



Valves, Automation & Controls

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INSTALLATION, OPERATIONS AND MAINTENANCE FOR SHARPE® SEA ELECTRIC ACTUATORS



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OVERVIEW

Sharpe® electric quarter-turn actuators offer a wide range of torque output models. The product design is based on a self-locking worm drive principal, which provides for a smooth running, dependable, robust drive system. All models are ISO 5211 compliant and most have a visual position indicator on top of actuator cover and manual override

LUBRICATION

The gearbox of the Sharpe® actuator is enclosed, and it has already been lubricated sufficiently with high temperature lubricant at the factory and should not require any attention unless it has leaked out.

IMPORTANT NOTICES & MAINTENANCE

➤ Notices:

- Make sure the voltage is correct before wiring.
- Turn off power before for maintenance purposes.
- Seal the casing and conduit entrance after wiring to prevent dust or water contamination.
- The angle of installation must between 0~180°. Do not install upside down or below the horizontal.
- Do not install when hazardous or explosive gases may be present.
- The frequency of open and close is restricted based on duty cycle. Avoid too high frequency.

Duty Cycle – compliance to IEC standard

"Duty cycle" means the starting frequency.

The formula: $\text{Running Time} \div (\text{Running time} + \text{Rest Time}) \times 100\% = \text{duty cycle}$
 $\text{Rest Time} = \text{Running Time} \times (1 - \text{duty cycle}) \div \text{duty cycle}$

For example : The running time for SEA 8 is 15 sec.

30% duty cycle $15 \times [(1 - 30\%) / 30\%] = 35 \rightarrow$ The rest time will be 35 sec.

75% duty cycle $15 \times [(1 - 75\%) / 75\%] = 5 \rightarrow$ The rest time will be 5 sec.

If the duty cycle is higher, the rest time will be shortened. It means the starting frequency will be higher.

- When more than one electric actuator needs to operate simultaneously, please connect individually.
- Always connect the ground wire to the inside of the electric actuator.
- Not intended for vacuum spaces and avoid installing near explosive atmospheres.
- To avoid functional failure caused by statics, do not touch any components on the PCB with metal tools or bare hands.

➤ Storage:

- The actuator should be placed in a clean and dry place, and protected from the weather and extreme vibration.



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- If actuator needs be stored outside, it must be protected from excess moisture, dust, and weather.

INSTALLATION

1. Before mounting actuator, verify that the torque requirement is less than the output torque of the actuator. (The suggested safety factor is 30% of the max. torque of valve.)
 1. **For example :**
If the maximum valve torque is 80Nm - 80×1.3 (safety factor) =104 Nm
 $104\text{Nm} < 150\text{Nm}$ SEA 13 is **OK!**
 $104\text{Nm} > 90\text{Nm}$ SEA 8 is **not OK!**
2. Check if the output shaft fits to the stem of valve before inserting into actuator. Please use mounting plate or adapter to connect if it does not match.
3. Insert output shaft adapter into actuator. Make sure it fits satisfactory.
4. Determine that actuator position, open or closed, matches with position of equipment prior to mounting. Use manual override to change position if necessary.
5. Remove valve's manual device and mount on the proper connection.



CAUTION: Don't remove any necessary parts for the proper operation of the valve.

6. Check again that the valve and actuator are in the same position.
7. Install the actuator to valve directly or with mounting kits, then tighten all screws and nuts.
8. Remove actuator cover.



CAUTION: Be sure power is off at the main power box.

9. Wire actuator using the wiring diagram inside cover.



CAUTION: For the 3-Phase on-off controller actuator, please use the hand-wheel to turn the actuator to 45 degree before test. If the operating direction is opposite after supplying power, please change any two of the U, V, W.

10. Supply power to actuator.



CAUTION: Use remarkable mark warning "there are live circuits that could cause electrical shock or death".

11. Make sure if it is needed to calibrate the fully-open or fully-closed position of the actuator.
12. If the actuator is modulating type make sure set the required settings.



CAUTION: Turn power off before changing any setting.

13. Replace cover and secure cover screws.



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SPECIFICATIONS

➤ 12V/24V

Model No.	Max Torque		Speed (90°)	Motor Power	12V DC/AC			24V DC/AC		
	Nm	lb-in			Run	Start	Lock	Run	Start	Lock
SEA 3	35	310	15s	10W	1.9A	2.0A	2.8A	1.1A	1.1A	1.6A
SEA 4	50	443	20s	10W	1.3A	1.5A	2.8A	0.8A	0.9A	1.6A
SEA 8	90	797	15s	40W	3.4A	5.2A	16.5A	2.2A	4.5A	14.5A
SEA 13	150	1328	22s	40W	4.4A	4.9A	16.5A	2.4A	5.0A	14.5A
SEA 35	400	3540	16s	80W	16.1A	16.1A	33.0A	8.5A	9.2A	30.0A
SEA 44	500	4425	22s	80W	14.1A	13.5A	33.0A	7.5A	9.0A	30.0A
SEA 57	650	5750	28s	80W	12.3A	12.5A	33.0A	7.0A	8.5A	30.0A
SEA 88	1000	8850	46s	80W				6.8A	7.8A	30.0A
SEA 132	1500	13275	46s	80W	25A	26A	59A	8.1A	8.0A	30.0A
SEA 177	2000	17700	58s	80W				8.8A	11.0A	26.0A
SEA 221	2500	22125	58s	80W	28A	60A	59A	11.8A	11.0A	26.0A
SEA 265	3000	26550	58s	220W				15.1A	11.0A	33.0A
SEA 310	3502	31000	58s	220W				17.8A	12.0A	33.0A

➤ Single Phase

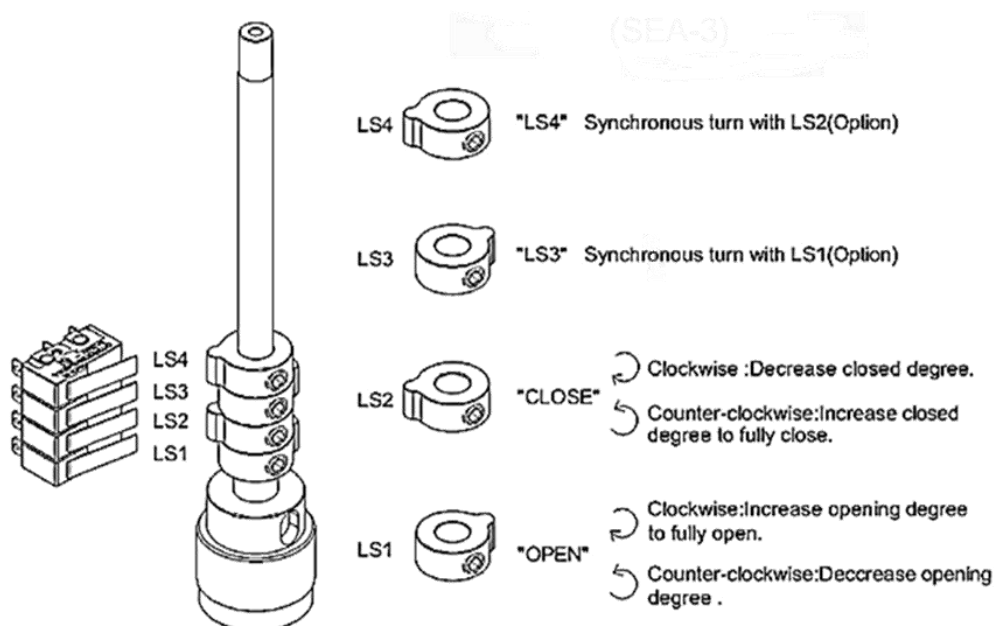
Model No.	Max Torque		Speed (90°)		Motor Power	110V Current			220V-240V Current		
	Nm	lb-in	60 Hz	50 Hz		Run	Start	Lock	Run	Start	Lock
SEA 3	35	310	12s	13s	10W	0.6A	0.6A	0.7A	0.3A	0.4A	0.4A
SEA 4	50	443	20s	24s	10W	0.6A	0.6A	0.7A	0.3A	0.4A	0.5A
SEA 8	90	797	15s	17s	40W	1.0A	1.8A	1.6A	0.5A	0.8A	0.9A
SEA 13	150	1328	22s	26s	40W	1.2A	1.8A	1.6A	1.0A	1.2A	0.9A
SEA 35	400	3540	16s	18s	80W	1.9A	3.8A	3.6A	1.1A	2.0A	2.2A
SEA 44	500	4425	22s	25s	80W	2.0A	3.8A	3.6A	1.1A	2.0A	2.2A
SEA 57	650	5750	28s	31s	80W	2.1A	3.8A	3.6A	1.1A	2.0A	2.2A
SEA 88	1000	8850	46s	55s	120W	3.1A	8.5A	9.0A	1.4A	4.1A	5.0A
SEA 132	1500	13275	46s	55s	120W	3.3A	9.0A	9.0A	1.6A	4.4A	5.0A
SEA 177	2000	17700	58s	70s	180W	3.3A	5.8A	5.9A	2.1A	3.8A	3.6A
SEA 221	2500	22125	58s	70s	180W	4.0A	6.5A	5.9A	2.3A	4.0A	3.6A
SEA 265	3000	26550	58s	70s	180W	4.5A	3.5A	5.9A	2.5A	4.2A	3.6A
SEA 310	3502	31000	58s	70s	220W	4.0A	8.0A	7.5A	2.4A	4.4A	4.8A

Note: It is the responsibility of the customer to determine the suitability of Sharpe® Valves products in their particular application.
 RUN= Operating; START= Start to operate; LOCK= When you input power to the actuator and the actuator can't operate.
 Disclaimer: Supplier shall not be liable or responsible for omissions or errors in its bulletin.

TRAVEL CAM & LIMIT SWITCHES ADJUSTMENT

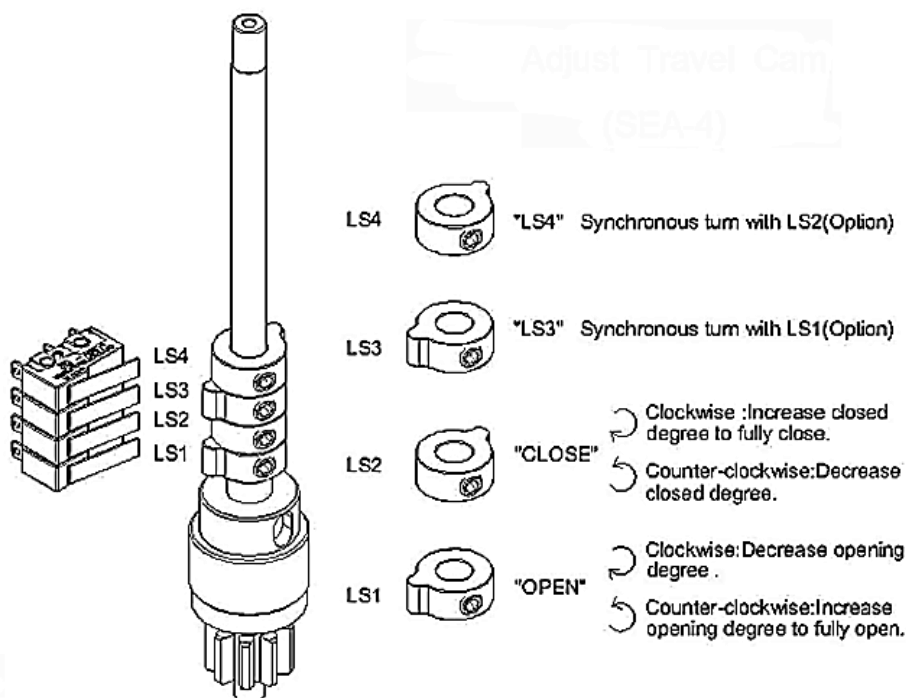
- The travel cams are set to control the open and closed position of the valve. LS1 & LS2 limit the maximum range by disabling the electric motor.
- LS3 & LS4 are optional. They allow external equipment to confirm that the valve has reached the fully open and fully closed positions.
 - **IMPORTANT:** If LS3 & LS4 are fitted, they should be set to trip prior to LS1 & LS2 to avoid over-travel.
- A 2.5mm hex key will be required to adjust cam settings.

➤ Travel Cam Adjustment –SEA 3

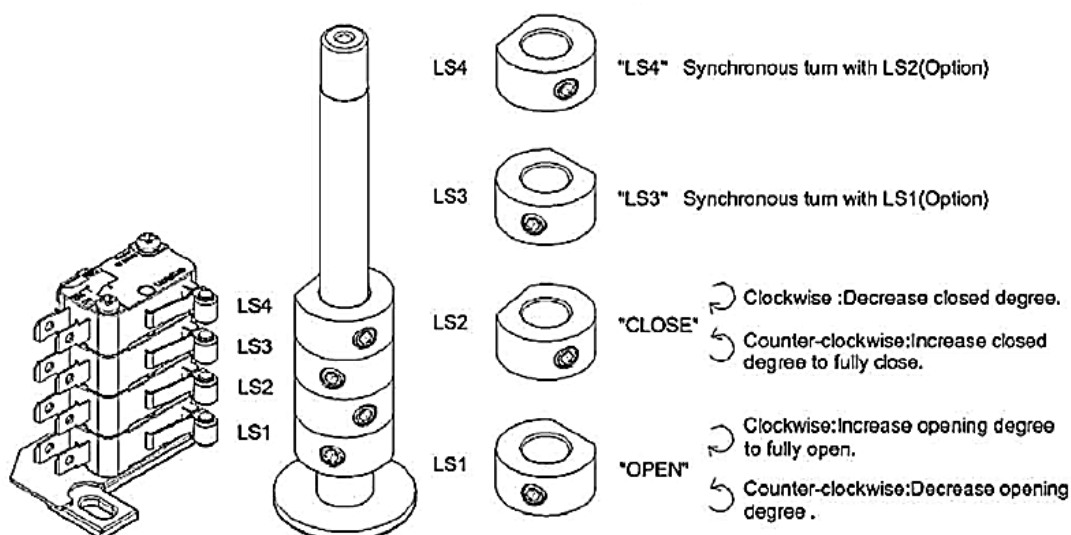


TRAVEL CAM & LIMIT SWITCHES ADJUSTMENT (cont.)

➤ Travel Cam Adjustment –SEA 4

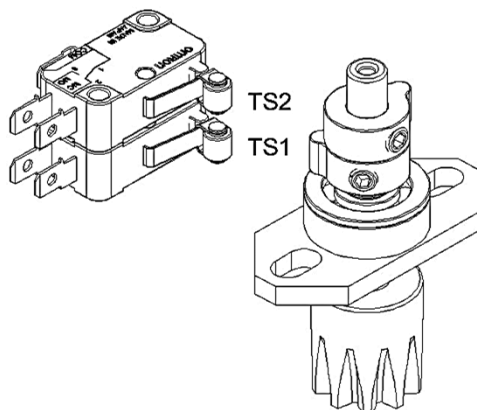


➤ Travel Cam Adjustment –SEA 8 - SEA310



TRAVEL CAM & TORQUE SWITCHES ADJUSTMENT

➤ Travel Cam Adjustment –SEA 8 - SEA310



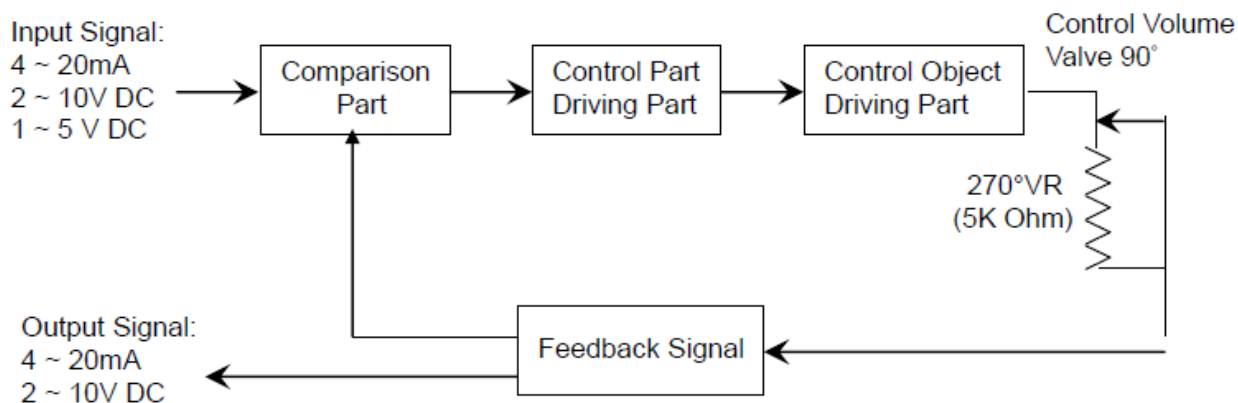
TS2
"CLOSE" ⤴ Counter-clockwise: Decrease the degree of torque setting.

⤵ Clockwise : Increase the degree of torque setting.

TS1
"OPEN" ⤴ Counter-clockwise: Decrease the degree of torque setting.

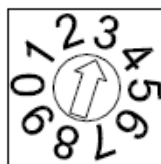
⤵ Clockwise : Increase the degree of torque setting.

MODULATING CONTROL BOARD PROCEDURE



Supplied Voltage : 24V DC / AC, 110V / 220V AC 1- Phase

SENSITIVITY SWITCH



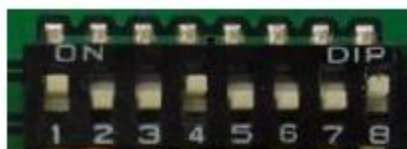
➤ Setting

- When switch is set to “1”:
 - The Highest Sensitive and the 0~90 degree can be divided up to around 50 times movement.
- When switch is set to “0”:
 - The Lowest Sensitive and the 0~90 degree can be divided up to around 10 times movement.
- The sensitivity decreases 5 times movement by sectors from SW1 to SW2, SW2 to SW3, SW3 to SW4 and so on.

DIP SWITCH SETTING

IMPORTANT: DO NOT ALTER SWITCH POSITIONS WHILE ACTUATOR HAS POWER

	1	2	3	4	5	6	7	8
Factory setting	ON	OFF	OFF	ON	OFF	OFF	OFF	ON
4~20mA input	ON	OFF						
1~5V input	OFF	OFF						
2~10V input	OFF	ON						
4~20mA output			OFF	ON	OFF			
2~10V output			ON	OFF	ON			
20mA / 5V / 10V means valve fully-open							OFF	
20mA / 5V / 10V means valve fully-closed							ON	
Close valve if input signal disconnected (when S6 sets “ OFF”)							OFF	ON
Open valve if input signal disconnected (when S6 sets “ OFF”)							ON	OFF





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DIP SWITCH SETTING (cont.)

➤ S1 & S2:

- INPUT SIGNAL SELECT
 - 4~20mA set 1-ON / 2-OFF.
 - 1~5V set 1-OFF / 2-OFF.
 - 2~10V set 1-OFF / 2-ON

➤ S3 & S4 & S5:

- OUTPUT SIGNAL SELECT
 - 2-10V set 3-ON / 4-OFF / 5-ON.
 - 4-20mA set 3-OFF / 4-ON / 5-OFF.

➤ Position Select:

- S6 ON
 - 4mA, 2V, 1V = valve fully-open.
 - 20mA, 10V, 5V = valve fully-closed.
- ❖ S7 & S8 – Position Select when input signal fails
 - Valve fully-closed set 7-ON / 8-OFF.
 - Valve fully-open set 7-OFF / 8-ON.
 - Valve stops set 7-ON / 8-ON or 7-OFF / 8-OFF.
- S6 OFF
 - 4mA, 2V, 1V valve fully-closed.
 - 20mA, 10V, 5V valve fully-open.
- ❖ S7 & S8 – Position Select when input signal fails
 - Valve fully-closed set 7-OFF / 8-ON.
 - Valve fully-open set 7-ON / 8-OFF.
 - Valve stops set 7-ON / 8-ON or 7-OFF / 8-OFF.

Even if S6 is adjusted, the feedback signal will not change.



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OPEN AND CLOSE SETTING (SEA 3 & SEA 4)

The settings are set at factory, though in some cases re-set may be required when a particular rate of signal is requested

➤ Settings for OPEN and CLOSE

- o The function of VR
 - Adjust output signal/input signal
 - VR1— Adjust 10V, 20mA (Input signal: fully-open)
 - VR51— Adjust 10V, 20mA (Output signal: fully-open)
 - VR2 — Adjust 2V, 4mA (Input signal: fully-closed)
 - VR52 — Adjust 2V, 4mA (Output signal: fully-closed)

Note: If it is necessary to adjust VR51 and VR52, VR1 and VR2 also need to be adjusted accordingly.



- o Rotate VR1 counterclockwise until a light click is heard, then supply 10V (or 20mA) to modulating board. Slightly rotate VR1 clockwise until green LED keeps on. Adjust VR51 to complete.
 - VR51:
 -  Clockwise: decreasing signal.
 -  Counterclockwise: increasing signal.
- o Rotate VR2 clockwise until a light click is heard, then supply 2V (or 4mA) to modulating board. Slightly rotate VR2 counterclockwise until red LED keeps on. Adjust VR51 to complete.
 - VR52:
 -  Clockwise: decreasing signal.
 -  Counterclockwise: increasing signal.

OPEN AND CLOSE SETTING (SEA 8 & SEA 310)

The settings are set at factory, though in some cases re-set may be required when a particular rate of signal is requested

- Open Setting
 - o Keep pressing “SET” for 2 seconds, then LD 9 comes on, it will enter to the manual mode.
 - o Keep pressing “UP” until actuator runs to fully-open position, LD2 comes on, then supplies the input signal (5V or 10V or 20mA).
 - o Press “MODE” once. The OPEN setting is completed.
- Close Setting
 - o Keep pressing “DOWN”, until actuator runs to fully-closed position, LD1 comes on , then supplies input signal (1V or 2V or 4mA).
 - o Press “MODE” once. The CLOSE setting is completed.

After completing the above settings, press “SET” once

- Adjust Output Signal
 - o VR2:
 -  Clockwise: increasing signal.
 -  Counterclockwise: decreasing signal.

MECHANICAL STOPS

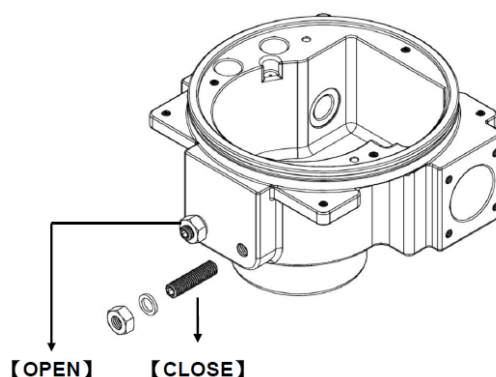
Mechanical stops should only be reached during manual operation. They are factory set, though in some cases adjustment may be required once a valve is fitted.

- For Electric Operation:
 - o Please refer to Travel Cam & Limit Switches Adjustment section of this document.

MECHANICAL STOPS (cont.)

- For Manual Operation:
 - Set the open stop.
 - Remove power from actuator.
 - Loosen locknut on the open stop stud (left side) and unscrew it a few turns.
 - Unscrew the stop stud.
 - Manually turn the actuator to the desire limit position.
 - Screw in the stop stud until it contacts the internal cam, then reverse one rotation.
 - Tighten the locknut.
 - Check that the electrical limit switches can still be reached.
 - Set the close stop.
 - Remove power from actuator.
 - Loosen locknut on the close stop stud (right side) and unscrew it a few turns.
 - Unscrew the stop stud.
 - Manually turn the actuator to the desire limit position.
 - Screw in the stop stud until it contacts the internal cam, then reverse one rotation.
 - Tighten the locknut.
 - Check that the electrical limit switches can still be reached.

Failures to ensure the electrical limit switches are reached before the mechanical stops are hit, when operating in electric mode, can cause personal injury or damage to the actuator.



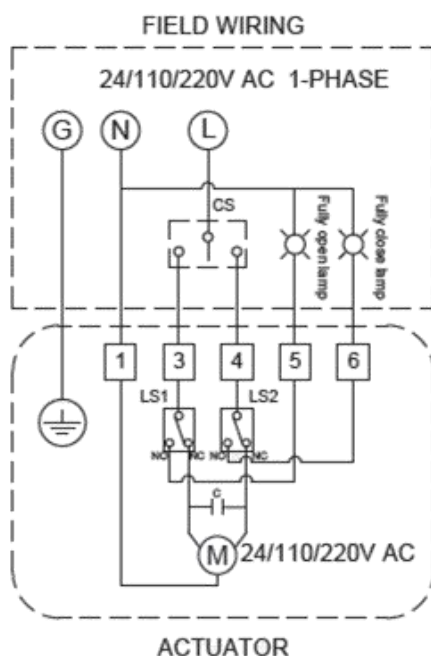


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WIRING DIAGRAMS

The wiring diagrams provided are for Sharpe® standard actuators, for special order actuators or versions not listed please contact Sharpe® Valves for the correct wiring diagram.

➤ SEA 1- 24/110/220V AC



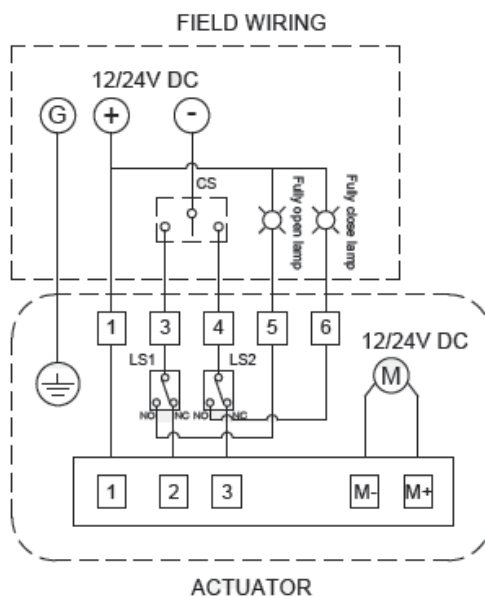
- Use proper wire size and fuse to prevent actuator failure. The data is provided below to assist on the selection of the proper wire and fuse.

Wire Gage	Max Current	Fuse
24(0.205mm ²)	3A	2A

TERMINALS:
N connects to 1.
L connects to 3 for OPEN.
L connects to 4 for CLOSE.

LS - Limit switch.
CS - Control switch or relay.

➤ SEA 1- 12/24V DC



- Use proper wire size and fuse to prevent actuator failure. The data is provided below to assist on the selection of the proper wire and fuse.

Wire Gage	Max Current	Fuse
24(0.205mm ²)	3A	2A

TERMINALS:
N connects to 1.
L connects to 3 for OPEN.
L connects to 4 for CLOSE.

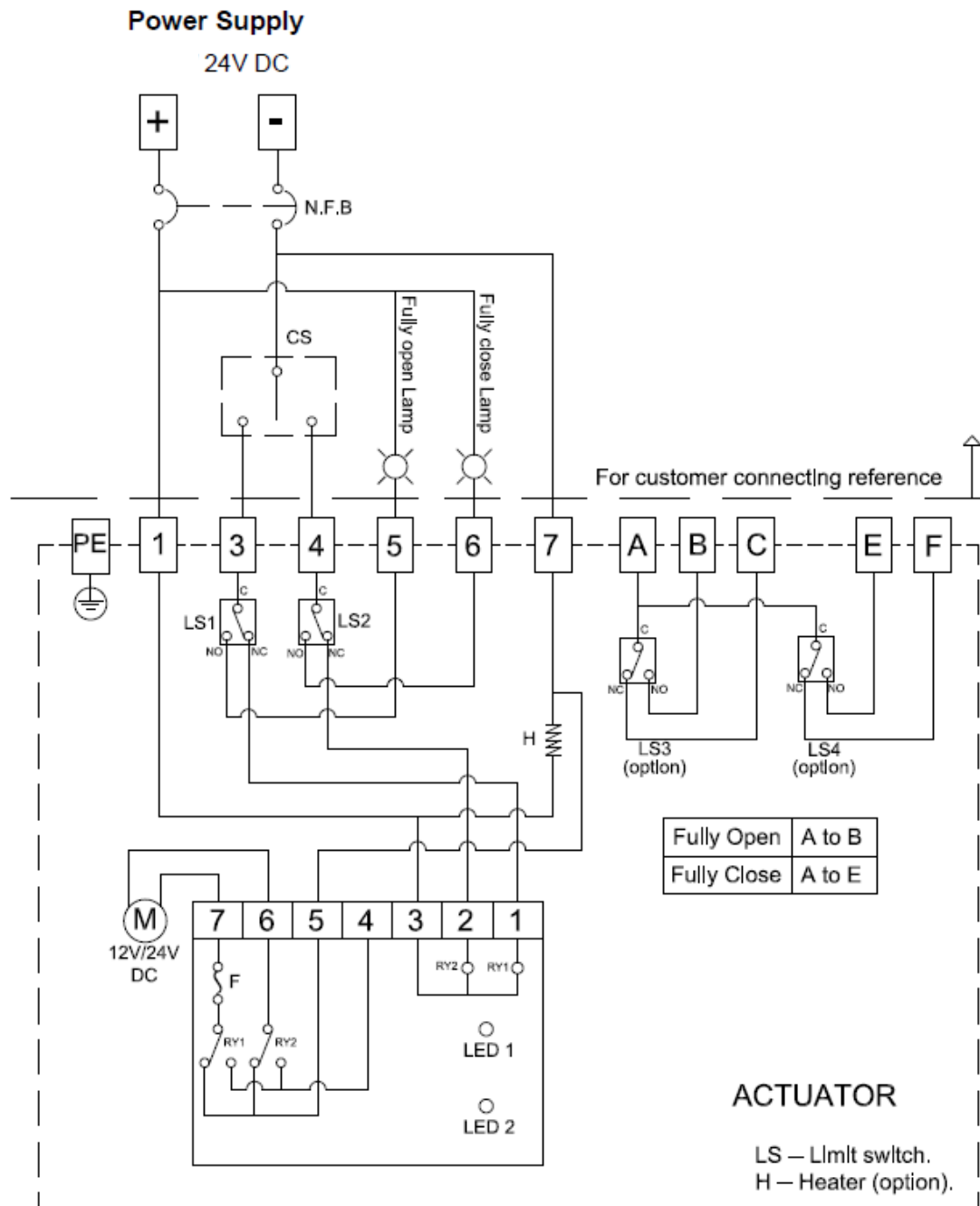
LS - Limit switch.
CS - Control switch or relay.



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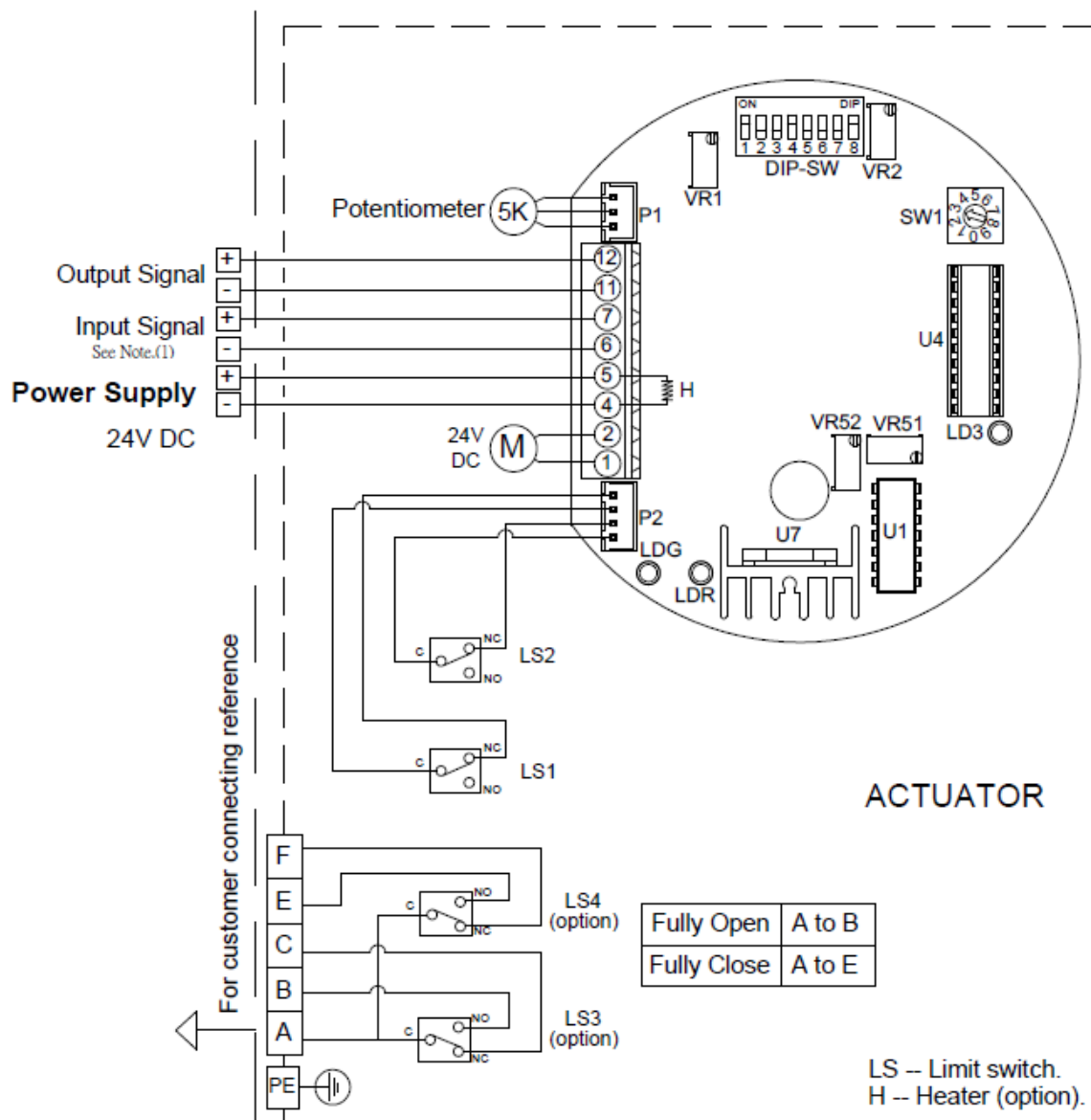
➤ SEA 3-4: 24V DC – 30% Duty Cycle



NOTE:

1. "+" connects to #1, "-" connects to #7.
2. "-" connects to #3 for "OPEN", "-" connects to #4 for "CLOSE".
3. Using less than 3A current for "A, B, C, E, F".
4. Using battery to supply power for DC units.

➤ SEA 3-4-PP: 24V DC – 75% Duty Cycle Modulating Controller



NOTE :

1. **Modulating Board**

a. Input Signal : 4~20mA, 1~5V, 2~10V

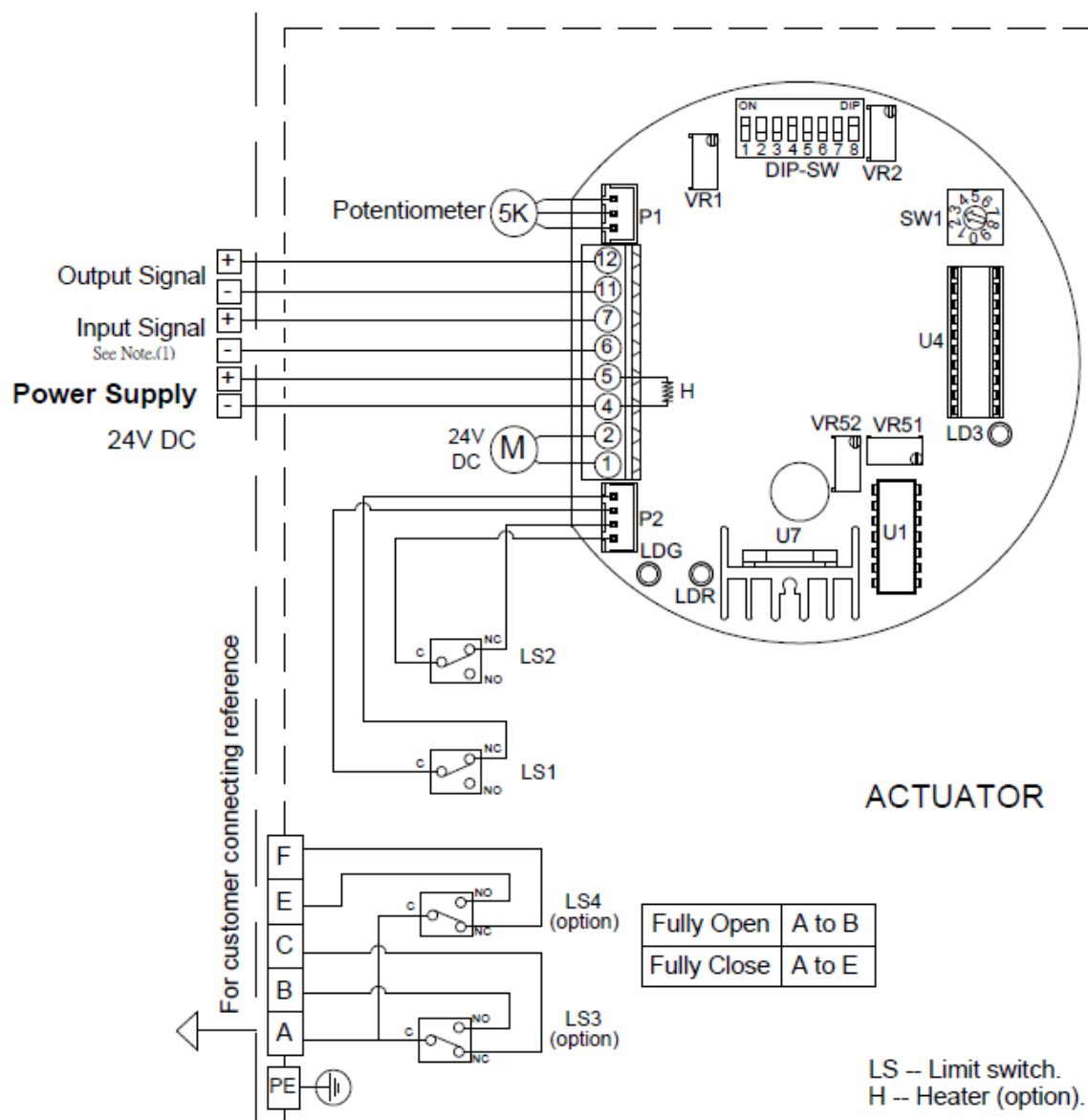
(It is suggested to use the shielding wire and its length should not exceed 30m.)

b. Output Signal : 4~20mA, 2~10V

2. Using less than 3A current for "A, B, C, E, F".

3. Using battery to supply power for DC units.

➤ SEA 4-4-PP: 24V DC – 75% Duty Cycle Modulating Controller



NOTE :

1. Modulating Board

a. Input Signal : 4~20mA, 1~5V, 2~10V

(It is suggested to use the shielding wire and its length should not exceed 30m.)

b. Output Signal : 4~20mA, 2~10V

2. Using less than 3A current for "A, B, C, E, F".

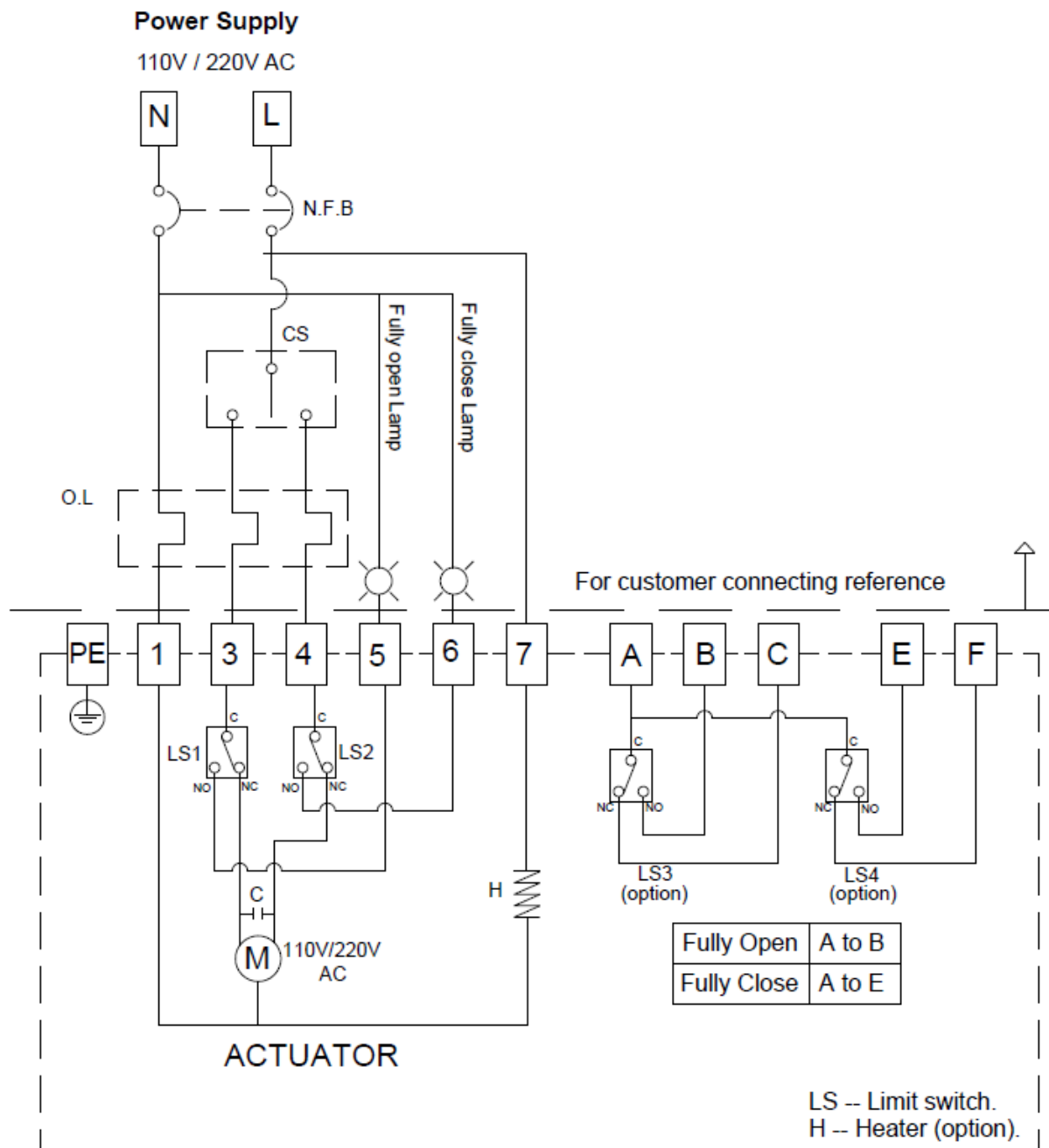
3. Using battery to supply power for DC units.



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➤ SEA 3 & SEA 4: 110V / 220V AC – 30% Duty Cycle



NOTE :

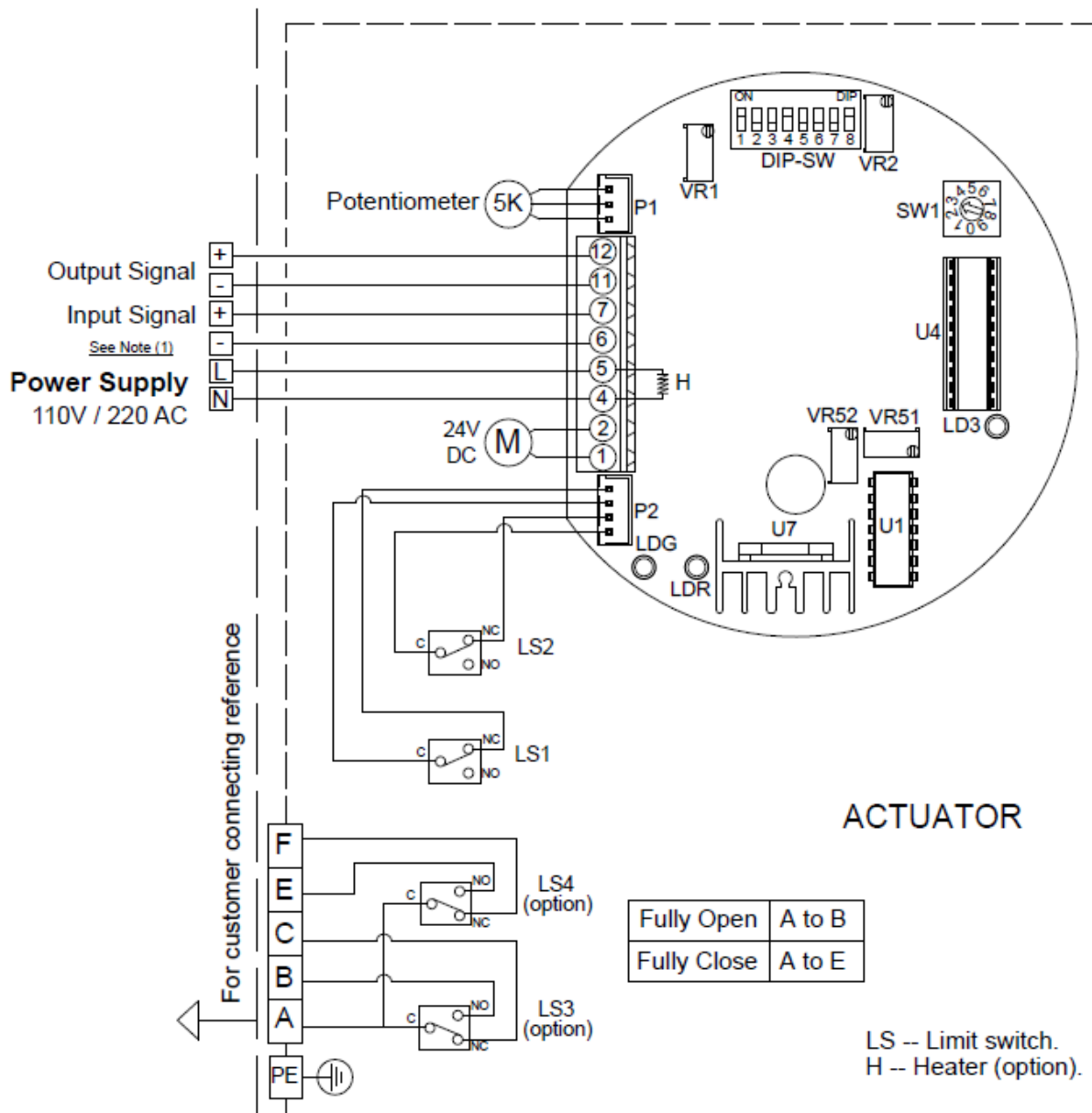
1. "N" connects to #1, "L" connects to #7.
2. "L" connects to #3 for "OPEN", "L" connects to #4 for "CLOSE".
3. Using less than 3A current for "A, B, C, E, F".



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➤ SEA 3-PP & SEA 4-PP: 110V / 220V AC-75% Duty Cycle Modulating Controller



NOTE:

1. Modulating Board

- Input Signal : 4~20mA, 1~5V, 2~10V
(It is suggested to use the shielding wire and its length should not exceed 30m.)
- Output Signal : 4~20mA, 2~10V

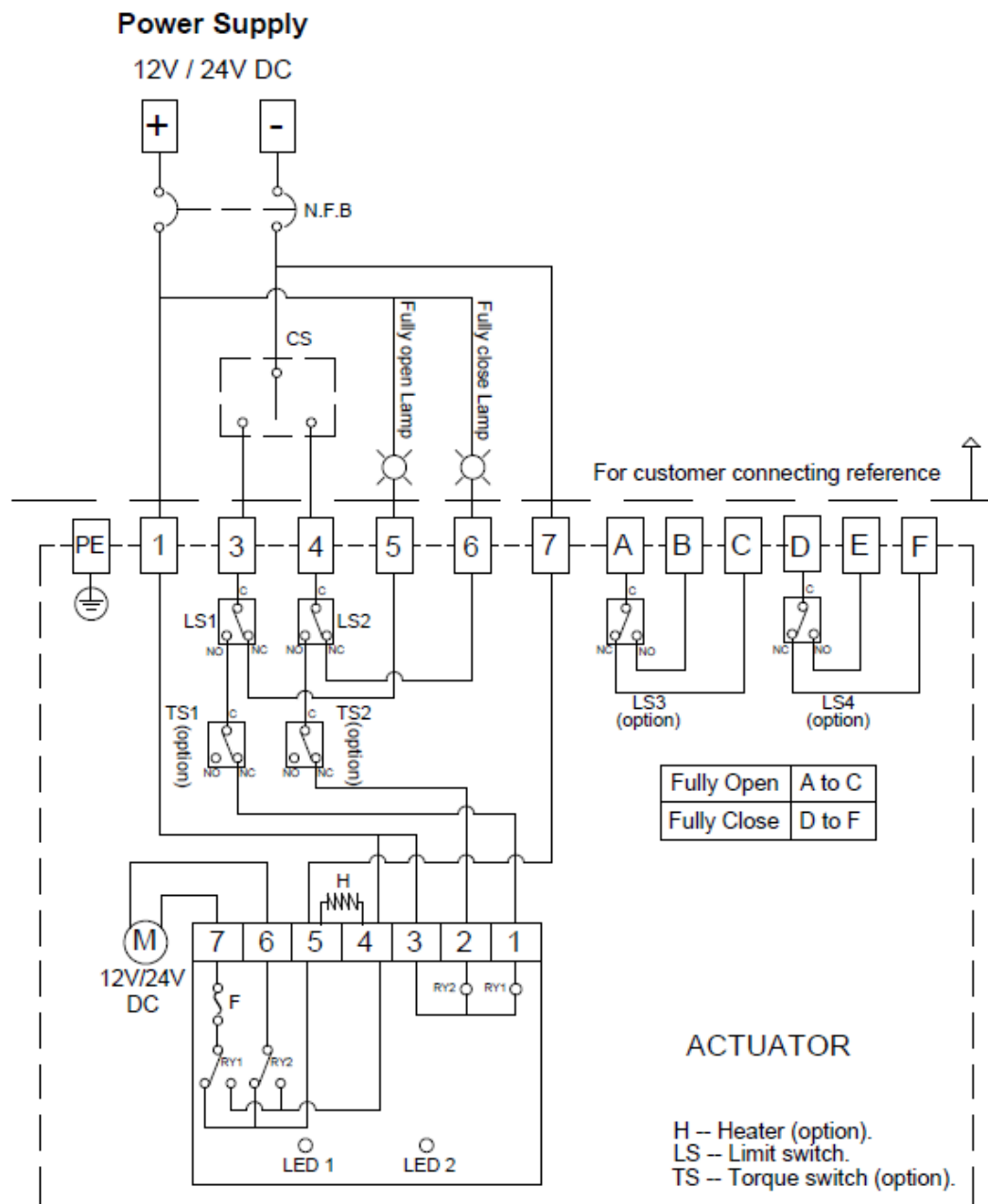
2. Using less than 3A current for "A, B, C, E, F".



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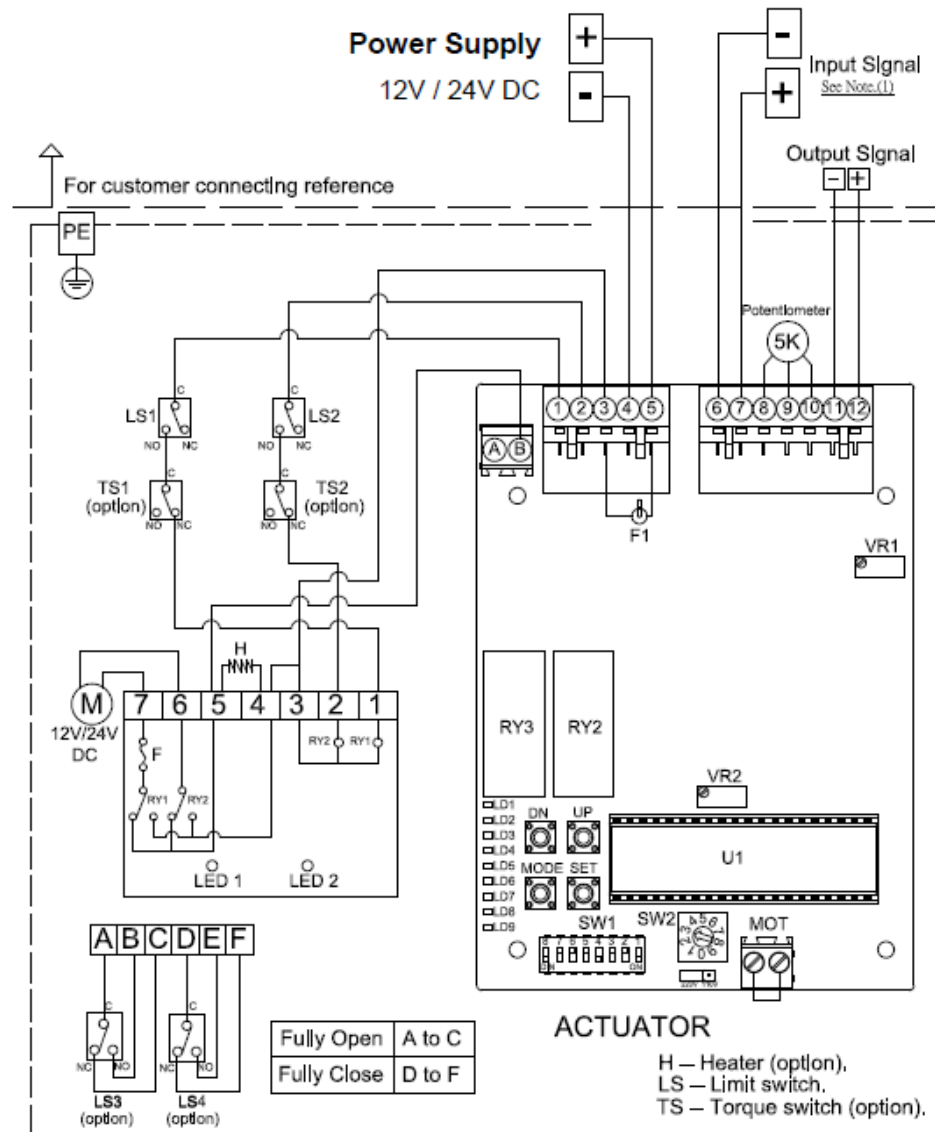
➤ SEA 8 – SEA 132: 12V / 24V DC – 30% Duty Cycle



NOTE:

1. "+" connects to #1, "-" connects to #7.
2. "-" connects to #3 for "OPEN", "-" connects to #4 for "CLOSE".
3. Using less than 5A current for "A, B, C, D, E, F".
4. Using battery to supply power for DC units.

➤ SEA 8-PP - SEA 132-PP : 12V / 24V DC-75% Duty Cycle Modulating Controller



NOTE:

1. Modulating Board

a. Input Signal : 4~20mA, 1~5V, 2~10V

(It is suggested to use the shielding wire and its length should not exceed 30m.)

b. Output Signal : 4~20mA, 2~10V

2. Using less than 5A current for "A, B, C, D, E, F".

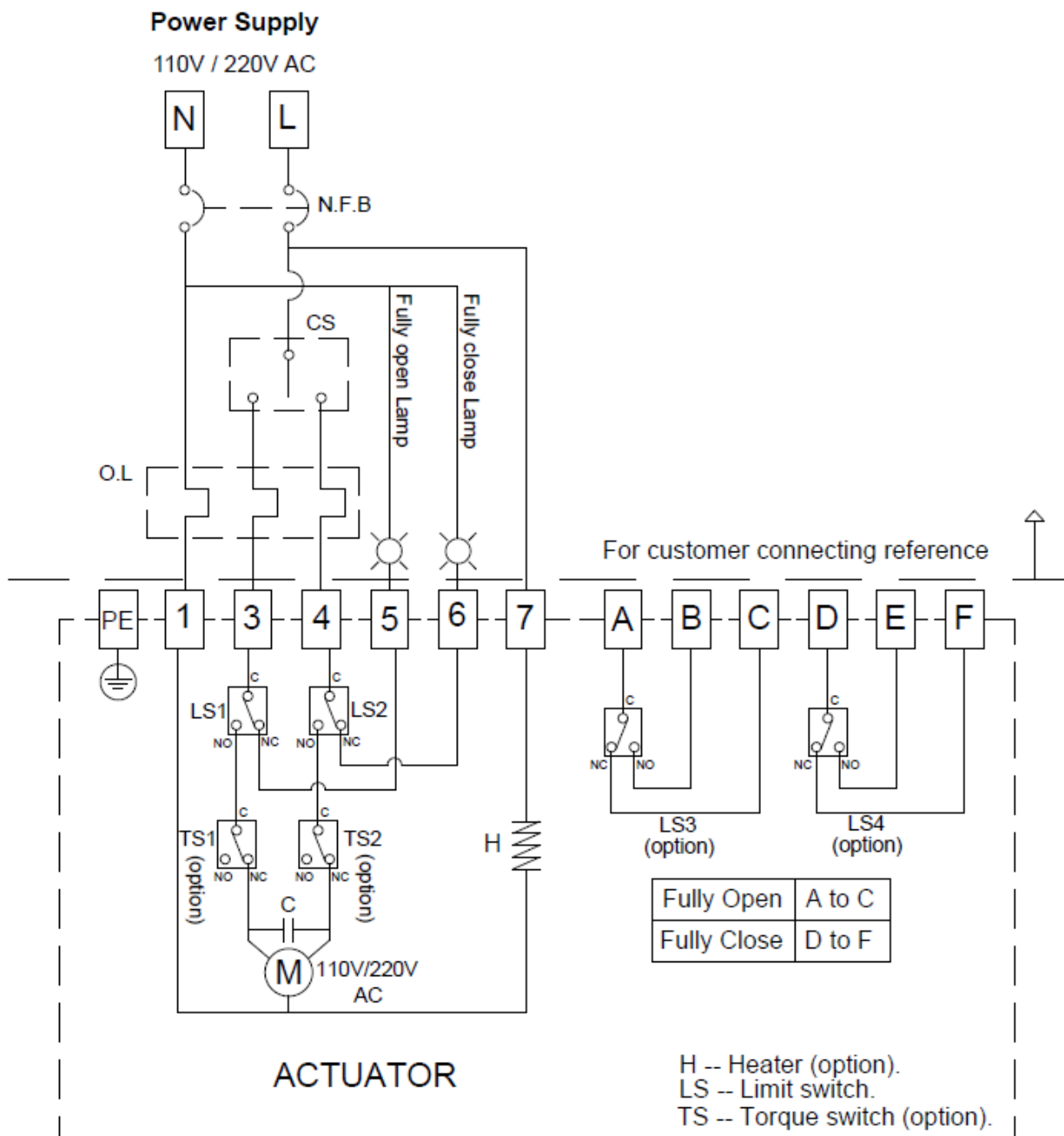
3. Using battery to supply power for DC units.



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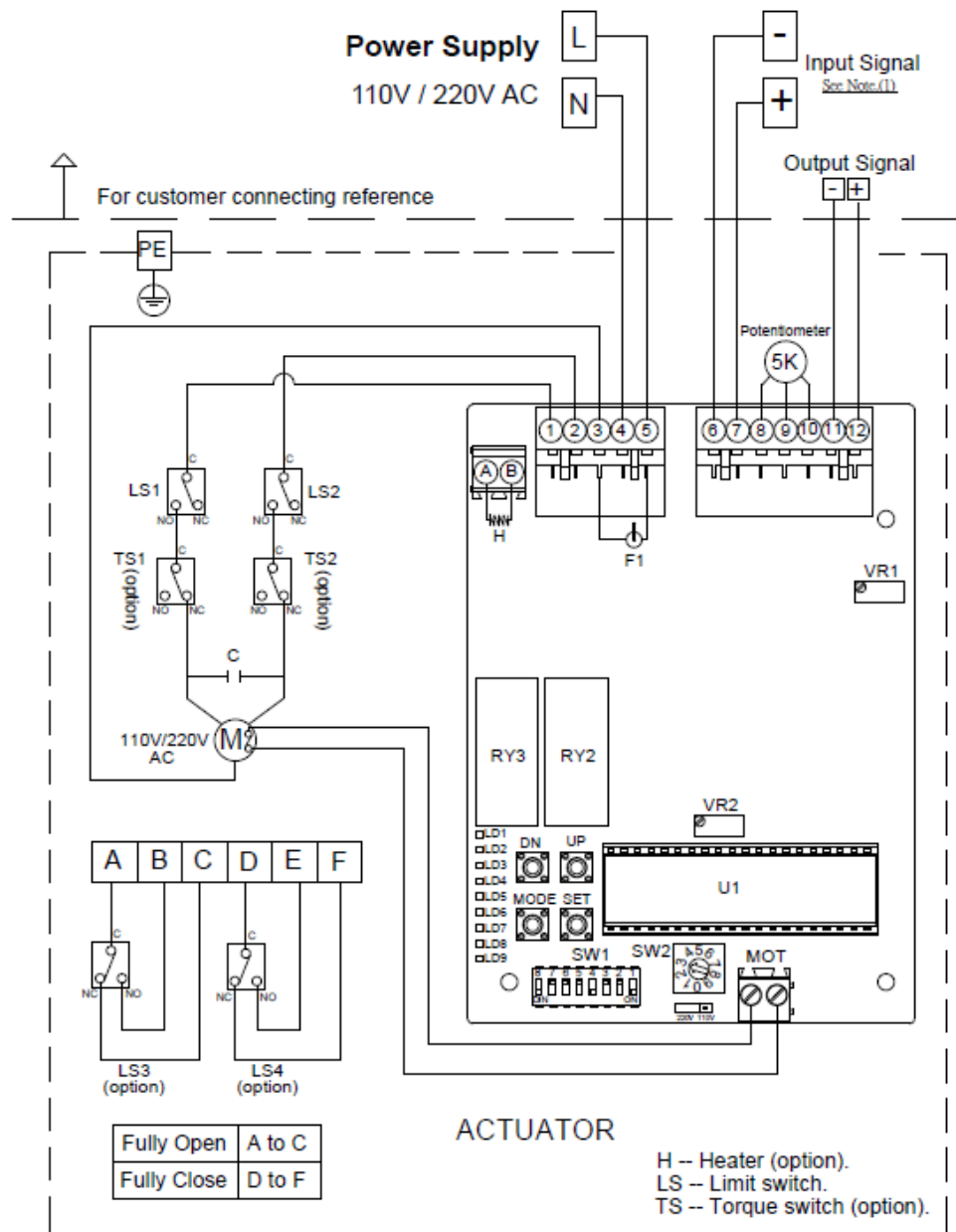
➤ SEA 8 – SEA 132: 110V / 220V AC – 30% Duty Cycle



NOTE :

1. "N" connects to #1, "L" connects to #7.
2. "L" connects to #3 for "OPEN", "L" connects to #4 for "CLOSE".
3. Using less than 5A current for "A, B, C, D, E, F".

➤ SEA 8-PP – SEA 132-PP: 110V / 220V AC–75% Duty Cycle Modulating Controller



NOTE:

1. **Modulating Board**

- Input Signal : 4~20mA, 1~5V, 2~10V
(It is suggested to use the shielding wire and its length should not exceed 30m.)
- Output Signal : 4~20mA, 2~10V

2. Using less than 5A current for "A, B, C, D, E, F".



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LAMP SIGNALS

LD1	Fully-closed	LD6	Motor thermostat turn off
LD2	Fully-open	LD7	Output signal short circuit
LD3	Power	LD8	Motor current is excessive
LD4	Abnormal Voltage	LD9	Manual Mode
LD5	Wrong input signal		

If the LED (LD4~LD9) is flashing under modulating control, refer to the following "Modulating Board Troubleshooting".

Lamp	Possibilities	Solution
No Lamp (LD3 off)	<ul style="list-style-type: none"> a. No power supply. b. The voltage is over 260V to cause the board burn out. c. Wrong connecting for the #8, #9 of the VR. d. Faulty Modulating board. 	<ul style="list-style-type: none"> a. Check the power supply and wiring (#4 & #5 of modulating board). b. Check the voltage. c. Check the wiring. d. Send back to factory for inspection.
LD5	<ul style="list-style-type: none"> a. Setting in 2-10V input signal but supply 4-20mA. b. Setting in 2-10V input signal, but the input signal is over 13.5V. <p>**Setting in 4-20mA but supply 2-10V signal. The actuator could still be operated within 2~7V. But if the signal is over 7.2V the LED5 will come ON.</p>	Confirm if the input signal is the same as dip switch setting (refer to P54~P55).
LD 6	Motor thermostat turns off.	<ul style="list-style-type: none"> a. Too high frequency for rated duty cycle(refer to P2). b. Motor thermostat (MOT) is not connected.
LD7	<ul style="list-style-type: none"> a. Output signal short circuit. b. Wrong connecting of the 2-10V input signal. 	<ul style="list-style-type: none"> a. Confirm the wiring of output signal #11(-) 、#12(+). b. Confirm the input signal for #6(-) 、#7(+).
LD8	Motor current is excessive.	<ul style="list-style-type: none"> a. Too high frequency for rated duty cycle (refer to P2). b. Check the load (refer to P4~P5). c. Check if the motor rotor is locked (For example: Valve is stuck by foreign objects).
LD9	Manual Mode - Setting position for open & close.	After completing the settings, press "SET" once.



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TROUBLE SHOOTING

➤ On-Off controller:

1. Motor does not operate and overheats

Possibilities	Solution
a. Supply power to #3 & #4 simultaneously (Parallel Connection).	a. Check the wiring.
b. The capacitor failed (whether the surface of the capacitor deforms).	b. Replace to a new part.
c. Valve's rubber is getting hardened or the valve's torque is excessive (it takes longer time to reach fully-closed position).	c. Use hand-wheel for test or change to a new valve.
d. Foreign objects in the flow stream.	d. Check if any obstructions
e. Broken motor stem or bearing.	e. Replace to a new parts
f. The limit switch for fully-closed does not trip.	f. Operate the actuator manually to fully-closed position and confirm if the limit switch trips.

2. The actuator is operated very well but the motor is hot.

Possibilities	Solution
a. Actuator operates too frequently (Starting frequency is too high).	a. Change system bandwidth or replace to a higher duty cycle actuator.
b. Overload.	b. This situation often happens after operating for a long time. It is suggested to replace to a new valve.
c. Under or over rated voltage.	c. Check the supply circuit.
d. Mechanical stops are reached by the gear train at fully-open or fully-closed position.	d. Reset the mechanical stops and cam.
e. Wrong power supply.	e. Check the power supply.

3. When operating two or more actuators simultaneously, the actuator works abnormally some times and the motor is getting hot.

Possibilities	Solution
Parallel connection.	a. Check current values and install a relay respectively.



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TROUBLE SHOOTING (cont.)

4. The valve can not fully-open or fully-closed by either power supply or hand-wheel.

Possibilities	Solution
a. The actuator does not mount with the valve tightly during installation process.	a. Contact technical department to solve the problem.
b. The torque of valve is larger than the torque of actuator.	b. Replace to a new valve or a larger actuator.
c. The set screw of the cam is loose.	c. Readjust the mechanical stops and limit switches
d. The installing angle of actuator and valve is not correct.	d. Check the angle of the valve and actuator.

5. The capacitor is failed.

Possibilities	Solution
a. Overload (exceed the rated torque of actuator).	a. Replace to a new part. It's suggested to change a new valve or a larger actuator.
b. Starting frequency is too high or ambient temperature is too high.	b. Replace to a new part and change to 75% duty cycle actuator
c. Over service life.	c. Check the capacitance and surface every year.

➤ Modulating controller:

1. The LED (LD5~LD9) is flashing after the operating check is completed.

Solution
Refer to p. 14

2. The lamps on the modulating board are normal but the actuator can't work properly during test or it only can turn to fully open/closed position.

Possibilities	Solution
The signal is connected oppositely (means to signal failure).	Confirm if the input signal and the wiring are correct (terminal #6 connects to “-” and terminal #7 connects to “+”).

3. Can not operate by modulating controller.

Possibilities	Solution
a. Faulty VR.	a. Replace to a new VR.
b. The sector gear of the VR is loose.	b. Remove the input signal wires. Operate the actuator to fully-closed. Then readjust the VR
c. Wrong input signal.	c. Check if the input signal is correct
d. Faulty modulating board.	d. Send back to factory for inspection.