

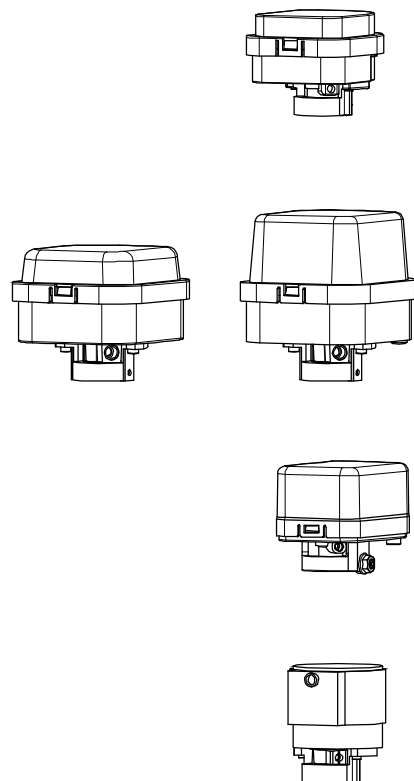


Please read this manual before installation and use.

GENERAL

The connection between actuator and valve by engineering plastic reduces heat conduction. It is suitable for installation on equipment.

- CM1 : AC power
- CM2 : AC power
- CD2 : DC power
- CMX : AC / DC power (Proportional control)
- CA1 : AC power
- PM1 : AC power (Contactless)



PRODUCT CODE

CM type	C M 1 - [] - [] - []			
	C M 2 - [] - [] - []			
CD2 type	C D 2 - [] - [] - []			
CMX type	C M X - [] - [] - [] - []			
CA1 type	C A 1 - 0 1 5 - [] - []			
PM1 type	P M 1 - 0 3 0 - [] - []			
	(1)	(2)	(3)	(4)
(1) Actuator	(2) Torque	(3) Voltage	(4) Option	
CM1 CM2	015	1 : 100 / 110V AC	M3 : Manual lever (015 / 030)	
CD2	030	2 : 200 / 220V AC	M4 : Manual lever (070)	
CMX	070	0 : 24V DC		
CA1		4 : 12V DC	(5) Operation mode (CMX)	
PM1			Nil : Mode A	
			J : Mode B	

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

CM1 CM2 type

Actuator type (□:Voltage code)	CM1-030-□	CM1-070-□	CM2-030-□	CM2-070-□
Voltage	100 / 110 V AC ±10 % 50/60 Hz (Code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Code: 2)			
Rated torque [N·m]	3	7	3	7
Operation time [s]	14.5 / 12 (50/60 Hz)	17 / 14 (50/60 Hz)	14.5 / 12 (50/60 Hz)	17 / 14 (50/60 Hz)
Power consumption [VA]	5	13	7	13
Motor	Synchronous motor			
Overload protection	Impedance protect			
Method of operation	Transfer input type		a-contact input type, with built-in relay	
Operation	Power to White → SHUT (SHUT PL is lit.) Power to Red → OPEN (OPEN PL is lit.)		SW is OFF → SHUT (SHUT PL is lit.) SW is ON → OPEN (OPEN PL is lit.)	
Input signal current	Nil		16 mA	
Output signal rating	Resistance load 1 A 250 V AC		Resistance load 0.5 A 120 V AC 0.2 A 250 V AC Micro load 2 mA Micro load 8 mA	
Duty cycle	50 % 30 min			
Ambient temperature	-20 to 50 °C			
Space heater	0.3 W			
Manual operation	Direct operation (070: with clutch button)			
Enclosure	Equivalent to IP65 (IEC 60529)			
Housing material	Polycarbonate resin (Brack)			
Conduct port	Flexible cable 5 leads 0.5 mm ² L=500 mm			

WIRING

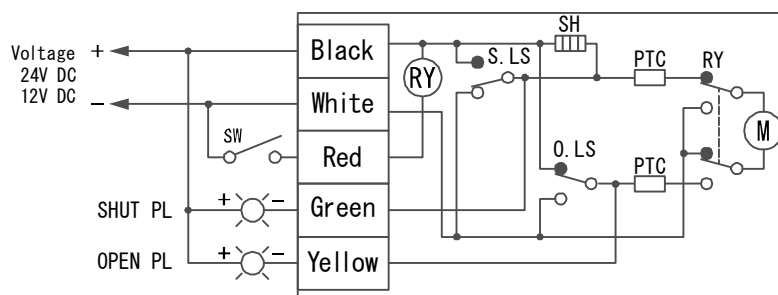
CM1	CM2
<p>• Control switch should be prepared one by one for actuator. Do not operate two or more actuator from one switch. It might malfunction.</p>	<p>• Two or more actuators can be operated with one control switch. • When using control switch with current leakage (more than 1 mA) such as TRIAC or relay with CR, it can cause malfunction.</p>
<p>Note) For manual operation on CM-070, press the clutch button while operating it.</p>	

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

CD2 type

Actuator type	CD2-030-4	CD2-030-0	CD2-070-0
Voltage	12V DC $\pm 20\%$	24V DC $\pm 20\%$	
	Cannot use a half or full-wave power supply.		
Rated torque [N·m]	3		7
Operation time [s]	1.5 to 3		2 to 3
Power consumption [VA]	In motion (Max) 10		In motion (Max) 24
	Not in motion SHUT 0.25 OPEN 0.5		Not in motion SHUT 0.25 OPEN 0.55
Motor	DC motor		
Overload protection	Thermistor		
Method of operation	a-contact input type, with built-in relay		
Operation	SW is OFF → SHUT (SHUT PL is lit.) SW is ON → OPEN (OPEN PL is lit.)		
Input signal current	35 mA	19 mA	22 mA
Output signal rating	Resistance load 1 A		
	Micro load 2 mA		
Duty cycle	20 % 15 min		
Ambient temperature	-20 to 50 °C		
Space heater	0.5 W		
Manual operation	Direct operation		Direct operation (with clutch button)
Enclosure	Equivalent to IP65 (IEC 60529)		
Housing material	Polycarbonate resin (Brack)		
Conduct port	Flexible cable 5 leads 0.5 mm ² L=500 mm		

WIRING

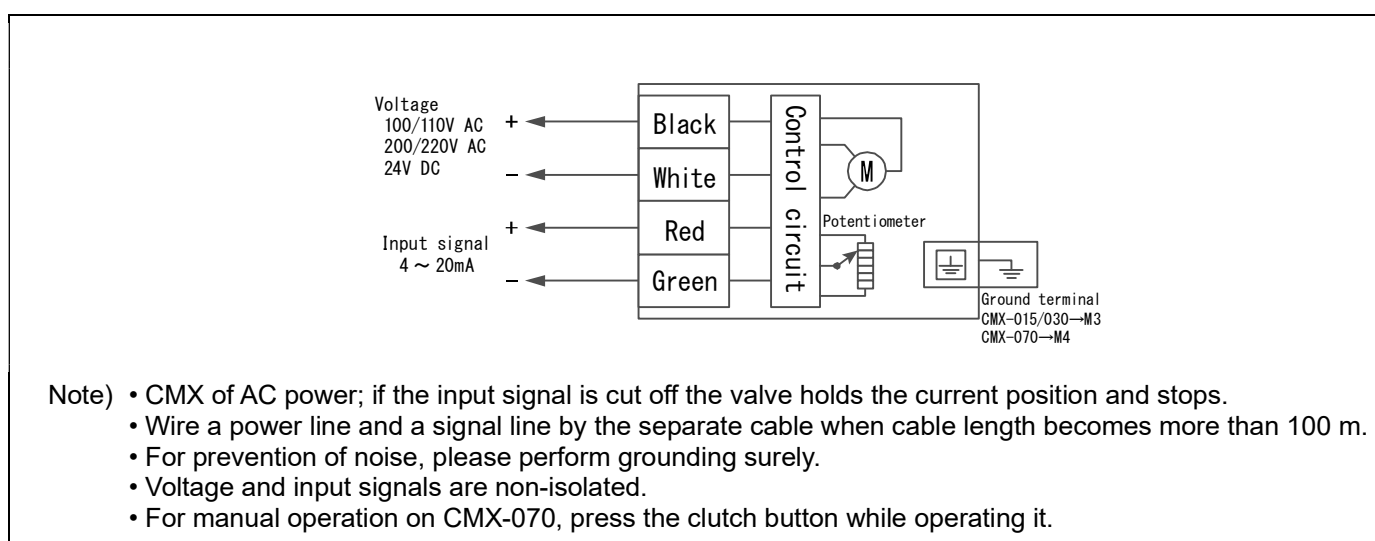
- Note)
- Two or more actuators can be operated with one control switch.
 - When using control switch with current leakage (more than 1 mA) such as TRIAC or relay with CR, it can cause malfunction.
 - For manual operation on CD2-070, press the clutch button while operating it.

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

CMX type

Actuator type (□:Voltage code)	CMX-030-□	CMX-070-□	CMX-015-0	CMX-070-0
Voltage	100 / 110 V AC ±10 % 50/60 Hz (Code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Code: 2)		24 V DC ±20 % (Code: 0) Cannot use a half or full-wave power supply.	
Rated torque [N·m]	3	7	1.5	7
Operation time [s]	14.5 / 12 (50/60 Hz)		14.5	17
Power consumption [VA]	5.5	13	3	6
Motor	Synchronous motor		Stepping motor	
Overload protection	Impedance protect			
Method of operation	Proportional control			
Input signal	4 to 20 mA (Voltage descent: less than 7 V)		4 to 20 mA (Input resistance: 187.5 Ω)	
Operation	[Mode A] SHUT by 4 mA ↔ OPEN by 20 mA (Standard) [Mode B] SHUT by 20 mA ↔ OPEN by 4 mA (Option: J)			
Resolution	Less than 0.4 %			
Dead band	About 1 %			
Duty cycle	50 % 30 min			
Ambient temperature	-10 to 50 °C			
Space heater	0.2 W (CMX-070-2: 0.4 W)			
Manual operation	Direct operation (070: with clutch button)			
Enclosure	Equivalent to IP65 (IEC 60529)			
Housing material	Polycarbonate resin (Brack)			
Conduct port	Flexible cable 4 leads 0.5 mm ² L=500 mm			
Ground terminal	Actuator mounting screw: M3 (CMX-070: M4)			

WIRING

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

CA1 PM1 type

Actuator type (□:Voltage code)	CA1-015-□	PM1-030-□
Voltage	100 V AC ±10 % 50/60 Hz (Code: 1) 200 V AC ±10 % 50/60 Hz (Code: 2)	100 / 110 V AC ±10 % 50/60 Hz (Code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Code: 2)
Rated torque [N·m]	1.5	3
Operation time [s]	4.6 / 3.8 (50/60 Hz)	7.5 / 6.3 (50/60 Hz)
Power consumption [VA]	4	8
Motor	Synchronous motor	Synchronous motor
Overload protection	Impedance protect	Timer
Method of operation	Transfer input type	a-contact input type
Operation	Power to White → SHUT (SHUT PL is lit.) Power to Red → OPEN (OPEN PL is lit.)	SW is OFF → SHUT SW is ON → OPEN
Input signal current	Nil	ON : 1.5 mA OFF : Less than 0.1 mA
Output signal rating	Resistance load 1 A 250 V AC	Nil
Duty cycle	100 %	20 % 15 min
Ambient temperature	-10 to 50 °C	-20 to 50 °C
Space heater	0.3 W	0.5 W
Manual operation	Direct operation	Direct operation
Enclosure	Equivalent to IP65 (IEC 60529)	Equivalent to IP65 (IEC 60529)
Housing material	Polycarbonate resin (Black)	Polycarbonate resin (Black)
Conduct port	Flexible cable 5 leads 0.5 mm ² L=500 mm	Flexible cable 3 leads 0.5 mm ² L=500 mm

WIRING

<p>CA1</p> <p>• Control switch should be prepared one by one for actuator. Do not operate two or more actuator from one switch. It might malfunction.</p>	<p>PM1</p> <p>• Two or more actuators can be operated with one control switch. • When using control switch with current leakage (more than 0.1 mA) such as TRIAC or relay with CR, it can cause malfunction.</p>
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INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

HANDLING & STORAGE

①HANDLING

Proper care in handling the actuator should be taken to prevent damage. Do not drop or throw it.

②STORAGE

Store the actuator in the protected area from dust, moisture, and direct sunlight. If possible, actuator should be kept in the original packaging.

③CHECKING

Check the product code, power supply, and voltage before installation.

INSTALLATION

①ENVIRONMENT

- Do not install in place where corrosive gas is present or where vibration is heavy (0.5 G or more).
- When radiant heat causes the surface temperature of the control unit to exceed 50 °C, provide an appropriate shielding plate.
- If there is a possibility that the fluid and drive part freeze, please take measures to prevent freezing.

②POSITIONING

Should be positioned through 90° upward from horizontal. Provide space around the product to allow manual operation, inspection and replacement work.

Maintenance space for upper part of actuator

CM1	CM2	CD2	CMX	More than 15 mm
CA1	PM1			

WIRING

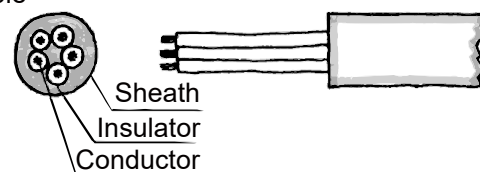
①PRECAUTIONS

When wiring is long distance or handling a weak current signal, it may be affected by induced voltage or noise. In this case, please use countermeasures such separating it from other power cables.

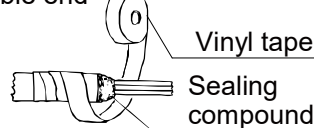
②CONNECTION

- Check the power supply voltage and connect properly as shown in the wiring diagram.
- Even when not using signal wires, please conduct insulation treatment so as not to short circuit.
- When connecting electric wires of flexible cable, please use a waterproof box or waterproof connector.
- When connecting with flexible cable wires, please ensure waterproof treatment at the connection part.
- When not waterproofed, moisture may enter the inside of the actuator from the gap of the insulator inside the sheath and the conductor gap, which may cause malfunction. Completely seal the sheath end and the wire end as shown below.

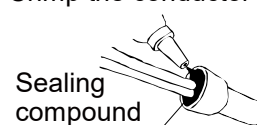
Flexible cable



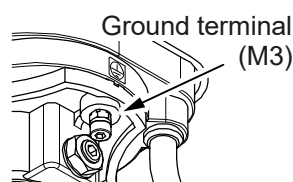
Cable end



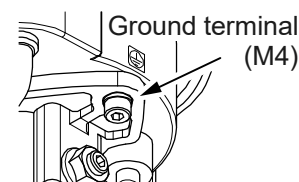
Crimp the conductor



- CMX type actuator should be electrically grounded. Use the terminal marked (≡) outside the actuator.



CMX (015 / 030)



CMX (070)

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS**CONTROL**

①CM1, CA1

Control switch should be prepared one by one for actuator. Do not operate two or more actuator from one switch. It might malfunction.

②CM2, CD2, PM1

- Two or more actuators can be operated with one control switch.
- Using a control switch with a current leakage more than 1 mA such as TRIAC or relay with CR, may cause malfunction. (PM1: more than 0.1 mA)

③DC power supply

- Cannot use a half or full-wave power supply.
- Consider an inrush current of motor.
(It is 1.5 to 3 times of consumed current.)
- When the wiring distance becomes long, please select the electric wire so that the voltage does not become 80 % or less at the actuator part during operation.

④USE OF OPEN/SHUT SIGNALS

Use signals within the capacity of output signal rating.

⑤PM1

If there are many motorized valves, please prepare the number of power supply capacity and fuse capacity. This is because all of the motorized valves at the same time operate at the same time for setting the initial position of the actuator when turning on the power for the first time.

⑥INPUT SIGNAL AND OPERATION MODE (CMX)

The input signal and operation mode are set as follows. (Factory shipped)

Input signal	4 to 20 mA
Operation mode	Mode A
Operation	SHUT by 4 mA OPEN by 20 mA

OPERATION

①TESTING

- Make sure that power supply voltage is correct. Also check operating position, wiring, speed and signals.
- During trial operation, check that valve movement and output signal are correct.

②DUTY CYCLE

- Confirm that the operation frequency is within the specified duty cycle.
- Use beyond the load time rate range will affect product life. Also, it may cause burnout.

Duty cycle is a value that regulates the opening / closing frequency of the actuator. The meaning of 20 % 15 minutes for Duty cycle is that 3 minutes (20 % of 15 minutes) operation is possible. The calculated value obtained by dividing 3 minutes by the operation time is the number of times of operation within 15 minutes.

③CMX

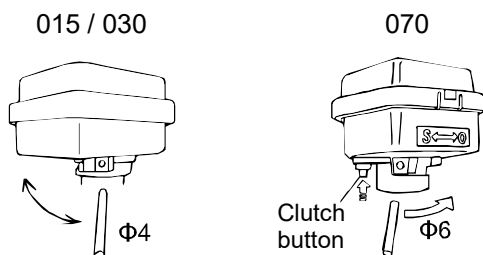
- Adjust fluid condition, controller setting, sensor etc. so that stable control is achieved.
- When used in an unstable control state, the life of the actuator and the valve will be shortened.
- The desired control state is stable at the target value. Adjust the PID setting value of the controller when overshooting the target value greatly, when not converging for a long time or hunting operation. Also, when the time delay is large, please consider the sensor position.

④ATTENTION

- Keep power supplied for built-in space heater to prevent condensation inside actuator.
- Do not touch the moving parts of actuator in operation.
- Do not input reverse signal during operation. It reduces product life. (CMX type is excluded)
- Never put anything on the actuator or make it into a foothold.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS**MANUAL OPERATION****① PRECAUTIONS**

- Manual operation should be a temporary operation.
- Be sure to turn off the power before manual operation.



- Put an allen wrench or a lever into the hole or drive shaft and turn slowly. For manual operation on CD / CM-070, press the clutch button while operating it.
- Manual lever is optional.
- Do not manually operate with an excessive operating force exceeding the output of the actuator. The connector part may be damaged.

MAINTENANCE

- To prevent electric shock, be sure to turn off the power when removing the actuator cover.
- Do the routine maintenance at least once in half a year.

Inspection items

- Confirm operation of opening and closing.
- Confirm that an actuator is not hot excessively.
- Confirm existence of abnormal noise and vibration during operation.
- Confirm whether screws are loose or not.

TROUBLE SHOOTING

Problem	Cause	Solution
Actuator does not move.	Faulty wiring.	Correct the wiring.
	No voltage is coming.	Check the voltage.
	Incorrect voltage.	When it's burned out by excess voltage, replace the actuator.
	Connection or wiring is not correct. (CMX)	Correct the miswiring and misconnection. Be careful not to mistake the plus and minus of wiring.
	Short the circuit, contact failure.	Review wires and connection.
	Motor is worn out.	Reconsider use conditions.
Operation is unstable.	Switch leakage current is large. (CM2, CD2) (PM1)	Current leakage should be less than 1 mA. (CM2, CD2)
		Current leakage should be less than 0.1 mA. (PM1)
Stop in the mid position.	Biting of valve seat.	Manually operate an actuator and remove a foreign object.
	Overload protector runs because of over-torque.	Turn off the power for about 3 minutes to remove a heat from motor protection circuit. (CD2)
		Motor protection circuit returns by the signal of operation of an opposite direction. Turn on the power again. (CM CMX CA1 PM1)

For more information contact
NIPPON VALVE CONTROLS, INC. for consultation.