NIPPON VALVE CONTROLS, INC.

Instruction manual

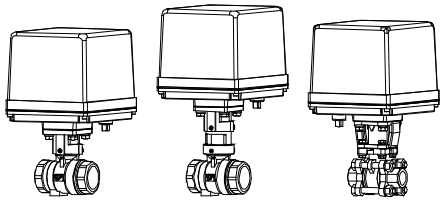
Electric Actuated Ball Valve E EG TV MS MV

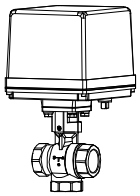
SP-1519

Please read this manual before installation and use.

GENERAL

Threaded-end ball valve with high-power electric actuator.
(proportional control)





Actuator

- AEX : For AC power.
- PEX : For AC / DC power.

Valve

- E type For general use.
- EG type For high temp. (up to 1 MPa)
- MS type 3 piece / For heavy load.
- MV type 3 piece / For control.
- TV type For diversion flow and mixing.

PRODUCT CODE

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
E type	(Brass)		E -			5	Y	Y	F -		-	-
	(Stainless)		E -			5	U	U	T -		-	-
EG type			E G			5	U	U	P -		-	-
MS type			M S			5	U	U	P -		-	-
MV type			M V			5	U	U	P -		-	-
	(Standard port)		M V			5	U	U	P R		-	-
TV type			T V			5	T	T	P -		-	-

(1) Actuator
- AEX
- PEX

(2) Valve
- E- EG MS MV
- TV

(3) Voltage
- 1 : 100 / 110 V AC
- 2 : 200 / 220 V AC
- 6 : 100 to 240 V AC
- 0 : 24 V DC

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

(5) Connection
- 5 : Threaded End Rc

(6) Body material
- Y : C3771BE
- U : SCS14A
- T : SCS13A

(7) Ball material
- Y : C3771BE / C3604BD
- U : SCS14A / SUS316
- T : SCS13A / SUS304

(8) Seat material
- F : F-PTFE
- T : PTFE
- P : R-PTFE

(9) Size [mm]
- ex. 25 A → 025

(10) Option
- EA : Alarm output board
- EI : 4 to 20 mA Indication signal board
- L0 : Auxiliary limit switch
- L2 : Auxiliary limit switch

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

(11) Input signal (AEX)
It corresponds to various control input signals.

VALVES SPECIFICATIONS

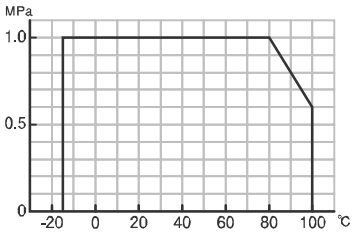
Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

E EG Type

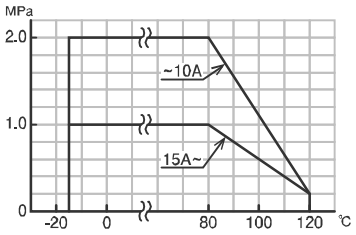
Valve type		E (Brass)		E (Stainless)			EG
Design		2 way, Standard port		2 way, Standard port			2 way, Standard port
Connection		Threaded End Rc		Threaded End Rc			Threaded End Rc
Fluid							
Max pressure		1 MPa		2 MPa	1 MPa		1 MPa
Size [mm]		015 to 025	032 to 050	008 to 010	015	020 to 050	015 to 050
Material	Body	C3771BE (Plated)		SCS14A			SCS14A
	Ball	C3604BD (Plated)	C3771BE (Plated)	SUS316		SCS14A	SCS14A
	Seat	F-PTFE		PTFE			R-PTFE
Stem seal	O-ring	FKM		FKM			Steam resistant FKM

PRESSURE & TEMPERATURE RATING

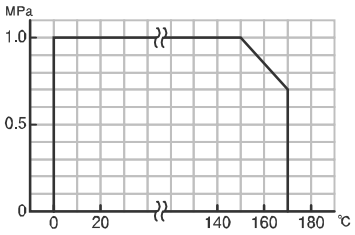
E (Brass)



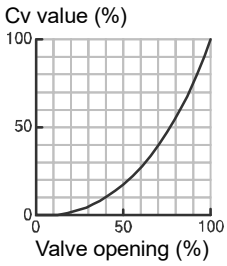
E (Stainless)



EG



INHERENT FLOW CHARACTERISTIC



Range ability 30:1

VALVES SPECIFICATIONS

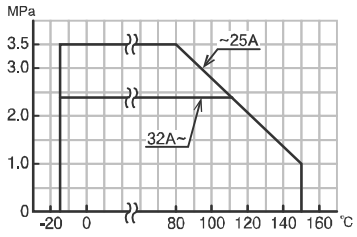
Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

MS MV type

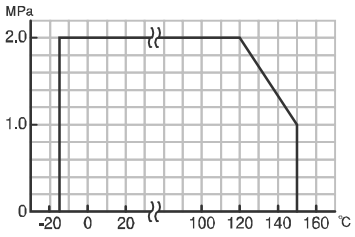
Valve type		MS		MV		
Design		2-way, Full port		2-way, V-port		
Connection		Threaded End Rc		Threaded End Rc		
Fluid						
Max pressure		3.5 MPa	2.4 MPa	2 MPa		
Size [mm]		010 to 025	032 to 050	R010 to R015	015	020 to 050
Material	Body	SCS14A		SCS14A		
	Ball	SCS14A		SUS316		SCS14A
	Seat	R-PTFE		R-PTFE		
Stem seal	Packing	R-PTFE		R-PTFE		
	O-ring	FKM		FKM		

PRESSURE & TEMPERATURE RATING

MS

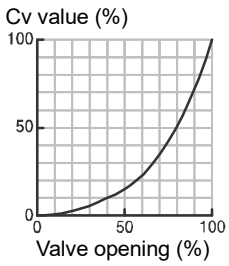


MV



INHERENT FLOW CHARACTERISTIC

MV



Range ability

MV-5UUP R 010 to 015 100:1

MV-5UUP - 015 to 050 50:1

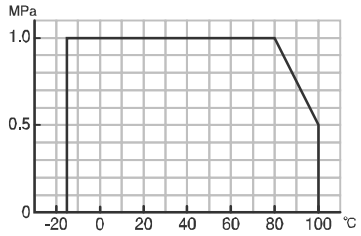
VALVES SPECIFICATIONS

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

TV type

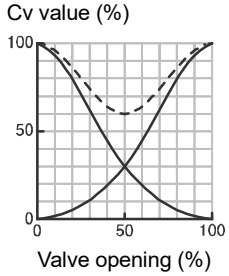
Valve type		TV	
Design		3 way, Standard port	
Connection		Threaded End Rc	
Fluid			
Max pressure		1 MPa	
Size [mm]		015 to 025	032 to 040
Material	Body	SCS13A	
	Ball	SUS304	SCS13A
	Seat	R-PTFE	
Stem seal	Packing	-	
	O-ring	FKM	

PRESSURE & TEMPERATURE RATING

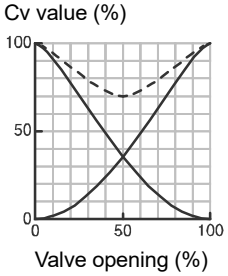


INHERENT FLOW CHARACTERISTIC

015 to 020 mm

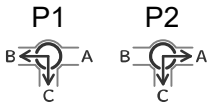


025 to 040 mm



Range ability 20:1

FLOW PATHS (Position① / P1) (Position② / P2)



Note) When a closed path is exposed to high pressure, it may leak slightly to an open path.

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

AEX type

Actuator type (□:Voltage code)	AEX-120-□	AEX-360-□	AEX-700-□	AEX-02K-□	AEX-06K-□
Voltage	100 / 110 AC V ±10 % 50/60 Hz (Code: 1) 200 / 220 AC V ±10 % 50/60 Hz (Code: 2)				
Rated torque [N·m]	12	36	70	200	600
Operation time [s]	30 / 25 (50/60 Hz)	36 / 30 (50/60 Hz)	72 / 60 (50/60 Hz)	77 / 64 (50/60 Hz)	77 / 64 (50/60 Hz)
Power consumption [VA]	9.5	13		45	220
Motor	Synchronous motor (Triac control)			Reversible motor (Triac control)	
Overload protection	Timer				
Method of operation	Proportional control				
Input signal	4 to 20 mA / 1 to 5 V (Input resistance: 250 Ω) (Standard) 0 to 5 V / 0 to 10 V / 2 to 10 V (Input resistance: more than 1 M Ω) 0-135 Ω to 0-1 kΩ Potentiometer input (Applied voltage: 5 V DC)				
Operation *1	[Mode A] SHUT by decreased signal (Standard) OPEN by increased signal [Mode B] SHUT by increased signal OPEN by decreased signal [Forced open / shut] It takes priority over the input signal. C-S is ON → SHUT. (Common in mode A / B) C-O is ON → OPEN.				
Indication signal	0 mA : SHUT ↔ 1 mA : OPEN (External load resistance: less than 3 kΩ) Common in mode A / B				
Override switch	It takes priority over the input signal. Common in mode A / B Dry contact / Transistor, Open collector. (Input signal current: 6 mA 15V DC)				
Operating range	SHUT: 0 to 40% OPEN: 50 to 100%				
Resolution	Less than 0.2%				
Duty cycle	100 %				
Ambient temperature	-20 to 55°C				
Space heater	2 W				
Manual operation	Manual shaft				
Enclosure	Equivalent to IP65 (IEC 60529)				
Housing material	Aluminum alloy die cast (acrylic resin baking finish)				
Wire connection	Terminal Block: M3, Ground terminal: M3				
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.				

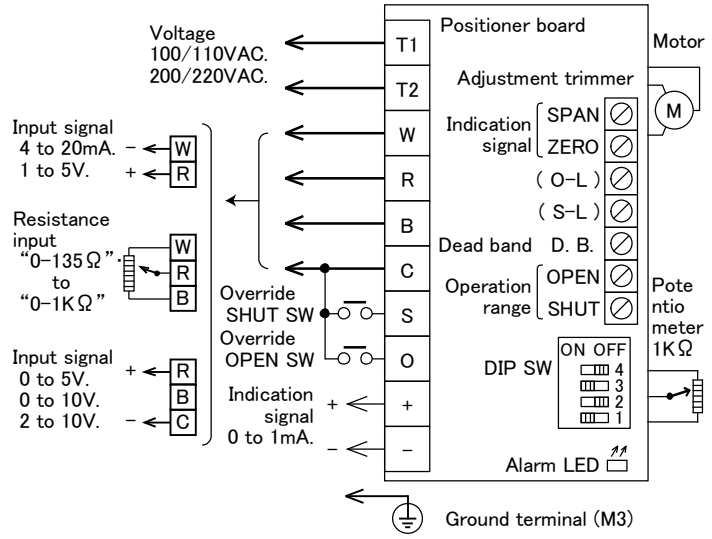
*1 Change by DIP switch. (Standard → Potentiometer input or 0 to 5 V / 0 to 10 V / 2 to 10 V)
*2 Change by DIP switch. (Standard → Mode B)

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

WIRING

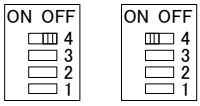
AEX



Setting with DIP SW

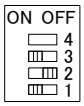
• Operation

Mode A Mode B

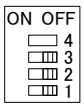


• Input signal

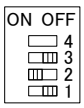
4 to 20 mA / 1 to 5 V



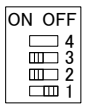
0-135 Ω to 0-1 kΩ Potentiometer input / 0 to 5 V



0 to 10 V



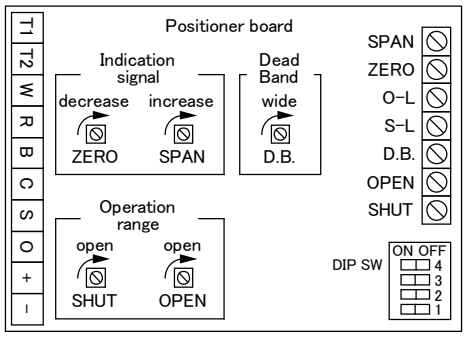
2 to 10 V



Note • Input signal circuit is non-isolated. Do not connect DC (minus) wire to other DC (minus) common.
• Do not adjust the "O-L" and "S-L" trimmer. It is adjusted at the factory.

ADJUSTMENT OF ACTUATOR

AEX



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

Turn clockwise and adjust valve / damper to open side.

• Adjust the closed position by SHUT trimmer.
• Adjust the open position by OPEN trimmer.

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

PEX type

Actuator type (□:Voltage code)	PEX-120-□	PEX-300-□	PEX-700-□
Voltage	100 to 240 V AC ±10 % 50/60 Hz (Code: 6) 24 V DC +20 % ~ -10 % (Code: 0) Cannot use a half or full-wave DC power supply.		
Rated torque [N·m]	10	21	50
Operation time [s]	2.5 to 4 (Max 12)	6 to 9 (Max 34)	12 to 18 (Max 68)
	The operation time is the time when it is operated by the override switch. Operation time with the override switch cannot be adjusted with S.C. trimmer. At factory shipment, the S.C trimmer is set to the fastest position.		
Power consumption [VA]	AC power 80 DC power 50		
Motor	Brushless DC motor (PWM Control)		
Overload protection	Current limiter		
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 (Standard) OPEN by increased signal [Mode B] SHUT by increased signal (Option: J) OPEN by decreased signal [Forced open / shut] It takes priority over the input signal. C-S is ON → SHUT. (Common in mode A / B) C-O is ON → OPEN.		
Indication signal	0 mA : SHUT ↔ 1 mA : OPEN (External load resistance: less than 3 kΩ) Common in mode A / B		
Override switch	It takes priority over the input signal. Common in mode A / B Dry contact / Transistor, Open collector. (Input signal current: 6 mA 15V DC)		
Operating range	SHUT: 0 to 40 % OPEN: 50 to 100 %		
Resolution	Less than 0.2 %		
Duty cycle	100 %		
Ambient temperature	-20 to 55 °C		
Space heater	3 W		
Manual operation	Manual shaft		
Enclosure	Equivalent to IP65 (IEC 60529)		
Housing material	Aluminum alloy die cast (acrylic resin baking finish)		
Wire connection	Terminal Block: M3, Ground terminal: M3		
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.		

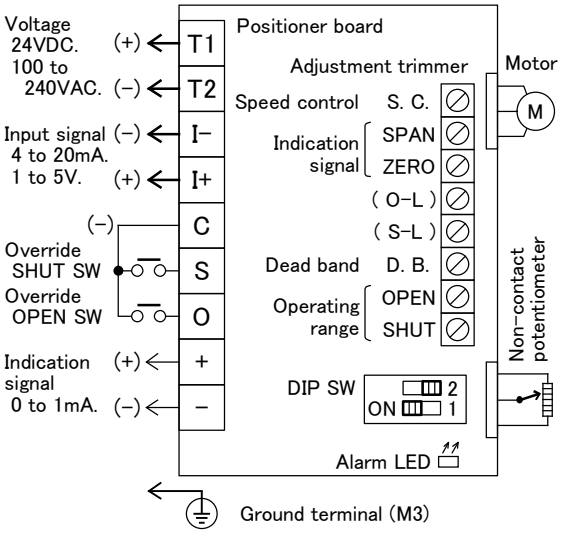
*1 Change by DIP switch. (Standard → Mode B)

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

WIRING

PEX



Setting with DIP SW

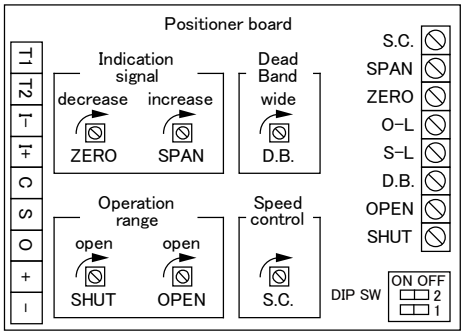
• Operation

Mode A (Standard) Mode B

Note • Do not adjust the "O-L" and "S-L" trimmer. It is adjusted at the factory.
• Minus terminal can be used in common, but T2 terminal for DC power supply is not a common terminal.

ADJUSTMENT OF ACTUATOR

PEX



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
Turn clockwise and adjust valve/damper to open side.
• Adjust the closed position by SHUT trimmer.
• Adjust the open position by OPEN trimmer.

③ Operating speed (Speed control)
Slow by turn the S.C. trimmer counterclockwise.
Fast by turn the S.C. trimmer clockwise.

Note) The operation time is the time when it is operated by the override switch.
Operation time with the override switch cannot be adjusted with S.C. trimmer.
At factory shipment, the S.C trimmer is set to the fastest position.

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

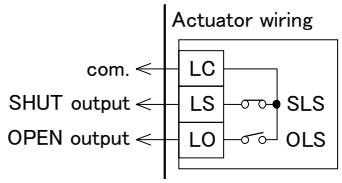
OPTIONAL PARTS

Specifications		Code No.	AEX	PEX	Remarks
Input signal and operation	4 to 20 mA or 1 to 5 V	Nil	○	○	Mode A (Standard)
		J	○	○	Mode B
	0-135 Ω to 0-1 kΩ Potentiometer input or 0 to 5 V	F	○		Mode A
		K	○		Mode B
	0 to 10 V	G	○		Mode A
		N	○		Mode B
	2 to 10 V	H	○		Mode A
		M	○		Mode B
Auxiliary limit switch (Select limit switch depending on the load)		L0	○	○	For standard signal
		L2	○	○	For micro load signal
Alarm output board		EA	○	○	EI and EA cannot be used together.
4 to 20 mA Indication signal board		EI	○	○	

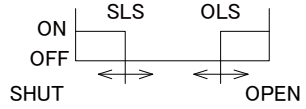
*Auxiliary limit switch: Please refer to the specifications.

WIRING (OPTION)

L0, L2 Auxiliary limit switch

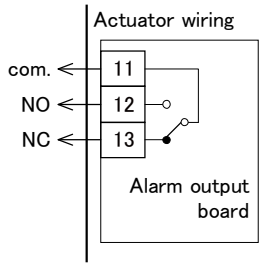


At CLOSE side, LC and LS is ON.
At OPEN side, LC and LO is ON.



ON point can be reset by adjusting the cam.

EA Alarm output board



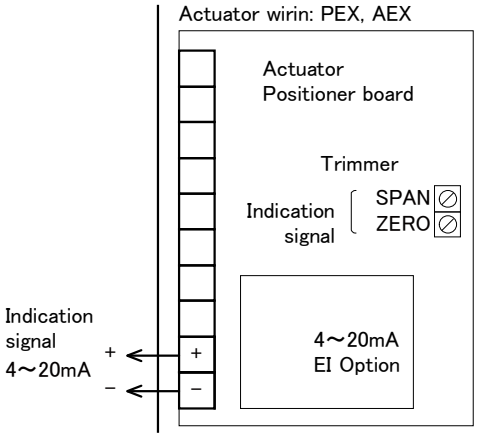
NO : Normally open
NC : Normally closed

Alarm SW will be ON, when overload protector works.

Error → 11 and 12 is ON.
Normal → 11 and 13 is ON.

Cannot be used with EI option.

EI 4 to 20 mA Indication signal board

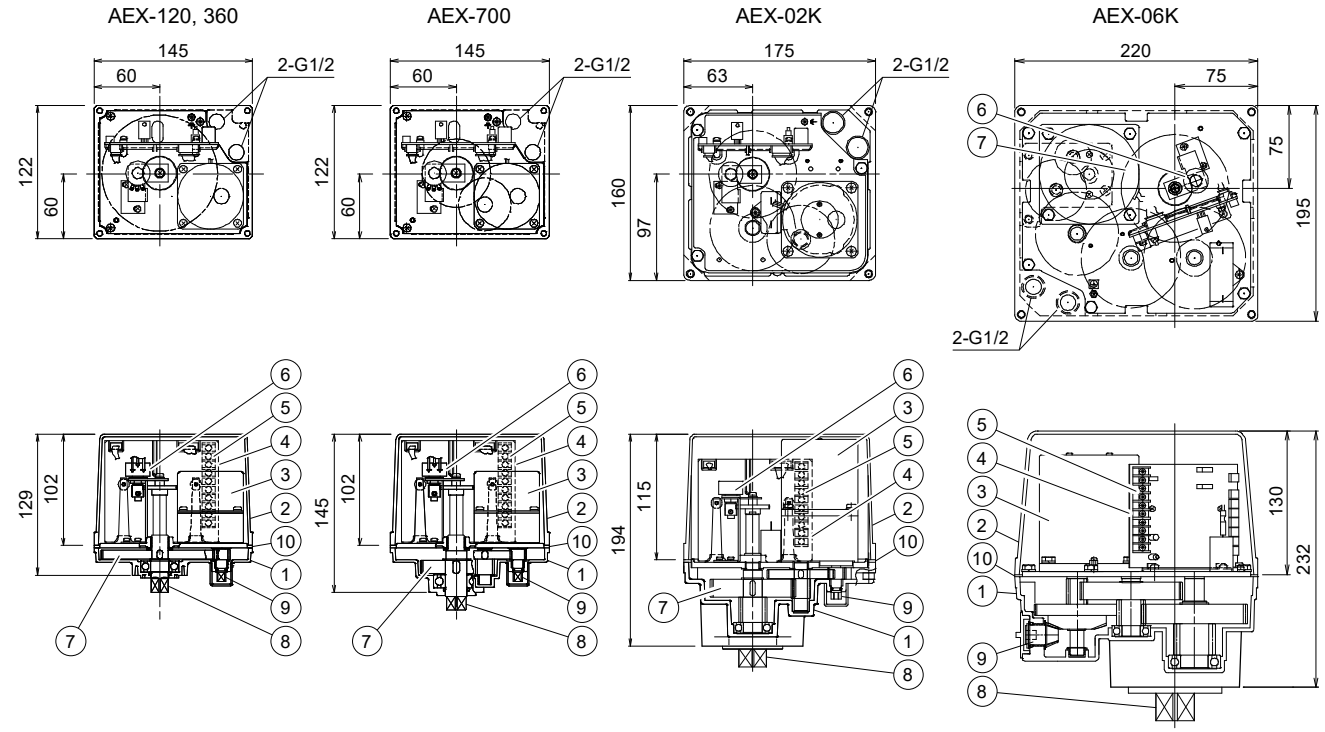


EI option board output an isolated indication signal from the plus and minus terminal with 4 to 20 mA by AEX / PEX positioner board.

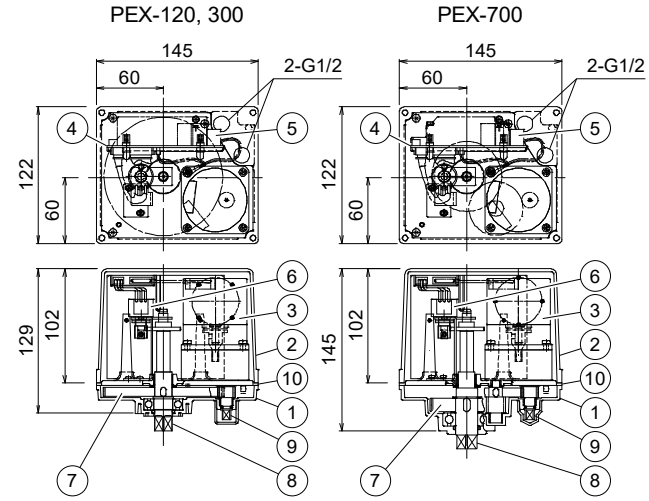
ELECTRIC ACTUATOR SPECIFICATIONS

DIMENSIONS

AEX



PEX



Parts name

1	Body	4	Control board	7	Drive gear	10	Rubber packing
2	Motor cover	5	Terminal block	8	Drive shaft		
3	Motor	6	Potentiometer	9	Manual shaft		

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.

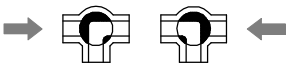
③CHECKING

- Check the product code, power supply, and voltage before installation.
- Make sure that the bolts are not loose.
- The DIP switch should be set up before the power is turned on. Do not touch unnecessary switches.

INSTALLATION

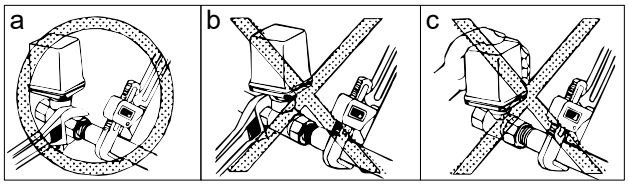
①PRECAUTIONS

- Flush the pipeline carefully before installing the valve. Foreign particles, such as sand or pieces of welding electrode, will damage the ball and seats.
- For valves with specified flow direction (EG, MV) or with ST / SC option, check the arrows on the product before piping.
- When the flow path is subjected to a high pressure from arrow, it may leak slightly to the low pressure port. (TV)



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.
- To prevent the valve from being damaged by stress, always hang a wrench on the end of the valve on the side where the pipe is to be connected when screwing in the pipe or when unscrewing it after correcting the angle (Fig a and b) and do not use a pipe wrench on the valve. Do not apply force to the actuator when working on the piping. (Fig. c)



- Refer to the recommended tightening torque table and do not apply excessive torque.

Valve size [mm]	Torque [N·m]
008 to 010	15 to 20
015	25 to 35
020	40 to 50
025	50 to 60
032	60 to 80
040	75 to 85
050	90 to 110

③ENVIRONMENT

- 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.

④POSITIONING

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.	
AEX (120 / 360 / 700) PEX	More than 105 mm
AEX (02K / 06K)	More than 120 mm

⑤OTHER 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

①PRECAUTIONS

- Remove the actuator cover before wiring.
- Two G1/2 electrical connections are provided with a cable gland and plug. Usable cable size is Φ6 to 12 mm.
- When using a flexible tube, dew condensation may occur inside the actuator due to respiration from the inside of the tube and malfunction may result. Seal the flexible tube connector part with a sealant.
- Sealants that affect the electrical contacts should not be used inside the electric actuator.
- If long distance wiring or low voltage operation, check that terminal voltage is in the proper range.
- AEX type input signal circuit is non-isolated. Do not connect DC (minus) wire to other DC (minus) common.
- PEX type minus terminal can be used in common, but T2 terminal for DC power supply is not a common terminal.

②CONNECTION

- 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.
- 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.
- 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

①INPUT SIGNAL

- 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 20mA or more than.

②DC 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 using a DC voltage, be selected the wire thickness by the wiring distance.
- Do not use power supply that require more than 1 second with rise and fall time.

③INPUT SIGNAL AND OPERATION MODE

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

Input signal	4 to 20 mA or 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

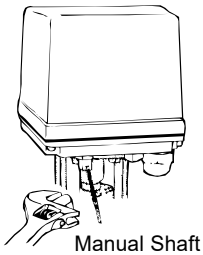
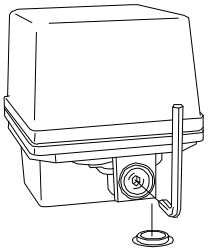
- Do not change an unnecessary dip switch.
- Keep power supplied for built-in space heater to prevent condensation inside actuator.
- Do not touch the moving parts of actuator in operation.
- Never put anything on the actuator or make it into a foothold.

MANUAL OPERATION

①PRECAUTIONS

- Be sure to turn off the power before manual operation.
- Operate manually with reference to the opening degree label. Do not turn beyond the fully open / fully closed position. Operation failure may occur during automatic operation.

②THE WAY OF OPERATION

AEX PEX	AEX (06K)
	
Turn manual shaft slowly with an adjustable wrench.	Remove the cap. Turn manual shaft solely with M8 hexagon socket screw keys.

Before automatic operation, be sure to remove the wrench.

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.
- 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.
	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. Repair in our factory.
Operation is unstable.	Excess surge or voltage was applied.	• Replace the control board or limit switch. (Repair in our factory) • Replace the actuator.
	Rainwater entered the actuator.	• Dry the inside. • Replace 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.

Problem	Cause	Solution
Stop in the mid position. (Input signal 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.	• Biting of valve seat. • The scale has adhered to the valve ball.	Remove a foreign object.
		Clean or replace valve parts. MS MV
	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.
Alarm LED is lit.		
Leakage from valve body	• Valve cap get loose. • Valve body is damaged.	Replace the valve.
Leakage from valve seat	Seat is worn or damaged.	Replace the valve.
		Replace the seat. MS MV
Leakage from valve stem	Stem packing is worn or distorted.	Replace the valve.
		Replace the packing. MS MV

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

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