

SE Series

Explosion-Proof

Spring Return Fail-safe

Electric Valve Actuator

Operation Manual

Service Unique Nice Youthful Energy Honesty

SUN YEH



SUN YEH ELECTRICAL IND. CO., LTD.

SY08-C001F-EN

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1. General Information

⚠ Failure to follow safety instructions may cause serious injury, equipment damage, or voided warranty.

1.1 Safety Instructions

- Installation, maintenance and repair works must be performed by trained personnel.
- The handling shall follow the safety and warning instruction contained in this manual.
- The user should read and follow instruction contained in this operation manual included with the product. Failure to do this may result in damages and void warranty. Sun Yeh will not be liable for damages caused by operator negligence or misuse.
- Local health and safety legislation shall be complied with.
- In a few cases, the surface temperature may exceed 60 °C (140 °F). Please check the surface temperature before operation, using an appropriate thermometer and wearing protective gloves before operation.

1.2 Installation Notices

⚠ Operating by handwheel: Do not use any tools to increase force on handwheel for operating as this can damage the actuator or valve.

1.2.1 Gernal

- The standard spring return actuator rotates counter-clockwise with power (spring compressed) and rotates clockwise with spring released (fully-closed or fully-open) when power outage.
- DO NOT install in ambient temperatures that exceed 70 °C (158 °F).
- DO NOT, under any circumstances, remove the cover of the actuator while in a hazardous location when the power is still live inside the actuator. This could cause ignition of a hazardous atmosphere.
- DO NOT, under any circumstances, use an explosion-proof electric actuator in a hazardous location that does not meet the specification which the actuator was designed for.
- Mount, test, and calibrate actuators in non-hazardous location.
- When removing the actuator, care must be taken not to scratch, scar or deform the flame path of the cover or base of the actuator. That will negate the protection rating of the enclosure in a hazardous location.
- The explosion-proof electric actuator is shipped with mating surfaces of the cover and

base. When assembling them, pay attention to the mating number (QA code) to assure the protection rating in a hazardous location.

- Please read operation manual and wiring diagram carefully before installation.
- Verify that supply voltage is in accordance with the data on nameplate to prevent short circuit or electrical/electronic parts damage caused by incorrect power input.
- Turn power off before wiring or maintenance.
- There are grounding devices both inside and outside of the actuator and the ground wires should be connected properly.
- The metal plugs in conduit entries are for transit only. For long term protection fit suitable flameproof cable gland and power cable should be with a minimum withstand temperature 105 °C (221°F). Please refer to 1.2.3 (P.3).
- To avoid functional failure caused by static, do not touch any components on the PCB with metal tools or bare hands.
- Do not parallel wire multiple actuators together without using an extra relay.
- Use proper techniques when installing conduit and properly seal the connection. Do not mount the actuator with conduit entries in upright position to prevent condensation from entering the unit.
- After manual operation, the actuator shall be returned to its spring released position by handwheel before electrical operation of the actuator.
- Actuator should be installed in an upright or horizontal position. Do not mount upside down or below a horizontal position.
- Periodically inspect actuator enclosure to prevent dust from accumulating.
- Perform below inspections prior to installation. Not allowed to adopt if any item is unqualified.
 - ✓ Check the marking and certificate number to see if it conforms to the indicated application.
 - ✓ All the parts of the housing are assembled in the right manner and fastened.
⚠ USE FASTENERS WITH YIELD STRESS ≥ 700MPa.
 - ✓ All the explosion-proof parts should be made without cracks or functional defects.

1.2.2 CSA Certification Considerations

- KEEP COVER TIGHT WHILE CIRCUITS ARE ALIVE.
⚠ AFTER DE-ENERGIZING, DELAY 10 MINUTES BEFORE OPENING THE COVER.
- SEAL REQUIRED WITHIN 18 INCHES (450 mm) OF ENCLOSURE (for Divisions only).
- SEAL REQUIRED WITHIN 2 INCHES (50 mm) OF ENCLOSURE (for Zones only).

1.2.3 Cable Glands

⚠ Please select the relatively explosion-proof cable connector according to the product specifications.

● ATEX / IECEEx / TS Certification :

- ✓ The actuator is delivered with two conduit entries plugged by metal plugs. Use cable glands with ATEX / IECEEx / TS certification and in accordance with the technical characteristics required by Ex db IIB Gb, Ex tb IIIC Db. The electrical supply cable must be suitable for power rating and with a minimum withstand temperature 105 °C (221 °F).

● CNEx / CCC Certification :

- ✓ The actuator is delivered with two conduit entries plugged by metal plugs. Use cable glands with CNEx certification and in accordance with the technical characteristics required by CNEx Ex db IIB Gb, Ex tD A21 IP68. The electrical supply cable must be suitable for power rating and with a minimum withstand temperature 105 °C (221 °F).

● CSA Certification :

- ✓ The actuator is delivered with two conduit entries plugged by metal plugs. Use cable glands with CSA certification. The electrical supply cable must be suitable for power rating and with a minimum withstand temperature 105 °C (221 °F).

1.3 Working Conditions

- **ATEX / IECEx / CNEx / CCC / TS Certification :**
 - ✓ Atmospheric pressure : 80 - 110 kPa.
 - ✓ Ambient temperature : - 30 °C to + 70 °C (- 22 °F to + 158 °F).
 - ✓ Relative humidity : Not more than 95 % (+ 25 °C / 77 °F).
 - ✓ The actuator can operate normally within tolerated variation of ± 10% of rated supply voltage or ± 1% of rated frequency.
- **CSA Certification :**
 - ✓ Atmospheric pressure : 80 - 106 kPa.
 - ✓ Ambient temperature : -30 °C to +70 °C (-22 °F to +158 °F).
 - ✓ Air with normal oxygen content : 21 % (Volume).

1.4 Standards

- ATEX European Hazardous Area : EN60079-0, EN60079-1, EN60079-31。

Directive	Group	Ambient Temperature
ATEX II 2 GD	Ex db IIB T4 Gb	- 30 °C to + 70 °C (- 22 °F to + 158 °F)
ATEX II 2 GD	Ex tb IIIC T130 °C Db	- 30 °C to + 70 °C (- 22 °F to + 158 °F)

- IECEx International Hazardous Area : IEC 60079-0, IEC 60079-1, IEC 60079-31。

Group	Ambient Temperature
Ex db IIB T4 Gb	- 30 °C to + 70 °C (- 22 °F to + 158 °F)
Ex tb IIIC T130 °C Db	- 30 °C to + 70 °C (- 22 °F to + 158 °F)

- North American Hazardous Area :

✓ Zone System :

CAN/CSA-C22.2 No. 0-10, CAN/CSA-C22.2 No. 60079-0, CAN/CSA-C22.2 No. 60079-1, CAN/CSA-C22.2 No. 60079-31, UL 60079-0, UL 60079-1, UL 60079-31

National Conformity	Class	Zone	Protection Method	Groups	T-Code	Ambient Temperature
AEx / Ex	I	1	db	IIB, IIA	T4	- 30 °C to + 70 °C (- 22 °F to + 158 °F)
AEx / Ex	II	21	tb	IIIC, IIIB, IIIA	T130°C	- 30 °C to + 70 °C (- 22 °F to + 158 °F)

✓ Division System :

CAN/CSA-C22.2 No. 0-10, CSA C22.2 No. 30-M1986, CSA C22.2 No. 25-17, FM 3600, FM 3615, FM 3616

Class	Division	Groups	T-Code	Ambient Temperature
I	1	C,D	T4	- 30 °C to + 70 °C (- 22 °F to + 158 °F)
II	1	E,F,G	T130°C	- 30 °C to + 70 °C (- 22 °F to + 158 °F)

- CNEx / CCC Certification : GB3836.1, GB3836.2, GB12476.1, GB12476.5

Group	Ambient Temperature
Ex d IIB T4 Gb	- 30 °C to + 70 °C (- 22 °F to + 158 °F)
Ex tD A21 IP68 T130°C	- 30 °C to + 70 °C (- 22 °F to + 158 °F)

- TS Certification : CNS3376-0, CNS3376-1, IEC 60079-0, IEC 60079-1, IEC 60079-31

Group	Ambient Temperature
Ex db IIB T4 Gb	- 30 °C to + 70 °C (- 22 °F to + 158 °F)
Ex tb IIIC T130°C Db	- 30 °C to + 70 °C (- 22 °F to + 158 °F)

1.5 Inspection , Storage , Transport

1.5.1 Receiving / Inspection

- Carefully inspect the package for any damages resulting from shipping and report all damages to the freight carrier and seller.
- After unpacking the product and information packet, please keep the cartons and any packing materials in case of product return or replacement. Verify that the items listed in packing slip or in bill of lading are the same as what were ordered. If there is any discrepancy, please contact the seller.
- Verify that the technical data on nameplate is in accordance with what was ordered.

1.5.2 Storage

- The actuator should be stored in a dry area with relative humidity of less than 90 % (20 ± 5 °C) and at temperature between -20 °C to + 40 °C (-4 °F to + 104 °F).
- The product shall be stored with suitable protection from corrosive substance that can damage the metal and insulating parts.
- The metal plugs for temporary protection should not be removed until the actuator is ready to be cabled. Use suitable flameproof cable glands to ensure IP rated protection when installing. Please refer to 1.2.3 (P.3).

1.5.3 Transport

- Attach ropes or hooks for the purpose of lifting by hoist only to housing and not to handwheel.
- Actuators packaged in cartons can stand up to land, sea, or air transportation.
- Packaged actuators shall avoid of violent impact and strong vibrations and be protected from rain or snow.

1.5.4 Lubrication

- The gear train has been sufficiently lubricated at the factory. No additional lubrication is required.

2. Product Overview

SE series explosion-proof spring return fail-safe actuators are structured as flame-proof and combustible dust-proof . SE series actuators offer torque ranges from 50 N·m to 260 N·m (445 in·lb to 2300 in·lb) and are designed for fail-safe positioning of valves or dampers upon loss of supply voltage, which include On/Off control, floating control and modulating control. A rack and pinion spring mechanism is used to position the controlled device to either fully OPEN or fully CLOSED position without any external power source. For On/Off type, a mechanical BUFFER is used at the end of the spring stroke to reduce the hammer-blow effects in pipes. A clutch-less manual override is optional to provide manual positioning of the controlled device.

- **ATEX / IECEEx / CNEx / TS Explosion-proof instructions :**



II2GD Ex db IIB T4 Gb, Ex tb IIIC T130°C Db

- ✓ SE series Explosion-proof Spring Return Fail-safe Electric Valve Actuator (referred as "actuator") is a control device for valves and can be used in the places, where is classified as Zone 1 or Zone 2, contained Group II A and Group II B gases, Zone 21 or Zone 22, contained the combustible dust atmosphere or the mixture circumstance with the explosive gas atmospheres and the combustible dust atmospheres. Temperature group T1 - T4.

➤ **Certificate Number :**

Sira14ATEX1307X

IECEEx SIR14.0109X

CNEx19.2909X (CCC : 2020312307000189)

(ITIR) 2018 No.07-00012X

- **CSA explosion-proof instructions :**

- ✓ **Division System** where is classified as North American Division 1 or Division 2 of hazardous location, contains Group C and Group D gases and temperature group T1 - T4; or contains one or several flammable dusts with minimum flaming point over 130 °C ; or include both above flammable gases and dusts.
- ✓ **Zone System** where is classified as North American Zone 1 or Zone 2 of hazardous location, contains Group II A and Group II B gases and temperature group T1 - T4 ; or in Zone 21 or Zone 22, contained one or several flammable dusts with the minimum flaming point over 130 °C ; or include both above flammable gases and dusts.

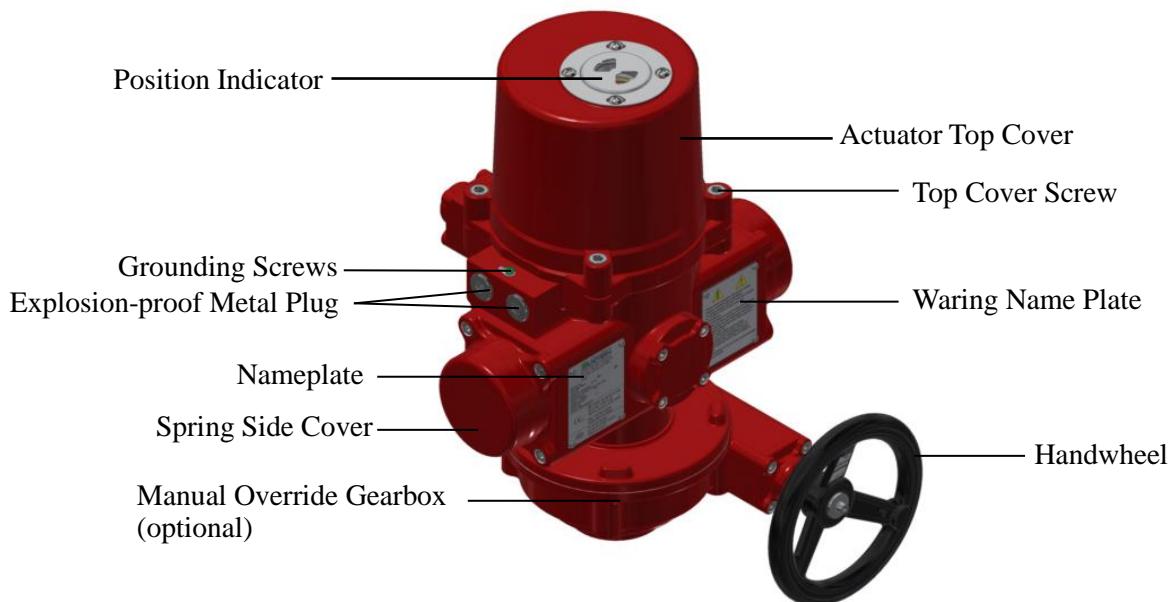
➤ **Certificate Number :** 70177249

2.1 Features

- Enclosure conforms to IP68 (7m / 72 hrs).
- Controls: On/Off, floating (optional), modulating (optional).
- Clutch-less manual override (optional).
- ISO 5211 mounting flange.
- Flatted position indicator.
- Built-in motor thermal protection

3. Product Mechanical Data

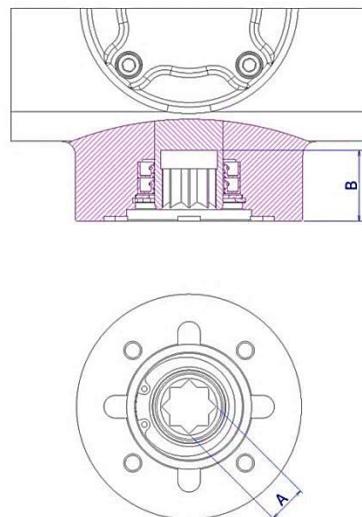
3.1 Parts Identification



3.2 Technical Information

Model	Torque		Motor Power Watt	Weight				
	N·m	in.lb		Standard		w/ Manual Override		
				kg	lb	kg	lb	
SE-500	50	445	50	28	62	38	84	
SE-1300	130	1150	130	59	130	76	168	
SE-2000	200	1770	130	97	214	137	302	
SE-2600	260	2300	130	97	214	137	302	

3.3 Mounting Base Details



Model	Mounting Flange	Shaft (A)		Depth of Shaft (B)	
	ISO 5211	mm	inch	mm	inch
SE-500	F07	17	0.669	30	1.181
SE-1300	F10	22	0.866	41	1.614
SE-2000	F12	27	1.063	45	1.772
SE-2600	F12	27	1.063	45	1.772

3.4 Actuator Selection

SE-①-②-③-④-⑤

① Type	② Voltage	③ Direction of Rotation	④ Control Mode	⑤ Manual Override
500	24 : 24VAC	CW : Fail Clockwise Spring Return.	T : On/Off. F : Floating. M : Modulating.	Y : With Manual Override. N : Without Manual Override.
1300	D24 : 24VDC	CCW : Fail Counter-Clockwise Spring Return.		
2000	120 : 110 - 120VAC1PH			
2600	220 : 220 - 240VAC1PH/3PH			
	380 : 380VAC 3PH			
	440 : 440VAC 3PH			

3.5 Sizing



**For safety reasons, do not remove or inspect the SPRING STRUCTURE.
Proper tools must be used, or serious injury will occur.**

The actuator shall be sized to ensure that its torque output meets the load requirements of valve. (As a MINIMUM, a 30% safety factor is suggested for the calculation of torque requirement).

- If the maximum torque of 5" valve is $80\text{ N}\cdot\text{m} \rightarrow 80 \times 1.3 = 104 \text{ N}\cdot\text{m}$
104 N·m < 130 N·m (SE-1300) →OK!
104 N·m > 50 N·m (SE-500) →Not OK!

3.6 Duty Cycle – IEC

- The duty cycle is the relationship between the running time and resting time. It is calculated as below:

$$\text{Duty Cycle} = \frac{\text{Running Time (Sec)}}{\text{Running Time (Sec)} + \text{Rest Time (Sec)}} \times 100 \%$$

→ Rest Time (Sec) = $\frac{\text{Running Time (Sec)} \times (1 - \text{Duty Cycle})}{\text{Duty Cycle}}$

- If the motor running time is 10 sec, spring return time is 5 sec, 50% duty cycle, the rest (off) time shall be calculated as below:

✓ Running time: $[10 \text{ sec} \times (1 - 50\%)] / 50\% = 10$, rest time is 10 sec.

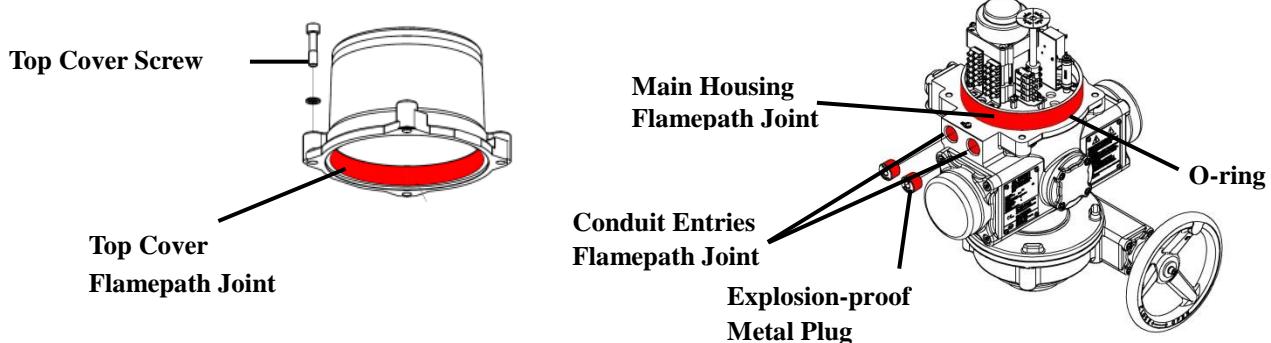
✓ Spring return time : $[5 \text{ sec} \times (1 - 50\%)] / 50\% = 5$, rest time is 5 sec.

 **One cycle consists of open-rest-close-rest.**

 **A rest time is required after spring returned because the gear train and motor are driven during spring release.**

3.7 Flamepath Joint

- ⚠ During cover removal and conduit entry removal, ensure that surfaces are free from scratches or scrapes.**
- ⚠ Actuator installation and maintenance must be performed by trained personnel.**



Cover Removal

Remove the conduit entry metal plugs to relieve the pressure inside the actuator for the ease of the top cover removal and gently remove the cover. DO NOT attempt to remove the top cover with a screwdriver as it will damage the surfaces.

Cover Installation

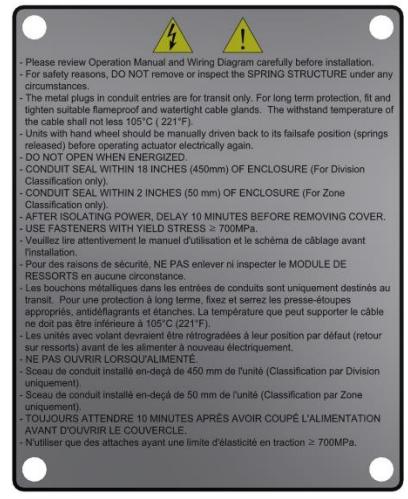
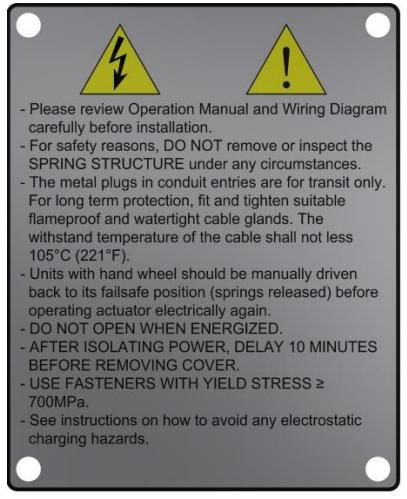
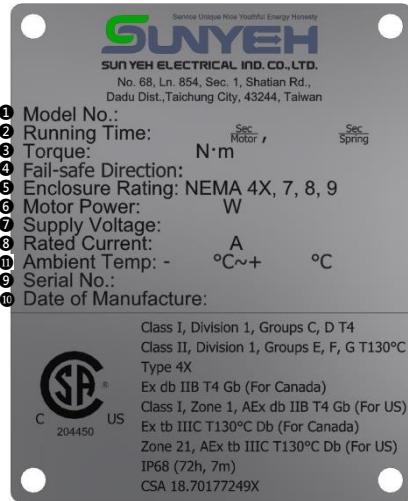
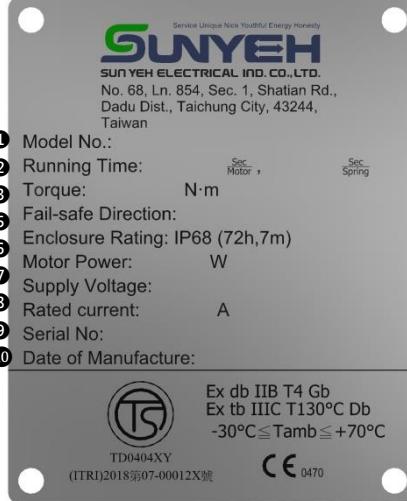
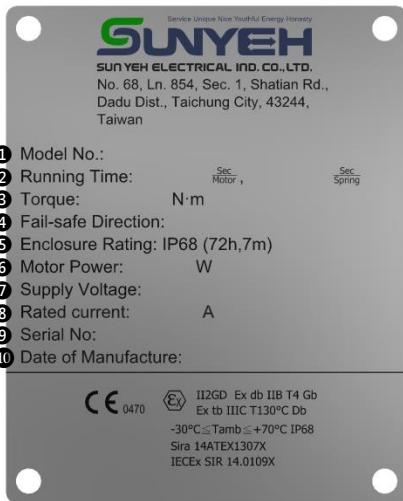
- ⚠ Please ensure that the O-ring seal is in good condition prior to cover installation.**
- Slowly re-install the cover while being careful not to pinch the O-ring seal.**
- ⚠ The explosion-proof enclosures are labeled with a QA code on both of the middle plate and the cover, please verify the QA code inside the cover is the same as the one on middle plate when installation. The cover is not interchangeable.**

Please follow below table to tighten the top cover screws:

Model	Screw	Allen Key	Torque
		mm	N·m
SE-500	M10	8	43
SE-1300	M14	12	120
SE-2000 to SE-2600	M16	14	185

3.8 Nameplate Details

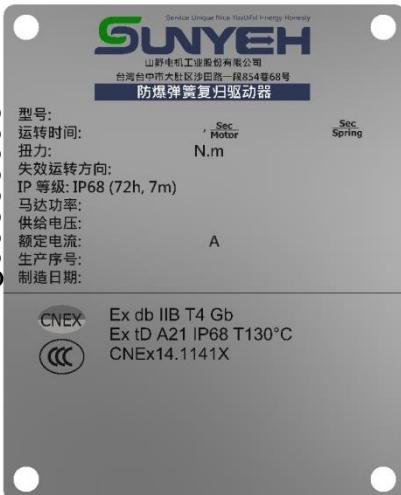
⚠ Please make sure the explosion-proof specification for the product is in consistence with nameplate and instruction.



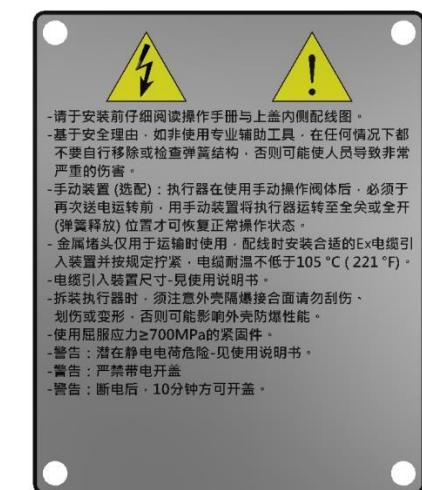
ATEX & IECEEx

TS

CSA



Nameplate Indication



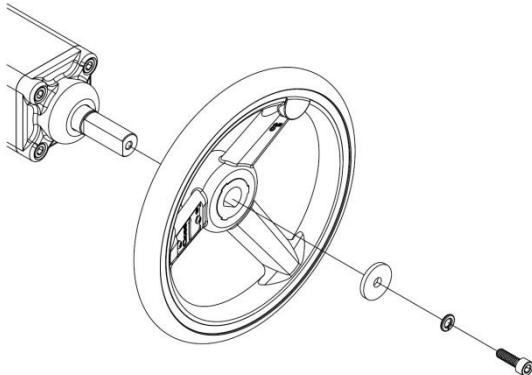
CCC & CNEEx

4. Mounting And Setup

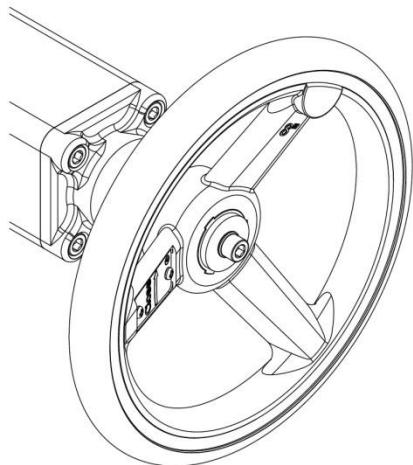
4.1 Manual Device Installation

- a. Slide fixing screw through washers and handwheel and secure them to override shaft as shown in the figure below.

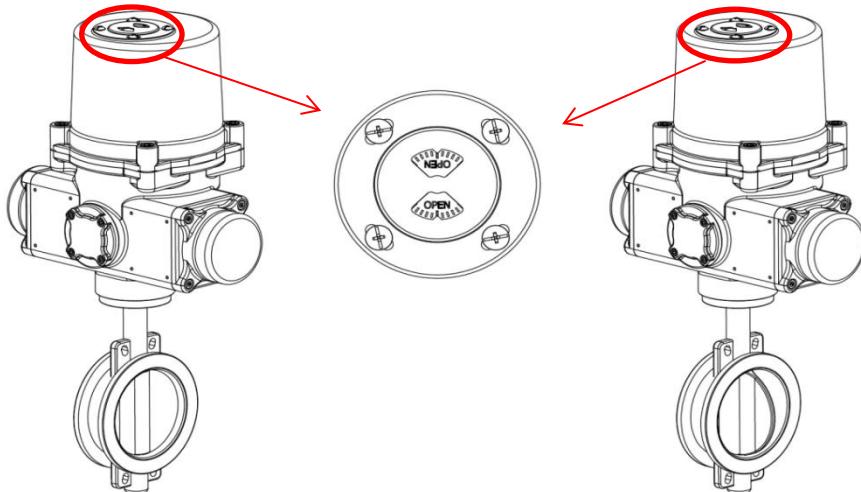
 **Turn off power when installing handwheel.**



- b. Assembly completed as shown in the figure below.



4.2 Valve Mounting Instructions



- a. The spring return actuator is shipped in spring return position (spring released) with the configuration of spring clockwise and fully-closed when power outage unless specified. Refer to section 8 to ensure actuator selected meets the application.
 - b. Make sure the valve is in correct FAIL POSITION before mounting the actuator to it. Refer to illustration above.
 - c. Remove all of valve handle parts, for example, the handle or open/close mechanical stops so as to not interfere with the actuator.
- ⚠️ Do not remove packing gland or other parts necessary for operation from valve.**
- d. Check again that the valve and actuator are in the same position (fully-open or fully-closed).
 - e. Once mounted together, either directly or with a mounting kit, ensure that they are properly secured together and all fasteners are tightened.
 - f. Remove the conduit entry metal plugs to relieve the pressure inside the actuator for the ease of the top cover removal and gently remove the cover. Please refer to 3.7 (P.12) for cover installation.
- ⚠️ The power must be off before removing the cover.**
- ⚠️ AFTER DE-ENERGIZING, DELAY 10 MINUTES BEFORE OPENING THE COVER.**
- g. Refer to section 4.3 for wiring notices and connect the wires according to the wiring diagram labeled inside the cover of actuator.
 - h. Supply power to actuator.
- ⚠️ Care must be taken at all times as there are live circuits present that may cause electrical shock.**

- i. Re-calibration may be required for the end positions, refer to section 4.4 (P. 18) for further instructions.
- j. Assemble the cover and secure cover screws firmly after setting.
 - Refer to 3.7 (P.12) for installation and check if there is any foreign object between top cover flamepath joint and base.
 - Please ensure that the O-ring seal is in good condition prior to cover installation.
 - ⚠ The explosion-proof enclosures are labeled with a QA code on both of the middle plate and the cover, please verify the QA code inside the cover is the same as the one on middle plate when installation. The cover is not interchangeable.

4.3 Wiring Instructions

- ⚠ Turn power off before making the electrical connection!
- ⚠ Please remove the spacer (if applicable) before wiring and do not let any objects fall into the holes of the mounting plate.

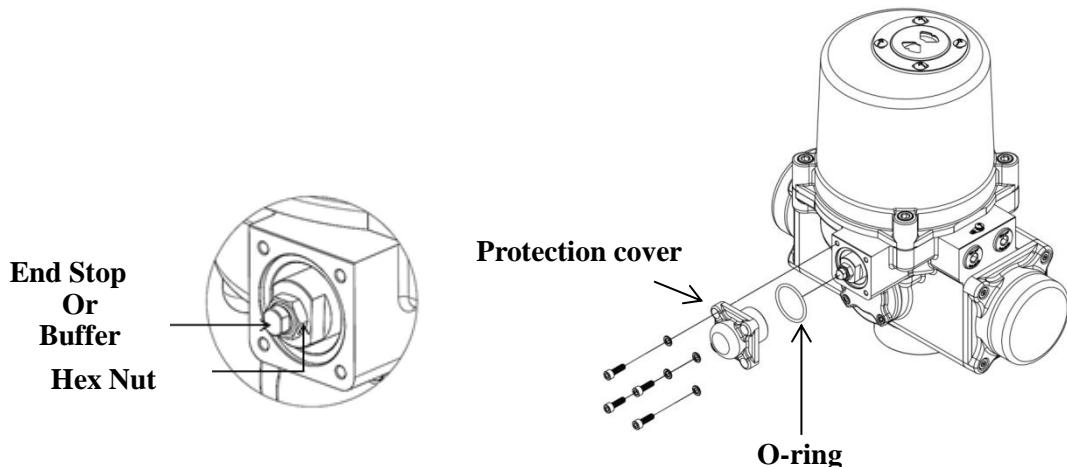
- There are grounding devices both inside and outside of the actuator (green screw) and the ground wires should be connected properly.
- The conduit entries are attached two conduit entries plugged by metal plugs, and the specification as below. Each actuator is attached with two metal plugs to conduit entries. SE-500 to SE-2600: 1/2" NPT, 3/4" NPT, M20 x 1.5 or M25 x 1.5.
 - ⚠ Use correct size of fittings so as to not damage the threads.
- Verify the supply power is in accordance with the data on the nameplate to prevent a short circuit and an electrical shock.
 - ⚠ Do not apply power to actuator before wiring, otherwise it can cause an electrical shock or damage components of the actuator.
- After wiring, please tighten the conduit entries with suitable cable glands and cover properly. Unused conduit entries have to be sealed with metal plugs to reach explosion- proof function. Please refer to 1.2.2 - 1.2.3 (P.3).

4.4 Actuator Set-up

- ⚠ If the actuator is equipped with a manual override, rotate the handwheel to return the actuator to its spring released position before the power is supplied.**
- ⚠ Use proper cable glands with IP rating when installing and securely tighten the conduit fittings to ensure the enclosure protection rating.**

The spring return actuator provides fail-safe positioning and the end stop position of spring return is determined by either buffer or end stop (On/Off by the buffer, floating or modulating limited by end stop). When the actuator is motorized, the end position is determined by limit switches.

The actuator has been set and calibrated at the factory. Most of products will not require recalibration of these settings. However these are general settings. After valve and actuator are bolted together, apply power to drive the actuator to its fully-open (spring compressed). Then remove power to let the rack and pinion spring mechanism drive back to its fully-closed position. If the OPEN or CLOSE stop point are not aligned with valve or damper correctly, its end positions must be adjusted. Please follow steps below:

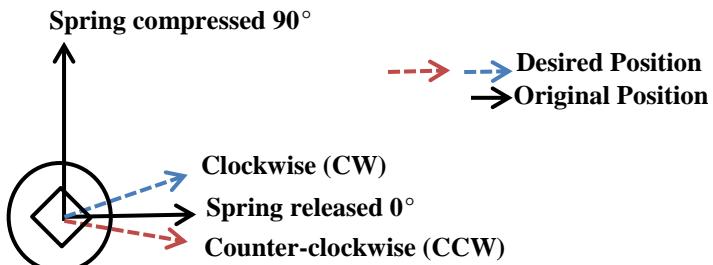


- ⚠ For modulating unit, ensure to loosen the sector gear of potentiometer first before adjusting the following settings.**

4.4.1 Adjustment procedure for spring-return actuator in the fail-closed position upon loss of supply voltage.

- Adjust FULLY-CLOSED (spring released) stop point as steps below:

- a. Turn power off and loosen the protection cover using a 5 mm hex key.
- b. Loosen the hex nut of the buffer or end stop using a 17 mm hex wrench. Hold the hex nut and turn the buffer or end stop using a 10 mm hex wrench to adjust end position.
- c. Turn the buffer or end stop to adjust the fully-closed stop point



➤ SE-500 : One turn = 2.3 degrees

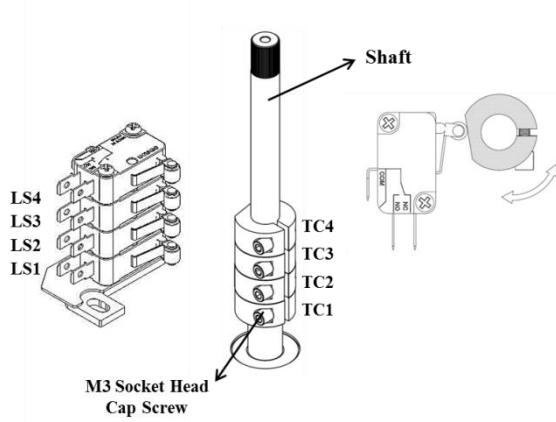
➤ SE-1300 to SE-2600 : One turn = 1.4 degrees.

- d. Once completed, tighten the hex nut, replace the protection cover and tighten all screws.

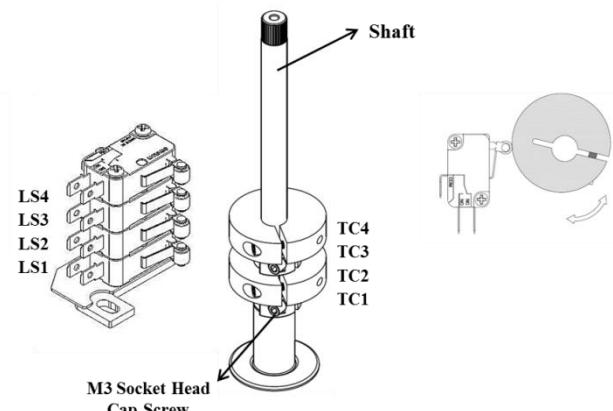
⚠ If the buffer or end stop is adjusted, TC2 must be reset in accordance with the buffer or the end stop.

- e. Loosen the M3 cap screw of cam TC2 with a 2.5 mm hex key..
- f. Rotate the cam TC2 counter-clockwise until a light click is heard, and then slowly rotate the cam TC2 clockwise until a light click is heard.
- g. Tighten the cap screw of cam TC2.

【SE-500】



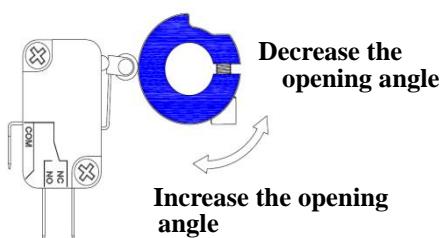
【SE-1300 to SE-2600】



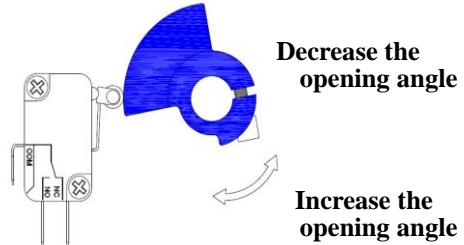
- **Adjust FULLY-OPEN (spring compressed) stop point as steps below:**

- Apply power to drive the actuator to its fully-open (spring compressed) position. If the open stop point is not aligned with the valve or damper properly, then it must be adjusted.
- Remove power to let spring system to drive back to its fully-closed (spring released) position.
- If it is required to adjust, loosen the cap screw of cam TC1 with a 2.5 mm hex key.
 - To increase the opening angle, turn the cam clockwise.
 - To decrease the opening angle, turn the cam counter-clockwise.

【SE-500】



【SE-1300 to SE-2600】

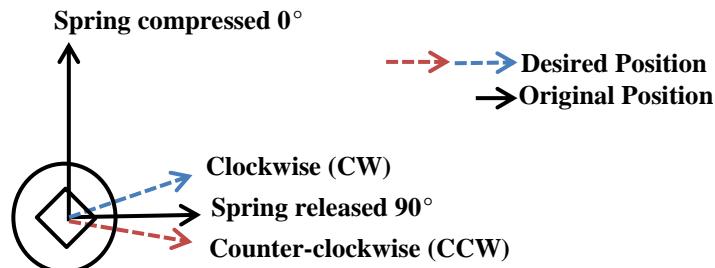


- After adjusting the cam, apply power to drive the actuator to the fully-open position.
- Verify that it is in the correct fully-open position.
 - If it is in correct position, remove power and lock the cap screw of cam TC1.
 - If it is not in correct position, repeat step C until the correct position is reached.
- If auxiliary switches will be used for feedback, cams TC3 and TC4 need to be calibrated.
 - Adjust cam TC3 so it trips just before cam TC1 does.
 - Adjust cam TC4 so it trips just before cam TC2 does.

4.4.2 Adjustment procedure for spring-return actuator in the fail-open position upon loss of supply voltage

- **Adjust FULLY-OPEN (spring released) stop point as steps below:**

- a. Turn power off and loosen the protection cover using a 5 mm hex key.
- b. Loosen the hex nut of the buffer or end stop using a 17 mm hex wrench. Hold the hex nut and turn the buffer or end stop using a 10 mm hex wrench to adjust end position.
- c. Turn the buffer or end stop to adjust the fully-open stop point.



➤ SE-500 : One turn = 2.3 degrees

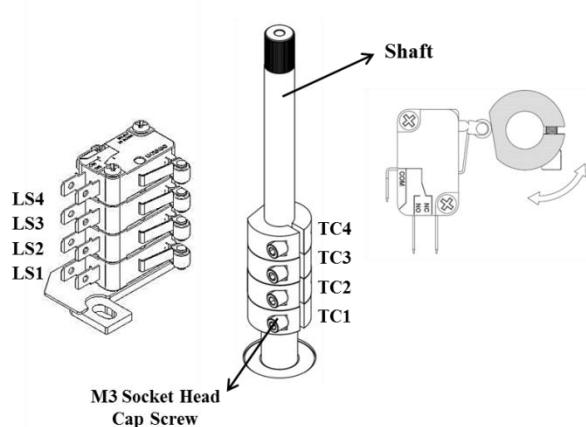
➤ SE-1300 to SE-2600 : One turn = 1.4 degrees

- d. Once completed, tighten the hex nut, replace the protection cover and tighten all screws.

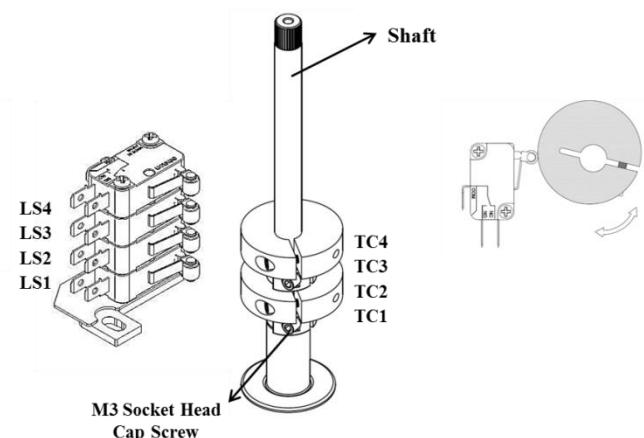
⚠ If the buffer or end stop is adjusted, TC2 must be reset in accordance with the buffer or the end stop.

- e. Loosen the M3 cap screw of cam TC2 with a 2.5 mm hex key.
- f. Rotate the cam TC2 counter-clockwise until a light click is heard and then slowly rotate the cam TC2 clockwise until a light click is heard.
- g. Tighten the cap screw of cam TC2.

【SE-500】



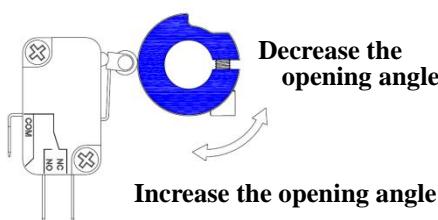
【SE-1300 to SE-2600】



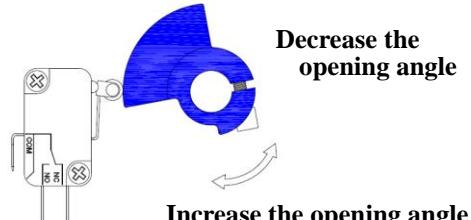
- Adjust **FULLY-CLOSED** (spring compressed) stop point as steps below:

- Apply power to drive the actuator to its fully-closed (spring compressed) position. If the close stop point is not aligned with the valve or damper properly, then it must be adjusted.
- Remove power to let spring system to drive back to its fully-open (spring released) position.
- If it is required to adjust, loosen the cap screw of cam TC1 with a 2.5 mm hex key.
 - To increase the opening angle, turn the cam clockwise.
 - To decrease the opening angle, turn the cam counter-clockwise.

【SE-500】



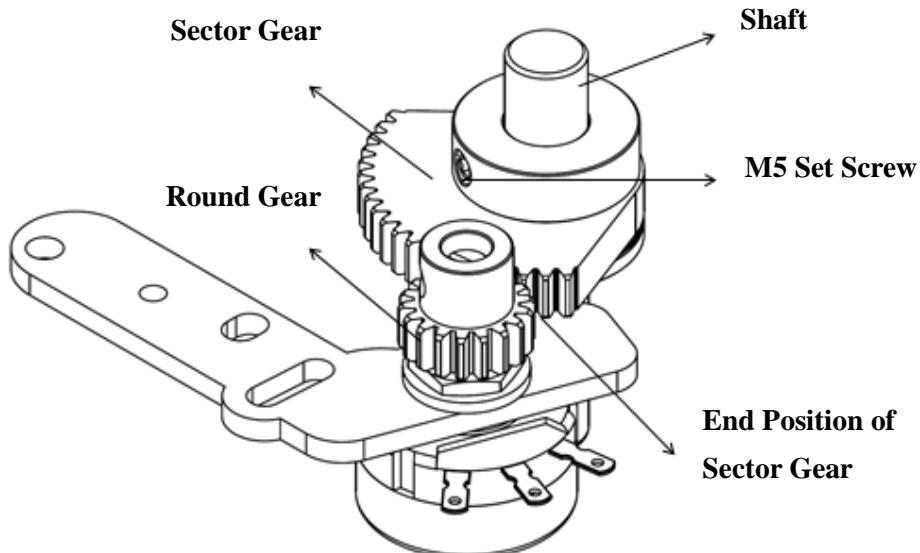
【SE-1300 to SE-2600】



- After adjusting the cam, apply power to drive the actuator to the fully-closed position.
- Verify that it is in the correct fully-closed position.
 - If it is in correct position, remove power and lock the cap screw of cam TC1.
 - If it is not in correct position, repeat step C until the correct position is reached.
- If auxiliary switches will be used for feedback, cams TC3 and TC4 need to be calibrated.
 - Adjust cam TC3 so it trips just before cam TC1 does.
 - Adjust cam TC4 so it trips just before cam TC2 does.

4.4.3 For modulating actuators, after completing the calibration, turn the actuator to fully-closed or fully-open (spring released) position and follow the procedure below:

- a. Loosen M5 set screw.
- b. Rotate sector gear clockwise to the position shown in figure below.
⚠ Ensure round gear and sector gear are engaged properly.
- c. Tighten M5 set screw.



TC2 is utilized for sensing fully-closed stop point. Once the spring mechanism has been released when power outage, the actuator will not drive under power again until it has reached its fail stop position and TC2 trips.

TC1 “OPEN” ↗ Clockwise:increase opening degree.
 ↙ Counter-clockwise: decrease opening degree.

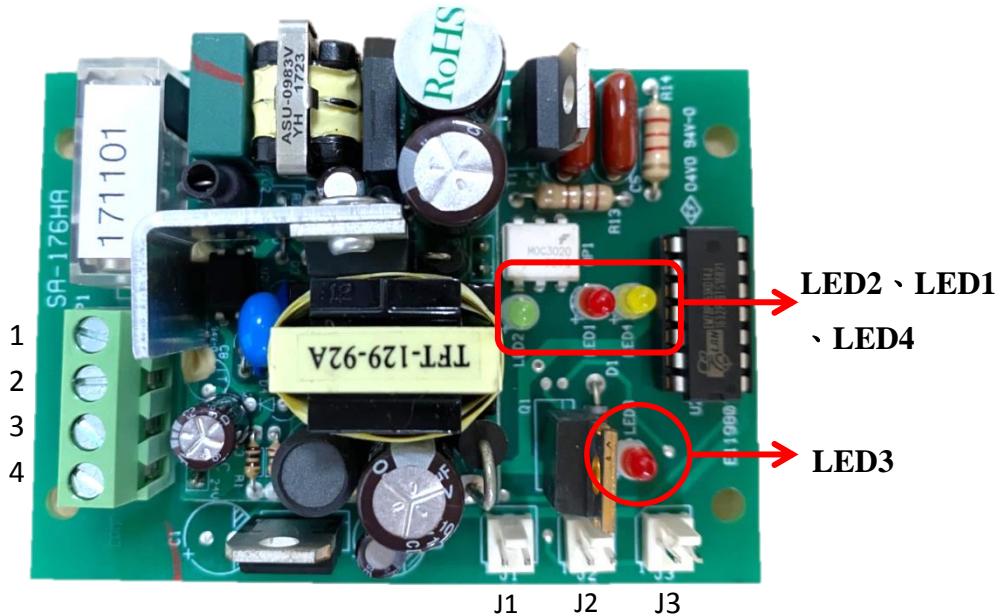
Note:

- LS2 shall trip while TC2 reaches the end stop point.
- TC3 &TC4 are optional ; refer to P.20 & P.22 section 4.4.1 (f.) and 4.4.2 (f.) for calibration.

5. On-off Control and Floating Control Board Adjustment

5.1 On-off Control Board Surface

The layout is based on 110/220V voltage.



- Indicator Lamp

Lamp No.	Actuator Status
LED1	Power
LED2	Operating
LED3	Motor Brake
LED4	Alerting Signal

5.2 Troubleshooting of On-off Controller

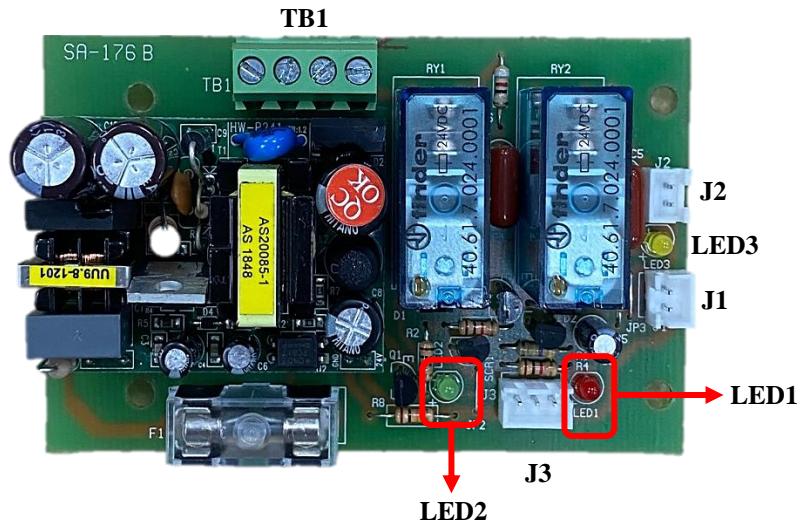


In case LED1 to LED3 does not light or LED4 lights when the actuators are motorized, please refer to steps below for basic troubleshooting.

Status of LEDs	Possible problems	Solution
LED4 goes on	<ul style="list-style-type: none"> a. LS1 and LS2 terminals loose or poor contact. b. Incorrect connection of the terminal LS1 or LS2. c. The input power failure time is more than 150ms. d. Abnormal setting of limit switches and cams. e. Supply the power again during spring release. f. LS1 and LS2 failed. g. Actuator overload cause it can not returned to spring released position and restart. h. Abnormal setting of cam TC and cause the contact of LS2 can not be released. 	<ul style="list-style-type: none"> a. When the terminals loosen, please refer to the wiring diagram for wiring. If it is damaged, please replace new terminals. b. Verify the actuator is wire properly as per wiring diagram. c. Please provide an independent power supply to actuator to avoid unstable power supply and cause the actuator enter to self-protection. d. Please refer to 4.4 (P.18 to P.23) Actuator set-up. e. Power off until the actuator return to spring released positon and then supply power again. f. Replace new limit switches. g. Please refer to 3.5 (P.10) Sizing. h. Please refer to 錯誤! 找不到參照來源。 (P.18 to P.23) Actuator set-up.
LED1 does not go on	<ul style="list-style-type: none"> a. Wrong supply voltage. b. Blown fuse. c. PCB failed. 	<ul style="list-style-type: none"> a. Check the power supply is according to the actuator rated voltage. b. Replace a new fuse. c. Replace a new PCB.
LED2 does not go on	<ul style="list-style-type: none"> a. Abnormal Setting for LS1 and LS2. b. PCB failed. ° 	<ul style="list-style-type: none"> a. Check the LED 4, if the LED4 lights please refer to the troubleshooting for LED4. b. Replace a new PCB.
LED3 does not go on	<ul style="list-style-type: none"> a. PCB failed. 	<ul style="list-style-type: none"> a. Replace a new PCB.

5.3 Floating Control Board Surface

The layout is based on 110/220V voltage.



● Indicator Lamp

Lamp No.	Actuator Status
LED1	Actuator Spring Release
LED2	Motor Operating
LED3	Power

5.4 Troubleshooting of Floating Controller

⚠ In case LED1 to LED3 does not light when the actuator is motorized, please refer to steps below for basic troubleshooting.

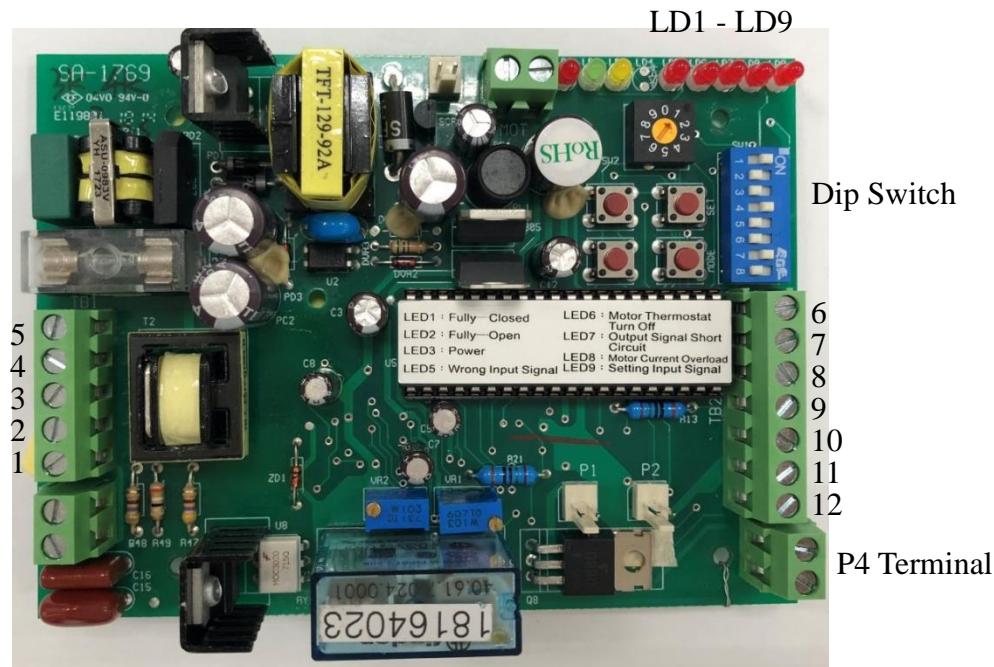
Status of LEDs	Possible problems	Solution
LED1 does not go on	<ul style="list-style-type: none"> a. Abnormal control signal. b. PCB failed. c. Abnormal power supplied. d. The terminals loose or poor contact. 	<ul style="list-style-type: none"> a. Check if the terminal #4 and #6 is conducted. b. Replace a new PCB。 c. Check the power supply is according to the actuator rated voltage. d. When the terminals loosen, please refer to the wiring diagram for wiring. If it is damaged, please replace new wirings.
LED2 does not go on	<ul style="list-style-type: none"> a. Abnormal control signal. b. PCB failed. c. Abnormal power supplied. d. The cam active the limit switch. e. Incorrect setting of the LS1 and TC1. f. Incorrect connection of LS1. g. The terminals loose or poor contact. 	<ul style="list-style-type: none"> a. Check if the terminal #4 and #5 is conducted. b. Replace a new PCB. c. Check the power supply is according to the actuator rated voltage d. It's normal condition, please refer to 錯誤! 找不到參照來源。 (P.18 to P.23) Actuator set-up if need to adjusted. e. Check if the LS1 is conducted when the actuator return to spring released positon, if not please refer to 錯誤! 找不到參照來源。 (P.18 to P.23) Actuator set-up. f. Verify the actuator is wire properly as per wiring diagram. g. When the terminals loosen, please refer to the wiring diagram for wiring. If it is damaged, please replace new terminals.

Status of LEDs	Possible problems	Solution
LED3 does not go on	<ul style="list-style-type: none"> a. Abnormal power supply. b. Blown fuse (F1). c. PCB failed. d. Incorrect setting of the LS2 and TC2. e. Actuator overload. f. Actuator is abnormal and can not return to spring released positon. g. Incorrect connection of LS1. h. The terminals loose or poor contact. 	<ul style="list-style-type: none"> a. Check the power supply is according to the actuator rated voltage. b. Blown fuse. c. Replace a new PCB. d. Check if the LS2 is conducted when the actuator return to spring released positon, if not please refer to 錯誤! 找不到參照來源。 (P.18 to P.23) Actuator set-up. e. Check if the torque of valve larger than actuator rated torque. f. Contact with factory to replace new actuator. g. Verify the actuator is wire properly as per wiring diagram h. When the terminals loosen, please refer to the wiring diagram for wiring. If it is damaged, please replace new terminals.

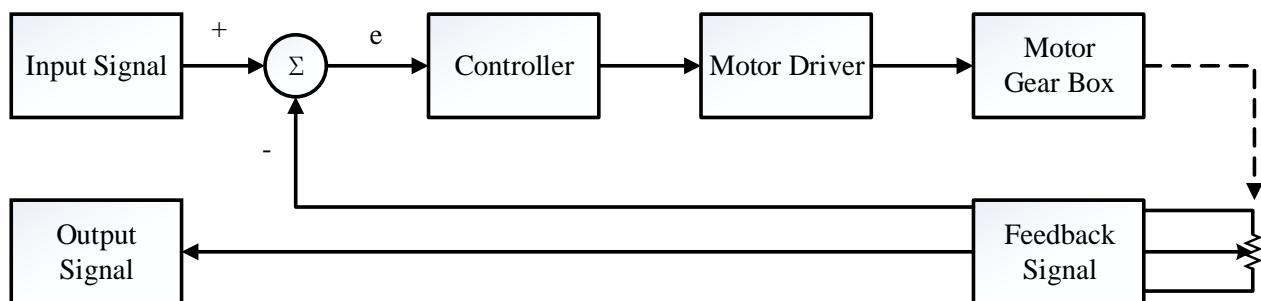
6. Modulating Control Board Adjustment

6.1 Modulating Control Board Surface

The layout is based on 110 / 220V voltage.



6.2 Programming



6.3 Dip Switch Setting (SW1)

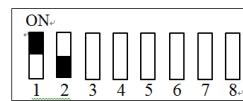
The Dip Switch SW1 is a combination of 8 switches and equally divided in two rows. It is utilized to select signal type of input as well as output and fail positioning when the signal input fails. The sliders can be placed at either ON (upper) or OFF (lower) state position.

Factory settings are switches 1, 4, 8 at ON state and switches 2, 3, 5, 6, 7 at OFF state.



**! Please follow steps below if an adjustment of these settings are required.
Please restart the actuator after adjusting.**

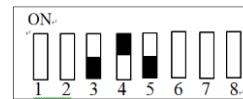
	1	2	3	4	5	6	7	8
Factory setting	ON	OFF	OFF	ON	OFF	OFF	OFF	ON
4 - 20 mA input	ON	OFF						
1 - 5 V input	OFF	OFF						
2 - 10 V input	OFF	ON						
4 - 20 mA output			OFF	ON	OFF			
2 - 10 V output			ON	OFF	ON			
Input 20 mA / 5V / 10V to operate valve to fully-open position						OFF		
Input 20 mA / 5V / 10V to operate valve to fully-closed position						ON		
When signal input failed, driving valve to fully-open (when S6 sets at “ON”).							OFF	ON
When signal input failed, driving valve to fully-closed (when S6 sets at “ON”).							ON	OFF
When signal input failed, driving valve to fully-closed (when S6 sets at “OFF”).							OFF	ON
When signal input failed, driving valve to fully-open (when S6 sets at “OFF”).							ON	OFF
When signal input failed, valve stays at the last position.							ON	ON



a. Input Signal Setting (switches 1 - 2)

Input Signal	State of Switches
4 - 20 mA	1 at ON, 2 at OFF.
1 - 5 V	1 at OFF, 2 at OFF.
2 - 10 V	1 at OFF, 2 at ON.

b. Output Signal Setting (switches 3 - 5)

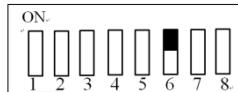


Output Signal	State of Switches
4 - 20 mA	3 at OFF, 4 at ON, 5 at OFF.
2 - 10 V	3 at ON, 4 at OFF, 5 at ON.

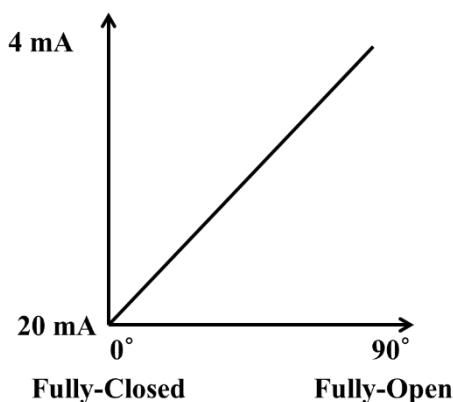
- c. Setting of fail position when input signal failed (Switches 6 - 8).

⚠ The input signal type is set by switches 1 and 2. And switch 6 is used to set the corresponding relationship between value of input signal and operation direction of actuator.

When S6 is set to ON



- The program defines 20 mA or 5 V or 10 V as a command for fully-closed positioning. The line graph below shows the signal level and the corresponding position of actuator.



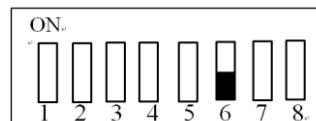
- When a low signal value is received, the actuator operates toward fully-open position and when a high signal value is received, the actuator operates toward fully-closed position.

Input Signal	Fully-Open (90°)	Fully-Closed (0°)
4 - 20 mA	4 mA	20 mA
1 - 5 V	1 V	5 V
2 - 10 V	2 V	10 V

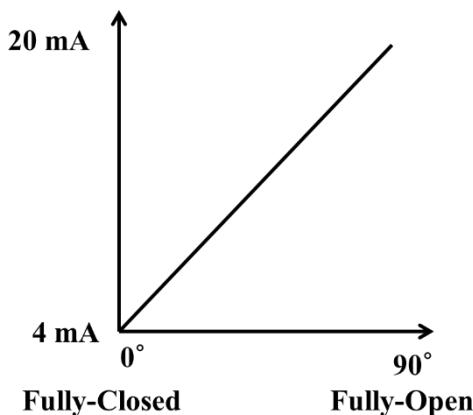
- The selection of the fail position while the input signal failed, please follow table below:

Signal Failed Position	State of Switch
Fully-Open (90°)	7 at OFF, 8 at ON
Fully-Closed (0°)	7 at ON, 8 at OFF
The Last Position	7 at ON, 8 at ON

When S6 is set to **OFF**



- The program defines 20 mA / 5 V / 10 V as a command for fully-open positioning. The line graph below shows the signal level and the corresponding position of the actuator.



- When a high signal value received, the actuator operates toward fully-open position and when a low signal value received, the actuator operates toward fully-closed position.

Input Signal	Fully-Open (90°)	Fully-Closed (0°)
4 - 20mA	20 mA	4 mA
1 - 5 V	5 V	1 V
2 - 10 V	10 V	2 V

- The selection of the fail position while the input signal failed, please follow table below:

Signal Failed Position	State of Switch
Fully-Open (90°)	7 at ON, 8 at OFF
Fully-Closed (0°)	7 at OFF, 8 at ON.
The Last Position	7 at ON, 8 at ON.

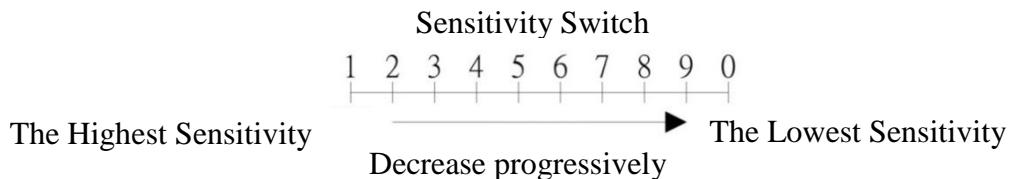
6.4 P4 Terminal

- P4 is a contact for alarm conduction. If the microprocessor detects that the actuator has not reached the preset end of travel stop within 15 seconds, then the microprocessor conducts P4. It can connect with an alarm or similar devices for warning.

6.5 Sensitivity Switch Setting (SW2)

When the sensitivity setting is higher, the resolution of the input signal will be higher, and relatively the dead band will be smaller. Excessive high sensitivity setting may cause the actuator to keep hunting and could not run to the desired position which will lead to the thermostat inside the motor to trip because of overheating, and finally the actuator will shut down. If this situation happens, it is suggested to turn down the sensitivity setting.

6.5.1 Setting



- When switched to "1": The Highest Sensitivity.
When switched to "0": The Lowest Sensitivity.

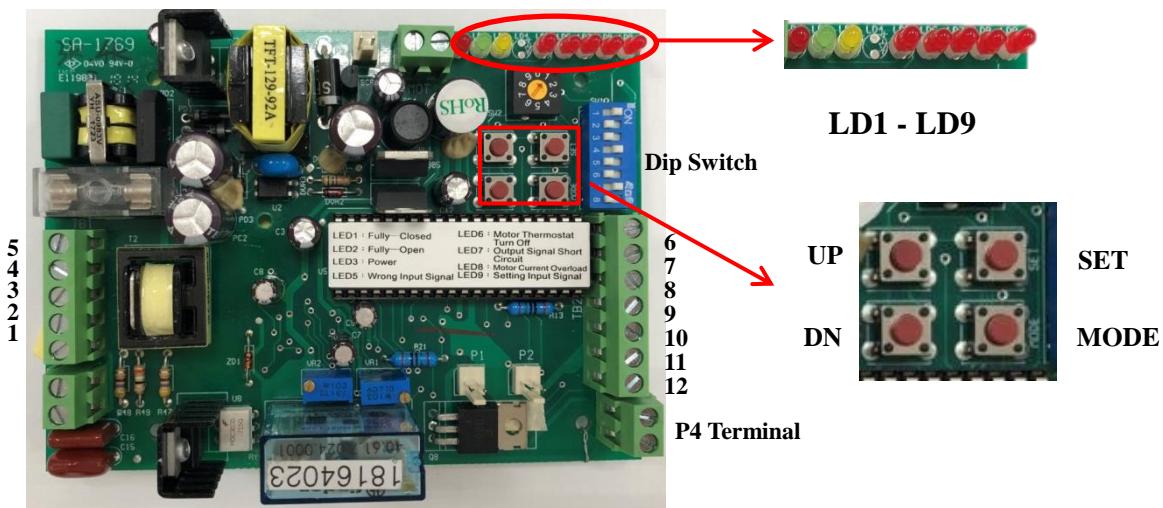
6.5.2 Original factory setting

- SE-500 to SE-2600 : 3.

Model	Figure
SE-500 to SE-2600	

6.6 Signal Settings for OPEN and CLOSE Position

- ⚠ These settings are set and calibrated at the factory. Mostly, they do not need to be recalibrated. Please follow steps below to set when required.
- ⚠ Use a multimeter to measure the output signal in accordance with the selected signal type.



LD1	Fully-closed	LD6	Motor thermal protector activated
LD2	Fully-open	LD7	Output signal short circuit
LD3	Power	LD8	Overcurrent in motor
LD5	Wrong input signal	LD9	Local setting mode

Press and hold "SET" switch for 2 seconds until LD 9 lights to enter local setting mode.

• Signal setting for Fully-OPEN position

- a. Press and hold "UP" switch to operate the actuator to open until it has reached the fully-open position and LD2 lights and then input a signal 5 V or 10 V or 20 mA.
- b. Press "MODE" switch for 2 seconds to complete the setting of fully-open position.

• Signal setting for Fully-CLOSED position

- a. Press and hold "DOWN" switch to operate the actuator to close until it has reached fully-closed position and LD1 lights, and then input a signal 1V or 2V or 4 mA.
- b. Press "MODE" switch for 2 seconds to complete the setting of fully-closed position.

After completing the above settings, press "SET" switch to quit local setting.

6.7 Troubleshooting of modulating controller

⚠ In case LD3 does not light or any of LD5 to LD9 lights when the actuator is motorized, please refer to steps below for basic troubleshooting.

⚠ Please do the troubleshooting when LD4 to LD8 lights, and then restart the power to turn the lights off.

Status of LEDs	Possible problems	Solution
LD3 does not go on	<ul style="list-style-type: none"> a. No power supplied. b. Incorrect connection of the lines #8, #9 of the potentiometer c. Modulating controller failed. 	<ul style="list-style-type: none"> a. Check the power supply as well as wires connected to terminals #4 & #5, please refer to 5 (P.29). b. Verify the actuator is wired properly as per wiring diagram. c. Send back to the factory for inspection.
LD5 goes on	<ul style="list-style-type: none"> a. An incorrect signal type inputted. For example, preset with 2-10 V input but input 4 - 20 mA. b. Input a voltage exceeding the rated. For example, preset with 2-10 V input but input 13.5 V. c. An incorrect signal type inputted. For example, preset with 4 - 20 mA input but input 2 - 10V. In this case, the actuator still works in 2 - 7V. When the signal is over 7.2 V, the LD5 lights. 	Verify if the switch 1 is set in accordance with the type of input signal. Please refer to 6.3 (P.30 - P.32).
LD 6 goes on	Motor thermal protector started.	<ul style="list-style-type: none"> a. The duty cycle exceeded the rated, please refer to 3.6 (P.11). b. The contact of motor thermal protector (MOT) disconnected.
LD7 goes on	<ul style="list-style-type: none"> a. Signal output short circuit. b. The input signal type 2 - 10 V with reversed polarity. . 	<ul style="list-style-type: none"> a. Verify if the signal output with reversed polarity. The negative pole should be connected to terminal #11 and the positive pole should be connected to terminal#12. b. Verify if the signal input with reversed polarity when applying 2 - 10 V, the negative pole should be connected to terminal #6 and the positive pole should be connected to terminal #7.
LD8 goes on	Motor over-current.	<ul style="list-style-type: none"> a. Duty cycle exceeded the rated. Please refer to 3.6 (P.11) and reduce the duty rating. b. Check the load. c. Check if the motor rotor is locked (For example: Valve is stuck by foreign objects).
LD9 goes on	Local setting mode - Setting position for open & close.	After completing setting, press "SET" button to quit.

7. Troubleshooting



If the actuator selected with handwheel , after doing handwheel operation, be sure to use the handwheel to turn back to fully-closed or fully-open (spring release) position before input the power, it can be operating normally.

Floating Controller

Motor does not operate or overheats

Possible problems	Solution
<ul style="list-style-type: none"> a. The seating torque of valve increased caused by oxidized seals and has resulted in a torque overload on actuator. b. Jammed pipe or valve seat stuck c. Motor shaft or bearing were stuck. d. The limit switch for fully-closed does not trip (with manual override). e. The limit switch for fully-closed does not trip (without manual override). 	<ul style="list-style-type: none"> a. Manual operate check if it can be operated, if not replace a new valve. b. Check if any blockage or obstacle in pipe and remove. c. Replace a new motor. d. Operate the actuator manually to fully-closed position and confirm if the limit switch trips. e. Check if a torque overload caused by the valve.

The actuator functions normally but motor is hot.

Possible problems	Solution
<ul style="list-style-type: none"> a. Actuator operates too frequently and exceeded duty cycle rating. b. A torque overload caused by the valve. c. Wrong power supply. 	<ul style="list-style-type: none"> a. Adjust the system bandwidth or reduce the frequency of operation. b. This problem happened frequently after valve operating for a long time. It is suggested to replace a new valve. c. Check the power supply.

To control two or more actuators, sometimes the actuator works abnormally and the motor is getting hot.

Possible problems	Solution
Parallel connection.	Check operating current values and install a relay respectively.

The valve does not operate no matter under either electrical operation or manual operation.

Possible problems	Solution
<ul style="list-style-type: none"> a. The actuator was mounted to the valve improperly. b. The torque of valve is larger than the torque of actuator. c. The cap screw of the cam loosened and resulted in that the travel end positions misaligned. d. The OPEN and CLOSE end stop points of actuator are not aligned with valve. 	<ul style="list-style-type: none"> a. Please refer to 4.2 (P. 16) installation steps. b. Replace a new valve or a larger size actuator. c. Readjust the mechanical stops and limit switches, please refer to 4.4 (P.18 to P.23). d. Separate the actuator from valve and reinstall to ensure the OPEN and CLOSE stop points are aligned properly.

The capacitor is failed.

Possible problems	Solution
Worked in an environment out of the withstandable temperature range.	Please use the capacitor at temperature between -30 °C to +70 °C (-22 °F to +158°F).

Modulating Controller**The LED indicators (LD5 - LD9) flash.**

Solution	
Refer to 6.6 (P. 34).	

The LED indication functions properly but the actuator could operate to fully-open as well as fully-closed, modulating control was out of function.

Possible problems	Solution
The signal input with a reversed polarity, it means a signal failure.	Verify if the negative pole of signal input connected to terminal #6 and the positive pole connected to terminal #7.

Modulating control was out of function.

Possible problems	Solution
<ul style="list-style-type: none"> a. Potentiometer failed and causes actuator out of control in some section or abnormal feedback. b. Input wrong signal type. c. Modulating board failed and causes actuator can not operate or only operate in a single direction. 	<ul style="list-style-type: none"> a. Replace a new potentiometer. b. Check if the input signal is correct, please refer to 6.3 (P.30- P32). c. Replace a new modulating board.

8. Actuator Options



Fail clockwise (CW) rotation

When energized, the driven valve rotates CCW (viewed from the top of the actuator). Meanwhile, the springs are compressed. On loss of power, the spring returns (unloaded) and the driven valve rotates CW.



Fail counter-clockwise (CCW) rotation

When energized, the driven valve rotates CW (viewed from the top of the actuator). Meanwhile, the springs are compressed. On loss of power, the spring returns (unloaded) and the driven valve rotates CCW.

Valve operating direction	Desired fail position upon loss of supply voltage	Actuator Type	Handwheel direction
CW rotation for CLOSE 	Valve at fully-closed	CW	Direct mount per original factory setting.
	Valve at fully-open	CCW	Adjust the tag and position indicator.
CW rotation for OPEN 	Valve at fully-closed	CCW	Direct mount per original factory setting.
	Valve at fully-open	CW	Adjust the tag and position indicator.



If the actuator selected with handwheel , after doing handwheel operation, be sure to use the handwheel to turn back to fully-closed or fully-open (spring release) position before input the power, it can be operating normally.

Instructions for adjusting the open/close indicator beacon:

1. Loosen the screws of position indicator window (Figure 1).
2. Rotate the position indicator window by 90 degrees and tighten the screws (Figure 2).

The tag of CLOSE direction with an arrow pointing on the handwheel is printed on both of the sides A and B as Figure

4. Please adjust its direction in accordance with the configuration.

1. Loosen the screws of tag and adjust the tag to reflect the correct CLOSE direction (Figure 3).
2. Adjust the tag to side B (counter-clockwise in the closing direction) and tighten the screws (Figure 4).



(Figure 1)



(Figure 2)



(Figure 3)



A

(Figure 4)

9. Warranty

Sun Yeh Ele. Co. Ltd warrants that for a period of twelve months from the date of manufacture it will either repair or replace, at its option, any of its products which prove to be defective in material or workmanship. This warranty does not cover damage resulting from causes such as abuse, misuse, modification or tampering by users. This warranty is extended only to the immediate purchaser of Sun Yeh product and is not transferable. To obtain service under this warranty, the purchaser must first acquire a return authorization from Sun Yeh. Products must be returned to Sun Yeh under freight prepaid.

This warranty is in lieu of all other obligations, liabilities or expressed warranties. Any implied warranties, including any implied warranty of merchantability are hereby expressly excluded. In no event shall Sun Yeh be liable for special, incidental or consequential damages arising in connection with the use of its products, or for any delay in the performance of this warranty due to cause beyond its control.



Service Unique Nice Youthful Energy Honesty

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