NIPPON VALVE CONTROLS, INC.

Instruction manual

Electric Actuated Ball Valve PA PL

SP-1519

Please read this manual before installation and use.

GENERAL

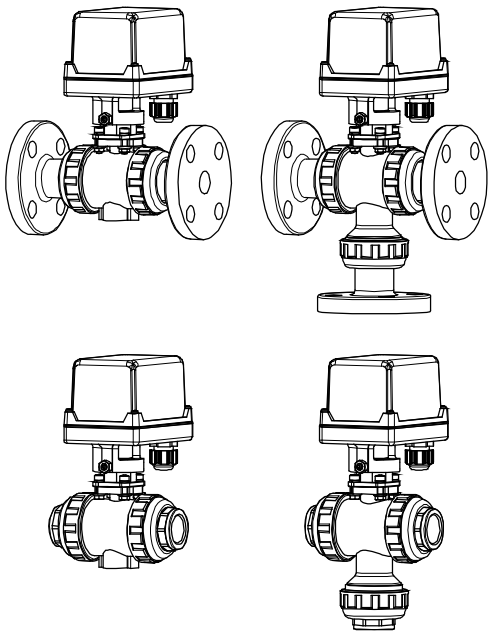
A plastic ball valve and compact electric actuator.
Various connections can be selected.
(Various materials can be selected.)

Actuator

- AM : For AC power.
- AH1 : For AC power. (High speed)
- DM : For DC power.
- PAX : Proportional control.

Valve

- PA type 2-way ball valve
- PL type 3-way ball valve



J10K Flanged-end, Threaded End Rc, Socket

PRODUCT CODE

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PA, PL type	J10K Flanged-end					1	P	P		-	-
						1	H	H		-	-
						1	R	R		-	-
						1	Q	Q		-	-
	Threaded End Rc					5	P	P		-	-
						5	H	H		-	-
						5	R	R		-	-
						5	Q	Q		-	-
	Socket					7	P	P		-	-
						7	H	H		-	-
						7	Q	Q		-	-

(1) Actuator
AM1 AM2 AH1
DM0 DM2 PAX

(2) Valve
PA
PL

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

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

(5) Connection
1 : J10K Flanged-end
5 : Threaded End Rc
7 : Socket

(6) Body material
P : PVC
H : C-PVC
R : PVDF
Q : PP

(7) Ball material
same as body material

(8) Stem seal
E : EPDM
V : FKM

(9) Size [mm]
ex. 25A → 025

(10) Option
AK : Aluminum alloy motor cover
M1 : Manual lever
C1 : Flexible cable

VALVES SPECIFICATIONS

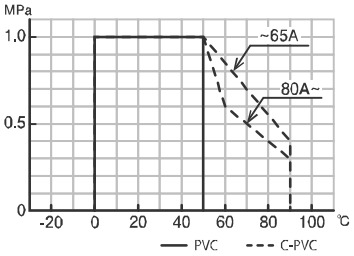
Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

PA PL type

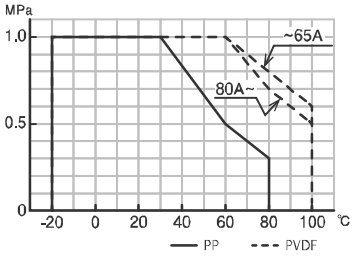
Valve type		PA				PL			
Design		2 way, Full port				3 way, Full port			
Connection		J10K Flanged-end Threaded End Rc	Socket			J10K Flanged-end Threaded End Rc	Socket		
Fluid									
Max pressure		1 MPa				1 MPa			
Size [mm]		015 to 040	015 to 025	032	040	015 to 040	015 to 025	032	040
Material	Body Ball	PVC C-PVC PVDF PP	PVC C-PVC PP	PVC C-PVC	PVC C-PVC PP	PVC C-PVC PVDF PP	PVC C-PVC PP	PVC C-PVC	PVC C-PVC PP
	Seat	PTFE				PTFE			
Stem seal	O-ring	EPDM FKM				EPDM FKM			

PRESSURE & TEMPERATURE RATING (PA)

Body material: PVC, C-PVC

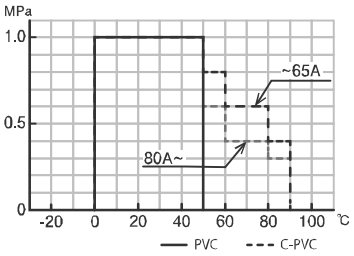


Body material: PVDF, PP

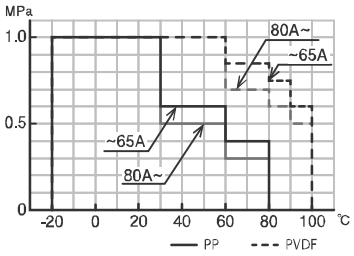


PRESSURE & TEMPERATURE RATING (PL)

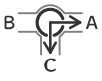
Body material: PVC, C-PVC



Body material: PVDF, PP



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

PL	
P1	P2
	

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

ELECTRIC ACTUATOR SPECIFICATIONS

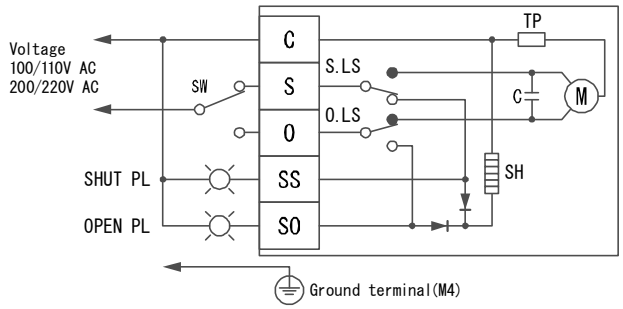
3 way valve: SHUT / Position①, OPEN / Position②

AM1 AM2 type

Actuator type (☐:Voltage code)	AM1-030-☐	AM1-070-☐	AM1-180-☐	AM2-030-☐	AM2-070-☐	AM2-180-☐
Voltage	100 / 110 V AC ±10 % 50/60 Hz (Voltage code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Voltage code: 2)					
Rated torque [N·m]	3	7	18	3	7	18
Operation time [s]	5.4 / 4.5 (50/60 Hz)	15.5 / 13 (50/60 Hz)	16 / 13.5 (50/60 Hz)	5.4 / 4.5 (50/60 Hz)	15.5 / 13 (50/60 Hz)	16 / 13.5 (50/60 Hz)
Power consumption [VA]	16		19	18		19
Motor	Synchronous motor					
Overload protection	Thermal protector					
Method of operation	Transfer input type			a-contact input type, with built-in relay		
Operation	Power to S → SHUT (SHUT PL is lit.) Power to O → OPEN (OPEN PL is lit.)			SW is OFF → SHUT (SHUT signal is output.) SW is ON → OPEN (OPEN signal is output.)		
Input signal current	Nil			9 mA (O-terminal) Leakage current in SW: less than 1 mA		
Output signal rating	Resistance load 3 A 250 V AC (Minimum 0.1 A)			Resistance load 0.5 A 125 V AC 2 A 30 V DC Micro load 1 mA 5 V DC		
Duty cycle	20 % 15 min.					
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 0.14 to 1.5 mm² (AWG 26 to 14) Ground terminal: M4					
Conduct port	G3/8 Cable gland (for Φ5 to 10.5 mm cable)					

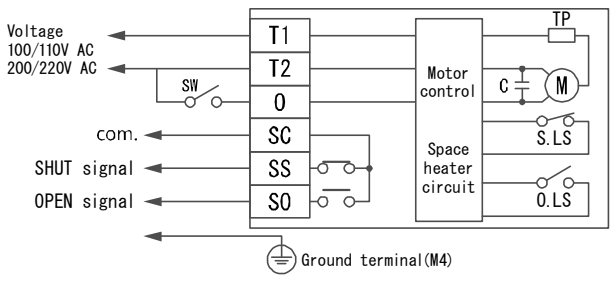
WIRING

AM1



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

AM2



- 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.

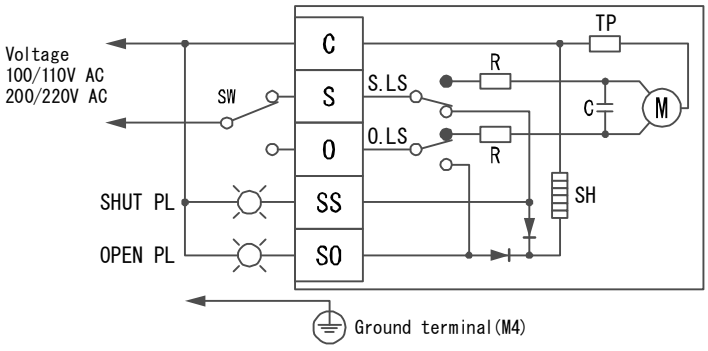
ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

AH1 type

Actuator type (☐:Voltage code)	AH1-030-☐	AH1-070-☐	AH1-180-☐
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	18
Operation time [s]	3 / 2.5 (50/60 Hz)		6 / 5 (50/60 Hz)
Power consumption [VA]	19	50	
Motor	Synchronous motor	Reversible motor	
Overload protection	Thermal protector		
Method of operation	Transfer input type		
Operation	Power to S → SHUT (SHUT PL is lit.) Power to O → OPEN (OPEN PL is lit.)		
Output signal rating	Resistance load 3 A 250 V AC (Minimum 0.1 A)		
Duty cycle	20 % 15 min.		
Ambient temperature	-20 to 55 ºC		
Space heater	0.5 W	1 W	
Manual operation	Direct operation of output shaft		
Enclosure	Equivalent to IP65 (IEC 60529)		
Housing material	Aluminum alloy die cast + Polycarbonate resin cover		
Terminal block	For bare wire 0.14 to 1.5 mm² (AWG 26 to 14) Ground terminal: M4		
Conduct port	G3/8 Cable gland (for Φ5 to 10.5 mm cable)		

WIRING



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

ELECTRIC ACTUATOR SPECIFICATIONS

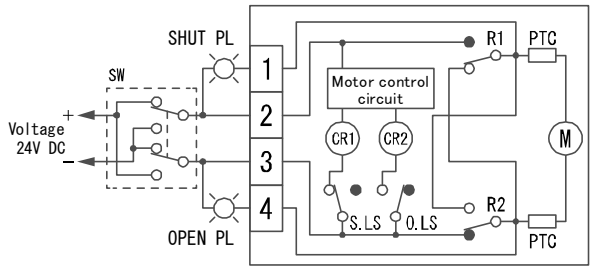
3 way valve: SHUT / Position①, OPEN / Position②

DM0 DM2 type

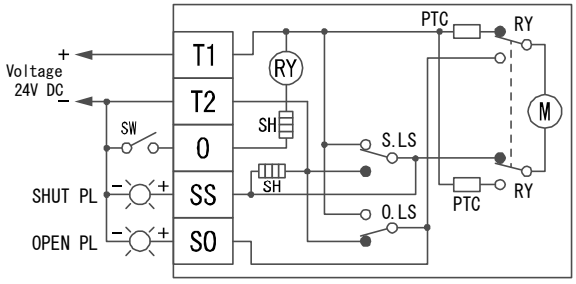
Actuator type	DM0-030-0	DM0-070-0	DM0-180-0	DM2-030-0	DM2-070-0	DM2-180-0
Voltage	24 V DC					
Rated torque [N·m]	3	7	18	3	7	18
Operation time [s]	0.8 to 1.5	2 to 3	4 to 6	2 to 3.5	2 to 3	4 to 6
Power consumption (Max) [VA]	24			10	24	
Motor	DC motor					
Overload protection	Thermistor					
Method of operation	Switching polarity type			a-contactinput type, with built-in relay		
Operation	[2] + [3] - → SHUT (SHUT PL is lit.) [3] + [2] - → 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			16.2 mA (O-terminal)		
Output signal rating	Resistance load 2 A 30 A DC Micro load 1 mA 5 V DC			Resistance load : Less than 1 A 24 V DC		
Duty cycle	20 % 15 min.					
Ambient temperature	-20 to 55 ºC					
Space heater	1 W					
Manual operation	Direct operation of output shaft					
Enclosure	Equivalent to IP65 (IEC 60529)					
Housing material	Aluminum alloy die cast + Polycarbonate resin cover					
Terminal block	For bare wire 0.14 to 1.5 mm² (AWG 26 to 16)					
Conduct port	G3/8 Cable gland (for Φ5 to 10.5 mm cable)					

WIRING

DM0



DM2



ELECTRIC ACTUATOR SPECIFICATIONS

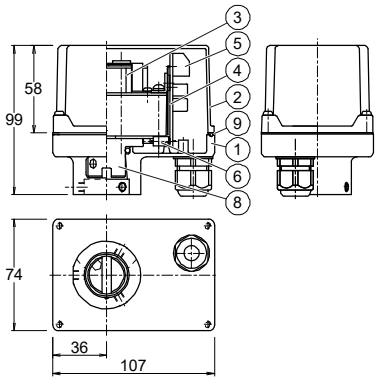
3 way valve: SHUT / Position①, OPEN / Position②

OPTIONAL PARTS

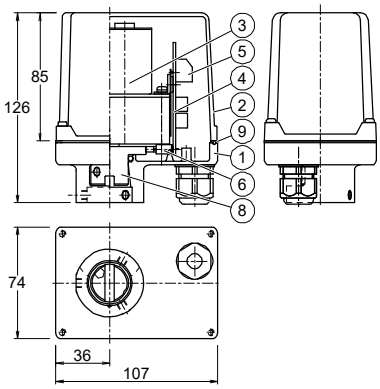
Specifications	Code No.	AM	AH1	DM	Remarks
Aluminum alloy motor cover	AK	○	○	○	
Manual lever	M1		○	○	Detachable lever
Flexible cable (Approx. 300 mm long)	C1	○	○	○	

DIMENSIONS

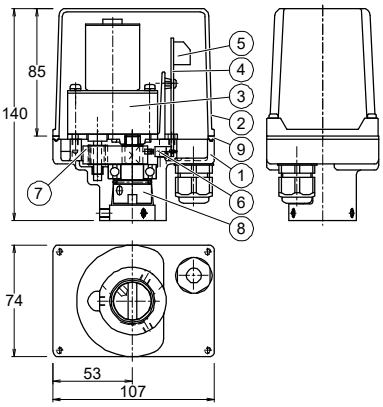
AM (030 / 070) DM2 (030)



DM0 (030) DM (070) AH1 (030 / 070)



AM (180) DM (180) AH1 (180)



Parts name

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

ELECTRIC ACTUATOR SPECIFICATIONS

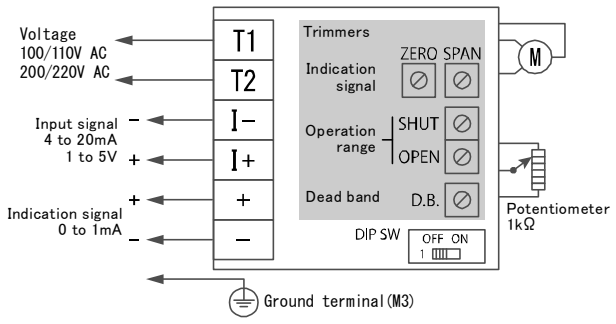
3 way valve: SHUT / Position①, OPEN / Position②

PAX type

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

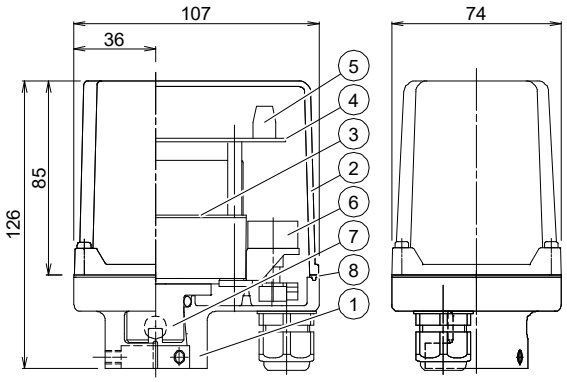
3 way valve: SHUT / Position①, OPEN / Position②

OPTIONAL PARTS

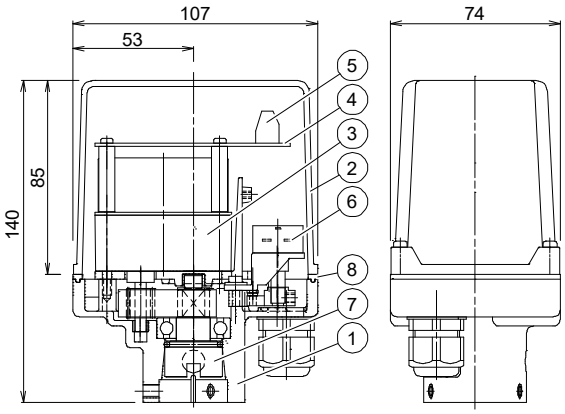
Specifications		Code No.	PAX	Remarks
Aluminum alloy motor cover		AK	○	
Flexible cable (Approx. 300 mm long)		C1	○	
Operation	SHUT by decreased signal ↔ OPEN by Increased signal	Nil	○	Mode A
	SHUT by increased signal ↔ OPEN by decreased signal	J	○	Mode B

DIMENSION

PAX (050)



PAX (120)



Parts name

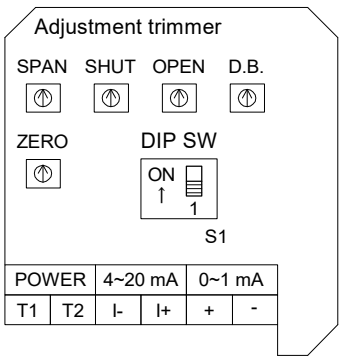
1	Body	4	Control board	7	Drive shaft
2	Motor cover	5	Terminal block	8	Rubber packing
3	Motor	6	Potentiometer		

ADJUSTMENT (PAX)

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)



GENERAL OPERATING INSTRUCTIONS

①WARNING

- Using a positive-pressure gas with our plastic piping may pose a dangerous condition due to the repellent force particular to compressible fluids even when the gas is under similar pressures used for liquids. Therefore, be sure to take the necessary safety precautions such as covering the piping with protective material. For inquiries, please contact us. For conducting a leak test on newly installed piping, be sure to check for leaks under water pressure. If absolutely necessary to use a gas in testing, please consult your nearest service station beforehand.
- Certain liquid such as H_2O_2, NaClO, etc may be prone to vaporization (Off-Gassing) which may cause irregular pressure increases, which may destroy the valve.

②CAUTION

- Do not step on or apply excessive weight on valve. (It can be damaged.)
- Keep the valve away from excessive heat or fire. (It can be damaged, or destroyed.)
- Do not use the valve to fluid containing slurry. (The valve will not operate properly.)
- Always operate the valve within the pressure vs. temperature range. (The valve can be damaged or deformed by operating beyond the allowable range.)
- Allow sufficient space for maintenance and inspection.
- Select a valve material that is compatible with the media. For chemical resistance information, refer to “CHEMICAL RESISTANCE ON ASAHI AV VALVE”. (Some chemicals may damage incompatible valve materials.)
- Do not use the valve in conditions where the fluid may have crystallized. (The valve will not operate properly.)
- Keep the valve out of direct sunlight, water and dust. Use cover to shield the valve. (The valve will not operate properly.)
- Perform periodic maintenance. (Leakage may develop due to temperature changes or periods of prolonged storage, rest, or operation.)
- Regarding the ball valve type, we recommend that you use fully open or fully closed. This is because the edge of the ball opening remains on the seat (PTFE) when used at an intermediate opening, so that the sealing performance temporarily deteriorates at the time of full closing.

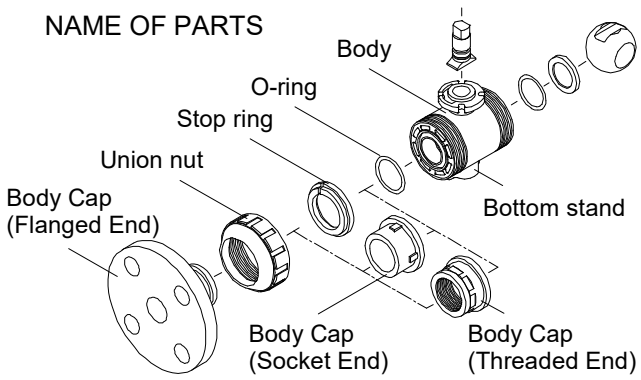
UNPACKING AND STORAGE

①WARNING

When suspending and supporting a valve, take care and do not stand under a suspended valve.

②CAUTION

- This valve is not designed to handle impacts of any kind. Avoid throwing or dropping the valve.
- Avoid scratching the valve with any sharp object.
- Do not over-stack cardboard shipping boxes. Excessively stacked packages may collapse.
- Avoid contact with any coal tar creosote, insecticides, vermicides or paint. (These chemicals may cause damage to the valve.)
- When transporting a valve, do not carry it by the handle.
- Store products in their corrugated cardboard boxes. Avoid exposing products to direct sunlight, and store them indoors (at room temperature). Also avoid storing products in areas with excessive temperatures. (Corrugated cardboard packages become weaker as they become wet with water or other liquid. Take care in storage and handling.)
- After unpacking the products, check that they are defect-free and meet the specifications.



HOW TO INSTALL A PLASTIC BALL VALVE

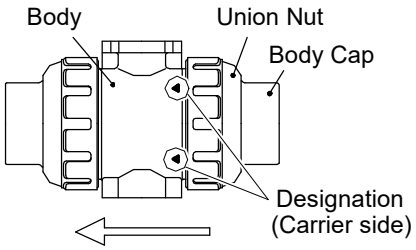
①WARNING

- When suspending and supporting a valve, take care and do not stand under a suspended valve.
- Be sure to conduct a safety check on all hand and power tools to be used before beginning work.
- Wear protective gloves and safety goggles as fluid remain in the valve even if the pipeline is empty. (You may be injured.)

②CAUTION

- When installing a pipe support by means of a U-band or something similar, take care not to over-tighten. (Excessive force may damage the pipe.)
- When installing pipes and valves, ensure that they are not subjected to tension, compression, bending, impact, or other excessive stress.
- When installing a piece of equipment at the end of the piping line, be sure to keep the secondary (Downstream) Body Cap and Union Nut installed on the valve.

- When installing Ball Valve, 15 to 50 mm (1/2" to 2") at the end, note the direction of flow.
- Find the mark ◄ molded on the Carrier-side body.
- The mark side is the primary side (upstream side).
- On the secondary (Downstream) side, the Carrier is integral with the valve body.
- This is the preferred method if installation when installing the equipment at the end of the line for safety purposes.



- When installing, disassembling, or reassembling the piping, fix the Body Cap.
- Before a water test, be sure that the Union Nut is tightly fastened.
- Fasten the Union Nut while avoiding the parallelism and axial misalignment of the flange surface.
- When connecting an ASAHI AV Valve to metal piping, take care not to let the pipe stress on the ASAHI AV Valve.
- When screwing in a Metal Insert (Ensat), install it vertically. Refer to the User's Manual for Metal Insert (Ensat) by the Maker.
- When loosening the union nut on the union side, fix the body cap (hold it with your hand) and do work. (If the body cap turns, the union will turn together, resulting in the union and ball separating from the body.) If the union is loosened, retighten the union.
- Take care not to over-tighten the Union Nut. (The valve can be damaged.)
- Do not use the pipe wrench. (The valve can be damaged.)

FLANGED END

①CAUTION

- Do not use the valve to fluid containing slurry. (The valve will not operate properly.)
- The installed valve must never be opened or closed when foreign matter such as sand is present in the pipeline.
- Use flat faced flanges for connection to AV Valves.
- Ensure that the mating flanges are of the same standards.
- Be sure to use sealing gaskets (AV Gasket), bolts, nuts, and washers and tighten them to specified torques. (When a non-AV gasket is used, a different tightening torque specification should be followed.)

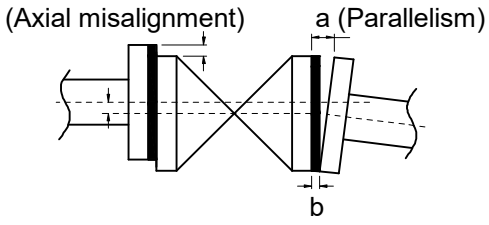
Necessary items

Torque wrench Spanner wrench
AV gasket Bolt Nut
Washer (For many flanges specification)

②PROCEDURE

1) Set the AV gasket between the flanges.
2) Insert washers and bolts from the pipe side, insert washers and nuts from the valve side, then temporarily tighten them by hand.

   The parallelism and axial misalignment of the flange surface should be under the values shown in the following table to prevent damage the valve. (A failure to observe them can cause destruction due to stress application to the pipe)



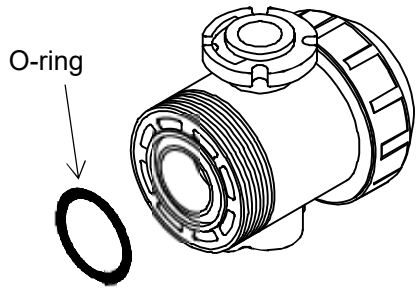
Valve size [mm]	Dimensions [mm]	
	Axial Misalignment	Parallelism (a-b)
015 020 025 032	1	0.5
040	1	0.8

3) Tighten the bolts and nuts gradually with a torque wrench to the specified torque level in a diagonal manner.
4) Tighten it more than 2 turns clockwise with specified torque.
   Do not tighten above the specified torque value. (The valve can be damaged or leaks.)

Valve size [mm]	Torque [N·m]	
	PTFE coated PVDF coated	Rubber
015 020	17.5	8
025 032 040	20	20

When the Union Nut is Loosened or Removed

If the union nut has been removed from the body (or loosened), install it in the following manner.



1) Make sure that the O-ring is mounted.
2) Set the body cap and union nut directly on the body without allowing the O-ring to come off.
3) Tighten union nuts on each valve until hand tight.
4) Using a strap wrench tighten union nuts uniformly on each side approx 90°-180° turns, 1/4 to 1/2 turns.

Threaded End

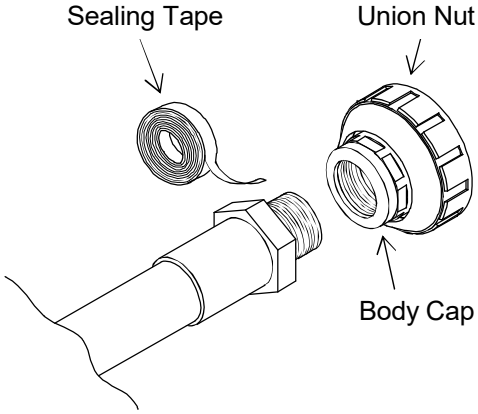
①CAUTION

- Avoid excessive tightening. (The valve can be damaged.)
- Make sure that the threaded connections are plastic × plastic. (Metallic thread can cause damage.)
- Wrap the threaded joints on our plastic piping with sealing tape. Using a liquid sealing agent or liquid gasket may cause stress cracks (Environmental Stress Cracking). Our product warranty shall not apply in case of said use, even when said use is unavoidable.

Necessary items

Sealing tape	Strap wrench	Spanner wrench

②PROCEDURE



1) Wind a sealing tape around the external thread of joint, leaving the end (about 3 mm) free.
2) Loosen the union nut with a strap wrench.
3) Remove the union nut and the Body Cap.
4) Tighten the external thread of the joint and the Body Cap hardly with hand.
5) Using a spanner wrench, screw in the Body Cap by turning 180°-360° carefully without damaging it.
6) Make sure that the O-ring is mounted.
7) Set the body cap and union nut directly on the body without allowing the O-ring to come off.
8) Tighten union nuts on each valve until hand tight.
9) Using a strap wrench tighten union nuts uniformly on each side approx 90°-180° turns, 1/4 to 1/2 turns.

Socket End (PVC, C-PVC)

①WARNING

- When using an adhesive, ventilate the space sufficiently, prohibit the use of a fire in the vicinity, and do not inhale adhesive vapors directly.
- If an adhesive gets into contact with your skin, wash it off immediately. If you feel sick or find any anomaly, receive a physician's diagnosis and take appropriate measures promptly.

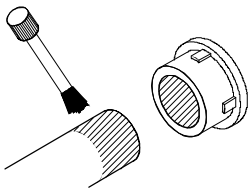
②CAUTION

- Take care in doing work at low temperatures. Solvent vapors are hard to evaporate and are likely to remain. (Solvent cracks may occur, damaging the equipment.) After assembling the piping system, open both ends of the piping and use a fan (of the Low-Voltage Type) or something similar to ventilate the space, thus removing the solvent vapors.
- Use the appropriate Asahi AV cement.
- Conduct a water test at least 24 hours after joining the pipes with an adhesive / cement.

Necessary items

Adhesive for hard vinyl chloride pipes
Strap wrench

③PROCEDURE



1) Loosen the union nut with a strap wrench.
2) Remove the union nut and the Body Cap.
3) Lead the union nut through the pipe.
4) Clean the hub part of the Body Cap by wiping the waste cloth.
5) Apply adhesive evenly to the hub part of the Body Cap and the pipe spigot.

   Do not apply more adhesive than necessary. (The valve can be damaged due to solvent cracking.)

Valve size [mm]	Adhesive quantity (guideline) [g]
015	1
020	1.3
025	2
032	2.4
040	3.5

6) After applying adhesive, insert the pipe quickly to the Body Cap and leave it alone for at least 60 seconds.

   Do not under any circumstances try to insert a pipe into another fitting or valve by striking it, which may break the piping.

7) Wipe away overflowing adhesive.
8) Make sure that O-ring is mounted.
9) Set the Body Cap and union nut directly on the body without allowing the O-ring to come off.
10) Tighten union nut hardly with hand.
11) Using a strap wrench tighten union nuts uniformly on each side approx 90°-180°turns, 1/4 to 1/2 turns.

Socket End (PP)

Necessary items

Strap wrench
Sleeve welder or automatic welding machine
User’s manual for the above equipment

PROCEDURE

1) Loosen the union nut with a strap wrench.
2) Remove the union nut and the Body Cap.
3) Lead the union nut through the pipe.
4) For the next step, refer to the user’s manual for the sleeve welder or the automatic welding machine.
5) After welding, make sure that the O-ring is mounted.
6) Set the Body Cap and the union nut directly without allowing the O-ring to come off.
7) Tighten union nut hardly with hand.
8) Using a strap wrench tighten union nuts uniformly on each side approx 90°-180° turns, 1/4 to 1/2 turns.

How to install the support for the valve (PA)

①CAUTION

- Do not allow the piping around the pump to cause significant vibration to the valve. Failure to do so may result in failure or damage.
- Install the valve support. If the valve body and piping are subjected to excessive force, it may cause damage to the valve.

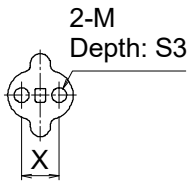
Necessary items

Wrench	U-band (with bolts)	Rubber sheet

②Attach Inserted metal to the bottom stand.

- When screwing in a Metal Insert (Ensat), install it vertically. Refer to the User's Manual for Metal Insert (Ensat) by the Maker.
- If specifying additional ensat fittings (option: 32), add ensat (off-the-shelf) to the valve. It will be shipped with it installed.

Bottom stand



Valve size [mm]	Bottom stand [mm]			Ensat
	X	M	S3	
015 020 025	19	Φ7.3	11	M5 × 10
032 040	30	Φ9	15	M6 × 14

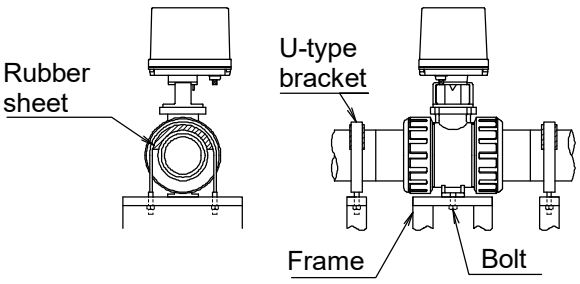
③HORIZONTAL PIPING

- If a bottom stand (ensat) is used and a support is installed, bolt the ensat section and the trestle together.

Valve size [mm]	Bolt size [mm]
015 020 025	M5
032 040	M6

- Put a rubber sheet on the top of the pipe and secure it with a U-band.

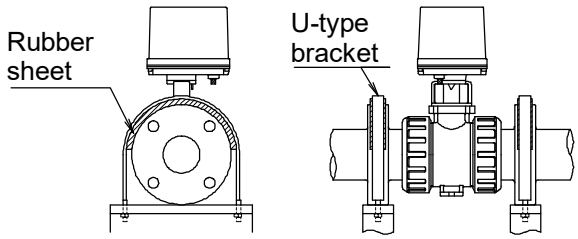
HORIZONTAL PIPING



③HORIZONTAL PIPING (FLANGE TYPE)

If you do not use a bottom stand (ensat) and you are installing a support, you may need to install a support at the valve flange. Lay down a rubber sheet and secure it with a U-band. (Body caps are flanged only.)

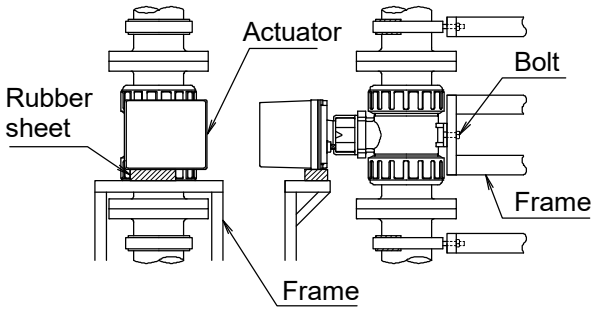
HORIZONTAL PIPING (Flange type)



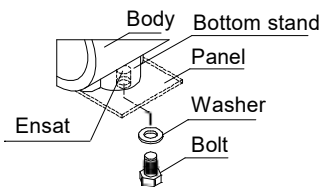
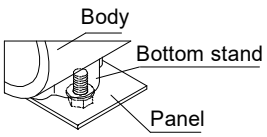
④VERTICAL PIPING

- Bolt the bottom stand (ensat) to the trestle.
- Put a rubber sheet on the top of the pipe and fix it with a U-band.

VERTICAL PIPING



⑤FIXATION OF BOTTOM STAND WITH PANEL

Before the fixation	After the fixation
	

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.
- When the flow path is subjected to a high pressure from arrow, it may leak slightly to the low pressure port. (PL)

②ENVIRONMENT

- 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.

③POSITIONING

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

Margin required around the actuator for maintenance	
AM (030 / 070)　DM2 (030)	More than 65 mm
AM　AH1　DM　PAX	More than 90 mm

④OTHER 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 mm² 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

①AM1, AH1

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

②AM2

- 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.
- 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 as using a shielded wire, separating it from other power cables.

③DC POWER SUPPLY (DM0, DM2)

- It is usable with a battery and full-wave rectification circuit.
- Consider an inrush current of motor.
  (It is 1.5 to 3 times of consumed current.)
- They may cause malfunction with decreasing voltage by the long wiring.
- Do not use power supply that require more than 1 second with rise and fall time.

④USE OF OPEN/SHUT SIGNALS (AM, AH, DM)

Use signals within the capacity of output signal rating.

⑤PAX

- 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 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.
- Check operating position and wiring. (AM / AH / DM)
- During trial operation, check that valve movement and output signal are correct. (PAX)

②DUTY CYCLE (AM, AH, DM)

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.

③CONFIRM THE OPERATING CONDITION (PAX)
- 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.

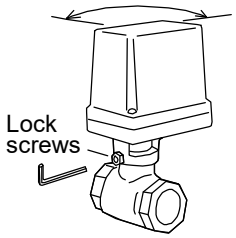
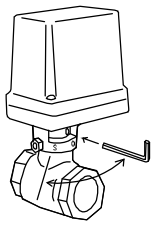
④ATTENTION
- Be sure to set the DIP-SW before turning on the power supply. (PAX)
- Keep power supplied for built-in space heater to prevent condensation inside actuator. (AM, AH, DM, PAX)
- Do not touch the moving parts of actuator in operation.
- Do not insert a reverse signal during operation. It may shorten the life of product. (AM, AH, DM)
- 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.

AM PAX	AH1 DM
	
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.	Put an allen wrench (5 mm) or a lever (Φ5.7) into the hole on drive shaft and turn slowly. Manual lever is optional.

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.
- Confirm the bolt tightening torque.

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. PAX	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.	
	Switch leakage current is large. AM2	Current leakage should be less than 1 mA.
Operation is unstable. PAX	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.) PAX	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.	Continuous irregular stop will shorten the motor life and wear the gear. Turn off the power and check. AM1 AM2 AH1-030	

Problem	Cause	Solution
Stop in the mid position.	• Biting of valve seat. • The scale has adhered to the valve ball.	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. AM1 AM2 AH1 DM2 DM0
		Motor protection circuit returns by the signal of operation of an opposite direction. Turn on the power again. PAX
Leakage from valve body	• Valve cap get loose. • Valve body is damaged.	Replace the valve.
Leakage from valve seat	Seat is worn or damaged.	
Leakage from valve stem	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