Multi-turn Electric Actuator

MBV Series

Installation & Maintenance Instructions

Contents

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(Maplef General Supplier changed its name to Maplef valves and Fittings Ltd on 22 December 2023)

1. BEFORE OPERATING

1. After getting MBV actuator, please check if everything with the actuator is as per your requirement.

2. Visual check: Painting, indicator, hand wheel etc.

3. Specification: Users must check with name plate to see if the actuator is suitable for your requirement or not.

4. Optional Items: Check if all optional items are correct or not.

5. Check if electrical specification is correct or not (wiring diagram is inside the actuator, name plate)

6. Check if the electrical power is correct or not.

7. Check if the instruction manual and electrical wiring diagram are supplied.

8. Check if the specification of valve is correct as you require.

9. Check if the mounting of the actuator on application is correct and tight enough.

10. Check if the settings of actuator such as limit switches, stopper bolts, indicator are correct or not.

11. Check if specification (Model No., Main Power, Control Power, Options) of delivered actuator meets your requirement.

12. Please do not intend to repair / change the wiring diagram.

13. In case of 3 phase motor, check rotating direction first before normal operation. Check the rotating direction of actuator:

● Open actuator about 50% manually, supply power to actuator for 5 seconds.

● Push close button and check if the actuator moves towards close direction or not.

● If yes, it is OK, but reverse, disconnect the power supply and exchange the 2 power lines among the 3 lines.

14. Generally, all functions of PCU are set by the factory before delivery and there is no need to set the functions again. Only if the customer wants to adjust the limit switches, setting the functions of PCU is required. The setting is simple, and the customer just needs to push the AUTO SETTING button after making the actuator about 50% open (or close) position. Then the PCU card will adjust by itself.

15. Disassembly and modification without our consent may affect the performance of the actuator.

2. PACKING AND STORING

1. It is better to pack the actuator with the valve. They should be transported to the destination in a covered vehicle or in containers. As per special packing instructions, the unpacked actuator without valve can be delivered directly to the destination. Upon receipt of the actuator from the factory, it is essential to

check that there is no damage caused. As soon as you receive the actuator, check it carefully for any damage or if it is as per the order. Inform the factory if not so.

2. When the unpacked actuator is not immediately installed, it should be stored in a clean environment, with a temperature within the range of -10°C to +50°C and relative humidity up to 75%. Make sure the environment is without gas and vapor. If the actuator is to be stored for a very long period, i.e., above one year, oil should be added before commissioning. Any manipulation of the equipment at a temperature below -25°C is forbidden. If the actuator is stored without any protection, ensure that it is clean and dry before using it. If the actuator is to be stored over 3 months, please put some desiccants in the terminal box.

3. Follow the instructions during mounting, maintaining, or operating the actuator. For maintenance or repair, disconnect the power supply, dismantle the actuator, and move it to a safe place.

4. Mounting of the actuator should be done only by trained engineers as per the O&M Manual.

5. The actuator should be kept dry. If the actuator has been mounted and not wired, it is advisable to change the plastic plug to metallic plug with PTFE packing. If there is no discrepancy, the double O-Ring system of the actuator can protect its inside components well. If the damage is caused by users without our consent, we will not take any guarantee.

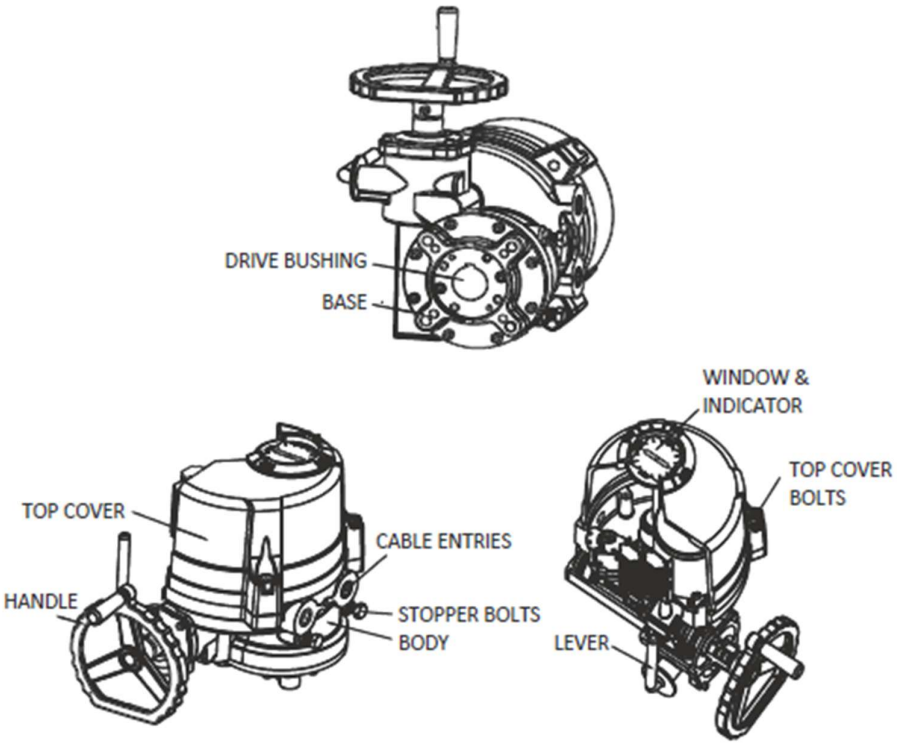
6. Each actuator has been tested. If mounted and maintained properly, it can be used for a long time.

3. STRUCTURE

The actuator is made of the following parts:

1. Enclosure: top cover and mounting base
2. Driving part: driven by highly efficient, hermetic, squirrel caged type motor
3. Rotating part: double worm gear
4. Manual override: hand wheel and clutch
5. Modulating part: separated with the actuator body, for easy modulation
6. Torque switch and limit switch
7. Travel testing and feedback

A. External Components – MBV100 – MBV1100



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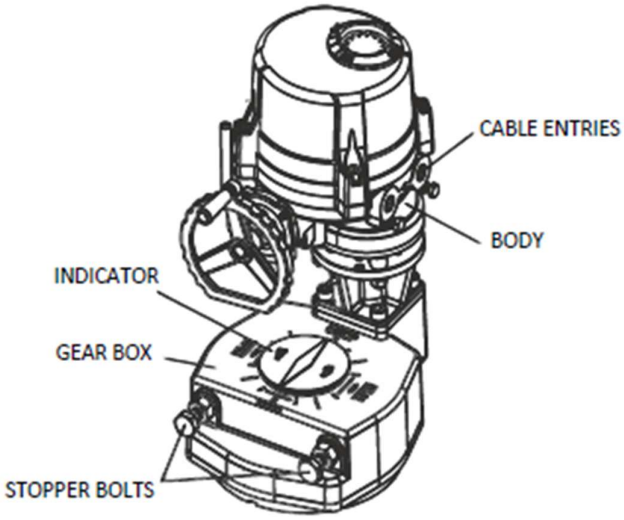
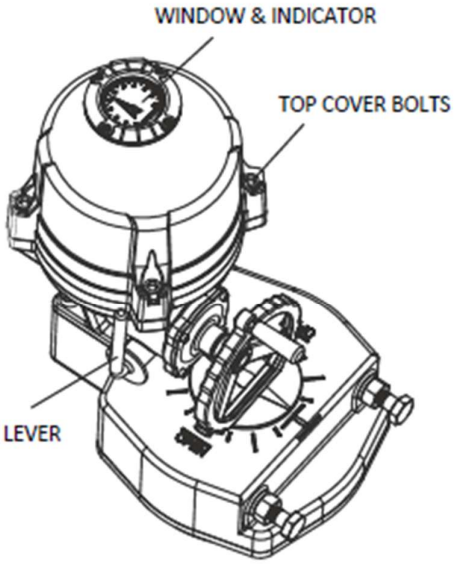
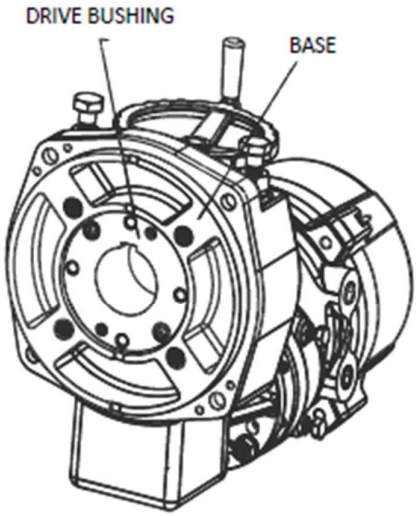
A. External Components – MBV1500 – MBV3000







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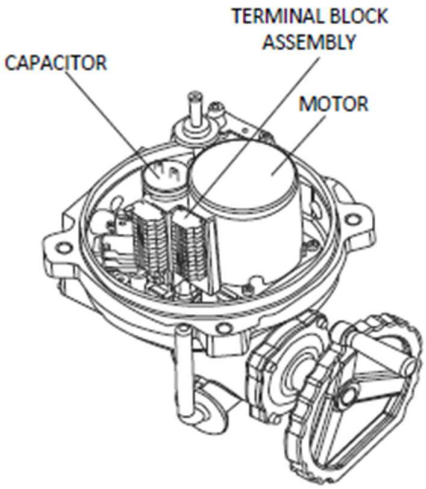
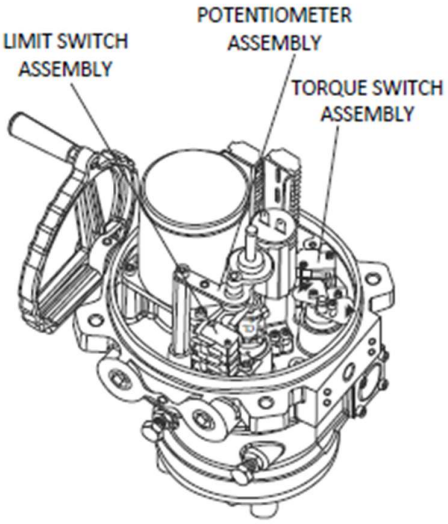
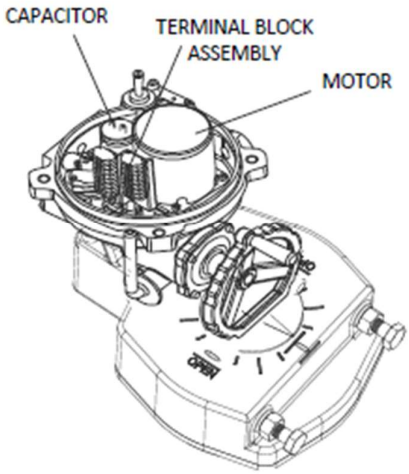
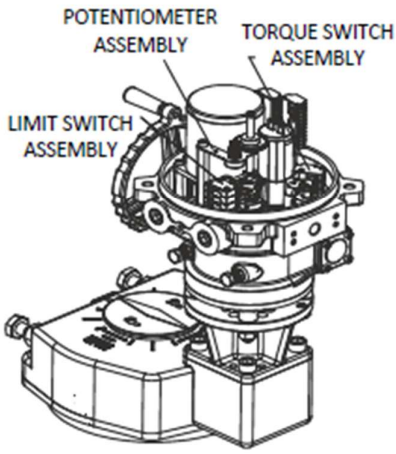
B. Internal Components – MBV1500 – MBV3000









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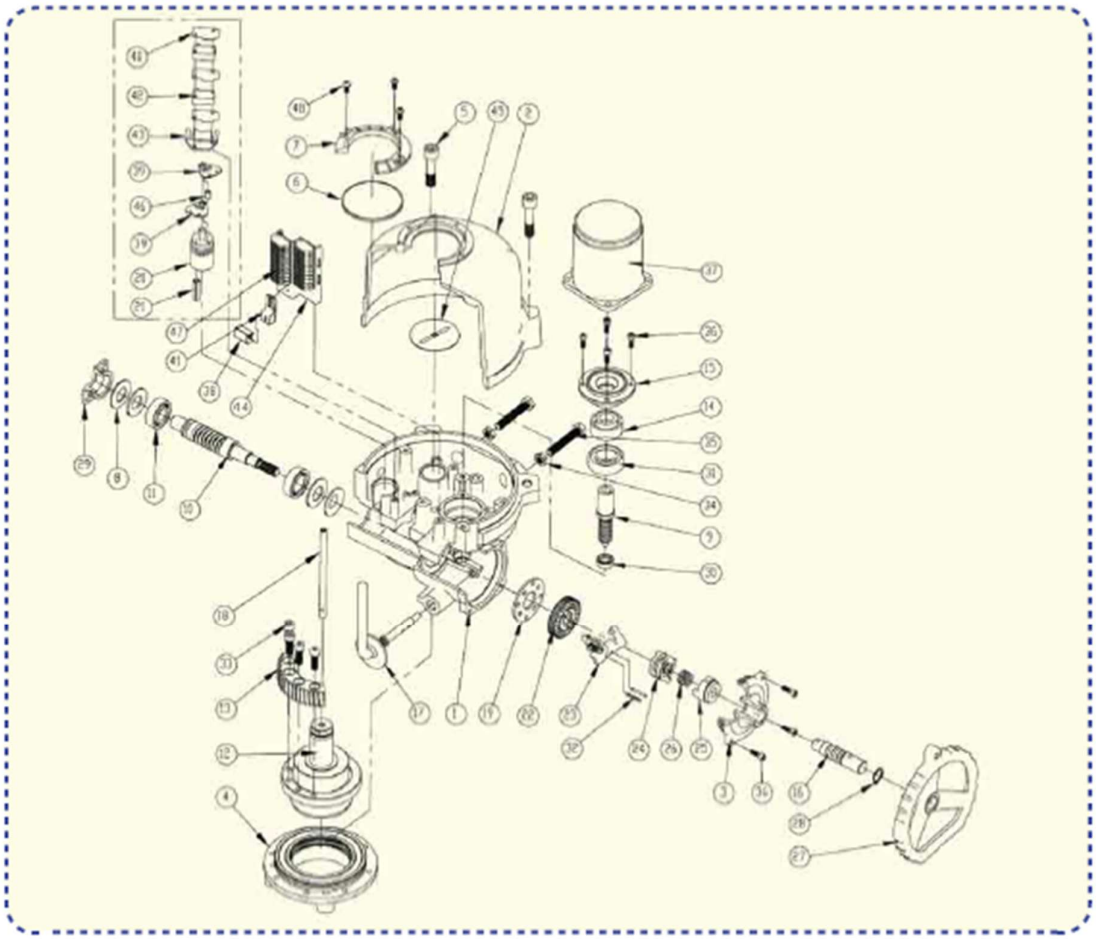

#	Part Name	Count	#	Part Name	Count	#	Part Name	Count
1	Body	1	17	Lever	1	33	Bolt	4
2	Cover	1	18	Point Shaft	1	34	Nut	2
3	Handle Cover	1	19	Thrust Cover	1	35	Bolt	2
4	Base	1	20	Torque Shaft	1	36	Bolt	8
5	Bolt	4	21	Spring Pin	1	37	Motor	1
6	Window	1	22	Hellca Gear	1	38	Heater	1
7	Window Cover	1	23	York Assembly	1	39	Cam	2
8	Spring Gasket	4	24	Clutch A	1	40	Separator	3
9	Driving Shaft	1	25	Clutch B	1	41	Sensor B/K	1
10	Driving Shaft	1	26	Spring	1	42	Switch	2
11	Bearing	2	27	Handle Wheel	1	43	Switch Plate	1
12	Output Shaft	1	28	Gasket	1	44	Terminal Block B/K	1
13	Second-level W.Gear	1	29	End Cover	1	45	Indicator	1
14	Disc	1	30	Bearing	1	46	Pipe	1
15	Disc Cover	1	31	Bearing	1	47	Terminal Block	2
16	Handle Shaft	1	32	Spring Pin	2	48	Screw	4

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C. Specification

Protection Degree	Weatherproof enclosure IP67, NAMUR 4 and 6. IP68 optional
Voltage of Power Supply	110/220-230V AC/ 1Ph/50/60Hz±10% 380/400/440/V AC/3Ph/50/60Hz±10%
Control Power Supply	110/220-230V AC/ 1Ph/50/60Hz±10%
Duty Cycle (On/Off)	S2: 10Min~30Min/S4:20~50%
Duty Cycle (Modulating)	S4: 30~50%, 300~1,200 Starts/Hour
Motor	Whole Sealing Squirrel-cage Inductive Motor of F Degree
Limit Switches	2 for Each Open/Close Switch (SPDT 250VAC/10A Rating) (More Available)
Thermal Protection and Temperature Setting	Thermal Protection Switch Set Inside (Max. 150°C±5°C, Min97°C±15°C)
Stroke	90°±5°(0°~100°)
Position Indicator	Continuous Mechanical Position Indication
Manual Operation Mechanism	Attached
Self-locking Function	Attached
Mechanical Limit	Attached (External Adjustment Available)
Anti-condensation Heater	5W (110/220-230VA C)
Cable Interface	2 PF 3/4”
Ambient Temperature	Basic Type: -20°C~+70°C Optional Type: -40°C~+100°C
Ambient Humidity	Min. Relative Humidity 10%, Max. Relative Humidity 100%, No Condensation
Anti-shock	XYZ 10g. 02~34Hz, 30 minutes
Housing	Aluminum Alloy Housing Processed of Hard Anodizing and Polyester Painting

4. GENERAL FEATURES

1. General

MBV series actuator is designed for the 90 degree turn application such as butterfly, ball, plug valves, dampers and other equipment.

2. Wide range of torque

Min. 100Nm to Max 3000Nm. In between there are 12 models and cater for various torque depending on application.

3. Material

Material is hard-anodized AL alloy and external coating of epoxy powder is suitable for the severe condition especially against the corrosion. Housing is designed in accordance with standard of ex-proof and IP67.

4. Sealing

Sealing provided by double O-ring system

5. Manual Override

Just by pulling over the lever, operating mode is switched to manual, then just supplying electrical power to actuator, clutch is automatically disengaged from manual and operating mode is switched to electric operation.

6. Gear & Self locking

2nd staged Double worm gearing prevents movement caused by backward force transferred from valve and it provides the exact and stable position of actuator and valve when electrical power is off. High efficiency, low noise level and trouble-free design are another advantage.

7. Manual hand wheel

The size of hand wheel is designed according to required to move the actuator, so that operator can easily move the actuator by hand.

8. Motor

Motor specially designed for MBV actuator has several features such as high output power, high efficiency and thermostat installed inside of motor to prevent overheat of motor and thermal damage of motor coil.

9. Limit switch

Since limit switch is directly driven by the 2nd output shaft, position during operation is continuous and accurate, setting of cam is so easy and once cam setting is done, position is almost permanent unless operator changes the setting again.

10. Torque switch

Torque switch driven by the 2nd output drive shaft for continuous and accurate torque detection. Torque spring, which detects the variation of torque during operation is installed for preventing damage of valve and actuator under overload condition. Once actuator is under overload, torque switch is tripped, and actuator stops immediately. Switches are installed for both open and close directions. These switches set by factory cannot be set again without checking with the factory.

11. Space heater

Spacer heater is installed for preventing damage caused by condensed water inside of actuator and includes thermostat inside to prevent overheating.

12. Stopper bolt

Stopper bolt installed in both close and open direction prevents actuator's travel over the limit during manual operation and protects internal gearing from its break away.

13. Indicator

Indicator directly driven by 2nd output drive shaft Operator perceives exact current operating situation even from a distance.

14. Terminal block

Spring loaded terminal strip is very strong against vibration and to add the number of strips for additional connection is so simple.

15. Wiring

Basic wiring is standardized to be simplest and optimal, so that variation depending on electrical specification and options can be so easy and simple.

16. Adaption

Mounting base is designed according to ISO5211 but different dimensions depending on application is also possible. Removable drive bushing provides convenient machining for adaption.

17. Lubrication

Using EP type Grease Moly, no need to refill lubricant for the long time.

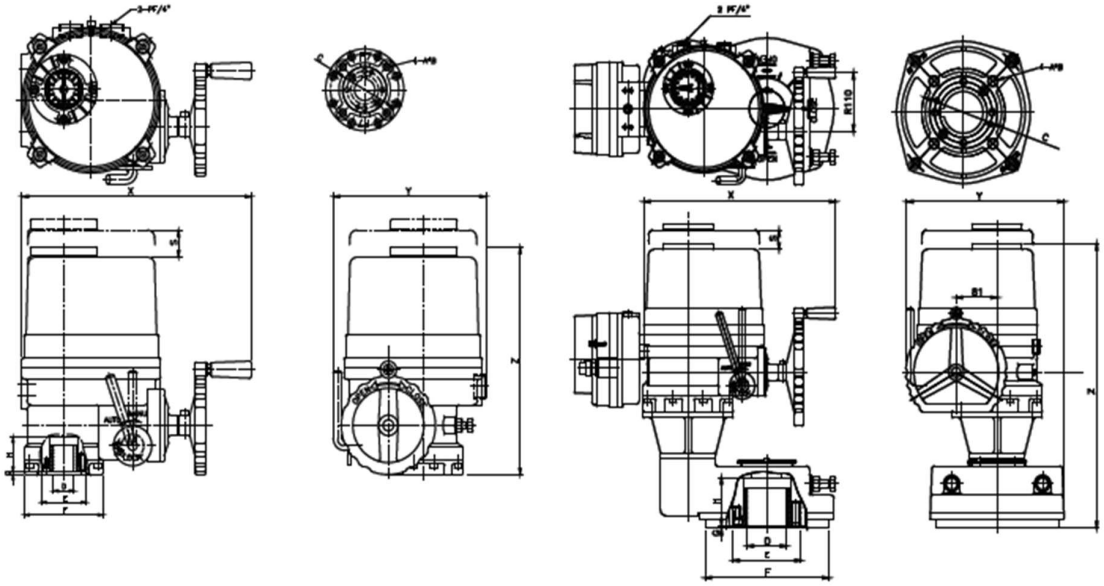
18. Others

MBV series actuators guarantee high-performance, high-quality product throughout various and severe test and inspection

5. MOUNTING BASE ACCORDING TO ISO 5211 STANDARD

1. Sizing & Actuator Dimensions

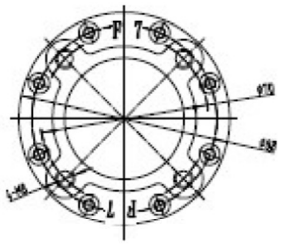
Type	MBV100	MBV160	MBV240	MBV350	MBV500	MBV800	MBV1100	MBV1500	MBV2000	MBV3000
	Without Gear Box							With Gear Box		
Flange	F07	F07	F07	F10	F10	F12	F12	F16	F16	F16
ISO5211		F10	F10	F12	F12	F14	F14			
C	Ø 70	Ø 70	Ø 70	Ø 102	Ø 102	Ø 125	Ø 125	Ø 165	Ø 165	Ø 165
		Ø 102	Ø 102	Ø 125	Ø 125	Ø 140	Ø 140			
A	M8	M8/M10	M8/M10	M10/ M12	M10/ M12	M12/ M16	M12/M16	M20	M20	M20
B	14	14/7	14/7	17/21	17/21	20/25	20/25	32	32	32
D (Key)	Ø 22	Ø 25	Ø 25	Ø 40	Ø 40	Ø 48	Ø 48	Ø 75	Ø 75	Ø 75
D(Squ.)	20	23	23	34	34	40	40	64	64	64
E	Ø 50	Ø 58.5	Ø 58.5	Ø 80	Ø 80	Ø 95	Ø 95	Ø 135	Ø 135	Ø 135
F	Ø 88	Ø 125	Ø 125	Ø 148	Ø 148	Ø 178	Ø 178	Ø 245	Ø 245	Ø 245
G	3	3	3	3	3	3	3	5	5	5
H	37	57	57	62	62	67	67	90	90	90
S	100	115	115	145	145	170	170	145	170	170
X	258	338	338	357	357	380	380	368	380	380
Y	172	229	229	244	244	287	287	293	312	312
Z	220	259	259	288	288	313	313	506	531	531



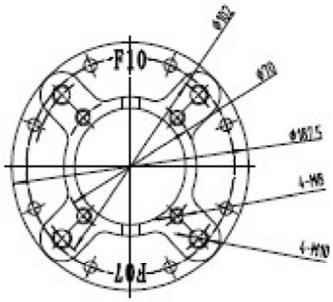
2. Mounting the Actuator

The drive bushings are for adaptation of the valve and the actuator. The bushings are not provided. It is advisable to shape it to keyway. First, loosen the bolts, dismantle the bushing from the actuator. If it is shaped to keyway, the customer should make the keyway wedge on one of the four bolt holes. Please see the picture.

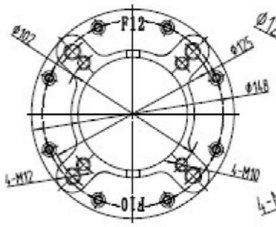
When re-installing, please make sure the switches of actuators keep the same direction with the valves. The standard of the flange at the bottom of valve is ISO5211. Actuator can be mounted directly if the standard of valve is also ISO5211. If not, please use supporting rack to connect them.



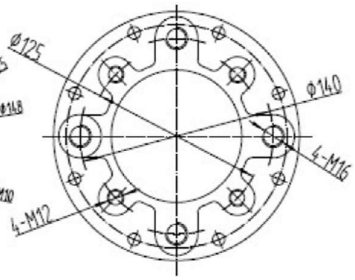
MBV100



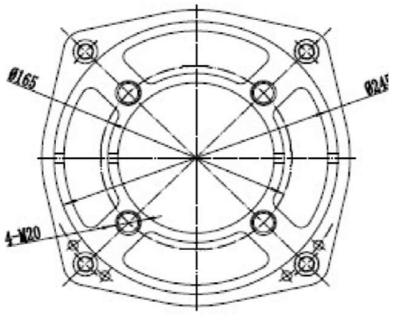
MBV160 - MBV240



MBV350 - MBV500

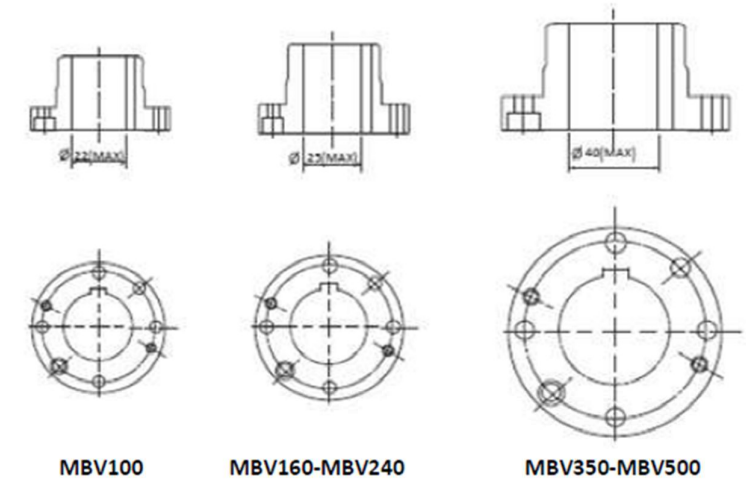


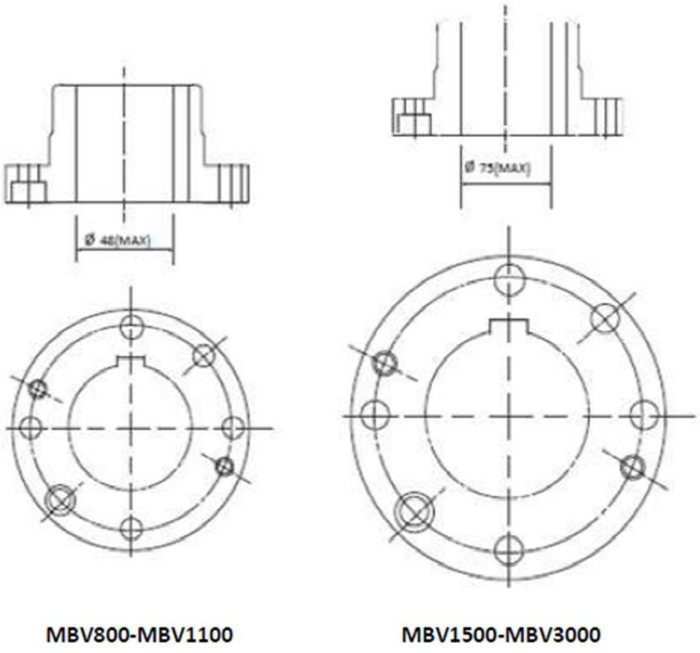
MBV800 - MBV1000



MBV1500 - MBV3000

3. Connecting using removable drive bushing





6. SELECTION AND APPLICATION

1. Selection

Model	Torque	Voltage of Power Supply	Control Type	Protection Grade	Explosiveproof Grade	Switching Time	Others
MBV	60NM 100NM 160NM 240NM 350NM 500NM 800NM 1100NM 1500NM 2000NM 3000NM	(1) 24V DC (2) 220V AC (3) 380V AC (4) Others	(1) On/Off Type (2) Modulating Type (3) Others	(1) IP67 (2) IP68	(0)Nil (1) Grade EXB (2) Grade EEC	(0)With No Requirement (1) With Requirement	(0) Non (1) Connecting Lever and Spherical Linkage (2) Local Control Unit LCU (3) Safe Return: FS (4) LCD (5) Infrared Ray (6) Fieldbus

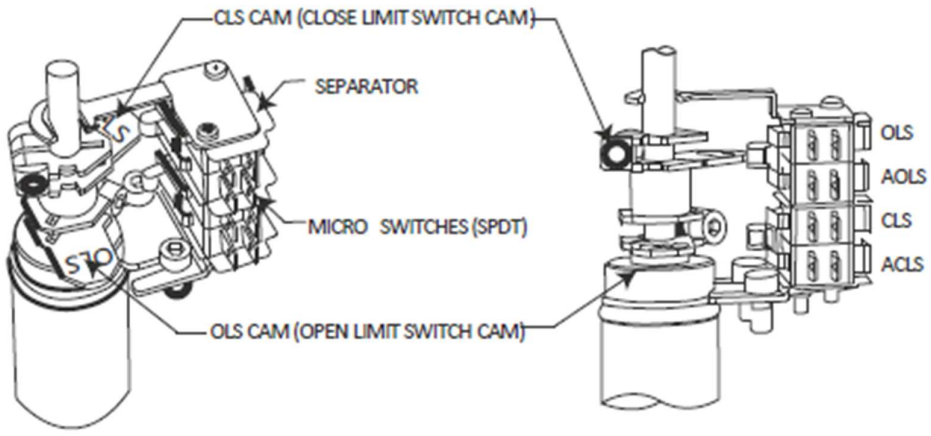
7. SETTING

1. Manual Operation

A. Pull over the lever toward hand wheel until lever stands perpendicularly.
B. If lever does not stand perpendicularly, pull over it again turning the hand wheel slowly.
C. There is casting mark to indicate rotating direction on hand wheel.
D. Clockwise is close direction and counterclockwise is open direction.
E. No need to position the lever to original for electrical operation.
F. Once electrical power is on, the lever automatically returns its origin position by internal clutch mechanism.

2. Limit Switch Setting

A. Pull over the lever for manual operation. Turn hand wheel to move actuator full close (or open) position.
B. Loosen the bolts tightening cam by L-wrench and turn CLS (or OLS) CAM to CW (or to CCW), so that the cam may hit the lever of close (or open) limit switch.
C. Then tighten the bolt by L-wrench.



3. Torque Switches

Torque switches are set by factory before delivery and therefore, it is not needed to set the switches again. Please follow the below instruction to check if the switches are functioning:

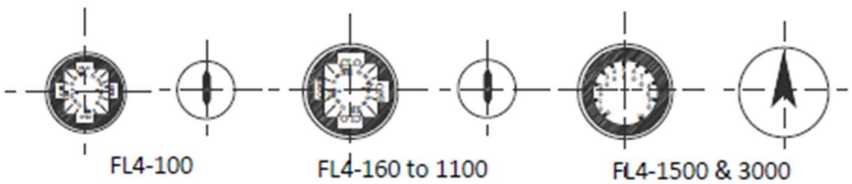
A. Push the lever of close switches by screwdriver until it sounds “click”. This will stop the actuator immediately, which means the switch is working fine.
B. Check open switches as per the above. If actuator stops, it means the switch is working well.
C. We do not guarantee the performance of the actuator if these switches are re-set.
D. Kindly consult with the factory if the re-setting is necessary.

4. Stopper Bolt Setting

A. Before manual operation, get both nuts loose, which are engaged with stopper bolts and turn stopper bolt to come out by 3-4 threads.
B. Move actuator to full close position manually. Once cam hits the lever of limit switch to trip, stop the manual operation.
C. Turn close stopper bolt to go forward until it doesn’t go any further (end of stopper bolt contacts the 2^{n}d worm wheel).
D. Turn close stopper bolt to come out by 2 threads and tighten the loosened nut.
E. Repeat all the above for open stopper bolt.
F. Check open switches as per the above. If actuator stops, it means the switch is working

5. Indicator Setting

A. Move actuator to full close position and turn indicator by hand until orientation of indicator is aligned to the figure of window.
B. Tighten the bolt (be careful not to be injured by the cutting edge of the indicator and leakage of electricity when power is on)
C. Figure of window and indicator according to AWWA standard.



8. SETTING AND USING THE PCU CARD

PCU card is the local actuator controller, using 12 bit A/D converter and 8 bits microprocessor which operates actuator to open and close according to the input signal from main control. After positioning actuator, detect the current position of actuator and transmit feedback output signal (4-20mA) about current position to the main controller.

1. Standard Specification

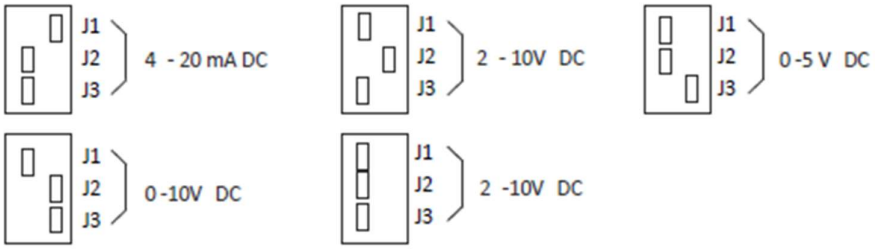
A. Model PCU-07-B
B. Power: 220VAC ± 10% 50/60Hz 4VA Max (Changeable by DIP switch)
C. Input signal: 4-20mA DC, 2-10VDC, 0-10VDC, 0-5VDC, 1-5VDC Input resistance: 250 Ohm, Feedback signal: 100-10K Ohm, Exaction: 2.3VDC
D. Output signal: 4-20 mA DC
E. Load resistance: 750 Ohm Max.
F. Control output: Relay contact 250VAC 10A Max (inductive load)
G. Number of output contact: 2 each (open and close contact)
H. Delay time adjustment: 0.5 - 8 sec.
I. Dead and adjustment: 0.1 - 4.5% (1 step 0.3%, total 15 steps)
J. Resolution: Min 1/1000
K. Position conversation accuracy: ±0.5 - ±1.5% (depends on installation)
L. Ambient temperature: -10°C - +60°C
M. Ambient humidity: 90% Rh Max (non-condensate)
N. Dielectric strength: 1500V AC 1 Min (input to output, power to ground)
O. Insulation resistance: Min. 500V DC 30Mohm
P. Vibration & shock (X,Y,Z): 10g (6g based on RMF, Frequency: 0.2-34Hz, 30Min)
Q. LED signal

LED	SIGNAL
Blue On	Power On
Green / Red Flicker	Auto Setting
Green On	Open
Red On	Close
Yellow On	Card Manual Mode
Yellow Flicker	Failure in either signal, CT or wiring
Yellow + Green + Flicker	Failure in PK

2. Main Function and Operation Instruction

A. Select input signal

User can select suitable input signal by adjusting DIP switches as follows. If there is no instruction for the input signal, factory already sets the signal as 4-20mA by default.

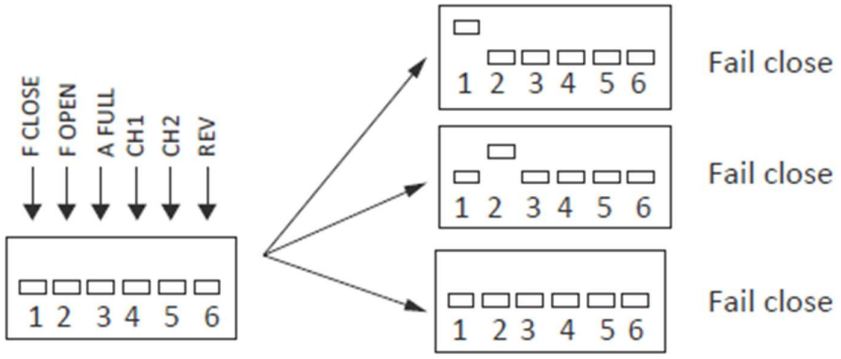


B. Change input signal

When input signal of user's system changed (e.g. Change 4-20mA to 2-10V DC), first select input signal to DIP switches at 2-10V DC, then put No. 4 switch ON, input 2V DC signal, push ZERO BUTTON, input 10V DC, push SPAN BUTTON, put No. 4 switch OFF. Put actuator 50% open, push AUTO SETTING button, when setting finished, confirm the difference between input and output signal.

C. Setting fail position

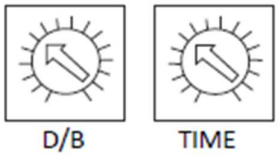
In order to prevent serious trouble when input signal is failed, user can set the fail position of actuator by setting of DIP switches as follows:



D. Delay Time

This prevents continuous operation of PCU card caused by abnormal signal input such as noise, microphone and other foreign frequency.
Once signal is detected. PCU follows that signal, but if there is preset time (delay time), PCU doesn't move within the pre-set time.
PCU can move when input signal last a certain time which is preset by turning the switch clockwise, delay time is getting longer.

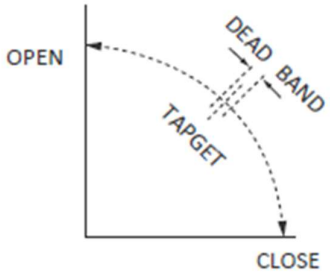
Vice versa (Range: 0.5-8 sec, 1 step; 0.5 sec, 0-15 steps)



E. Dead Band

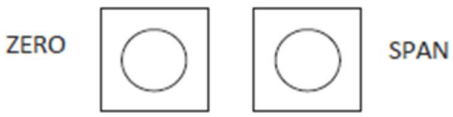
This is tolerance between input signal and position of actuator and if it is turned clockwise, it gets wider and vice versa. Please be careful when turning this counterclockwise too much, sensitivity will get increased and will result in being called "HUNTING".

HUNTING means that actuator doesn't stop at a position and repeat to pen and close.
Range: 0.1 - 4.5%, 1 step; 0.3%, 0-15 steps.
HUNTING could be the reason for motor Burning, and damage of potentiometer and PCU card.

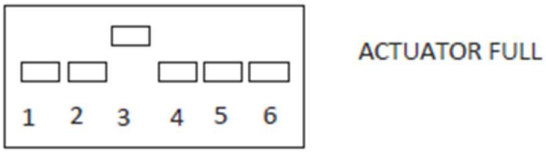


F. Manual Operation

To operate actuator manually, push the ZERO SPAN for 2 seconds, the yellow LED comes ON and the PCU shifts into manual operation mode. If ZERO button is pushed, the actuator moves towards CLOSE and SPAN button is pushed, the actuator will move towards OPEN position. Leaving it for 15 seconds without operation, the PCU will automatically come out from manual operation mode. (In manual operation mode, input signal is ignored).



G. Special setting for full open and close.

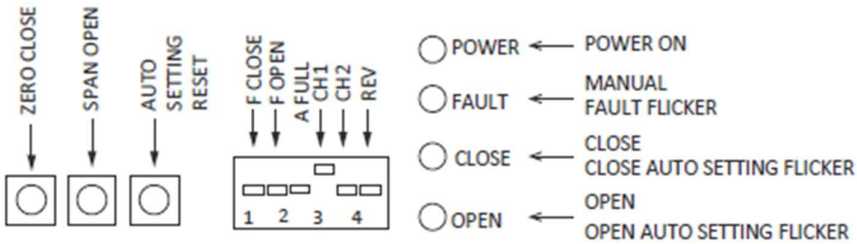


H. Auto Setting

To ensure if actuator is properly mounted, on application, please check input power, input signal and wiring are correct or not. Without input signal, put actuator 50% open by hand wheel, push AUTO SETTING button (red button) for 3 seconds. Firstly, the actuator moves by itself to set the close and open position automatically. After setting, the actuator stops at the position, which corresponds with the current input signal and transmits the output signal.

I. Split Range (CH1)

This is a useful function when end user wants to set actuator at full close and full open position at a signal, or when input signal is not very exact.
If the end user wants to set actuator at full close position at 5mA, supply 5mA DC for this purpose.
Then put CH1 DIP switch on and push ZERO button one time, the actuator acknowledges that position as full close position and transmits 4mA DC.
OPEN step is same as above but push SPAN button instead of ZERO button.
Once setting is done, switch OFF CH1 DIP.
Adjustable range is: **Close**: 3-8mA DC / **Open**: 16-21mA DC
By using this DIP switch, end user may set various positions at certain signal.

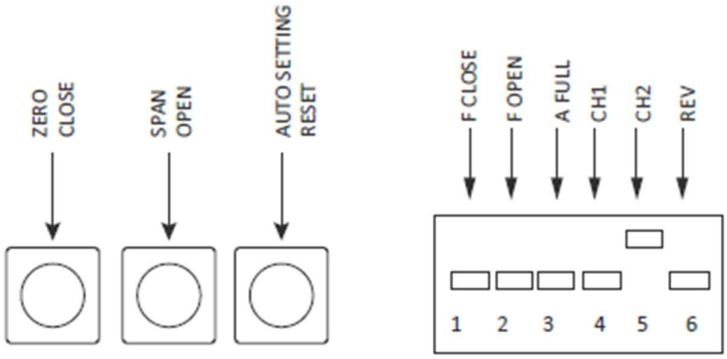


J. Manual Setting (CH2)

This is a useful function when user wants to set using control panel.
- To put the actuator in CLOSE position by using control panel without input signal, put CH2 DIP switch ON and push ZERO button.
- To put the actuator in OPEN position by using control panel without input signal, push SPAN button.
After putting CH2 DIP switch OFF, check the operation supplying 4-20mA.

K. Signal LED

LED	SITUATION	INDICATION
Power (Blue)	ON	Power ON
Close (Red)	ON	Full Close
	Flickering	Closing
Open (Green)	ON	Full Open
	Flickering	Opening
Fault (Yellow)	ON	Manual Operation
	Flickering	No Input Signal
Close (Red)+Open (Green)+Fault(Yellow	Interval Flickering	Failure in PK
	All Flickering	Wring Wiring



3. Special Tools for Adjustment

A. L-Wrench - 1 set (metric)
B. Screwdriver (-)
C. Monkey spanner (1 set)
D. DC signal generator (0-24mA DC)
E. Multi-meter
F. mA DC meter (0-25mA DC)

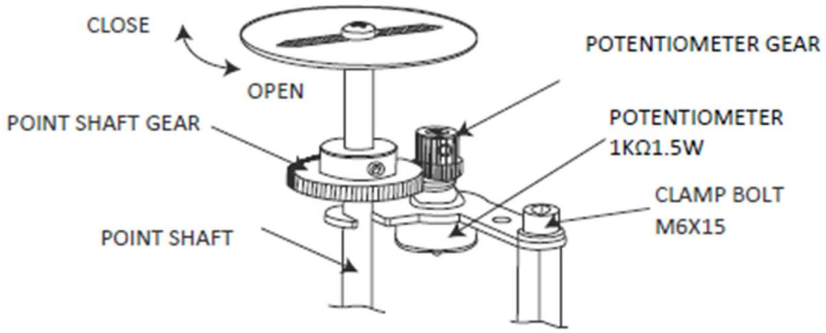
4. Setting Reverse Action Actuator

Generally clockwise rotating direction of an actuator is for CLOSE. However, if a user wants to reverse the action, then please follow the below instructions:

A. Open the top cover of the actuator by L-wrench.
B. Put DIP switch 6 ON
C. Exchange 9 and 10, 11 and 12 on main terminal block of the actuator.
D. Change the direction of indicator (only applicable to MBV-1500, MBV-2000 and MBV-3000)
E. Put actuator at 50% open (or close) position and push auto-setting button.
F. Supplying 4-20mA, check operation and rotating direction.

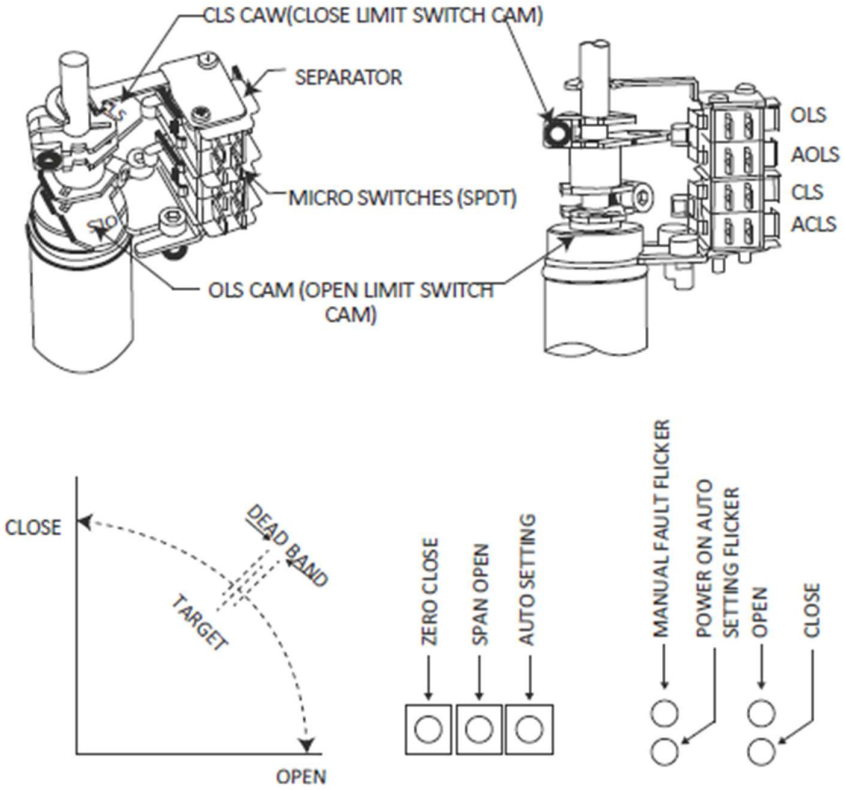
5. Setting Potentiometer

A. Put actuator at full CLOSE position.
B. Take P1 and P2 and measure its resistance.
C. Turn potentiometer around by moving point shaft gear with L-wrench (M4) until measured resistance reaches 80-120 Ohm (close position). Tighten the unfixed screw in shaft gear.
D. Tighten the potentiometer by spring.



6. Setting Limit Switch

A. Pull forward the lever of the actuator and turn the hand wheel clockwise to put the valve or damper to full CLOSE position.
B. Loosen the bolts tightening cam by L-wrench and turn CLS cam clockwise (or counterclockwise). After the cam hits the micro-switches, tighten the bolts by L-wrench again. Turn the CLS cam to move CCW, the valve will be towards CLOSE position.
C. Turn the hand wheel clockwise to OPEN the valve, turn CLS cam clockwise (or counterclockwise). After the cam hits the micro-switches, tighten the bots by L-wrench again. Turn the CLS cam to move CW, the valve will be towards OPEN position.



CAUTION

Before supplying power to the actuator, please make sure to read the operation manual carefully. Without Maplef's consent or agreement, it is not allowed to dismantle, repair, or change the wiring diagram, switches, or any other functional keys for which Maplef will not be responsible in any way whatsoever.

9. ELECTRICAL WIRING

1. Before Wiring

A. Cable entries are machined with PF 3/4" tap and sealed by plug before delivery.
B. Please keep the plug as it is if user doesn't use both cable entries.
C. Please make sure to seal the entries by using rubber or metallic packing after wiring so that water may not come in.
D. When the actuator is used as ex-proof, please make sure to use the certified connection component which is at least of the same grade as the actuator.
E. If the certified connection component (not in our scope of supply) is not used, Maplef won't guarantee the performance of ex-proof actuator.

2. Electrical Wiring

A. Check if the electrical specifications such as power, wiring etc. are correct.
B. The wiring diagram is attached with the actuator packing.
C. Do the wiring as per given wiring diagram, such as power, control power, internal wiring, and ground.
D. Make sure to supply electric power to heater for keeping inside of actuator clean and dry.
E. Make sure to check wiring to the terminal is strong enough.
F. Make sure that one relay operates one actuator only (cannot operate two or more actuators simultaneously).

3. Check Rotating Direction

A. In 3 phase actuator, operators should check the rotating direction of actuator before electrical operation.
B. If operating direction is wrong, limit switches have no function and it results damage from jamming or motor overheating.
C. Put the actuator at 50% OPEN (or CLOSE) position manually, and supply power to the actuator and check its rotating direction.
D. If actuator moves to OPEN according to open signal, the direction is OK, but if reverse, then wiring need to be changed.
E. Among the 3 power wires, exchange 2 wires with each other.

4. Commissioning

A. Make sure to check the rotating direction of actuator first before operation.
B. Check the performance of limit and torque switches, direction of indicator and space heater.
C. Check if lever movement is ok (manual override).
D. Check the lamps in the control panel.
E. After commissioning, please make sure to tighten the 4 bolts of the top cover and to do proper sealing.

10. OTHERS

1. Jamming

A. If the actuator moves in wrong direction & moves over the travel limit, internal worm gear contact the stopper bolt and engages each other, it is called jamming. In this case the actuator will not move at all.
B. How to solve the Jamming:
- Off the power
- If jamming happens during CLOSE, take close stopper bolt out about 2-3 threads.
- Pull over the lever and put it at manual position.
- Turn hand wheel counterclockwise until 50% open position.
- Check rotating direction again.
- If everything is OK, put stopper bolt at original position.
- If jamming happens during OPEN, procedure is the same as CLOSE, but turn hand wheel clockwise manually.

2. Special Tools for Setting

A. L-Wrench - 1 set (metric)
B. Screw driver (- / +)
C. Spanner set (metric), Monkey spanner 200mm & 300mm, 1 each
D. Wire stripper, Long nose, Light
E. Multi meter (AC, DC Volt, Resistance)
F. DC signal generator (0-4mA DC): PCU option
G. mA DC meter (0-25mA DC): PCU & CT

11. CAUTION

1. Selection of valve and actuator: Review all specifications of valve and actuator carefully before making selection.
2. Option: Please consult with factory before making selection, if required.
3. Before necessary setting such as limit switch, please do not operate actuator, either fully open or fully close.
4. After electrical wiring, make sure to secure the sealing of cable entries.
5. Before operating actuator, please review this manual carefully and follow the instructions. Please be careful of temperature, humidity, vibration, voltage drop.
6. Storage: Keep the actuator dry, clean, and cool.
7. Trouble: Please refer to the trouble shooting, but please do not dismantle the actuator without consulting the factory.
8. If repair or maintenance is required, please inform the supplier, the model number, electrical connection, serial number, and current situation.
9. Before doing manual operation, lever must be engaged.

12. AFTER SALES SERVICE

A. Warranty will be for a period of 12 months from the date of delivery against manufacturing defects.
B. Warranty will be null and void if:
   1. The fault is due to misuse ignoring actuator specifications.
   2. The actuator is dismantled without the consent of the supplier.
   3. Any modification is done on the actuator by the user.
   4. Fault is due to not checking the rotating direction of a 3-phase actuator.
   5. Un-proper sealing of cable entries.
   6. Damaged due to fire, flood, and other natural disasters.

13. MAINTENANCE

1. **Lubrication**
   Lubrication is already done by factory and generally no need to refill it again. But in the places, such as very dry condition with the relative humidity (R.H.) 15% or high temperature of more than 30°C, it is required to do lubrication once every two years through Grease Nipple.

2. **Regular Operation**
   Electrical power should always be supplied to actuator, and it is recommended to operate actuator once a week.

3. **Maintenance**
   To use actuator for long time, regular maintenance once a year is required. Please check operating condition, corrosion, painting…etc.

14. TROUBLESHOOTING AND REPAIRING

Trouble	Cause	Counter Plan
Actuator doesn't work at all	No power	Power on
	Check if voltage is too low	Check power
	Motor and supplied power is different	Check motor power and supply power
	Wiring is not correct (tight or loose)	Do wiring again tightly
	Coil of motor is damaged	Change the motor
	Thermostat of motor trips	Change thermostat
	Capacitor is damaged	Change the capacitor
	Setting of limit and torque switch is not correct	Reset switches
	Jamming happens	Check rotating direction as per instructions
Torque switch open	Actuator is undersized	Select again as per requirement
	Foreign material between valve seat and disc	Remove foreign material
	Stopper bolt is set prior to limit switch	Reset the stopper bolt
Switching to manual is not possible	Lever is not fully pulled over	Fully pull over the lever
	Lever is not pulled over because of jamming	Disengage the jamming
	Clutch of lever and handle is engaged with each other	Turning handle slowly, pull over lever
Abnormal signal indicator	Damage of signal LED	Change signal LED
	Damage of micro switches	Change micro switches
	Setting of limit switch is wrong	Reset limit switch
	Stopper bolt is set prior to limit switch	Reset the stopper bolt
Cannot operate in remote control	Wiring is not as per the wiring diagram	Redo the wiring as per the wiring diagram
	LP2/4 is not in the remote position	Turn the LP2/4 on the remote position