NIPPON VALVE CONTROLS, INC.

Instruction manual

Electric Actuator PAX

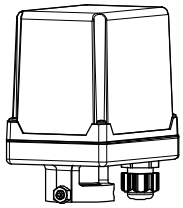
SP-1516

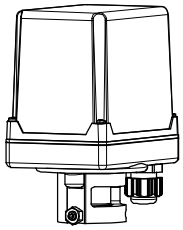
Please read this document before using these valves.

GENERAL

A light weight, compact and long service life electric actuator built in high reliability and proportional motor.

PAX : For AC power.





PRODUCT CODE

P A X - [:] - [ ] - [:] - [ ]

(1) (2) (3) (4) (5)

(1) Actuator	(2) Torque	(3) Voltage	(4) Option	(5) Operation mode
PAX	050	1 : 100 / 110 V	AK : Aluminum alloy motor cover	Nil : Mode A
	120	2 : 200 / 220 V	C1 : Flexible cable	J : Mode B

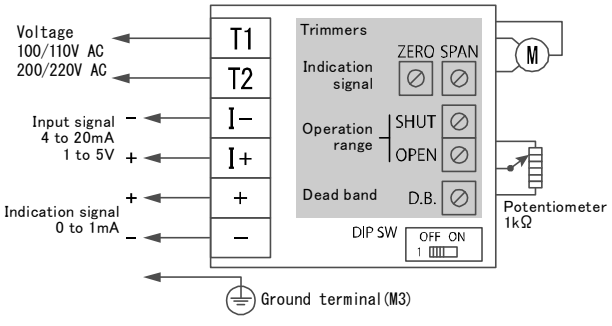
ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

Actuator type (☐:Voltage code)	PAX-050-☐	PAX-120-☐
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]	5	12
Operation time [s]	14 / 12 (50/60 Hz)	30 / 25 (50/60 Hz)
Power consumption [VA]	9.5	
Motor	Synchronous motor (Triac control)	
Overload protection	Impedance protect	
Method of operation	Proportional control	
Input signal	4 to 20 mA / 1 to 5 V (Input resistance: 250 Ω)	
Operation *1	[Mode A] SHUT by decreased signal ↔ OPEN by increased signal (Standard) [Mode B] SHUT by increased signal ↔ OPEN by decreased signal (Option: J)	
Indication signal	0 mA : SHUT ↔ 1 mA : OPEN (External load resistance: less than 3 kΩ) Common in mode A / B	
Resolution	Less than 0.2 %	
Duty cycle	100 %	
Ambient temperature	-20 to 55 ºC	
Space heater	1 W	
Manual operation	Direct operation of actuator by loosening lock screw	
Enclosure	Equivalent to IP65 (IEC 60529)	
Housing material	Aluminum alloy die cast + Polycarbonate resin cover	
Terminal block	For bare wire 0.2 to 1.5 mm² (AWG 26 to 16) Ground terminal: M3	
Conduct port	G3/8 Cable gland (for Φ5 to 10.5 mm cable)	

*1 Change by DIP switch. (Standard → Mode B)

WIRING



Setting with DIP switch

Mode A / B is selected simply by setting the mode change DIP switch located on built-in control board.

Mode A

Mode B

Note) • Input signal circuit is non-isolated. Do not connect DC (-) wire to other DC (-) common.
• Do not adjust operating angle of a valve (OPEN/SHUT trimmer).
Please contact us if you need to adjust operating angle.

ELECTRIC ACTUATOR SPECIFICATIONS

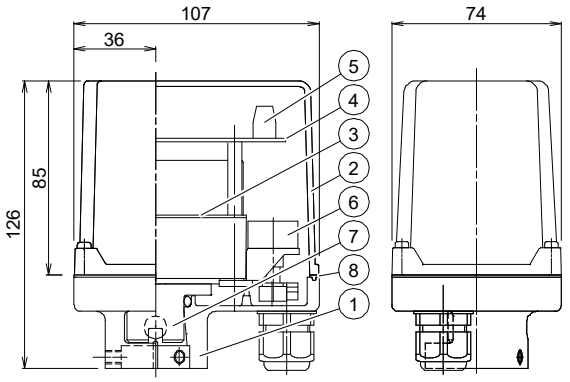
3 way valve: SHUT / Position①, OPEN / Position②

OPTIONAL PARTS

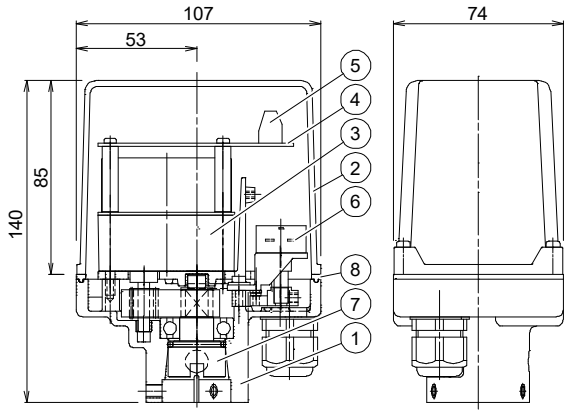
Specifications			Code No.	PAX	Remarks
Aluminum alloy motor cover			AK	○	
Flexible cable (Approx. 300 mm long)			C1	○	
Operation mode	SHUT by 4 mA.	(Decreased input signal)	Nil	○	Mode A (Standard)
	SHUT by 20 mA.	(Increased input signal)	J	○	Mode B

DIMENSION

PAX-050



PAX-120



Parts name

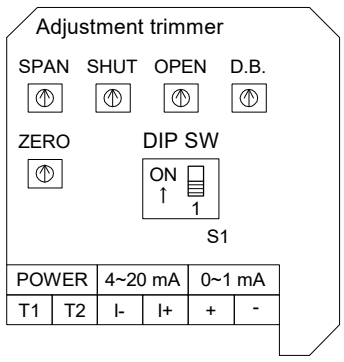
1	Body	4	Control board	7	Drive shaft
2	Motor cover	5	Terminal block	8	Rubber packing
3	Motor	6	Potentiometer		

ADJUSTMENT

① Dead band
Turn the trimmer clockwise for wide the dead band as necessary.
It is useful to prevent the hunting reaction of actuator.
*Each trimmer on a built-in control board.

② Operating range
Do not adjust operating angle of a valve (OPEN, SHUT trimmer).
Please contact us if you need to adjust operating angle.

③ Operating speed (Speed control)
No adjustment required. (ZERO, SPAN trimmer)



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 55 °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	
PAX	More than 90 mm

③OTHER NOTES

Until the wiring is completed there must be no condensation or flooding in the interior of the actuator, after piping. Protective caps on the cable gland are not waterproof.

WIRING

- Do not wiring outdoors on a rainy day.
- Check the power supply and voltage.
  Connect the signal as shown in the wiring diagram.
  Do not connect unnecessarily terminal.
- Use suitable flexible cable (Φ5 to 10.5 mm).
  Lock and seal the cable completely to prevent condensation inside the actuator.
- Built-in terminal block can clamp up to 1.5 mm in diameter without using solderless terminal.
- Allow proper cable slack for maintenance.
- Actuator should be electrically grounded.
  Use the terminal marked (⏚) inside the actuator.

PREVENT DEW CONDENSATION

- When installing the cover after wiring, perform the bolt by the temporary tightening procedure and the permanent tightening procedure to tightly and securely tighten the rubber packing so that water does not enter from the outside.
- Tighten the cable gland nut so that there is no leakage from the wire entrance.

CONTROL

- Use shielded wire for signal wiring where high level noise is generated or when the wiring distance is long.
- Control with a 1 to 5 V input signal becomes an input resistance 250 Ω. Provide a voltage that can safely 20 mA or more than.
- Check whether the MODE change DIP SW on a circuit board substrate is set up correctly.
  When wiring, if wiring of a signal is mistaken, it will not operate correctly. Contact us when you use two valve or more by one controller or indicator.
- Input signal circuit is non-isolated.
  Do not connect DC (-) wire to other DC (-) common.
- The input signal and operation mode are set as follows. (Factory shipped)

Input signal	4 to 20 mA / 1 to 5 V
Operation mode	Mode A
Operation	SHUT by decreased signal OPEN by increased signal

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.

②CONFIRM THE OPERATING CONDITION

- 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.

③ATTENTION

- Be sure to set the DIP-SW before turning on the power supply.
- Keep power supplied for built-in space heater to prevent condensation inside actuator.
- Do not touch the moving parts of actuator in operation.
- Never put anything on the actuator or make it into a foothold.

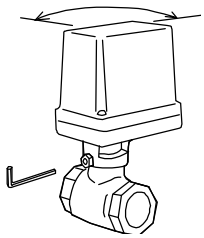
MANUAL OPERATION

①PRECAUTIONS

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

②NOTE

For manual operation, do not give more than the rated torque and make at a slow rate. Actuator might be damaged if excessive force is added.



Actuator can be easily removed from the valve by loosing 3 lock screws, and that allows direct operation of the valve.
After operation, be sure to put back the actuator to the original position and lock.

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 that water or condensation no remains in the actuator.

TROUBLE SHOOTING

Problem	Cause	Solution
Actuator does not move.	Faulty wiring.	Correct the wiring.
	Voltage and input signal are not coming.	Check the voltage and input signal.
	Incorrect voltage.	When it's burned out by excess voltage, replace the actuator.
	Connection or wiring is not correct.	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 too old.	Replace the actuator.
Operation is unstable.	Excess surge or voltage was applied.	Replace the actuator.
	Rainwater entered the actuator.	
	Added high harmonics noise from an inverter.	Attachment a filter for each inverter maker option.
	Effect of high level noise.	Use the shielded wire and ground the wiring. Separate signal wire from power line.
Stop in the mid position. (Input signal's 1 to 5 V.)	Signal voltage source capacity shortage.	Use a voltage source that can be made to flow more than 20 mA. Please contact us.
Stop in the mid position.	Overload protector runs because of over-torque.	Motor protection circuit returns by the signal of operation of an opposite direction. Turn on the power again.

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

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