERS of SMART-20/40/60

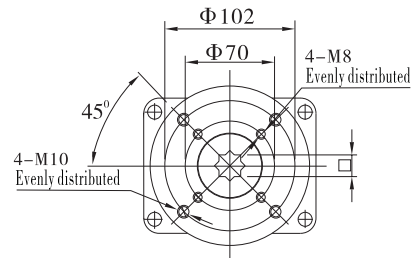
### Standard type



### Direct installation type



Parameters for direct installation type	
	SMART-20    SMART-40/60
Square	□14x14 or □17x17    □17x17 or □22x22
Flange	F07    F10
Valve shaft	Height: ≤44mm,

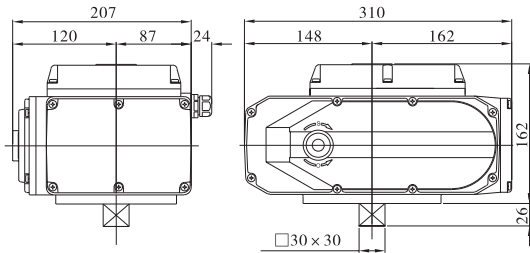


Parameters	SMART-20				SMART-40				SMART-60			
	DC24V	AC110V	AC380V	AC220V	DC24V	AC110V	AC380V	AC220V	DC24V	AC110V	AC380V	AC220V
Motor Power	35W	40W	30W	40W	70W	90W	40W	90W	70W	90W	40W	90W
Rated Current	3.57A	0.65A	0.15A	0.37A	5.13A	1.12A	0.29A	0.57A	6.04A	1.18A	0.29A	0.60A
Standard Time/Torque	30S/200Nm				30S/400Nm				45S/600Nm			
Optional Time/Torque	15S/100Nm		15S/100Nm 60S/200Nm	15S/200Nm		15S/200Nm 60S/400Nm						
Turning Angle	0~90° Adjustable				0~90° Adjustable				0~90° Adjustable			
Available Control Circuit	Types of A B C D E F G H				Types of A B C D E F G H				Types of A B C D E F G H			
Total Weight	8.0kg				8.5kg				9.0kg			
Insulation Resistance	DC 24V: 100 MΩ /250VDC				AC110V/220V/380V: 100 MΩ /500VDC							
Voltage-withstand Class	DC24V: 500VAC 1 Minute、 AC110V/220V: 1500VAC 1 Minute、 AC380V: 1800VAC 1 Minute											
Protection Class	IP67											
Installation Angle	360°, at any angle											
Electric Interface	G1/2 Water-proof Cable Connector											
Ambient Temperature	-30℃~+60℃											
Optional Function	●Over-torque Protection    ●Heater for eliminating moisture											

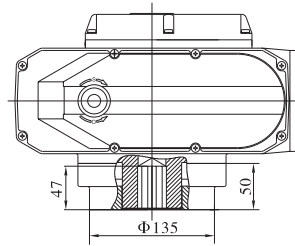


## OVERALL DIMENSIONS AND PERFORMANCE PARAMETERS of SMART-100/160/200

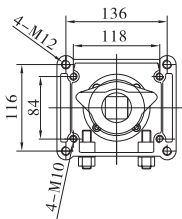
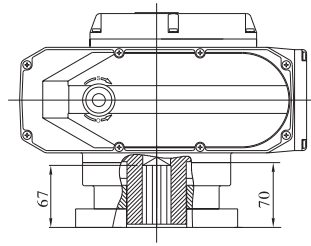
**Standard type**



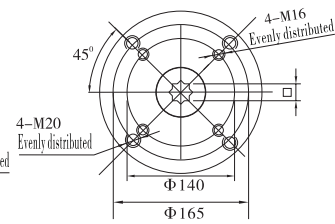
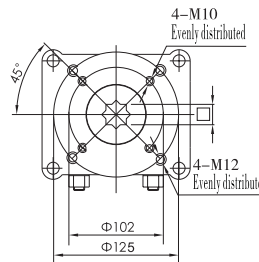
**Direct installation type (SMART-100 160)**



**Direct installation type (SMART-200)**



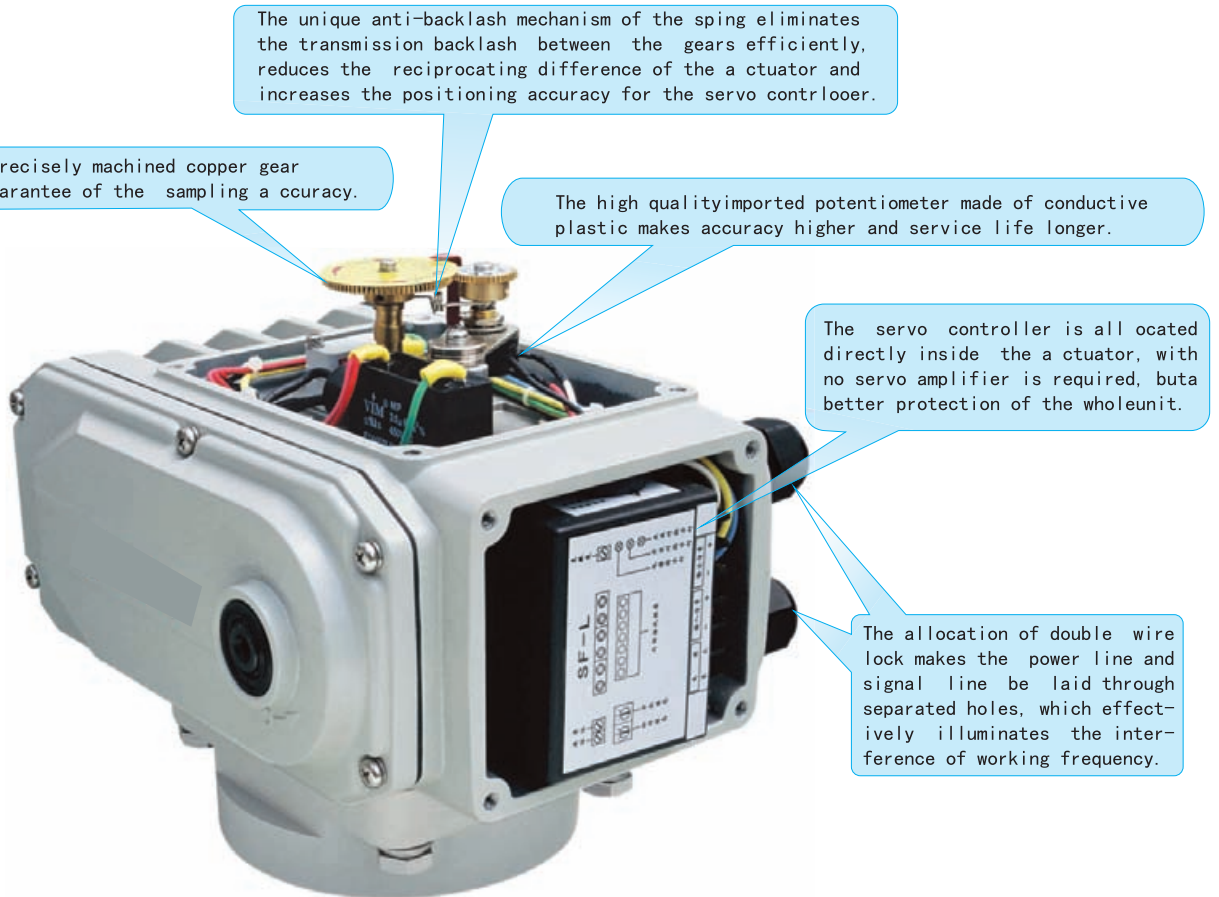
Parameters for direct installation type		SMART-100/160	SMART-200
Square		□ 22x22 or □ 27x27	□ 27x27 or □ 36x36
	Flange	F10 F12	F14 or F16
Valve shaft		Height: ≤46mm	Height: ≤66mm



Parameters	Type	SMART-100			SMART-160			SMART-200		
		AC110V	AC220V	AC380V	AC110V	AC220V	AC380V	AC110V	AC220V	AC380V
Power										
Performance										
Motor Power		120W	120W	90W	140W	140W	100W	140W	140W	100W
Rated Current		1.93A	0.94A	0.44A	1.75A	0.96A	0.46A	1.75A	0.98A	0.48A
Standard Time/Torque		30S/1000Nm			48S/1600Nm			60S/2000Nm		
Optional Time/Torque		15S/500Nm								
Turning Angle		0~90° Adjustable			0~90° Adjustable			0~90° Adjustable		
Available Control Circuit		Types of A/B/C/D/E/F/H			Types of A/B/C/D/E/F/H			Types of A/B/C/D/E/F/H		
Total Weight		17kg			17.5kg			18kg		
Insulation Resistance		AC110V/220V/380V: 100 MΩ/500VDC								
Voltage-withstand Class		AC110V/220V: 1500VAC 1 Minute、 AC380V: 1800VAC、 1 Minute								
Protection Class		IP67								
Installation Angle		360°, at any angle								
Electric Interface		G1/2 Water-proof Cable Connector								
Ambient Temperature		-30°C~+60°C								
Optional Function		● Over-torque Protection ● Heater for eliminating moisture								



## PERFORMANCE PARAMETERS OF ADJUSTING SERIES (Type E)



Type	SMART E	SMART E	SMART E	SMART E	SMART E	SMART E	SMART E	SMART E
Parameters Performance	AC110V/AC220V 50/60Hz							
Motor Power	10W	25W	40W	90W	90W	120W	140W	140W
Rated Current	0.24/0.16A	0.57/0.35A	0.65/0.37A	1.12/0.57A	1.18/0.60A	1.93/0.94A	1.75/0.96A	1.75/0.98A
Standard Time/Torque	20S/50Nm	30S/100Nm	30S/200Nm	30S/400Nm	30S/600Nm	30S/1000Nm	48S/1600Nm	60S/2000Nm
Optional Time/Torque		15S/50Nm	15S/100Nm	15S/200Nm		15S/500Nm		
Turning Angle(°)	0~90°	0~90°	0~90°	0~90°	0~90°	0~90°	0~90°	0~90°
Total Weight(Kg)	2.0Kg	3.0Kg	8.0Kg	8.5Kg	9.0Kg	17.0Kg	17.5Kg	18.0Kg
Insulation Resistance(MΩ)	100MΩ/500VDC							
Voltage-withstand Class	1500VAC, 1 Minute							
Protection Class	IP67							
Installation Angle	360°, at any angle							
Electric Interface	Two G1/2 Water-proof Cable Connectors, one for power line and one for signal line.							
Ambient Temperature	-30°C~+60°C							
Adjustment Performance	Input Signal	Output Signal	Basic Error	Reciprocating Error	Dead Space	Damping Characteristic	Repeating Error in Actuator	
	4~20mADC、1~5VDC	4~20mADC	≤±0.5%	≤0.3%	0.4%~1.5%	0 times	0%	
Note: The input signal (or output signal) for other types shall be specially noted when placing order.								



## CONTROL CIRCUIT

**Type A: Limit Switch with Active contact**  
 The opening or closing operation is realized by switching open or close the circuit, outputting a group of full open or full close active signals.

**Notes of wiring terminals:**

- Terminal 1 is for the connection of zero line of power cord.
- The connection between power phase line and terminal 2 is for the operation of "close".
- The connection between power phase line and terminal 3 is for the operation of "open".
- When the power phase line is connected with the terminal 2 and "close" operation is at its position, the "full close" signal indication lamp connected with terminal 4 lights.
- When the power phase line is connected with the terminal 3 and "open" operation is at its position, the "full open" signal indication lamp connected with terminal 5 lights.

**Type B Intermediate Position Switch with Passive contact**  
 The opening or closing operation is realized by switching "open" or "close" the circuit, outputting a group of full open or close passive signals.

**Notes of wiring terminals:**

- Terminal 1 is for the connection of zero line of power.
- The connection between power phase line and terminal 2 is for "close" operation.
- The connection between power phase line and terminal 3 is for "open" operation.
- Terminal 4 is common terminal as passive contact. 5. When it is at "open" operation position, terminal 5 will output the "full open" signal.
- When it is at "close" operation position terminal 6 will output the "full close" signal.

**Type C: With 1 K  $\Omega$  (or 500  $\Omega$ ) Potentiometer**  
 The opening or closing operation is realized by switching "open" or "close" circuit, outputting resistant signals corresponding to opening position.

**Notes of wiring terminals:**

- Terminal 1 is for the connection of zero line of power.
- The connection between power phase line and terminal 2 is for "close" operation.
- The connection between power phase line and terminal 3 is for "open" operation.
- Terminal 4 is for the lower end of potentiometer. When it is at "open" operation, the resistance value between terminal 4 and terminal 5 is increasing along with the increasing of opening.
- Terminal 5 is for the moving arm of potentiometer.
- Terminal 6 is for higher end of potentiometer. When it is at "open" operation, the resistance value between terminal 6 and terminal 5 is reducing along with the increasing of opening.

**Type D: Position Switch with Potentiometer and Passive Contact**  
 The opening or closing operation is realized by switching "open" or "close" the circuit, outputting resistant signals corresponding to the opening position, and at the same time outputting a group of "Full-close" and "Full-open" passive signals.

**Notes of wiring terminals:**

- Terminal 1 is for the connection of zero line of power.
- The connection between power phase line and terminal 2 is for the operation of "close".
- The connection between power phase line and terminal 3 is for the operation of "open".
- Terminal 4 is common terminal as passive contact.
- When it is at "open" operation position, terminal 5 will output the "full open" signal.
- When it is at "close" operation position, terminal 6 will output the "full close" signal.
- Terminal 7 is for the lower end of potentiometer. When it is at "open" operation, the resistance value between terminal 7 and terminal 8 is increasing along with the increasing of opening.
- Terminal 8 is for the moving arm of potentiometer.
- Terminal 9 is for higher end of potentiometer. When it is at "open" operation, the resistance value between terminal 9 and terminal 8 is reducing along with the increasing of opening.

Note: The internal circuit of actuator is shown in the dotted frame.



## CONTROL CIRCUIT

**Type E: With Servo Controller**

Input: 4~20mA DC or 1~5VDC; Output: 4~20mA DC

**Notes of wiring terminals:**

1. The “N” of input end of power supply is connected with zero line and “L” is connected with phase line.
2. The “-” at input signal end is connected with negative pole of input signal and “+” is connected with positive pole of input signal.
3. The “-” at output signal end is connected with negative pole of output signal and “+” is connected with positive pole of output signal.

**Type F: With Position Transmitter**

To output signal of 4~20mADC for valve (full-range feedback for valve)

**Notes of wiring terminals:**

1. The “N” at input end of power supply is connected with zero line and “L” is connected with phase line.
2. When phase line “L” at input end of power supply is connected with “close”, it runs towards to “close” direction, when it is connected with “open” it runs towards to “open” direction.
3. The “-” at output signal end is connected with negative pole of output signal and “+” is connected with positive pole of output signal.

**Type G : DC Control Circuit, with Passive Contact Switch**

According to the single conductivity of diode, the opening and the closing operation can be realized by means of the exchange of the positive polarity and the negative polarity of DC power supply and output a group of full open and close passive signals.

**Notes of wiring terminals:**

1. For the operation of “close”, the terminal 1 is connected with positive pole and the terminal 2 is connected with negative pole. For operation of “open”, the terminal 2 is connected with positive pole and the terminal 1 is connected with negative pole.
2. The terminal 3 is the common terminal with passive contact.
3. When it is at “open” operation position, terminal 4 will output the “full open signal”.
4. When it is at its “close” operation position, terminal 5 will output the “full close signal”.

**Type H : 3-phase AC Control Circuit, with Passive Contact Switch**

By means of the external phase-reversing circuit, the “open” or “close” operation can be realized for running normally or reversibly of motor and output a group of full open or close passive signal.

**Notes of wiring terminals:**

1. Terminal 1, 2 and 3 are connected with 3-phase AC power supply, the running normally or reversibly of motor can be realized by means of the external phase-reversing circuit.
2. Terminal 4 is the common terminal of external control circuit.
3. Terminal 5 is for the control of “close” operation.
4. Terminal 6 is for the control of “open” operation.
5. Terminal 7 is the common terminal passive contact.
6. When it is at its “open” operation position, terminal 8 will output the “full open” signal.
7. When it is at its “close” operation position, terminal 9 will output the “full close” signal.

Note: The internal circuit of actuator is shown in the dotted frame.

## APPLICATION REQUIREMENTS

### 1 Requirement of Installation Conditions

- The product can be installed not only indoors, but also outdoors.
- The product is not explosion-proof, Care shall be taken to avoid inflammable and explosive environment.
- It is necessary to have protective cover installed if it operates in such conditions of long time raining, directly receiving sunshine or spatter.
- Maintenance space shall be reserved for connection and manual operation.
- The ambient temperature shall be within the rang of  $-30\sim 60^{\circ}\text{C}$ .

### 2 Requirement of Working Medium Temperature

- When it operates with valve, the heat of working medium will be conducted to the body of the unit, care shall be taken to the temperature rising.
- When the temperature of the working medium is high, the support connected to the valve will reduce the heat conductivity.
- Please select the standard type support if the temperature of working medium is below  $80^{\circ}\text{C}$ .
- Please select the support for high temperature if the temperature of working medium is higher than  $80^{\circ}\text{C}$ .

### 3 Installation Requirement for Cable and Cable Pipe

- Refer to Fig.1 when installing pipes.

- ① The outer diameter of the pipe shall be  $\Phi 9\sim\Phi 11$ .
- ② Waterproof shall be fully adopted.
- ③ The electric actuator shall be allocated higher than the pipe, so water in the pipe will not flow into the unit and the safety of the unit can be ensured.

- The outer diameter of the cable shall be  $\Phi 9\sim\Phi 11$ , refer to Fig. 2. No cable, which is not fit to the inner diameter of waterproof cable connector, is allowed to use. Otherwise, water may enter into the unit through the connector to damage the parts inside actuator.

- In principle, the shielded cable shall be adopted as the signal cable, which shall be wired separately from the power cable.

### 4 Requirement of Power Supply

- The power supply corresponding to that specified for the type of actuator ordered must be provided at the installation site.

- Following requirements of voltage shall be met at the installation site:

AC380V $\pm 10\%$  50Hz/60Hz AC 220V $\pm 10\%$  50Hz/60Hz  
 AC110V $\pm 10\%$  50Hz/60Hz AC 24V $\pm 10\%$  50Hz/60Hz  
 DC 24 V $\pm 5\%$

### 5 Selection of Fuses for Circuit Breaker

Type	Ampere	Voltage	DC24	AC24V	AC110V	AC220V	AC380V
SMART-03, 05			5A	5A	3A	2A	2A
SMART-10			7A	7A	5A	3A	2A
SMART-20, 40, 60			15A	/	7A	5A	3A
SMART-100, 160, 200			/	/	10A	7A	5A

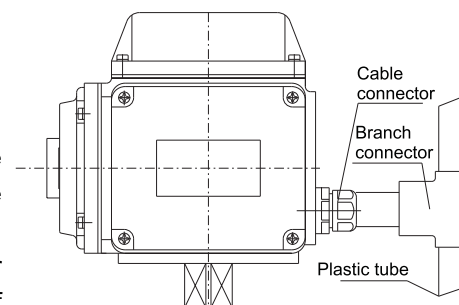


Fig. 1

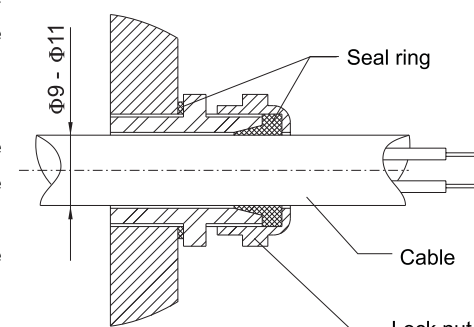


Fig. 2



## INSTALLATION OF ELECTRIC ACTUATOR ONTO VALVE

### Installation of electric actuator onto valve (Fig. 3)

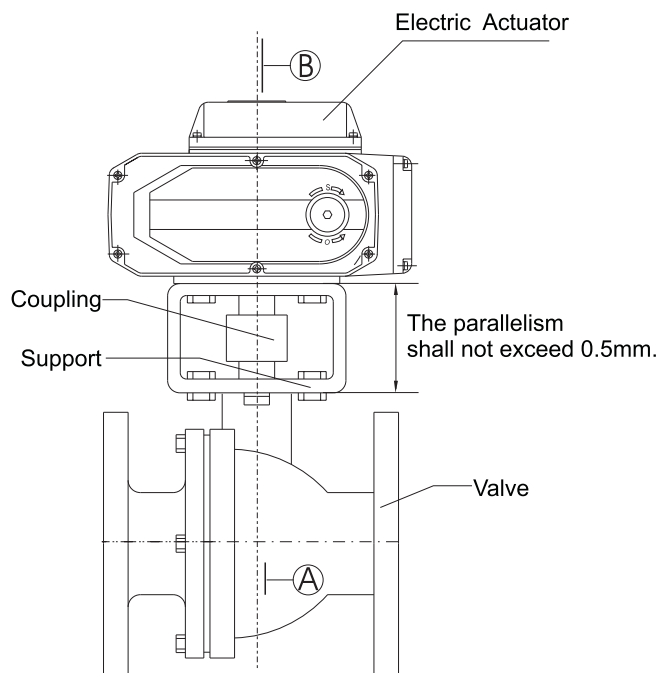
1. Turn the valve to full close position manually and check if there is any abnormal condition.
2. Fix the support on the valve.
3. Put one end of the coupling into the spindle of valve.
4. Drive the electric actuator to the full close position by crank (pointer is pointing at SHUT, which is at the starting position of scale), insert the output shaft into the square hole of coupling.
5. Fasten connecting bolts to connect support with electric actuator and the body of valve.
6. Drive the electric actuator by crank and confirm the operation is stable without offcenter and distortion, check the valve, see if the full close and full open positions can be realized within the indication range of opening indicator of electric actuator.

**Note: Too much force will lead the electric actuator over-travel and being damaged.**

### Special Hints:

Please be noted to those customers who provide the support and coupling by their own:

- The support and coupling shall be designed and processed by the professional mechanical technicians and meet the requirements noted in Fig. 4
- The accuracy of square holes at two ends of coupling shall be guaranteed, try as much as possible to eliminate driving clearance, so as to avoid backlash (Reciprocating Error) during operation of valve.
- It is necessary to guarantee the position degree of square holes at the two ends of coupling. Otherwise, it may exceed the working range designed for actuator; leading to that valve could not work normally due to the travel of actuator not able to be adjusted.



The coaxiality between axes A and B shall not exceed  $\phi 0.2\text{mm}$ .

Fig. 4

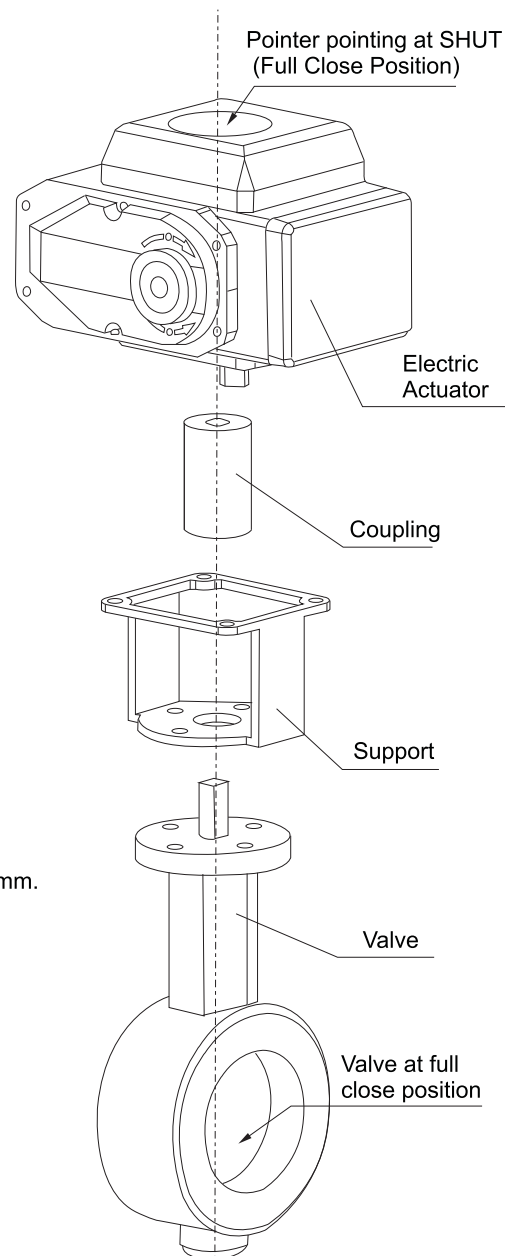


Fig. 3



**OVERALL ADJUSTMENT OF ELECTRIC VALVE**

**1. Adjustment of limit position switch (electrical limit) (Fig. 5)**

- ① Drive the valve to Full Close position by crank.
- ② Loose the fixing screw on travel dog, D1; Turn D1 clockwise, making the corresponding microswitch, K1 move. When the microswitch being initiated, you can hear a sound of "click", and then stop turning D1 and fasten the screws on D1, so as to fix D1.
- ③ Drive the valve to Full Open position by crank. Loose the fixing screw on travel dog, D2; turn D2 anti-clockwise, making the corresponding microswitch, K2 move. When the microswitch just being initiated, you can fasten the screws on D2 and fix D2.

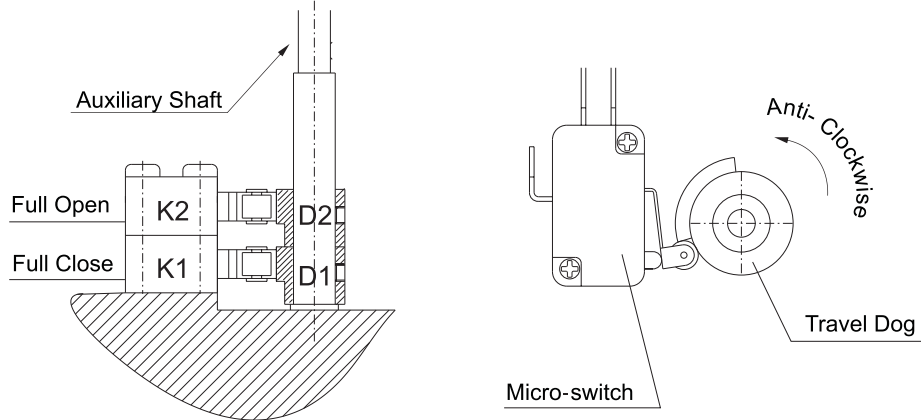


Fig. 5

**2. Adjustment of intermediate position switch (Fig. 6)**

Suitable for Type B, Type D, Type G and Type H

- ① Drive the valve by crank to the max. opening position.
- ② Loose the fixing screw of travel dog, D3; Turn D3 anti-clockwise, making K3 be initiated. When you hear a sound from K3, you can lock D3.
- ③ Drive the valve by crank to the min. opening position required. Loose the fixing screw on D4; turn D4 clockwise, making K4 be initiated. When you hear a sound from K4, you can lock D4.

**Special Hints:** Before ex-works, K3 is adjusted to the position of 2, which is the lead full open position of valve. The output represents the signal of passive contact position at the full open of valve. K4 is adjusted to the position of 2, which is the lead full close position of valve. When it is initiated, the output represents the signal of passive contact position at full close position. In reality, it is adjusted according to the needs of control.

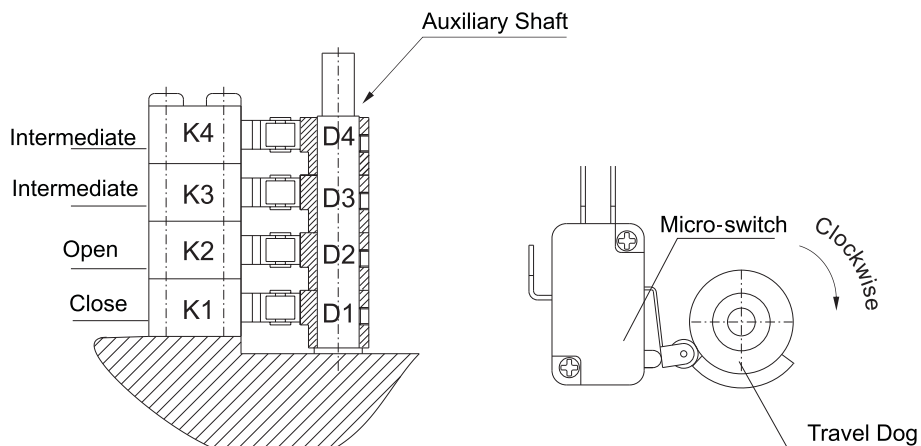


Fig. 6



## OVERALL ADJUSTMENT OF ELECTRIC VALVE

### 3. Adjustment of potentiometer (Fig. 7) Suitable for Type C and Type D

- ① Drive the actuator to the intermediate position by crank, making the indicator indicating 50% of the scale.
- ② Measure the resistance at the initial end and terminal end of the potentiometer by means of universal meter (Resistance between pin 1 and pin 3 of the potentiometer), refer to Fig. 7. Write down the R value (If no special requirement, the factory had set it to  $1k\ \Omega \pm 15\%$ ).
- ③ Apply appropriate force to the potentiometer mounting plate, making the gear for opening being disengaged from the gear of potentiometer.
- ④ Connect the universal meter, one end to the moving arm of the potentiometer (Pin 2) and another end to any pin of the potentiometer. Slowly turn the gear of potentiometer and observe the reading of the universal meter. When the resistance is  $R/2 \pm 2\ \Omega$ , stop the adjustment and cancel the force on the mounting plate, making the gear for opening be engaged with the gear of potentiometer.

**Special hints: The potentiometer and gear for type E is not allowed to be adjusted.**

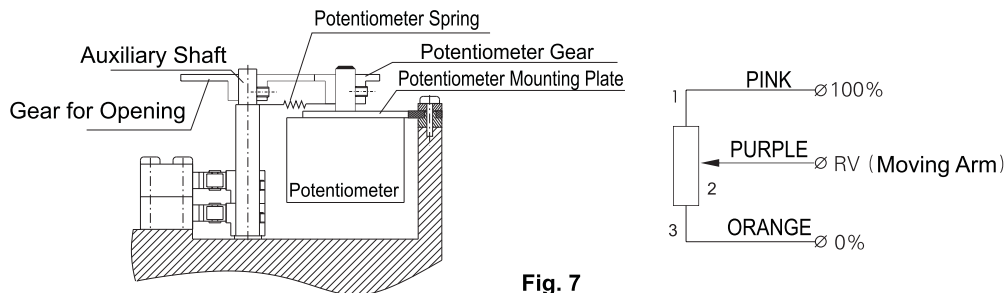


Fig. 7

### 4. Adjustment of Mechanical Limit Stopper (Fig. 8, 9)

- ① Drive the valve to the Full Close Position by crank and make the Full Close Position Limit-switch move (When the Limit Switch moves, you can hear a sound of “click” ).
- ② Loose the lock nut on the right side and turn clockwise the adjusting screw for closing limit-switch by means of hex socket wrench and make the adjusting screw to contact with the mechanical stopper, and then turn back the adjusting screw anti-clockwise by half of ring, make the Mechanical Limit-switch at the Full Close Position be delayed with  $2.5^\circ$  angle distance to the Electric Limit-switch and then fasten the lock nut.

- ③ Use the same method to make the adjustment of Full Open Position Mechanical Limit-switch (on left side).

**Special Hints: After adjustment, you have to make the travel of actuator, electric limit-switch, mechanical limit-switch meet the requirements of Fig. 9. During the operation, if the mechanical limit-switch is leading or coincident with the electric limit-switch, the turning of motor would be blocked and the motor would have the danger of being burnt out or over-heated!**

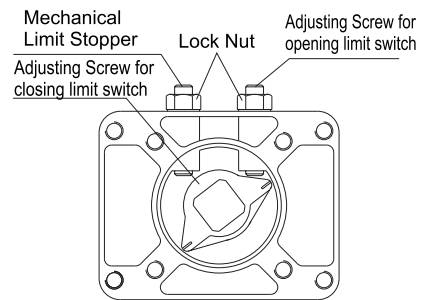


Fig.8

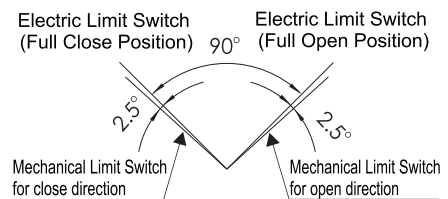


Fig. 9

### 5. Electric Test-run

- ① Make correct wiring according to the control circuit drawing adhered inside the cover for Junction Box. After confirming, switch on the power supply.
- ② The switch is turned to CLOSE; execute the operation of mechanical driving of valve to close position (clockwise) till the closing of the limit-switch (K1) being actuated. The electric actuator will stop turning.
- ③ The switch is turned to OPEN; the actuator drives the valve to the operation of full open position (anti-clockwise) till the opening of the limit-switch (K2) being actuated. The electric actuator will stop turning.
- ④ After the adjustment mentioned above, if the indication status of opening indicator is not in conformity with the real position, loose fixing screw at the center of scale plate, re-adjust the position of the scale plate till the indication of valve being correct.

## ADJUSTMENT METHOD OF ADJUSTING TYPE (TYPE E) ACTUATOR

- 1、 Install correctly the electric actuator on the body of valve according to the instruction of 《INSTALLATION OF ELECTRIC ACTUATOR ONTO VALVE》 , make sure the operation is in normal condition by means of manual operation.
- 2、 Refer to the adjustment requirements of 《OVERALL ADJUSTMENT OF ELECTRIC VALVE》 , adjust correctly the "Zero" position (4mA position, the corresponding valve at Full Close Position), "Electric Limit Switch" (CLS for close limit, OLS for open limit) and mechanical limit switch to meet the requirement of Fig. 10.

### Special Hints:

- ① In order to ensure the actuator to realize the control valve at full opening and full closing position according to the control signals, and the two electric limit switches not functioning when at the Full position and Zero position, the actuator is set to 90° between Full position and Zero position at the factory before ex-works (the acting position of the two limit switches has 1~1.5 distance to the Zero position or Full position). In case the control signal or the servo controller is abnormal, the limit-switch will switch off the power to realize the electric protection. Only when the electric limit-switch is out of work, can the protection of mechanical limit switch put into functioning;
- ② User is not allowed to adjust the potentiometer and the gear as the potentiometer in all adjusting type of FLUCON electric actuator (type E) has been considered during the adjustment with the deviation of working area of potentiometer due to the possible changes of position of limit switch.
- ③ During normal operation, the electric limit switch will not put into operation.

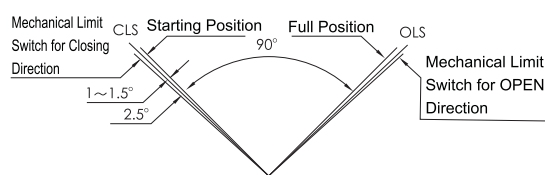


Fig. 10

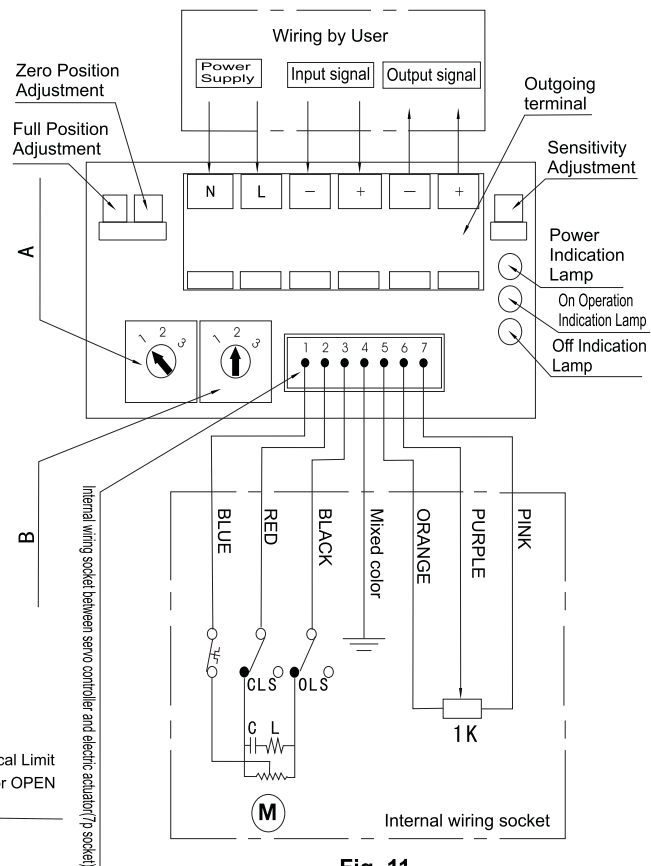


Fig. 11

- 3、 Connect the power and signals correctly according to the indications on the Servo Controller panel (Fig11). When the power indication lamp (green light) lights, it is possible to conduct all adjustment of servo controller. (Refer to the instructions of adjustment for Servo-controller on page 16)

### 4、 Test-Run

Check the working conditions of valve and servo controller by changing the input current values successively according to the table below:

Item to be checked \ Input signal	4mA	8mA	12mA	16mA	20mA
Pointer Position	Shut	2.5	5	7.5	OPEN
Valve Status	Full Close	25%opening	50%opening	75%opening	Full Open
Feedback current	4mA	8mA	12mA	16mA	20mA

Note: ● The servo controller is set to forward function mode before ex-works: The pointer will stop at the present position with interruption of signal. 4mA is corresponding to Full Close; 20mA is corresponding to Full Open.

- The accuracy of the servo controller is 1" class, The allowance is less than  $\pm 1\%$ .



## ADJUSTMENT METHOD OF ADJUSTING TYPE (TYPE E) ACTUATOR

Adjustment	Function	Operation method	Remarks
Status indication (LED)	When power is on, the power indication lamp lights. When opening, the open indication lamp lights. When closing, the close indication lamp lights.		The power indication lamp is in green; The opening indication lamp and closing indication lamp are in red.
Adjustment of Full position and Starting position (Multi-coil potentiometer)	Adjustable range for Starting position: 0%~50% of whole range; Adjustable range for full position: 60%~100% of whole range.	Input 4mA signal (forward function), adjust the potentiometer for starting to make the electric actuator to the difficult but necessary exact starting position; Input 20mA signal (forward function) adjust the potentiometer for Full to make the electric actuator to the difficult but necessary exact Full position.	<b>Adjustment status:</b> <b>A=1、B=2</b> <b>(Set at the factory)</b>
Action model select switch (A)	It is possible to make the electric actuator acted according to the forward function mode or backward function mode by means of the operation of action model select switch.	A=1: The electric actuator is acting at forward function ; A=2: Manual operation status (equivalent to signal interruption); A=3: The electric actuator is acting at backward function.	Forward function mode: 4mA is corresponding to full close position. (0% opening) 20mA is corresponding to full open position. (100% opening) Backward function mode: 4mA is corresponding to full open position. (100% opening) 20mA is corresponding to full close position. (0% opening) <b>Before ex-works, A is set to "1" which is forward function mode.</b>
Interruption model select switch (B)	When the control signal is interrupted or less than 2.5mA, it is convinced as it is at the "signal interruption" status. At this time, the Servo controller can set the electric actuator at full open or full close or keeping the present position according to the presetting.	B=1: When at the " signal in terruption" status, the electric actuator is at full open position (OPEN) ; B=2: When at the " signal in terruption" status, the electric actuator keeps the present position; B=3: When at the " signal in terruption" status, the electric actuator is at full close position (SHUT) .	When A=2 (signal interruption) , associated with select switch B, it is possible to have electric actuator electrically operated. <b>At ex-works, B is set to "2" , which means when at "signal interruption" status, the valve position will be kept at present position.</b>
Electric operation	It is possible to have the electric actuator manually operated by means of joint application of A and B select switches.	Set A to "2" ( at this time signal is in terruption) , after that: Set B to "1" , the electric a ctuator can be operated to full open, after it being po sitioned, set B to "2" ; When set B to "3" ,the electric actuator can be operated to full close, after it being positioned, set B to "2" ;	After electric operation, it is necessary first to set B to the correct position, and then set A to the correct position.
Adjustment of sensitivity (Potentiometer)	Adjustment range of sensitivity:0.4%~1.5%. adjustableMax.: 0.4% (1/250) Min.: 1.5% (1/67).	Adjust clockwise: Sensitivity increased Adjust anticlockwise: Sensitivity decreased.	<b>At the ex-works, the sensitivity is set to 0.67%, which is 1/150.</b>
Output signa	This type of servo controller can output the feed back signal of valve position by automaticallyfollowing the control signal with an error ≤ 1%.	User no need to adjust.	The User can have the output signal type made to order. We can provide 4~20mA、1~5V, etc. <b>Ex-works: 4~20mA</b>



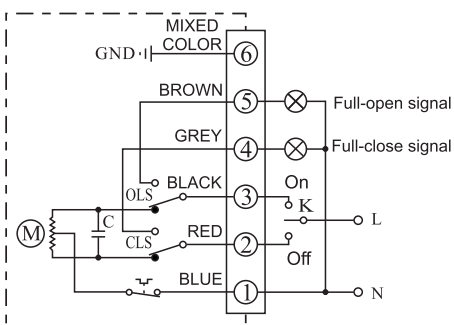
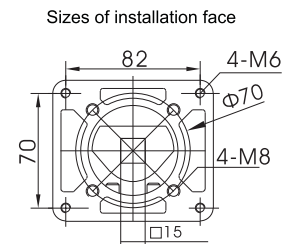
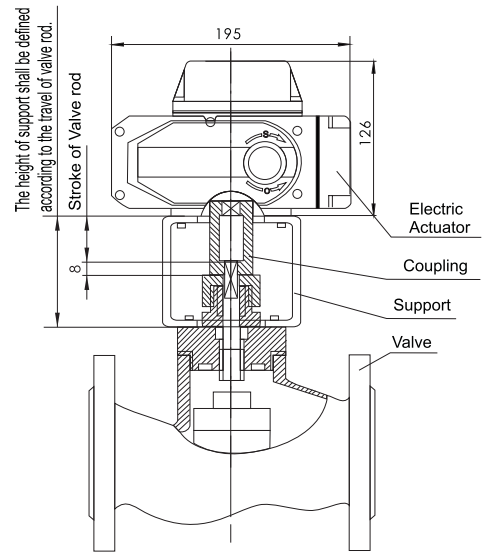
## OVERALL DIMENSIONS AND PERFORMANCE PARAMETERS of SMART MULTI-TURN SERIES of M02/M05/M10

It is mainly applied to stop valve, diaphragm valve and gate valve, etc..  
It fills vacancy of domestic multi-turn electric actuator with its exquisite in design and outstanding in quality.

- Small in volume, light in weight and graceful in shape;
- Free maintenance, easy installation and small space occupation;
- Suitable for harsh working conditions, especially for the driving of ship valve.

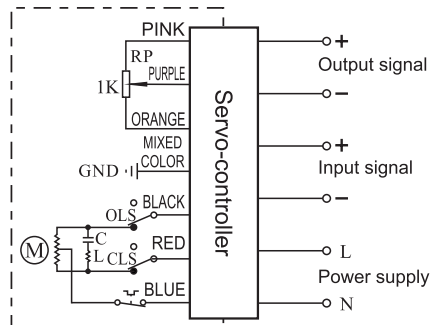


Type	SMART M	SMART M	SMART M
Parameters Performance	AC110V、AC220V		
Motor Power	25W		
Rated Current	AC110V: 0.57A、AC220V: 0.35A		
Number of Turns	0~16 Turns		
Turning Speed	15r / min	4r / min	2r / min
Output Torque	15Nm	50Nm	80Nm
Available Control Circuit	Types of A, E, F		
Total Weight (Kg)	3.0kg		
Insulation Resistance (MΩ)	100 MΩ / 500VDC		
Voltage-withstand Class	1500VAC, 1 Minute		
Protection Class	IP67		
Installation Angle	360°, at any angle		
Electric Interface	Two G1/2 Water-proof Cable Connectors, one for power line and one for signal line.		
Ambient Temperature	-30°C ~ +60°C		



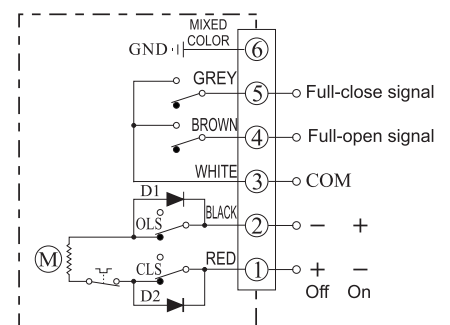
The opening or closing operation is realized by switching "on" or "off" the circuit, outputting a group of full open or close active signal

**Type A**



Input: 4~20mA DC or 1~5VDC;  
Output: 4~20mA DC

**Type E**



To output Valve signal of 4~20mADC  
(Whole Range Feedback for Valve)

**Type F**



## OPERATION AND MAINTENANCE

### 1. Maintenance and service

- ① Since the molybdenum-base grease with long service life and good pressure resistance is employed, no lubrication and periodical maintenance are needed.
- ② If the operation of valve is rare, periodically driving the actuator is necessary and check if there is any abnormal condition.

### 2. Trouble shooting

Problem	Cause	Remedy
Motor does not start	The power cord is not plugged in.	Plug in the power cord.
	Power line is disconnected or the connection between connector and terminals is loosen.	Connect the power line. Connect and fasten the terminal correctly.
	Voltage is not right or too low.	Check the voltage if it is normal.
	The overheat protection device is initiated. (The ambient temperature too high, or valve clogged)	Cool down the ambient temperature. Check the valve manually, see if it can be opened and closed normally.
	The micro-switch is not properly moving.	Replace the micro-switch.
	The capacitor is defective.	Contact the manufacturer and replace the capacitor.
	The diode for DC electric actuator is open circuited.	Contact the manufacturer and replace the diode.
Indication lamp for close/open does not work.	Bulb damaged.	Replace the lamp.
	The action of micro-switch is not proper.	Replace the micro-switch.
Motor could not stop running when reaching to the limit position	The action of limit-switch is not proper.	Replace the limit-switch.
	Phase order of 3-phase DC power is wrong connected.	Adjust the order of three-phase.
	Misconnect the limit-switch with the control circuit.	Adjust the connection.
	Mechanical limit makes lead action.	Re-adjust the mechanical limit according to adjustment instruction of mechanical limit stopper.
	The diode of DC electric actuator is short circuited.	Contact the manufacturer and replace the diode.
Actuator got water	Irregular cable or cable end at inlet side is not properly having sealing treatment according to the Manual Instruction.	Contact the manufacturer for repair.
	The glass len for electric elements is broken.	
	The fixing screws for the covers of electric elements, junction box and driving unit are not locked.	