OPERATION MANUAL

Electrical Actuator

Quarter-Turn Actuator

July , 2011 3rd

INDEX

OVERVIEW

Inline's electric quarter-turn actuators offer a range of 35Nm to 4500Nm torque. 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, have a visual position indicator on top of actuator cover and manual override except BM-2 and OMA. The manual operation is **non-clutch** design that can be operated without any lever, clutch or brake upon power outage. This design has already won the new Patent in Taiwan, U.S.A. and China.

Features

- ✓ 30% duty cycle at ambient temperature and rated torque.
- ✓ Self - locking gearing.
- ✓ Built-in thermal protection prevents motor burning out. AC motor is 125°C (257°F)and 90°C (194°F)for DC motor. (The 75% duty cycle actuator uses DC motor.)

Model	Max Torque		Weight		Manual Override
	N.m	lb.in	Kg	lb	
BM-2	120	1063	5.5	12.13	N/A
OM-A	50	443	2	4.41	N/A
OM-A-M	50	443	3	6.61	Lever
OM-1	35	310	2	4.41	Lever
OM-2	90	797	11	24.25	Hand-wheel
OM-3	150	1328	11	24.25	Hand-wheel
OM-4	400	3542	20	44.09	Hand-wheel
OM-5	500	4427	20	44.09	Hand-wheel
OM-6	650	5756	20	44.09	Hand-wheel
OM-7	1000	8855	32	70.55	Hand-wheel
OM-8	1500	13282	32	70.55	Hand-wheel
OM-9	2000	17709	71	156.53	Hand-wheel
OM-10	2500	22137	71	156.53	Hand-wheel
OM-11	3000	26564	72	158.73	Hand-wheel
OM-12	3500	30991	72	158.73	Hand-wheel
OM-13	4500	39846	106	233.69	Hand-wheel

IMPORTANT NOTICES

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 direction is opposite, please change any two of the U, V, W.

a. Check for correct voltage prior to wiring.
b. Turn power off before servicing or for maintenance purpose.
c. Use sealant to seal conduit connections after wiring to prevent dusting or water contamination.
d. The angle of electric actuator installation must be between 0~180 degree. Do not install upside down or below the horizontal.
e. When more than one electric actuator needed to operate simultaneously, please connect with the individual cables.
f. Please connect the ground wire to PE inside the electric actuator.
g. The warranty period is one year.
h. Not intended for vacuum spaces and avoid installing near explosive atmospheres.
i. The standard actuator is 30% duty cycle and optional for 75% duty cycle. Avoid too high frequency for the rated duty cycle.
j. TO avoid functional failure caused by statics do not touch any components on the PCB with metal tools or unarmed.

Duty Cycle – compliance to IEC standard

"Duty cycle" means the starting frequency.

The formula : Running Time ÷ (Running time + Rest Time) × 100% = duty cycle

➔ **Rest Time = Running Time × (1- duty cycle) ÷ duty cycle**

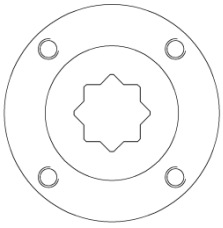
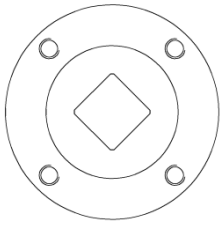
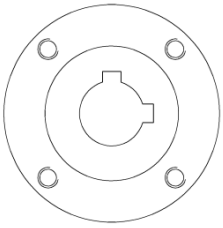
For example： The running time for OM-2 is 15 secs.

30% duty cycle 15 ×[(1 – 30%) / 30%]= 35 ➔ The rest time will be 35 secs.

75% duty cycle 15 ×[(1 – 75%) / 75%]= 5 ➔ The rest time will be 5 secs.

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

STANDARD MOUNTING

Model		Mounting Flange	Shaft		Depth		Key	
		(ISO 5211)	mm	inch	mm	inch	mm	inch
OM-A		F07 / F05	17	0.67	16	0.63	N/A	
OM-A-M		F07 / F05	17	0.67	16	0.63	N/A	
OM-1		F05 / F03	14	0.55	15	0.59	N/A	
BM-2		F07	22	0.87	30	1.18	N/A	
OM-2		F07	22	0.87	30	1.18	N/A	
OM-3		F07	22	0.87	30	1.18	N/A	
OM-4		F10	35	1.38	40	1.57	N/A	
OM-5		F10	35	1.38	40	1.57	N/A	
OM-6		F10	35	1.38	40	1.57	N/A	
OM-7		F14 or F12	35	1.38	60	2.36	10 ×10	0.39×0.39
OM-8		F14 or F12	35	1.38	60	2.36	10 ×10	0.39×0.39
OM-9		F16	75	2.95	100	3.94	12 ×10	0.47×0.39
OM-10		F16	75	2.95	100	3.94	12 ×10	0.47×0.39
OM-11		F16	75	2.95	100	3.94	12 ×10	0.47×0.39
OM-12		F16	75	2.95	100	3.94	12 ×10	0.47×0.39
OM-13		F25	72	2.83	110	4.33	20 ×12	0.79×0.47

SPECIFICATION

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
BM-2	-		-	-	-	-	-	-	-	-
OM-A	50	443	20 s	10 W	1.3A	1.5A	2.8A	0.8A	0.9A	1.6A
OM-A-M	50	443	20 s	10 W	1.3A	1.5A	2.8A	0.8A	0.9A	1.6A
OM-1	35	310	15 s	10 W	1.9A	2.0A	2.8A	1.1A	1.1A	1.6A
OM-2	90	797	15 s	40 W	3.4A	5.2A	16.5A	2.2A	4.5A	14.5A
OM-3	150	1328	22 s	40 W	4.4A	4.9A	16.5A	2.4A	5.0A	14.5A
OM-4	400	3542	16 s	80W	16.1A	16.1A	33.0A	8.5A	9.2A	30.0A
OM-5	500	4427	22 s	80W	14.1A	13.5A	33.0A	7.5A	9.0A	30.0A
OM-6	650	5756	28 s	80W	12.3A	12.5A	33.0A	7.0A	8.5A	30.0A
OM-7	1000	8855	46 s	80W				6.8A	7.8A	30.0A
OM-8	1500	13282	46 s	80W				8.1A	8.0A	30.0A
OM-9	2000	17709	58 s	80W				8.8A	11.0A	26.0A
OM-10	2500	22137	58 s	80W				11.8A	11.0A	26.0A
OM-11	3000	26564	58 s	220W				15.1A	11.0A	33.0A
OM-12	3500	30991	58 s	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
BM-2	120	1063	8 s	10 s	40W	1.3A	1.6A	1.6A	0.6A	0.9A	0.9A
OM-A	50	443	20s	24s	10W	0.6A	0.6A	0.7A	0.3A	0.4A	0.5A
OM-A-M	50	443	20s	24s	10W	0.6A	0.6A	0.7A	0.3A	0.4A	0.5A
OM-1	35	310	12s	13s	10W	0.6A	0.6A	0.7A	0.3A	0.4A	0.4A
OM-2	90	797	15s	17s	40W	1.0A	1.8A	1.6A	0.5A	0.8A	0.9A
OM-3	150	1328	22s	26s	40W	1.2A	1.8A	1.6A	1.0A	1.2A	0.9A
OM-4	400	3542	16s	18s	80W	1.9A	3.8A	3.6A	1.1A	2.0A	2.2A
OM-5	500	4427	22s	25s	80W	2.0A	3.8A	3.6A	1.1A	2.0A	2.2A
OM-6	650	5756	28s	31s	80W	2.1A	3.8A	3.6A	1.1A	2.0A	2.2A
OM-7	1000	8855	46s	55s	120W	3.1A	8.5A	9.0A	1.4A	4.1A	5.0A
OM-8	1500	13282	46s	55s	120W	3.3A	9.0A	9.0A	1.6A	4.4A	5.0A
OM-9	2000	17709	58s	70s	180W	3.3A	5.8A	5.9A	2.1A	3.8A	3.6A
OM-10	2500	22137	58s	70s	180W	4.0A	6.5A	5.9A	2.3A	4.0A	3.6A
OM-11	3000	26564	58s	70s	180W	4.5A	3.5A	5.9A	2.5A	4.2A	3.6A
OM-12	3500	30991	58s	70s	220W	4.0A	8.0A	7.5A	2.4A	4.4A	4.8A
OM-13	4500	39846	80s	95s	220W	4.2A	8.0A	7.5A	2.4A	4.8A	4.8A

SPECIFICATION

Three Phase

Model No.	Max Torque		Speed (90°)		Motor Power	220V Current			380V Current			440V Current		
	Nm	lb-in	60Hz	50Hz		Run	Start	Lock	Run	Start	Lock	Run	Start	Lock
BM-2	120	1063	8 s	10 s	40W	0.8A	1.4A	1.5A	0.4A	0.9A	0.7A	0.4A	0.5A	0.6A
OM-1	-		-	-	-	-	-	-	-	-	-	-	-	-
OM-A	-		-	-	-	-	-	-	-	-	-	-	-	-
OM-A-M	-		-	-	-	-	-	-	-	-	-	-	-	-
OM-2	90	797	15 s	17 s	40W	0.8A	1.4A	1.5A	0.4A	0.7A	0.7A	0.4A	0.9A	0.6A
OM-3	150	1328	22 s	26 s	40W	0.8A	1.4A	1.5A	0.4A	0.7A	0.7A	0.4A	0.9A	0.6A
OM-4	400	3542	16 s	18 s	80W	1.0A	1.8A	2.3A	0.7A	1.3A	1.5A	0.6A	1.4A	1.4A
OM-5	500	4427	22 s	25 s	80W	1.0A	1.8A	2.3A	0.7A	1.3A	1.5A	0.6A	1.4A	1.4A
OM-6	650	5756	28 s	31 s	80W	1.0A	1.8A	2.3A	0.7A	1.3A	1.5A	0.6A	1.4A	1.4A
OM-7	1000	8855	46 s	55 s	120W	0.9A	2.0A	2.2A	0.7A	1.2A	1.4A	0.5A	1.3A	1.3A
OM-8	1500	13282	46 s	55 s	120W	1.0A	2.4A	2.6A	0.7A	1.5A	1.5A	0.6A	1.2A	1.2A
OM-9	2000	17709	58 s	70 s	180W	1.3A	3.7A	3.9A	0.7A	2.0A	2.3A	0.7A	2.0A	2.2A
OM-10	2500	22137	58 s	70 s	180W	1.3A	3.4A	3.9A	0.7A	2.0A	2.4A	0.7A	2.0A	2.2A
OM-11	3000	26564	58 s	70 s	180W	1.3A	3.5A	3.9A	0.7A	2.0A	2.4A	0.7A	2.0A	2.2A
OM-12	3500	30991	58 s	70 s	220W	1.5A	4.8A	5.4A	0.9A	2.5A	2.5A	0.8A	2.6A	2.4A
OM-13	4500	39846	80 s	95 s	220W	1.5A	4.9A	5.4A	1.0A	2.5A	2.5A	0.8A	2.6A	2.4A

Note :

Run: Full Load Ampere

Lock : Locked Rotor Ampere

STORAGE INFORMATION

Receiving/Inspection

Carefully inspect for shipping damage. Damage to the shipping carton is usually a good indication that it has received rough handing. Report all damage immediately to the freight carrier and your seller.

Unpack the product and information packet taking care to save the shipping carton and any packing material should return be necessary. Verify that the item on the packing list or bill of lading agree with your own documentation.

Storage

If you actuator cannot be installed immediately store it in a dry place, it must be protected from excess moisture, dust, and weather, until you are ready to connect incoming cables.

If the actuator has to be installed but cannot be cable, please don't remove the plastic transit cable entry pings. When the actuator has to be cable it is recommended that to replace with suitable water-proof plugs have to IP protection.

LUBRICATION

The gear train has been permanently lubricated at the factor sufficient.

INSTALLATION

a. Before mounting actuator, verify that the torque requirement is less than the output torque of the actuator. (The suggested safety factor is 1.3.)

For example：

If the maximum torque of 5" valve is 70Nm. → 80 × 1.3(safety factor) ＝104

104Nm ＜ 150Nm (OM-3) → **OK** !

104Nm ＞ 90Nm (OM-2) → **NO**!

b. Check that output shaft adaptor fits stem of valve before inserting into actuator.

c. Insert output shaft adaptor into actuator. Make sure it fits satisfactory.

d. Determine that actuator position, open or closed, matches position of equipment with which it is to be mounted. Use manual override to change position, if necessary.

e. Remove valve mechanical stops and mount on the proper connection.

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

f. Check again that the valve and actuator are in the same position.

g. Install mounting hardware on the valve or mount on the valve directly, mount actuator to valve securely tighten all bolts and screws once actuator screws have been started.

h. Remove actuator cover.

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

i. 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, please change two of U, V, W.

j. Turn on power to actuator.

CAUTION: Use extreme caution as there are live circuits that could cause electrical shock or death.

k. Make sure if it is needed to calibrate the fully-open or fully-closed position of the actuator. Refer to the page 42~45 to set the fully -open or fully-closed position and mechanical stops.

l. If the actuator is modulating type, refer to page 46 to set the functions.

CAUTION: Turn power off before changing any setting

m. Replace cover and secure cover screws.

WIRING DIAGRAM

ABBREVIATION ILLUSTRATION

a. MC1 & MC2：Electromagnetic contactor.

b. NFB：No fuse breaker.

c. C.S.：Control switch.

d. L.：Over-load relay.

e. H ：Heater.

f. LS : Limit switch.

g. TS : Torque switch

h. Switch(1) : Local/ Remote Control
Switch(2) : Open/Stop/Close select.

i. Duty cycle (Standard Model)
OM-1~OM-13 ： 30% duty cycle
Extended duty cycle:
OM-1~OM-8 : 75% duty cycle
OM-9~OM-13 : 50% duty cycle

j. LS1：Limit switch for open.
LS2：Limit switch for close.

k. The usage for 2 additional limit switches：

OM-1, OM-A,OM-A-M

LS3 Fully Open ：Terminal “A” connects to terminal “B”.
LS4 Fully Closed ：Terminal “A” connects to terminal “E”.

BM-2, OM-2~OM-13

LS3 Fully Open ：Terminal “A” connects to terminal “C”.
LS4 Fully Closed ：Terminal “D” connects to terminal “F”.

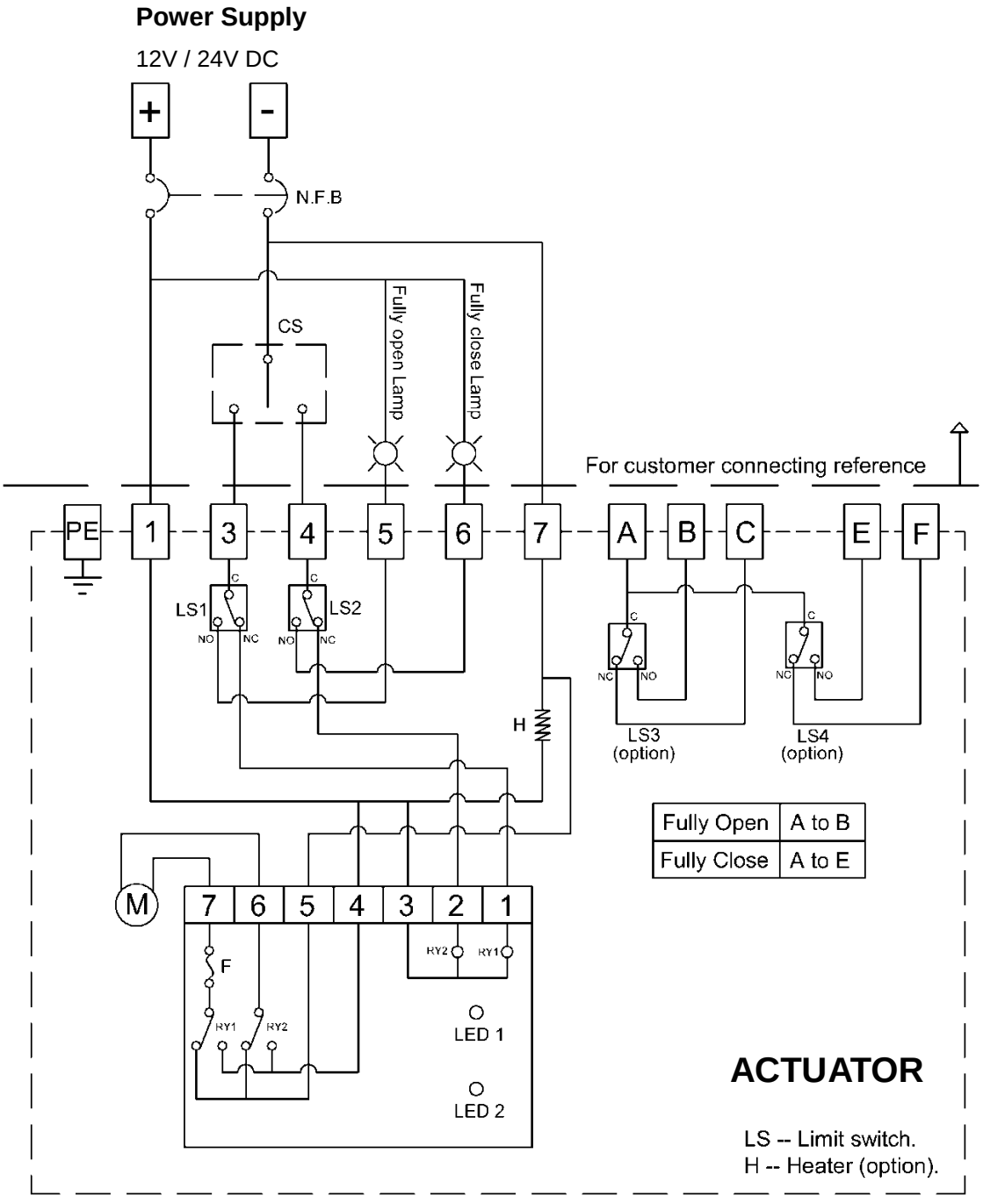
NOTE :

When a set of control wire or switch needs to control two or more actuators at the same time, please refer to page 41.

WIRING DIAGRAM – Quarter Turn Actuator

OM-1 & OM-A & OM-A-M 12V, 24V DC

On-Off Controller



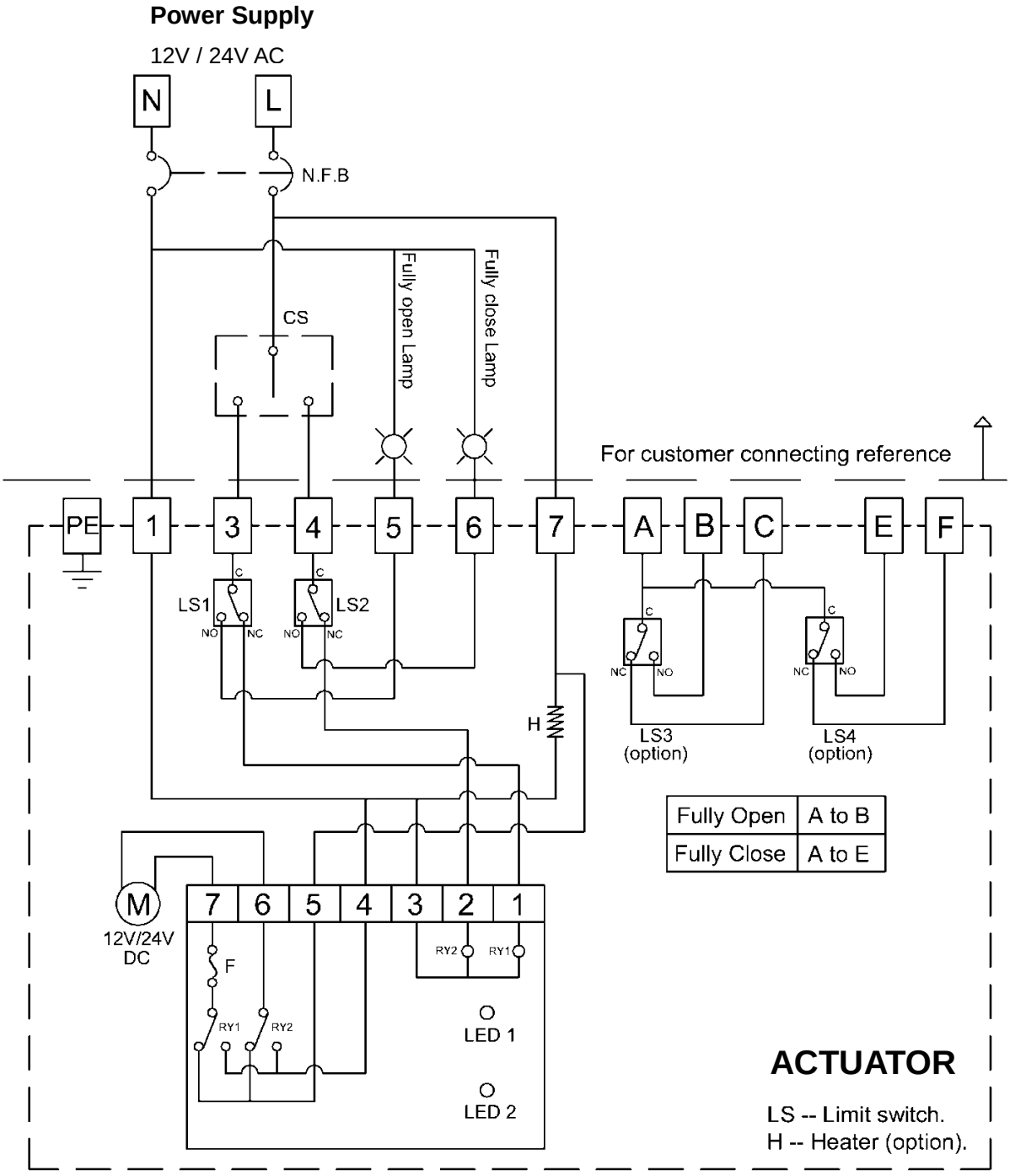
NOTE:

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.

WIRING DIAGRAM – Quarter Turn Actuator

OM-1 & OM-A & OM-A-M 12V, 24V AC

On-Off Controller



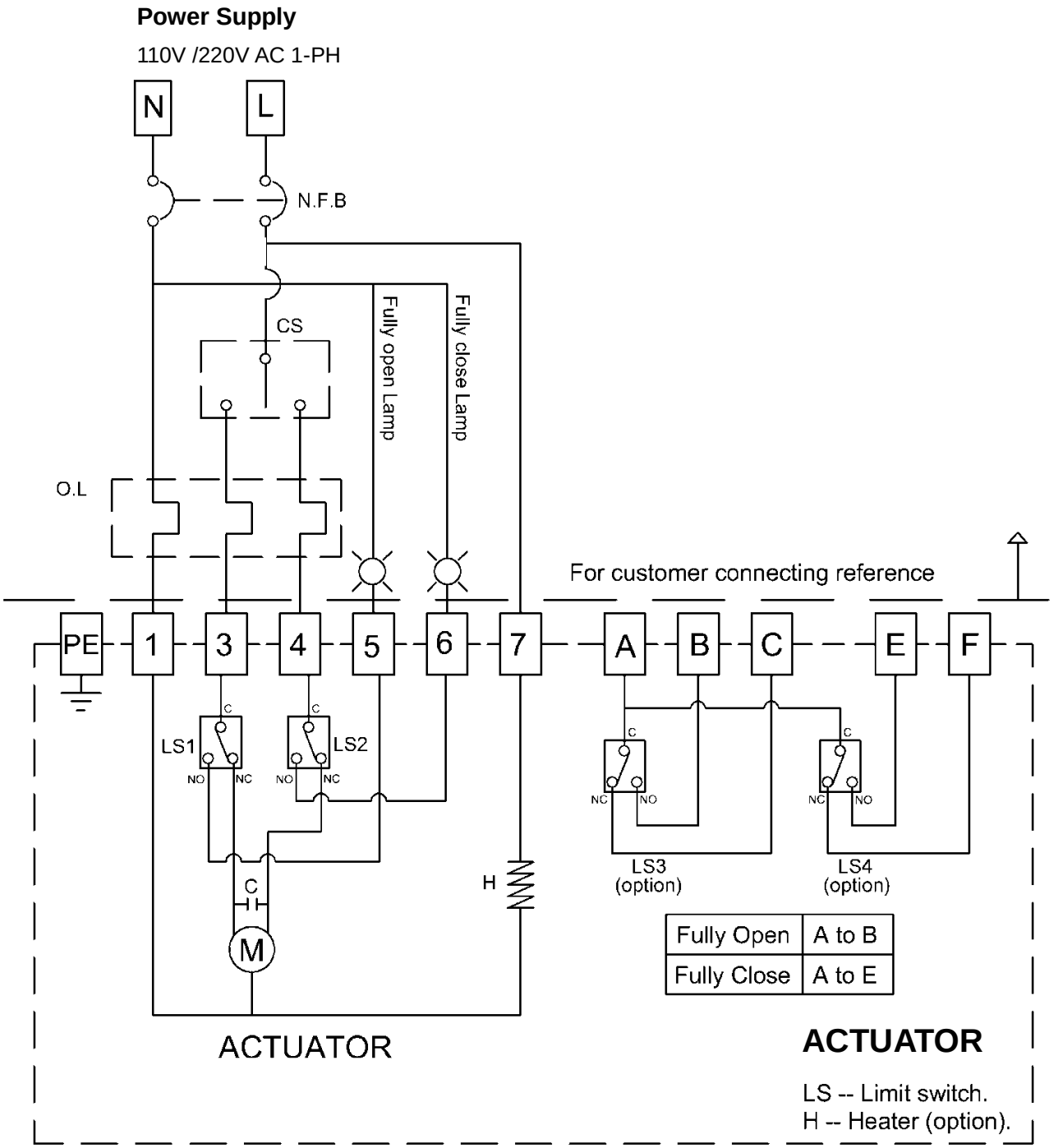
NOTE :

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".

WIRING DIAGRAM – Quarter Turn Actuator

OM-1 & OM-A & OM-A-M 110V, 220V AC 1-phase

On-Off Controller , 30% duty cycle



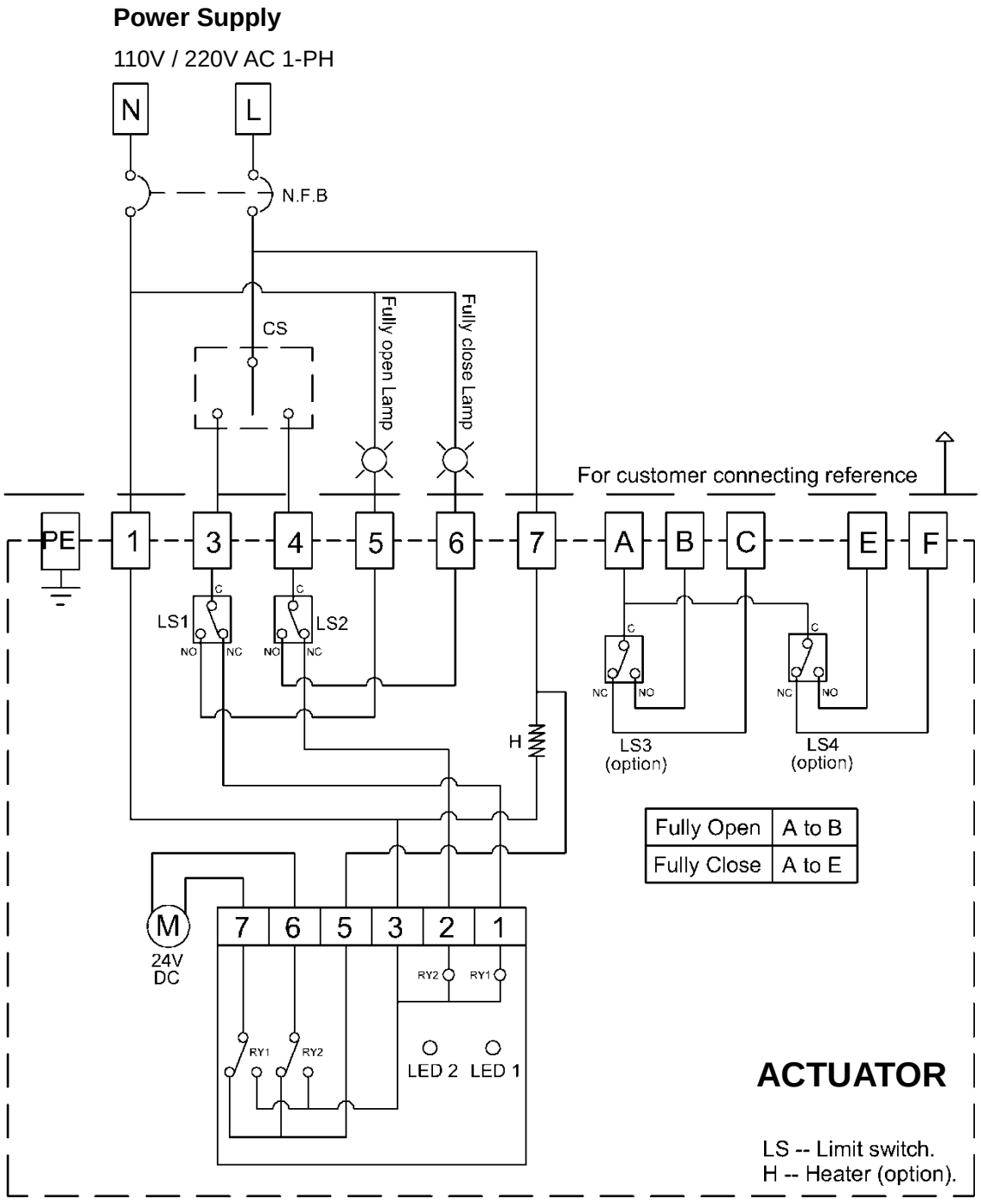
NOTE :

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".

WIRING DIAGRAM – Quarter Turn Actuator

OM-1 & OM-A & OM-A-M 110V, 220V AC 1-Phase

On-Off Controller , 75% duty cycle



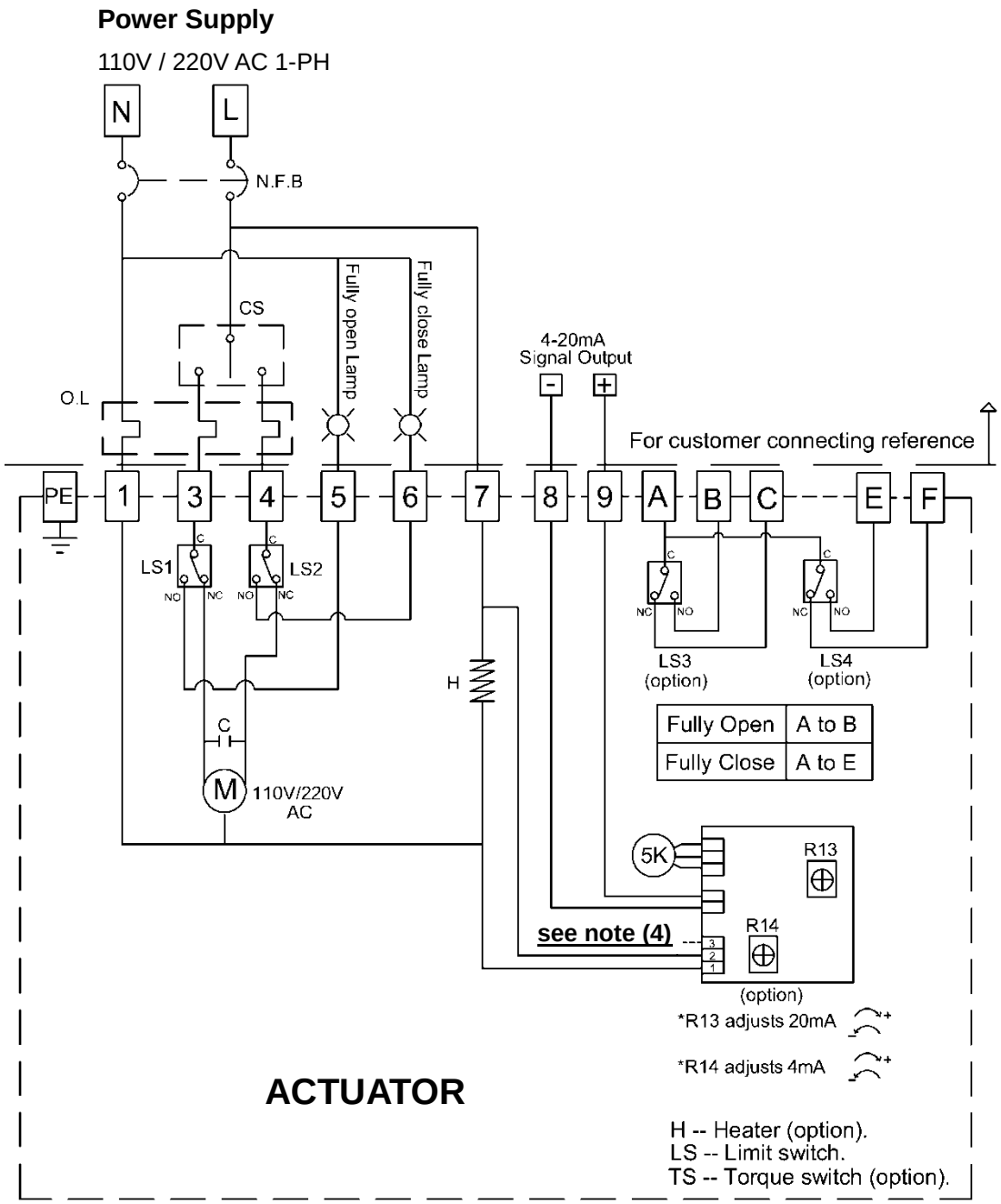
NOTE:

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".

WIRING DIAGRAM – Quarter Turn Actuator

OM-1 & OM-A & OM-A-M 110V, 220V AC 1-phase

Current Position Transmitter



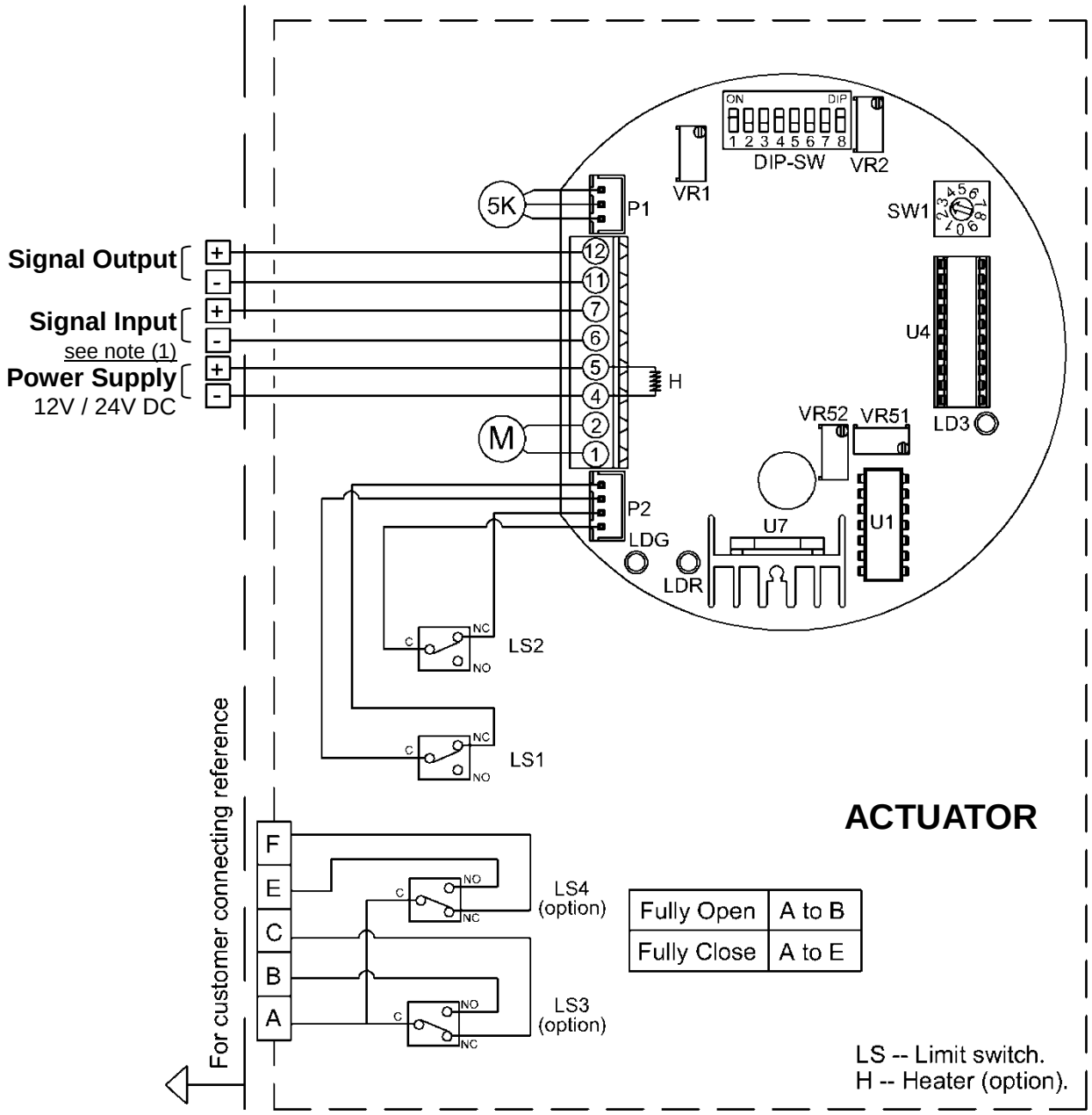
NOTE:

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".
4. If the control power is 220VAC, N &L connect to #1 & #3.
   If the control power is 110VAC, N & L connect to #1 & #2 or #2 & #3.

WIRING DIAGRAM – Quarter Turn Actuator

OM-1 & OM-A & OM-A-M 12V, 24V DC

Modulating Controller



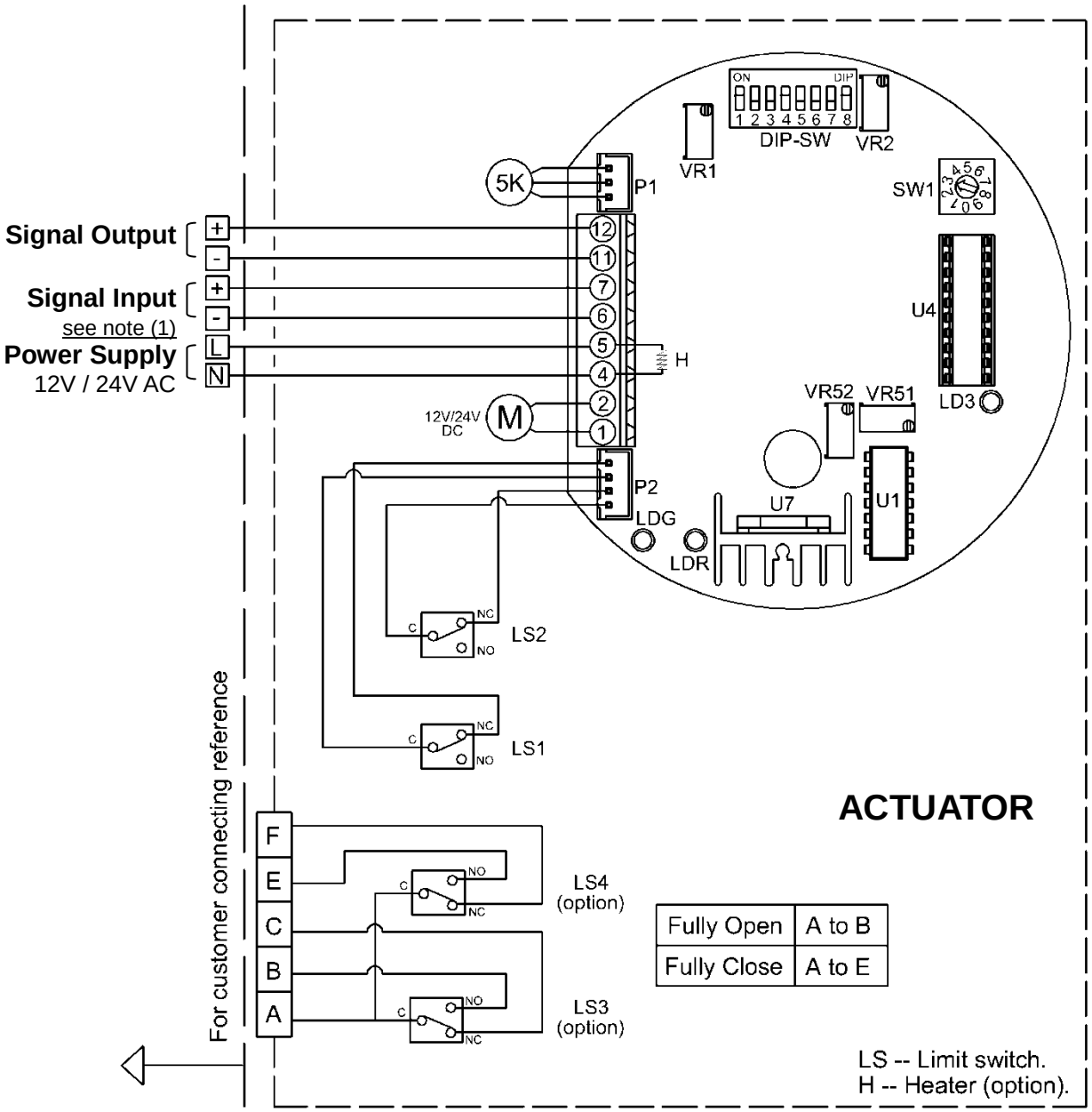
NOTE :

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.

WIRING DIAGRAM – Quarter Turn Actuator

OM-1 & OM-A & OM-A-M 12V, 24V AC

Modulating Controller



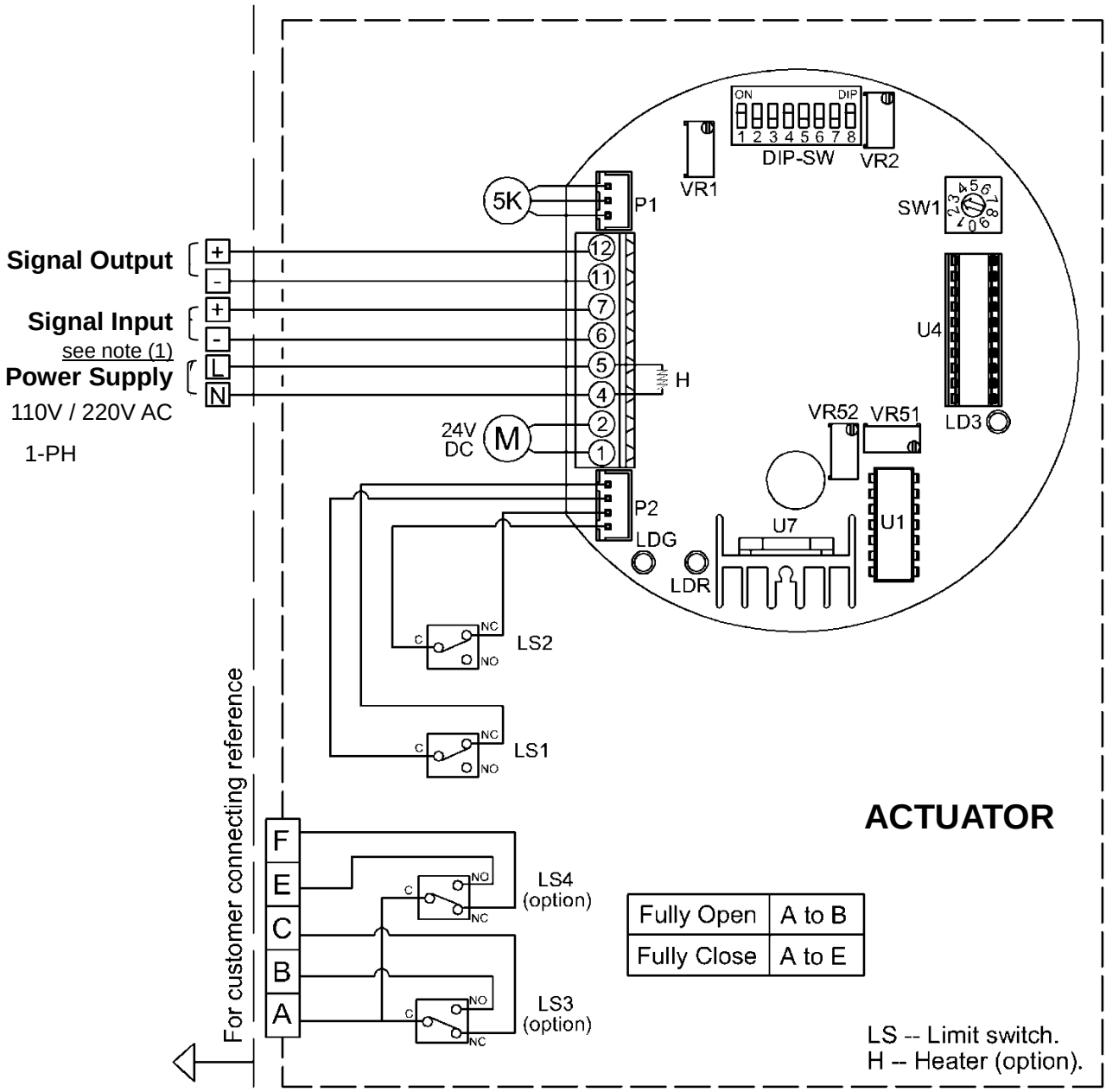
NOTE :

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”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-1 & OM-A & OM-A-M 110V, 220V AC 1-Phase

Modulating Controller



NOTE:

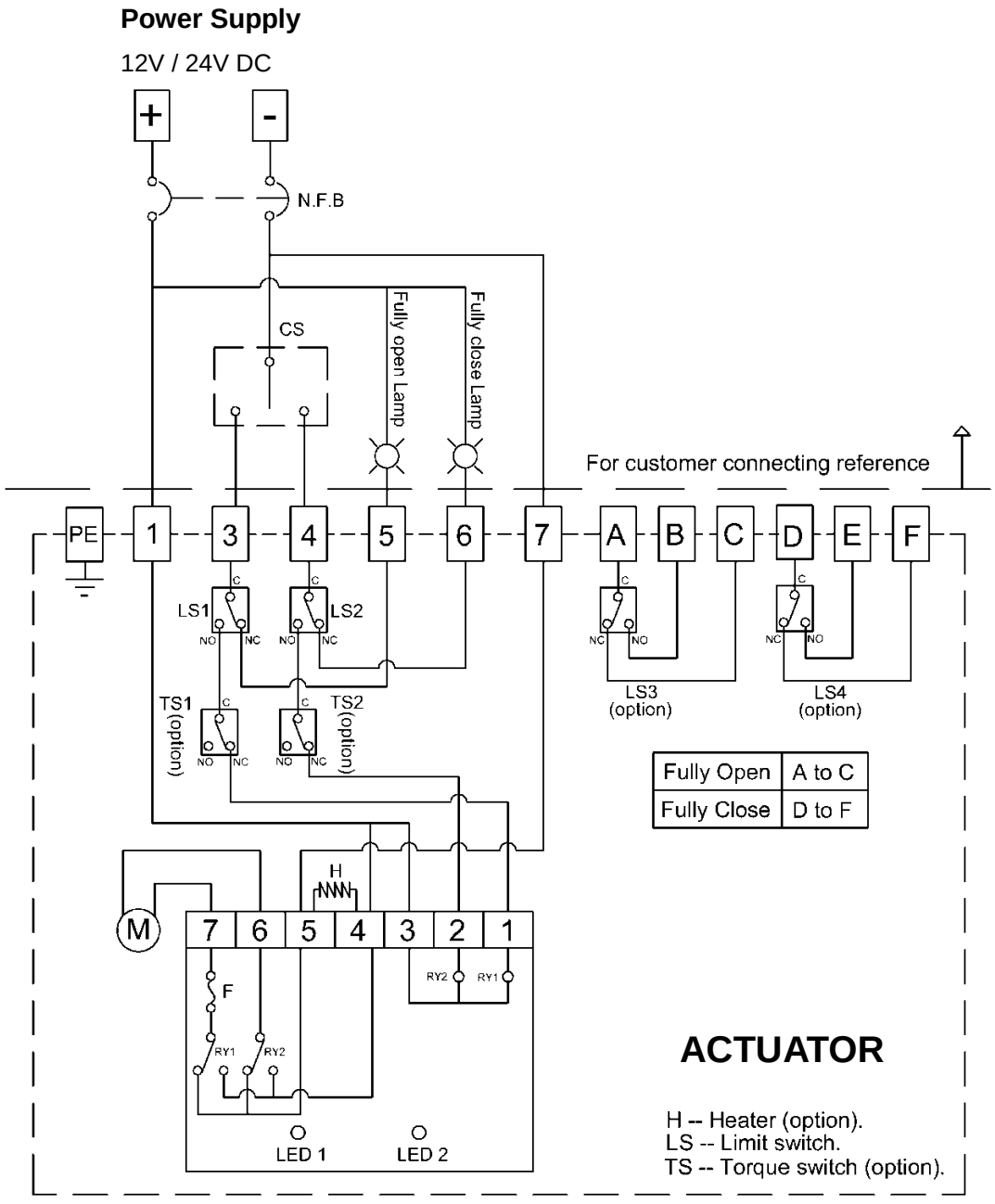
1. **Modulating Board**
   a. Input Signal：4-20mA, 1-5V, 2-10V
   (It is suggested to use the shielding wire and its length should not exceed 30m.)
   b. Output Signal：4-20mA, 2-10V
2. Using less than 3A current for “A, B, C, E, F”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-6 12V DC

OM-2 ~ OM-12 24VDC

On-Off Controller



NOTE:

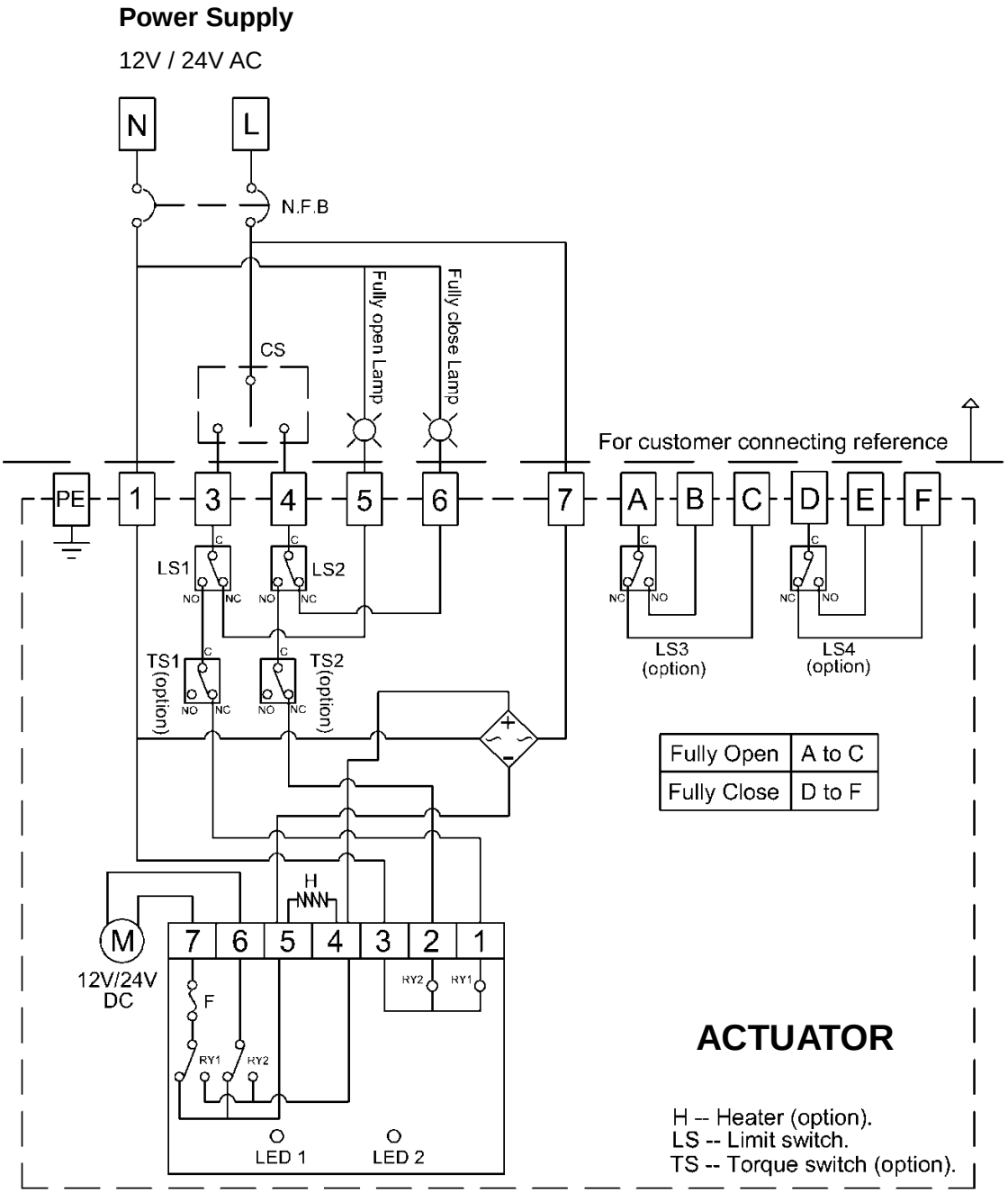
1. "+" connects to 1, "– " connects to 7.
2. "–" connects to 3 for "OPEN", "–" connects to 4 for "CLOSE".
3. Using less than 5A current for "A, B, C, D, E, F".
4. Using battery to supply power for DC units.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-6 12V AC

OM-2~ OM-12 24VAC

On-Off Controller



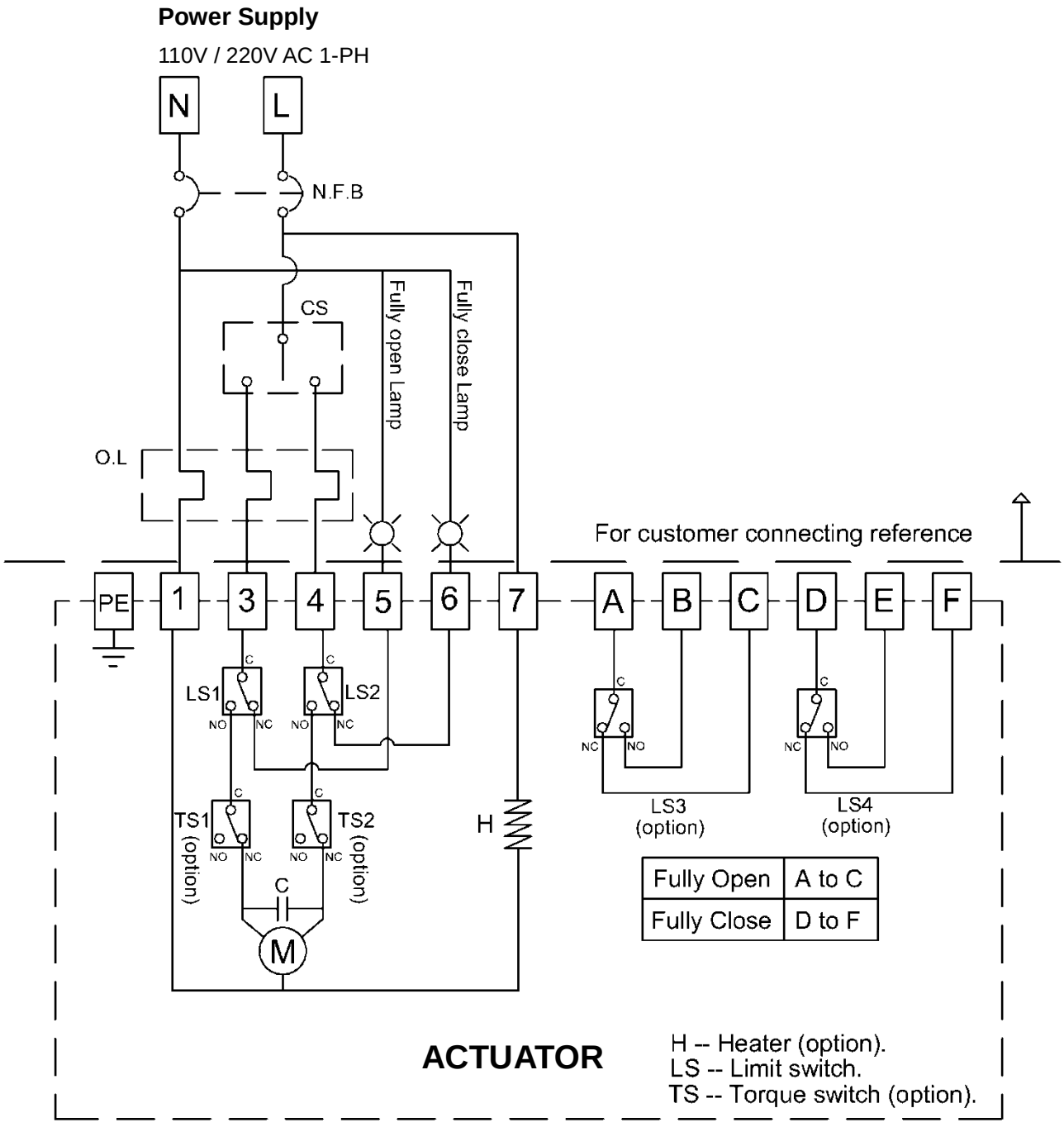
NOTE :

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".

WIRING DIAGRAM – Quarter Turn Actuator

BM-2, OM-2 ~ OM-13 110V, 220V AC 1-Phase

On-Off Controller , 30% duty cycle



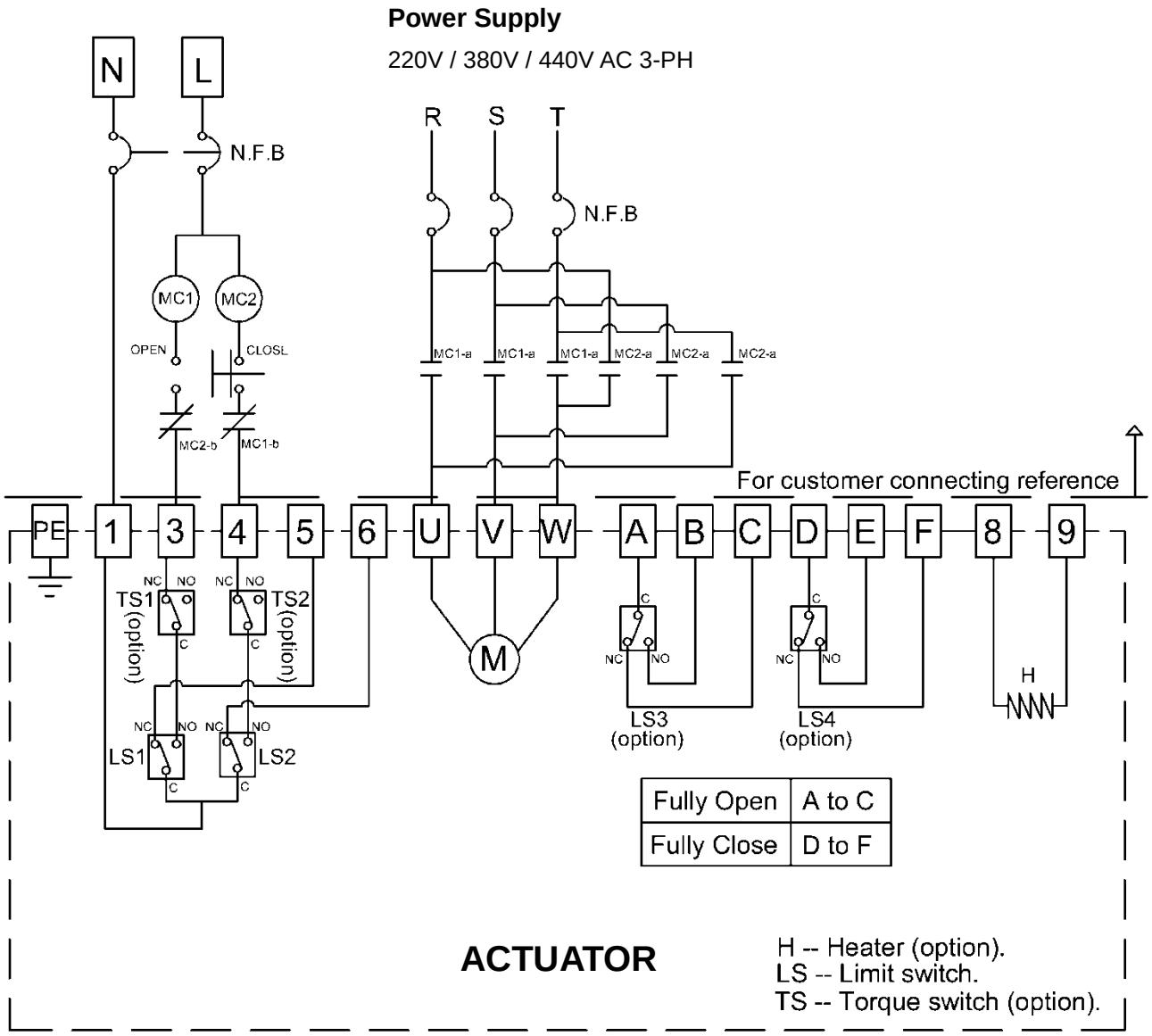
NOTE :

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".
4. BM-2 could not install torque switches.

WIRING DIAGRAM – Quarter Turn Actuator

BM-2, OM-2 ~ OM-13 220V, 380V, 440V AC 3-Phase

On-Off Controller



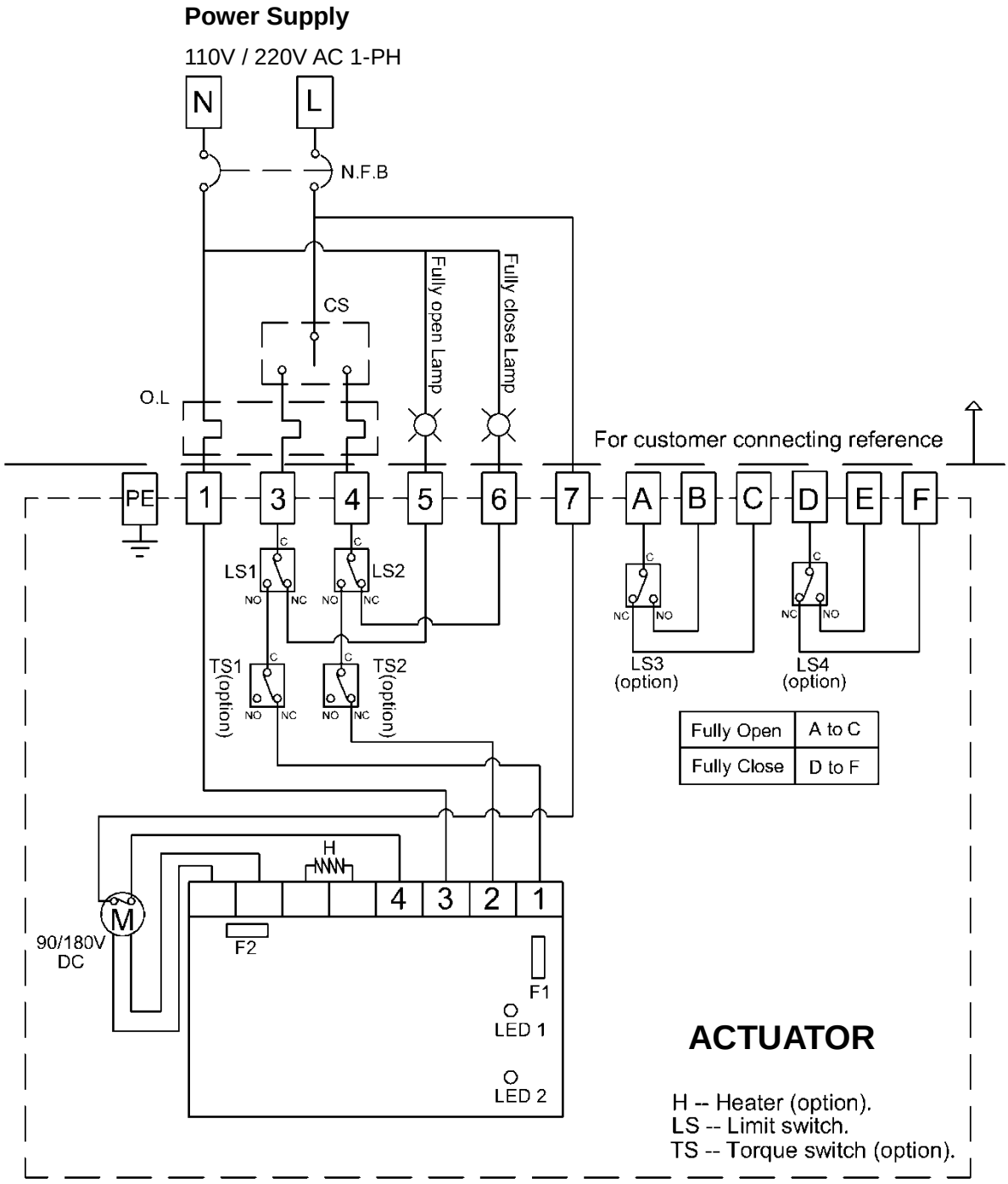
NOTE :

1. Using the hand-wheel to turn the actuator to 45 degree before test. If the operating direction is opposite, please change any two of U, V, W.
2. Using less than 5A current for “A, B, C, D, E, F”.
3. BM-2 could not install torque switches.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-8 110V, 220V AC 1-Phase

On-Off Controller , 75% duty cycle



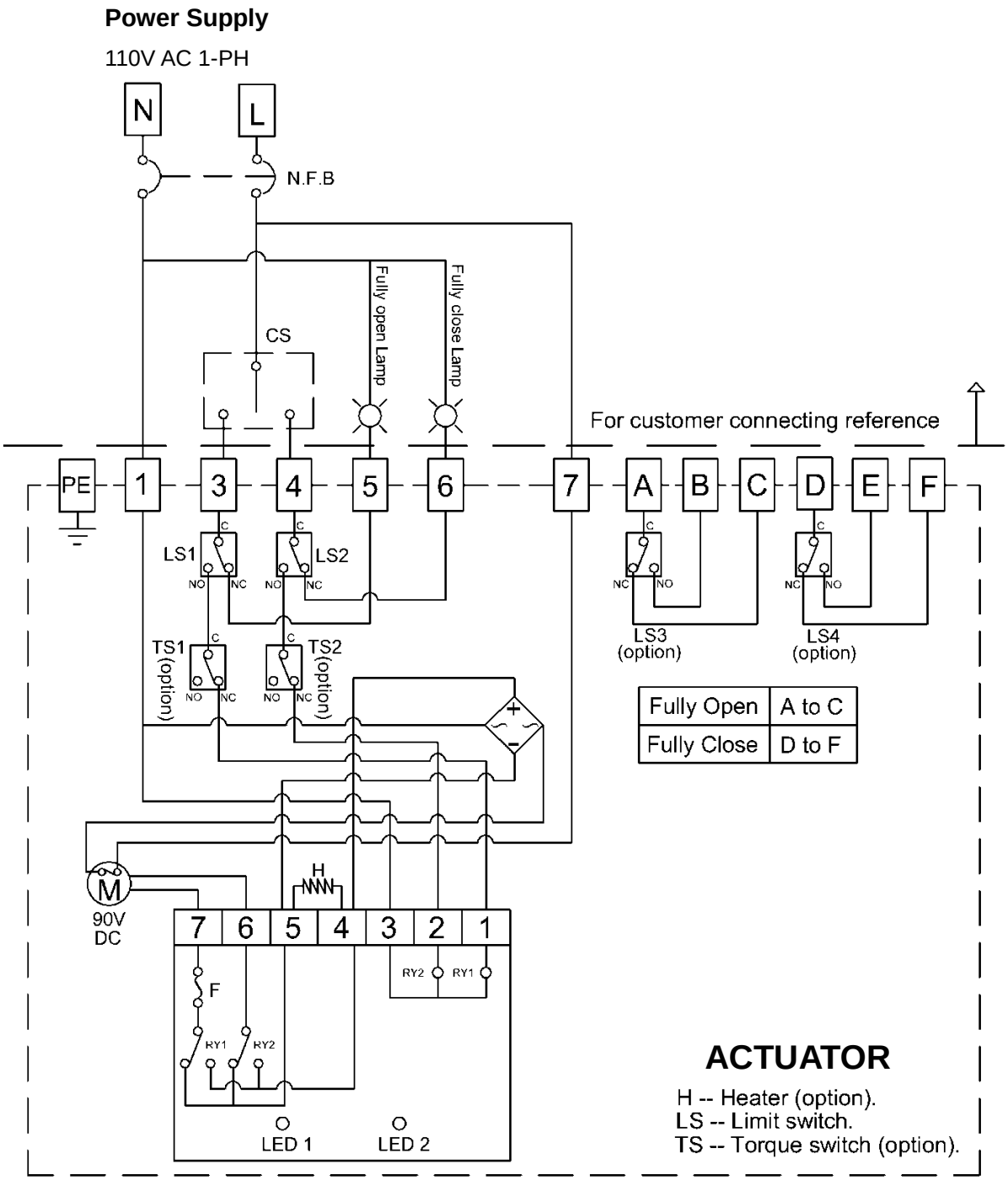
NOTE :

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".

WIRING DIAGRAM – Quarter Turn Actuator

OM-9 ~ OM-13 110V AC 1-Phase

On-Off Controller , 50% duty cycle



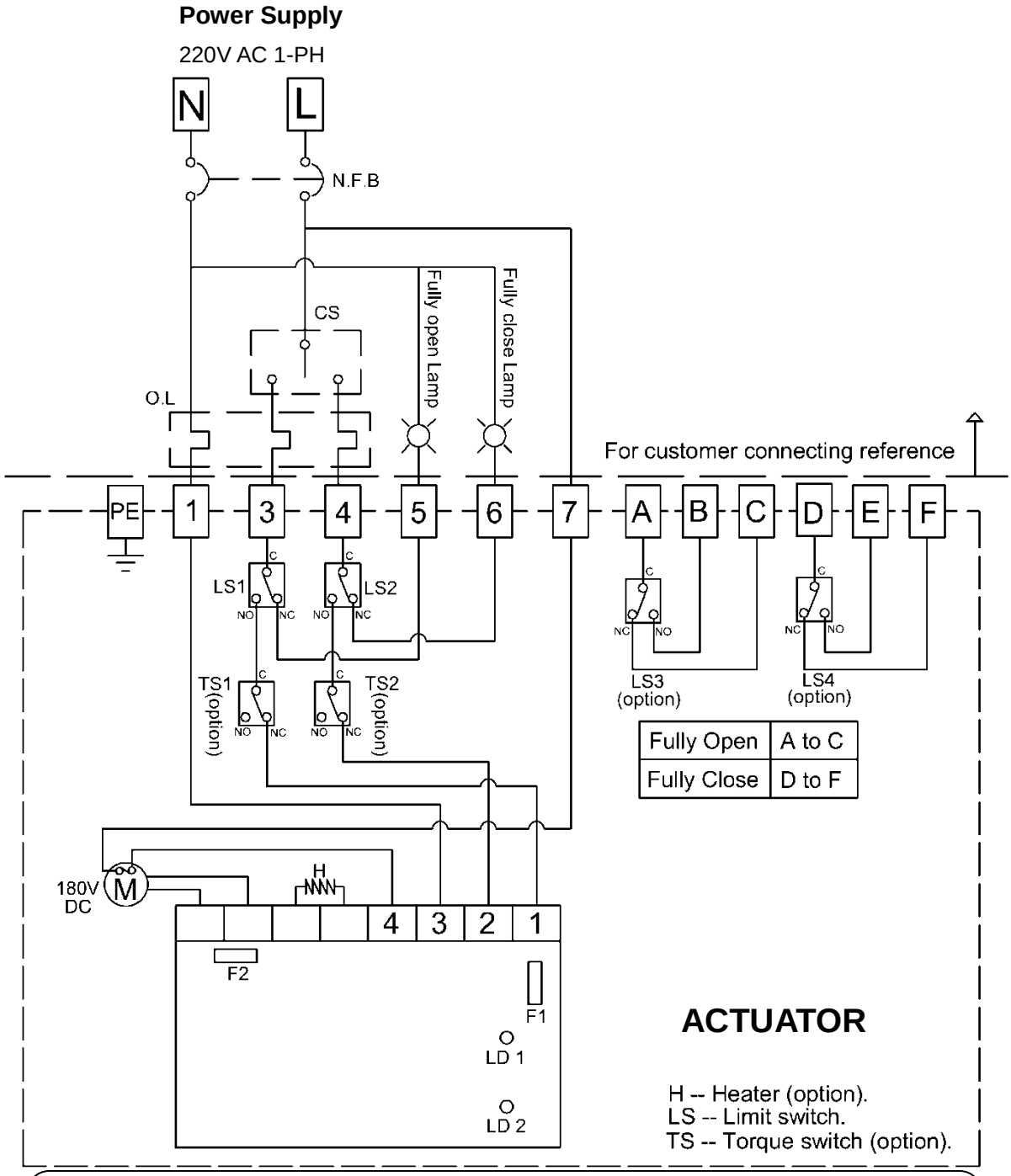
NOTE :

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".

WIRING DIAGRAM – Quarter Turn Actuator

OM-9 ~ OM-13 220V AC 1-Phase

On-Off Controller , 50% 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".

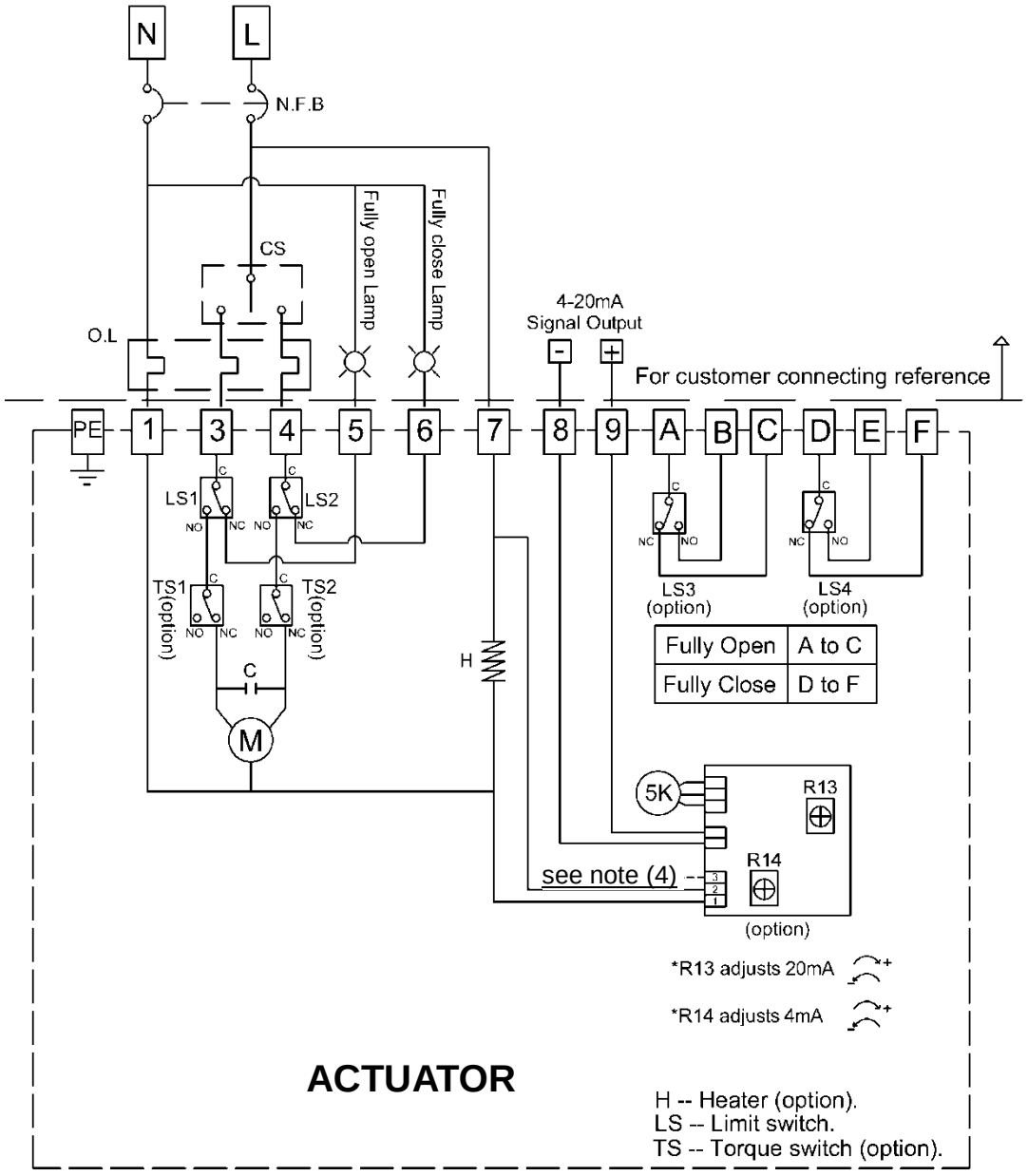
WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-13 110V, 220V AC 1-phase

Current Position Transmitter

Power Supply

110V / 220V AC 1-PH



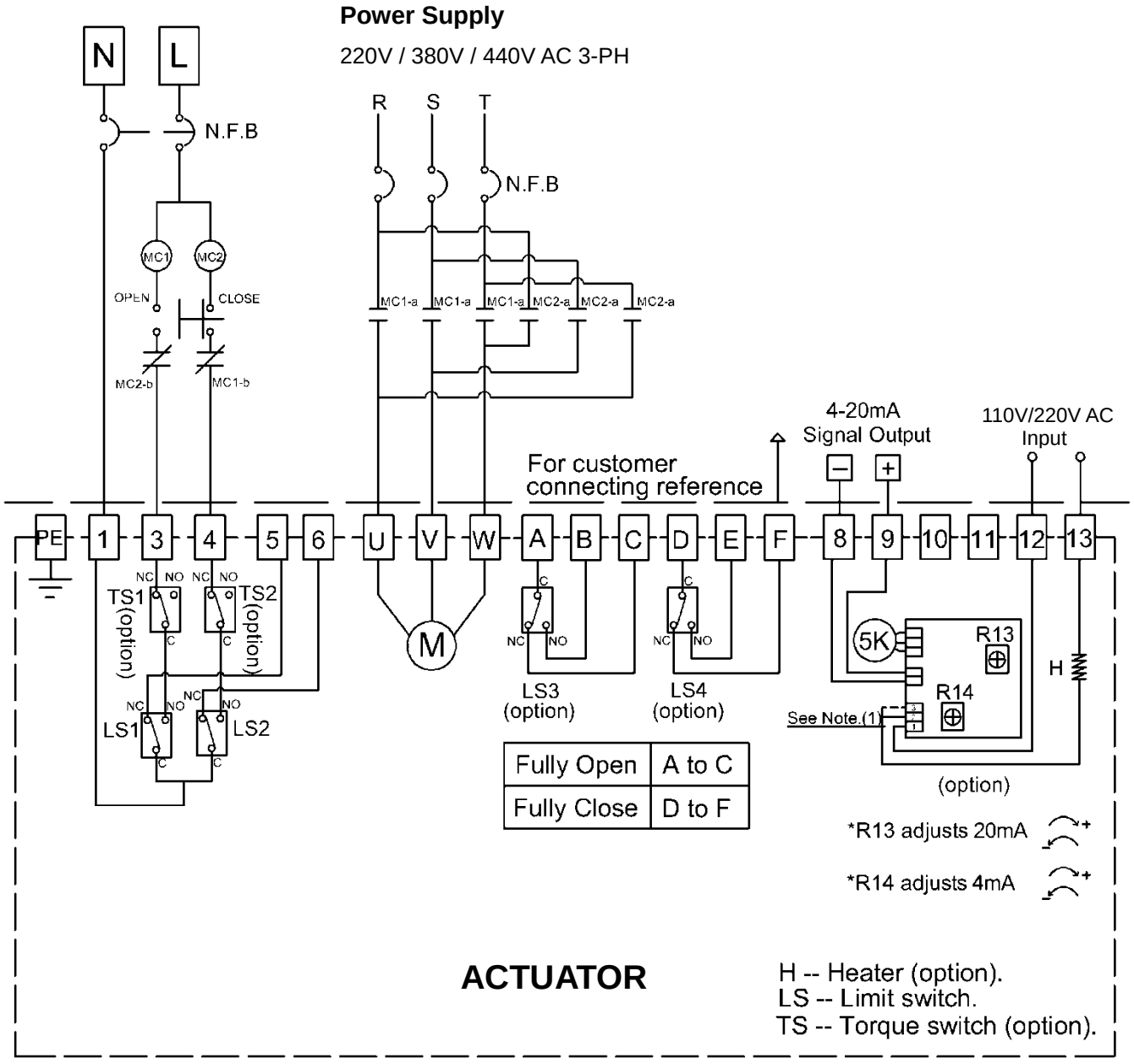
NOTE:

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".
4. If the control power is 220VAC, N &L connect to #1 & #3.
   If the control power is 110VAC, N & L connect to #1 & #2 or #2 & #3.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-13 220V, 380V, 440V AC 3-phase

Current Position Transmitter



NOTE:

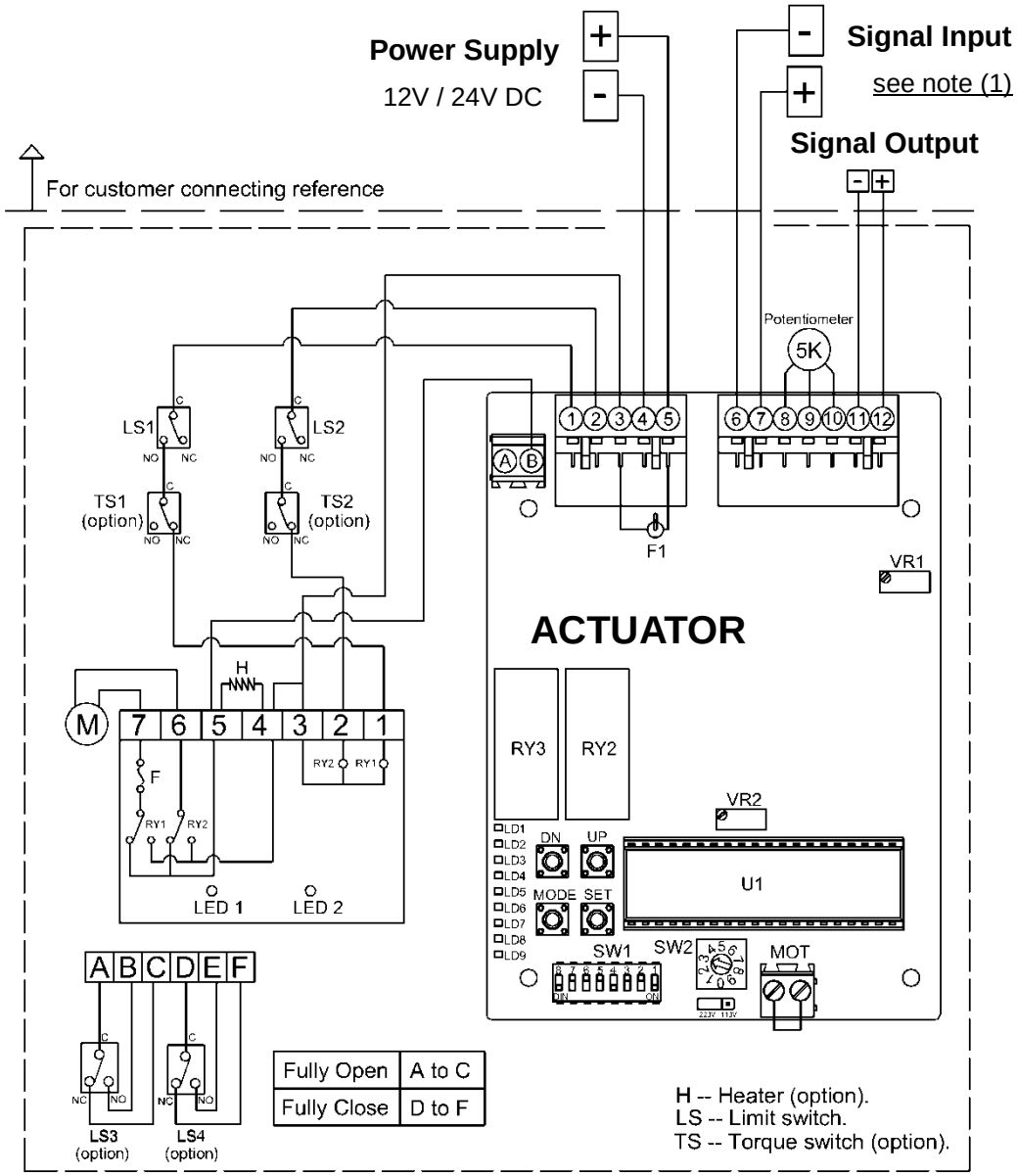
1. If the control power is 220VAC, N &L connect to #1 & #3.
   If the control power is 110VAC, N & L connect to #1 & #2 or #2 & #3.
2. Using the hand-wheel to turn the actuator to 45 degree before test. If the operating direction is opposite, please change any two of U, V, W.
3. Using less than 5A current for “A, B, C, D, E, F”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM- 6 12V DC

OM-2 ~ OM-12 24V DC

Modulating Controller



NOTE:

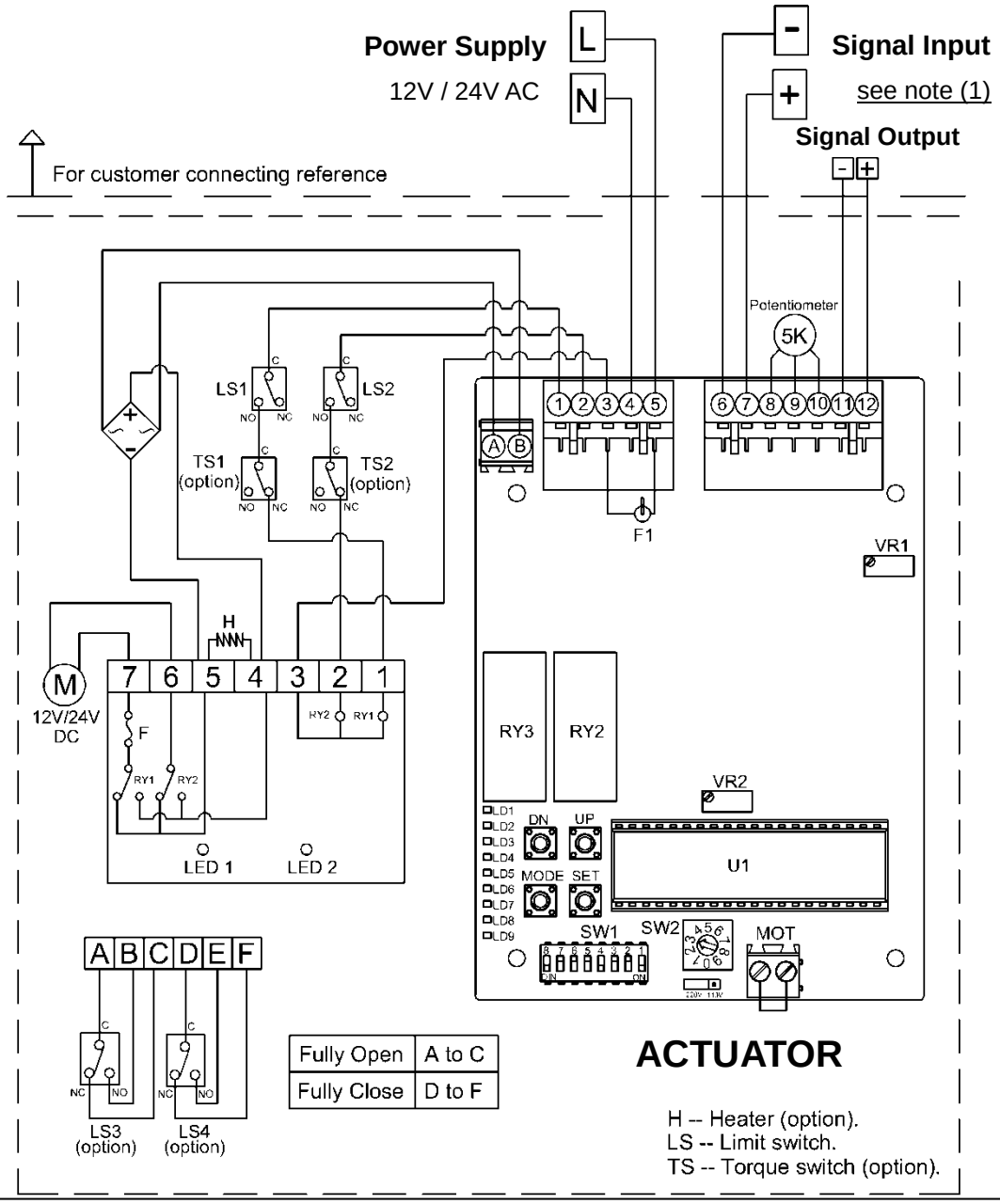
1. **Modulating Board**
   a. Input Signal：4-20mA, 1-5V, 2-10V
   (It is suggested to use the shielding wire and its length should not exceed 30m.)
   b. Output Signal：4-20mA, 2-10V
2. Using less than 5A current for “A, B, C, D, E, F”.
3. Using battery to supply power for DC units.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM- 6 12V AC

OM-2 ~ OM-12 24V AC

Modulating Controller



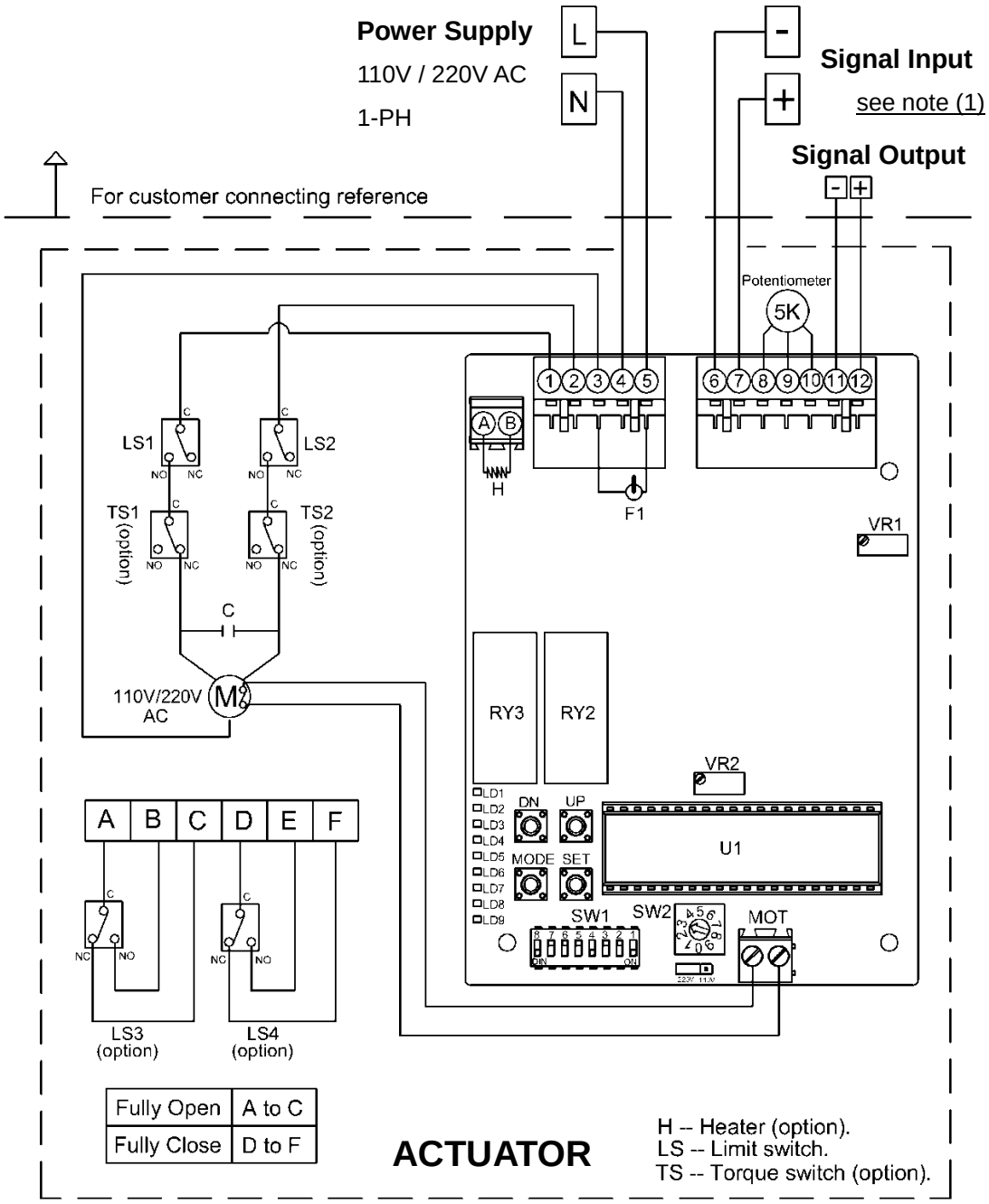
NOTE:

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”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-8 110V, 220V AC 1-Phase

Modulating Controller , 30% duty cycle

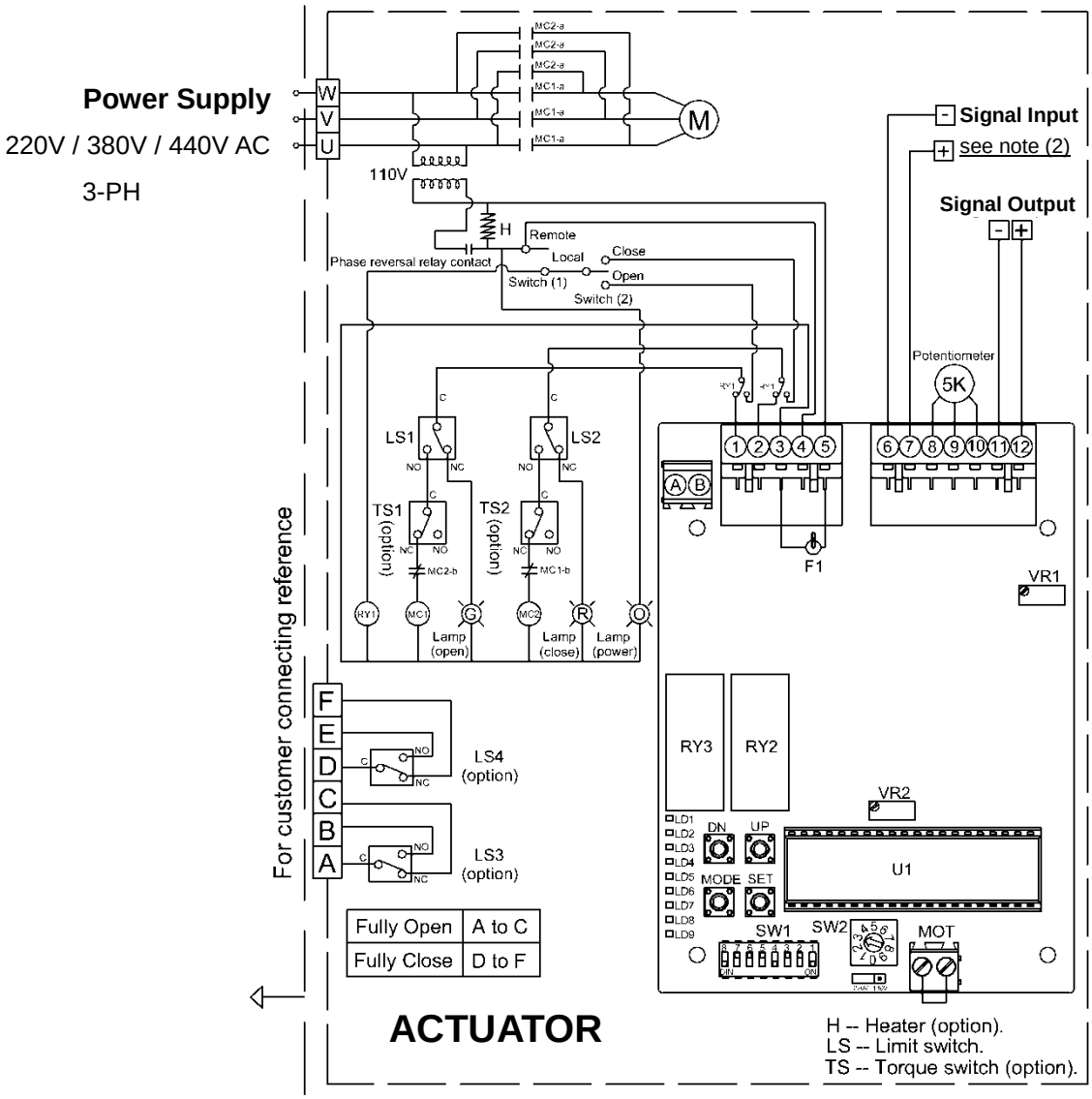


NOTE :

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”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-13 220V, 380V, 440V AC 3-Phase Modulating Controller



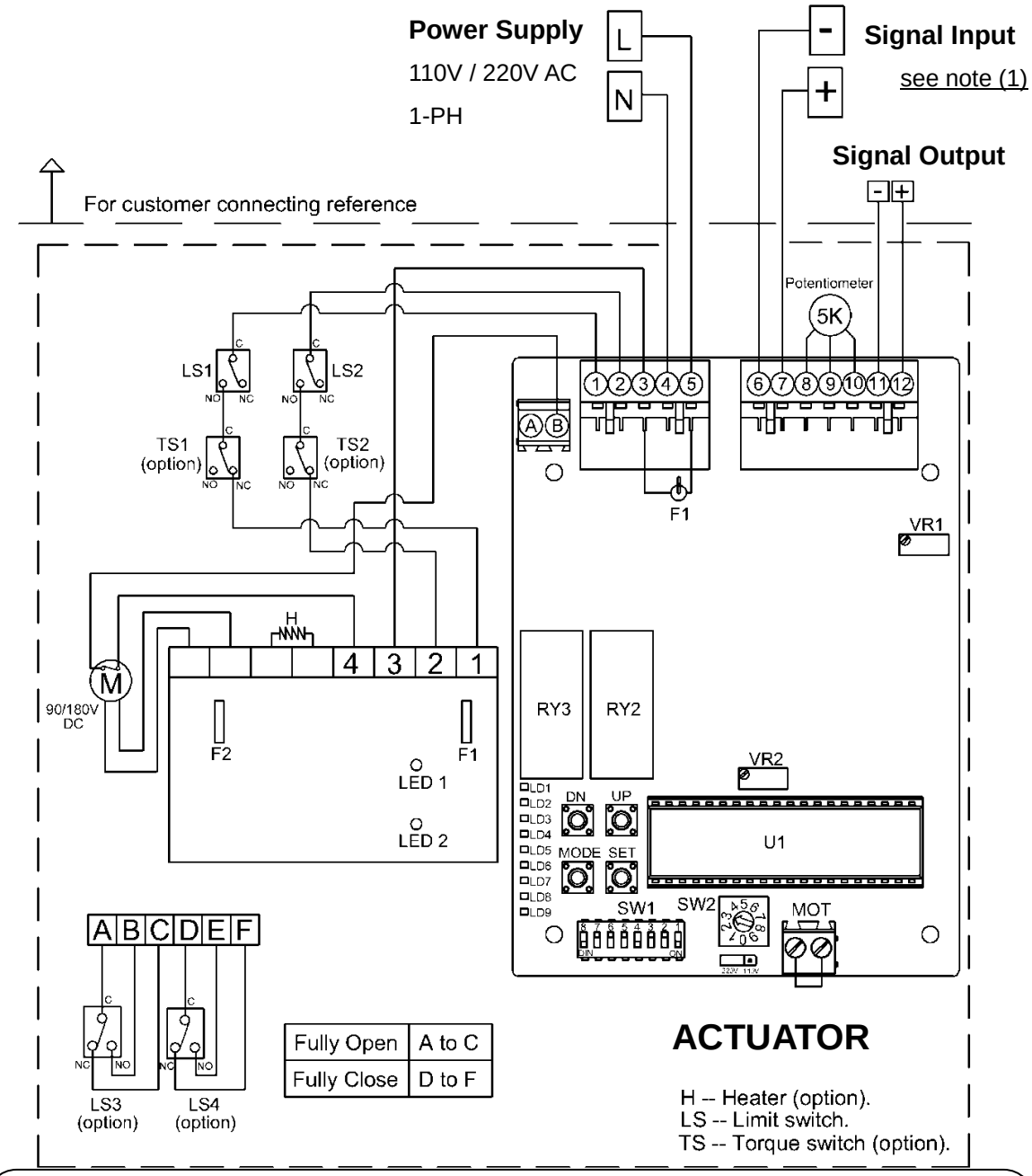
NOTE:

1. Please change any two of U, V, W when the power lamp is off.
2. **Modulating Board**
   a. Input Signal : 4-20mA, 2-10V, 1-5V
   (It is suggested to use the shielding wire and its length should not exceed 30m.)
   b. Output Signal: 4-20mA, 2-10V
3. **Local / Remote Switches**
   a. Select "Remote"：Controlled by signal.
   b. Select "Local "：Controlled by switch (2).
4. Using less than 5A current for " A, B, C, D, E, F"

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-8 110V, 220V AC 1-Phase

Modulating Controller , 75% duty cycle



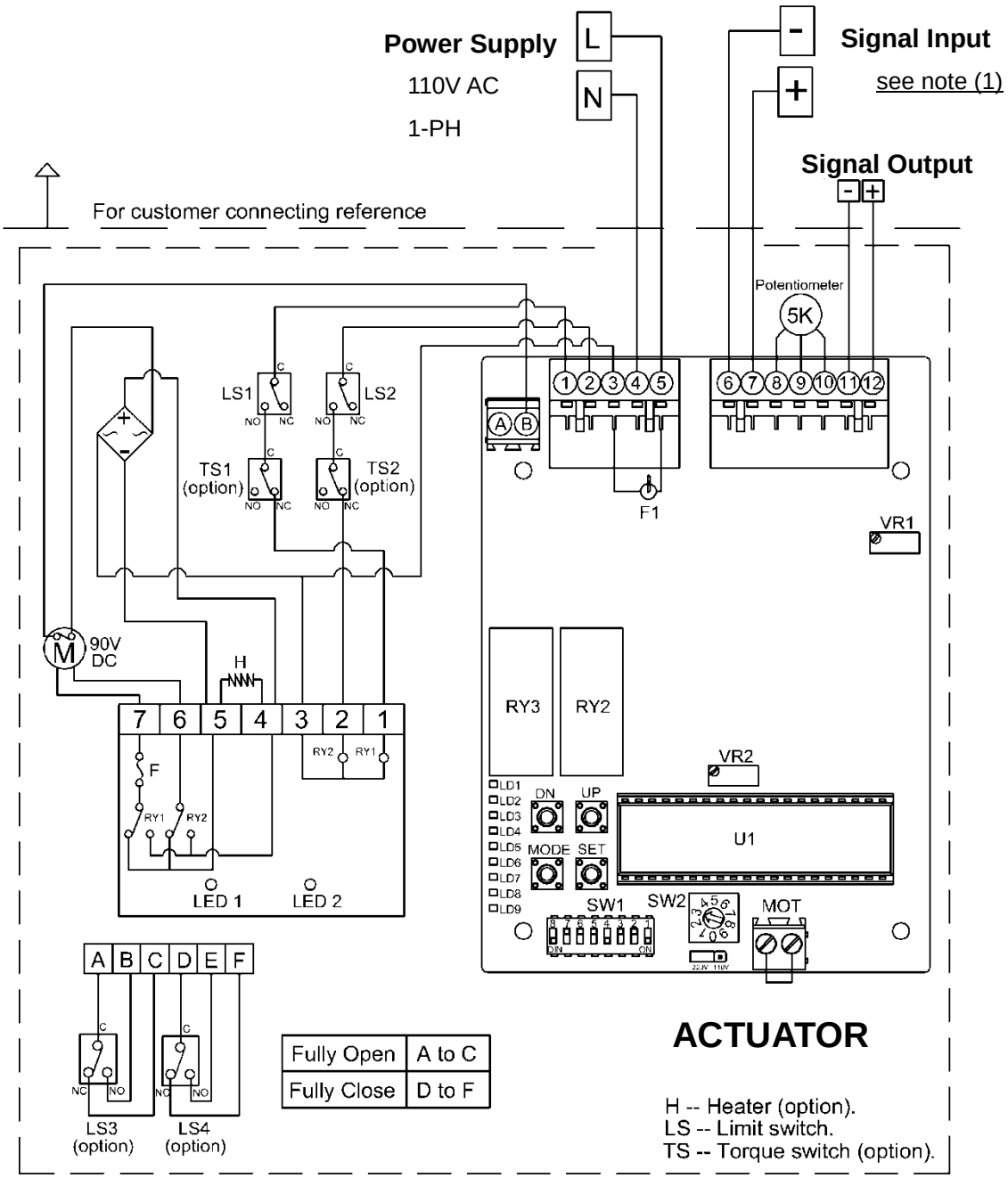
NOTE :

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”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-9 ~ OM-13 110V AC 1-Phase

Modulating Controller , 50% duty cycle



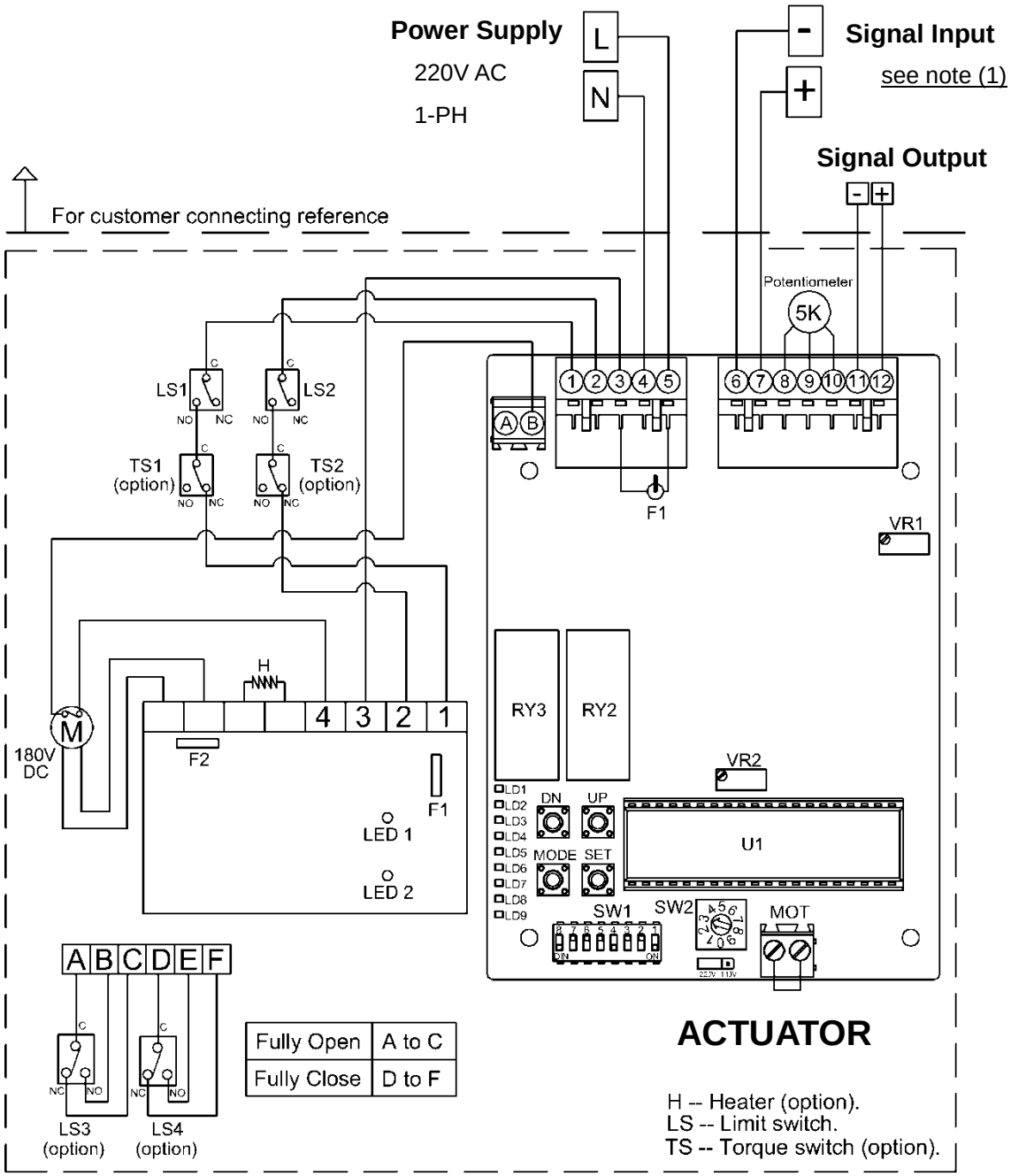
NOTE :

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”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-9 ~ OM-13 220V AC 1-Phase

Modulating Controller , 50% duty cycle



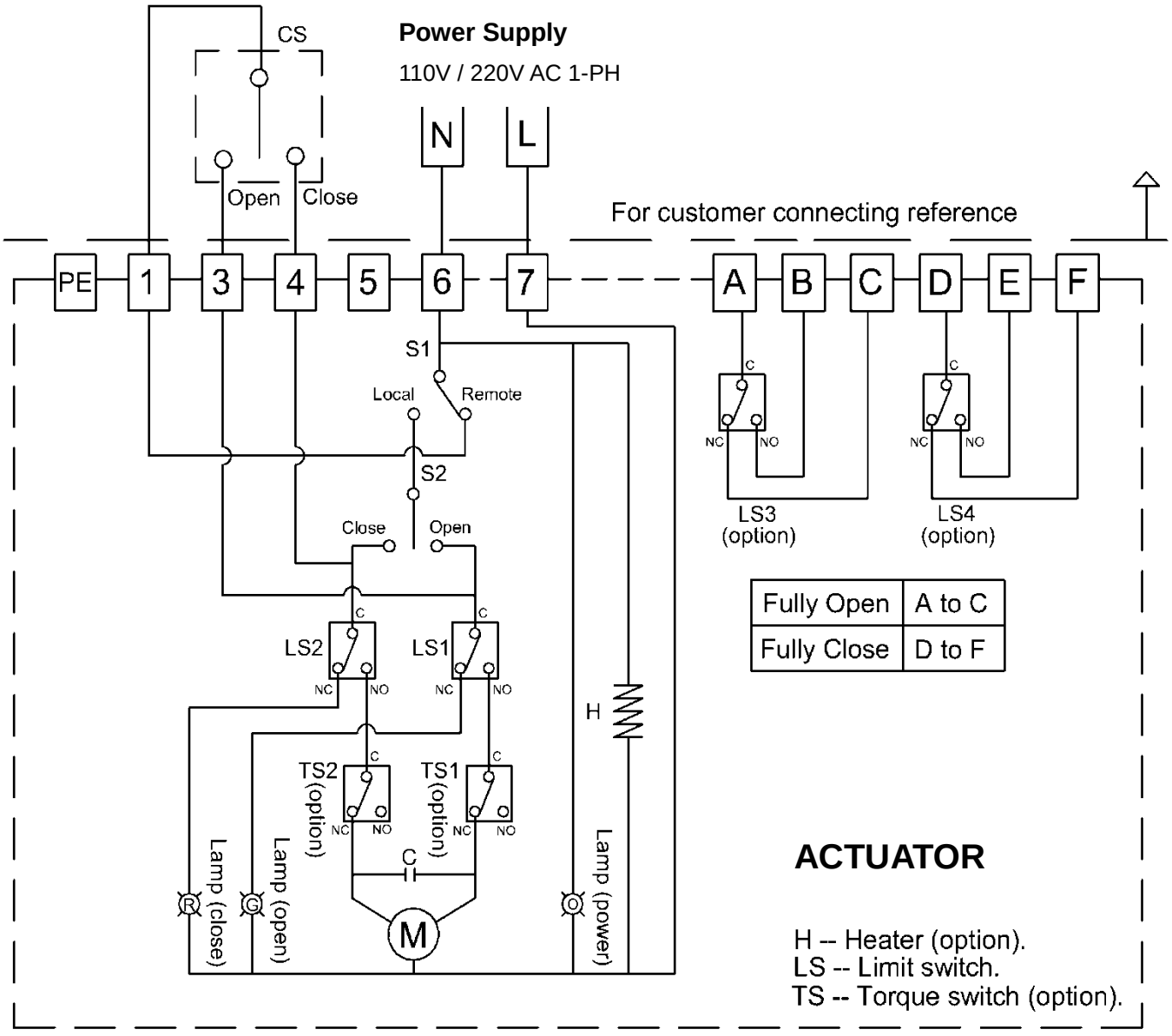
NOTE :

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”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-13 110V, 220V AC 1-Phase

On-Off Controller , Local Control Unit



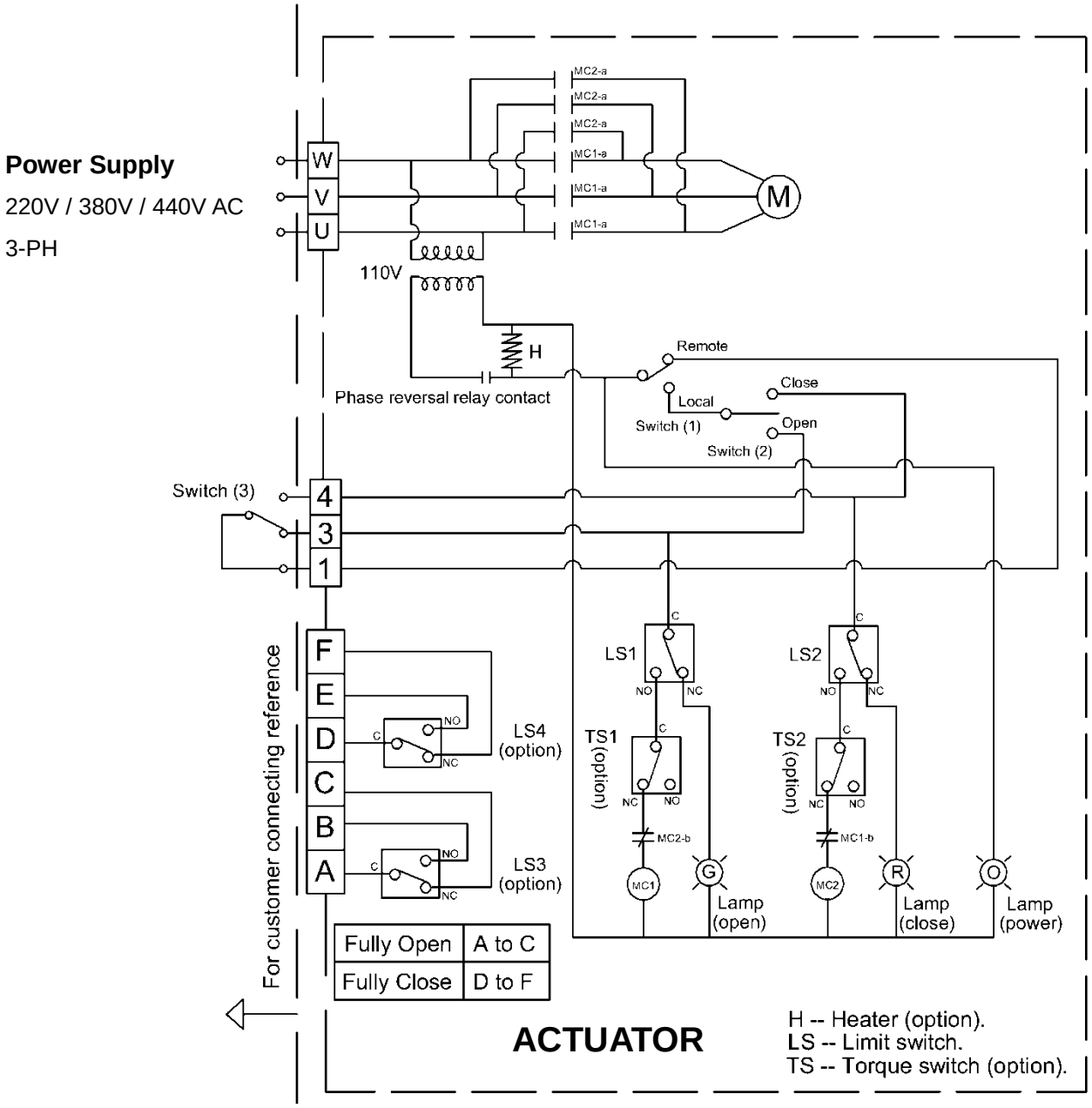
NOTE:

1. Using less than 5A current for “A, B, C, D, E, F”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-13 220V, 380V, 440V AC 3-Phase

On-off Controller , Local Control Unit



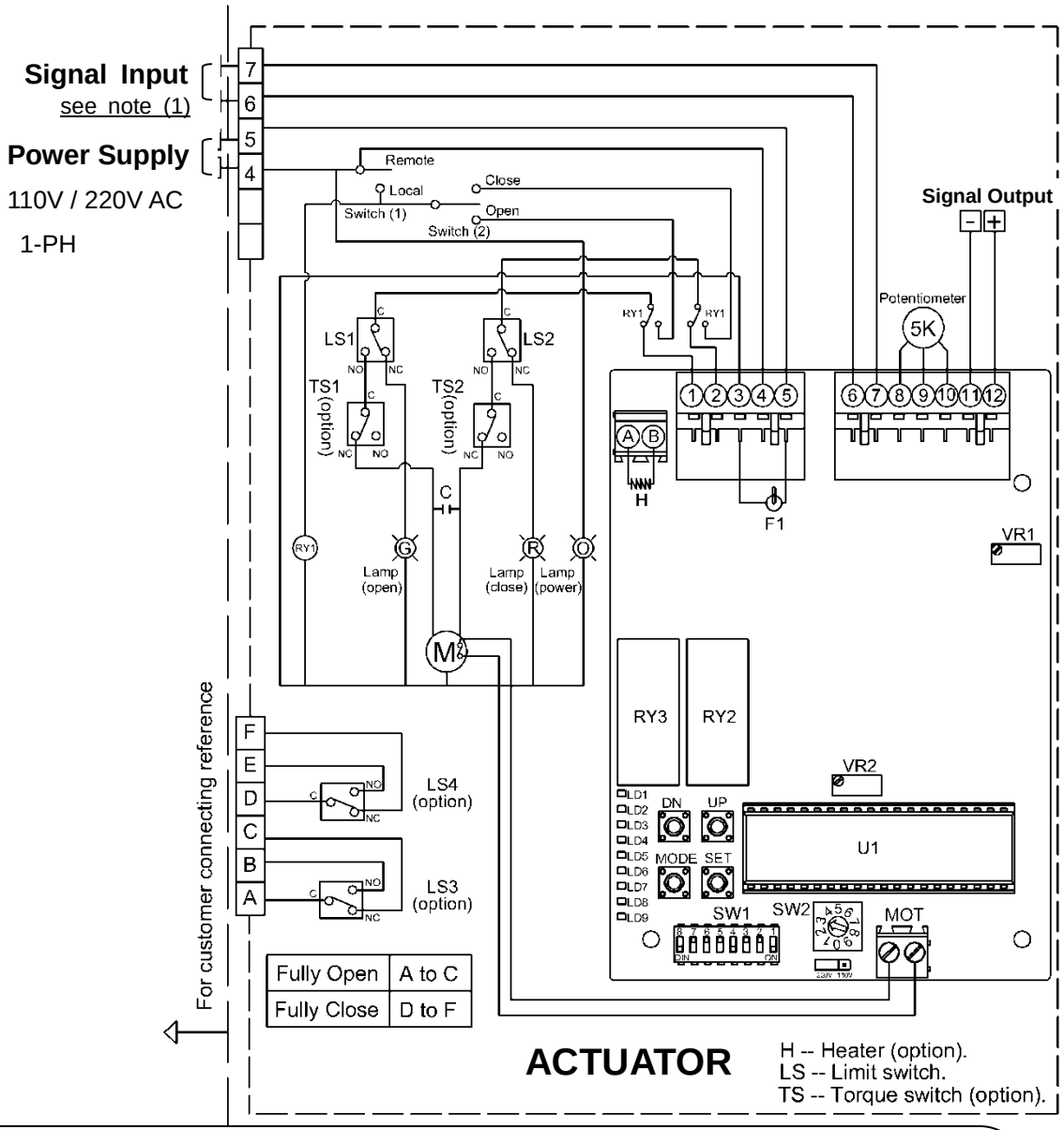
NOTE :

1. Please change any two of U, V, W when the power lamp is off.
2. Switch (3) is the switch of remote control (provided by user).
   a. Connecting #1 & #3 for OPEN.
   b. Connecting #1 & #4 for CLOSE.
   c. #1, #3, #4 can't connect together at the same time.
3. Using less than 5A current for " A,B, C, D, E, F"

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-8 110V, 220V AC 1-Phase

Modulating Controller , Local Control Unit , 30% duty cycle



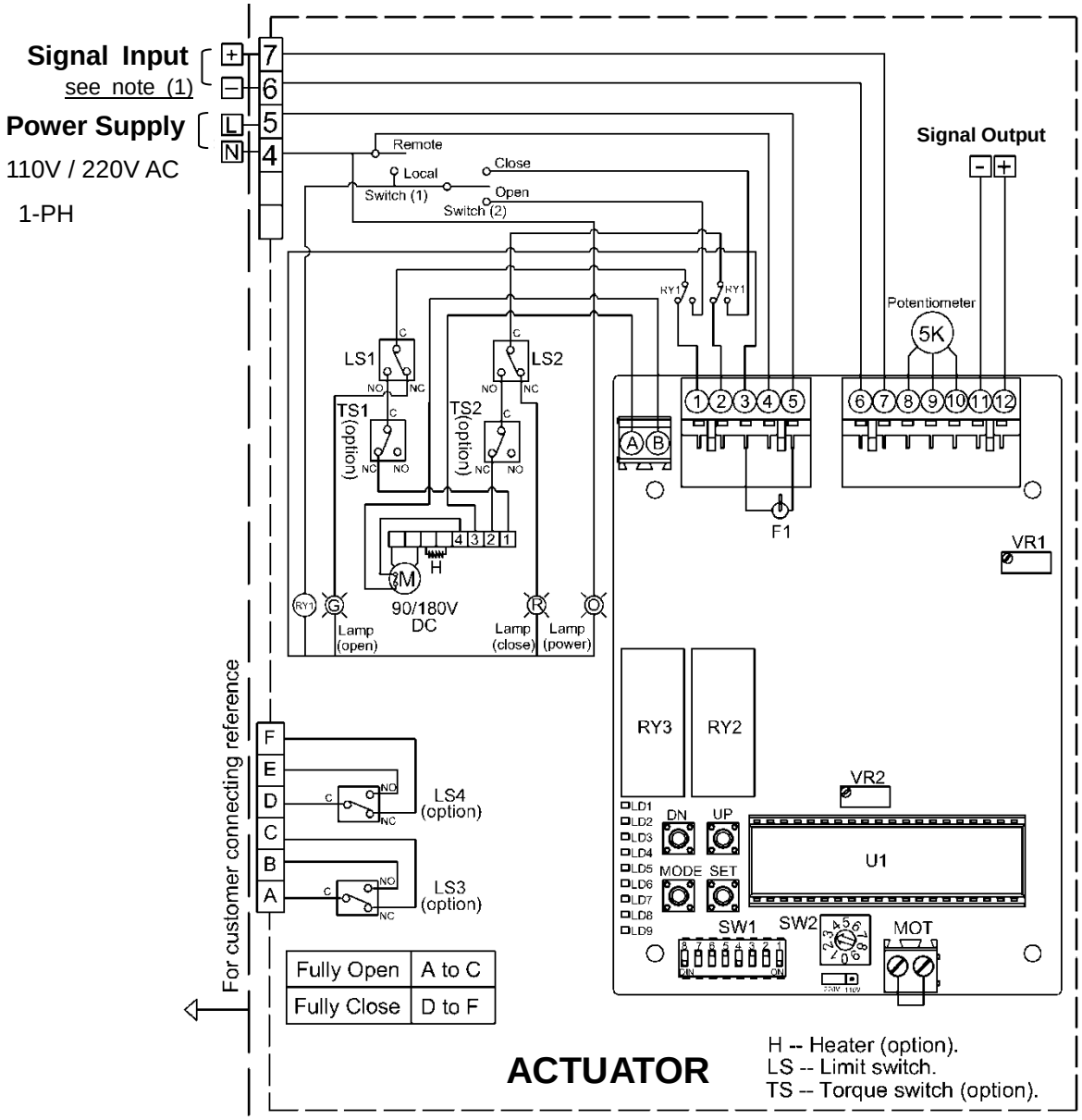
NOTE :

1. Please change any two of U,V,W when the power lamp is off.
2. **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
3. **Local / Remote Switches**
   a. Select " Remote"：Controlled by signal.
   b. Select "Local "：Controlled by switch (2).
4. Using less than 5A current for "A, B, C, D, E, F".

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-8 110V, 220V AC 1-Phase

Modulating Controller , Local Control Unit , 75% duty cycle



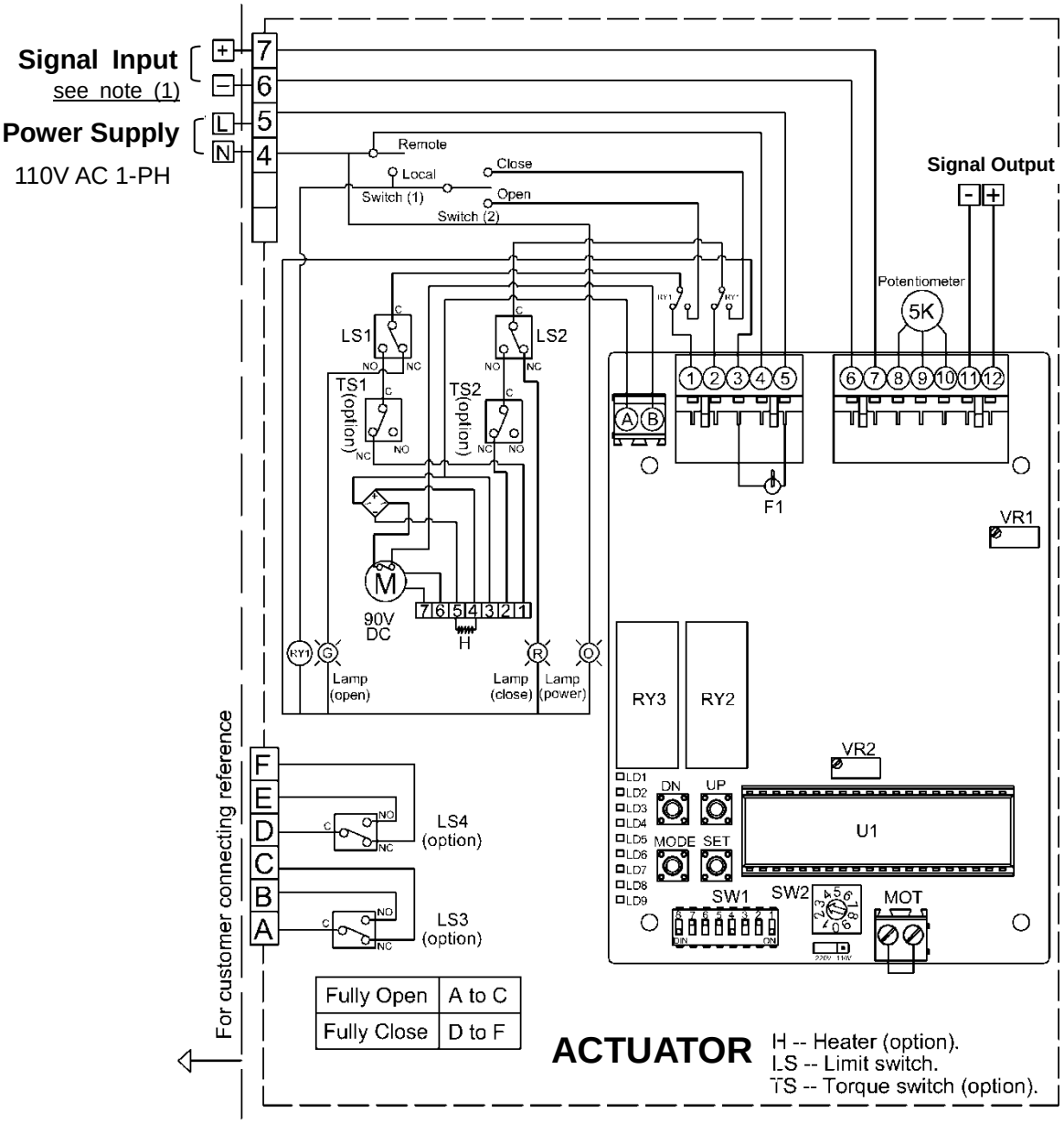
NOTE :

1. Please change any two of U,V,W when the power lamp is off.
2. **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
3. **Local / Remote Switches**
   a. Select “Remote”：Controlled by signal.
   b. Select “Local “：Controlled by switch (2).
4. Using less than 5A current for “A, B, C, D, E, F”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-9 ~ OM-13 110V AC 1-Phase

Modulating Controller , Local Control Unit, 50% duty cycle



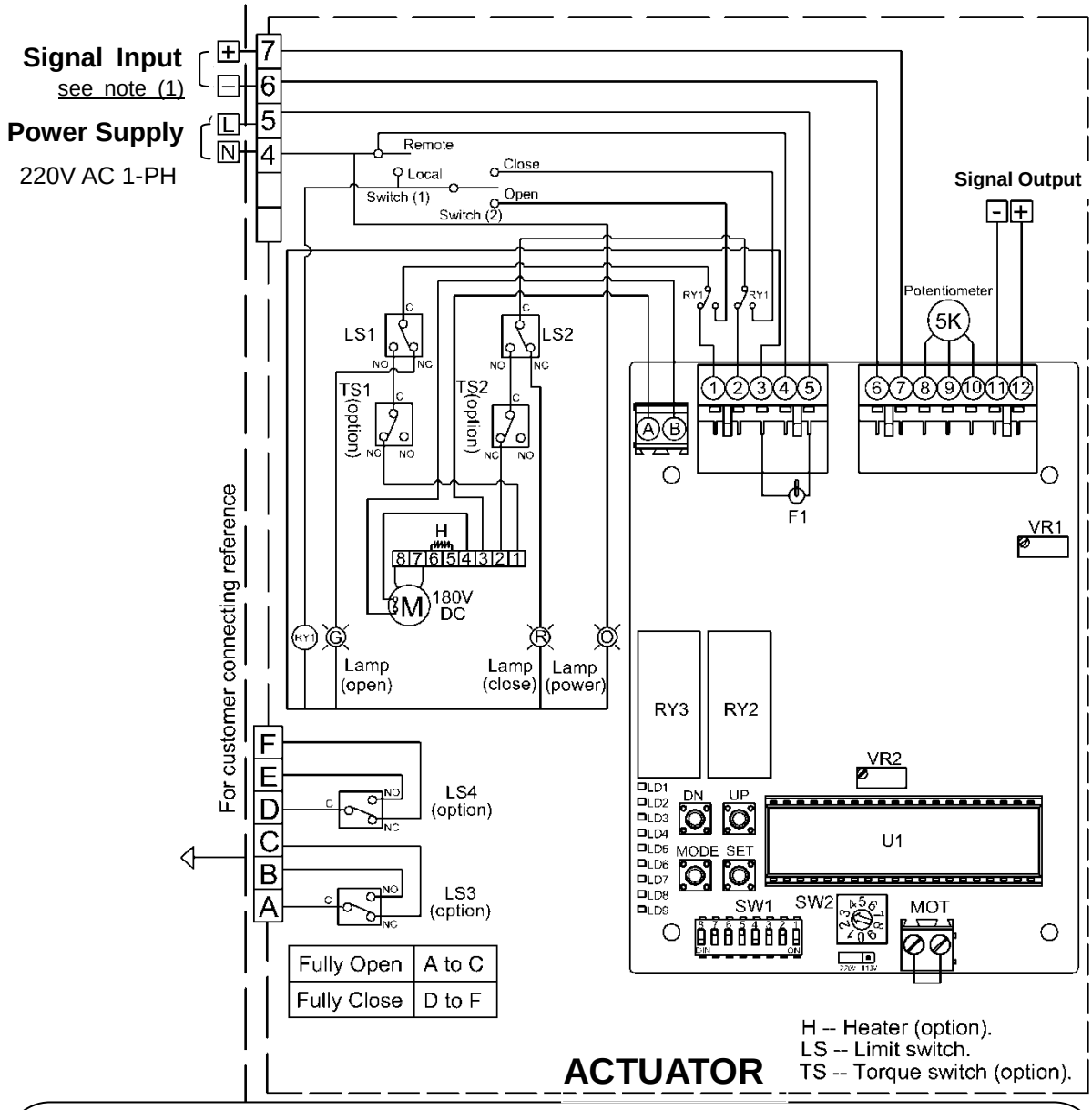
NOTE :

1. Please change any two of U,V,W when the power lamp is off.
2. **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
3. **Local / Remote Switches**
   a. Select “Remote”：Controlled by signal.
   b. Select “Local “：Controlled by switch (2).
4. Using less than 5A current for “A, B, C, D, E, F”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-9 ~ OM-13 220V AC 1-Phase

Modulating Controller , Local Control Unit, 50% duty cycle



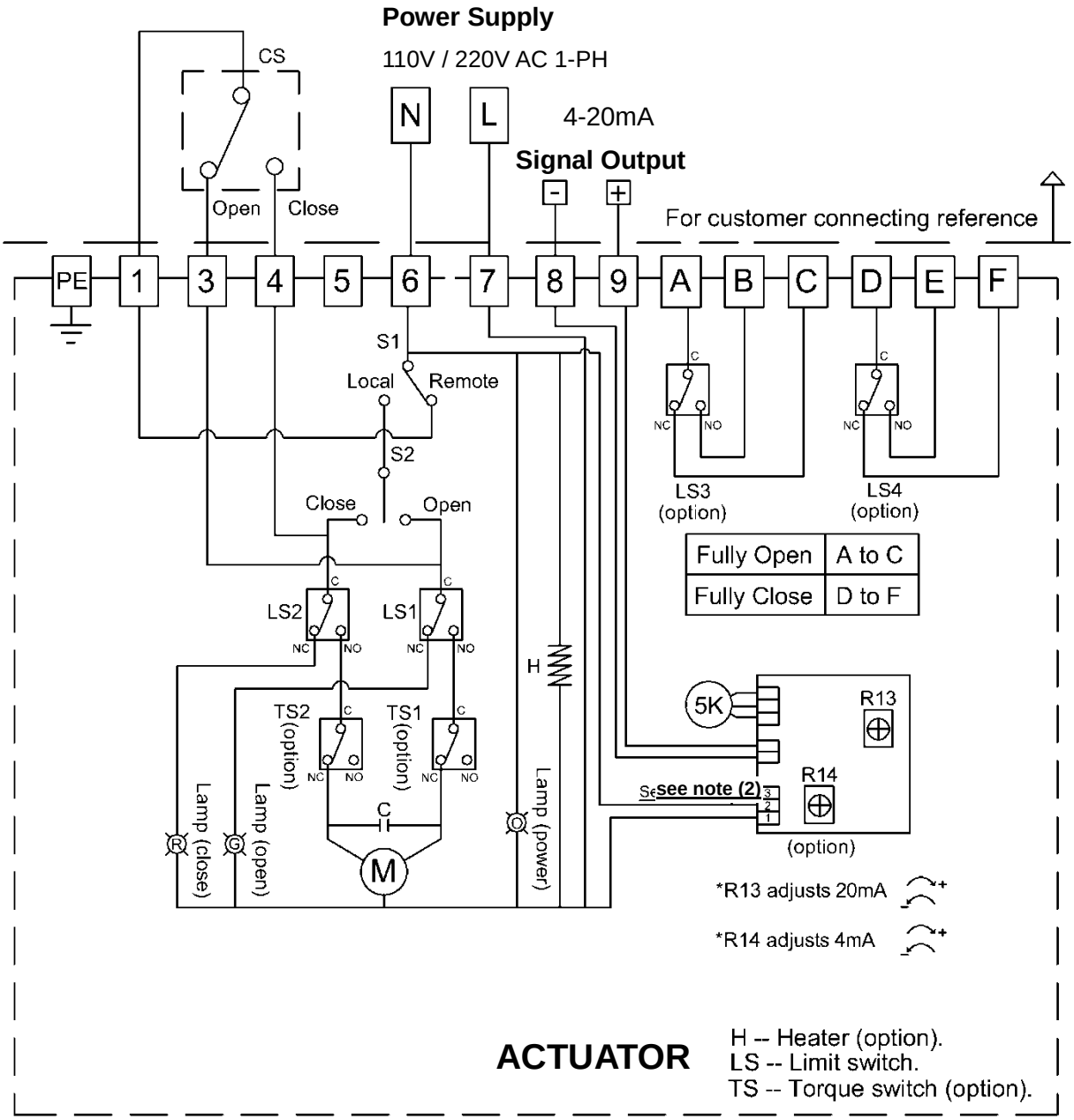
NOTE :

1. If power lamp is off, please change any two of the U, V, W.
2. **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
3. **Local / Remote Switches**
   a. Select “Remote”：Controlled by signal.
   b. Select “Local “：Controlled by switch (2).
4. Using less than 5A current for “A, B, C, D, E, F”.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-13 110V, 220V AC 1-Phase

On-off Controller , Local Control Unit, Current Position Transmitter

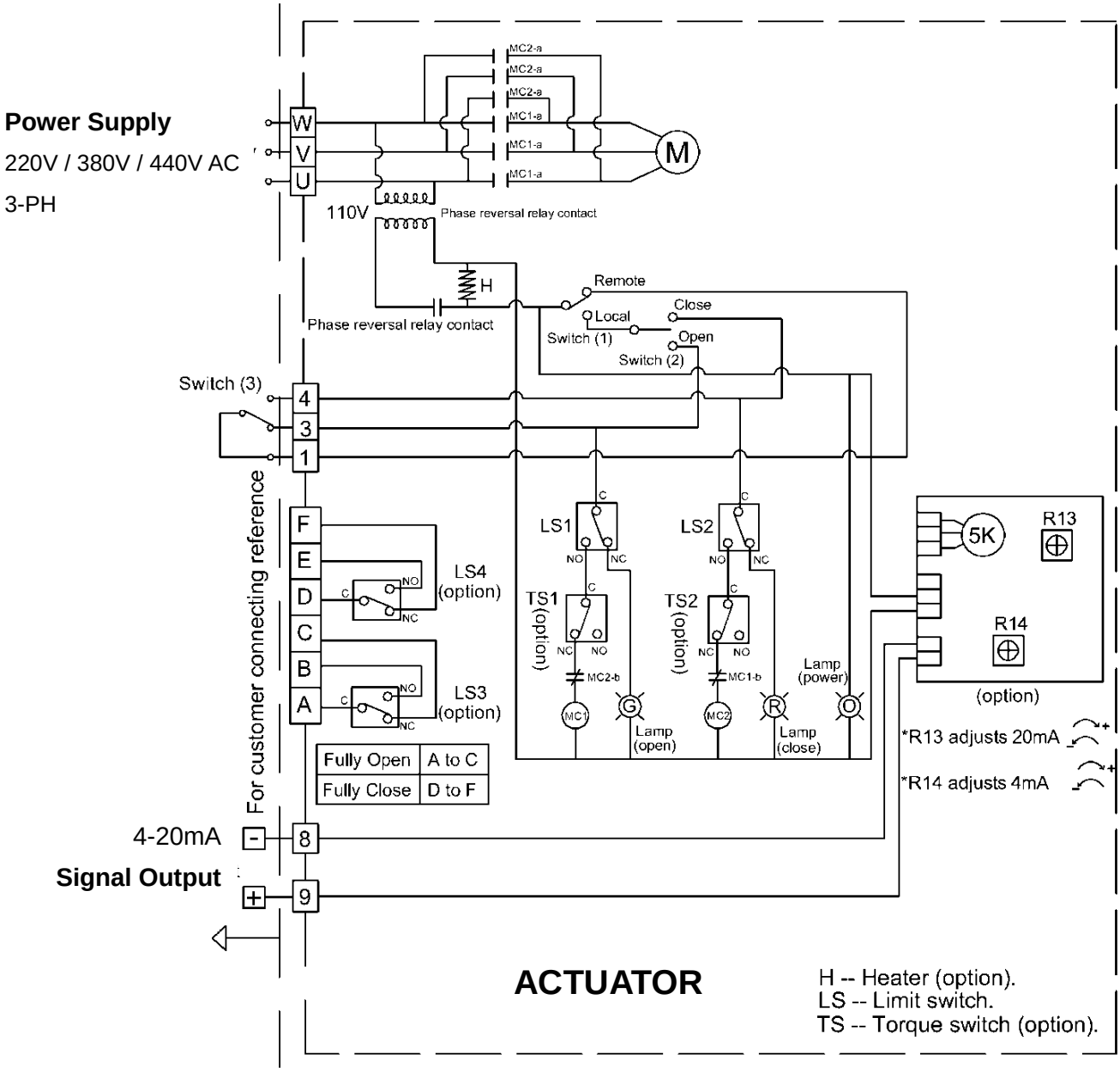


NOTE :

1. Using less than 5A current for “A, B, C, D, E, F”.
2. If the control power is 220V AC, N &L connect to #1 & #3.
3. If the control power is 110V AC, N & L connect to #1 & #2 or #2 & #3.

WIRING DIAGRAM – Quarter Turn Actuator

OM-2 ~ OM-13 220V, 380V, 440V AC 3-Phase
On-off Controller , Local Control Unit, Current Position Transmitter, 30% duty cycle

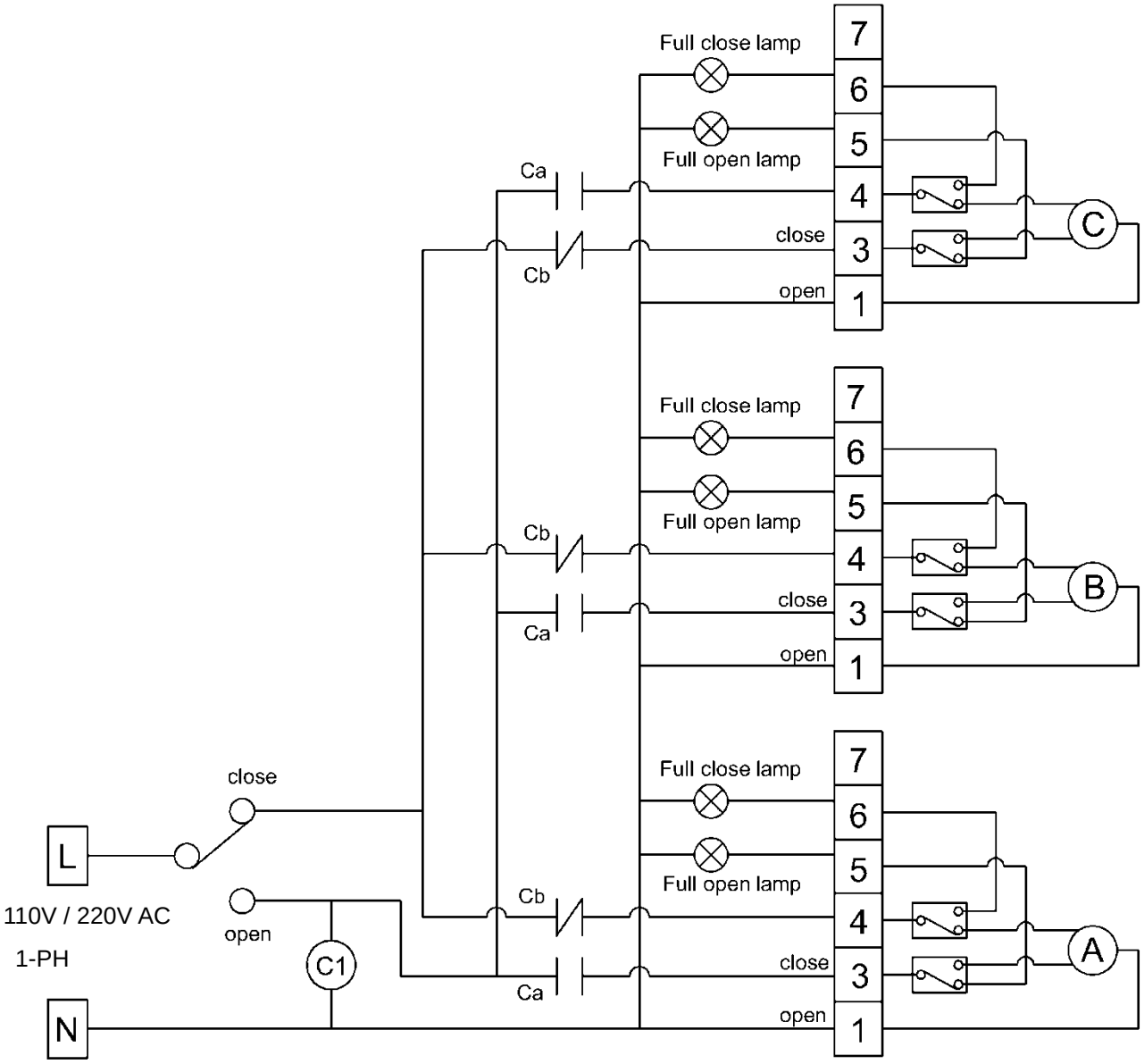


NOTE :

1. Please change any two of U, V, W when the power lamp is off.
2. Switch (3) is the switch of remote control (provided by user).
   a. Connecting #1 & #3 for OPEN.
   b. Connecting #1 & #4 for CLOSE.
   c. #1, #3, #4 can't connect together at the same time.
3. Using less than 5A current for " A,B, C, D, E, F"

WIRING DIAGRAM – Quarter Turn Actuator

BM-2, OM-A, OM-A-M, OM-1 ~ OM-13 110V, 220V AC 1-Phase
Same Switch Coupling Wiring



NOTE :

1. The wiring is base on the 3 sets of motor for one switch – 1 sets is open and 2 set is close. (if more sets, the rest can be done by this logic.)
2. When a set of control wire or switch needs to control two or more actuators at the same time, please refer to the wiring diagram.
3. Add 1 pcs contactor for separation to prevent from interference of condenser coupling.
4. C1=3a3b contactor

ADJUSTMENT – Travel Cam & Limit Switches

NOTE:

If LS3 & LS4 are fitted, they should be set to operate before LS1 & LS2 prevent further travel.

The travel cams are set to control the open and closed position of the valve. The position is set to stop the travel of the actuator when the travel cams activate the limit switch. Standard is two limit switches (LS1 & LS2), one for open, one for closed. 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.

The travel cams can be adjusted by 2.5mm Hex. Spanner. The cams are preset at the factory. When additional adjustments are needed, follow steps described below.

OM-A , OM-A-M

1. To set the open position:

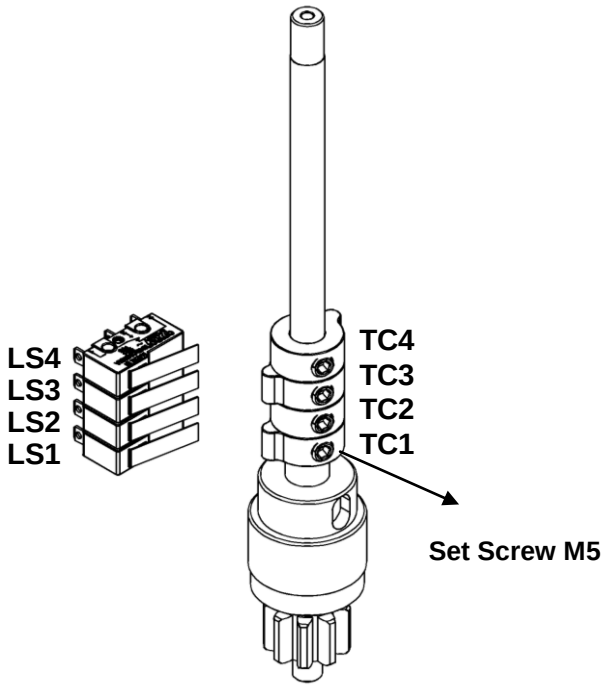
a. Turn power off .
b. Use manual override to turn valve to the fully open position.
c. Remove cover and loosen the M5 set screw in the TC1 by 2.5mm Hex Spanner.
d. Rotate cam counterclockwise into switch.
e. Slowly rotate cam clockwise until a light click is heard.
f. Securely tighten the set screw and apply power to check the traveling position. If the position is not correct, please repeat steps a ~ f.
g. After the adjustment is completed, check again the M5 set screw is securely tightened.

2. To set the close position:

a. Turn power off.
b. Use manual override to turn valve to the fully closed position.
c. Loosen the M5 set screw in the TC2 by 2.5mm Allenkey.
d. Rotate cam clockwise into switch.
e. Slowly rotate cam counterclockwise until a light click is heard.
f. Securely tighten the set screw and apply power to check the traveling position. If the position is not correct, please repeat steps a ~ f.
g. After the adjustment is completed, check again the M5 set screw is securely tightened.

ADJUSTMENT – Travel Cam & Limit Switches

【OM-A & OM-A-M】



TC 4 Synchronous turn with TC2 (optional).

TC 3 Synchronous turn with TC1 (optional).

TC 2 "CLOSE"
- **Clockwise : increase closing degree to fully closed.**
- **Counter Clockwise: decrease closing degree.**

TC 1 " OPEN"
- **Clockwise : decrease opening degree.**
- **Counter Clockwise: increase opening degree to fully open.**

OM-1~OM-13 & BM-2

1. To set the open position:

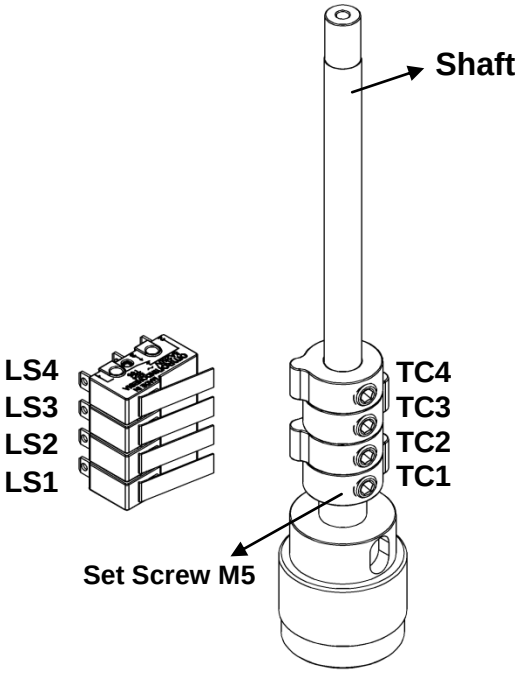
a. Turn power off and loosen both mechanical stops (refer to P45).
b. Use manual override to turn valve to the fully open position.
c. Remove cover and loosen the M5 set screw in the TC1 by 2.5mm Hex Spanner.
d. Rotate cam clockwise into switch.
e. Slowly rotate cam counterclockwise until a light click is heard.
f. Securely tighten the set screw and apply power to check the traveling position. If the position is not correct, please repeat steps a ~ f.
g. After the adjustment is completed, check again the M5 set screw is securely tightened.

ADJUSTMENT – Travel Cam & Limit Switches

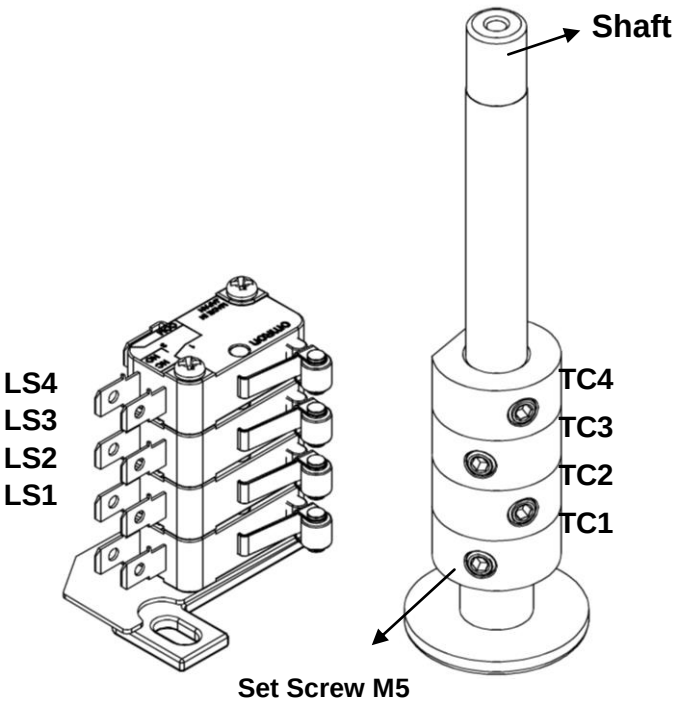
2. To set the close position:

a. Turn power off.
b. Use manual override to turn valve to the fully closed position.
c. Loosen the M5 set screw in the TC2 by 2.5mm Allenkey.
d. Rotate cam counterclockwise into switch.
e. Slowly rotate cam clockwise until a light click is heard.
f. Securely tighten the set screw and apply power to check the traveling position. If the position is not correct, please repeat steps a ~ f.
g. After the adjustment is completed, check again the M5 set screw is securely tightened.

【OM-1】



【BM-2, OM-2~13】



TC 4 Synchronous turn with TC2 (optional).

TC 3 Synchronous turn with TC1 (optional).

TC 2 "CLOSE" ↻ **Clockwise : decrease closing degree.**

↺ **Counter Clockwise: increase closing degree to fully close.**

TC 1 " OPEN" ↻ **Clockwise : increase opening degree to fully open.**

↺ **Counter Clockwise: decrease opening degree.**

ADJUSTMENT – Mechanical Stops

CAUTION：

Mechanical stops should only be reached during manual operation.

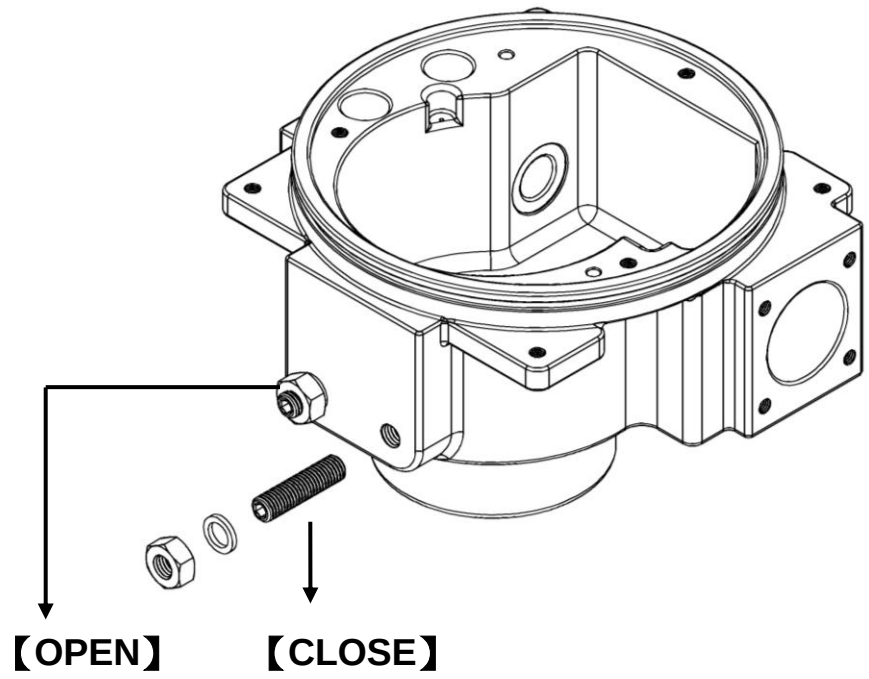
The Mechanical stops are factory set, though in some cases adjustment may be required once a valve is fitted.

1. For Electric Operation

   Please refer to “Adjustment – Travel Cam & Limit Switches”.

2. For Manual Operation

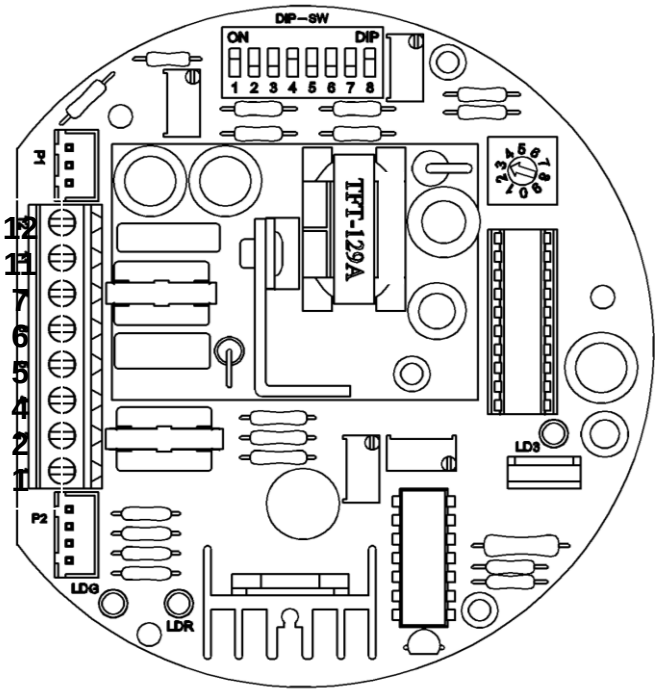
   a. Turn power off.
   b. Loosen locknut and unwind it a few turns.
   c. For modulating type, loosen the set screws in the sector gear.
   d. Use manual override to turn the actuator to desire limit position.
   e. For modulating type, rotate sector gear counterclockwise to the end. Then tighten set screw.
   f. Screw in the grub-screw until it reaches the internal cam, then reverse one cycle.
   g. Tighten locknut.
   h. Check that the electrical limit switches can still be reached.



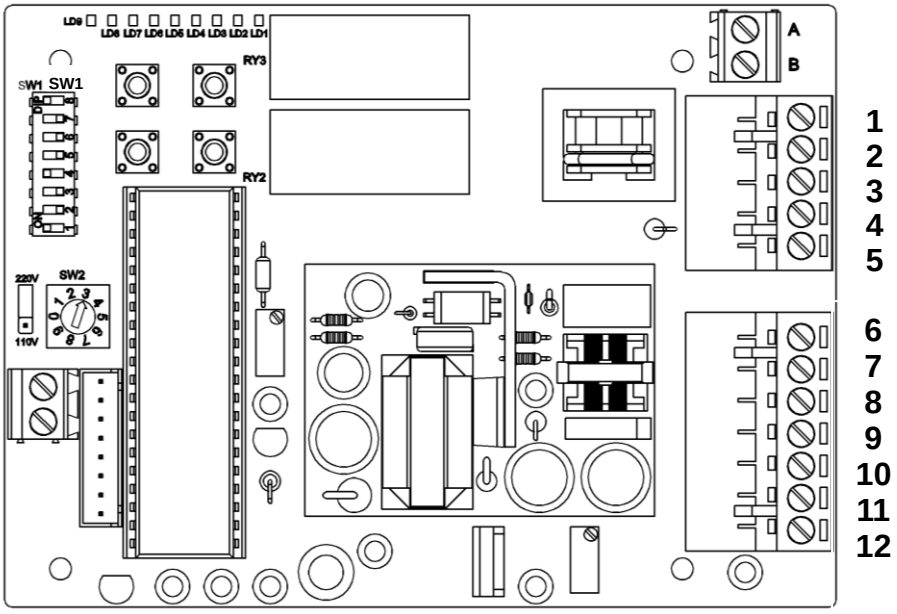
ADJUSTMENT – Modulating Control Board

a. Surface *The surface is based on the actuator in 110 / 220V voltage.*

OM-1, OM-A & OM-A-M

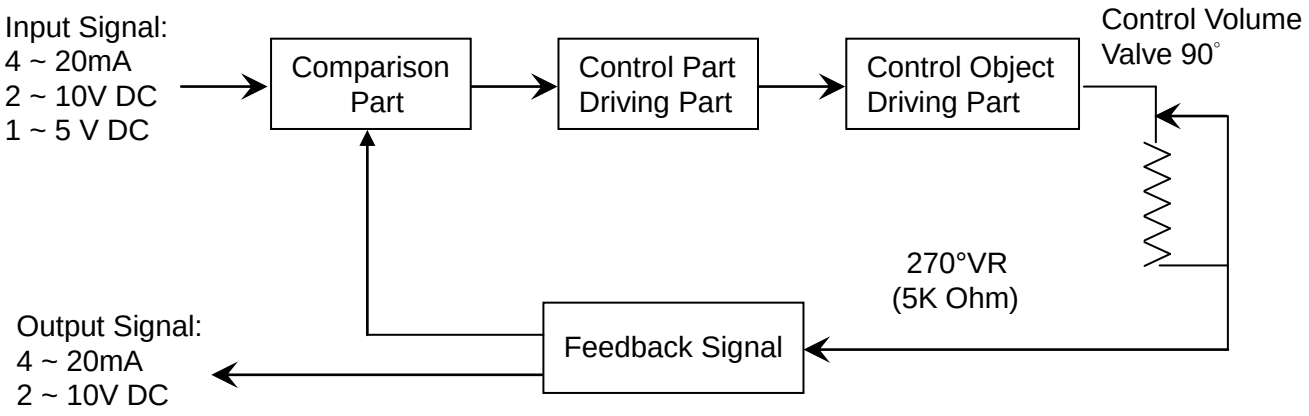


OM-2~13



ADJUSTMENT – Modulating Control Board

b. **Procedure**



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

c. **DIP-SWITCH SETTING (SW1)**

CAUTION: Do not alter switch positions while actuator is turned on.

8	7	6	5	4	3	2	1	
ON	OFF	OFF	OFF	ON	OFF	OFF	ON	Factory setting
						OFF	ON	4-20mA input
						OFF	OFF	1-5V input
						ON	OFF	2-10V input
			OFF	ON	OFF	4-20mA output		
			ON	OFF	ON	2-10V output		
		OFF	20mA / 5V / 10V means valve fully-open					
		ON	20mA / 5V / 10V means valve fully-closed					
ON	OFF	Close valve if input signal disconnected (when S6 sets " OFF")						
OFF	ON	Open valve if input signal disconnected (when S6 sets " OFF")						
ON OFF	ON OFF	Actuator will not operate if input signal disconnected (when S6 sets " OFF")						

ADJUSTMENT – Modulating Control Board

	FUNCTION	SETTING
S1, 2	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, 4, 5	OUTPUT SIGNAL SELECT.	"4-20mA" set 3-OFF / 4-ON / 5-OFF. "2-10V" set 3-ON / 4-OFF / 5-ON.

When S6 sets " ON "

S6	INPUT SIGNAL SELECT： 4mA, 2V, 1V →valve fully-open 20mA, 10V, 5V→valve fully-closed	Set 6-ON.
S7, 8	POSITION SELECT (When the 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.

When S6 sets " OFF "

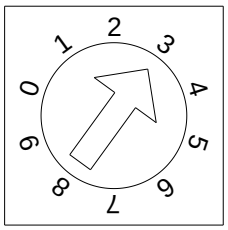
S6	INPUT SIGNAL SELECT： 4mA, 2V, 1V →valve fully-closed 20mA, 10V, 5V→valve fully-open	Set 6-OFF.
S7, 8	POSITION SELECT (When the input signal fails)	"valve fully-closed" set 7-OFF 8-ON. "valve fully-open" set 7-ON / 8-OFF. "valve stops" set 7-ON / 8-ON. Or 7-OFF / 8 - OFF.

Note: 1. The standard factory presetting is 1, 4, 8 for ON and 2, 3, 5, 6, 7 for OFF.

ADJUSTMENT – Modulating Control Board

d. **Sensitivity Switch Setting**

SW2



SW2: 1,2,3~ 0 Sensitivity switch：

When switch to “1”: The Highest Sensitive and the 0~90 degree can be divided up to around 70 times movement.

When switch 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.

e. **Settings for OPEN and CLOSE (for OM-2~ OM-13)**

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

OPEN setting

a. Keep pressing “**SET**” for 2 seconds, then LD 9 comes on, it will enter the manual mode.
b. Keep pressing “**UP**” and let the actuator run to fully-open position, LD2 comes on, then supplies the input signal (5V or 10V or 20mA).
c. Press “**MODE**” once. The OPEN setting is completed.

CLOSE setting

a. Keep pressing “**DOWN**”, let the actuator run to fully-closed position, LD1 comes on , then supplies input signal (1V or 2V or 4mA).
b. Press “**MODE**” once. The CLOSE setting is completed.

After completing the above settings, press “SET” once.

ADJUSTMENT – Modulating Control Board

f. **Lamp Signal (for OM-2~ OM-13)**

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 - Setting position for open & close
LD5	Wrong input signal		

If the LED (LD4~LD9) is flashing after the operating check is completed, refer to the following "Modulating Board Troubleshooting".

Lamp	Possibilities	Solution
No Lamp (LD3 off)	a. No power supply b. The voltage is over 260V and cause the board burn out. c. Wrong connecting for the #8, #9 of the VR. d. Modulating board fault.	a. Check the power supply. b. Check the voltage. c. Check the wiring. d. Send back to factory.
LD5	a. Setting in 2-10V input signal but supply 4-20mA. b. Setting in 2-10V input signal and the signal is over 13.5V. ***Setting in 4-20mA but supply 2-10V signal. The actuator will operate by 2~7V. But if the signal over 7.2V the LED5 will come ON.***	Confirm the Input Signal
LD 6	Motor thermostat turn off	a. Too high frequency for rated duty cycle. b. Motor thermostat (MOT) isn't connect.
LD7	Output signal short circuit	a. Confirm the wiring of output signal #11(-)、#12 (+) b. Whether the #11 & #12 output signal short circuit.
LD2、LD7	Incorrect wiring for 2-10V input signal.	Confirm the wiring of input signal #6(-)、#7 (+)
LD8	Motor current is excessive	a. Too high frequency for rated duty cycle. b. Check the load. c. Check if the motor rotor is locked.
LD9	Manual Mode - Setting position for open & close	After completing the settings, press "SET" once.

TROUBLE SHOOTING

ON-OFF Controller

a. Motor does not operate and overheats

Possibilities	Solution
a. Supply power for #3、#4 simultaneously. (Parallel Connection)	a. Check the wiring.
b. The capacitor failed.（whether the surface of the capacitor deforms）	b. Replace a new part.
c. Valve's rubber is sunken（valve has been set at fully closed position for a long period.）	c. Use hand-wheel for test or change a new valve
d. Check if any foreign objects in the flow stream.	d. Check for obstructions.
e. Broken motor stem or bearing	e. Replace new parts.

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

Possibilities	Solution
a. Starting the actuator too frequently. (too high frequency for rated duty cycle)	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 a new valve.
c. Under or over requested voltage.	c. Check the supply circuit
d. The gear jams the mechanical stops in fully open or closed position.	d. Reset the mechanical stops and limit switches.
e. Wrong supply power.	e. Check the supply power.

c. Operating two or more actuators simultaneously. The actuator works abnormally some times and the motor is hot.

Possibilities	Solution
Parallel Connection	Check circuits, install relay for separation. (refer to wiring diagram page 41)

d. The valve can't fully open or close during test by either power supply or hand-wheel.

Possibilities	Solution
a. When mounting the actuator with valve the worker doesn't aim at center, the disc lock the flange which on the pipe.	a. Call the working group to solve the problem.
b. The torque of valve over than actuator.	b. Replace new valve or larger actuator.
c. The set screw of the cam is loosen.	c. Reset the mechanical stops and limit switches.
d. The angle of actuator and valve don't is the same angle.	d. Check the angle of the valve and actuator.

TROUBLE SHOOTING

ON-OFF Controller

e. The capacitor is failed.

Possibilities	Solution
a. Overload (exceed the rated torque of actuator) b. Over rated duty cycle. c. Over service life.	a. Replace a new part. Suggest change new valve or larger actuator. b. Replace high duty cycle actuator c. Check the capacitance and surface every year.

Modulating Controller

a. The LED is flashing after the operating check is completed.

Solution
Refer to **page 50.**

b. The lamp on the modulating board is ON 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 opposed. （equal to signal failure）	Confirm if the input signal and the wiring are correct.

c. Can't operate by modulating controller.

Possibilities	Solution
a. Fault VR. b. The sector gear of the VR is loosen. c. Wrong input signal. d. Fault modulating board.	a. Replace a new VR. b. Switching the dip switches #7 to OFF, #8 to ON and take apart the input signal. The actuator will operate to fully close then set the sector gear again. Put all parts back after all adjustment and setting c. Check the input signal. d. Send back to factory for inspect.

WARRANTY

Inline Industreis, Inc. 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 Inline product and is not transferable.

To obtain service under this warranty, the purchaser must first acquire a return authorization from Inline. Products must be returned to Inline under freight prepaid.

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INLINE
BALLVALVE.COM
INLINE INDUSTRIES, INC.
9056 Garvey Avenue
Rosemead, CA 91770
Tel: (626) 813-6188
Fax: (626) 813-6186
www.ballvalve.com
info@ballvalve.com

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