GRAT®
Simple & Reliable

Ex

Explosion-proof Series
Electric Actuators

Instruction Manual

- Please read this instruction manual carefully before installation and use.
- Retain this manual for future reference.
- Ensure proper use of the product by thoroughly understanding the contents of this manual.

Special Instructions

1.Do not manually operate the electric actuator while it is powered on, as this may cause accidental physical harm to the operator.

2.Add a fuse to the electric actuator's power supply circuit as required by the instruction manual and select a compliant fuse element.

3.Check the product's power supply before use and connect it to the circuit correctly according to the product manual.

4.Do not drive two or more electric actuators in parallel under the same relay output. Otherwise, the interaction of nonlinear components such as internal capacitors and motor windings will cause abnormal electrical operation failure and motor overheating.

5.Select cable wires strictly as specified in the instruction manual. Never use cables with an outer diameter that does not meet the manual's requirements or replace them with other wires. Failure to comply may result in seal failure at the wire inlet, allowing external water or dirt to enter the product and damage the electric actuator.

6.You need not consider the thermal protection of this product during use. It is equipped with a memory-equipped overheat protection device. When the motor temperature exceeds 85°C, the device automatically cuts off the motor power supply; it resumes power supply when the temperature drops to approximately 80°C.

7.Wire and debug the servo controller correctly as required by the instruction manual to avoid man-made damage.

8.Installation and commissioning personnel must possess relevant operational qualifications.

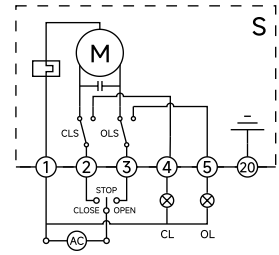
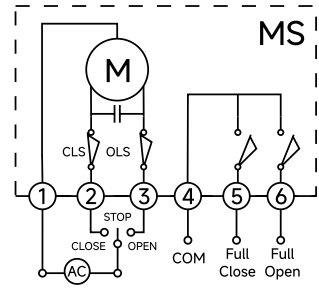
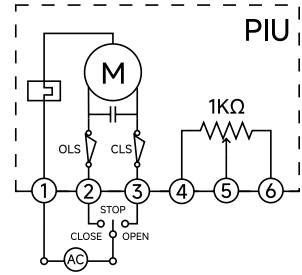
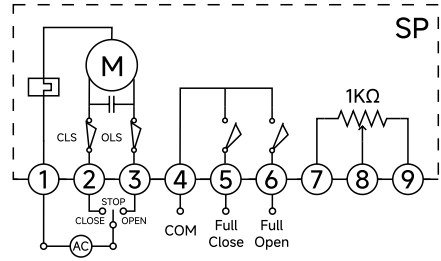
9.Select and use the electric actuator correctly and reasonably. Overloading will lead to fault losses and increased maintenance costs.

10.The manufacturer assumes no responsibility for any improper modification or repair of the actuator.

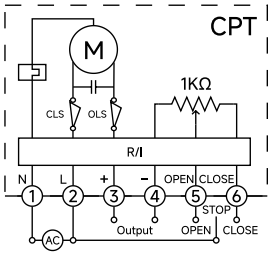
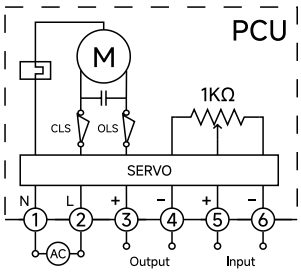
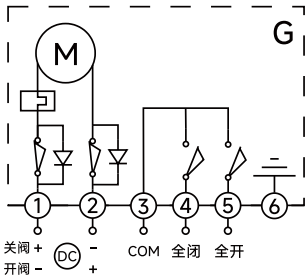
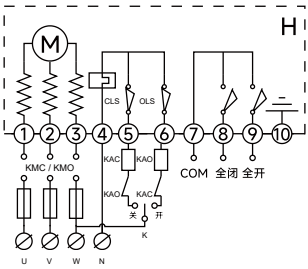
Contents

Operation & Debugging

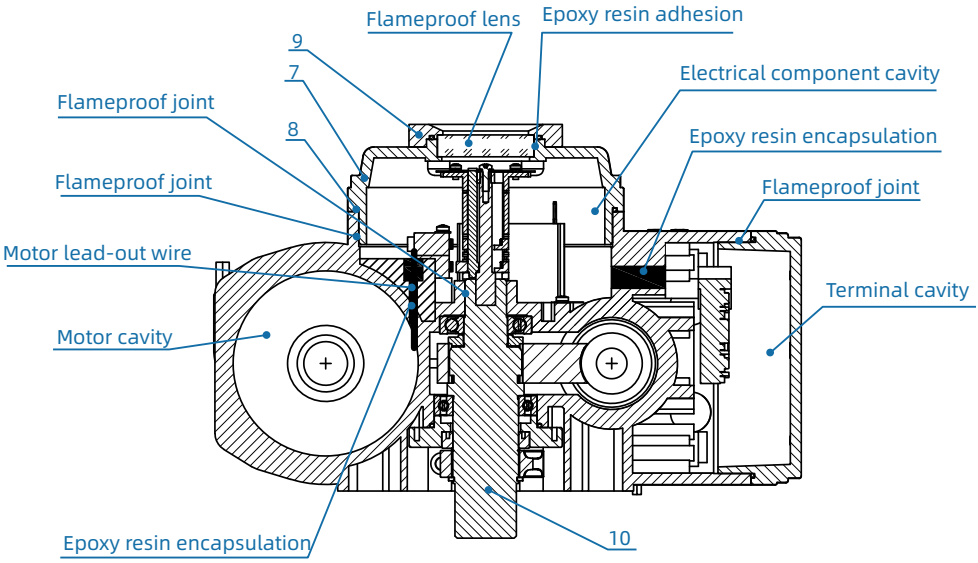
Electrical Wiring Diagram

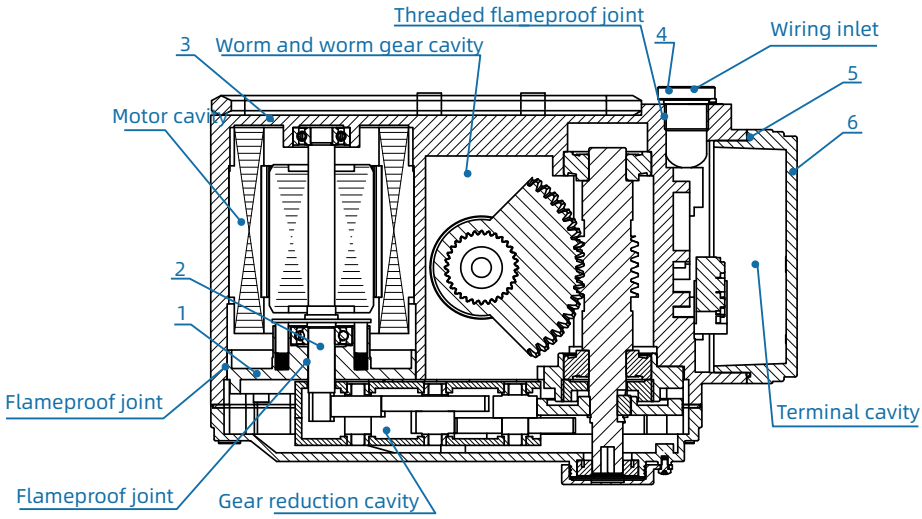
Control Circuit	Model Code	Circuit Diagram
Switching Action Mode: Switching operations (open/close) are achieved via AC switching signals, and a set of active position signals indicating fully open/fully closed status are output.	S	
Switching Action Mode: Outputs passive contact signals. Structure: Equipped with two intermediate position switches.	MS	
Switching Action Mode: Outputs 0~1000Ω feedback signal. Structure: Equipped with 500 Ω or 1kΩ potentiometer.	PIU	
Switching Action Mode: Controls valve opening angle via switching circuit, corresponding to potentiometer resistance value, while enabling intermediate position control function. Structure: Integrated with potentiometer and intermediate position switch.	SP	

Electrical Wiring Diagram

Switching Action Mode: Outputs 4~20mA valve position feedback signal. Structure: Equipped with 1kΩ potentiometer and R/I converter.	CPT	
Regulating Action Mode: Accepts 4~20mA control signal input and outputs 4~20mA valve position feedback signal. Structure: Integrated with 1kΩ potentiometer and control module (servo amplifier).	PCU	
DC switching signals are output from the circuit via an external AC power supply to control the opening/closing program, and a set of passive contact signals corresponding to fully open/fully closed positions are provided.	G	
Three-phase AC switching signals are output through an external three-phase power phase-reversing circuit to control opening/closing operations, accompanied by a set of passive contact signals for fully open/fully closed position indication.	H	

Explosion-proof Structural Drawing





Explosion-proof Components Detail List

Item No.	Designation	Quantity	Material	Item No.	Designation	Quantity	Material
1	Motor Cover	1	ADC12	6	Terminal Cover	1	ADC12
2	Motor Rotor Shaft	1	40Cr	7	Electrical Installation Cover	1	ADC12
3	Enclosure	1	ADC12	8	O-ring Seal	1	Nitrile Rubber (NBR)
4	Explosion-proof Plug	2	Nickel-plated Brass	9	Explosion-proof Lens Gland	1	304
5	O-ring Seal	1	Nitrile Rubber	10	Output Shaft	1	40Cr

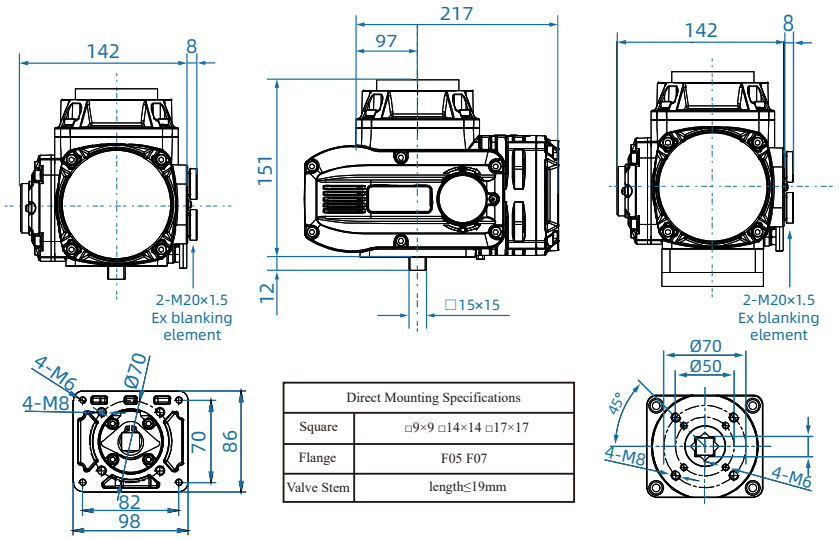
EA-Ex Explosion-proof Performance Parameters

Model		EA-50-Ex	EA-100-Ex	EA-200-Ex	EA-400-Ex	EA-600-Ex
Output Torque		50N·m	100N·m	200N·m	400N·m	600N·m
Recommended Compatible Valve Bodies	Ball Valve	DN15-40	DN50-65	DN65-80	DN100-125	DN125-150
	Butterfly Valve	DN32-50	DN50-125	DN150-200	DN200-250	DN300
Actuation Time		15S	30S	30S	30S	45S
Rotation Angle		0~90°	0~90°	0~90°	0~90°	0~90°
Motor Power	AC24V	10W	25W			
	AC110V	10W	25W	40W	90W	90W
	AC220V	10W	25W	40W	90W	90W
	AC380V	6W	15W	30W	40W	40W
	DC24V	13W	25W	40W	70W□	70W
Rated Current	AC24V	1.5A	2.12A			
	AC110V	0.24A	0.57A	0.63A	1.12A	1.18A
	AC220V	0.15A	0.30A	0.35A	0.64A	0.67A
	AC380V	0.07A	0.10A	0.19A	0.29A	0.29A
	DC24V	1.28A	2.03A	3.12A	7.8A	8.0A
Total Machine Weight		4.5Kg	5.0Kg	9.0Kg	9.5Kg	10.0Kg
Insulation Resistance		≥50MΩ at 500VDC				
Withstand Voltage Rating		DC24V: 500V for 1 min AC110V: 1000V for 1 min AC220V: 1500V for 1 min AC380V: 2000V for 1 min				
Ingress Protection (IP)		IP67				
Explosion Protection Rating		Ex db IIC T6 Gb				
Installation Orientation		360° Adjustable				
Electrical Interface		2-M20x1.5 explosion-proof plugs: Users shall install corresponding explosion-proof cable glands according to the selected cables.				
Control Circuit		Type S / MS / PIU / SP / PCU / CPT / G / H				
Optional Functions		◆Dehumidifying Heater ◆Passive Contact Switch ◆Over-torque Protection ◆Field Protection Unit				
Testing Standard		JB/T8219-2016, GB/T 3836.1-2021, GB/T 3836.2-2021				

Explosion-proof Dimension Drawing

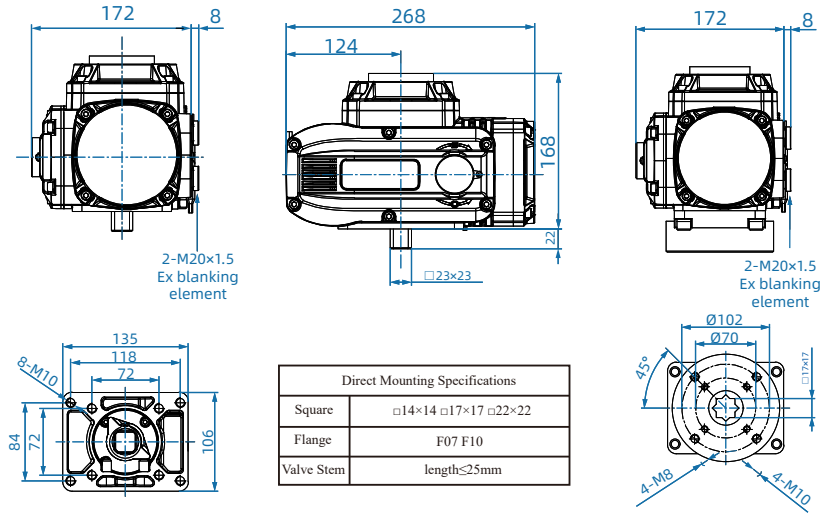
EA-50/100-Ex Explosion-proof Series Outline Dimensions

Standard Type | **Direct Mounting Type**



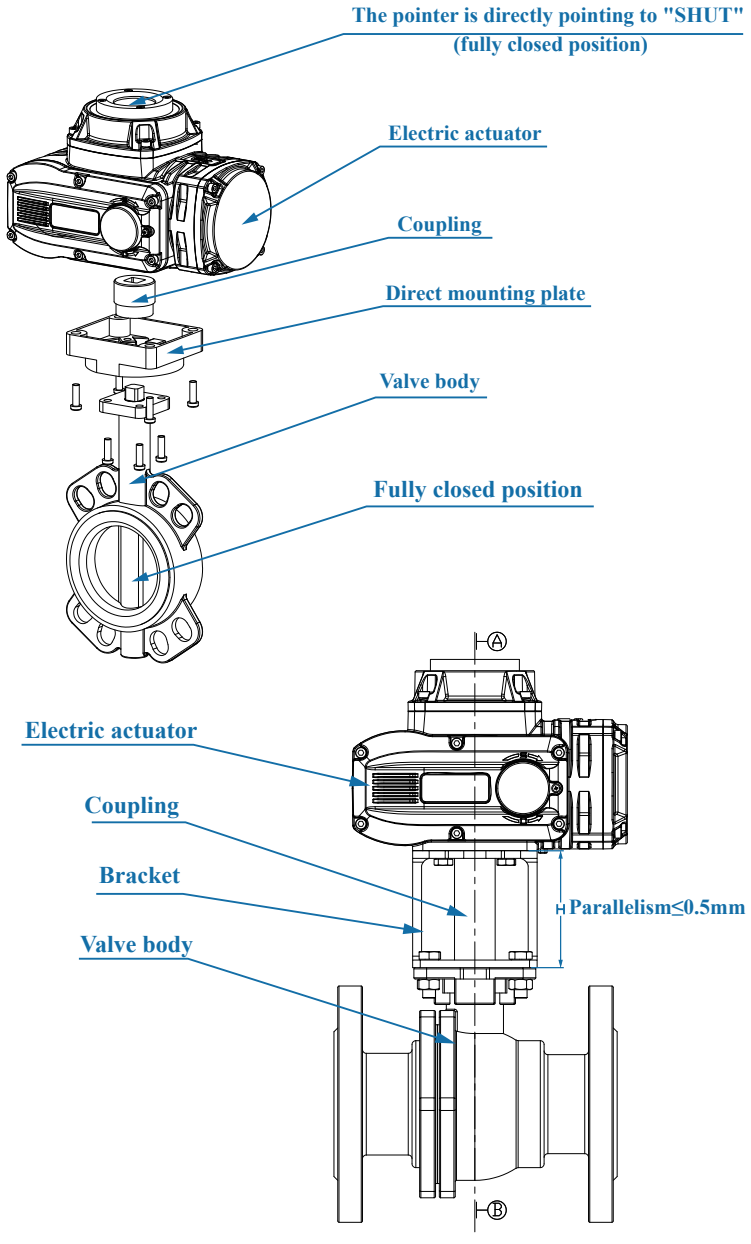
Direct Mounting Specifications	
Square	□9×9 □14×14 □17×17
Flange	F05 F07
Valve Stem	length≤19mm

EA-200/400/600-Ex Explosion-proof Series Outline Dimensions



Direct Mounting Specifications	
Square	□14×14 □17×17 □22×22
Flange	F07 F10
Valve Stem	length≤25mm

Explosion-proof Assembly Drawing



Installation of Electric Actuator and Valve Body

1.Manually operate the valve (or use tools to do so) to check for abnormalities. Ensure the valve is in the fully closed position.

2.Mount the bracket onto the valve.

3.Slide one end of the coupling over the valve stem.

4.Drive the electric actuator to the fully closed position (either electrically or manually) until the pointer aligns with the "●" mark (0% opening), then insert the output shaft into the square hole of the coupling.

5.Tighten the connecting bolts between the bracket, electric actuator, and valve body.

6.Use the handle to operate the actuator. Confirm smooth operation without eccentricity or misalignment. Check that the valve can fully open and close within the stroke indicated by the actuator's position gauge.

Note: When using the handle, avoid excessive force. Overexertion may cause the actuator to overtravel and result in damage.

Special Reminders:

For users providing their own brackets and couplings:

● Have professional mechanical technicians design and fabricate the brackets and couplings, ensuring compliance with the dimensions specified in the diagram.

● Ensure the machining accuracy of the shaft holes at both ends of the coupling to minimize transmission clearance, preventing excessive backlash during valve operation.

● Strictly maintain the positional accuracy of the shaft holes at both ends of the coupling. Failure to do so may push the actuator beyond its designed operating range, making stroke adjustments impossible and causing valve malfunction.

● Consider the impact of medium temperature in the pipeline on the electric actuator when designing the bracket:

For medium temperatures below 60°C, set the bracket height (H) to the minimum required for proper installation.

For medium temperatures above 60°C, increase the bracket height to 1.6–2.2 times H.

Product Usage Requirements

Installation Environment Requirements

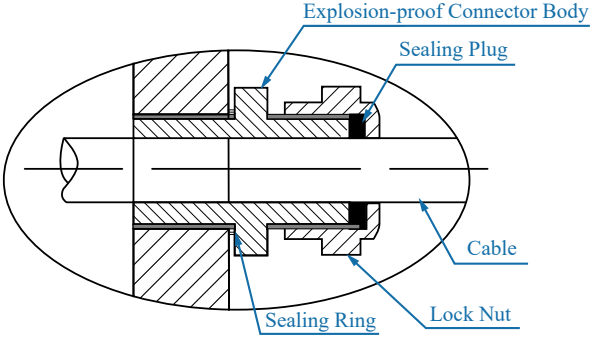
● This product can be installed both indoors and outdoors.

● Ensure the type and group of explosive media around the installation site match the explosion-proof media allowed for this product.

● In environments with long-term exposure to rain, splashes of raw materials, or direct sunlight, install protective devices to shield the entire electric actuator.

● Reserve space for wiring, manual operation, and other installation and maintenance work.

● Ambient temperature must range from -20°C to 40°C.



Inlet Requirements

● The wiring cavity has two explosion-proof plugs at the cable inlet. When wiring, remove one or both plugs as needed, and install explosion-proof joints compatible with the incoming cables. The diameter of incoming cables must be ≤14mm.

● Run power cables and signal cables through separate explosion-proof joints into the electric actuator. Ensure proper grounding; signal cables should use shielded wires in principle.

Wiring Methods

● Remove the explosion-proof plugs, install explosion-proof joints matching the incoming cables, and tighten them.

● As shown in the diagram, unscrew the locking nut of the explosion-proof joint. Thread the incoming cable through the locking nut, sealing plug, and explosion-proof joint body into the electric actuator.

● Wire according to the control circuit diagram.

● Tighten the locking nut to expand the outer diameter of the sealing plug and shrink its inner hole, ensuring effective sealing.

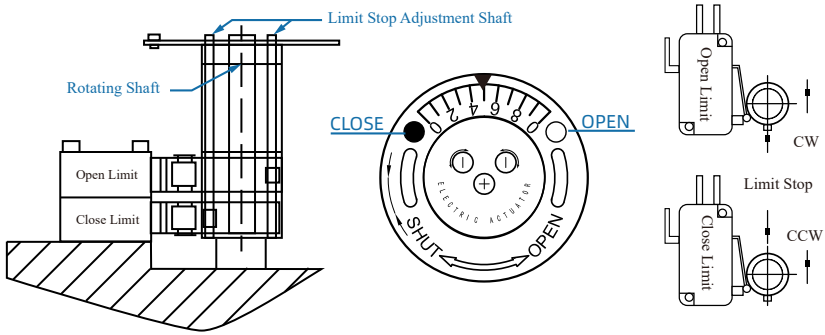
● The outer diameter of the incoming cable must match the inner hole diameter of the explosion-proof joint. Never use single wires that do not meet explosion-proof requirements.

● Ensure proper grounding of both the actuator's interior and housing.

● This manual describes one type of explosion-proof cable joint. Users may select other explosion-proof cables, joints, and wiring methods that meet explosion-proof standards as needed.

Product Commissioning

Adjustment Method for Limit Position Switches (Electrical Protection)



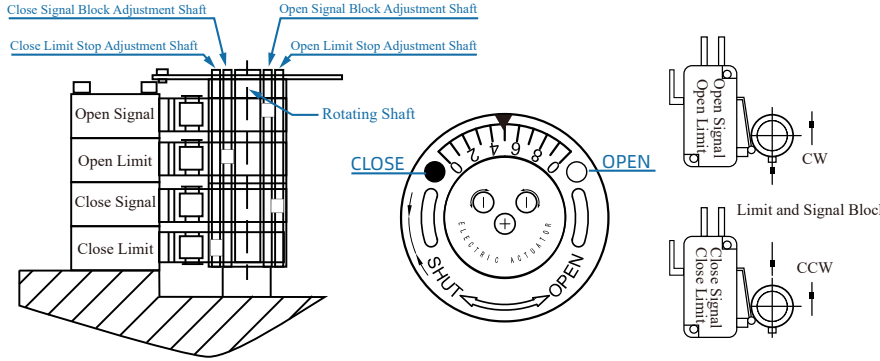
● The lower switch serves as the closed limit position switch; the upper switch serves as the open limit position switch.

● Manually move the valve to the fully closed position.

● Use a small flat-blade screwdriver to rotate the limit stop adjustment shaft, driving the limit stop until the travel switch activates.

● Adjust the fully open position using the same method as above.

Adjustment for Intermediate Position Signal Switch



● Adjust the limit switches for the fully closed and fully open positions as described in step 1.

● The actuation position of the intermediate position signal switch must be at least 2° ahead of the actuation positions of the limit switches.

Adjust it using the same method as for the limit switches.

Potentiometer Adjustment

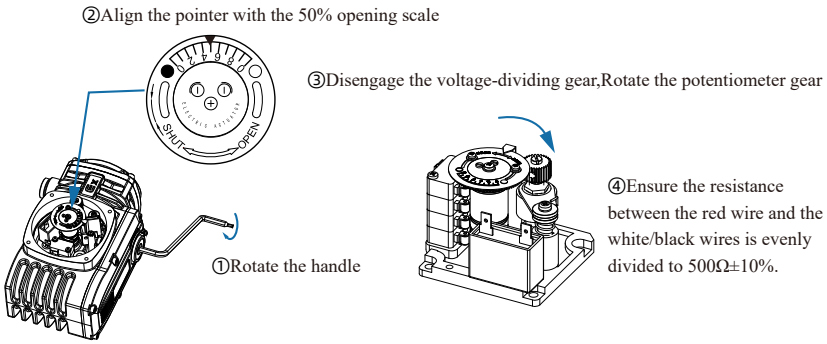
(The actuator is pre-calibrated at the factory. Potentiometer adjustment is generally unnecessary. Standard resistance value: 1KΩ. Optional values: 135Ω/5KΩ)

●Use the manual handle to position the valve at the 50% scale mark.

●Disengage the voltage-dividing gear. Rotate the potentiometer gear while measuring resistance between:

Red lead and black lead: 500Ω±10%

Red lead and white lead: 500Ω±10%



Mechanical Stop Adjustment

●On-off type

① Use the handle to rotate to the fully open position as shown in the diagram.

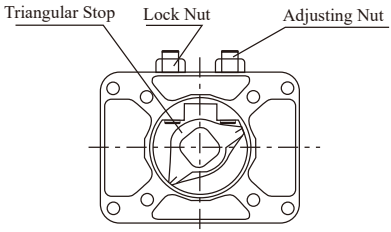
② Loosen the lock nut, bring the adjusting screw into contact with the stopper, then rotate it back half a turn and tighten the lock nut.

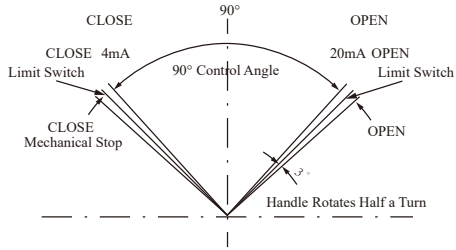
③ Adjust the closing direction using the same method.

●Regulating type

① Adjust the mechanical stopper as shown in the diagram: starting from the fully open position, use the handle to rotate half a turn until the full-open limit switch activates; rotate another half turn, loosen the lock nut, tighten the adjusting screw until it touches the stopper, then secure the lock nut.

② Adjust the fully closed position in the opposite direction using the same method.





Motor Operation

Before electric operation, manually check that the positions (fully open, fully closed) indicated on the scale plate match those of the valve.

Verify correct wiring. You must use an external changeover switch to determine the opening and closing actions.

After confirming the above conditions, start the electric operation.

Product Usage Requirements

Maintenance and Lubrication

The transmission parts use high-grade molybdenum-based grease with long service life and excellent pressure resistance, so you need not perform inspections or add lubricant.

If the valve remains unused for a long time or operates rarely, drive the actuator regularly to check for abnormalities.

Troubleshooting and Countermeasures

Fault Symptom	Cause	Countermeasure
Motor fails to start	Power supply not connected	Reconnect the power supply properly
	Open circuit, loose connection or terminal	Repair open circuit, correctly connect and tighten terminal blocks
	Incorrect supply voltage or low voltage	Check whether the voltage is normal
	Overheat protector activated (high ambient temperature, valve stuck)	Reduce ambient temperature and manually check if the valve opens normally
	Defective start/run capacitor	Contact the manufacturer for capacitor replacement
Open/close indicator light not working	Bulb failure	Replace the bulb
	Faulty limit switch	Replace the limit switch
	Improper adjustment of mechanical travel stop	Readjust the mechanical limit stops
Motor fails to stop at limit position	Malfunctioning micro switch	Replace the micro switch
	Reversed polarity for DC24V, reversed phase sequence for AC380V main power	Adjust the polarity of DC power supply or the phase sequence of three-phase power
	Incorrect connection of limit switch to control circuit	Adjust the wiring

Operation & Debugging

TEL： +86-27-60706976
+86-27-60706977
Email： info@gratcv.com
Web： https://www.gratcv.com
CO.Addr:No. 62, Guanggu Avenue,Wuhan ,Hubei ,China.
Fty.Addr:B8-3-2, OVU, Wuhan , Hubei ,China.

official website