NIPPON VALVE CONTROLS, INC.

Instruction manual

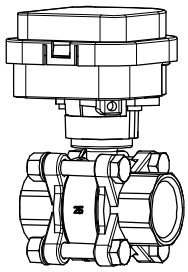
Electric Actuated Butterfly Valve Z

SP-1519

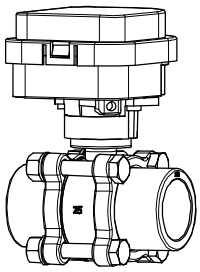
Please read this manual before installation and use.

GENERAL

Light weight, low price and economical butterfly valve.
This type designed for 3-piece structure and it is easy to maintenance.



Threaded End Rc



Socket End

Actuator

- CM : For AC power
- CD2 : For DC power
- CMX : For AC / DC power (Proportional control)
- CA1 : For AC power
- PM1 : For AC power (Contactless)

Valve

Z type It is small, light weight and economical butterfly valve.
This type designed for 3 piece structure
and it is easy to maintenance.

PRODUCT CODE

Z type	Threaded End Rc			Z	-			5	T	U		-		-		-	
	Socket End	(PVC)		Z	-			7	T	P		-		-		-	
		(C-PVC)		Z	-			7	T	H		-		-		-	
			(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)		(9)		(10)		(11)

(1) Actuator
CM1 CM2
CD2
CMX
CA1
PM1

(2) Valve
Z-

(3) Voltage
1 : 100 / 110 V AC
2 : 200 / 220 V AC
0 : 24 V DC
4 : 12 V DC

(4) Sizing code
0 : Standard
1 : Light
2 : Heavy

(5) Connection
5 : Threaded End Rc
7 : Socket End

(6) Body material
T : SCS13A

(7) Cap material
U : SCS14A

(7) Socket material
P : PVC
H : C-PVC

(8) Seat material
E : EPDM
B : NBR
V : FKM

(9) Size [mm]
ex. 25 A → 025

(10) Option
M3 : Manual lever (015 / 030)
M4 : Manual lever (070)

(11) Operation mode (CMX)
Nil : Mode A
J : Mode B

VALVES SPECIFICATIONS

Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

Valve type		Z	
Design		3 piece structure	
Connection		Threaded End Rc	Socket End
Fluid			
Max pressure		1 MPa	
Size [mm]		015 to 050	
Material	Body	SCS13A	
	Disc	PPS	
	Cap	SCS14A	-
	Socket	-	PVC C-PVC
	Seat	EPDM NBR FKM	
Stem seal	O-ring	Depend on seat material	

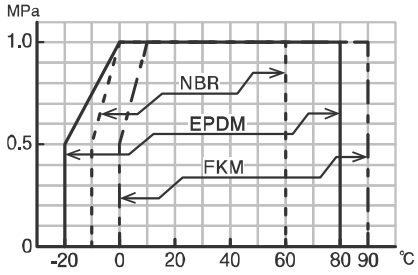
SEAT MATERIAL GUIDE

Seat material	Fluid temp.	Use
EPDM	-20 to +80 °C	
NBR	-10 to +60 °C	
FKM	-0 to +90 °C	

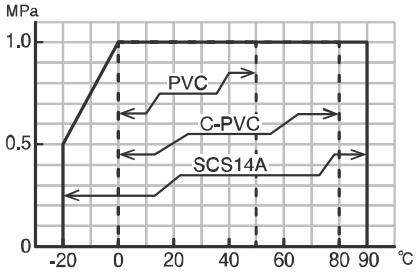
Note) • EPDM seat cannot be used for oil.
• Unsuitable for steam or hot water over 80 °C.
• Can flow the seawater with PVC socket and EPDM sheet.

PRESSURE & TEMPERATURE RATING

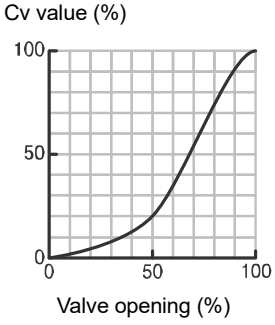
Valve seat



Cap / Socket



INHERENT FLOW CHARACTERISTIC



Range ability 30:1

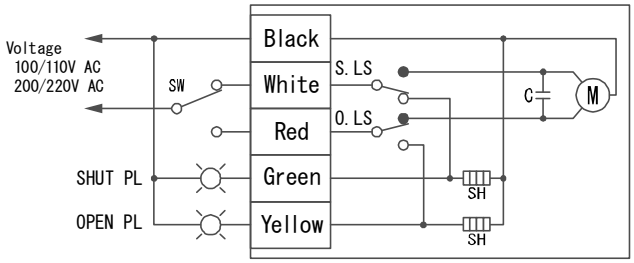
ELECTRIC ACTUATOR SPECIFICATIONS

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 ºC			
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 mm² L=500 mm			

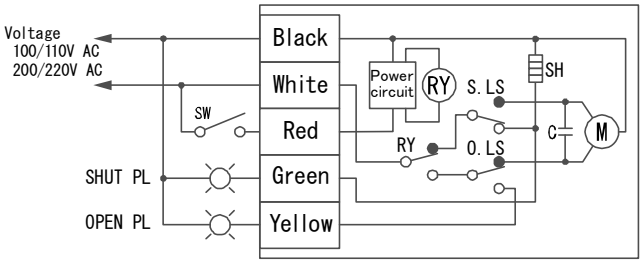
WIRING

CM1



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

CM2



- 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.

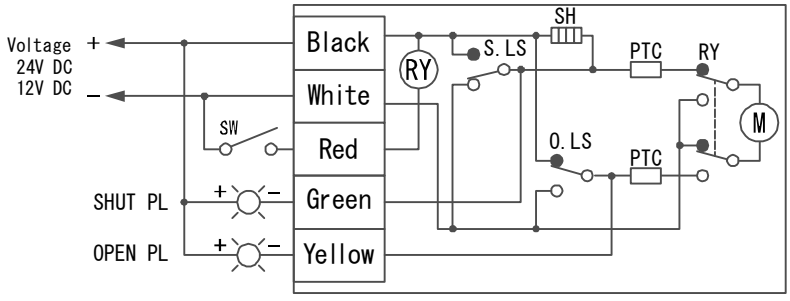
Note) For manual operation on CM-070, press the clutch button while operating it.

ELECTRIC ACTUATOR SPECIFICATIONS

CD2 type

Actuator type	CD2-030-4	CD2-030-0	CD2-070-0
Voltage	12V DC ±20 %	24V DC ±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 Not in motion SHUT 0.25 OPEN 0.5		In motion (Max) 24 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 ºC		
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 mm² L=500 mm		

WIRING



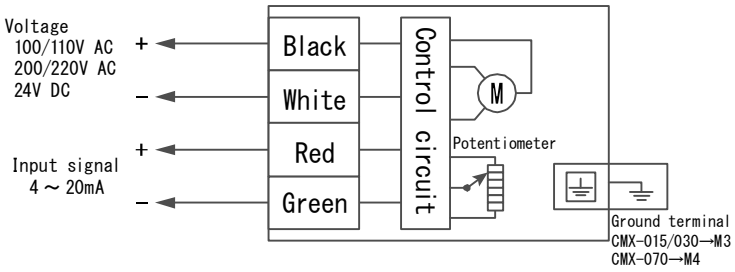
Note) • Two or more actuators can be operated with one control switch.
• When using control switch with current leakage (more than 1 mA) such as TRIAC or relay with CR, it can cause malfunction.
• For manual operation on CD2-070, press the clutch button while operating it.

ELECTRIC ACTUATOR SPECIFICATIONS

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)	17 / 14 (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 mm² L=500 mm			
Ground terminal	Actuator mounting screw: M3 (CMX-070: M4)			

WIRING



Note) • CMX of AC power; if the input signal is cut off the valve holds the current position and stops.
• Wire a power line and a signal line by the separate cable when cable length becomes more than 100 m.
• For prevention of noise, please perform grounding surely.
• Voltage and input signals are non-isolated.
• For manual operation on CMX-070, press the clutch button while operating it.

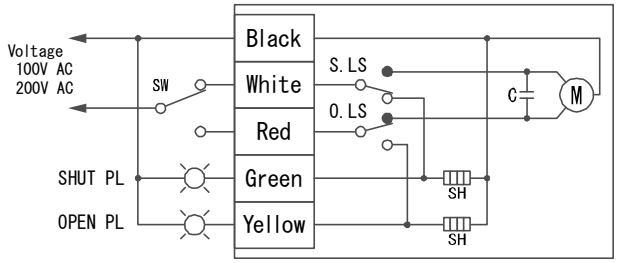
ELECTRIC ACTUATOR SPECIFICATIONS

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 mm² L=500 mm	Flexible cable 3 leads 0.5 mm² L=500 mm

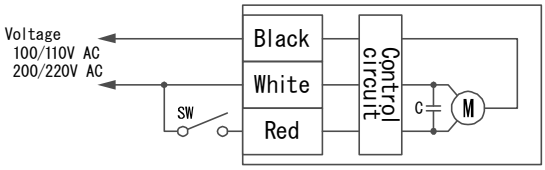
WIRING

CA1



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

PM1



- 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.

HANDLING & STORAGE

①HANDLING

Do not drop or throw the product as it may break.

②STORAGE

- Store away from dust, moisture and direct sunlight. If possible, store in the original package.
- Do not remove a dust proof cap until the piping.

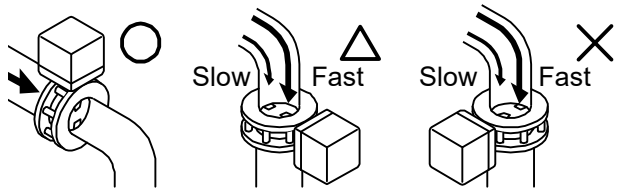
③CHECKING

- Check the product code, power supply, and voltage before installation.
- Make sure that the bolts are not loose.

INSTALLATION

①PRECAUTIONS

- Flush the pipeline carefully before installing the valve. Foreign particles, such as sand or pieces of welding electrode, will damage the disk and seats.
- When piping the valve disk should be closed before mounting.
- Avoid oil or grease when using EPDM seat.
- The butterfly valve should be piped upstream of the elbow. When piping downstream from the elbow, considered a straight line that is at least five times the length of the pipe.



- The valve stem should be mounted perpendicular to the flow for biased fluid.

②PIPING

- Using a pipe with too long a thread will damage the valve.
- If sealing tape or sealant gets inside the valve, the valve seat leaks or malfunctions.
- When connecting a pipe or fitting to a valve, use a tool on the octagonal or hexagonal part of the insertion side and screw it.
- Refer to the recommended tightening torque table and do not apply excessive torque.

Valve size [mm]	Torque [N·m]
015	25 to 35
020	40 to 50
025	50 to 60
032	60 to 80
040	75 to 85
050	90 to 110

③Socket End

Should use adhesive suitable for valve materials.

④ENVIRONMENT

- 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.

⑤POSITIONING

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 CA1 PM1	More than 15 mm

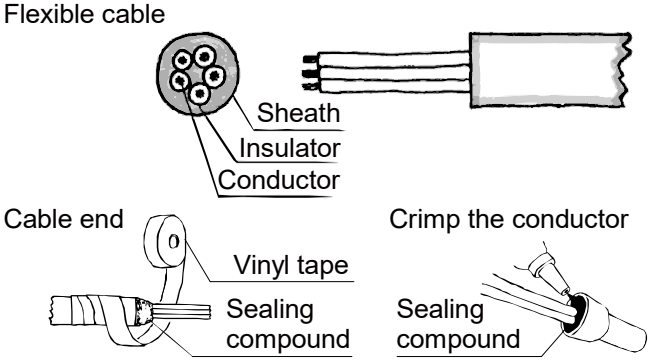
WIRING

①PRECAUTIONS

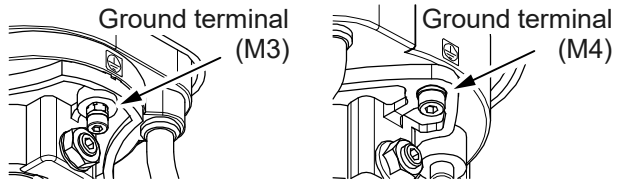
When wiring is long distance or handling a weak current signal, it may be affected by induced voltage or noise. In this case, please use countermeasures such separating it from other power cables.

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.



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



CMX (015 / 030) CMX (070)

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.

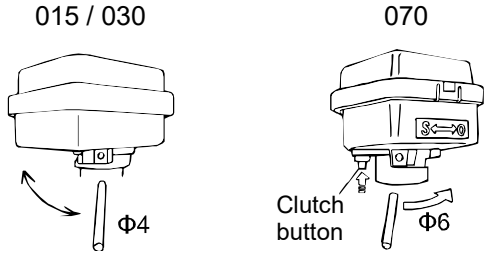
④ATTENTION

- 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.

MANUAL OPERATION

①PRECAUTIONS

- 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.
- Confirm the fluid temperature or pressure.
- Confirm the leak from valve stem.

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.
	Motor is too old.	Replace the actuator.
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.	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. CM1 CM2 CMX CA1 PM1
Leakage from valve seat	Seat is worn or damaged.	Replace the valve.
Leakage from valve stem	Packing is worn or distorted.	

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

NIPPON VALVE CONTROLS, INC.
1-21-19 Meieki minami, Nakamura-ku, Nagoya 450-0003 JAPAN
TEL: 81-52-582-6435 FAX: 81-52-582-6439