Ball Valve Type 21/Type 21α
Electric actuated Type TC (15-100mm)

Instruction Manual

Thank you for choosing our product.
This instruction manual contains important information for safe operation of this product.
Please be sure to read it before handling the product.
After reading, please keep this manual in a place where it is always accessible
to anyone who uses the product.

ASAHI YUKIZAI CORPORATION

-Important Safety Instructions-

This instruction manual is written on the assumption that those who handle our products have basic knowledge of our products, electricity, machinery, control, etc., and may contain technical terms depending on the content. Please read this instruction manual carefully, fully understand the contents, and use the product correctly while observing safety precautions.

In this instruction manual, particularly important matters are classified and described with marks such as ""Warning,"" ""Caution,"" ""Prohibited,"" and ""Mandatory"" to inform you of the circumstances and scale of personal injury or property damage.
Failure to comply may result in unexpected injury or damage, so please be sure to comply.

<Warning/Caution Indications>

⚠Warning	**This sign denotes that death or serious injury may result** from improper use of the product.
⚠ Caution	**This sign denotes that bodily injury or damage to property may result** from improper use of the product.

<Prohibited/Mandatory Indications>

Prohibited	**Actions that must not be performed** when handling the product.
Mandatory	**Actions that must be followed** when handling the product.

Table of Contents

1. Warranty Information

Unless otherwise specified in contracts, specifications, etc., the warranty for piping material products such as valves manufactured and sold by us (hereinafter referred to as ""target products"") is as follows.

1.1. Scope of Application

This warranty applies only when the target products are used within Japan. For use overseas, please contact us separately.

1.2. Warranty Period

The warranty period is one year from delivery.

1.3. Scope of Warranty

If a failure or defect occurs due to our responsibility during the above warranty period, we will replace or repair the product free of charge. However, even within the warranty period, the following cases are not covered by the warranty (chargeable):

- ▶ When storage/use conditions and precautions described in specifications, instruction manuals, etc. are not followed during installation, handling, and maintenance.
- ▶ When defects are caused by factors other than the target products, such as the customer's equipment or software design.
- ▶ When defects are caused by modification or secondary processing of the product by parties other than us.
- ▶ When defects could have been avoided if periodic inspections and maintenance/replacement of consumable parts described in instruction manuals, etc. had been performed properly.
- ▶ When parts are used for purposes other than the intended use of the product.
- ▶ When failures or defects are caused by reasons that could not be foreseen based on the level of science and technology at the time of shipment.
- ▶ When defects are caused by external factors not attributable to us, such as natural disasters.

1.4. Disclaimer

- ▶ Secondary damages caused by failure of our products (equipment damage, opportunity loss, lost profits, etc.) and any other damages are not covered by compensation.
- ▶ We strive to improve the quality and reliability of our products, but do not guarantee their perfection. When using in equipment that may endanger human life, body, or property, please implement appropriate safety design measures that fully consider defects that may normally occur. Please note that we cannot be held responsible for such use unless our prior written consent has been obtained through specifications, etc.
- ▶ When using our products, please comply with product specifications and precautions. We shall not be liable for any damage to customers caused by their failure to comply with these requirements. However, this does not apply when damage to customers is caused by defects in our products.

2. Safety Precautions

2.1. Unpacking, Transport, and Storage

⚠Warning	
Prohibited	**Serious injury may result.** ► When lifting or slinging the valve, pay sufficient attention to safety and do not go under the suspended load.

⚠ Caution	
Prohibited	**The valve may be damaged, impaired, or leak.** ► Do not subject to impact from throwing, dropping, or striking. ► Do not scratch or pierce with sharp objects such as knives or hand hooks. ► Do not stack cardboard packaging excessively to prevent collapse. ► Do not expose to coal tar, creosote (wood preservative), termite exterminator, insecticide, paint, etc.
Mandatory	**The valve may be damaged, impaired, or leak.** ► Keep in cardboard until just before piping and store indoors (at room temperature) away from direct sunlight. Also avoid storing in high-temperature locations. (Cardboard packaging loses strength when wet. Handle and store with care.) ► After unpacking, check that the product has no abnormalities and matches the specifications.

2.2. Handling the Product

⚠Warning	
Prohibited	**Serious injury may result.** ► Do not disassemble the actuator. ► Do not touch moving parts during operation with hands, feet, or tools.
Mandatory	**The valve may be damaged or serious injury may result.** ► When using positive pressure gas with our plastic piping materials, even at the same pressure as water pressure, dangerous conditions may occur due to the repulsive force characteristic of compressible fluids. Please be sure to implement safety measures for the surrounding area, such as covering pipes with protective materials. If you have any questions, please contact us separately. ► This valve has dead space in its structure. Volatile liquids such as hydrogen peroxide (H2O2) and sodium hypochlorite (NaClO) may vaporize in the dead space and cause abnormal pressure rise inside the valve. Please exercise caution. (Since gas with abnormally increased pressure due to vaporization is a compressible fluid, if the valve is damaged, fragments may scatter explosively, which is extremely dangerous.) ► After completing piping work, when performing a leak test on the pipeline, be sure to test with water pressure. If testing with gas is unavoidable, please consult us in advance. **The actuator may be damaged or serious injury may result.** ► Before use, check the power supply voltage against the nameplate voltage.

⚠ Caution	
Prohibited	**The valve may be damaged, impaired, or leak.** ► Do not stand on the valve or place heavy objects on it. ► Keep away from fire and high-temperature objects. ► Do not use in locations where submersion may occur. ► Do not subject the valve to excessive vibration. **The actuator may malfunction.** ► Do not use the actuator outside the allowable ambient temperature range.

⚠ Caution

Mandatory

Injury may result.

- ▶ Use a commercially available hex wrench for manual operation.
- ▶ When performing manual operation, cut off the power supply to the actuator and confirm that the actuator is not operating.
- ▶ When piping, allow sufficient space for maintenance.

The valve may be damaged, impaired, or leak.

- ▶ Pay attention to the atmosphere where the valve is installed. Avoid locations exposed to sea breeze, corrosive gases, chemical solutions, seawater, steam, etc.
- ▶ Use the fluid pressure and temperature within the allowable range. (The maximum allowable pressure includes water hammer pressure.)
- ▶ Use a valve made of materials suitable for the operating conditions. (Some types of chemicals may corrode parts. Please consult us in advance for details.)
- ▶ Use fluids containing crystalline substances under conditions that prevent recrystallization.
- ▶ Avoid locations where water or dust constantly splashes and locations exposed to direct sunlight, or protect the valve with a cover that covers the entire unit.
- ▶ Perform regular maintenance referring to ""**11. Inspection Items.**"" Pay particular attention to long-term storage, shutdown periods, and temperature changes or aging during use.
- ▶ When installing the valve, provide appropriate valve support to prevent excessive force on the valve or piping.
- ▶ Be sure to use within the indicated product specifications.
- ▶ When the valve is used at intermediate opening, marks from the ball opening may remain on the seat (PTFE), which may temporarily reduce sealing performance when fully closed. We recommend using the valve fully open or fully closed.

The base plate may be damaged.

- ▶ **(Nominal size 15-50mm only)** When removing the actuator from the valve body, be sure to use the base plate removal jig (sold separately).

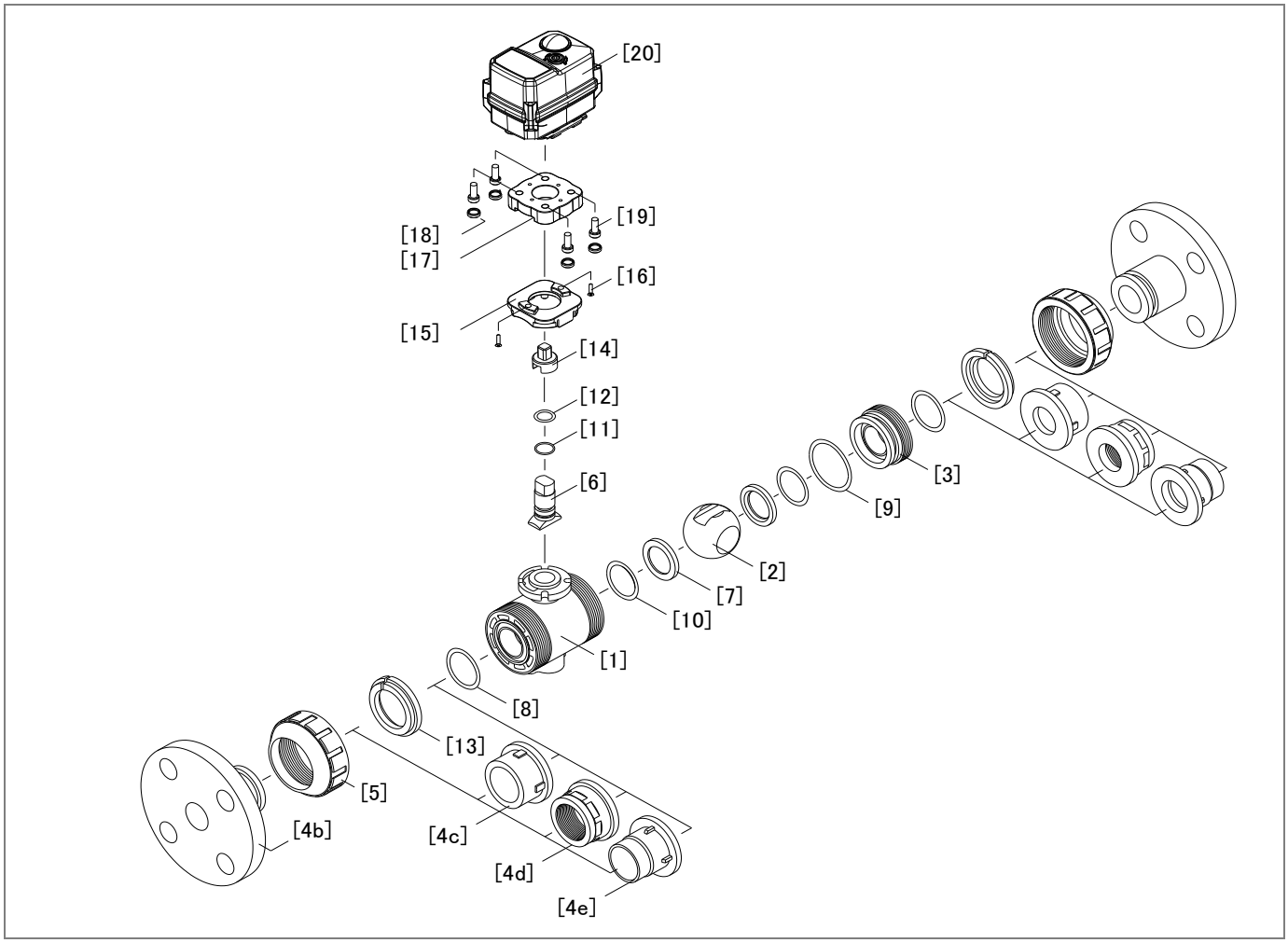
The actuator may malfunction.

- ▶ If you notice an unusual odor, heat generation, or smoke, immediately turn off the power supply. If any abnormality is found, be sure to contact the dealer where you purchased the product or us for inspection.
- ▶ Keep the ambient temperature of the installation location within the allowable range.
- ▶ Avoid locations with volatile gases or poor atmosphere, and provide a cover that covers the entire unit.

3. Name of Components

3.1. Nominal size 15-50mm

3.1.1. Developed View



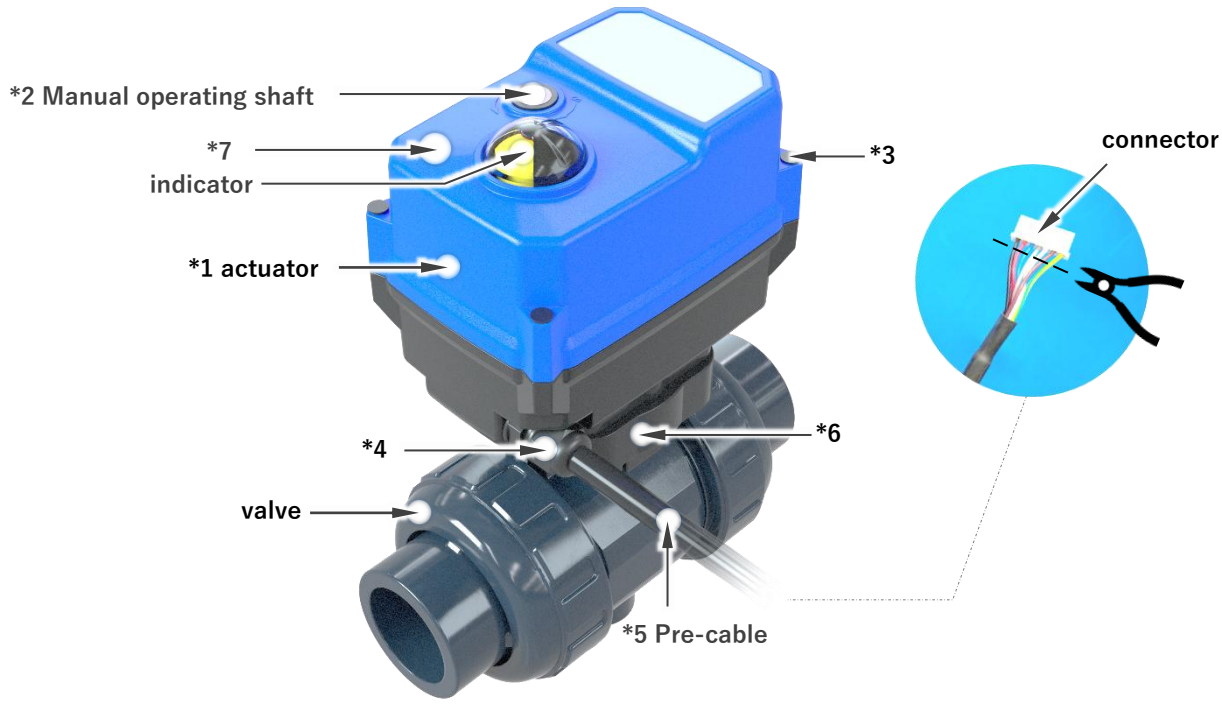
3.1.2. Parts List

No.	Name	No.	Name	No.	Name
[1]	Body ***1)**	[8]	O-ring (A)	[18]	Rubber cap
[2]	Ball ***1)**	[9]	O-ring (B) ***2)**	[19]	Bolt
[3]	Carrier ***1)**	[10]	O-ring (C) ***2)**	[20]	actuator
[4b]	End connector (flanged end)	[11]	O-ring (D)	-	-
[4c]	End connector (socket end)	[12]	O-ring (E)	-	-
[4d]	End connector (threaded end)	[13]	Stop ring	-	-
[4e]	End connector (spigot end)	[14]	adapter	-	-
[5]	Union nut	[15]	Base plate	-	-
[6]	stem ***1)**	[16]	tapping screw	-	-
[7]	seat ***1)**	[17]	Connector plate	-	-

***1)** Type 21 and Type 21α are not compatible.

***2)** Type 21 and Type 21α are partially incompatible. Please contact us for details.

3.1.3. External View



*1) Do not open the cover of the actuator. This will void the warranty regardless of the warranty period.
This is a rendering of the standard specification. Appearance varies depending on the options.
Refer to **4.4 Actuator** for actuator specifications.

*2) Do not remove the cap on the manual operation shaft except when performing manual operation.

*3) Do not remove the caps (4 locations) on the housing fastening section.

*4) Do not loosen the tightening cap at the base of the pre-cable. The waterproof and dustproof performance of the actuator will decrease.

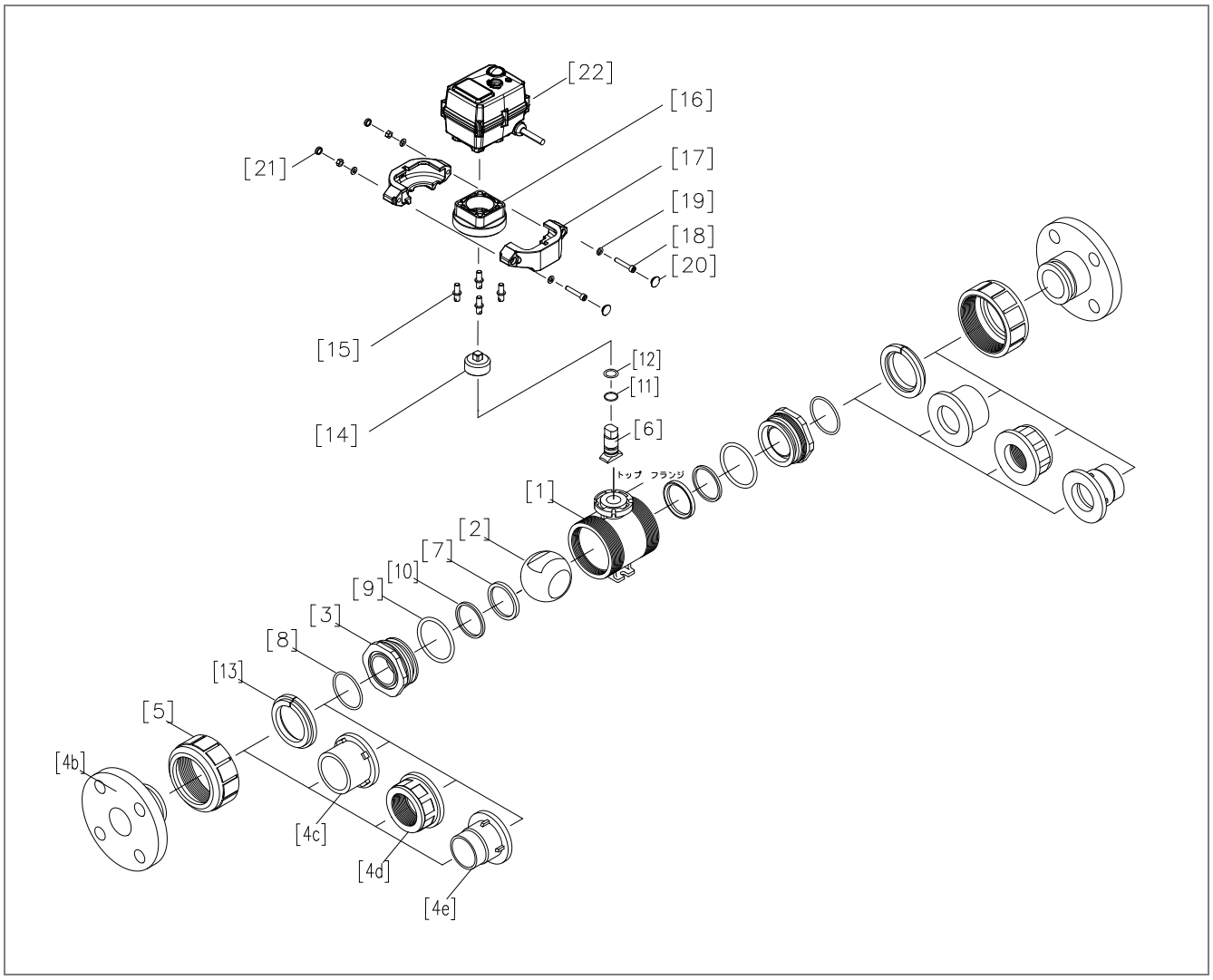
*5) Cut off the connector at the end of the pre-cable (for product shipping inspection only) when performing wiring installation.

*6) The actuator can be removed from the valve. The required tool is a removal jig (sold separately).

*7) The actuator is not equipped with an LED lamp.

3.2. Nominal size 65-100mm

3.2.1. Developed View



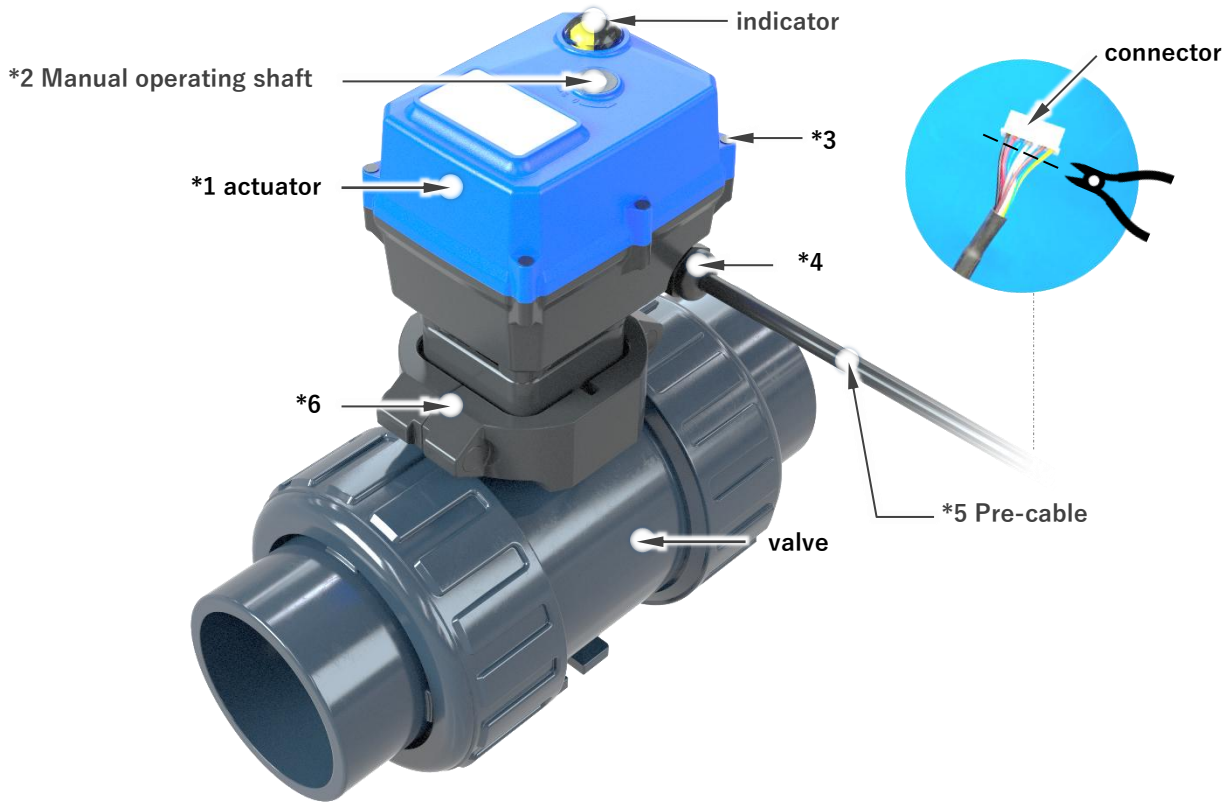
3.2.2. Parts List

No.	Name	No.	Name	No.	Name
[1]	Body ***1)**	[8]	O-ring (A)	[18]	Bolt
[2]	Ball ***1)**	[9]	O-ring (B) ***2)**	[19]	Spring washer
[3]	Carrier ***1)**	[10]	O-ring (C) ***2)**	[20]	Rubber cap (A)
[4b]	End connector (flanged end)	[11]	O-ring (D)	[21]	Rubber cap (B)
[4c]	End connector (socket end)	[12]	O-ring (E)	[22]	actuator
[4d]	End connector (threaded end)	[13]	Stop ring		
[4e]	End connector (spigot end)	[14]	adapter		
[5]	Union nut	[15]	Bolt		
[6]	stem ***1)**	[16]	Base plate		
[7]	seat ***1)**	[17]	cover-plate		

***1)** Type 21 and Type 21 α are not compatible.

***2)** Type 21 and Type 21 α are partially incompatible. Please contact us for details.

3.2.3. External View



*1) Do not open. This will void the warranty regardless of the warranty period.
This is a rendering of the standard specification. Appearance varies depending on the options.
Refer to **4.4 Actuator** for actuator specifications.

*2) Do not remove the cap on the manual operation shaft except when performing manual operation.

*3) Do not remove the caps (6 locations) on the housing fastening section.

*4) Do not loosen the tightening cap at the base of the pre-cable. The waterproof and dustproof performance of the actuator will decrease.

*5) Cut off the connector at the end of the pre-cable (for product shipping inspection only) when performing wiring installation.

*6) The actuator can be removed from the valve. The required tool is a hexagon wrench.

4. Product specifications

4.1. Model number table

Actuation	Valve type	Operating system	Voltage	Body material	Seal material	Connection	Standard	Size	High purity series	Terminal box
A	* *	C	U	*	*	*	*	* * *	*	*
A Automatic valve	21 Type 21	C Electric Type TC	U 95～265VAC	U U-PVC	E EPDM	S Socket	J JIS	015 15mm	0 Non	0 Non
	2A Type 21 α			C C-PVC	V FKM	N Threaded	D DIN	020 20mm	1 Lubricant free	D Attached
				P PP		P Spigot	A ANSI	025 25mm		
				F PVDF		F Flanged	1 JIS 10K	032 32mm		
							5 JIS 5K	040 40mm		
								050 50mm		
								065 65mm		
								080 80mm		
								100 100mm		

[Note]

- JIS standard socket end with PVDF body material is not manufactured.
- JIS standard socket end 32mm with PP body material is not manufactured.
- Spigotend connection is available only in DIN standard, and C-PVC body material is not manufactured.

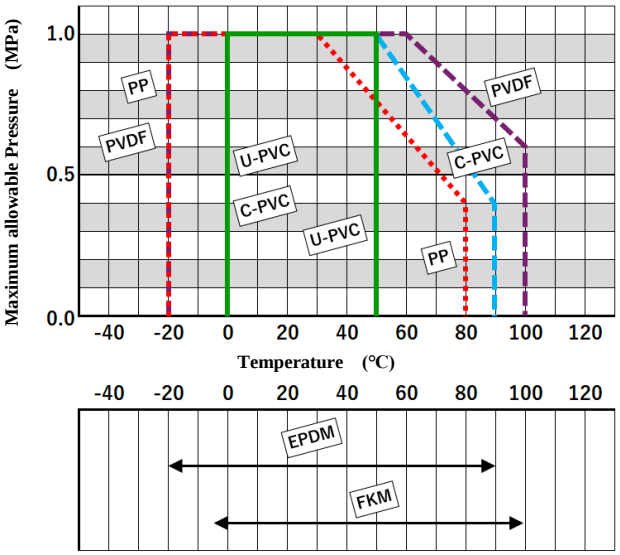
4.2. Valve specifications

nominal size	Body material			
	U-PVC	C-PVC	PP	PVDF
15-50mm	Type 21 α		Type 21	
65-100mm	Type 21			

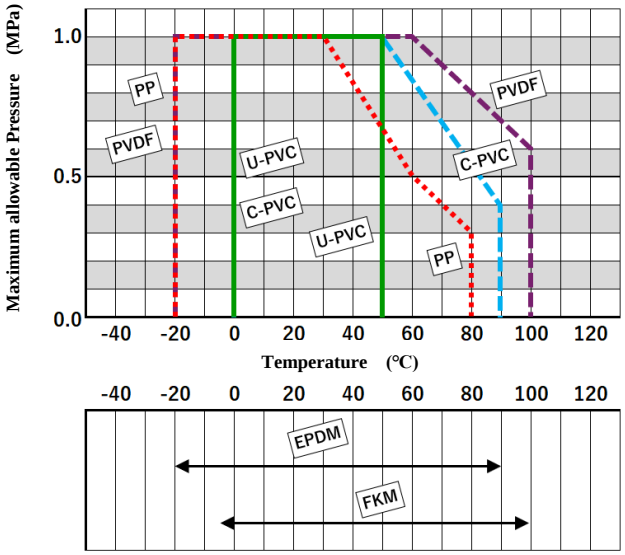
4.3. Relationship between maximum allowable pressure and temperature

4.3.1. Connection standard other than DIN / ANSI

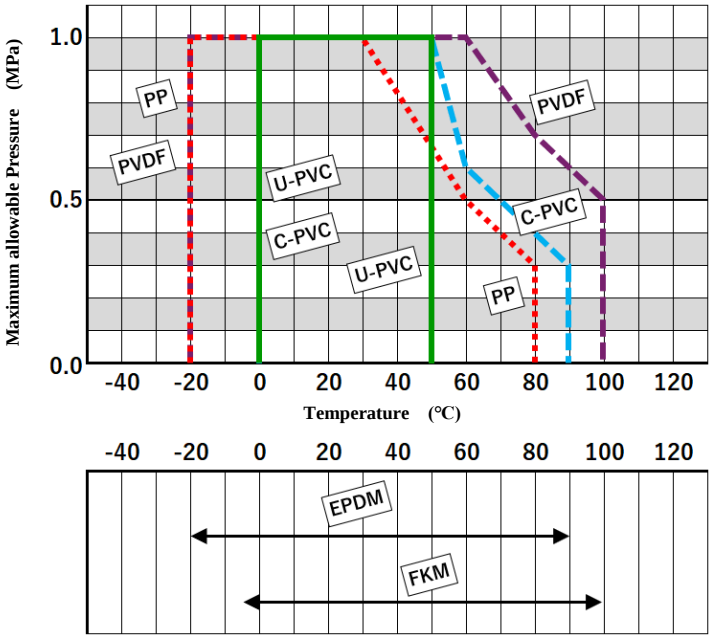
Nominal size 15-50mm



Nominal size 65 mm

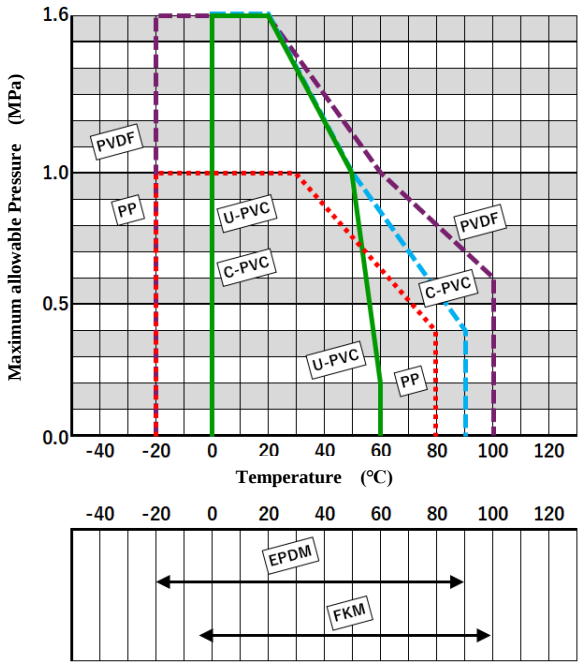


Nominal size 80, 100 mm

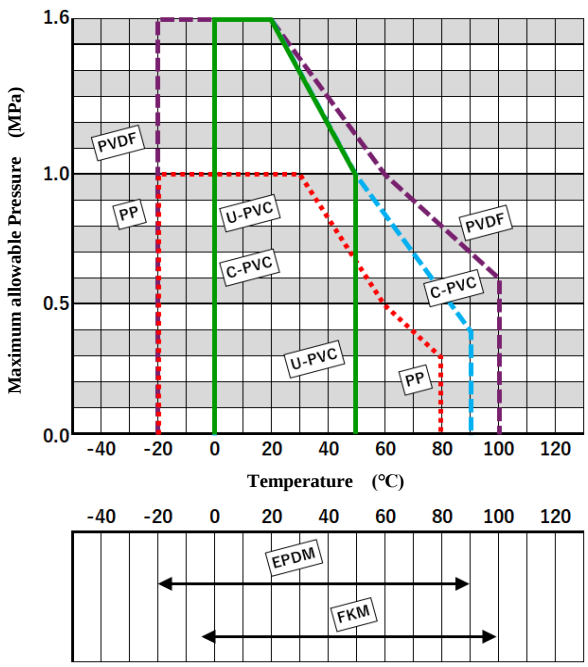


4.3.2. Connection standard DIN / ANSI

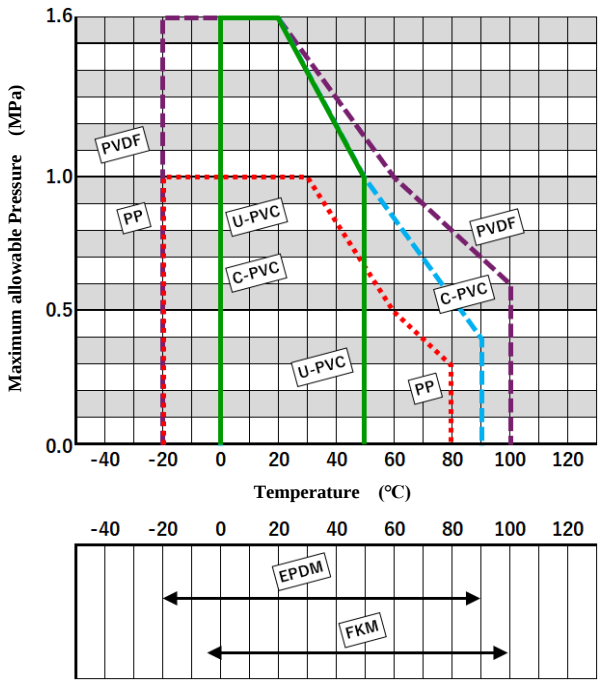
Nominal size 15-50mm



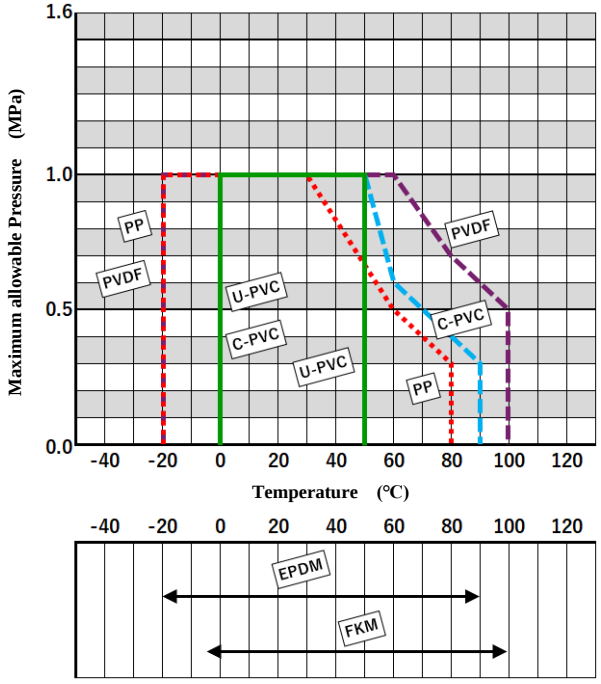
Nominal size 65 mm



Nominal size 80 mm



Nominal size 100 mm



4.4. actuator

Product type (Option name)	TC-020(BASIC)-B3S (Standard equipment)	TC-050(BASIC)-B3S (Standard equipment)	TC-050(BASIC)-B3R (Potentiometer)	TC-050(SMART)-B3J (Speed controller)	TC-050(SMART-MODU) (E-E Positioner)
Valve size[mm]	15-50	65-100	15-100	15-100	15-100
Product specifications					
Rated torque	20 N-m	50 N-m			
rated voltage *1	95-265VAC (50/60Hz)				
Power consumption MAX/RUN	15W/9.6W	25W/9.6W			
Cycle Time/90°	10 sec.	12 sec.			
Duty Cycle *2	75%				
Housing Material/Color/Protection class	PC+PET/Top: Blue, Bottom: Black/IP67				
Net Weight	0.6 kg	1.6 kg			
wiring inlet *3	Pre-cable (3 meters)				
Motor	BLDC motor				
Installed functions					
indicator *4	●	●	●	●	●
Position switch assembly *5	●	●	-	●	●
Contact rating	Fully open / Fully closed: 1 each (dry contact) 250VAC-0.1A／30VDC-0.5A				
Space heater *6	●	●	●	●	●
overload protection *7	●	●	●	●	●
manual operation *8	●	●	●	●	●
Hexagon socket diameter/Number of turns	4 mm/6.5 turns	5 mm/3 turns			
potentiometer *9	-	-	●	-	-
Speed controller	-	-	-	●	-
Electro-pneumatic positioner	-	-	-	-	●
Installation environment					
Installation environment *10	Indoor and outdoor				
Applicable Temperature	-15°C to 45°C				
Storage temperature	≤-40°C or ≥ 80°C				
Ambient humidity	5-95%RH (no condensation)				
Insulation resistance/Dielectric Strength	500VDC, 10MΩ or more / 1500VAC, 1 minute				

*1) The guideline for overcurrent protection devices (fuses or thermal protectors) is ""1A"".

*2) Load and Duty cycle conform to S4 (refer to IEC60034-1) equivalent to valve load.

*3) The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If it exceeds this, the actuator may malfunction.

*4) Solid yellow indicates fully open, and solid red indicates fully closed.

*5) Designed for both general loads and micro loads.

*6) The space heater monitors the internal temperature of the actuator and turns ON/OFF automatically.

*7) When the actuator detects an abnormal valve load, it stops operation regardless of whether it is fully open or fully closed. Remove the cause of the abnormal load and switch the open/close control of the actuator to restore operation.

*8) Manual operation tools (hexagon wrench) are not included, so please prepare commercially available products.

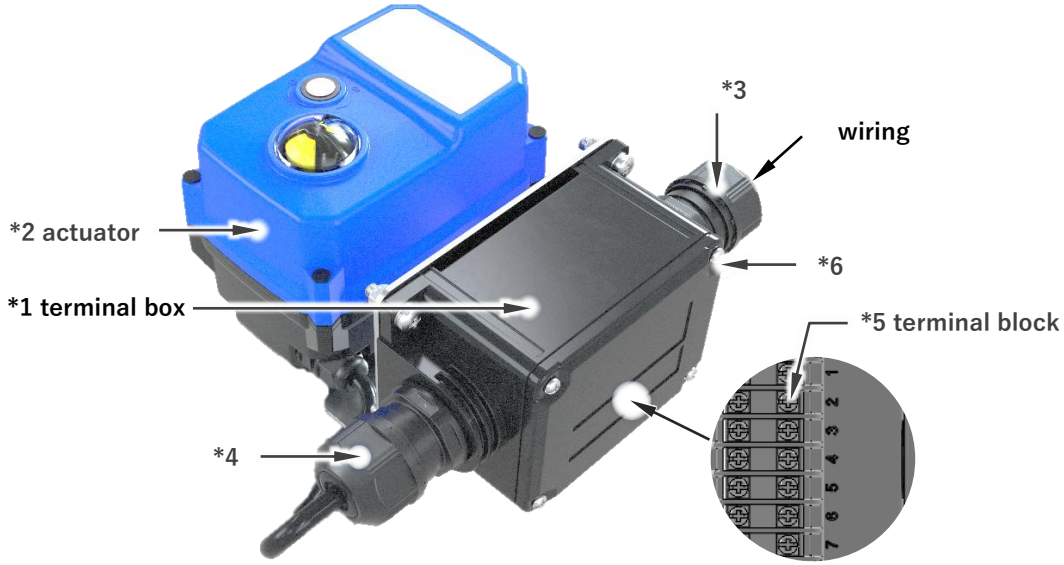
*9) The resistance value of the potentiometer is ""10kΩ"". There are no options for resistance values.

*10) When using outdoors, attach protective covers to the actuator and cables, and avoid direct sunlight and rain.

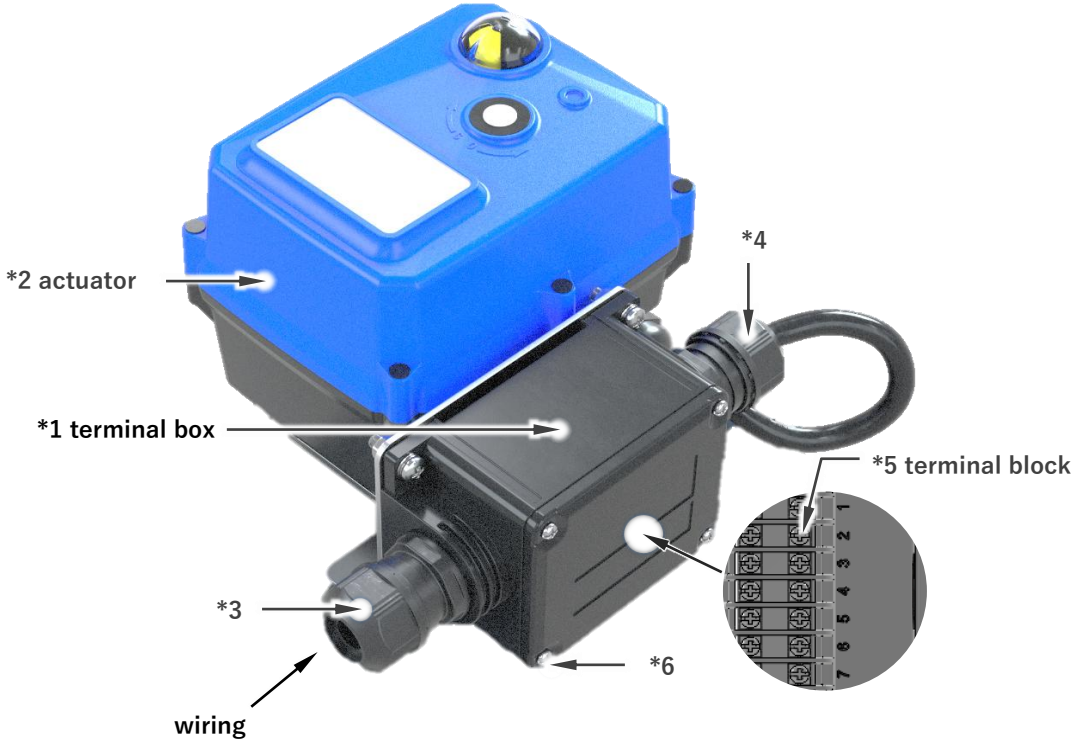
4.4.1. With terminal box

You can select a product specification with a terminal box containing a round terminal block on the side of the actuator.

Nominal size 15-50mm



Nominal size 65-100 mm



***1)** The protection class of the terminal box is ""IP67"".
***2)** This is a rendering of the actuator when no option is selected.
When an option is selected, the appearance of the actuator differs.
***3)** The cable gland on the wiring inlet side (thread standard: G 1/2) is removable.
***4)** Do not loosen the tightening cap on the actuator side. The protection performance of the terminal box may be compromised.
***5)** Connect the wiring cables to the terminal block (thread standard: M3) inside the terminal box.
***6)** Securely tighten the cover fastening screws (4 locations) of the terminal box.

4.4.2. Options

Option name	Actuator model	
	Nominal size 15-50mm	nominal size 65-100 mm
None (standard specification)	TC-020(BASIC)-B3S	TC-050(BASIC)-B3S
Potentiometer ※1	TC-050(BASIC)-B3R	
Speed controller ※1	TC-050(SMART)-B3J	
Electro-pneumatic positioner	TC-050(SMART-MODU)	

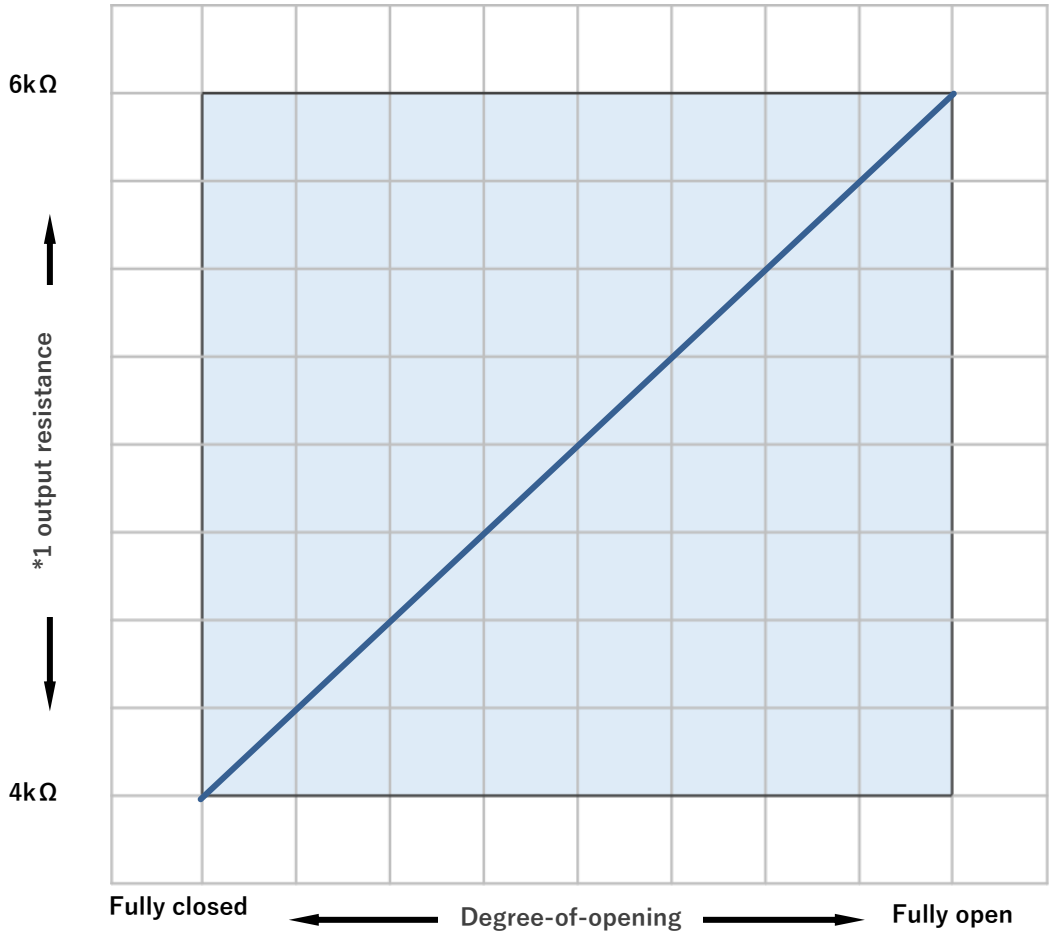
*1) Potentiometer and speed controller cannot be installed simultaneously.

*2) When selecting with options for nominal size 15-50 mm, the actuator will be upgraded.

*3) **4.4.1 With terminal box** can be selected for all options.

4.4.2.1. Potentiometer

The potentiometer is an option that converts valve opening information into ""resistance value (Ω)"" and outputs it externally. Input the output resistance value to an external device such as a potentiometer converter.

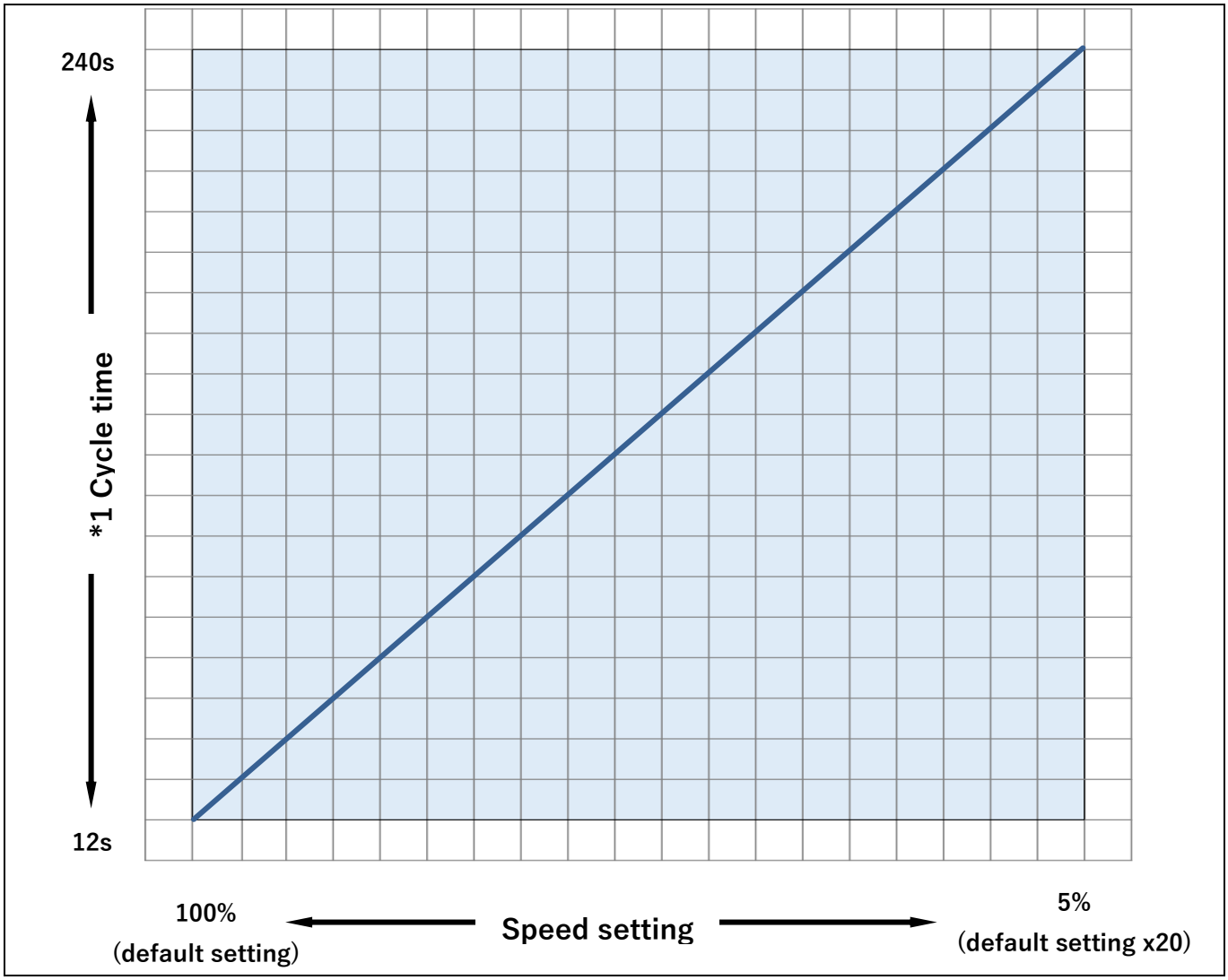


*1) The output resistance is a reference value. This is not a guaranteed value as it varies depending on the actuator's operating environment and individual differences.
This is the resistance value between the gray and white pre-cables of the actuator. The resistance value between the brown and white pre-cables has reversed polarity.

4.4.2.2. Speed controller

The speed controller is an optional function for adjusting the opening and closing time.
It allows 20-step adjustment in 5% increments, from 100% (default setting) to 5% (default setting × 20).

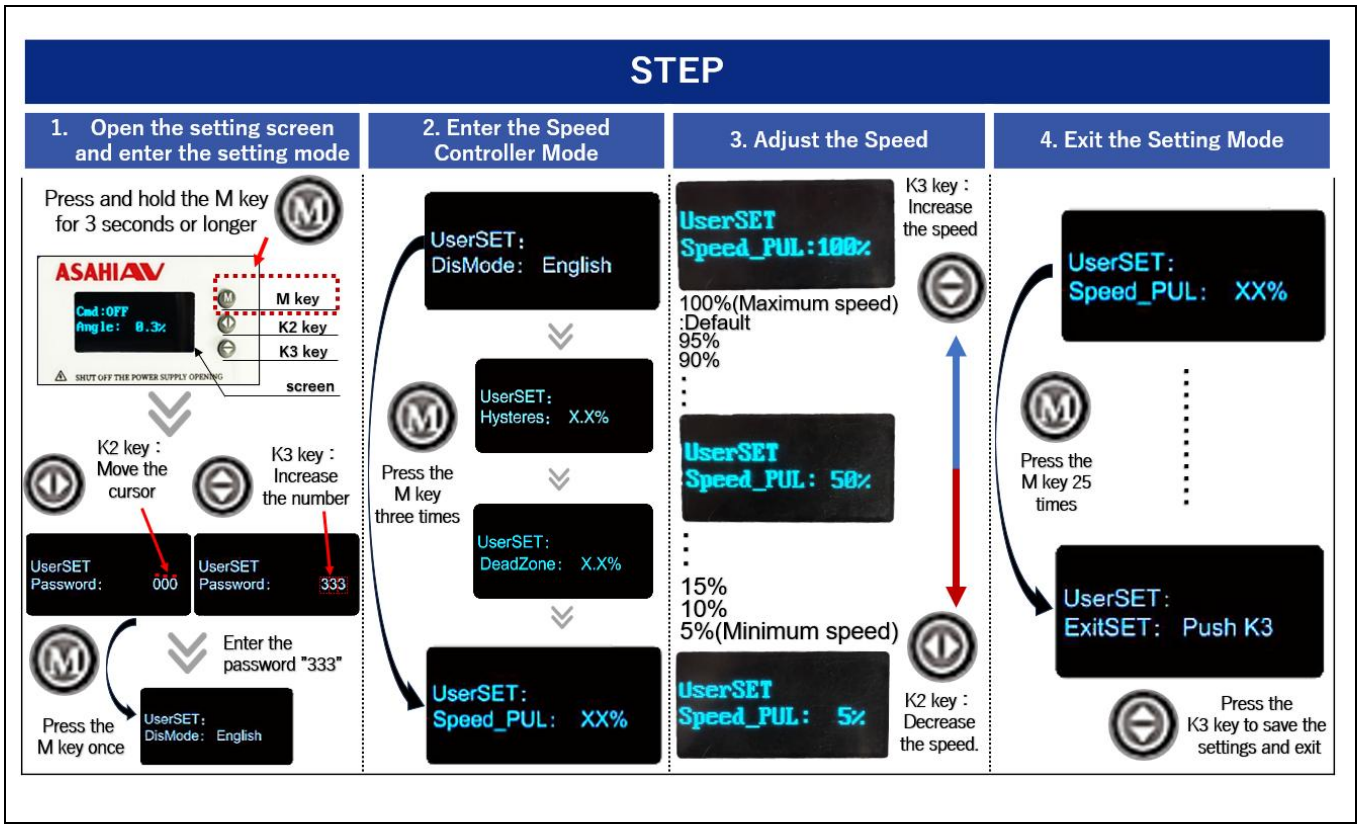
The opening and closing time is adjusted by repeating operation and stop cycles from the start to the end of actuator control, and by varying the stop time during these cycles.



*1) Cycle Time is a reference value. This is not a guaranteed value as it varies depending on the actuator's operating environment and individual differences.

●Speed Controller Setting Procedure

When setting the speed controller, please ensure that either the open power supply or the close power supply is applied to the actuator. Do not turn off the power during the setting process.



1. **Open the setting screen and enter the setting mode.**

   Press and hold the M key for 3 seconds or longer.

   Then perform the following key operations in order:

   ① K Press the K3 key three times, then press the K2 key once.

   ② Again, press the K3 key three times, then press the K2 key once.

   ③ Finally, press the K3 key three times, then press the M key.

   ＊Using the K2 and K3 keys, confirm that the password display is set to “333”.

   After completing these operations, confirm that the setting screen “DisMod : English” (shown in the table above) is displayed.

2. **Enter the Speed Controller Mode**

   Press the M key three times and confirm that the display changes to “Speed_PUL : 100%”.

3. **Adjust the Speed**

   Set the desired speed.

   -K2 key：Decreases the speed

   -K3 key：increases the speed

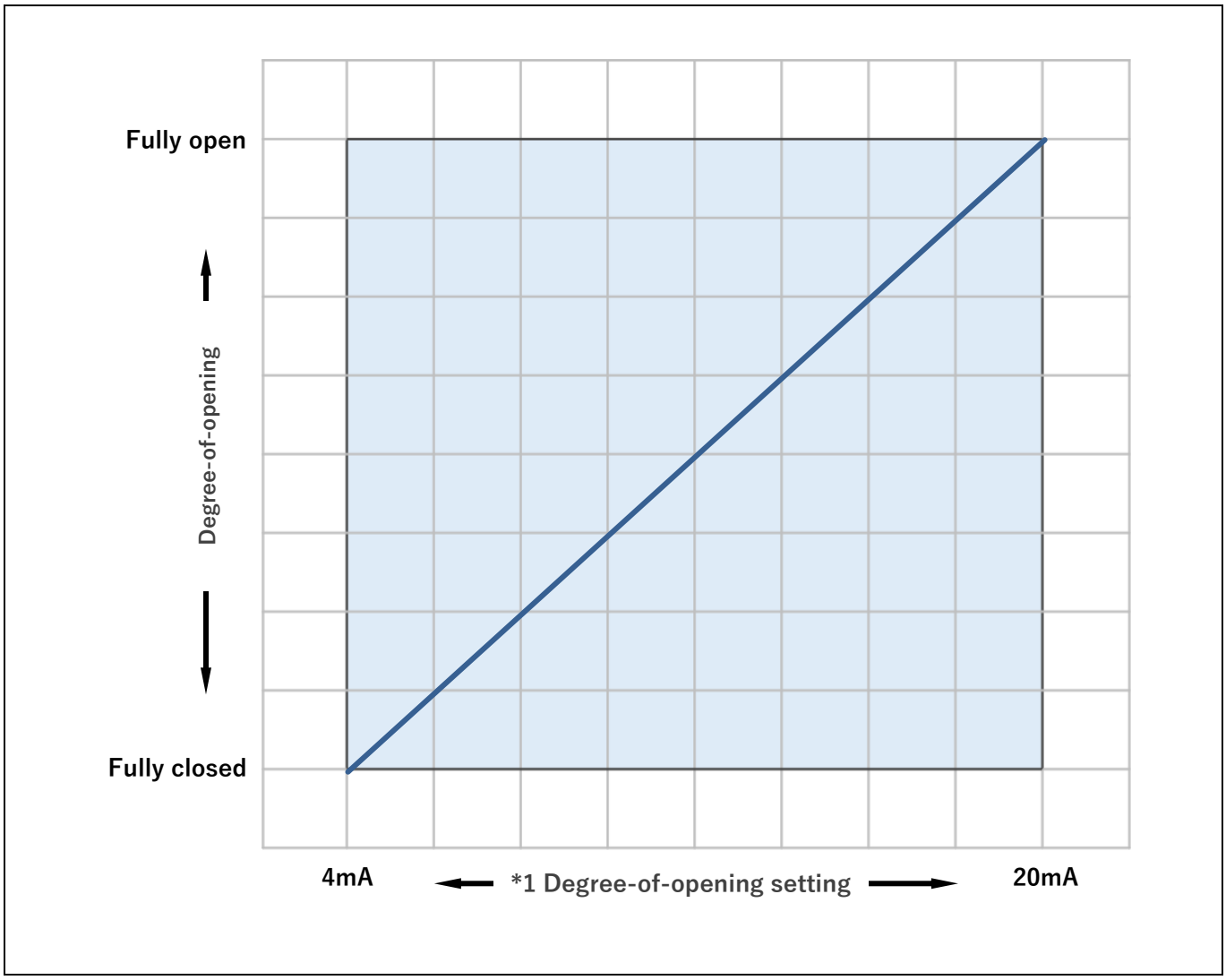
   ※Each press of the K2 or K3 key adjusts the speed in 5% increments.

4. **Exit the Setting Mode**

   From the “Speed_PUL” screen, press the M key 25 times and confirm that the display changes to “ExitSET : Push K3”. Then press the K3 key to save the settings. After saving, the unit can be operated with the updated settings.

4.4.2.3. E-E positioner

The E-E positioner is an option that controls valve opening with direct current (4-20mADC).



*1) Supply direct current (4-20mADC) between the gray and white pre-cables of the actuator.

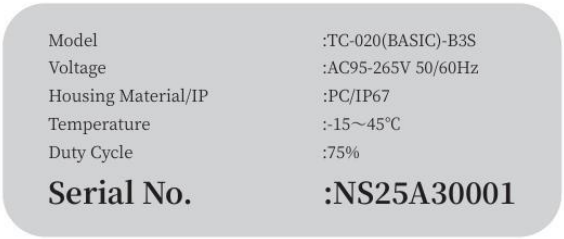
4.4.3. Labels

The labels affixed to the actuator are intended for product identification information and product warranty management. Do not peel off, damage, or modify them.

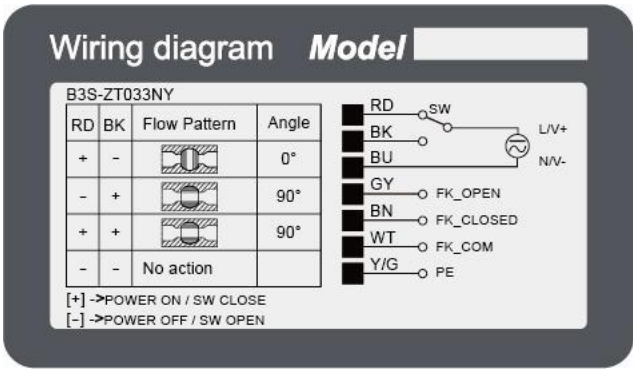
【 example 】 nominal size 15-50 mm (standard specification)

Logo label

Specification label



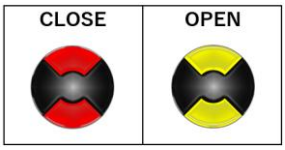
Wiring label



*1 Do not open label

*2 Traceability label

Indicator label



*1) If evidence of peeling is found on the do not open seal, it may void the product warranty.

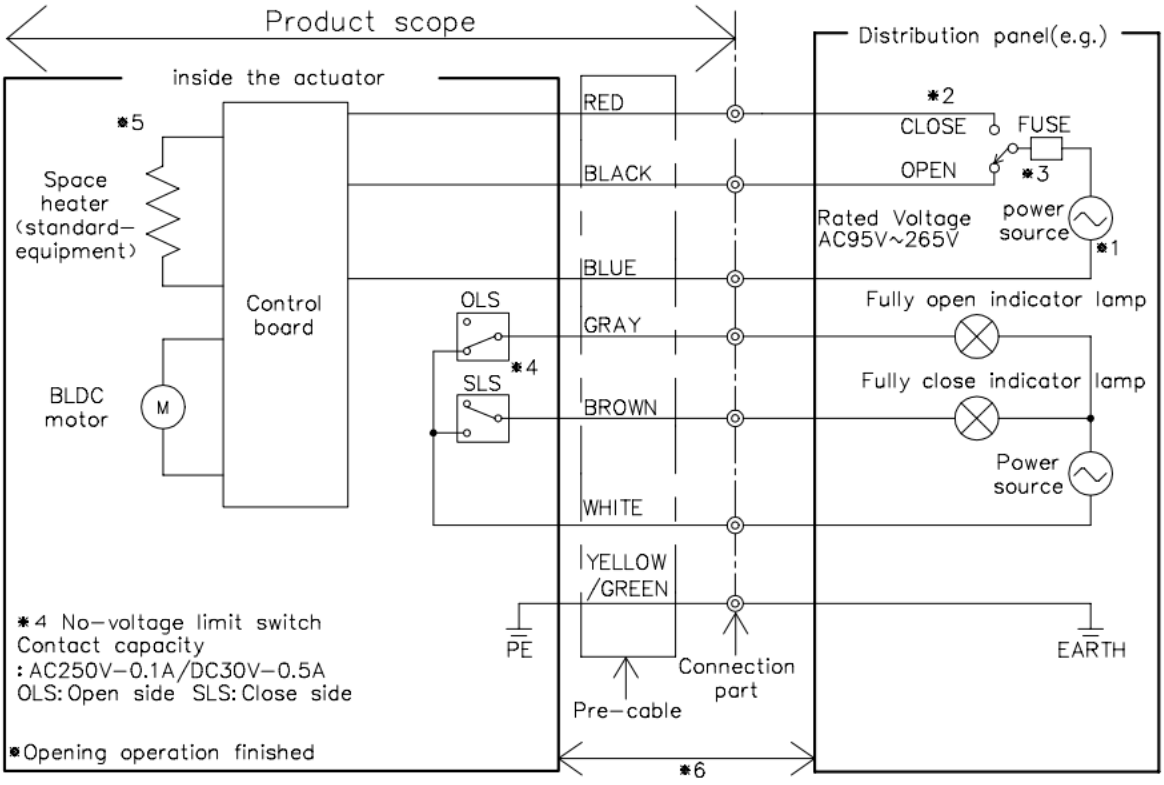
*2) If the traceability label is missing or unreadable, warranty service or after-sales service may not be available.

4.5. Wiring diagram

⚠ Caution	
Prohibited	Seat leakage may occur. ▶ Do not stop power supply by the operation of the voltage-free position switch.

4.5.1. Standard specifications

A wiring example for standard specifications is shown below. Actual wiring should follow the specifications of the distribution panel.



＊1 Use a power supply within the rated voltage range.

＊2 Open control: Supply power between the black and blue pre-cables. Close control: Supply power between the red and blue pre-cables.

＊3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

＊4
- The gray-white pre-cable turns ON slightly before fully open. The brown-white pre-cable turns ON slightly before fully closed.
- Refer to **Figure 4.5.1-1** for the switching chart.
- This is designed for both general loads and micro loads.
- Do not control to turn OFF the power to the actuator upon receiving the fully closed signal output. The valve may not fully close, causing internal leakage.

＊5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

＊6 The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If it exceeds this, the actuator may malfunction. If long pattern wiring is required, refer to **4.5.6 Standard Specification (Long Pattern)**.

＊7 Refer to **Figure 4.5.1-2** for the actuator pre-cable specifications.

Figure 4.5.1-1 Switching Chart

Nominal size 15-100mm

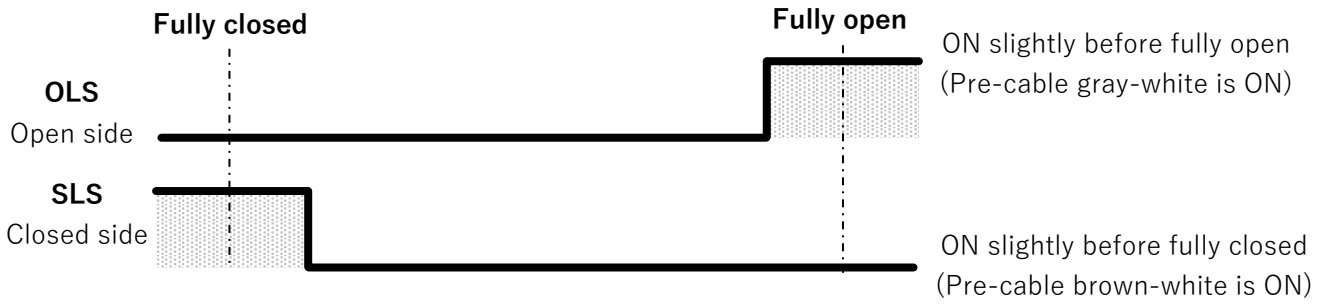
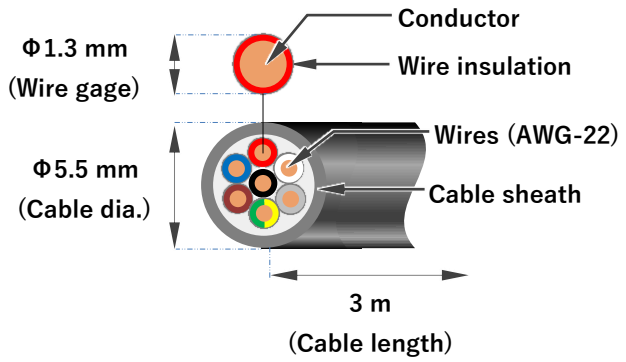
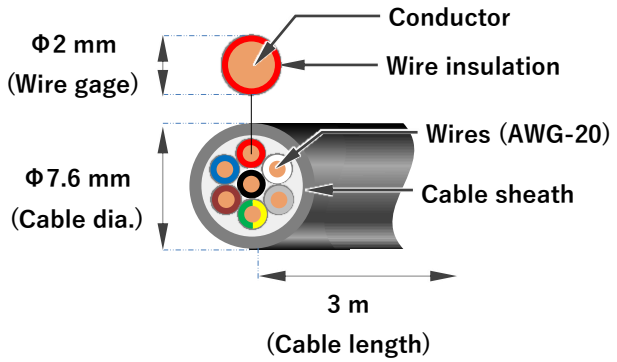


Figure 4.5.1-2 Pre-cable Specifications

Nominal size 15-50mm

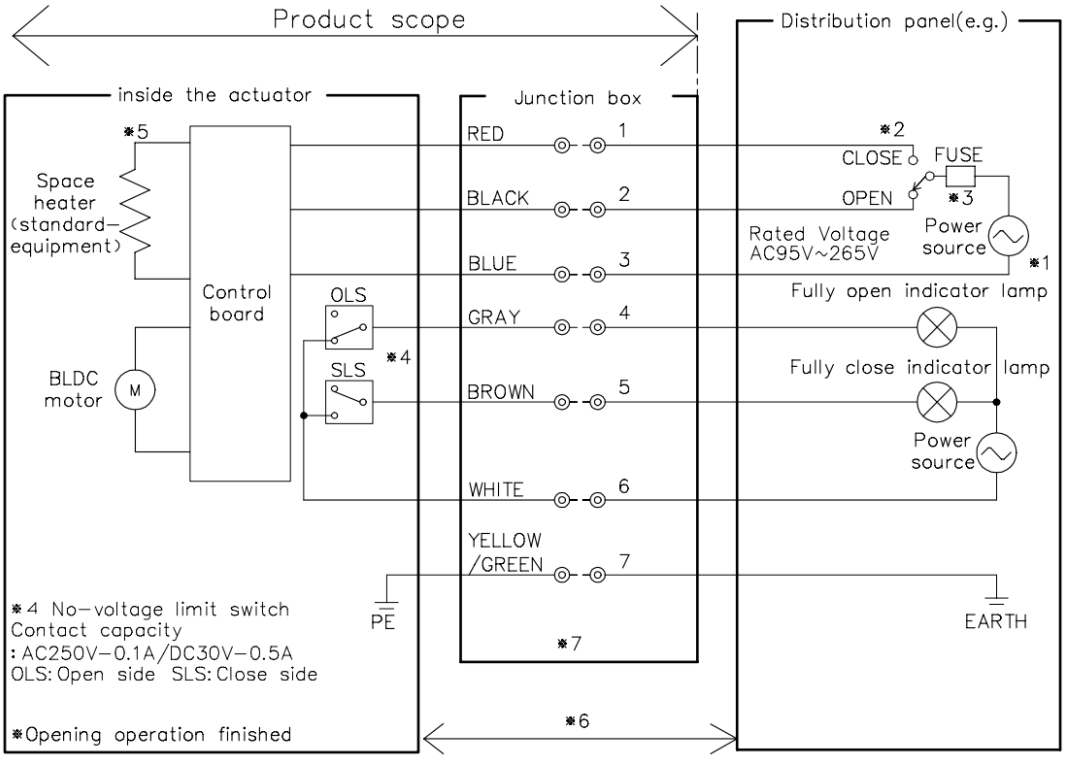


nominal size 65-100 mm



4.5.2. Standard Specification: With terminal box

The following example describes the wiring when **4.4.1 with terminal box** is selected. For actual wiring, follow the specifications of the distribution panel.



※1 Use a power supply within the rated voltage range.

※2 Open control: Supply power between 2 (black) - 3 (blue) of the terminal box.
Close control: Supply power between 1 (red) - 3 (blue) of the terminal box.

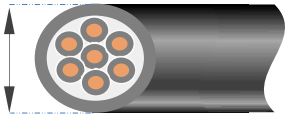
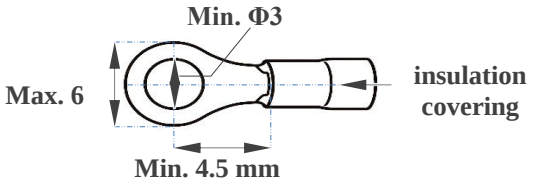
※3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

※4 ・Terminals 4 (gray) - 6 (white) in the terminal box turn ON slightly before fully open. Terminals in the wiring junction turn ON slightly before fully closed:
5 (brown) - 6 (white) turn ON.
・Refer to **Figure 4.5.1-1** for the switching chart.
・This is designed for both general loads and micro loads.
・Do not control to turn OFF the power to the actuator upon receiving the fully closed signal output.
The valve may not fully close, causing internal leakage.

※5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

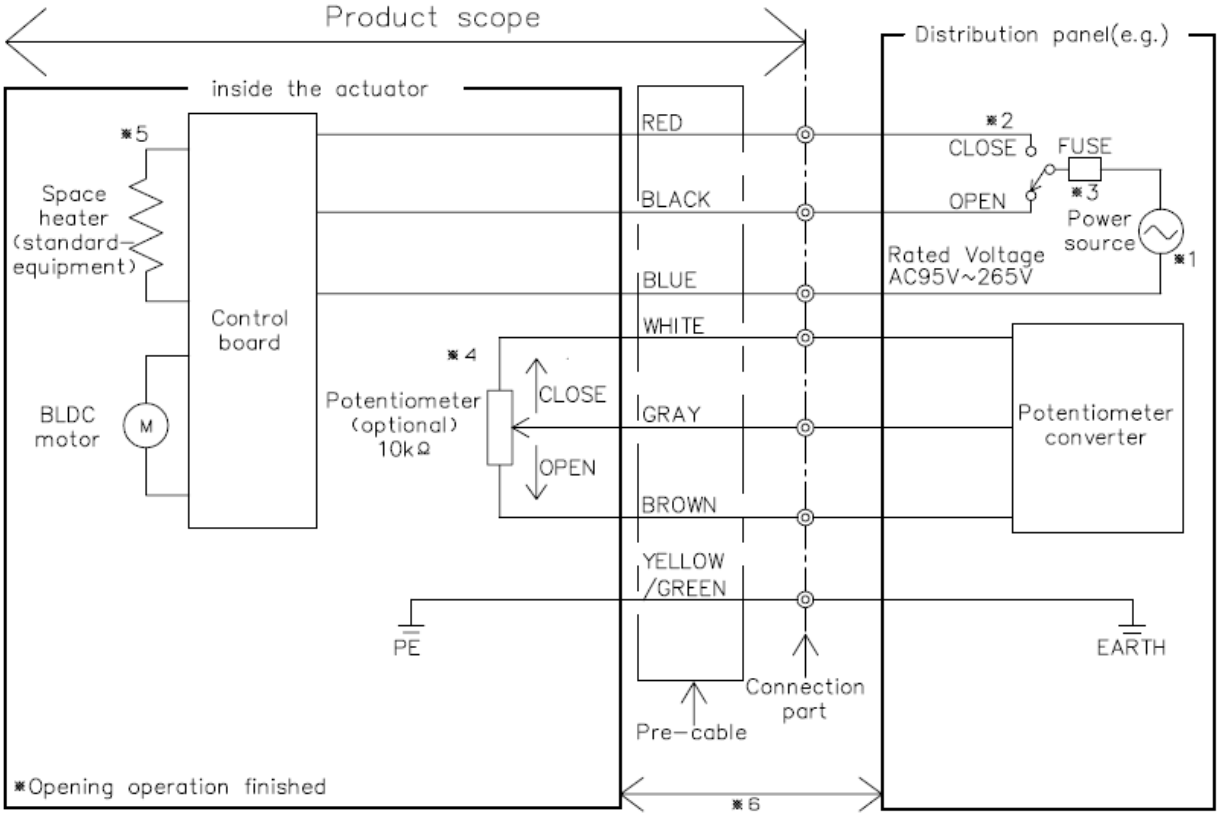
※6 The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If it exceeds this, the actuator may malfunction. If long pattern wiring is required, refer to **4.5.6 Standard Specification (Long Pattern)**.

※7 The terminal box model is ""JB-WG307"", the thread standard is ""G 1/2"", and refer to **Figure 4.5.2-2** for compatible terminals. Refer to **Figure 4.5.2-1** for compatible cables for the terminal box with the included cable gland.
To ensure insulation distance between terminals, select terminals with insulation covering or attach mark tubes.

Figure 4.5.2-1 Compatible Cables	Figure 4.5.2-2 Compatible Terminals
Φ8-15 mm (cable dia.) 	

4.5.3. Option: Potentiometer

The following example describes the wiring when potentiometer is selected in **4.4.2 option**. For actual wiring, follow the specifications of the distribution panel.



※**1** Use a power supply within the rated voltage range.

※**2** Open control: Supply power between the black and blue pre-cables. Close control: Supply power between the red and blue pre-cables.

※**3** The standard current for the overload protection device (FUSE) is 1A. Select according to the specifications of the distribution panel.

※**4** The resistance between gray - white of the pre-cable is maximum when fully open. The resistance between gray - white of the pre-cable is minimum when fully closed.

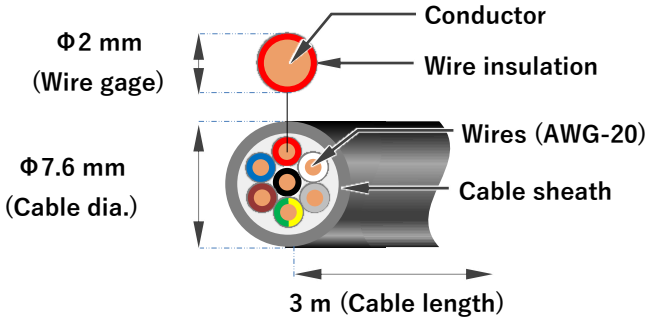
※**5** The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

※**6** The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If it exceeds this, the actuator may malfunction. If long pattern wiring is required, refer to **4.5.6 Standard Specification (Long Pattern)**.

※**7** Refer to **Figure 4.5.3-1** for the actuator pre-cable specifications.

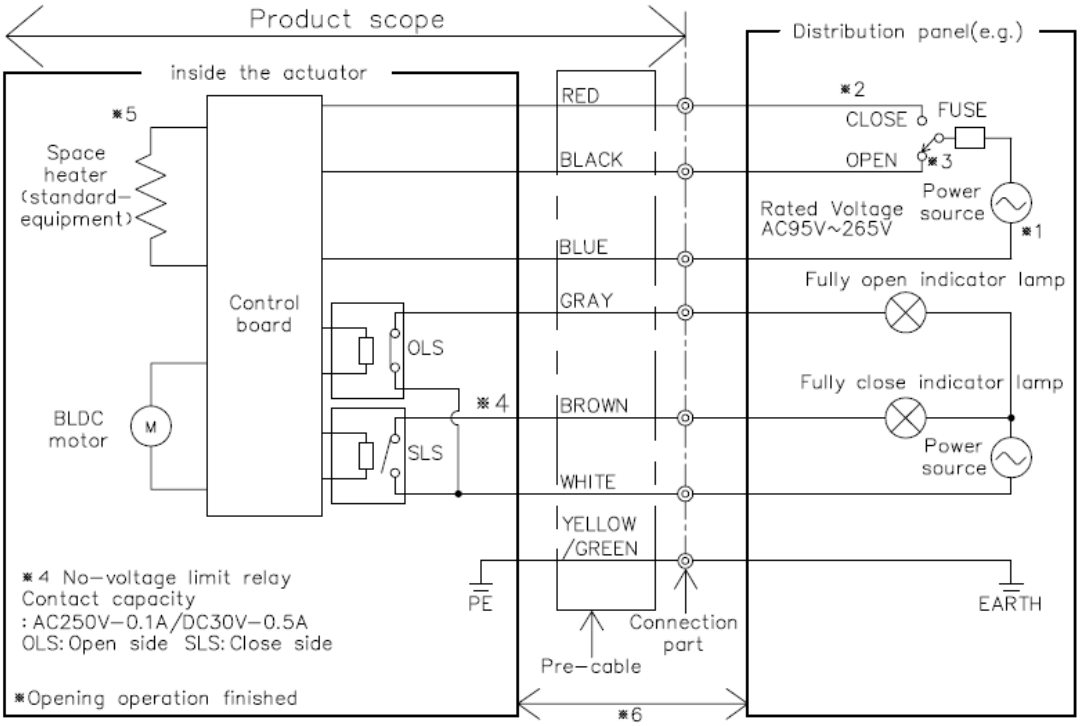
Figure 4.5.3-1 Pre-cable Specifications

Nominal dia. 15-100 mm



4.5.4. Option: Speed controller

The following example describes the wiring when speed controller is selected in **4.4.2 option**. For actual wiring, follow the specifications of the distribution panel.



※1 Use a power supply within the rated voltage range.

※2 Open control: Supply power between the black and blue pre-cables. Close control: Supply power between the red and blue pre-cables.

※3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

※4 ・Gray - white of the pre-cable turns ON simultaneously with fully open. Brown - white of the pre-cable turns ON simultaneously with fully closed.

When the actuator power is turned OFF, gray - white and brown - white of the pre-cable turn OFF regardless of the opening degree.

・Refer to **Figure 4.5.5-1** for the switching chart.

・This is designed for both general loads and micro loads.

※5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

※6 The wiring distance between the actuator and the distribution panel should be ""50 meters or less"". If it exceeds this, the actuator may malfunction. If long pattern wiring is required, refer to **4.5.6 Standard Specification (Long Pattern)**.

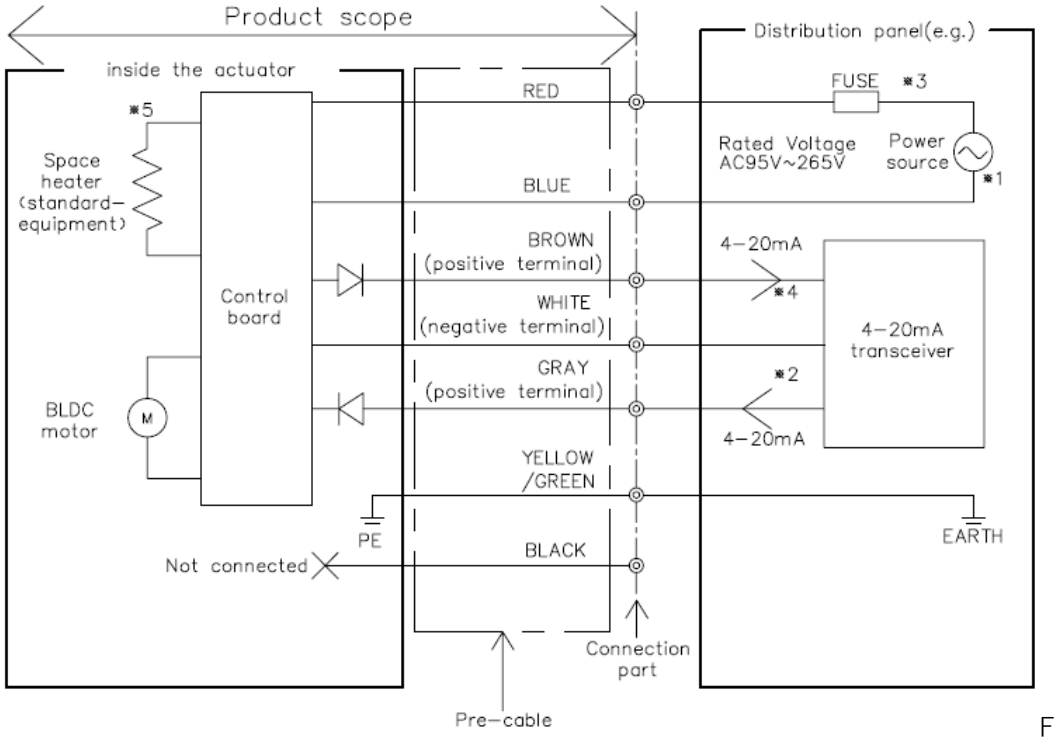
※7 Refer to **Figure 4.5.3-1** for the actuator pre-cable specifications.

Figure 4.5.5-1 Switching Chart

Nominal size 15-100 mm

4.5.5. Option: E-E Positioner

The following example describes the wiring when speed controller is selected in **4.4.2 option.** For actual wiring, follow the specifications of the distribution panel.



※1 Use a power supply within the rated voltage range.

※2 Open control: Supply 20mADC between gray - white of the pre-cable.
Close control: Supply 4mADC between gray - white of the pre-cable.

※3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

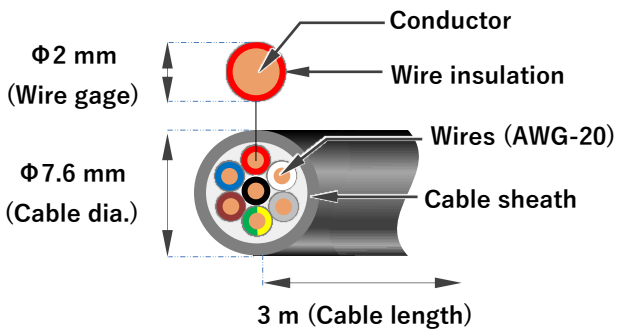
※4 20mADC is output between brown - white of the pre-cable when fully open.
4mADC is output between brown - white of the pre-cable when fully closed.
・For cable wiring of this product, the white wire is the negative terminal, and the brown and gray wires are the positive terminals.

※5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

※6 Refer to **Figure 4.5.4-1** for the actuator pre-cable specifications.

Figure 4.5.4-1 Pre-cable Specifications

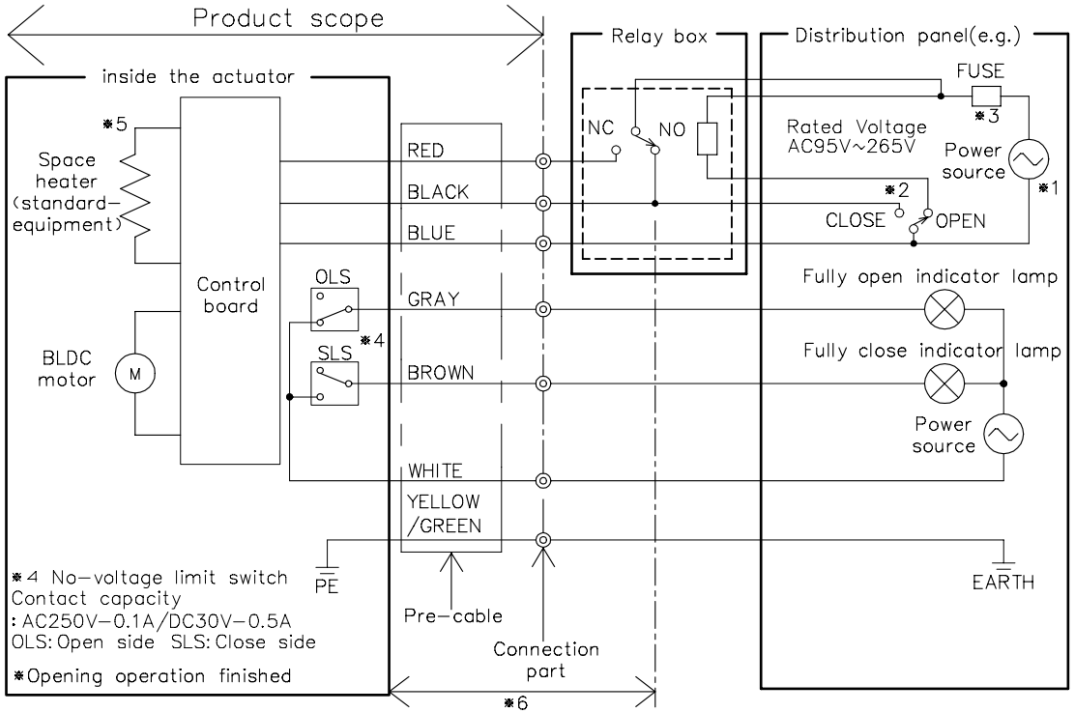
Nominal dia. 15-100 mm



*The black wire is not used. (It is not connected inside the actuator)

4.5.6. Standard Specification: Long Pattern

The following example describes wiring for standard specification when the wiring distance between the actuator and the distribution board is long (approximately 50 meters or more). Install a terminal box containing a relay circuit between the actuator and the distribution board. Actual wiring should follow the specifications of the distribution panel.



※1 Use a power supply within the rated voltage range.

※2 Open control: Supply power between the black and blue pre-cables. Close control: Supply power between the red and blue pre-cables.

※3 The guideline current for the overcurrent protection device (FUSE) is ""1A"". Select according to the specifications of the distribution panel.

※4 ・The gray-white pre-cable turns ON slightly before fully open. The brown-white pre-cable turns ON slightly before fully closed.
・Refer to **Figure 4.5.1-1** for the switching chart.
・This is designed for both general loads and micro loads.
・Do not control to turn OFF the power to the actuator upon receiving the fully closed signal output.
The valve may not fully close, causing internal leakage.

※5 The space heater (standard equipment) automatically turns ON/OFF according to the internal temperature of the actuator.

※6 The wiring distance between the actuator and the terminal box should be approximately 50 meters or less. If it exceeds this, the actuator may malfunction.

※7 Refer to **Figure 4.5.1-2** for the actuator pre-cable specifications.

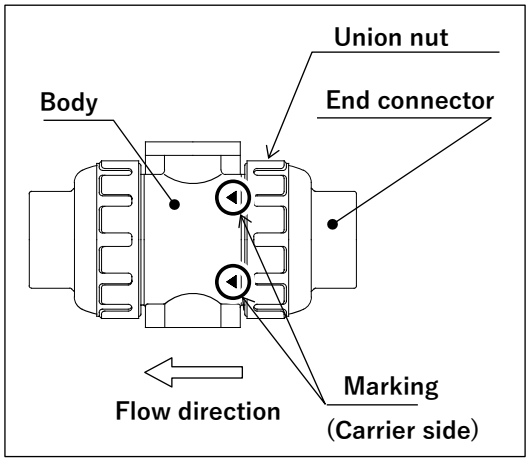
Caution: The terminal box is not included with this product. If a terminal box is required, please prepare it separately.

5. Piping Method

5.1. Flanged ends

⚠Warning	
Prohibited	**Serious injury may result.** ▶ When lifting or slinging the valve, take sufficient safety precautions and do not go under the suspended load.
Mandatory	**Electric shock or injury may result.** ▶ Always perform a safety check on machine tools and power tools before use. ▶ Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**The valve may be damaged, impaired, or leak.** ▶ Do not overtighten the union nut. ▶ Do not use a pipe wrench when tightening the union nut. ▶ Do not tighten piping bolts and nuts beyond the values in ""**Table 5.1-2 Flange Tightening Specified Torque Values**"".
Mandatory	**The valve may be damaged, impaired, or leak.** ▶ Install so that excessive stress such as tension, compression, bending, or impact is not applied to the piping or valves. ▶ When performing piping work or disassembly/assembly, secure the end connector before working. ▶ When installing the valve at the end of a pipe, always attach the union nut and end connector on the secondary side (downstream side). ▶ When connecting to metal piping, ensure that piping stress is not applied to the valve. ▶ Use flat face type for the connection flanges. ▶ Confirm that there are no differences between the mating flange standards. ▶ Always use a sealing gasket (AV packing) between flanges and tighten piping bolts and nuts according to ""**Table 5.1-2 Flange Tightening Specified Torque Values**"". (If using other than AV packing, the tightening torque value will differ) ▶ Keep the axial misalignment and parallelism of the flange faces within the values in ""**Table 5.1-1 Axial Misalignment and Parallelism**"". ▶ Tighten piping bolts and nuts diagonally according to ""**Table 5.1-2 Flange Tightening Specified Torque Values**"".

⚠ Caution		
-	**This allows for safer use.** ▶ When installing the valve at the end of the pipe, pay attention to the flow direction. (Check for the ◀ mark on the carrier side body. The secondary side (downstream side) has the carrier part integrated with the main body, allowing for safer use when installing at the end of the pipe.)	

Things to prepare	▶ Torque wrench ▶ Spanner or box wrench ▶ Belt wrench ▶ Piping bolts/nuts/washers ▶ AV packing ▶ Cloth

Procedure

1) Clean both flange surfaces with a cloth.

2) Set the AV packing between the flanges.

3) Insert the washer and bolt from the connecting flange side, insert the washer and nut from the valve side, and hand-tighten temporarily.

4) Keep the axial misalignment and parallelism of the flange surfaces within the values shown in ""**Table 5.1-1 Axial Misalignment and Parallelism**"". (**Figure 5.1-1**)

5) Using a torque wrench, gradually tighten diagonally to the values shown in ""**Table 5.1-2 Specified Flange Tightening Torque Values**"". (**Figure 5.1-2**)

6) Further tighten clockwise at the values shown in ""**Table 5.1-2 Specified Flange Tightening Torque Values**"" for at least 2 rounds. (**Figure 5.1-2**)

7) If it becomes necessary to loosen or remove the union nut for installation purposes, tighten the union nut according to the following procedure.

7-1) Confirm that the O-ring (A) is correctly installed on the body. (**Figure 5.1-3**)

7-2) Bring the end connector and union nut into contact with the body side so that the O-ring (A) does not come off.

7-3) Tighten the union nut by hand until it is tight.

7-4) Screw in 1/4 to 1/2 turn with a belt wrench, being careful not to damage the union nut.

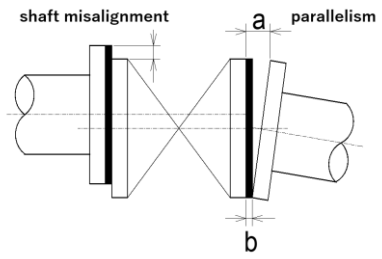


Figure 5.1-1

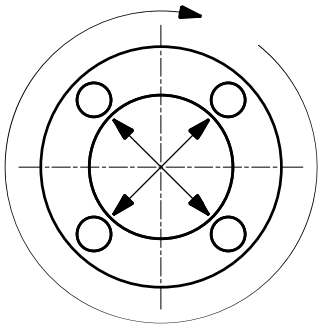


Figure 5.1-2

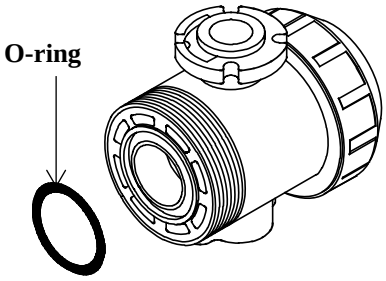


Figure 5.1-3

Table 5.1-1 Axial Misalignment and Parallelism

nominal size	Axial misalignment	Parallelism (a-b)
15mm	1.0mm	0.5mm
20mm		
25mm		
32mm		
40mm		0.8mm
50mm		
65mm		
80mm		
100mm		

Table 5.1-2 Specified Flange Tightening Torque Values

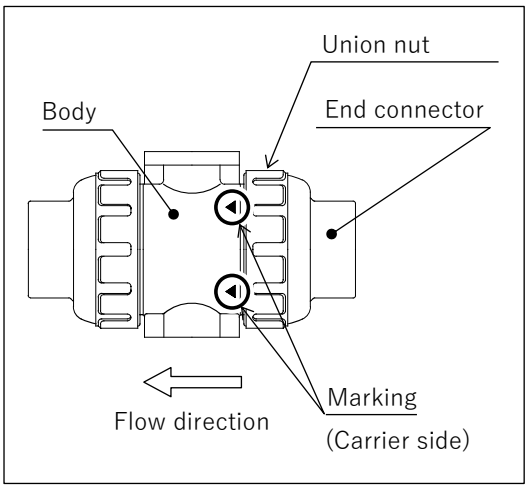
nominal size	PTFE coated	PVDF coated	Rubber
15mm	17.5 N-m	17.5 N-m	8.0 N-m
20mm			
25mm	20.0 N-m	20.0 N-m	20.0 N-m
32mm			
40mm			
50mm	22.5 N-m	22.5 N-m	22.5 N-m
65mm			
80mm	30.0 N-m	30.0 N-m	30.0 N-m
100mm			

5.2. Threaded ends

⚠Warning	
Prohibited	**Serious injury may result.** ► When lifting or slinging the valve, pay sufficient attention to safety and do not go under the suspended load.
Mandatory	**Electric shock or injury may result.** ► Always perform a safety check on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**The valve may be damaged, impaired, or leak.** ► Do not overtighten the screws on the joint. ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.
Mandatory	**The valve may be damaged, impaired, or leak.** ► The union nut on this product is lightly tightened for easy loosening. Always remove the end connector before installation. ► Install so that excessive stress such as tension, compression, bending, or impact is not applied to the piping or valves. ► When performing piping work or disassembly/assembly, secure the end connector before working. ► When installing the valve at the end of a pipe, always attach the union nut and end connector on the secondary side (downstream side). ► When connecting to metal piping, ensure that piping stress is not applied to the valve. ► Confirm that the screws on the joint are made of resin. ► Use seal tape as the sealing material for the threaded section. Using liquid sealant or liquid gasket may cause stress cracking (environmental stress cracking).

-	**This allows for safer use.** ▶ When installing the valve at the end of the pipe, pay attention to the flow direction. (Check for the marking (◀) on the carrier side body. The secondary side (downstream side) has the carrier part integrated with the main body, allowing for safer use when installing at the end of the pipe.)



Things to prepare	▶ Seal tape ▶ Belt wrench ▶ Spanner or motor wrench

Procedure

1) Wrap seal tape around the male thread of the fitting, leaving approximately 3 mm from the tip.
2) Loosen the union nut by hand.
3) Remove the union nut and end connector from the body.
4) Tighten the male thread of the fitting and the end connector by hand until tight.
5) Screw in 1/2 to 1 turn with a spanner or motor wrench, being careful not to damage the end connector. (**Figure 5.2-1**)
6) Confirm that the O-ring (A) is correctly installed on the body. (**Figure 5.2-2**)
7) Bring the end connector and union nut into contact with the body side so that the O-ring (A) does not come off.
8) Tighten the union nut by hand until it is tight.
9) Screw in 1/4 to 1/2 turn with a belt wrench, being careful not to damage the union nut.

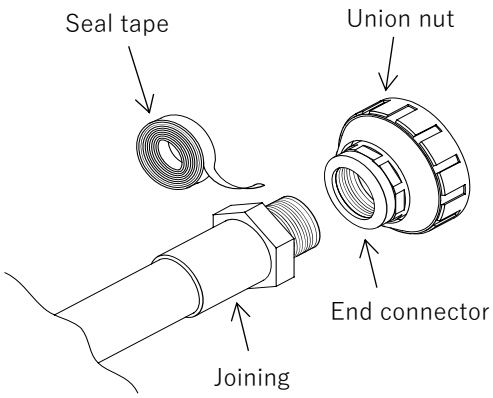


Figure 5.2-1

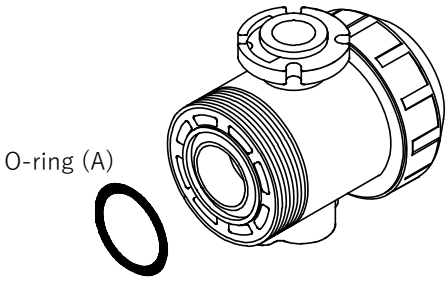


Figure 5.2-2

5.3. Socket ends (adhesive)

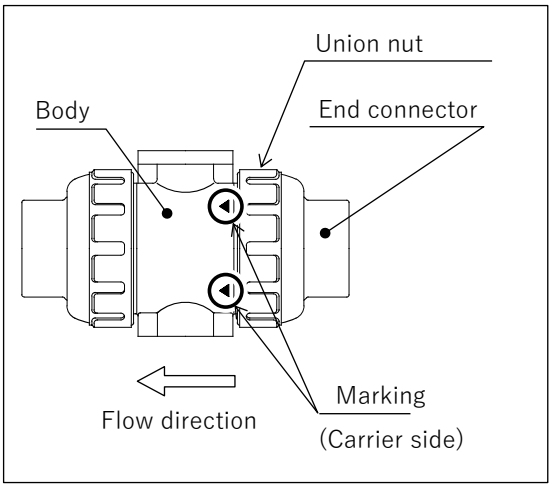
⚠Warning	
Prohibited	**Serious injury may result.** ► When lifting or slinging the valve, pay sufficient attention to safety and do not go under the suspended load. **Fire or explosion may occur.** ► When using adhesive, ensure adequate ventilation and do not use open flames nearby.
Mandatory	**Electric shock or injury may result.** ► Always perform a safety check on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**Injury may result.** ► Adhesive contains volatile solvents; do not inhale the fumes directly. **The valve may be damaged, impaired, or leak.** ► Do not apply too much adhesive. Excess adhesive will flow into the valve. ► Do not hammer when inserting the pipe into the end connector. ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.
Mandatory	**Injury may result.** ► If adhesive adheres to the skin, remove it promptly. ► If you feel unwell or notice any abnormality when using adhesive, promptly seek medical attention and receive appropriate treatment. **The valve may be damaged, impaired, or leak.** ► The union nut on this product is lightly tightened for easy loosening. Always remove the end connector before installation. ► Install so that excessive stress such as tension, compression, bending, or impact is not applied to the piping or valves. ► When performing piping work or disassembly/assembly, secure the end connector before working. ► When installing the valve at the end of a pipe, always attach the union nut and end connector on the secondary side (downstream side). ► Be careful when working at low temperatures, as solvent vapors are difficult to evaporate and tend to remain. ► After piping, open both ends of the pipe and ventilate with a blower (low-pressure type) to remove solvent vapors. ► Use ""AV cement"" appropriate for the material. ► Conduct the water flow test at least 24 hours after the adhesive has completely set.

⚠ Caution

This allows for safer use.

▶ When installing the valve at the end of the pipe, pay attention to the flow direction. (Check for the ◀ mark on the carrier side body. The secondary side (downstream side) has the carrier part integrated with the main body, allowing for safer use when installing at the end of the pipe.)



Things to prepare	▶ AV cement ▶ Belt wrench ▶ Cloth

Procedure

1） Loosen the union nut by hand.
2） Remove the union nut and end connector from the body.
3） Pass the union nut through to the pipe side.
4） Wipe the pipe insertion section and the socket section of the end connector clean with a cloth.
5） Referring to ""**Table 5.3-1 Guideline for Amount of Adhesive**"", apply adhesive evenly to the socket section of the end connector, then to the pipe insertion section (**Figure 5.3-1**).
6） After applying the adhesive, quickly insert the pipe into the end connector and hold it for at least 60 seconds.
7） Wipe off any excess adhesive with a cloth.
8） Confirm that the O-ring (A) is correctly installed on the body (**Figure 5.3-2**).
9） Bring the end connector into contact with the body so that the O-ring (A) does not come off.
10） Tighten the union nut by hand until it is tight.
11） Screw in 1/4 to 1/2 turn with a belt wrench, being careful not to damage the union nut.

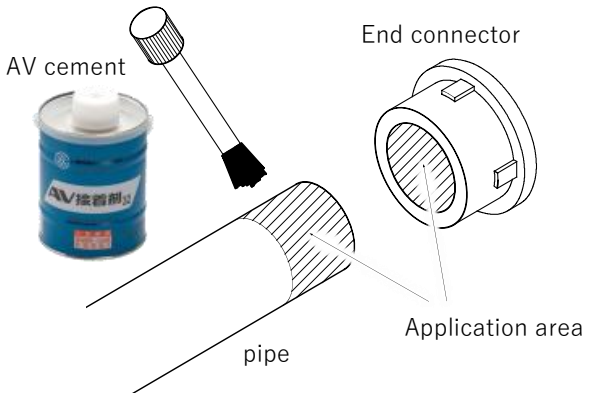


Figure 5.3-1

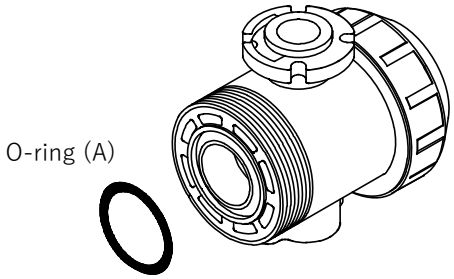


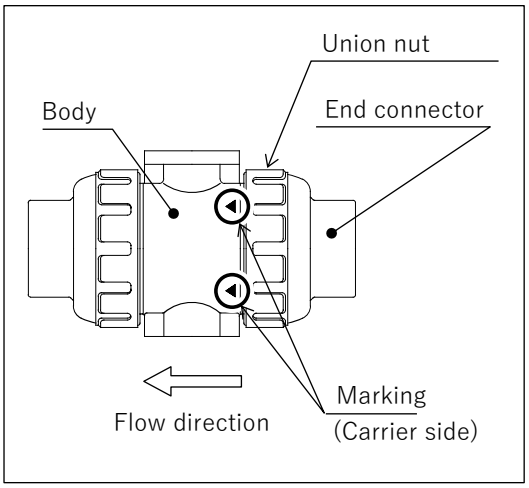
Figure 5.3-2

Table 5.3-1 Guideline for Amount of Adhesive

nominal size	Application amount
15mm	1.0 g
20mm	1.3 g
25mm	2.0 g
32mm	2.4 g
40mm	3.5 g
50mm	4.8 g
65mm	6.9 g
80mm	9.0 g
100mm	13.0 g

5.4. Socket ends, spigot ends (fusion)

Warning	
Prohibited	**Serious injury may result.** ► When lifting or slinging the valve, pay sufficient attention to safety and do not go under the suspended load.
Mandatory	**Electric shock or injury may result.** ► Always perform a safety check on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

Caution	
Prohibited	**The valve may be damaged, impaired, or leak.** ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.
Mandatory	**The valve may be damaged, impaired, or leak.** ► The union nut on this product is lightly tightened for easy loosening. Always remove the end connector before installation. ► Install so that excessive stress such as tension, compression, bending, or impact is not applied to the piping or valves. ► When performing piping work or disassembly/assembly, secure the end connector before working. ► When installing the valve at the end of a pipe, always attach the union nut and end connector on the secondary side (downstream side).
-	**This allows for safer use.** ► When installing the valve at the end of the pipe, pay attention to the flow direction. (Check that the ► mark is stamped on the body on the carrier side. On the secondary side (downstream side), the carrier part is integrated with the main body, allowing for safer use when installing at the end of the pipe.) 

Things to prepare	▶ Belt wrench ▶ Fusion machine ▶ Fusion machine instruction manual

Procedure	
1）	Loosen the union nut by hand.
2）	Remove the union nut and end connector from the body.
3）	Pass the union nut through to the pipe side.
4）	From this point, refer to the fusion machine instruction manual for fusion.
5）	Confirm that the O-ring (A) is correctly installed on the body (**Figure 5.4-1**).
6）	Bring the end connector into contact with the body so that the O-ring (A) does not come off.
7）	Tighten the union nut by hand until it is tight.
8）	Screw in 1/4 to 1/2 turn with a belt wrench, being careful not to damage the union nut.

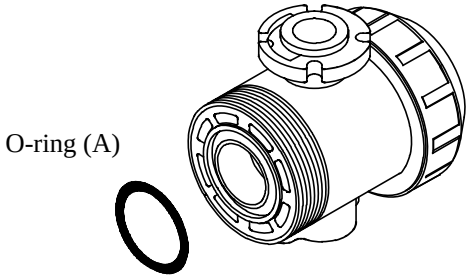


Figure 5.4-1

5.5. Product support

⚠Warning	
Mandatory	**Electric shock or injury may result.** ► Always perform a safety check on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**The valve may be damaged, impaired, or leak.** ► When supporting piping with U-bands, etc., do not overtighten. ► When installing valves on piping around pumps, do not allow large vibrations to occur on the valve.
Mandatory	**The valve may be damaged, impaired, or leak.** ► When supporting piping with U-bands, etc., do not overtighten. ► When screwing in the Ensat, install it vertically. ► For detailed handling of Ensat installation tools, refer to the Ensat manufacturer's instruction manual separately.

Things to prepare	▶ Spanner ▶ Bolt set (bolts/nuts/washers) ▶ Ensat (**nominal size 15-50 mm only, see Table 5.5-2**) ▶ Ensat installation tool (**nominal size 15-50 mm only**)

Procedure 1: Secure the bottom stand and frame (panel)

1) Machine bolt fastening holes in the panel (frame) (**Figure 5.5-3, Figure 5.5-4, Table 5.5-1**).
2) **Nominal size 15-50 mm only;** attach the Ensat to the bottom stand.
3) Fasten the bottom stand and frame with the bolt set and tighten with a spanner (**Figure 5.1-1, Figure 5.1-2**).

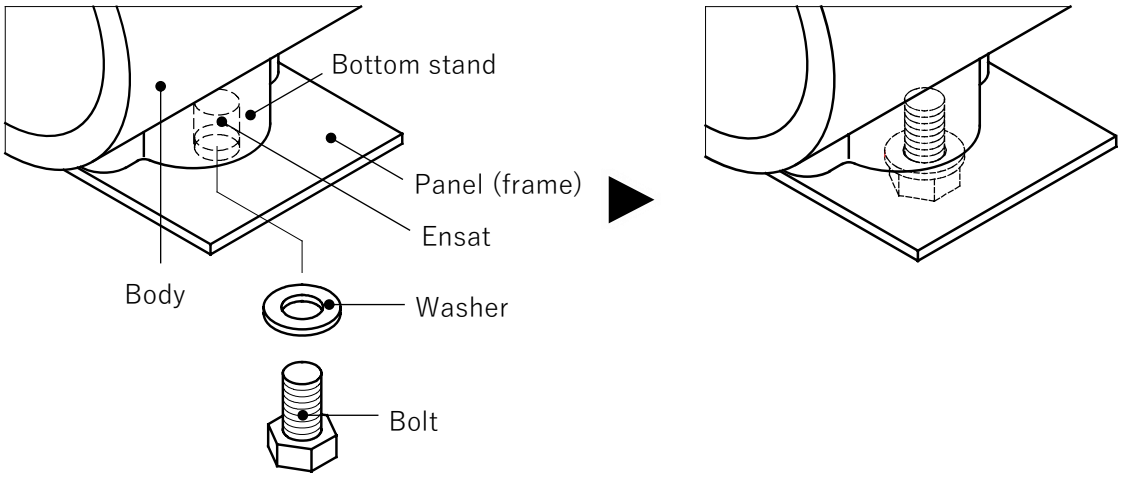


Figure 5.5-1 Bottom stand fixing example (nominal size 15-50 mm)

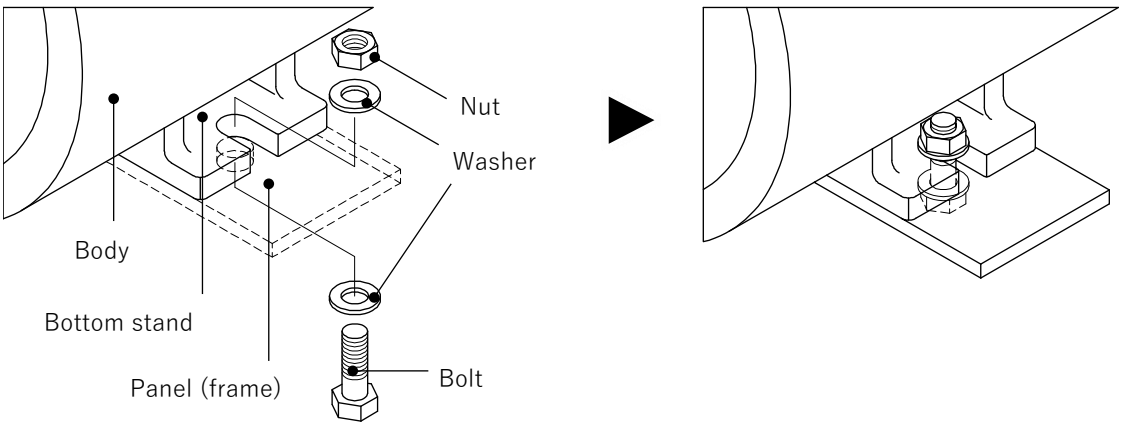


Figure 5.5-2 Bottom stand fixing example (nominal size 65-100 mm)

Table 5.5-1 Bottom stand dimensions

nominal size	Bottom stand (mm)		
	S1	S2	S3
15mm	19	7.3	11
20mm	19	7.3	11
25mm	19	7.3	11
32mm	30	9	15
40mm	30	9	15
50mm	30	9	15
65mm	48	9	6
80mm	55	11	7
100mm	65	11	8

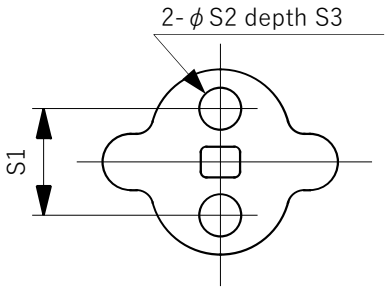


Figure 5.5-3 Bottom stand (Nominal size 15-50 mm)

Table 5.5-2 Compatible Ensat (nominal size 15-50 mm only)

nominal size	Bottom stand (mm)		
	Thread designation	length	Material
15mm	M5	10	Stainless steel or Brass
20mm	M5	10	
25mm	M5	10	
32mm	M6	14	
40mm	M6	14	
50mm	M6	14	

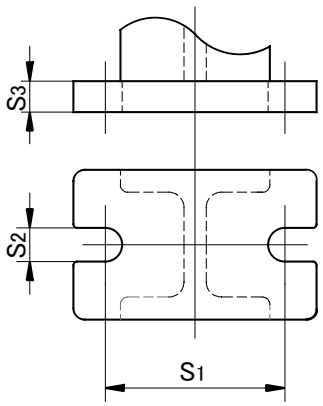


Figure 5.5-4 Bottom stand (Nominal size 65-100 mm)

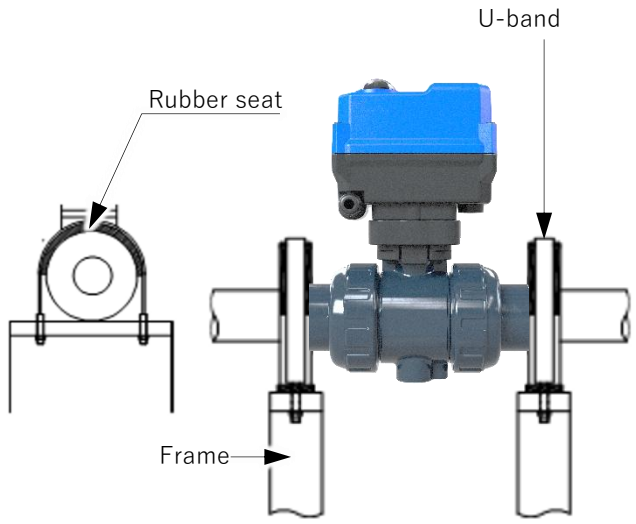
5.5.1. Horizontal piping

Things to prepare	▶ Rubber seat ▶ U-band (with bolt) ▶ Spanner

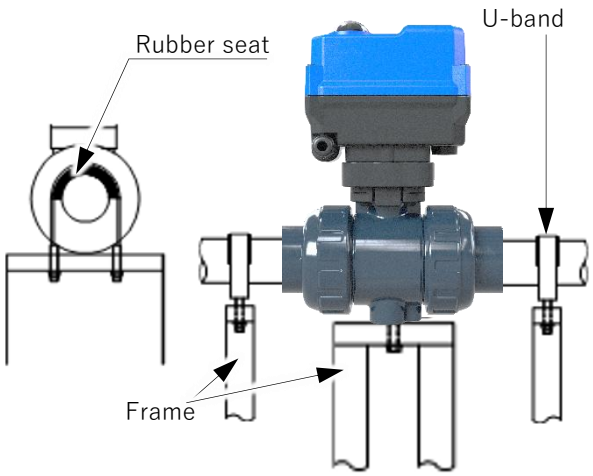
Procedure 2: Support the valve and piping

1） For flange end; place the rubber seat on the flange part of the valve.
For non-flange end; place the rubber seat on top of the pipe part.
2） Place the U-band over the rubber seat and secure to the frame with nuts.

Horizontal piping support example (flange end)



Horizontal piping support example (non-flange end)

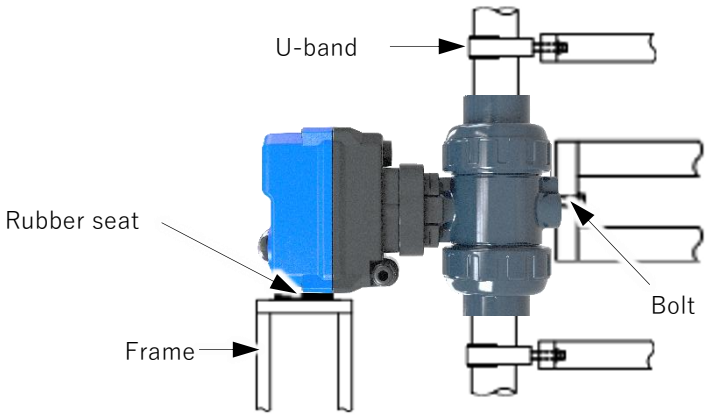


5.5.2. Vertical piping

Procedure 2: Support the valve and piping

1） For flange end; place the rubber seat on the flange part of the valve.
For non-flange end; place the rubber seat on top of the pipe part.
2） Place the U-band over the rubber seat and secure to the frame with nuts.
3） Place the rubber seat between the actuator and the frame.

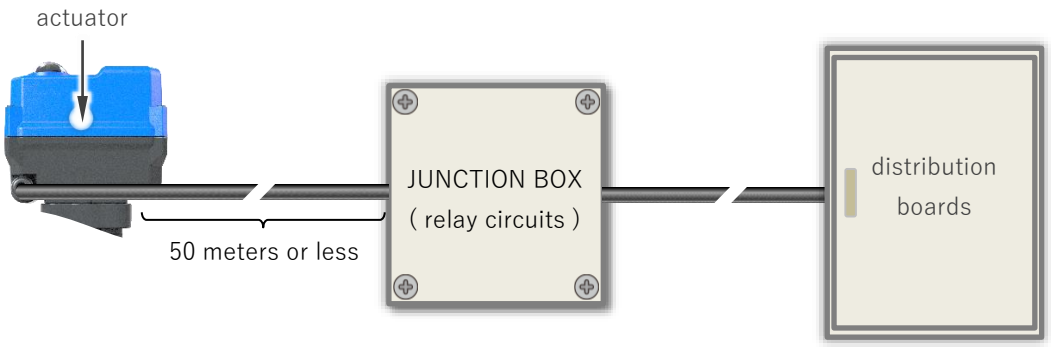
Vertical piping support example



6. Electrical wiring method

Warning	
Prohibited	**There is a risk of electric shock.** ► Do not perform wiring work while the power is on. ► Do not perform wiring work in environments where rainwater or moisture is present (such as outdoor work in rainy weather). ► Do not perform wiring work with wet hands or tools.
Mandatory	**Electric shock or injury may result.** ► Always perform a safety check on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

Caution	
Prohibited	**The actuator may fail or malfunction.** ► Do not apply a load exceeding the contact capacity to the voltage-free limit switch. ► Do not use near high-voltage lines, inverters, or other noise-generating or magnetic field-generating equipment.
Mandatory	**Electric shock or injury may result.** ► Ensure that hands are free of moisture and oil during work. **The actuator may fail or malfunction.** ► Provide an open/close switch (or relay contact) for each motorized valve. ► Be sure to connect the ground wiring. ► Connect wires correctly according to the wiring diagram. ► Perform wiring work in a condition free of insulation defects. ► Connect wires so that the conductors of the wires inside the pre-cable do not contact each other. ► After wiring work, confirm that there are no forgotten or loose screws on crimping terminals, etc. ► This product supports universal power supply. Use within the power supply voltage range.

⚠ Caution	
Mandatory	**The actuator may fail or malfunction.** ▶ Indicator lights and devices connected to the limit switch (voltage-free contact) for open/close signals should be within the contact capacity range. ▶ The wiring distance between the actuator and distribution board should be 50 meters or less as a guideline. ▶ When the wiring distance between the actuator and distribution board exceeds 50 meters, connect through a junction box containing relay circuits, and keep the wiring distance between the actuator and junction box to 50 meters or less. 

6.1. Wiring method (standard specifications)

The procedure for wiring using a commercially available terminal box as an example of wiring between a standard specification actuator and distribution board is shown. (**Figure 6.1-1**).

- ▶ Select an appropriate wiring method according to the installation environment and operating conditions.
- ▶ Select terminal blocks and cable glands in the terminal box (commercially available) by referring to the actuator pre-cable specifications (**Figure 4.5.1-2**).

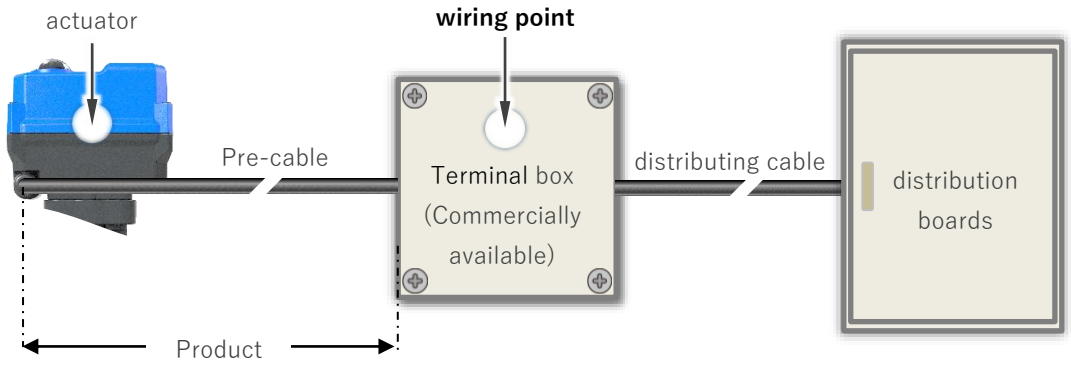
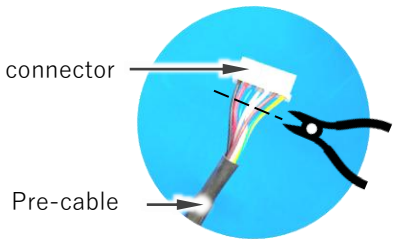


Figure 6.1-1 Wiring image

Things to prepare	▶ Nippers ▶ Cable stripper ▶ Wire stripper ▶ Crimping terminals ▶ Crimping tool ▶ Terminal box (commercially available)

Procedure	
1) Cut the connector at the tip of the actuator pre-cable with nippers (**Figure 6.1-2**). 2) Remove the pre-cable sheath with a cable stripper to expose the wires. 3) Remove the wire insulation with a wire stripper, etc. to expose the wire conductor. 4) Attach crimping terminals to the wire conductor using a crimping tool. 5) Connect the pre-cable to the terminal box (commercially available).	 **Figure 6.1-2**

6.2. Wiring method (standard specifications: with terminal box)

4.4.2Options Figure 6.2-1 Wiring image

► Select the wiring cable by referring to **Figure 4.5.2-1**.

► Select the wire terminals for the wiring cable by referring to **Figure 4.5.2-2**.

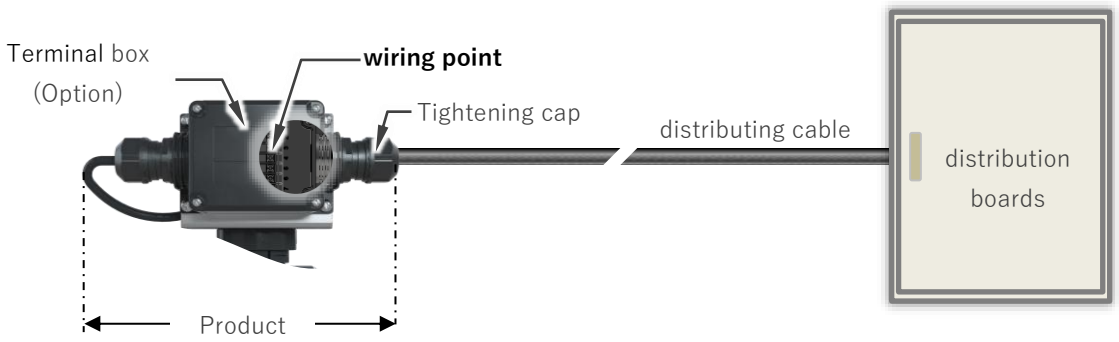


Figure 6.2-1 Wiring image

Things to prepare	▶ Cable stripper ▶ Wire stripper ▶ Crimping terminals ▶ Crimping tool ▶ Phillips screwdriver ▶ Torque wrench

Procedure

1) Remove the cable sheath of the wiring cable with a cable stripper to expose the wires.
Remove the wire insulation of the wiring cable with a wire stripper to expose the wire conductor.
Attach crimping terminals to the conductor of the wiring cable with a crimping tool.

2) Loosen the screws (4 locations) of the terminal box with a Phillips screwdriver and remove the cover (**Figure 6.2-2**).

3) Insert the wiring cable into the terminal box through the cable gland of the terminal box.
Connect the crimping terminals of the wiring cable to the terminal block inside the terminal box with a Phillips screwdriver (**Figure 6.2-3**).
* For wiring points, refer to **4.5.2 Standard specifications; terminal box**.
* After connection, gently pull the wire to confirm that it does not come off.

4) Tighten the tightening cap of the cable gland with a monkey wrench.
* Use **Table 6.2-1** as a guideline for the tightening torque of the tightening cap.
* Over-tightening or under-tightening can cause airtightness failure.

Attach the cover to the terminal box and tighten the screws (4 locations) with a Phillips screwdriver (**Figure 6.2-4**).
※Insufficient tightening may cause airtight failure.

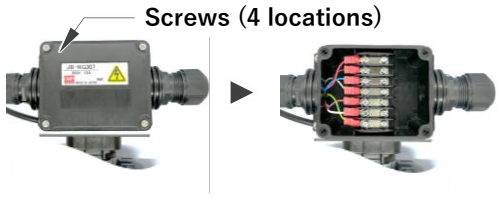


Figure 6.2-2

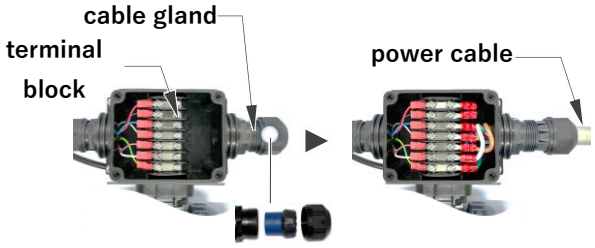


Figure 6.2-3

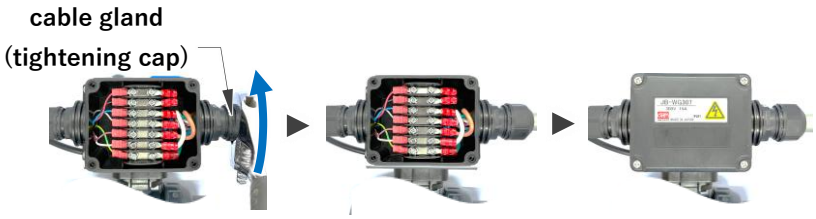


Figure 6.2-4

Table 6.2-1 Tightening cap Tightening torque

cable dia.	Tightening torque
Φ8 mm	1.3 Nm
Φ9 mm	1.6 Nm
Φ11 mm	1.6 Nm
Φ13 mm	1.0 Nm
Φ15 mm	0.7 Nm

7. Test Run Procedure

⚠Warning	
Prohibited	**Serious injury may result.** ► Do not apply high voltage without considering the insulation resistance and withstand voltage specifications of the actuator. ► Never touch moving parts (valve and actuator) during operation.
Mandatory	**Electric shock or injury may result.** ► Always perform a safety check on machine tools and power tools before use. ► Wear appropriate protective equipment according to the work being performed.

⚠ Caution	
Prohibited	**Electric shock or injury may result.** ► Do not open the actuator cover. ► Do not perform manual operation with the power on. ► Do not perform electric operation with the hex wrench inserted in the operating shaft. **The actuator may malfunction.** ► Do not turn the manual operation further than necessary from the fully open and fully closed positions.
Mandatory	**Electric shock or injury may result.** ► Ensure that hands are free of moisture and oil during work. **The actuator may fail or malfunction.** ► If you notice an unusual odor, heat generation, or smoke, immediately turn off the power supply. If any abnormality is found, be sure to contact the dealer where you purchased the product or us for inspection. ► This product uses a switch mode power supply. If there is concern about the effects of electromagnetic noise, be sure to check in advance that peripheral devices do not malfunction.

7.1. manual operation

Things to prepare	▶ Hex wrench *For size, see ""**4.4 Actuator**"".

Procedure

1） Getting Ready

Shut off the power to the actuator and remove the cap from the operating shaft (**Figure 7.1-1**).

2） manual operation

[For closing operation]

Insert the hex wrench into the operating shaft. Confirm that the indicator is "solid yellow", turn the hex wrench clockwise, and stop turning when the indicator reaches "solid red" (**Figure 7.1-2**).

*Do not turn the hex wrench counterclockwise when the indicator is in the "solid yellow" state.

[For opening operation]

Confirm that the indicator is "solid red", turn the hex wrench counterclockwise, and stop turning when the indicator reaches "solid yellow" (**Figure 7.1-3**).

*Do not turn the hex wrench clockwise when the indicator is in the "solid red" state.

3） End of carrier sense

Remove the hex wrench from the operating shaft and attach the cap to the operating shaft (**Figure 7.1-4**).

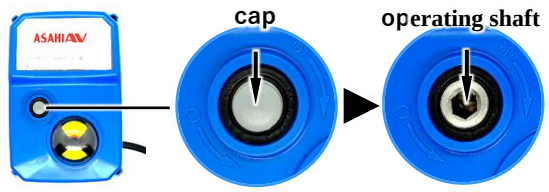


Figure 7.1-1

Figure 7.1-2

Figure 7.1-3

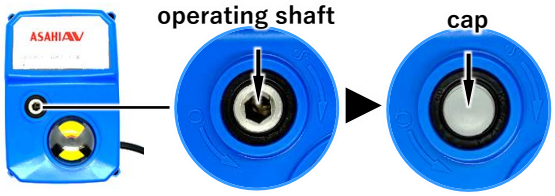


Figure 7.1-4

7.2. to control the current

Procedure
1） **to control the current** **[For closing control]** ❶Confirm that the actuator indicator is "solid yellow". ❷Supply closing power (power between blue and red of the pre-cable) from the distribution panel to the actuator. ❸After time has elapsed, confirm that the actuator indicator automatically stops at "solid red" (**Figure 7.2-1**). **[For opening control]** ❶Confirm that the actuator indicator is "solid red". ❷Supply opening power (power between blue and black of the pre-cable) from the distribution panel to the actuator. ❸After time has elapsed, confirm that the actuator indicator automatically stops at "solid yellow" (**Figure 7.2-2**). 2） **End of carrier sense** Stop the power supply to the actuator and end the electric operation.

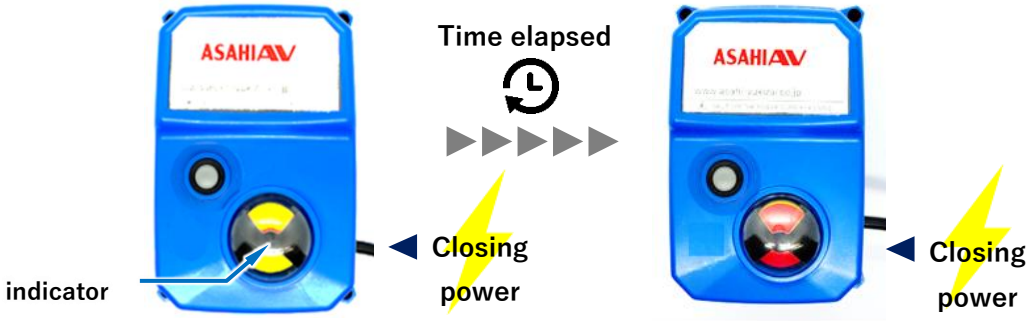


Figure 7.2-1 Closing control

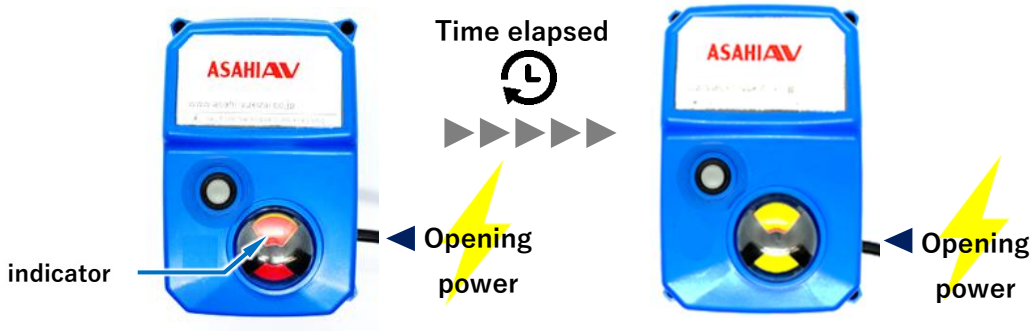


Figure 7.2-2 Opening control

7.3. Water flow test

Procedure	
1)	Flow fluid through the piping.
2)	Supply power to the actuator and perform opening control or closing control.
3)	Confirm that there is no internal leakage (seat leakage) or external leakage.
4)	Fully open or fully close and turn off the power.
5)	If leakage occurs, see ""**12. Causes of Problems and Remedial Measures**"".

8. how to improve internal leakage (seat leakage)

If internal leakage (seat leakage) occurs when the valve is fully closed, re-tightening the carrier may improve the seat leakage. If the seat leakage does not improve even after re-tightening the carrier, replace the valve according to ""**9. Disassembly/Assembly Procedure for Parts Replacement**"".

⚠Warning	
Mandatory	**Serious injury may result.** ► Some fluid will remain in the valve, so wear protective gloves and protective glasses.

⚠ Caution	
Prohibited	**The valve may be damaged, impaired, or leak.** ► Do not over-tighten the carrier. ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.

Things to prepare	▶ Belt wrench ▶ Protective gloves ▶ Protective glasses ▶ Manual valve handle (sold separately) ▶ Base plate removal jig (sold separately. See photo on right)

Procedure

1) Reduce the pressure in the pipe to zero and completely drain the fluid.
2) Remove the actuator according to the removal procedure in ""**10. Actuator Attachment/Detachment Procedure**"" (**Figure 8-1**).
3) Remove the adapter attached to the valve stem.
4) Loosen the left and right union nuts with a belt wrench (**Figure 8-2**).
5) Remove the body section from the piping.
6) Use the manual valve handle to half-open the valve and remove any fluid remaining in the valve, then fully close the valve and remove the manual valve handle.
7) Remove the O-ring (A) attached to the carrier.
8) Fit the convex part on the top of the manual valve handle into the concave part of the carrier.
9) Rotate the manual valve handle to turn the carrier and adjust the surface pressure.
10) Attach the manual valve handle to the stem and confirm that manual operation is smooth.
11) Fully close the valve with the manual valve handle, then remove the manual valve handle.
12) Attach the O-ring (A) to the carrier.
13) Return the body section to the piping without misalignment.
14) Screw the left and right union nuts into the body by hand until tight.
15) Screw in the union nuts 1/4 to 1/2 turn with a belt wrench, taking care not to damage them.
16) Attach the adapter to the valve stem.
17) Attach the actuator section to the valve according to the installation procedure in ""**10. Actuator Attachment/Detachment Procedure**"".
18) Flow fluid through the piping, turn on the power, and open and close the valve several times by electric operation to confirm smooth operation and no external leakage.
19) Fully close the valve by electric operation and confirm that there is no seat leakage.

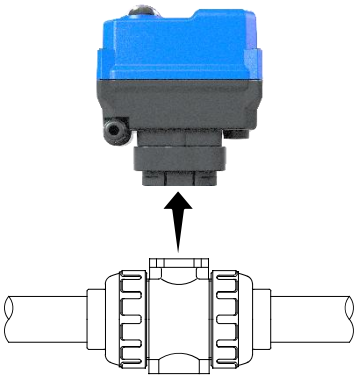


Figure 8-1

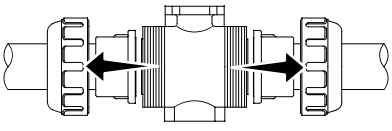


Figure 8-2

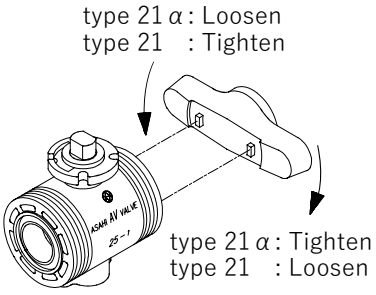


Figure 8-3

9. Disassembly/Assembly Procedure for Parts Replacement

If internal leakage (seat leakage) or external leakage occurs when the valve is fully closed, replacing parts may improve the leakage. If the leakage does not improve even after replacing parts, remove and replace the valve according to this section.

⚠Warning	
Mandatory	**Serious injury may result.** ► Some fluid will remain in the valve, so wear protective gloves and protective glasses.

⚠ Caution	
Prohibited	**The valve may be damaged, impaired, or leak.** ► Do not over-tighten the carrier. ► Do not overtighten the union nut. ► Do not use a pipe wrench when tightening the union nut.

9.1. Disassembly

Things to prepare	▶ Belt wrench ▶ Manual valve handle (sold separately) ▶ Protective gloves ▶ Protective glasses ▶ Base plate removal jig (sold separately. See photo on right)

Procedure

1) Reduce the pressure in the piping to zero and completely drain the fluid.
2) Remove the actuator according to the removal procedure in ""**10. Actuator Attachment/Detachment Procedure**"" (**Figure 9.1-1**).
3) For products with a shaft adapter attached to the valve stem, also remove the shaft adapter.
4) Loosen the left and right union nuts with a belt wrench (Refer to: **Figure 9.1-2**).
5) Remove the body section from the piping.
6) Attach the manual valve handle to the stem, half-open the valve to remove any fluid remaining in the valve, then fully close the valve and remove the manual valve handle.
7) Remove the O-rings (A) attached to both ends of the body section.
8) Fit the convex part on the top of the manual valve handle into the concave part of the carrier.
9) Rotate the manual valve handle to remove the carrier. (Refer to: **Figure 9.1-3**)
10) Remove the seat, O-ring (B), and O-ring (C) attached to the carrier without damaging them.
11) Push out the ball by hand.
12) Push out the stem from the top flange side toward the body side.
13) Remove the seat and O-ring (C) from the body without damaging them.
14) Remove the O-ring (D) and O-ring (E) from the stem without damaging them.

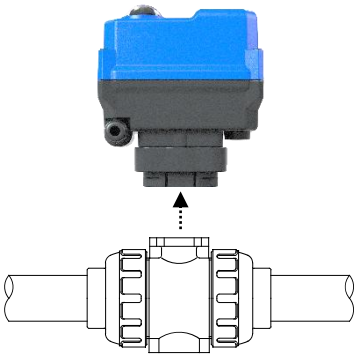


Figure 9.1-1

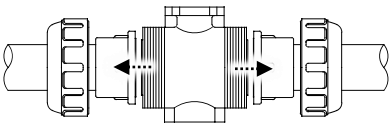


Figure 9.1-2

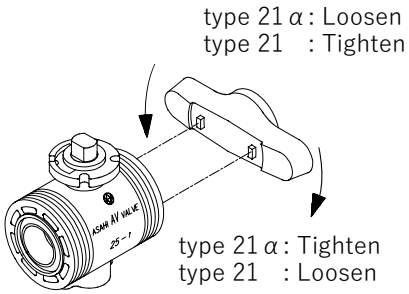


Figure 9.1-3

9.2. Assembling

Procedure
1) Perform the procedure in reverse order starting from **Step 14** of Section **9.1 Disassembly**. ※The seat has a front and back side. Check the front and back when installing (**Figure 9.2-1**). When attaching the actuator to the valve, confirm that the actuator opening indicator and the stem orientation match, and attach the actuator to the valve according to the <Installation> **procedure** in ""**10. Actuator Attachment/Detachment Procedure**"".

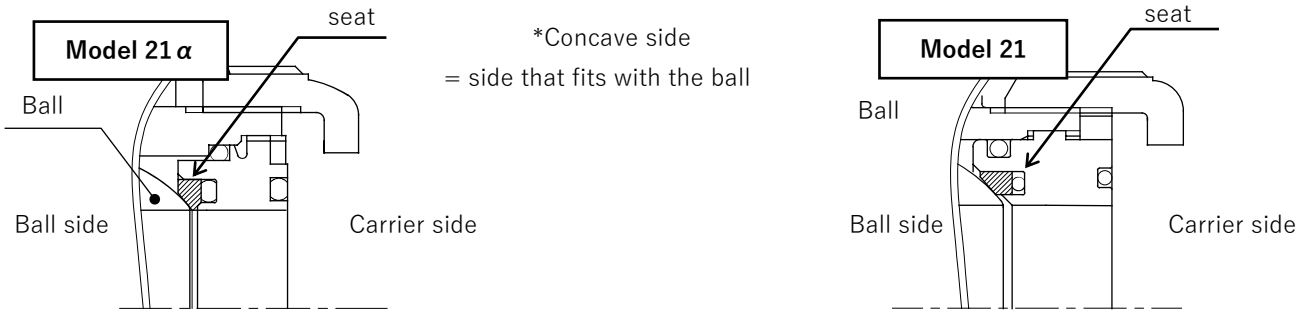
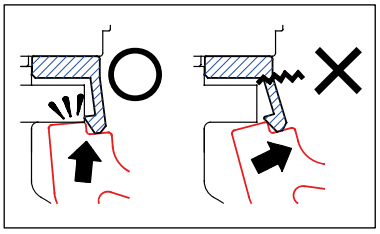
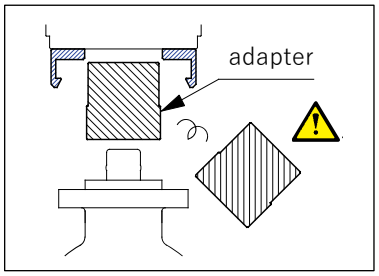


Figure 9.2-1

10. Actuator Attachment/Detachment Procedure

10.1. Nominal size 15-50mm

⚠ Caution	
Prohibited	**The base plate may be damaged.** ▶ When removing the base plate from the valve, do not apply excessive force to the base plate removal jig to forcibly spread the claw parts. ▶ Do not repeatedly attach and detach the base plate excessively. ▶ Do not place an excessive load on the piping or valve when attaching or removing the base plate. 
Mandatory	**The base plate may be damaged.** ▶ Always use the base plate removal jig when removing the actuator. **Injury may result.** ▶ An adapter is installed between the valve and the actuator. Be careful of the adapter popping out or falling when removing the base plate from the valve. 

10.1.1. Removal

Things to prepare	▶ Removal jig (sold separately: see photo on the right) 

Procedure
1) Set the pressure inside the piping to zero.
2) Control the actuator to open or close, and turn off the power.
3) Press the tip of the removal tool against the tip of the base plate claw between the actuator and valve, move the removal jig to push up the base plate claw from below using the valve body as a fulcrum, and release the claw engagement (**Figure 10.1.1-1**). ・For valve nominal size 15, 20 mm, position the removal tool with the ""13-20"" mark facing downward. ・For valve nominal size 25-50 mm, position the removal tool with the ""25-50"" mark facing downward. ※If the removal jig is used in an improper direction, excessive force will be applied to the base plate claw, causing problems such as claw breakage.
4) Perform step 3) on the base plate claw on the opposite side as well, and confirm that both claws are disengaged (**Figure 10.1.1-2**).
5) Lift the actuator vertically and remove it from the valve (**Figure 10.1.1-3**).

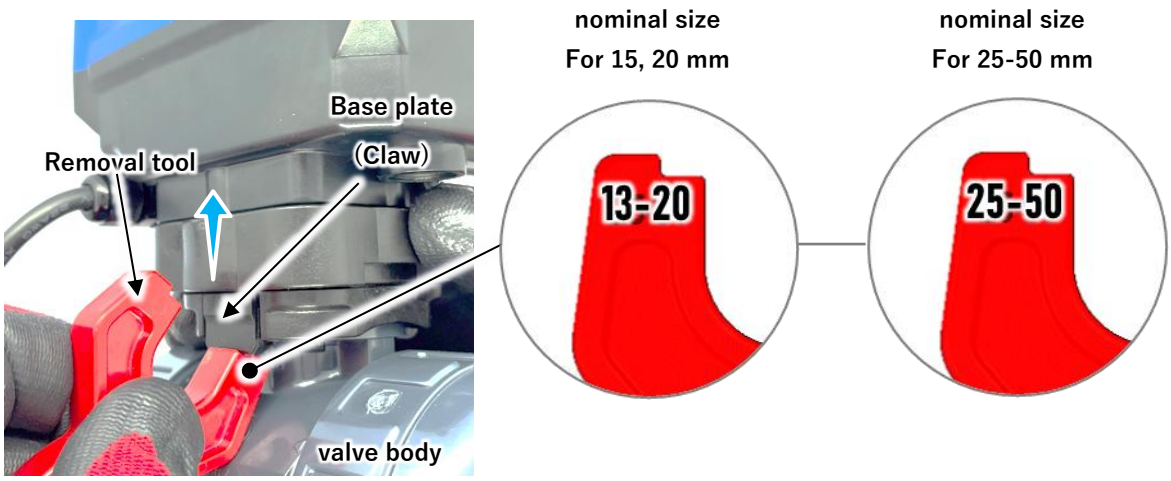


Figure 10.1.1-1

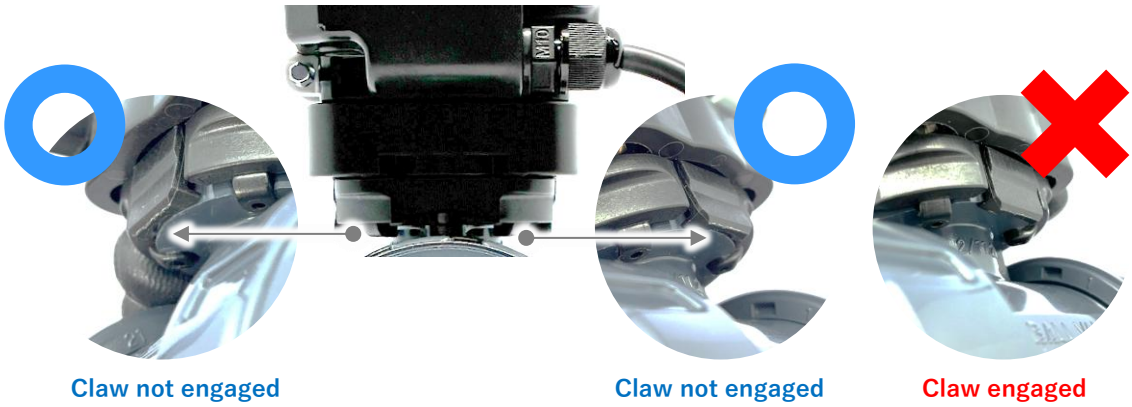


Figure 10.1.1-2

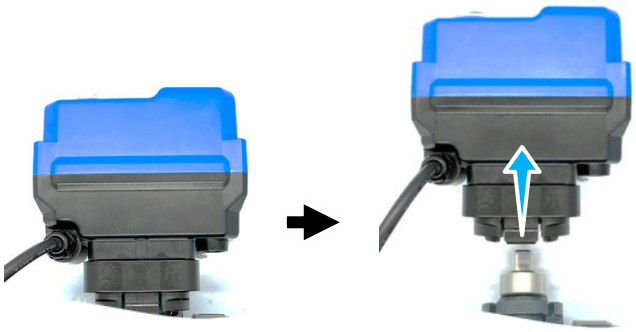


Figure 10.1.1-3

10.1.2. Installation

Procedure
1) Attach the actuator to the valve. Verify the following (**Figure 10.1.2-1**). ・The ""Pre-cable"" side of the actuator and the ""AV mark"" side of the valve are on the same side. ・The adapter is attached to the valve stem. ※Push in until both claws click into place. ※Confirm that both claws are fully engaged (**Figure 10.1.2-2**).

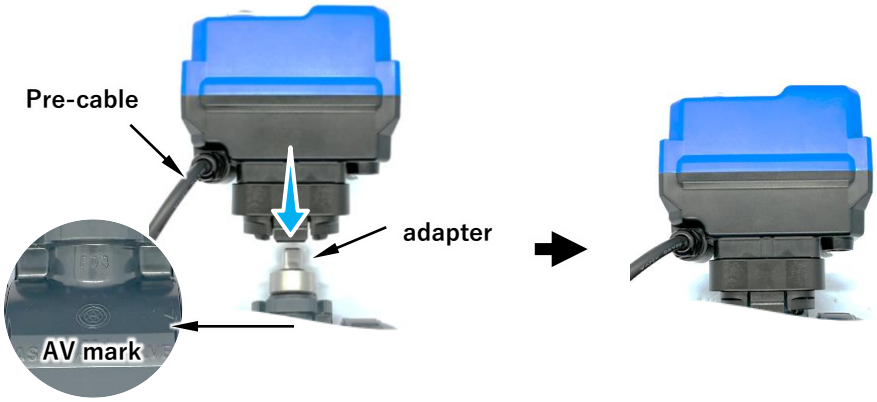


Figure 10.1.2-1

Figure 10.1.2-2

10.2. nominal size 65-100 mm

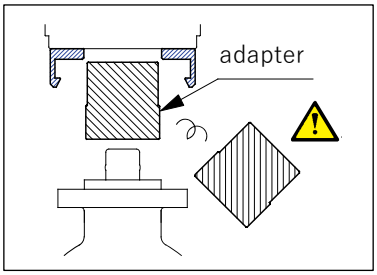
⚠ Caution

Mandatory

Injury may result.

▶ An adapter is installed between the valve and the actuator. Be careful of the adapter popping out or falling.

▶ The actuator is heavy, so be careful not to drop it.



10.2.1. Removal

Things to prepare	▶ Hex wrench (5mm)

Procedure

1) Set the pressure inside the piping to zero.
2) Fully open or fully close the valve and turn off the actuator power.
3) Remove the rubber caps (2 locations) from the bolt fixing holes of the cover plate on the AV mark side of the valve.
   Loosen the cover plate bolts (2 locations) by turning them counterclockwise with a hex wrench. (**Figure 10.2.1-1**)
4) Remove the cover plate by sliding it horizontally. (**Figure 10.2.1-2**)
5) Lift the actuator and remove it from the valve. (**Figure 10.2.1-3**)

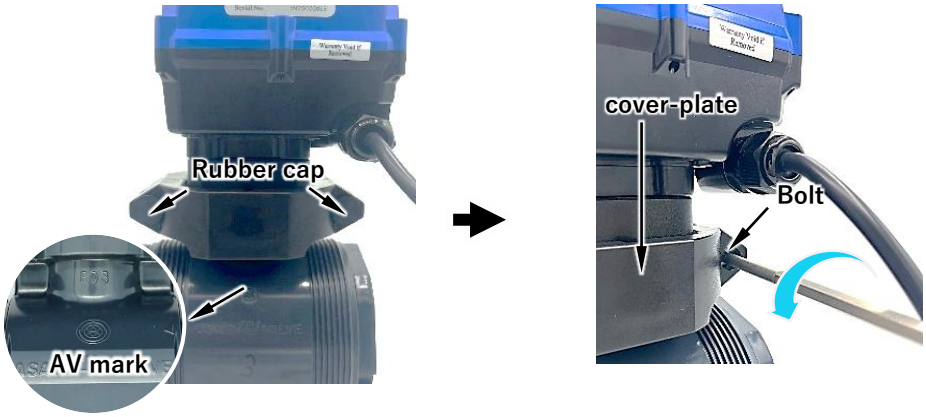


Figure 10.2.1-1

Figure 10.2.1-2

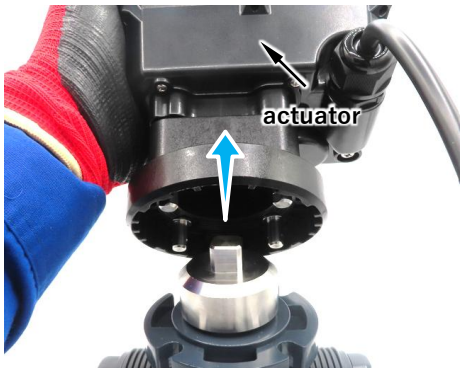


Figure 10.2.1-3

10.2.2. Installation

Procedure
1) Attach the actuator to the valve. Verify the following (**Figure 10.2.2-1**). ・The pre-cable side of the actuator and the AV mark side of the valve are on the same side. ・The adapter is attached to the valve.
2) Confirm that the valve top flange and base plate are engaged (4 locations) (**Figure 10.2.2-2**).
3) Attach the cover plate (**Figure 10.2.2-3**).
4) Insert the bolts into the bolt fixing holes of the cover plate and tighten the bolts by turning them clockwise with a hex wrench. (Recommended tightening torque: 5.2 N-m). Attach rubber caps to the bolt fixing sections of the cover plate (**Figure 10.2.2-4**).

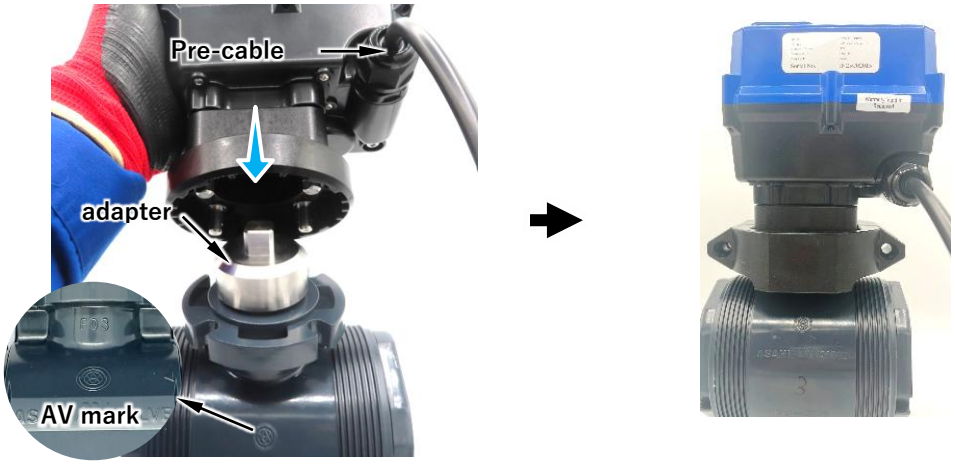
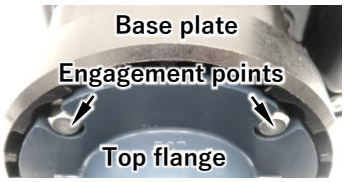


Figure 10.2.2-1

[Nominal size 65, 80 mm]



[Nominal size 100 mm]

Figure 10.2.2-2

Figure 10.2.2-3

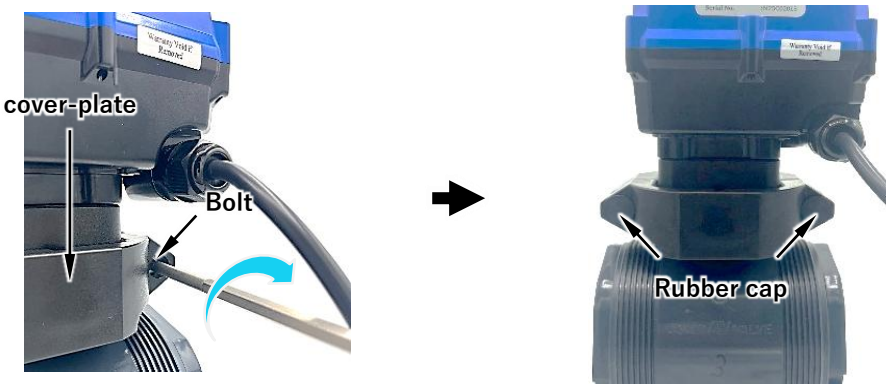


Figure 10.2.2-4

11. Inspection items

⚠ Caution	
Mandatory	**Fluid may leak from the valve, or the actuator may malfunction.** ► To maintain normal conditions and ensure long-term use, perform maintenance approximately every 3 to 6 months. Pay particular attention to long-term storage, shutdown periods, and temperature changes or aging during use. **Electric shock or injury may result.** ► When removing the valve from the piping to replace the valve or parts, completely drain the fluid from the piping before performing the work. ► When a malfunction is confirmed, refer to ""**12. Causes of Malfunctions and Corrective Actions**"" for troubleshooting.

11.1. Daily inspection

Inspection items and Inspection method	Judgment criteria	Inspection location	Corrective action
external leakage (Visual inspection)	Leakage None	[Flanged ends] Pipe flange connection	① Retighten piping bolts to the specified torque ② Remove the valve from the piping and retighten the piping bolts (Refer to: **5.1 Flanged ends**)
		[Socket ends] Adhesive bonding section	Remove the valve from the piping and redo the adhesive bonding (Refer to: **5.3 Socket ends (adhesive)**)
		[Threaded ends] Threaded connection	Remove the valve from the piping and redo the threaded connection (Refer to: **5.2 Threaded ends**)
		Valve top flange	Remove the valve from the piping and replace the valve or defective parts (Refer to:**9. Disassembly/Assembly Methods for Parts Replacement**)
		Valve union nut	・ Retighten the union nut ・ Remove the valve from the piping, check the O-ring and sealing surfaces, and replace defective parts (Refer to: **5. Piping Methods**)
		Entire valve surface	Remove the valve from the piping and replace the valve (Refer to:**9. Disassembly/Assembly Methods for Parts Replacement**)
Internal leakage (Visual inspection and measurement)	Leakage None	Leakage to the secondary side when the valve is fully closed	Remove the valve from the piping and replace the valve or defective parts (Refer to:**9. Disassembly/Assembly Methods for Parts Replacement**)
		Measurements from flow meters, pressure gauges, etc.	Remove the valve from the piping and replace the valve or defective parts (Refer to:**9. Disassembly/Assembly Methods for Parts Replacement**)
Abnormal noise (sound detection)	Abnormal noise None	Valve and actuator	Remove the valve from the piping and replace the valve or actuator (Refer to:**9. Disassembly/Assembly Methods for Parts Replacement**)
		Piping around the valve	Reconfirm the operating conditions (Refer to: **2. Safety Precautions**)
Abnormal odor *1) (Smell)	Abnormal odor None	Valve and actuator	Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

***1) Items that may lead to burnout or fire if abnormalities are present.**

11.2. Periodic inspection

● Inspection frequency guideline: 3 months

Inspection items and Inspection method	Judgment criteria	Inspection location	Corrective action for malfunctions
opening and closing Operating time (Measuring)	Error within ±1 second	Actuator indicator	confirm the power supply voltage (Refer to: Actuator nameplate)
			Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Vibration (Touch inspection)	Difference from other areas None	Valve and actuator	Reconfirm the operating conditions and eliminate the vibration source (Refer to: **2. Safety Precautions**)
			Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
		Piping around the valve	Reconfirm the operating conditions and eliminate the vibration source (Refer to: **2. Safety Precautions**)

● Inspection frequency guideline: 6 months

Inspection items and Inspection method	Judgment criteria	Inspection location	Corrective action for malfunctions
Manual handle Operability (feel)	Smoothly Rotates	Manual operation section	Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Bolts Looseness (Visual inspection, touch inspection)	Looseness None	[Flanged ends] For flange piping	Retighten piping bolts to the specified torque (Refer to: **5.1 Flanged ends**)
measuring of insulating resistance ***1)** (Measuring)	10MΩ GB or more Present	Actuator pre-cable	Replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Corrosion or rust ***1)** (Visual inspection)	Corrosion or Rust None	Product appearance	Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Product damage	No scratches, cracks, or deformation	Product appearance	Remove the valve from the piping and replace the valve or actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

***1) Items that may lead to burnout or fire if abnormalities are present.**

12. Causes of malfunctions and corrective actions

⚠ Caution	
Mandatory	**Electric shock or injury may result.** ▶ When a malfunction is confirmed, immediately stop use and take corrective action. ▶ When removing the valve from the piping to replace the valve or parts, completely drain the fluid from the piping before performing the work.

Malfunction	Predicted cause	Countermeasures/Corrective actions
During manual operation, the hex wrench does not turn (or cannot be turned)	Foreign matter is caught in the valve	Remove the valve from the piping, disassemble it, and remove the foreign matter (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Piping stress is applied to the valve	Remove the piping stress
	Valve torque has increased due to fluid effects (temperature, composition, pressure, etc.)	Reconfirm the operating conditions (Refer to: **2. Safety Precautions**)
Full open/close signal is not output	The limit switch inside the actuator is malfunctioning	Replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	The wiring between the actuator and the distribution panel is disconnected	Recheck the wiring condition
	The wiring between the actuator and the distribution board is incorrect	Recheck the wiring condition and correct the wiring (Reference: **4.5. Wiring Diagram**)
	The cable between the actuator and the distribution board is disconnected	Replace the cable
Unable to control electrically	No power is supplied to the actuator	Recheck the distribution board and supply power to the actuator
	The wiring between the actuator and the distribution panel is disconnected	Recheck the wiring condition
	The wiring between the actuator and the distribution board is incorrect	Recheck the wiring condition and correct the wiring (Reference: **4.5. Wiring Diagram**)
	The cable between the actuator and the distribution board is disconnected	Replace the cable
	Open and close signals are being energized simultaneously	Recheck the distribution board

Cause of Malfunction and Corrective Action (Continued)

Malfunction	Predicted cause	Countermeasures/Corrective actions
Unable to control electrically	The wiring has a short circuit	Recheck the wiring condition
	The power supply voltage to the actuator is low	Check the distribution board voltage with a tester and supply the correct power to the actuator
	The wiring length between the actuator and the distribution board is too long	Keep the wiring length between the actuator and the distribution board to 50 m or less (as a guideline)
	Foreign matter is caught in the valve	Remove the valve from the piping, disassemble it, and remove the foreign matter (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Piping stress is applied to the valve	Remove the piping stress
	Valve torque has increased due to fluid effects (temperature, composition, pressure, etc.)	Reconfirm the operating conditions (Refer to: **2. Safety Precautions**)
	Water or foreign matter has entered the actuator and caused a short circuit	Replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	The insulation resistance of the actuator has decreased	Check the insulation resistance value and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
Fluid leaks even when fully closed (internal leakage)	Fluid pressure is high	Use at or below the maximum allowable pressure (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	The carrier is loose	Remove the valve from the piping, tighten the carrier, and adjust the surface pressure (Reference: **8. Method for Improving Internal Leakage (Seat Leakage)**)
	The seat or ball has wear or scratches	Remove the valve from the piping and replace the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

Cause of Malfunction and Corrective Action (Continued)

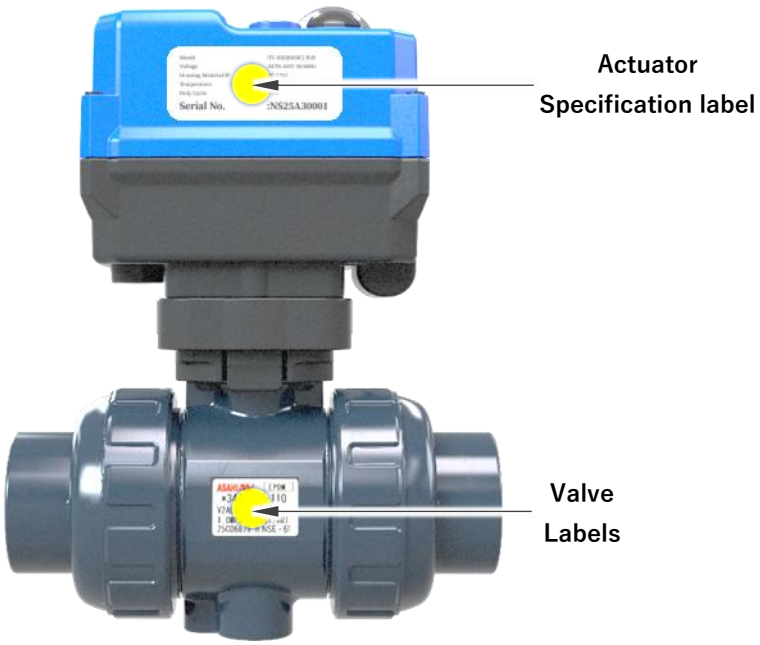
Malfunction	Predicted cause	Countermeasures/Corrective actions
Fluid leaks from the valve (external leakage)	Parts are missing	Remove the valve from the piping and install the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Foreign matter is caught in the valve	Remove the valve from the piping, disassemble it, and remove the foreign matter (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Piping stress is applied to the valve	Remove the piping stress
	The power to the actuator is turned OFF upon receiving the fully closed signal output	Do not turn OFF the power to the actuator upon receiving the fully closed signal output
	The union nut is loose	Retighten the union nut (Refer to: **5. Piping Methods**)
	The O-ring shows scratches, wear, deformation, dissolution, or deterioration	Immediately stop use, remove the valve from the piping, and replace the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	The sliding surface or fixed surface of the O-ring shows scratches or wear	Immediately stop use, remove the valve from the piping, and replace the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	The valve has cracks or damage	Immediately stop use, remove the valve from the piping, and replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
The actuator is operating but the valve is not opening or closing	The stem or ball is damaged	Immediately stop use, remove the valve from the piping, and replace the applicable parts, or replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
There is an unusual odor, heat generation, or smoke from the actuator	The actuator is malfunctioning	Immediately stop use, remove the valve from the piping, and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

Cause of Malfunction and Corrective Action (Continued)

Malfunction	Predicted cause	Countermeasures/Corrective actions
There is an unusual odor, heat generation, or smoke from the actuator	The wiring is incorrect	Immediately stop use, remove the valve from the piping, and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	Overcurrent is flowing to the actuator	Immediately stop use, remove the valve from the piping, and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
	The actuator is affected by lightning strike	Immediately stop use, remove the valve from the piping, and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
The actuator is corroded	Exposed to liquids such as chemicals	Immediately stop use, remove the valve from the piping, and replace the actuator (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)
The valve is corroded or deformed	Exposed to liquids such as chemicals	Immediately stop use, remove the valve from the piping, and replace the valve (Refer to: **9. Disassembly/Assembly Methods for Parts Replacement**)

13. How to Inquire About Malfunctions or Replacement

If the malfunction is not resolved after implementing countermeasures and corrective actions, or if parts replacement is required, check the specification label attached to the side of the actuator and the valve label attached to the side of the valve, and contact your nearest distributor or our sales office.



14. Disposal Method for Residual and Waste Materials

⚠Warning	
Mandatory	**Burning generates toxic gas.** ► When disposing of products or parts, follow the guidelines of your local authority and have a waste disposal specialist handle the disposal.

15. Contact Us

For inquiries about this product, please contact your nearest distributor, our sales office, or the ""Contact Us"" section on our website.

[INSTRUCTION MANUAL]
Ball Valve Type 21/Type 21α Electric actuated Type TC
15-100 mm

https://www.asahi-yukizai.co.jp/en/

Please note that the contents of this document are subject to change without notice. May 2026