CKD

SM-11590-A/4

Instruction Manual

Motor 3-port Ball Valve

MXGI -15 to 50

- Be sure to read this instruction manual before using the product.
- In particular, read the safety instructions carefully.
- Keep this instruction manual in a safe place so that it can be taken out and read immediately when needed.

4th Edition
CKD

To Use This Product Safely

When designing and manufacturing equipment using our company's products, you have an obligation to check that safety can be ensured for the systems operated by the equipment's mechanical mechanisms, air pressure control circuits, or water control circuits and for the electrical controls that control them, and to manufacture safe equipment.
To use our products safely, it is important to select, use, handle them properly, and perform proper maintenance management for them.

To ensure the safety of equipment, be sure to observe the warnings and precautions.
Furthermore, we ask that you check that safety can be ensured for equipment and manufacture safe equipment.

⚠ Warnings

1. **This product has been designed and manufactured to be equipment and a component for general industrial machinery.**
   Therefore, handling should be performed by persons with sufficient knowledge and experience.

2. **Be sure to use the product within its specifications.**
   The product cannot be used outside its own specifications. In addition, never modify or add to the product.
   Furthermore, this product is intended for use in general industrial equipment and components, and is therefore not applicable for outdoor use or for use under the following conditions or in the following environments.
   (However, if you consult us before adopting it and understand our product's specifications, it will be applicable, but take safety measures to avoid danger in the unlikely event of a failure.)
   ① Use in equipment and applications that come into direct contact with atomic energy, railways, aviation, ships, vehicles, medical equipment, beverages, food, etc., and applications requiring safety, such as entertainment equipment, emergency shutdown circuits, press machines, brake circuits, and applications for safety measures.
   ② Use in applications where significant impacts on people and property are expected and where safety is particularly important.

3. **Be sure to observe all applicable organization standards, laws, regulations, etc. regarding safety related to equipment design and management.**
   ISO4414, JIS B 8370 (General rules for pneumatic systems)
   JFPS2008 (Principles for pneumatic cylinder selection and use)
   High Pressure Gas Safety Act, Industrial Safety and Health Act and other safety regulations, organization standards, laws and regulations, etc.

4. **Never handle this product or remove any pipes or equipment until safety has been confirmed.**
   ① Before inspecting or maintaining machinery or equipment, be sure to confirm that all systems involving this product are safe.
   ② Even when machinery or equipment is not operating, there may be hot or live parts present, so be careful.
   ③ When inspecting or maintaining equipment, shut off the energy sources (air supply, water supply) and the power to the relevant equipment, exhaust any compressed air in the system, and take care to avoid water leakage and electrical leakage.
   ④ When starting or restarting machinery or equipment that uses pneumatic equipment, be sure to check that the safety of the system has been ensured, including measures to prevent the machinery or equipment from jumping out, and proceed with caution.

5. **To prevent accidents, be sure to observe the warnings and precautions on the following pages.**

■ **The safety precautions shown here are categorized into three levels: "Danger," "Warning," and "Caution."**

⚠ **Danger**	Limited cases where improper handling may result in a dangerous situation resulting in death or serious injury, and the urgency (degree of imminence) of the danger occurring is high.
⚠ **Warning**	Cases where improper handling may result in danger of death or serious injury.
⚠ **Caution**	Cases where improper handling may result in a dangerous situation resulting in minor injury or property damage only.

Furthermore, even the matters described under "Caution" may lead to serious consequences depending on the situation.
All safety precautions contain important information, so be sure to observe them.

Warranty Precautions

- Warranty period
  The warranty period for our products is one year after delivery the location specified by you.

- Warranty coverage
  If a failure occurs during the above warranty period that is clearly our responsibility, we will provide a replacement product or necessary replacement parts free of charge, or repair the product at our factory free of charge.
  However, the following cases will be excluded from the scope of this warranty.

  ① Cases where the product is being handled or used under conditions or environments other than those described in the catalog or specifications
  ② Cases where the cause of the failure is due to reasons other than the product
  ③ Cases where the product is used in a way other than its intended use
  ④ Cases where the cause is modifications or repairs that we are not involved in
  ⑤ Cases where the cause is unforeseeable with the technology in use at the time of delivery
  ⑥ Cases where the cause is a natural disaster or other disaster that is not our responsibility

  Furthermore, the warranty here relates to the delivered product alone and excludes any damage caused by defects in the delivered product.

- Checking compatibility
  It is the customer's own responsibility to verify the compatibility of our products with the systems, machines, and equipment used by the customer.

[Table of Contents]

1. Unpacking

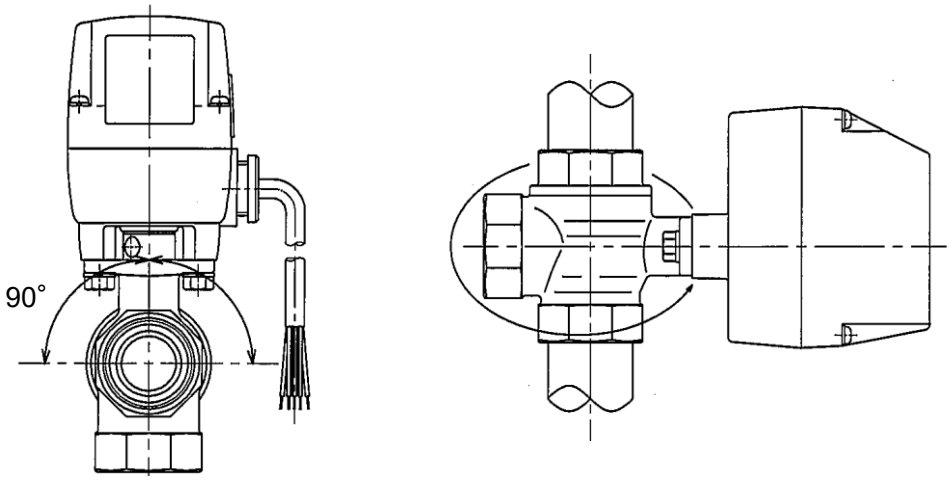
- Check that the model number of the product you ordered is the same as the model number on the product nameplate.
- Check that the rated voltage and rated frequency match.
- Check that there is no external damage.
- When storing, attach a sealing plug to prevent foreign matter from entering the valve interior. Then, remove the sealing plug when piping.

2. Installation

2.1. Installation conditions

2.1.1 Installation orientation

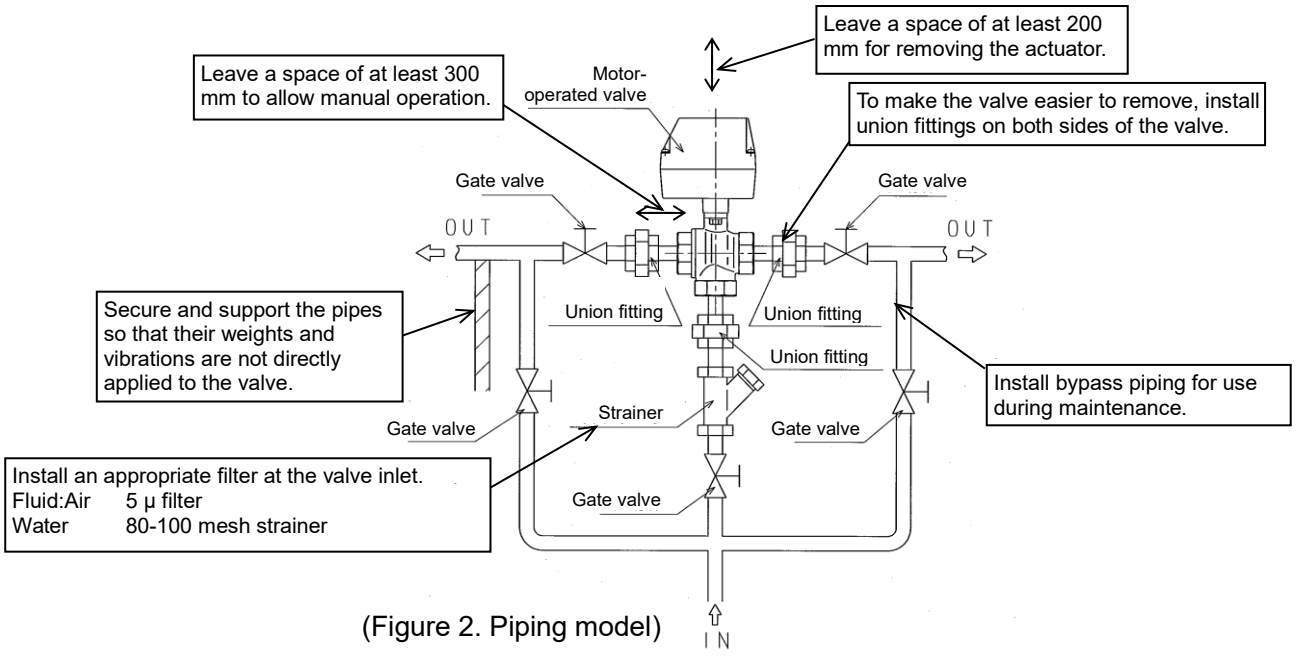
- Install with the actuator facing upward within a ±90° range. (Figure 1)



(Figure 1. Installation orientation)

2.1.2 Maintenance space

Ensure there is sufficient space for safely performing maintenance and troubleshooting. (Figure 2)



(Figure 2. Piping model)

2.1.3 Product protection

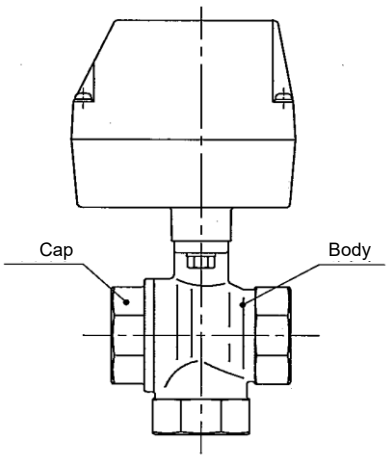
- If using it in cold regions, take appropriate measures to prevent the product from freezing.
- When using this product with machinery or equipment that uses water jets (hoses) for cleaning, protect it from water splash by covering it with a cover, etc.
  This product's dust and water resistance complies with IEC-529 standard IPX3.

2.2. Piping work

- When piping on the cap side, secure the cap with a spanner, etc. and screw it in.
- When piping on the body side, secure the body with a spanner, etc. and screw it in.
- Refer to Table 1 for tightening torque when doing piping.

Table 1. Recommended pipe tightening torque

Nominal diameter of pipe	Pipe tightening torque (recommended value)
Rc 1/2	41 to 43 [N·m]
Rc 3/4	62 to 65 [N·m]
Rc 1	83 to 86 [N·m]
Rc $1^1/_4$	97 to 100 [N·m]
Rc $1^1/_2$	104 to 108 [N·m]
Rc 2	132 to 136 [N·m]



(Figure 3. Exterior drawing)

- Make sure there are no foreign matter, cutting chips, or burrs adhering to the piping materials before installing the piping.
  To clean, blow compressed air at 0.3 MPa or higher to remove foreign matter, cutting chips, and burrs from the piping.
- When using sealant, be careful not to let it get inside the pipes and ensure that it does not leak outside.
  When wrapping sealing tape around threads, leave two or three threads at the tip of the screw. (Figure 4)
  When using liquid sealant, be sure not to apply too much, leaving two or three threads on the tip of the screw.
  Do not apply it to the female thread side of the equipment.

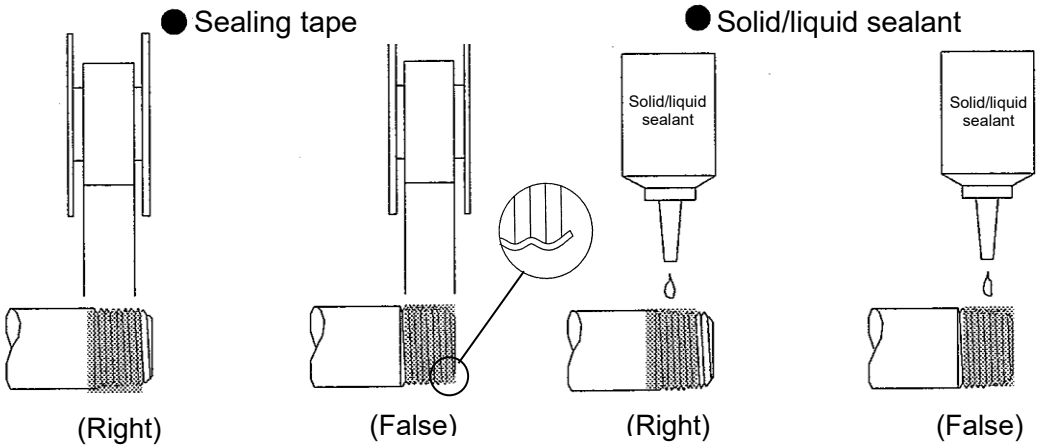
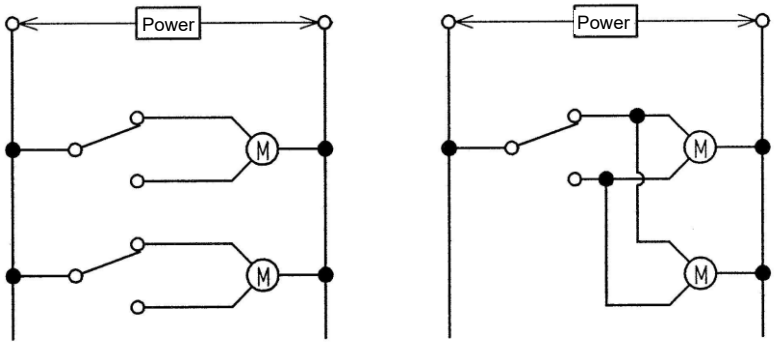


Figure 4

2.3. Wiring work

⚠ Caution	Connect the power supply correctly according to the motor valve wiring diagram (displayed on the product). If you make a mistake, it may cause a short circuit accident.

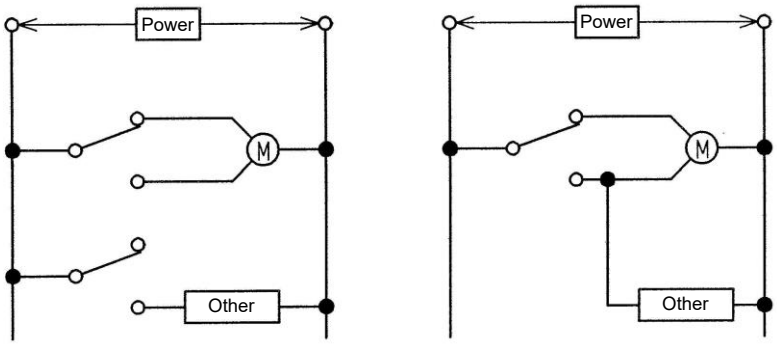
- When connecting two or more motor-operated valves, keep the contacts separate. (Figure 5)



(Good (Bad

(Figure 5. Wiring method for two or more units)

- When wiring the motor-operated valve to other equipment, keep the contacts separate. (Figure 6)

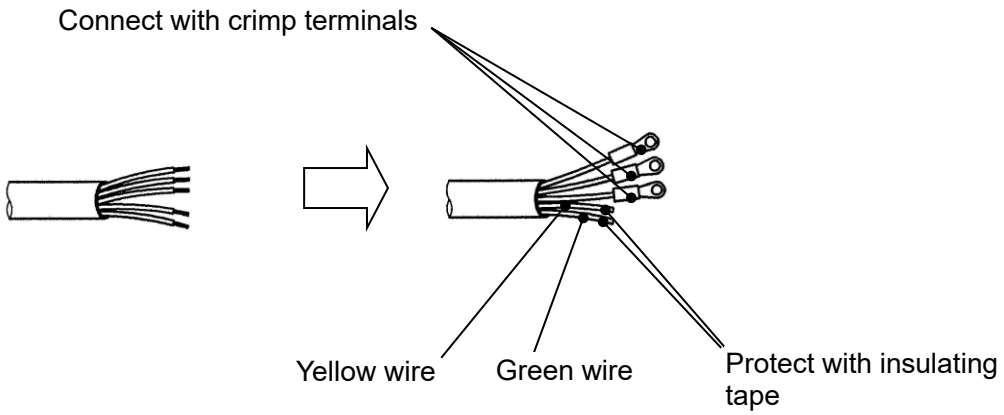


(Good example) (Bad example)

(Figure 6. Wiring method with other

- Secure the lead wire with a wire tie, etc. to prevent it from being pulled.
  When using in a location where there is a risk of damage to electrical wiring, take safety measures such as installing electrical conduit wiring.

- If the yellow and green wires for signal confirmation are not used, cut the exposed portion of the core wire and insulate it securely with insulating tape. (Figure 7)



(Figure 7. Core wire processing)

- For circuit diagrams and operation explanations, refer to pages 12 to 14.
  Refer to Table 2-1 for the energization time required for valve opening and closing.
  In addition, if not used for more than one day, the initial startup time may be approximately 1 to 5 seconds longer.

Table 2-1. Operating time

Model No.	AC voltage specifications (50Hz/60Hz)	DC voltage specifications
MXGI -15 to 25	20/16 seconds	14-18 seconds
MXGI -32 to 50	26/22 seconds	19-23 seconds

Note: Option:K (mixed water type) is 1/2.

- Use the valve opening/closing signal switching so that the next signal is received after the valve operation is complete.

3. Checking Before Use (Checking After Installation)

3.1. Checking the appearance

⚠ Caution	Stop the fluid flow. (Close the main valve) Turn off the power.

- Press the ball valve body with your hand to make sure it is securely fastened to the piping.
- Check that threaded parts such as hex bolts are not loose.

3.2. Checking the electricity

⚠ Caution	Turn off the power.

- Make sure that the wiring is correct according to the motor-operated valve wiring diagram shown on the product.
- Checking the insulation resistance
  Measure the insulation resistance between the ball valve body and the current-carrying part. (Table 3-1)

  Table 3-1. Insulation resistance

Type of power supply	Applied voltage	Insulation resistance
AC voltage specifications	DC 1000 V megger	100 MΩ or more
DC voltage specifications	DC 500 V megger	100 MΩ or more

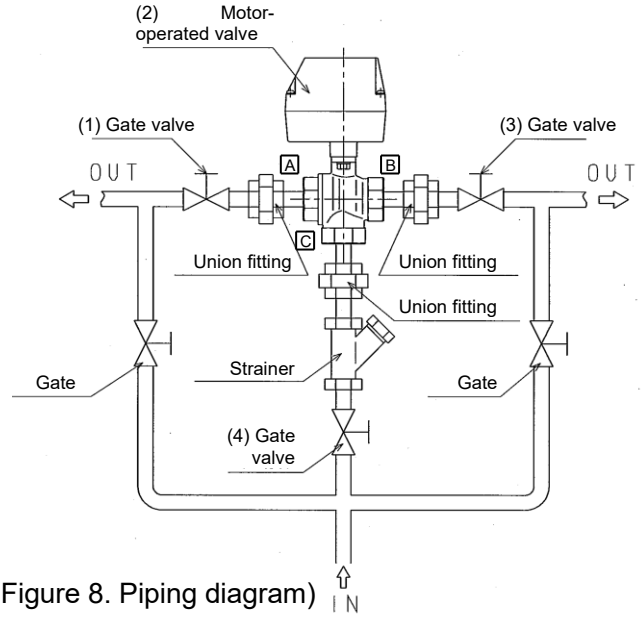
3.3. Checking for leaks

- Turn on the power.
- Pressurize the fluid and check the connections for leaks.
  To check for leaks, we recommend supplying compressed air (0.3 to 0.5 MPa), applying soapy water, and checking to see if bubbles form.

[Procedure]

a) After setting motor-operated valve (2) to the B-C flow path, open the gate valves (4) and (1) in sequence, ensuring no leakage to the external environment or the (1) side.

b) With gate valve (4) open, close gate valve (1), then set motor-operated valve (2) to the A-C flow path. After opening gate valve (3), ensure no leakage to the external environment or the (3) side.



(Figure 8. Piping diagram)

4. Proper Use

⚠ Warning	Never remove the bonnet. Touching the internal electrical components may result in electric shock.

- The energization time required for switching the flow path is shown in Table 2-1. Refer to the page 6.
  In addition, if not used for more than one day, the initial startup time may be approximately 1 to 5 seconds longer.
- If the valve has not completed operation after the operating time in Table 2-1 has elapsed, the following causes are possible:
  (1) Locking due to valve jamming,
  (2) Electrical component failure.
  ⇒Refer to "7. Troubleshooting" (page 11).
- Do not apply an external force of 0.5 N·m or more to the actuator.
- If you notice any abnormalities, refer to "7. Troubleshooting" (page 11).
- Voltage fluctuations should be within the range of ±10% of the rated voltage.
- Observe the operating frequency. (Table 4-1)

Table 4-1. Operating frequency

Model No.	AC voltage specifications	DC voltage specifications
MXGI -15 to 25	1 time/minute or less	0.5 time/minute or less
MXGI -32 to 50	0.5 time/minute or less	0.2 time/minute or less

- Always perform a full operation from the B-C flow path to the A-C flow path or from the A-C flow path to the B-C flow path.
  If it is used while stopped halfway, it may cause malfunction or internal leakage.
- When the power outage occurs, the valve maintains its state prior to the power outage. Operate the gate valve of the piping model on page 3 (Figure 2).

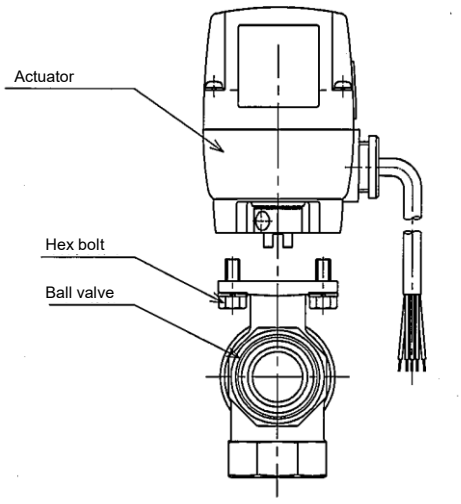
5. Disassembling/Assembling

5.1. Replacing the actuator

5.1.1 Disassembly procedure

⚠ Caution	Turn off the power and stop the fluid before starting work.

- Remove the wiring.
- Loosen the hex bolt with a spanner.
- Lift the actuator up to separate it from the ball valve body.



(Figure 9)

5.1.2 Assembly procedure

- Refer to the flow path of the ball valve and the operating position of the new actuator 9.2 (page 13) to align them and then assemble.
- Tighten the hex bolt to a torque of 5 to 7.5 N·m.
- Attach crimp terminals to the lead wires.
- Connect the wires according to the wiring diagram.
- Measure the insulation resistance between the ball valve and the current-carrying part.
  AC specifications: Measure with a DC 1000 V megger, 100 MΩ or more.
  DC specifications: Measure with a DC 500 V megger, 100 MΩ or more.
- Turn on the power and activate the fluid circuit.

5.2. Ball valve replacement

5.2.1 Disassembly procedure

⚠ **Caution**	Turn off the power and stop the fluid before starting work.

- Loosen the hex bolt and separate the actuator.
  At this time, be careful not to apply tension to the lead wires.
- Loosen the piping of the ball valve.

5.2.2 Assembly procedure

- Install a new ball valve.
  When installing the piping on the cap side, secure the cap with a spanner, and when installing the piping on the body side, secure the body with a spanner.
- After aligning the actuator operating position and the flow path of the new ball valve section by referring to 9.2 (13 page), assemble the actuator. Tighten the hex bolt to a torque of 5 to 7.5 N·m.
- Apply fluid pressure and check that the fluid is not leaking out.
- Turn on the power and activate the fluid circuit.

6. Maintenance

6.1. Maintenance and check

- To ensure optimal use of this product, perform regular inspections usually once every six months.
- For details on the inspection, refer to ⇒ "3. Checking Before Use" (page 7).

6.2. Maintenance parts

- Actuator
  Replace when electrical malfunctions or abnormalities are detected.
  As a guideline, the operating cycle is 50,000 times.
- Ball valve body
  Replace the valve if any abnormalities such as leakage or sticking of the valve are found during use.
  As a guideline, the operating cycle is 25,000 times.

7. Troubleshooting

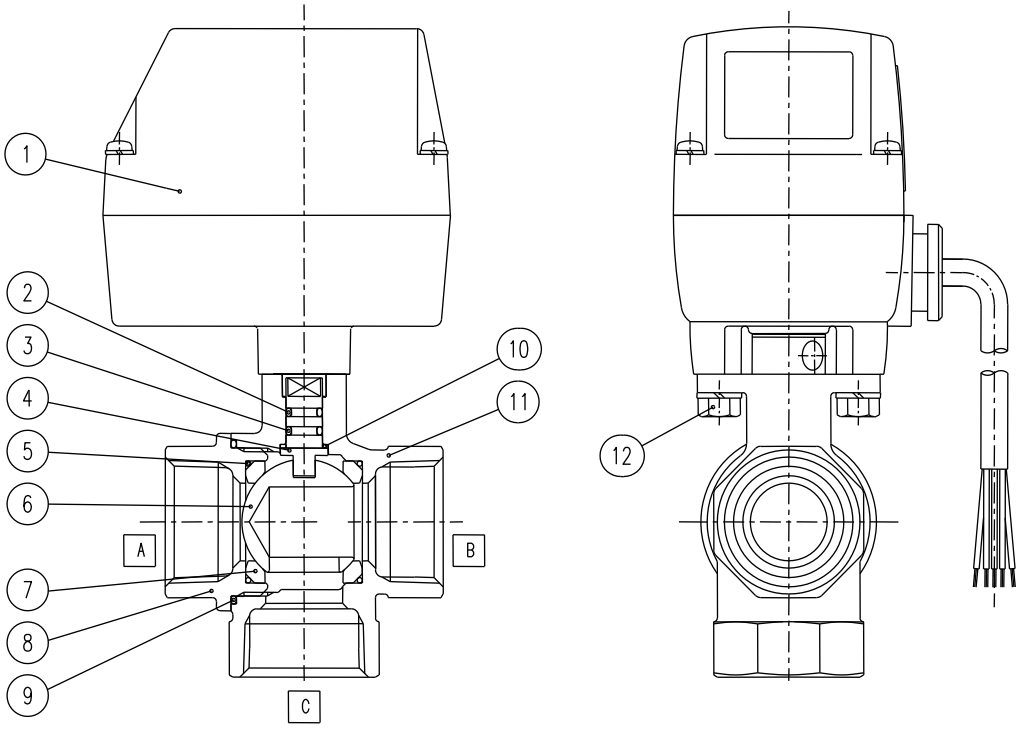
- If the motor-operated valve does not function as intended, perform the following inspections according to the table below.

Table 7-1. Troubleshooting

Failure condition	Cause	Remedy
Not operating.	The power is not turned on.	Check the wiring, fuses, etc., and then turn on the power.
	Below the rated voltage.	Check the power supply and input the rated voltage.
	Foreign matter caught inside the ball valve.	Disassemble and clean the inside of the valve, or replace the ball valve.
	Ball seat sticking.	
	Signals from both flow paths are being input.	Review the switches and relays.
	Actuator failure.	Replace the actuator.
The valve is operating but is not functioning properly. (The actuator vibrates. It stops midway.)	Two or more units are operated in parallel.	For each signal circuit, connect separately via contacts such as relays.
	Working in the opposite way.	The open and closed connections are reversed. Correct the wiring.
	Foreign matter caught inside the ball valve.	Disassemble and clean the inside of the valve, or replace the ball valve.
	Ball seat sticking.	
The motor moves, but the valve does not move.	Damage or end of service life of the gearhead.	Disassemble and clean the inside of the valve. If there is no problem with the valve, replace the actuator. If both are abnormal, replace the product.
Leakage.	Foreign matter caught inside the ball valve.	Replace the ball valve.
	Ball seat wear.	
	The power is on for a short time and the valve is not fully closed.	Set the energization time to the value above in Table 2-1 (page 6).

- If you have any other questions, contact us or our distributor.

8. Internal Structure Diagram



(Figure 10)

Table 8-1. Parts list

Part No.	Part name	Quantity	Material
(1)	Actuator	1	
(2)	O-ring	1	NBR (FKM)
(3)	O-ring	1	FKM
(4)	Shaft	1	SUS303 (SUS304)
(5)	O-ring	2	FKM
(6)	Valve ball	1	C3771 + Chrome plating (SUS304)
(7)	Ball seat	2	PTFE
(8)	Cap	1	CAC406 (SCS13)
(9)	O-ring *2	1	FKM
(10)	Spacer *2	1	PTFE
(11)	Body	1	CAC406 (SCS13)
(12)	Hex bolt	2	SWCH

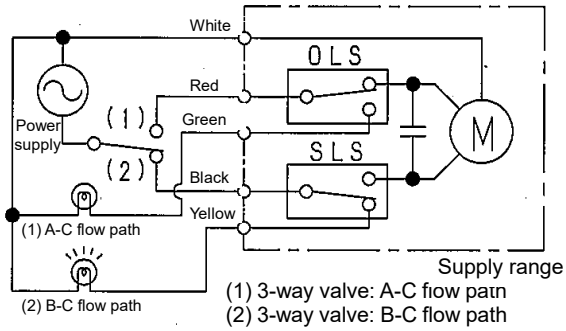
Note 1.: ( ) indicates the case where the ball valve body material is stainless steel (E/W).
Note 2.: When the ball valve body material is bronze (O/H), there is no O-ring (9) and spacer (10) are not included.

9. Circuit Diagram and Operation Explanation

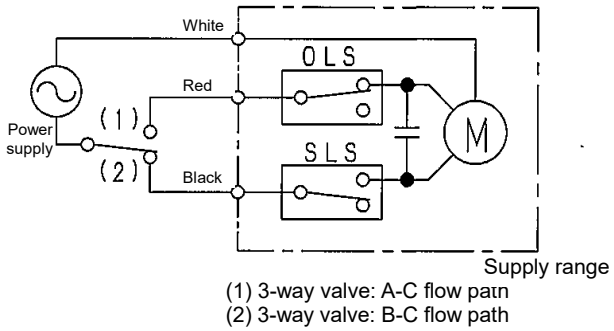
9.1. Circuit diagram

9.1.1 AC voltage specifications

- Standard type

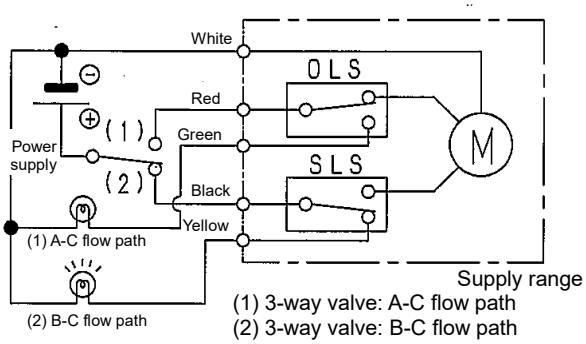


- Option (3-core cable)



(Figure 11)

9.1.2 DC voltage specifications

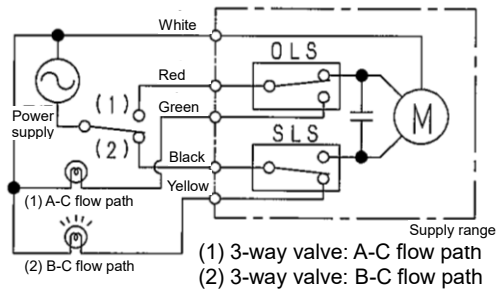


(Figure 12)

9.2. Operation explanation

9.2.1 Standard (including option:B.)

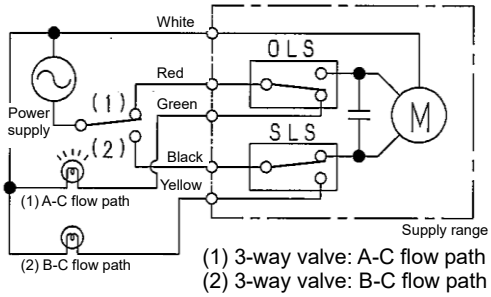
(1) A-C flow path operation (B-C flow path → A-C flow path)



(Figure 13. When B-C flow path operation is completed)

When the operation switch is switched to the (1) side from the state shown in Figure 13 and electricity is applied between the white and red lead wires, the motor will start to rotate and the output shaft will turn counterclockwise (looking at the valve side from the top of the actuator).
Then, the OLS contact switches at the A-C flow path position, the motor stops, and the A-C flow path lamp lights up. If a relay, etc., is connected instead of the A-C flow path lamp, it can operate other equipment.
(Figure 14)

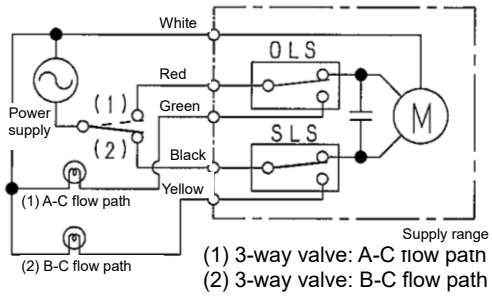
(2) B-C flow path operation (A-C flow path → B-C flow path)



(Figure 14. When A-C flow path operation is completed)

When the operation switch is switched to the (2) side from the state shown in Figure 14 and electricity is applied between the white and black lead wires, the motor will start to rotate and the output shaft will turn clockwise (looking at the valve side from the top of the actuator).
Then, the SLS contact switches at the B-C flow path position, the motor stops, and the B-C flow path lamp lights up. If a relay, etc., is connected instead of the B-C flow path lamp, it can operate other equipment.
(Figure 13)

(3) A-C flow path and B-C flow path in operation

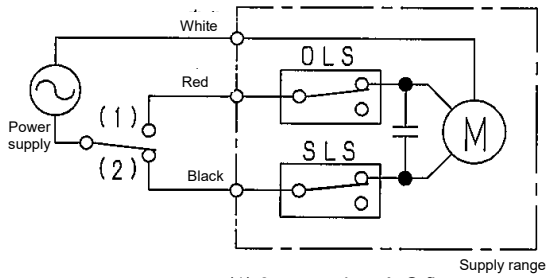


(Figure 15 in operation)

During operation of (1) and (2), the OLS and SLS are in the state shown in the left diagram, and the output shaft rotates accordingly based on the position of the control switch.
However, do not attempt to reverse the operation while it is running, as this will damage the gears.
(Figure 15)

Option: K (mixed water type) connects all ports during operation.

9.2.2 Option:T (3-core cable)



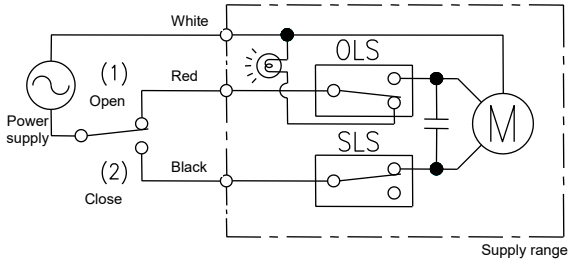
(1) 3-way valve: A-C flow path
(2) 3-way valve: B-C flow path

(Figure 16)

1) A-C flow path operation (B-C flow path → A-C flow path)
   When the operation switch is switched to the (1) side and electricity is applied between the white and red lead wires, the motor will rotate, and when it reaches the fully open position, the cam will activate the OLS, switching the contacts and stopping the motor.

2) B-C flow path operation (A-C flow path → B-C flow path)
   When the operation switch is switched to the (2) side and electricity is applied between the white and black lead wires, the motor will rotate, and when it reaches the fully closed position, the cam will activate the SLS, switching the contacts and stopping the motor.

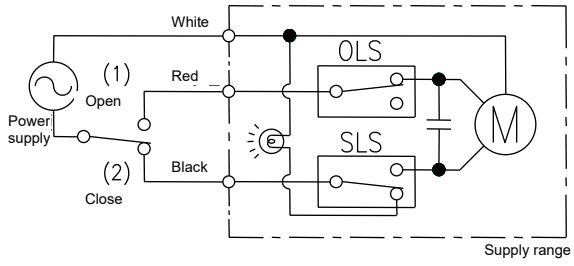
9.2.3 Option:L (with A-C flow path lamp)



(Figure 17)

The A-C flow path lamp shown in Figure 14 is built into the terminal box. When the A-C flow path operation (B-C flow path → A-C flow path) is complete (1), the lamp in the terminal box illuminates.
It does not light up during operation.
(Wiring is the same as option:T.)

9.2.4 Option:R (with closing lamp)

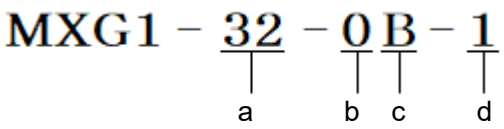


(Figure 18)

The B-C flow path lamp shown in Figure 14 is built into the terminal box. When the B-C flow path operation (A-C flow path → B-C flow path) is complete (2), the lamp in the terminal box illuminates.
It does not light up during operation.
(Wiring is the same as option:T.)

10. Product Specifications

10.1. Model No. display



a. Connection diameter

Symbol	Description
15	Rc 1/2
20	Rc 3/4
25	Rc 1
32	Rc $1^1/_4$
40	Rc $1^1/_2$
50	Rc 2

b. Body/Seal material

Symbol	Description	
	Body	Sheet
0	Bronze	PTFE
H		Reinforced PTFE
E	Stainless	PTFE
W		Reinforced PTFE

c. Option

Symbol	Description
Nil	5-core cable (with signal extraction wire)
T	3-core cable
B	With round terminal box (5 terminals)
L	With round terminal box and lamp (Lights up when 3 terminals A-C flow path)
R	With round terminal box and lamp (Lights up when 3 terminals B-C flow path)
K	Mixed water type

Note 1: If optional specifications overlap, select from the combinations listed below.
TB.TK.BK.LK.RK.TBK

d. Voltage

Symbol	Description
1	AC 100 V（50/60 Hz）
2	AC 200 V（50/60 Hz）
3	DC 24 V
4	DC 12 V

10.2. Product specifications

Table 10-1. Product specifications

Common specifications

Model name		MXG1-15	MXG1-20	MXG1-25	MXG1-32	MXG1-40	MXG1-50
Pressure resistance	MPa	2 (water pressure)					
Fluids used		Water, hot water, air					
Fluid pressure	MPa	0 to 1					0 to 0.5
Fluid temperature	ºC	0 to 80 (but no freezing)					
Ambient temperature	ºC	-10 to 50					
Ambient humidity	%	95 or less					
Power consumption (W)	AC	7			15		
	DC 24 V	17			24		
	DC 12 V	13			18		
Operating frequency		1 time/minute or less (DC: 0.5 times/minute)			0.5 time/minute or less (DC: 0.2 times/minute)		
Allowable voltage fluctuation		±10% of rated voltage					

Model-specific specifications

Item / Model number	Connectable diameter	Orifice diameter (mm)	Cv value	Mass (kg)
MXG1-15	Rc 1/2	10	3	1.3 (1.3)
MXG1-20	Rc 3/4	14	6	1.4 (1.4)
MXG1-25	Rc 1	19	11	1.7 (1.7)
MXG1-32	Rc $1^1/_4$	23	16	2.7 (2.8)
MXG1-40	Rc $1^1/_2$	30	28	3.2 (3.3)
MXG1-50	Rc 2	38	47	4.1 (4.2)

( ) indicates when the ball valve body material is stainless steel.