

## Series SEA-SR IOM

# INSTALLATION, OPERATION AND MAINTENANCE FOR SHARPE® SEA-SR SPRING RETURN ELECTRIC ACTUATOR



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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 instructions contained in this operation manual included with the product. Failure to do this may result in damages and void warranty. ASC- ES 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.**

- 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.
- 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.
- Connect the ground wire to PE point inside the electric actuator.
- 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.

- These units are not designed to operate in vacuum spaces or where an explosive atmosphere exists.
- Periodically inspect actuator enclosure to prevent dust from accumulating

## **1.3 Inspection, Storage, Transport**

### **1.3.1 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.

### **1.3.2 Storage**

- The actuator should be stored in a dry area with relative humidity of less than 90 % ( $20 \pm 5$  °C) and at temperatures 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 red conduit plug for temporary protection should not be removed until the actuator is ready to be cabled. Use suitable cable glands to ensure IP rated protection when installing.

### **1.3.3 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.

### **1.3.4 Lubrication**

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

## 2. Product Overview

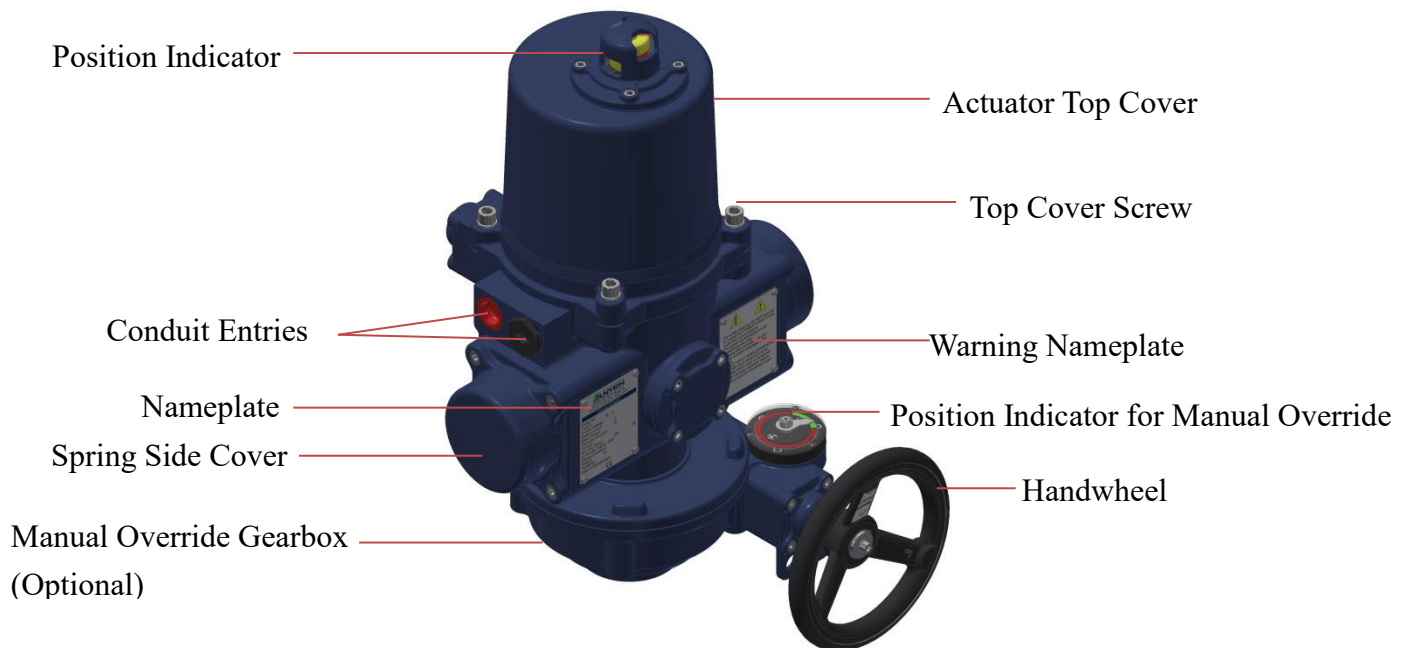
Series SEA spring return fail-safe electric actuators offer torque ranges from 50 N·m to 260 N·m (440 in·lb to 2300 in·lb) and are designed for fail-safe positioning of valves or dampers upon loss of supply voltage, which include On/Off control, floating control and modulating control. A rack and pinion 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.

### 2.1 Features

- Controls: On/Off, floating (optional), modulating (optional).
- Clutch-less manual override (optional).
- Dry-powder coated aluminum alloy enclosure conforms to C3, NEMA 4X, 5 & IP 67 outdoor use.
- ISO 5211 mounting flange.
- Domed position indicator.
- Built-in motor thermal protection.

## 3. Product Mechanical Data

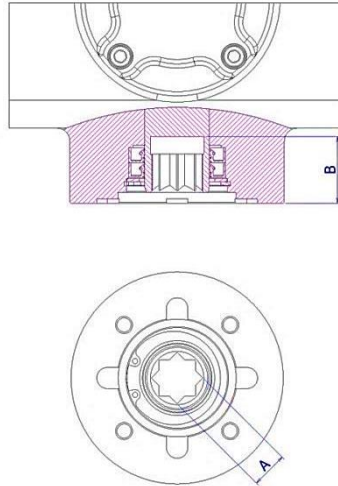
### 3.1 Parts Identification



### 3.2 Technical Information

| Model        | Torque |        | Motor Power<br>Watt | Weight<br>w/Manual Override |     |
|--------------|--------|--------|---------------------|-----------------------------|-----|
|              | N·m    | in· lb |                     | kg                          | lb  |
| SEA-4-SR-MO  | 50     | 440    | 50                  | 37                          | 81  |
| SEA-11-SR-MO | 130    | 1150   | 130                 | 74.5                        | 164 |
| SEA-17-SR-MO | 200    | 1770   | 130                 | 135                         | 297 |
| SEA-23-SR-MO | 260    | 2300   | 130                 | 135                         | 297 |

### 3.3 Mounting Base Details



| Model        | Mounting Flange | Shaft (A) |       | Depth of Shaft (B) |       |
|--------------|-----------------|-----------|-------|--------------------|-------|
|              | ISO 5211        | mm        | inch  | mm                 | inch  |
| SEA-4-SR-MO  | F07             | 17        | 0.669 | 30                 | 1.181 |
| SEA-11-SR-MO | F10             | 22        | 0.866 | 41                 | 1.614 |
| SEA-17-SR-MO | F12             | 27        | 1.063 | 45                 | 1.772 |
| SEA-23-SR-MO | F12             | 27        | 1.063 | 45                 | 1.772 |

### 3.4 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 80N·m →  $80 \times 1.3 = 104\text{N}\cdot\text{m}$

**$104\text{ N}\cdot\text{m} < 130\text{ N}\cdot\text{m}$  (SEA-11-SR-MO) → OK!**

$104\text{ N}\cdot\text{m} > 50\text{ N}\cdot\text{m}$  (SEA-4-SR-MO) → Not OK!

### 3.5 Duty Cycle – IEC

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

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

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

- **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:**

✓ Motor 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.**

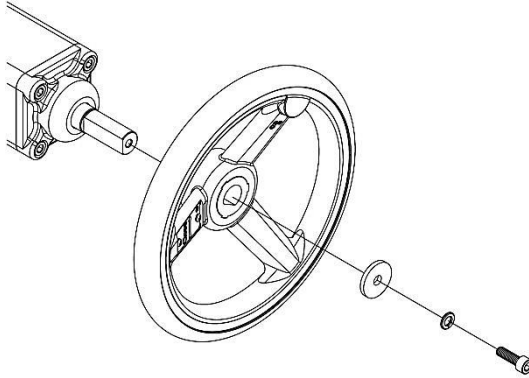
**⚠ A rest time is required after spring returned because the gear train and motor are driven during spring release.**

## 4. Mounting and Setup

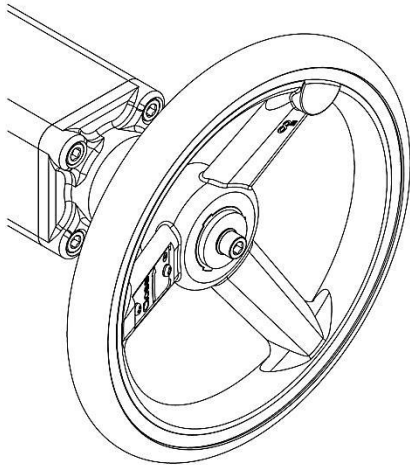
### 4.1 Manual Device Installation

- 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.**

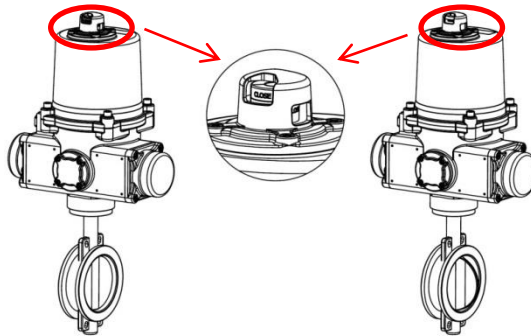


- b. Assembly completed as shown in the figure below.





## 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 7 to ensure actuator selected meets the application.
- b. The valve or damper must be rotated to fully-closed position before mounting with actuator if FAIL POSITION is fully-closed and vice versa.
- 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 plug to relieve the pressure inside the actuator for the ease of the top cover removal and gently remove the cover.  
**⚠ The power must be off before removing 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.9 to 14) for further instructions.
- j. Assemble the cover and secure cover screws firmly after setting.  
**⚠ Please ensure that the O-ring seal is in good condition prior to cover installation.**

### 4.3 Wiring Instructions

**⚠ Turn power off before making the electrical connection!**

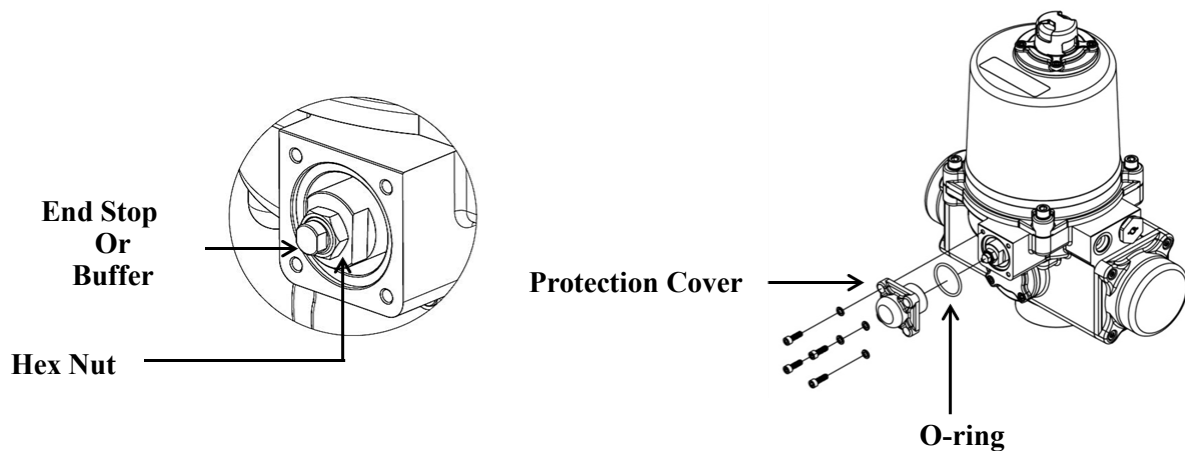
- Connect the ground wire to PE point placed on middle metal plate inside the electric actuator (a green screw).
- Each actuator is attached with a black water-proof plug and a temporary red dust-proof plug to conduit entries.
- ⚠ **Use correct size of fittings so as to not damage the threads.**
- Verify 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.**
- Use proper sealant to seal the conduit connection after wiring procedure to prevent dust or water from entering the actuator.
- ⚠ **The red plastic dust-proof plug is not meant for long-term use. Replace with suitable water-proof connector to ensure the enclosure protection rating.**

## 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.**
- ⚠ 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.

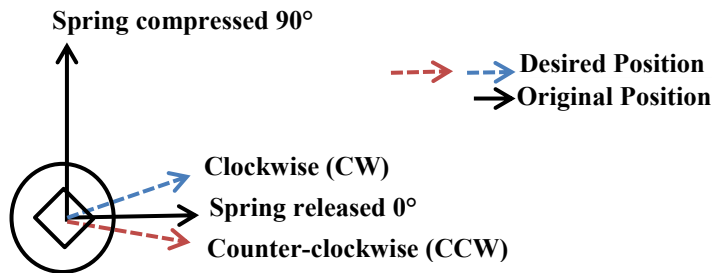
The actuator has been set and calibrated at the factory. Most of products will not require recalibration of these settings. However these are general settings. After valve and actuator are bolted together, apply power to drive the actuator to its fully-open (spring compressed). Then remove power to let 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.

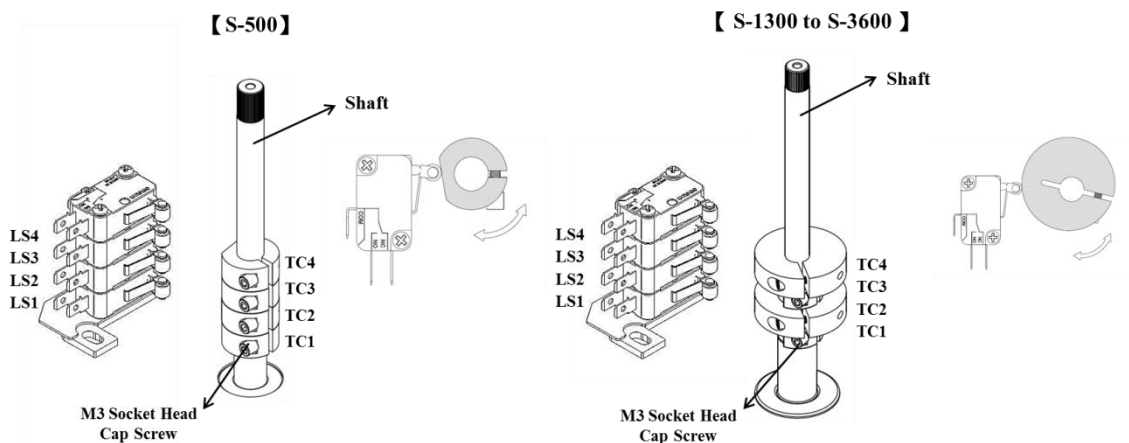


- SEA-4-SR-MO : One turn = 2.3 degrees
- SEA-11-SR-MO to SEA-23-SR-MO : One turn = 1.4 degrees

- 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.**

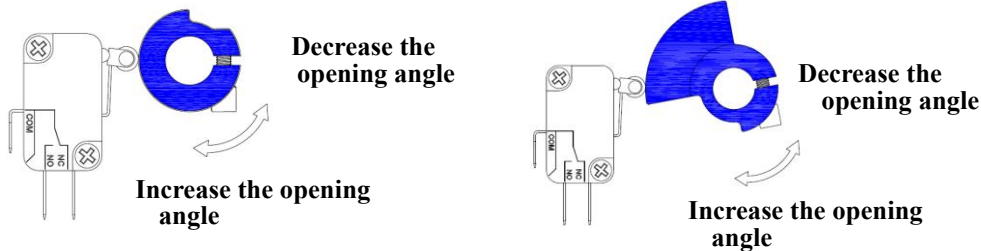
- e. Loosen the M3 cap screw of cam TC2 with a 2.5 mm hex key.
- f. Rotate the cam TC2 **counter-clockwise** until a light click is heard, and then slowly rotate the cam TC2 **clockwise** until a light click is heard.
- g. Tighten the cap screw of cam TC2.



- **Adjust FULLY-OPEN (spring compressed) stop point as steps below:**
  - a. 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.
  - b. Remove power to let spring system to drive back to its fully-closed (spring released) position.
  - c. 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.

**【SEA-4-SR-MO】**

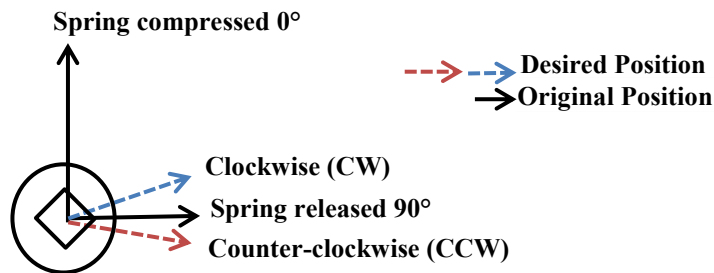
**【SEA-11-SR-MO to SEA-23-SR-MO】**



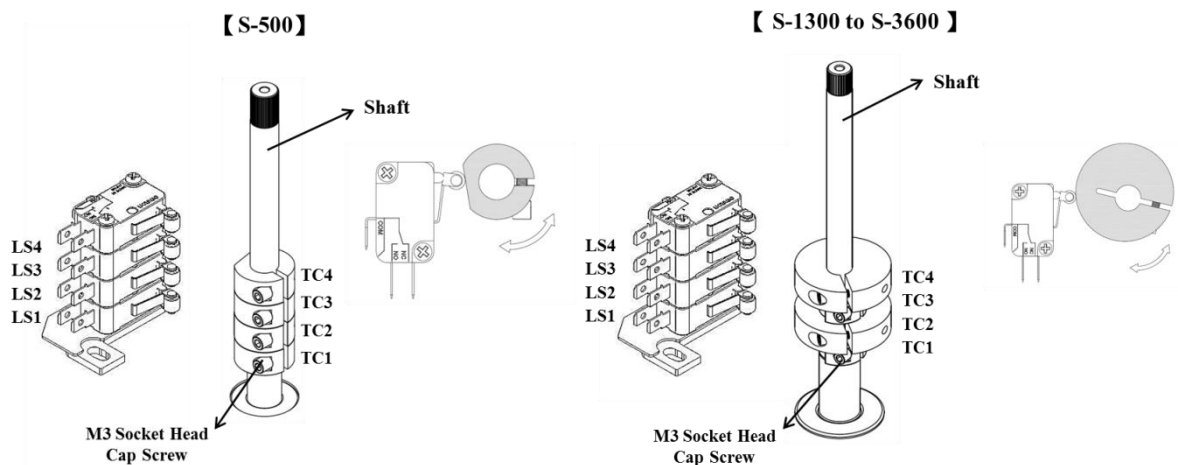
- d. After adjusting the cam, apply power to drive the actuator to the fully-open position.
- e. Verify that it is in the correct fully-open position.
  - If it is in correct position, remove power and lock the cap screw of cam TC1
  - If it is not in correct position, repeat step C until the correct position is reached.
- f. 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.

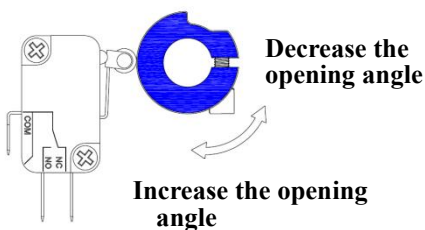


- SEA-4-SR-MO : One turn = 2.3 degrees
  - SEA-11-SR-MO TO SEA-23-SR-MO : One turn = 1.4 degrees
- d. Once completed, tighten the hex nut, replace the protection cover and tighten all screws.
- ⚠ If the buffer or end stop is adjusted, TC2 must be reset in accordance with the buffer or the end stop.**
- 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, the cam TC2 doesn't be trigger.
  - g. Tighten the cap screw of cam TC2.

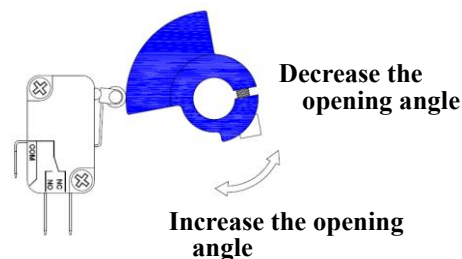


- **Adjust FULLY-CLOSED (spring compressed) stop point as steps below:**
  - a. Apply power to drive the actuator to its fully-closed (spring compressed) position. If the close stop point is not aligned with the valve or damper properly, then it must be adjusted.
  - b. Remove power to let spring system to drive back to its fully-open (spring released) position.
  - c. 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.

**【SEA-4-SR-MO】**



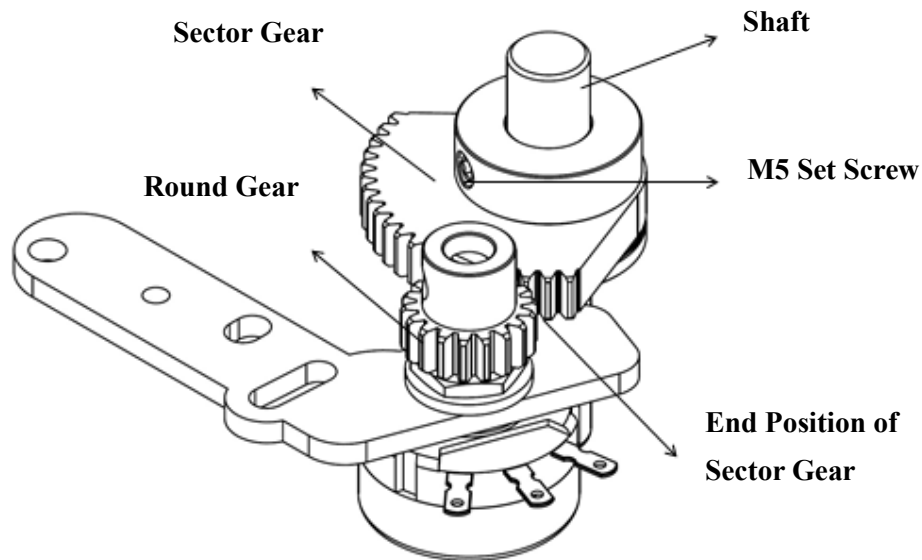
**【SEA-11-SR-MO to SEA-23-SR-MO】**





- d. After adjusting the cam, apply power to drive the actuator to the fully-closed position.
- e. 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.
- f. 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 position (spring released) and follow the procedure below:**

- a. Loosen M5 set screw.
- b. Rotate sector gear clockwise to the position shown in figure below.  
⚠ **Ensure that 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:**

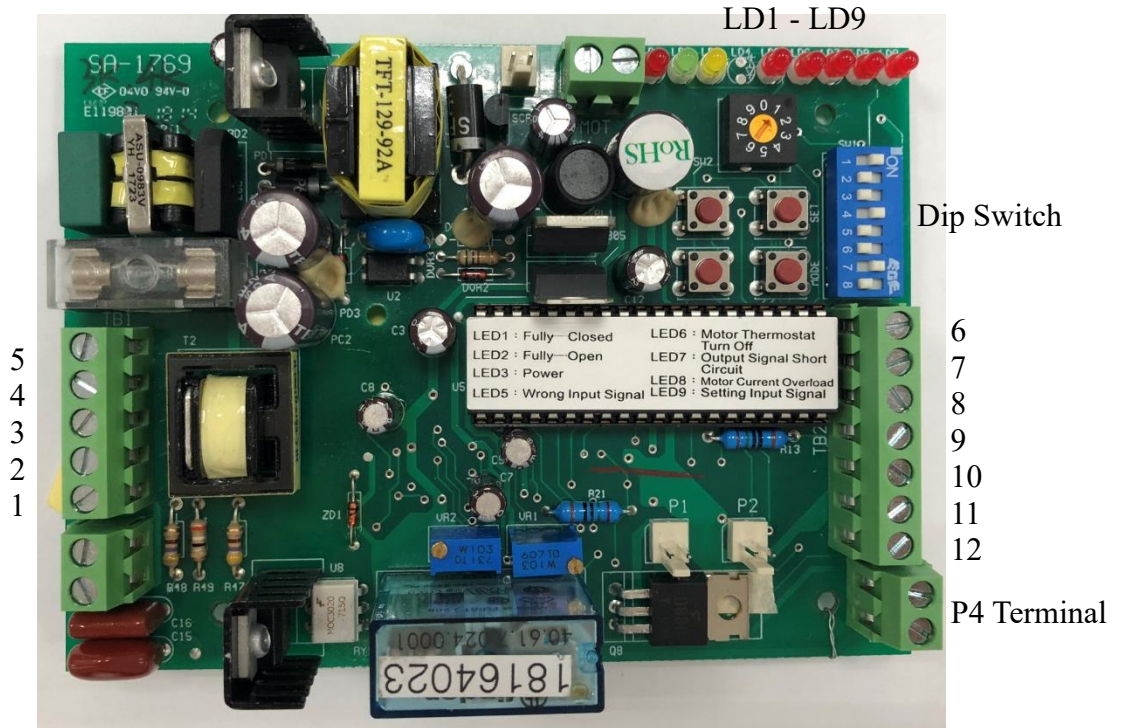
- LS2 shall trip while TC2 reaches the end stop point.
- TC3 & TC4 are optional, refer to P.11 & P.13 section 4.4.1 (f.) and 4.4.2 (f.) for calibration.



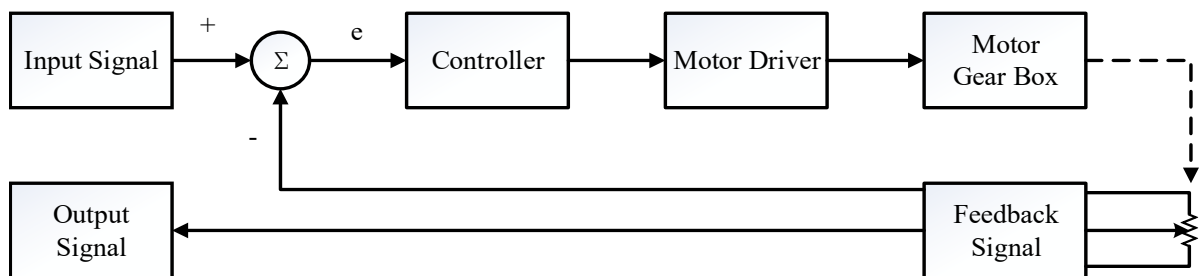
## 5. Modulating Control Board Adjustment

### 5.1 Modulating Control Board Surface

**The layout is based on 110/220V voltage.**

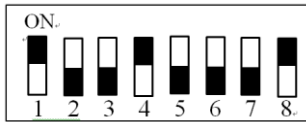


### 5.2 Programming



### 5.3 Dip Switch Setting (SW1)

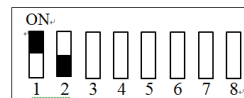
The Dip Switch SW1 is a combination of 8 switches and equally divided in two rows. It is utilized to select signal type of input as well as output and fail positioning when the input signal fails. The sliders can be placed at either ON (upper) or OFF (lower) state position. Factory settings are switches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

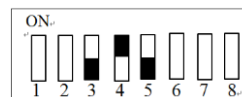
|                                                                                  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   |
|----------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>Factory Setting</b>                                                           | ON  | OFF | OFF | ON  | OFF | OFF | OFF | ON  |
| 4 - 20 mA input                                                                  | ON  | OFF |     |     |     |     |     |     |
| 1 - 5V input                                                                     | OFF | OFF |     |     |     |     |     |     |
| 2 - 10V input                                                                    | OFF | ON  |     |     |     |     |     |     |
| 4 - 20 mA output                                                                 |     |     | OFF | ON  | OFF |     |     |     |
| 2 - 10V 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 - 5V       | 1 at OFF, 2 at OFF |
| 2 - 10V      | 1 at OFF, 2 at ON  |

b. Output Signal Setting (switches 3 - 5)

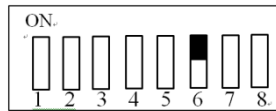


| Output Signal | State of Switches           |
|---------------|-----------------------------|
| 4 - 20 mA     | 3 at OFF, 4 at ON, 5 at OFF |
| 2 - 10V       | 3 at ON, 4 at OFF, 5 at ON  |

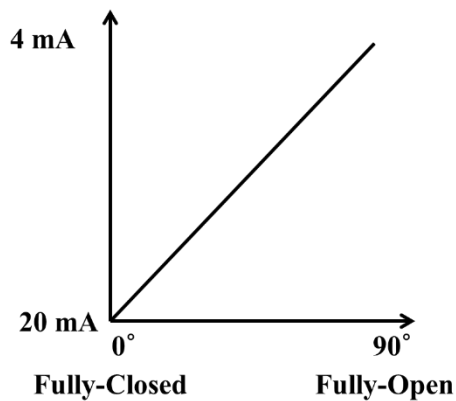
c. Setting of fail position when input signal failed (Switches 6 - 8)

**⚠ 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.



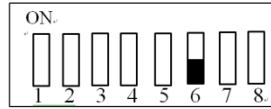
- When a low signal value is received, the actuator operates toward fully-open position and when a high signal value is received, the actuator operates toward fully-closed position.

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

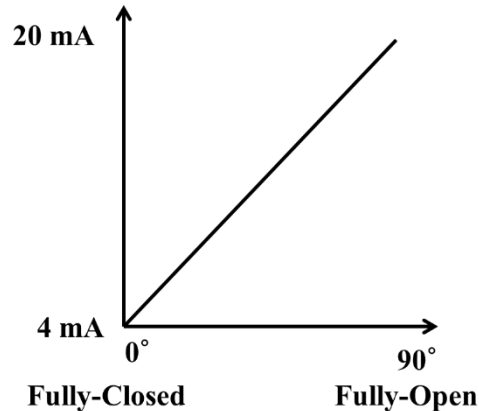
- The selection of the fail position while the input signal failed, please follow table below:

| 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 - 20 mA    | 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.  |

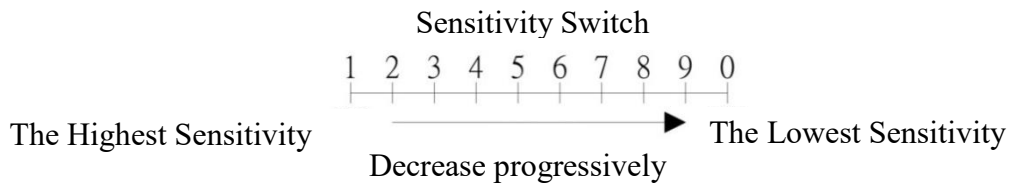
## 5.4 P4 Terminal

- 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.

## 5.5 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.


### 5.5.1 Setting



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

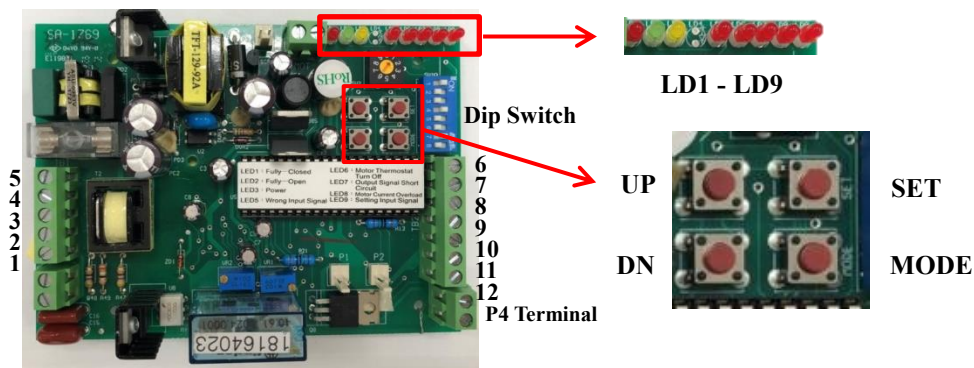
### 5.5.2 Original Factory Setting

- SEA-4-SR-MO to SEA-23-SR-MO: 3.

| Model                       | Figure                                                                               |
|-----------------------------|--------------------------------------------------------------------------------------|
| SEA-4-SR-MO to SEA-23-SR-MO |  |

## 5.6 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.**

## 5.7 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"> <li>a. No power supplied.</li> <li>b. Incorrect connection of the lines #8, #9 of the potentiometer</li> <li>c. Modulating controller failed.</li> </ul>                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>a. Check the power supply as well as wires connected to terminals #4 &amp; #5, please refer to 5 (P.15).</li> <li>b. Verify the actuator is wired properly as per wiring diagram.</li> <li>c. Send back to the factory for inspection.</li> </ul>                                                                                                                                       |
| LD5 goes on        | <ul style="list-style-type: none"> <li>a. An incorrect signal type inputted. For example, preset with 2 - 10 V input but input 4 - 20 mA.</li> <li>b. Input a voltage exceeding the rated. For example, preset with 2 - 10 V input but input 13.5 V.</li> <li>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.</li> </ul> | <p>Verify if the switch 1 is set in accordance with the type of input signal.<br/>Please refer to 5.3 (P.16 - P.18).</p>                                                                                                                                                                                                                                                                                                       |
| LD6 goes on        | Motor thermal protector started.                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>a. The duty cycle exceeded the rated, please refer to 3.5 (P.5).</li> <li>b. The contact of motor thermal protector (MOT) disconnected.</li> </ul>                                                                                                                                                                                                                                      |
| LD7 goes on        | <ul style="list-style-type: none"> <li>a. Signal output short circuit.</li> <li>b. The input signal type 2 - 10 V with reversed polarity.</li> </ul>                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>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.</li> <li>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.</li> </ul> |
| LD8 goes on        | Motor over-current.                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>a. Duty cycle exceeded the rated. Please refer to 3.5 (P.5) and reduce the duty rating.</li> <li>b. Check the load.</li> <li>c. Check if the motor rotor is locked (For example: Valve is stuck by foreign objects).</li> </ul>                                                                                                                                                         |
| LD9 goes on        | Local setting mode - Setting position for open & close.                                                                                                                                                                                                                                                                                                                                                                                                                     | After completing setting, press "SET" switch to quit.                                                                                                                                                                                                                                                                                                                                                                          |

## 6. Troubleshooting

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

### Floating Controller

#### Motor does not operate or overheats

| Possible problems                                                                                                    | Solution                                                                                         |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| a. The seating torque of valve increased caused by oxidized seals and has resulted in a torque overload on actuator. | a. Manually operate or replace the valve.                                                        |
| b. Jammed pipe or valve seat stuck.                                                                                  | b. Check if any blockage or obstacle in pipe and remove.                                         |
| c. Motor shaft or bearing were stuck.                                                                                | c. Replace them.                                                                                 |
| d. The limit switch for fully-closed does not trip (with manual override).                                           | d. Operate the actuator manually to fully-closed position and confirm if the limit switch trips. |
| e. The limit switch for fully-closed does not trip (without manual override).                                        | e. Check if a torque overload caused by the valve.                                               |

#### The actuator functions normally but motor is hot.

| Possible problems                                                          | Solution                                                                                                                |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| a. Actuator operates too frequently and exceeded duty cycle rating.        | a. Adjust the system bandwidth or reduce the frequency of operation.                                                    |
| b. A torque overload caused by the valve.                                  | b. This problem happened frequently after valve operating for a long time. It is suggested to replace with a new valve. |
| c. Supply voltage was too high or too low, out the tolerance of deviation. | c. Check if the operating current values are higher than the rated values.                                              |
| d. Wrong power supply.                                                     | d. 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                                                                                                                      |
|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| a. The actuator is not properly installed onto the valve.                                      | a. Contact technical department to solve the problem.                                                                         |
| b. The torque of valve is larger than the torque of actuator.                                  | b. Replace with a new valve or a larger size actuator.                                                                        |
| c. The cap screw of the cam loosened and resulted in that the travel end positions misaligned. | c. Readjust the mechanical end stops and limit switches, please refer to 4.4 ( P.9 - 14).                                     |
| d. The OPEN and CLOSE end stop points of actuator are not aligned with valve.                  | d. Disassemble the actuator from the valve and reassemble them 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 + 65 °C (- 22 °F to +149 °F). |

**Modulating Controller**

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

| Solution             |
|----------------------|
| Refer to 5.7 (P.21). |

**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                                                                                                                       |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| a. Potentiometer failed.                      | a. Replace with a new potentiometer.                                                                                           |
| b. The sector gear of potentiometer loosened. | b. Remove the input signal wires and operate the actuator to fully-closed. And then recalibrate VR, please refer to 4.4 (P.9). |
| c. Input wrong signal type.                   | c. Check if the input signal is correct, please refer to 5 (P.15 - P.18).                                                      |
| d. Modulating board failed.                   | d. Send back to factory for inspection.                                                                                        |