

ACTIVAL[™] Modbus[™] Protocol Model (PN16 / EN-GJL-200)

■ Overview

ACTIVAL[™] Flow Measurement and Control Valve Model FVY5137J/FVY5147J/FVY5157J is a series of motorized two-way valves with flanged-end connection. DN15 to DN150 rotary valve and actuator are integrated in a single unit.

In combination with the functions of a control valve, Model FVY5137J/FVY5147J/FVY5157J measures and controls flow. Model FVY5137J/FVY5147J/FVY5157J thus enables to control temperature for air conditioning by controlling chilled/hot water volume and to measure chilled/hot water flow.

For such a high functionality, compact size and simple installation of Model FVY5137J/FVY5147J/FVY5157J are incomparable.

Four kinds of control signals are available to operate Model FVY5137J/FVY5147J/FVY5157J.

- 4-20 mA DC input:
Provides proportional control in combination with a DDC controller. (e.g., Inflex[™] GC Model WY5111, Model R35/R36)
- 2-10 V DC input:
Provides proportional control in combination with a DDC controller. (e.g., Inflex[™] AC Model WY5117)
- 0-10 V DC input:
Provides proportional control in combination with a DDC controller.
- Modbus[™] protocol:
Provides proportional control in combination with a DDC controller (e.g., Model WJ-1101).

Flow data stored in Model FVY5137J/FVY5147J/FVY5157J is retrieved via RS-485 communication (Modbus[™] protocol). The retrieved flow data is effective for energy-saving facility operation.

Note: * DDC: Direct Digital Control

■ Features

- Compact and lightweight:
Rotary valve actualizes small body and light weight.
- Valve and actuator integrated in a single unit.
- IP54 (dust-proof, splash-proof)
Can be installed in AHU.

Note: Waterproof connectors are required to assure IP54.



- Valve for chilled/hot water control applicable to large Cv value, high rangeability, and low leakage.
- Durable actuator with low power consumption.
- Flow control/position control operation selectable:
For flow control, flow characteristic is selectable (equal percentage or linear). For position control, flow characteristic is equal percentage.
- Model FVY5137J/FVY5147J/FVY5157J holds flow data effective for maintenance and energy-saving facility operation. The data is retrieved via RS-485 communication (Modbus[™] protocol).
- In combination with Display Panel (Model QY5010S1000) and the insertion-type pipe temperature sensor (Model TY7830) or the temperature sensor for pipe surface (Model TY7820), pressure, temperature, and flow can be displayed on the Display Panel.

Note: It is necessary to separately order the display panel, pipe-insertion type temperature sensor, and temperature sensor for pipe surface.

IMPORTANT:

- Do not use the data measured by Model FVY5137J/FVY5147J/FVY5157J for charging or dealing purposes.

Safety Precautions

Please read instructions carefully and use the product as specified in this manual. Be sure to keep this manual nearby for quick reference.

■ Restrictions on Use

This product was developed, designed, and manufactured for general air conditioning use.

Do not use the product in a situation where human life may be at risk or for nuclear applications in radiation controlled areas. If you wish to use the product in a radiation controlled area, please contact Azbil Corporation.

Particularly when the product is used in the following applications where safety is required, implementation of fail-safe design, redundant design, regular maintenance, etc., should be considered in order to use the product safely and reliably.

- Safety devices for protecting the human body
- Start/stop control devices for transportation machines
- Aeronautical/aerospace machines

For system design, application design, instructions for use, or product applications, please contact Azbil Corporation.

Azbil Corporation bears no responsibility for any result, or lack of result, deriving from the customer's use of the product.

■ Recommended Design Life

It is recommended that this product be used within the recommended design life.

The recommended design life is the period during which you can use the product safely and reliably based on the design specifications.

If the product is used beyond this period, its failure ratio may increase due to time-related deterioration of parts, etc.

The recommended design life during which the product can operate reliably with the lowest failure ratio and least deterioration over time is estimated scientifically based on acceleration tests, endurance tests, etc., taking into consideration the operating environment, conditions, and frequency of use as basic parameters.

The recommended design life of this product is shown in the following table.

The recommended design life assumes that maintenance, such as replacement of the limited life parts, is carried out properly.

Refer to the section on maintenance in this manual.

Product	Recommended design life
FVY51_7J00_ _	10 years
FVY51_7J01_ _	5 years

■ Warnings and Cautions



WARNING

Alerts users that improper handling may cause death or serious injury.



CAUTION

Alerts users that improper handling may cause minor injury or material loss.

■ Signs

	Notifies users that specific actions are prohibited to prevent possible danger. The symbol inside  graphically indicates the prohibited action. (For example, the sign on the left notifies that disassembly is prohibited.)
	Instructs users to carry out a specific obligatory action to prevent possible danger. The symbol inside  graphically indicates the actual action to be carried out. (For example, the sign on the left indicates general instructions.)
 WARNING	
	When handling or transporting any heavy product (more than 18 kg), carefully move the product with a handtruck or the like, or with 2 or more people. Careless lifting or accidental dropping of the product may result in injury or product damage.
 CAUTION	
	Install, wire, and use this product under the conditions specified by this manual. Failure to do so may cause fire or device failure.
	When installing this product, hold it in the proper position and securely fasten it to the pipes. Excessive tightening or improper installation position may damage the valve.
	After installation, make sure no fluid leaks from the valve-pipe connections. Improper piping may cause fluid leakage outside of the valve.
	Do not put a load or weight on this product. Doing so may damage the product.
	Do not freeze this product. Doing so may damage the valve body and cause leakage.
	Installation and wiring of the actuator must be performed by personnel qualified to do instrumentation and electrical work. Mistakes in installation or wiring may cause fire or electric shock.
	Provide a circuit protector (e.g., a fuse or circuit breaker) for the power source. Failure to do so may cause a short circuit leading to fire or device failure.
	All wiring must comply with applicable codes and ordinances. Otherwise there is a danger of fire.
	Before wiring or maintenance, be sure to turn off the power to this product. Failure to do so may result in electric shock or device failure.
	After wiring or maintenance, be sure to reattach the cover. Failure to do so may result in electric shock.
	For wiring, strip the insulation from cables as specified in this manual. If the length of exposed wire is longer than specified, it may cause electric shock or short circuit between adjacent terminals. If it is too short, it may not make proper contact.
	Use crimp terminals with insulation for connections to the product terminals. Failure to do so may cause a short circuit leading to fire or device failure.
	Do not touch the moving parts of this product. Doing so may result in injury.
	Do not carelessly touch this product when it is used to control hot water. Doing so may result in burns, because the product reaches a high temperature.
	Tighten the terminal screws with the specified torque. Insufficient tightening of the terminal screws may cause fire or overheating.

■ System Configuraiton

● Connection example of Modbus™ Protocol

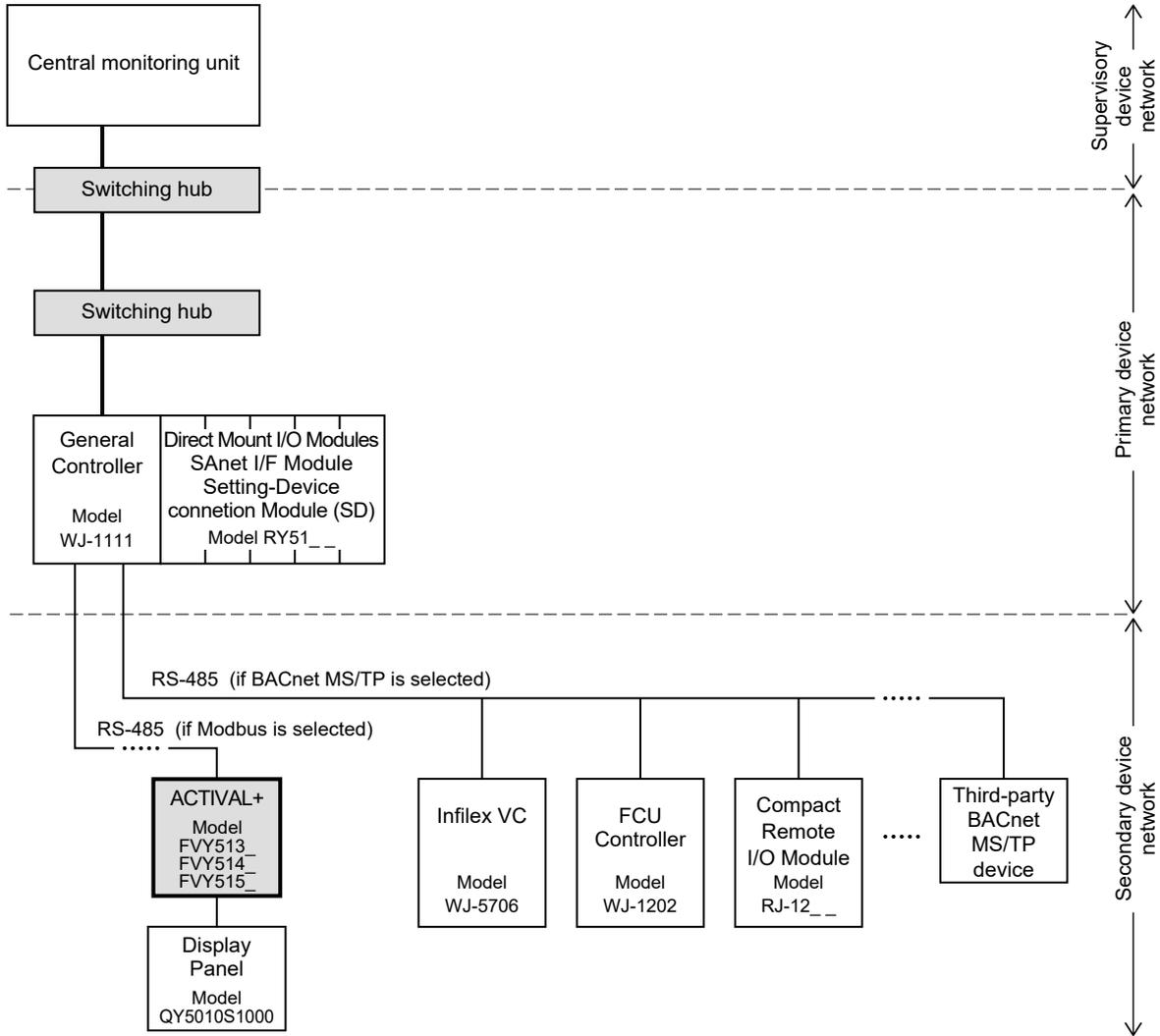


Figure 1. System configuration example: Modbus™ Protocol

■ Model Numbers

Base model number	Actuator control signal	Valve rating/material	Actuator type	–	Valve size/Cv value	Description
FVY51						Flow measurement and control valve
	3					4-20 mA DC input, pulse output, RS-485 communication (Modbus™ protocol)
	4					2-10 V DC input, pulse output, RS-485 communication (Modbus™ protocol)
	5					0-10 V DC input, pulse output, RS-485 communication (Modbus™ protocol)
		7				PN16 / EN-GJL-200 for chilled/hot water
			J			IEC IP54 (dust-proof and splash-proof) protected and standard torque type actuator with terminal block
				0		Fixed
					011	DN15 (½") / 1.0 in Cv value
					012	DN15 (½") / 2.5 in Cv value
					013	DN15 (½") / 6.0 in Cv value
					021	DN25 (1") / 10 in Cv value
					022	DN25 (1") / 16 in Cv value
					041	DN40 (1½") / 25 in Cv value
					042	DN40 (1½") / 40 in Cv value
					051	DN50 (2") / 65 in Cv value
					061	DN65 (2½") / 95 in Cv value
					081	DN80 (3") / 125 in Cv value
					101	DN100 (4") / 145 in Cv value
					121	DN125 (5") / 234 in Cv value
					151	DN150 (6") / 350 in Cv value

● Parts ordered separately

Item	Part number	Description	Remarks
Waterproof connector	83104098-001	Applicable wire size: dia. 4–6 mm	If the cable gland with three ports is not used, this connector is used for the insertion-type temperature sensor for pipe.
	83104346-003	Applicable wire size: dia. 7–9 mm	
	83104346-004	Applicable wire size: dia. 9–11 mm	
	83104346-005	Applicable wire size: dia. 11–13 mm	
	83104346-012	Applicable wire size: dia. 6–8 mm	If the cable gland with three ports is used, this connector is used.
	83104346-013	Applicable wire size: dia. 7–9 mm	
	83104346-014	Applicable wire size: dia. 9–11 mm	
	83104346-015	Applicable wire size: dia. 11–13 mm	
Outdoor cover	DY3001A1017		If the product is used outdoors, this cover is used.
Cable gland with three ports	DY7000A1000	Do not use it outdoors. For the specifications of the cable gland with three ports, refer to AS-923E Specifications of Cable Gland with Three Ports.	
Display panel	QY5010S1000	Display for Model FVY513_, FVY514_, FVY515_	For the specifications of Display Panel, refer to AB-7043 Specifications/ Instructions of Display Panel.
Pipe-insertion type temperature sensor	TY783	For the specifications of the insertion type pipe temperature sensor, refer to AB-5429 Specifications/Instructions of Pipe Temperature Sensor.	
Temperature sensor for pipe surface	TY7820Z0P01	Length: 1.5 m	For the specifications of the pipe sensor, refer to AB-6923 Specifications/ Instructions of Temperature Sensor for Pipe Surface.
	TY7820Z0P05	Length: 5 m	
	TY7820Z0P10	Length: 10 m	
	TY7820Z0P30	Length: 30 m	
RS-485/analog output signal converter	RYY792C3001	Signal converter from RS-485 to 4–20 mA DC.	For the specifications of RS-485/analog output signal converter, refer to AB-7045 Specifications/Instructions of RS-485/ Analog Output Signal Converter.
RS-485 terminating resistor	83172137-001		120 Ω resistors (× 10 pcs)

■ Specifications

For weight, refer to the table shown in the section ■ Dimensions.

● Valve and actuator (as a single unit) specifications

Item		Specification	
Environmental conditions		Rated operating condition	Transport/storage conditions (packaged)
	Ambient temperature	-20 °C to 50 °C (Do not allow process fluid to freeze.)	-20 °C to 70 °C
	Ambient humidity	5 % RH to 95 % RH	
	Vibration	4.9 m/s ² (10 Hz to 150 Hz)	19.6 m/s ² (10 Hz to 150 Hz)
Installation locations		Indoor / outdoor (Outdoor cover (optional) is required outdoors. Avoid locations with salt pollution or atmosphere with corrosive gas.)	
Mounting orientation		Refer to ● "Mounting orientation."	
Manual operation		Available. Refer to ● "Manually opening/closing valve."	
Insulation resistance	Between terminals and case	5 MΩ or more / 50 V DC	
Withstand voltage	Between terminals and case	250 V AC / 1 min with leak current 5 mA or less	

● Valve specifications

Item	Specification			
Model	Two-way valve with flanged-end connection			
Body pressure rating	PN16 (Max. working pressure: 1.6 MPa)			
End connection	PN16 flanged-end, raised face flange (RF) (equivalent to ISO 7005-2:1988)			
Size, Cv, Close-off rating	Model number	Nominal size	Cv	Close-off ratings
	FVY5137J0011, FVY5147J0011, FVY5157J0011	DN15 (½")	1.0	1.0 MPa
	FVY5137J0012, FVY5147J0012, FVY5157J0012	DN15 (½")	2.5	1.0 MPa
	FVY5137J0013, FVY5147J0013, FVY5157J0013	DN15 (½")	6.0	1.0 MPa
	FVY5137J0021, FVY5147J0021, FVY5157J0021	DN25 (1")	10	1.0 MPa
	FVY5137J0022, FVY5147J0022, FVY5157J0022	DN25 (1")	16	1.0 MPa
	FVY5137J0041, FVY5147J0041, FVY5157J0041	DN40 (1½")	25	1.0 MPa
	FVY5137J0042, FVY5147J0042, FVY5157J0042	DN40 (1½")	40	1.0 MPa
	FVY5137J0051, FVY5147J0051, FVY5157J0051	DN50 (2")	65	1.0 MPa
	FVY5137J0061, FVY5147J0061, FVY5157J0061	DN65 (2½")	95	1.0 MPa
	FVY5137J0081, FVY5147J0081, FVY5157J0081	DN80 (3")	125	1.0 MPa
	FVY5137J0101, FVY5147J0101, FVY5157J0101	DN100 (4")	145	0.5 MPa
	FVY5137J0121, FVY5147J0121, FVY5157J0121	DN125 (5")	234	0.5 MPa
FVY5137J0151, FVY5147J0151, FVY5157J0151	DN150 (6")	350	0.4 MPa	
Applicable fluid	Chilled/hot water			
Allowable fluid temperature	0 °C to 80 °C (Non-freezing) * Frozen process fluid around the valve sensor may damage or may cause output error.			
Rangeability	100 : 1			
Flow characteristic	Equal percentage for DN15-DN80, modified linear for DN100-DN150 For flow control, flow characteristic is selectable between equal percentage and linear.			
Seat leakage	0.01 % of rated Cv value (0.0006 Cv or less for DN15 model)			
Materials	Body	Gray cast iron (EN-GJL-200 (EN 1561))		
	Plug, stem	Stainless steel		
	Seat ring	Heat-resistant PTFE		
	Gland packing	Inorganic fiber		
	Gasket	Expansion graphite sheet		
Paint	Gray			
Actuator to be combined	Integrated with the valve			

● Actuator specifications

Item		Specification
Power supply		24 V AC \pm 15 %, 50 Hz/60 Hz
Power consumption		8 VA
Timing		63 \pm 5 sec (50 Hz) / 53 \pm 5 sec (60 Hz)
Control signal	Model FVY5137J	4-20 mA DC input (Input impedance: 282 Ω)
	Model FVY5147J	2-10 V DC input (Input impedance: 500 k Ω)
	Model FVY5157J	0-10 V DC input (Input impedance: 500 k Ω)
DI*1(Cooling/heating switch signal)	Input type	Potential free (dry) contact input
	Voltage, current	12 V DC, 5 mA
Pulse output*2 (Totalized energy output Totalized flow output)	Output type	Open collector output
	Contact rating	30 V DC, Max. 60 mA
	Pulse rate*3	3.4 Hz or lower
Temperature sensor input*4		Pt100 RTD, 3-wire
Communication (Modbus™ RTU)*5	Transmission system	RS-485
	Transmission speed	4800 bps
	Connection	Multi-drop (1 to 31 max.)
	Transmission distance	Max. 1200 m
Communication (Display Panel)	Transmission system	AP-bus (RS-485 communication)
	Transmission speed	4800 bps
	Transmission distance	Max. 50 m
Materials	Case	Die cast aluminum
	Top cover, terminal cover	Polycarbonate resin
	Yoke	Steel plate (bright chromate finish)
Position indication		Pointer of the actuator shows the position (0 % to 100 %). Position and flow can be indicated on the optional Display Panel.
Position for shipment		100 % (fully open) preset at factory.
Enclosure rating		IEC IP54 (dust-proof and splash-proof)
Wire connection	Power, control signal, DI, pulse output	M3.5 screw terminal connection (Recommended Tightening torque: 0.8 - 1.0 N•m)
	Temperature sensor (Pt100 input)	6-pin (3-pin \times 2) connector
	RS-485 communication	6-pin (3-pin \times 2) connector
	Display Panel	4-pin connector
Operation status indicator LED		1 red LED

(Note) *1 Heating and cooling modes are switched over by DI (open/closed contact). Heating and cooling modes are also switched over by setting the Display Panel (Model QY5010S1000). Refer to **AB-7044 Instruction Manual of ACTIVAL +™ Modbus™ Protocol / Standalone Model** for details.

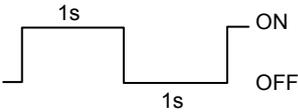
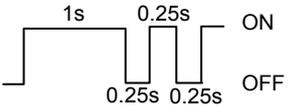
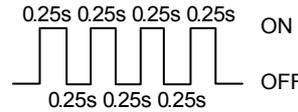
*2 Totalized energy or totalized pulse rate for the pulse output is selectable by setting the Display Panel (Model QY5010S1000). Refer to **AB-7044 Instruction Manual of ACTIVAL +™ Modbus™ Protocol / Standalone Model** for details.

*3 Pulse rate is set with the Display Panel (Model QY5010S1000). Refer to **AB-7044 Instruction Manual of ACTIVAL +™ Modbus™ Protocol / Standalone Model** for details.

*4 In combination with 2 temperature sensors (Pt100 RTD, 3-wired), Model FVY5137J/FVY5147J/FVY5157J is applicable to simplified energy calculation. Refer to **AB-7044 Instruction Manual of ACTIVAL +™ Modbus™ Protocol / Standalone Model** for details.

*5 Flow measuring data and device data are output in Modbus™ protocol via RS-485 communication. Besides, in combination with the RS-485/ analog output signal converter (Model RYY792C3001), flow measuring data is converted in 4-20 mA DC output signal. Refer to **AB-7044 Instruction Manual of ACTIVAL +™ Modbus™ Protocol Model** for details.

● LED indication

Operation status indicator LED		1 red LED
Status	LED indication	
Normal	Repetition of 1-second ON → 1-second OFF.	
Major alarm	Continuous ON.	
Minor alarm	Repetition of 1-second ON → 0.25-second OFF → 0.25-second ON → 0.25-second OFF.	
Communication error (and minor alarm)	Repetition of 0.25-second ON → 0.25-second OFF	

Operating status LED (red)

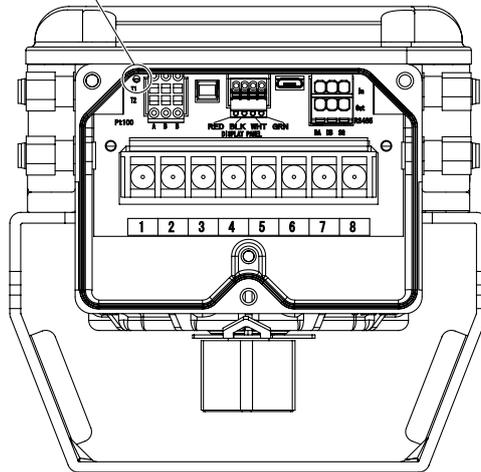


Figure 2. Operating status LED

● Measuring range and accuracy

IMPORTANT:

- Observe the following cautions in order to assure accuracy of flow measurement.
Use this product for chilled/hot water.
This product cannot be used for the fluid other than water. Brine, air, etc. cannot be used.
Do not loosen the retaining screws for the yoke and actuator.
Thermal insulation is required. For details, refer to ■ "Installation," ● "Heat insulating."
Control quality of water so that no rust or foreign substances collect inside the pipes.

(1/2)

Item		Specification			
Flow measuring	Setting range	Model number	Nominal size	Cv value	Max. set flow
		FVY5137J0011, FVY5147J0011, FVY5157J0011	DN15 (½")	1.0	10 l/min
		FVY5137J0012, FVY5147J0012, FVY5157J0012	DN15 (½")	2.5	25 l/min
		FVY5137J0013, FVY5147J0013, FVY5157J0013	DN15 (½")	6.0	60 l/min
		FVY5137J0021, FVY5147J0021, FVY5157J0021	DN25 (1")	10	100 l/min
		FVY5137J0022, FVY5147J0022, FVY5157J0022	DN25 (1")	16	160 l/min
		FVY5137J0041, FVY5147J0041, FVY5157J0041	DN40 (1½")	25	250 l/min
		FVY5137J0042, FVY5147J0042, FVY5157J0042	DN40 (1½")	40	400 l/min
		FVY5137J0051, FVY5147J0051, FVY5157J0051	DN50 (2")	65	650 l/min
		FVY5137J0061, FVY5147J0061, FVY5157J0061	DN65 (2½")	95	950 l/min
		FVY5137J0081, FVY5147J0081, FVY5157J0081	DN80 (3")	125	1250 l/min
		FVY5137J0101, FVY5147J0101, FVY5157J0101	DN100 (4")	145	1450 l/min
		FVY5137J0121, FVY5147J0121, FVY5157J0121	DN125 (5")	234	2340 l/min
FVY5137J0151, FVY5147J0151, FVY5157J0151	DN150 (6")	350	3500 l/min		
Measuring accuracy (Factory preset)	Chilled/hot water				

(Note) *1 The accuracy of flow measurement assumes the temperature range as 7–17 °C or 45–65 °C, pressure in pipe as 0.1–1.4 MPa, and differential pressure as 0.03–0.3 MPa.

If the actual conditions are out of the assumed ones, the accuracy may degrade.

It is differential pressure between valve inlet pressure (Pvin) and outlet pressure (Pvout).

*2 Flow measuring accuracy above may change depending on the conditions including valve positions, differential pressure, etc.

Item		Specification						
Valve sensor*3	Pressure measuring	Measuring range	0 MPa to 1.6 MPa*4					
		Accuracy of the displayed pressure	± 0.5 %FS (factory preset)*5					
	Temperature measuring	Measuring range	-10 °C to 100 °C					
		Accuracy	± 1.0 °C (factory preset) in the 0 °C to 80 °C measuring range*6 (within 0 °C to 80 °C measuring range, at -25 °C to 40 °C temperature difference between measuring temperature and ambient temperature)					
Temperature measuring of Pt100 input	Accuracy*7	Conversion accuracy: ± 0.4 °C (at 0 °C to 50 °C ambient temperature) ± 0.6 °C (at -20 °C to 0 °C ambient temperature) Error due to wiring length: ± 0.15 °C (15 ± 15 m) in the 0 °C to 80 °C measuring range						
Energy calculation*8 (with two temperature sensors (Pt100 input) connected)	Accuracy	Temperature difference b/w supply and return water	Flow measuring accuracy*9					
			± 5 % RD	± 7 % RD	± 10 % RD	± 1 % FS	± 3 % FS	
			ΔT = 5 °C	± 25 % RD	± 27 % RD	± 29 % RD	± 21 % FS	± 23 % FS
			ΔT = 10 °C	± 15 % RD	± 17 % RD	± 20 % RD	± 11 % FS	± 13 % FS
			ΔT = 15 °C	± 12 % RD	± 14 % RD	± 17 % RD	± 8 % FS	± 10 % FS

(Note) *3 Valve sensor is the temperature and pressure sensors mounted onto the valve (Model FVY5137J/FVY5147J/FVY5157J), measuring valve surface temperature and inlet and outlet flow pressure.

*4 When you test the withstand pressure of the valve sensor, up to 2.4 MPa pressure can be applied to the valve sensor.

*5 Accuracy of the displayed pressure was calibrated with the conditions, temperature of fluid: 7 °C to 65 °C, barometric pressure: 99 kPa. If the actual conditions are out of the estimated ones, the accuracy may degrade.

*6 For accurate measuring of flow temperature, thermal insulation is required. Refer to the subsection Heat insulation for applying thermal insulation.

*7 Overall accuracy is calculated based on the sensing accuracy of the temperature sensors connected, the conversion accuracy, and the error due to wiring length.

*8 Energy calculation accuracy is calculated from the flow measuring accuracy at 1 °C measuring error of the temperature difference.

*9 The flow measuring accuracy in the table corresponds to the data shown in the above flow measuring accuracy graph.

■ Wire Specifications

Item		Specification	Length* ¹	Connection
Power		600V PVC-insulated cable (IEC 60227-3) , 0.75 mm ² - 1.5 mm ² / JIS* ² CVV(control-use vinyl insulated vinyl sheathed cable) equivalent, stranded cable, 0.75 mm ² - 2.0 mm ² . May be jointly fastened.	–	M3.5 screw connection
Control signal, DI (Cooling/heating switch signal), pulse output		600V PVC-insulated cable (IEC 60227-3) , 0.75 mm ² / JIS* ² CVV(control-use vinyl insulated vinyl sheathed cable) equivalent, stranded cable, 0.75 mm ² - 1.25 mm ² / JCS* ³ CVV-S equivalent, shielded stranded cable, 0.75 mm ² - 1.25 mm ² / KPEV* ⁴ equivalent, stranded cable, 0.75 mm ² - 1.25mm ² . May be jointly fastened.	50 m	M3.5 screw connection
Display Panel		Flexible cable (Cabtire cable), 0.3 mm ² ×4-core, dia. 4.5 mm to dia. 6.0 mm / JIS* ² VCTF cable , 0.3 mm ² × 4-core , dia. 4.5 mm to dia. 6.0 mm.	50 m	4-pin connector
Temperature sensor (Pt100 input)	Temperature sensor for pipe surface (Pipe sensor)	3-core cable assembled with the sensor	30 m	6-pin (3-pin × 2) connector
	Insertion-type pipe temperature sensor	Flexible cable (Cabtire cable), 0.3 mm ² ×3-core , dia. 4.5mm to dia. 6.0 mm / JIS* ² VCTF cable , 0.3 mm ² × 3-core , dia. 4.5 mm to dia. 6.0 mm	30 m	
RS-485 communication		Equivalent to Belden 3106A / 3107A / 9842, shielded twisted-pair cable, 0.2 mm ² - 0.3 mm ² × 3-core	1200 m* ⁴	6-pin (3-pin × 2) connector

(Note) *1 Total length of the product - relay terminal block wiring and the relay terminal block - load (device in connection).

*2 JIS: Japanese Industrial Standards

*3 JCS: Japanese Electric Wire and Cable Makes' Association

*4 KPEV: Wire standard provided by Furukawa Electric Co., Ltd.

*5 Max. wiring length is 100 m for Model FVY5137J/FVY5147J/FVY5157J with the RS-485/analog output signal converter (Model RYY792C3001).

■ Display and Collection Data Type

Data type	Description
Flow data	<p>Following items are displayed on Display Panel (Model QY5010S1000): Actual flow, supply water temperature, return water temperature, valve inlet pressure, valve outlet pressure, actual flow (% in bar graph), actual valve position (% in bar graph)</p> <p>Following items are output in analog signal using RS-485/analog output signal converter (Model RYY792C3001): Control setting value, actual valve position, actual flow, set flow, supply water temperature, return water temperature, valve inlet pressure, valve outlet pressure, instantaneous energy</p> <p>Following items are retrieved via RS-485 communication (Modbus™ protocol): Control setting value, actual valve position, actual flow, set flow, supply water temperature, return water temperature, valve inlet pressure, valve outlet pressure, instantaneous energy, totalized flow, totalized energy, cool/heat status, point status*1</p>
Device data	<p>Following items are retrieved via RS-485 communication (Modbus™ protocol): Model number, date of manufacture, version of hardware, version of software, serial number, power-ON time, operating time, operating level, number of operations, number of reverse, range, device status*2</p>

IMPORTANT:

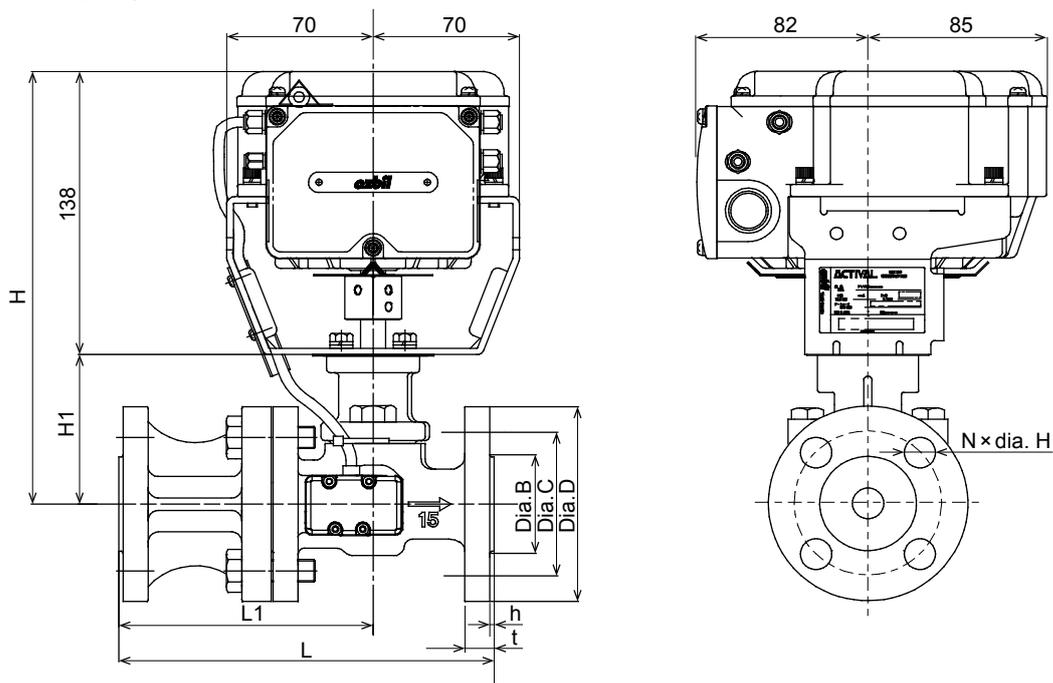
- Do not use the data measured by Model FVY5137J/FVY5147J/FVY5157J for charging or dealing purposes.

(Note) *1 Point status indicates an error of analog data. Refer to **AB-7044 Instruction Manual of ACTIVAL +™ Modbus™ Protocol / Standalone Model** for details.

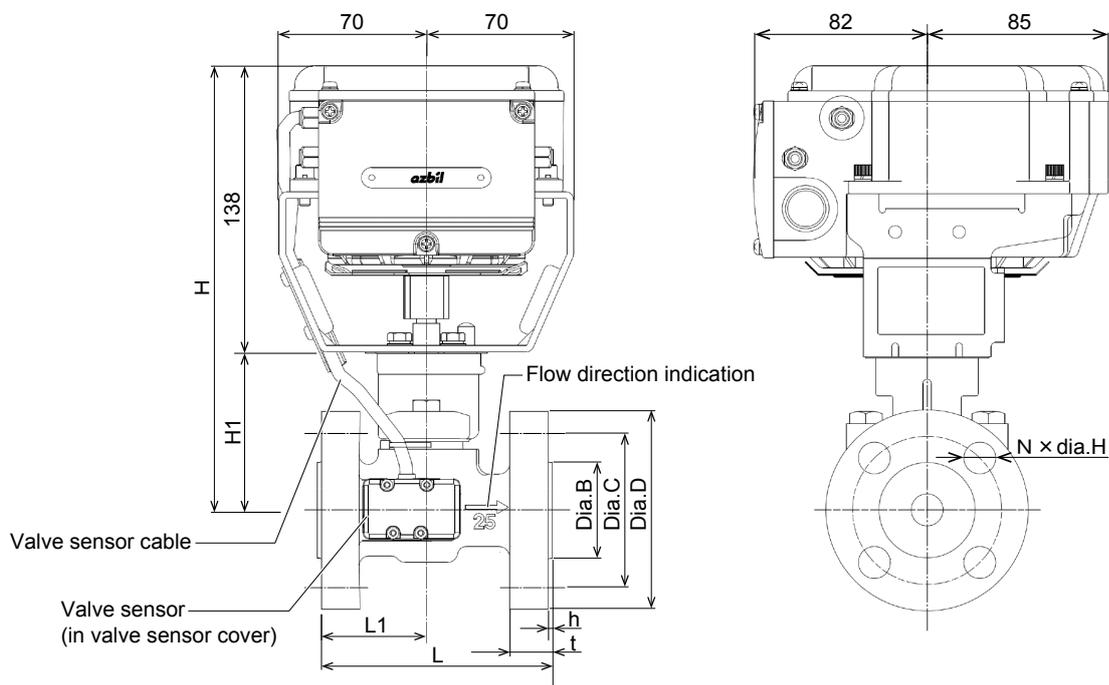
*2 Device status indicates the status of this product. Refer to **AB-7044 Instruction Manual of ACTIVAL +™ Modbus™ Protocol / Standalone Model** for details.

■ Dimensions

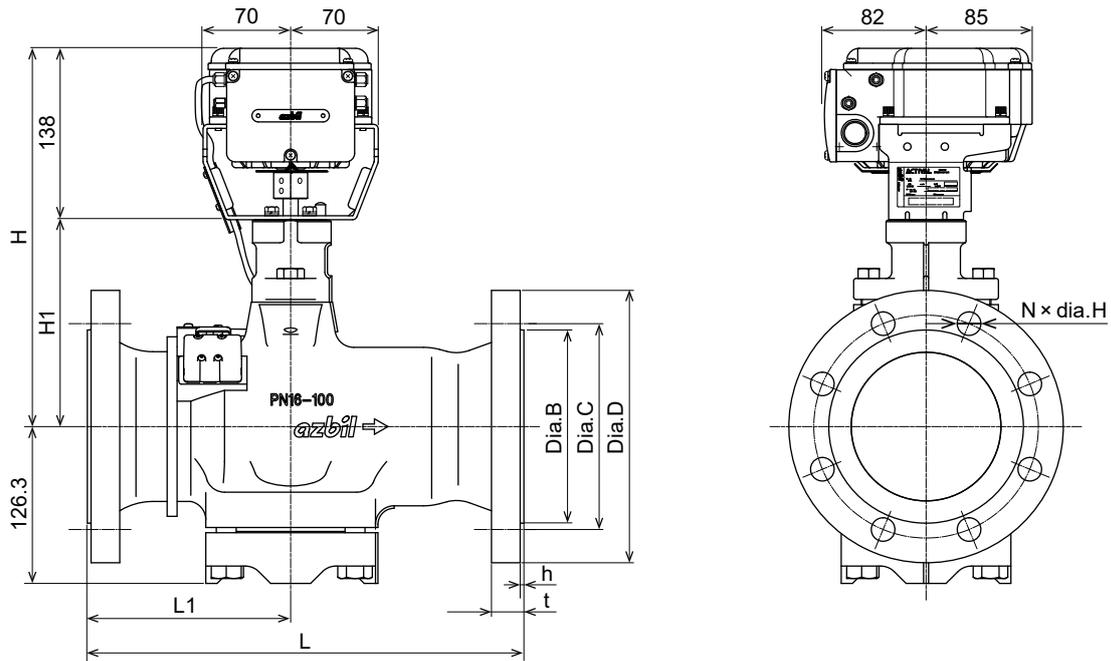
Model with DN15 valve



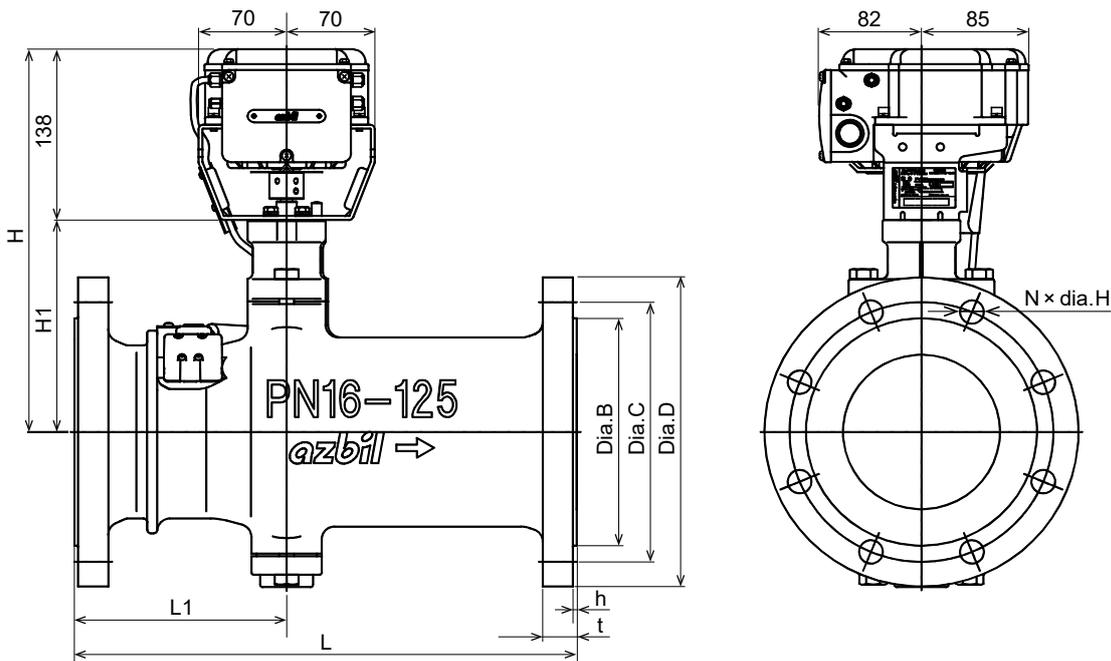
Model with DN25 to DN80 valve



Model with DN100 valve



Model with DN125 to DN150 valve



Model number	Valve size (DN)	L (mm)	L1 (mm)	H (mm)	H1 (mm)	Dia. D (mm)	Dia. C (mm)	t	Dia. B	h	Dia. H (mm)	N	Weight (kg)
FVY51X7 ISO PN16-EN-GJL-200	15	180	124	213	75	95	65	14	46	2	14	4	6.3
	25	127	60	228	90	115	85	16	65	3	14	4	6.6
	40	165	82.5	241	103	150	110	18	84	3	19	4	10
	50	178	89	245	107	165	125	20	99	3	19	4	11.5
	65	190	90	262	124	185	145	20	118	3	19	4	16
	80	203	100	263	125	200	160	22	132	3	19	8	18.5
	100	350	163	304.5	166.5	220	180	24	156	3	19	8	35
	125	400	169	309.5	171.5	250	210	26	184	3	19	8	39
150	480	212	318	180	285	240	26	211	3	23	8	51	

Figure 3. Dimensions (mm)

● Maintenance space

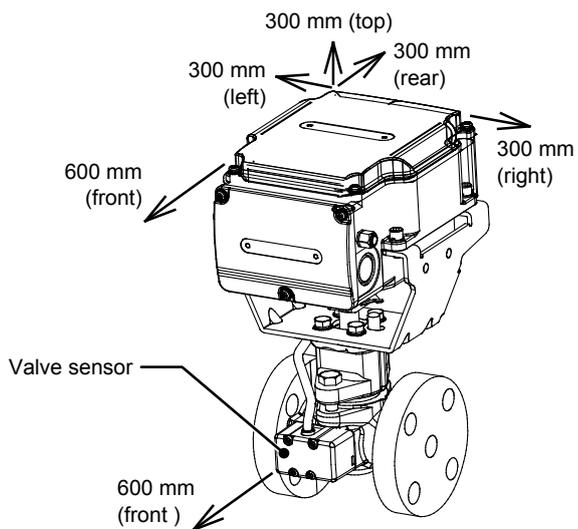
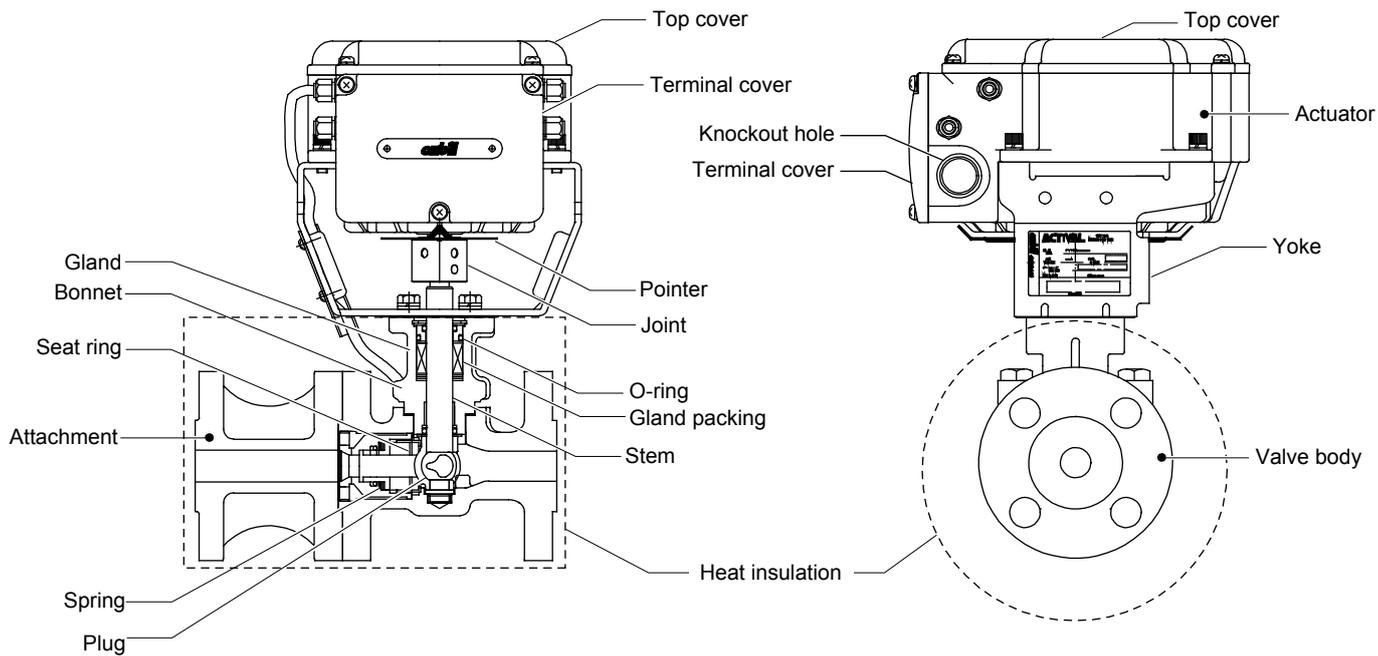


Figure 4. Clearance for maintenance

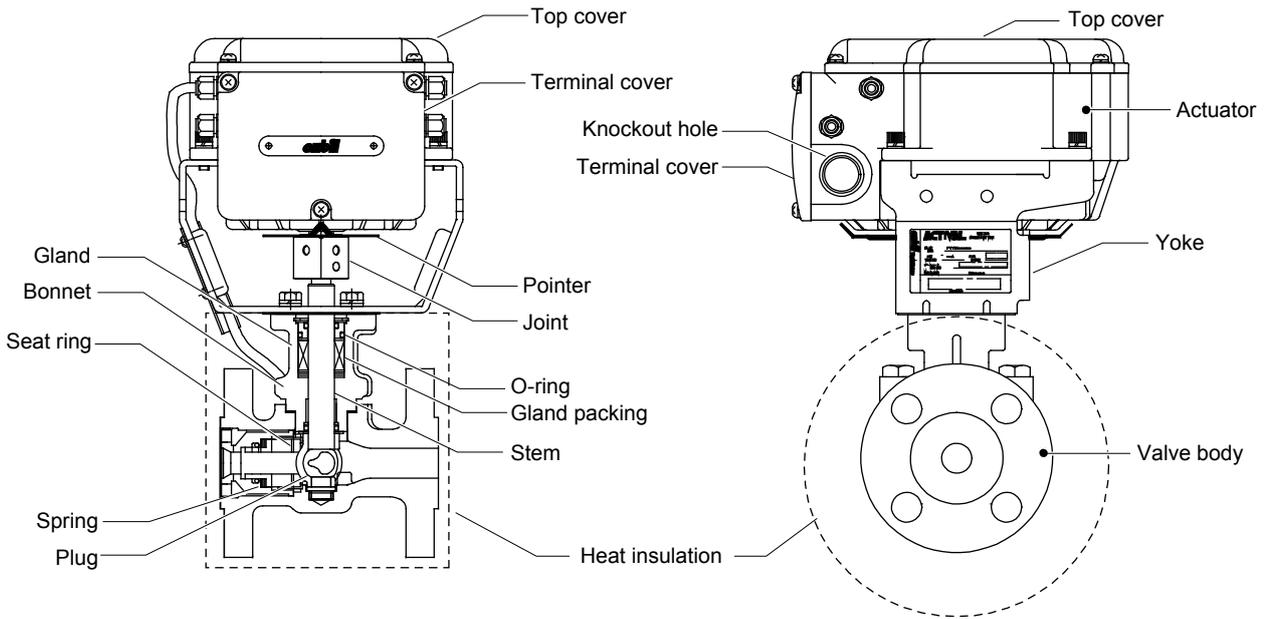
■ Parts Identification

● Valve details

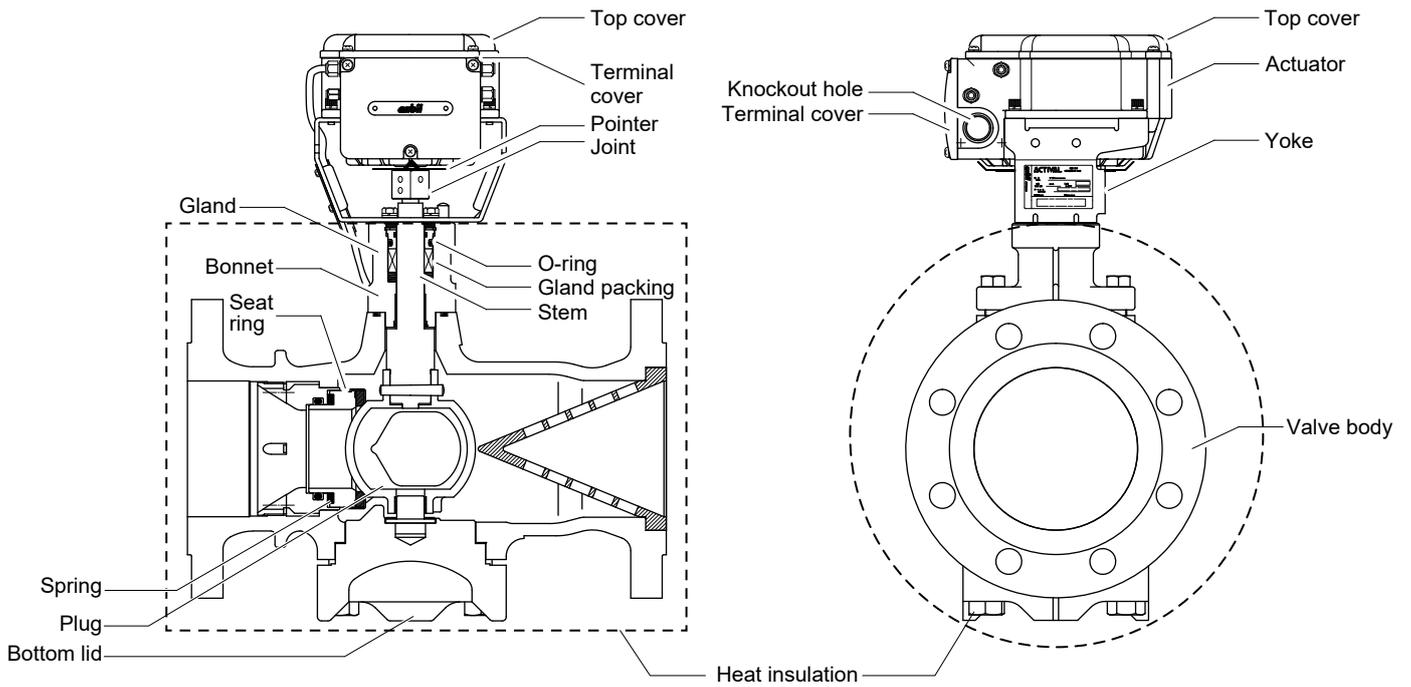
DN15 valve



DN25 to DN80 valve



DN100 valve



DN125 to DN150 valve

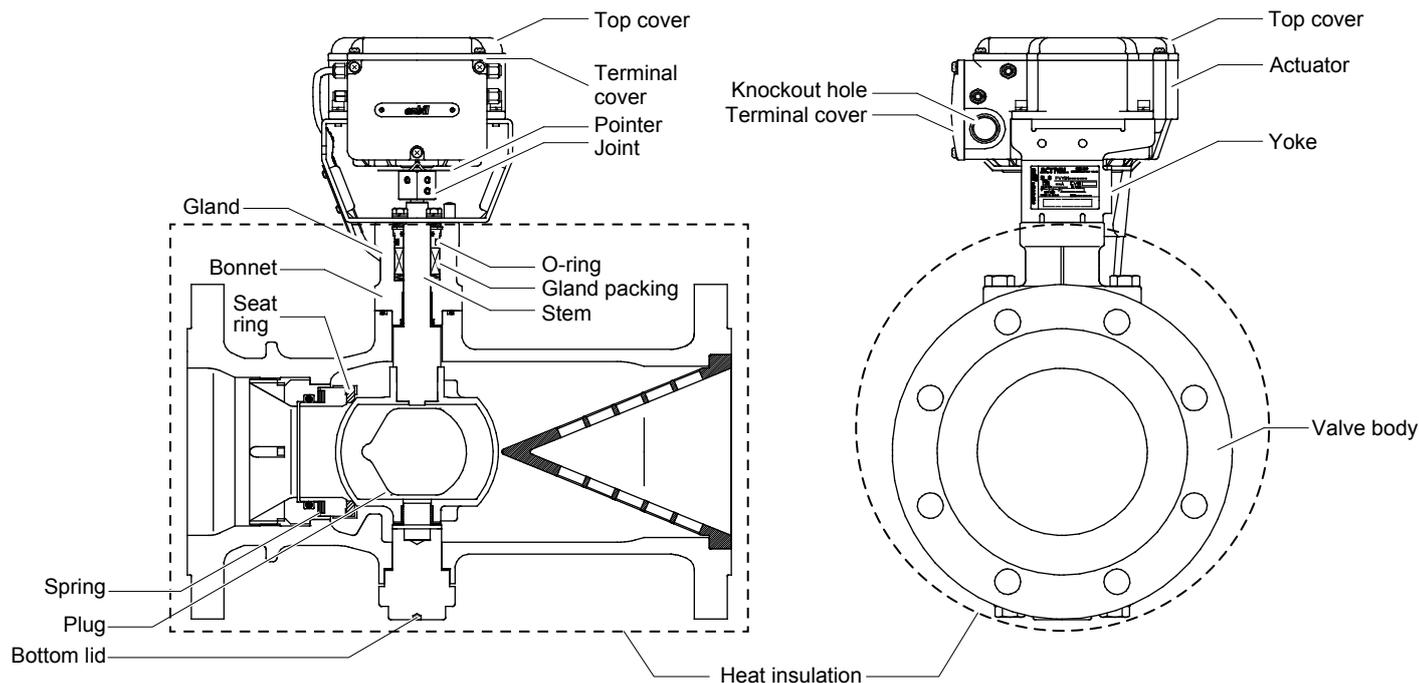


Figure 5. Parts identification: Valve details

■ System Indication label

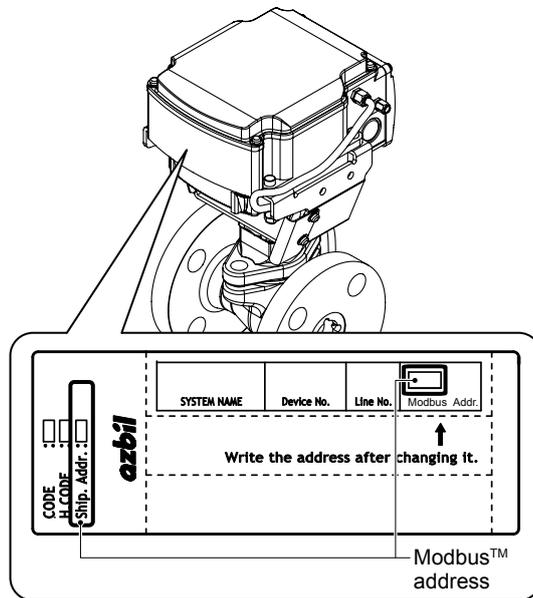


Figure 6.

The default Modbus™ address is printed on the nameplate affixed to the side of main unit.

When the Modbus™ address is changed, print the new address on the nameplate.

The label, which contains the system name, device No., and Modbus™ address, can be affixed anywhere you want.

The label is a part of the nameplate on the side of main unit. Cut the label along the dotted line and affix it in a visible place on the unit.

■ Installation

⚠ WARNING



When handling or transporting any heavy product (more than 18 kg), carefully move the product with a handtruck or the like, or with 2 or more people. Careless lifting or accidental dropping of the product may result in injury or product damage.

⚠ CAUTION



Install, wire, and use this product under the conditions specified by this manual. Failure to do so may cause fire or device failure.



When installing this product, hold it in the proper position and securely fasten it to the pipes. Excessive tightening or improper installation position may damage the valve.



After installation, make sure no fluid leaks from the valve-pipe connections. Improper piping may cause fluid leakage outside of the valve.

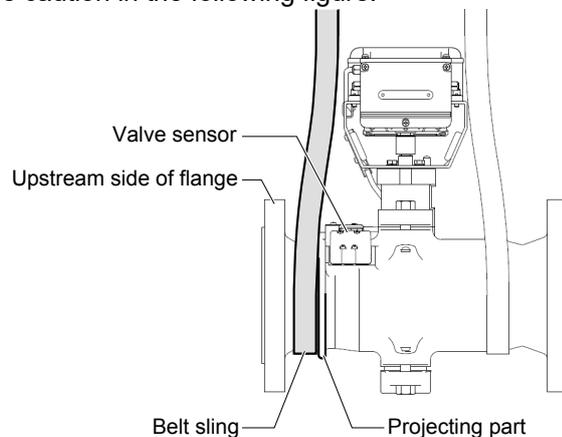


Do not put a load or weight on this product. Doing so may damage the product.

● Notes for installation

Observe the following cautions in order to avoid failure of this product.

- Do not subject this product to shock or impact.
- When Model FVY51_7J0101, FVY51_7J0121, or FVY51_7J0151 is hung using a hanging tool such as belt sling, observe the caution in the following figure.



Hang the belt sling between the upstream side of flange and the projecting part. If the belt sling is hung over the valve sensor, weight is loaded on it and it may be damaged.

- Do not leave any foreign substances in the pipes of this product. Observe the following instructions to remove foreign substances.
 - Provide a strainer on the inflow side of the valve.
 - For chilled/hot water: 40 or more meshes
 - If the strainer cannot be installed just before the inlet of each valve, install it on the pipe diverting sections for each piping system.
 - Install the bypass pipes for this product and install the gate valves at the inflow, outflow, and bypass side.
- Do not install this product nearby a steam coil or a hot-water coil. High temperature radiation may cause device failure of the actuator.
- Avoid connecting the product to pipes where water hammer may occur or slag, etc. easily collects.

Observe the following cautions in order to measure flow precisely.

- Install straight pipes, minimum length is 2 times of valve diameter (d), on the inflow and outflow sides of the valve.
- If flange gaskets are installed for connecting to the pipes, do not use the rubber gaskets or the gaskets that go inside the pipes.
- Install the product to pipes so that they are electrically connected at the same potential.
If the valve and the pipe are electrically isolated, noise will be generated, causing incorrect measurement and control of flow.

In addition, observe the following cautions.

- Place a drain pan under the valve.
- Install the product where maintenance or replacement can be done easily.
Refer to ■ "Maintenance Space."
- When installing the product in the ceiling, make a trapdoor within 50 cm around the valve.

● **Mounting orientation**

- Install the valve so that fluid flows in the direction pointed by the arrow on the valve body, and keep the valve orientation as described below.
Orientation of the actuator cannot be changed.
- The product can be mounted with any position from upright to sideways (max. 90-degree inclination) and flow direction is from bottom to top.
- If the product is installed inclining from the upright position, the valve sensor should be placed upper side.

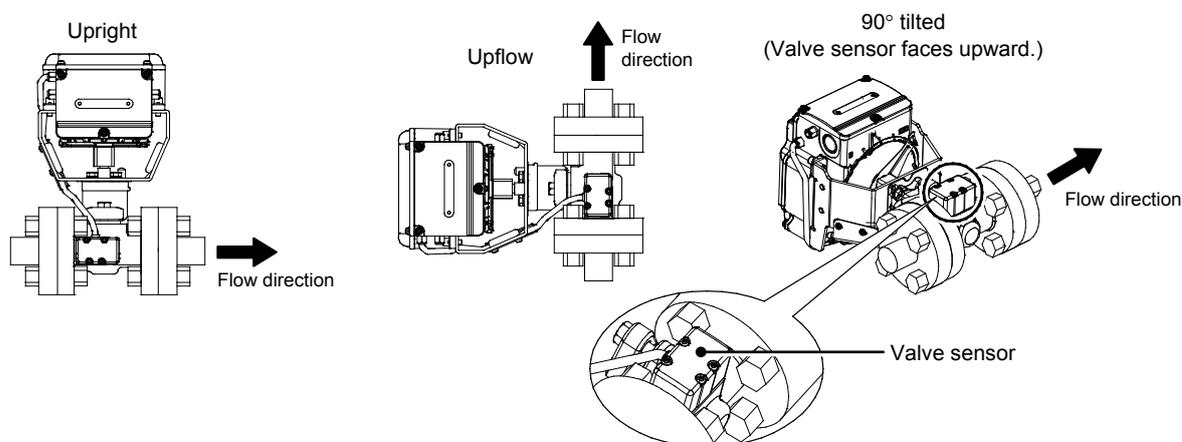


Figure 7. Correct mounting orientations

- If the product is installed outdoors, place it in upright position.

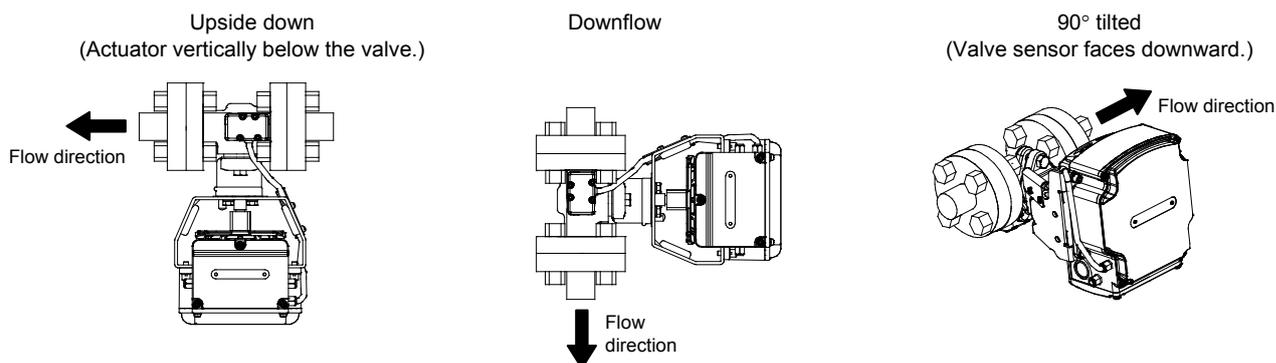


Figure 8. Incorrect mounting orientations

● Piping

⚠ CAUTION



When installing this product, hold it in the proper position and securely fasten it to the pipes. Excessive tightening or improper installation position may damage the valve.

IMPORTANT:

- Do not apply excessive force on the valve sensor and its cable during piping or applying heat insulation. Doing so may cause device failure.

- (1) Check the Model number, printed on the label affixed on the yoke, of this product
- (2) Install the valve so that fluid flows in the direction pointed by the arrow on the valve body.

Refer to ● “Mounting Orientation.”

- Do not apply too much sealing material, such as solidifying liquid and tape, to the pipe connection sections.
- Do not allow chippings, sealing material, etc. to enter the pipes.

The foreign substances, such as chippings, seal material, may be caught in, resulting damages on the sheet and the valve may not be fully closed.

- (3) Fully open the valve and flush it out with the maximum flow rate. When fluid flows for the first time, it is to clean out the foreign substances and refuse in the pipes. The valve is set to fully open when it is shipped from the factory.

⚠ CAUTION



After installation, make sure no fluid leaks from the valve-pipe connections. Improper piping may cause fluid leakage outside of the valve.



Do not put a load or weight on this product. Doing so may damage the product.

● Heat insulating

- Apply heat insulation as illustrated by  in Fig. 9.
- If the yoke and/or the actuator are covered with insulation material, the point cannot be checked or may be distorted.
- If the heat insulation is inappropriate, accuracy of flow rate measurement and temperature measurement may degrade.
- When cutting the insulation material that covers the valve, be sure not to damage the valve sensor cable.

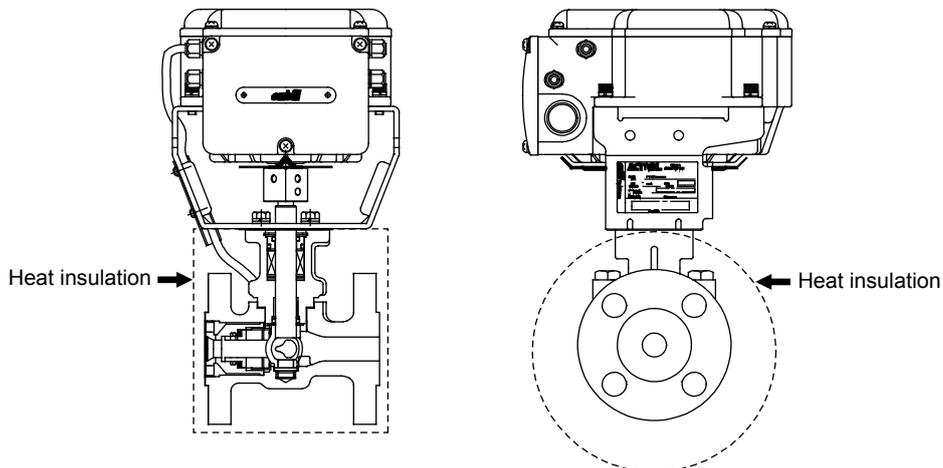


Figure 9. Heat insulating

● Factory preset position

The actuator shaft is positioned at 100 % for shipment.

The shaft is thus completely turned clockwise, and the pointer points at “100.”

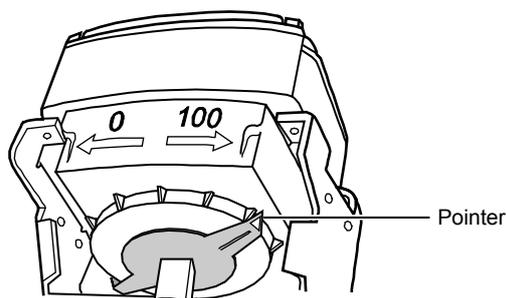


Figure 10. Pointer position for shipment

● Manually opening/closing valve

IMPORTANT:

- Before opening or closing the valve manually, turn off the power.
If the valve is manually opened or closed while the power 24 V AC active, the actuator may break down.
- Do not manually open or close the valve more than 100 % or less than 0 % scale.

- (1) Turn off the power.
- (2) Hold the joint using a wrench, etc., gently turn the wrench to the desired position, open or close.

Note: If the valve is subject to shock, the actuator may break down.

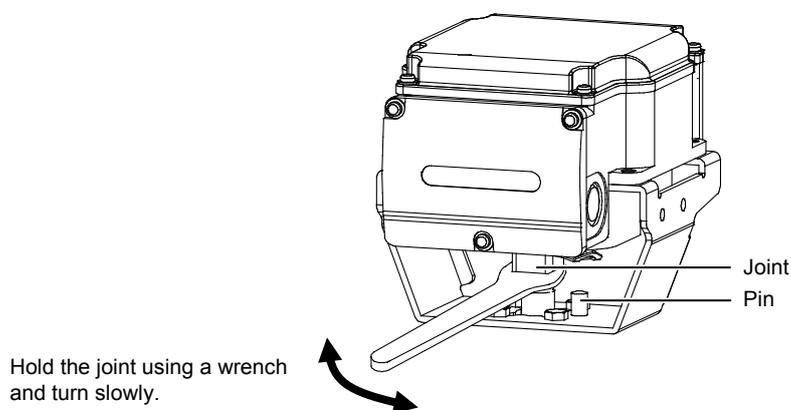


Figure 11. Manually opening/closing valve

■ **Wiring**

 CAUTION	
	Provide a circuit protector (e.g., a fuse or circuit breaker) for the power source. Failure to do so may cause a short circuit leading to fire or device failure.
	Install, wire, and use this product under the conditions specified by this manual. Failure to do so may cause fire or device failure.
	Installation and wiring of the actuator must be performed by personnel qualified to do instrumentation and electrical work. Mistakes in installation or wiring may cause fire or electric shock.
	All wiring must comply with applicable codes and ordinances. Otherwise there is a danger of fire.
	Before wiring or maintenance, be sure to turn off the power to this product. Failure to do so may result in electric shock or device failure.
	After wiring or maintenance, be sure to reattach the cover. Failure to do so may result in electric shock.
	For wiring, strip the insulation from cables as specified in this manual. If the length of exposed wire is longer than specified, it may cause electric shock or short circuit between adjacent terminals. If it is too short, it may not make proper contact.
	Use crimp terminals with insulation for connections to the product terminals. Failure to do so may cause short circuit leading to fire or device failure.
	Tighten the terminal screws with the specified torque. Insufficient tightening of the terminal screws may cause fire or overheating.

IMPORTANT:

- Provide a circuit breaker for the power source of this product.
- When a knockout hole is opened, remove the generated metal chippings or wiring waste from the inside of product.

● **Notes for wiring**

For this product, only the pulse output and RS-485 communication signals are isolated.

If the devices, to which the control signals and DI (cooling/heating switching) signal are connected, are not isolated, attach isolators.

Solid line — : isolated Dotted line - - - - : not isolated

Power	Internal circuit	T1 (supply water temperature)
Pulse output		T2 (return water temperature)
DI (cooling/heating switching signal)		Display panel
INPUT (control signal)		RS-485 communication In
		RS-485 communication Out

● **Wiring procedure**

Describes the procedure based on the case that waterproof connectors are used.

Allow a minimal cable clearance at the connection ports.

If the wires are slack, problems may occur such as the terminal cover cannot be attached, the reset switch is pushed in, the product does not work.

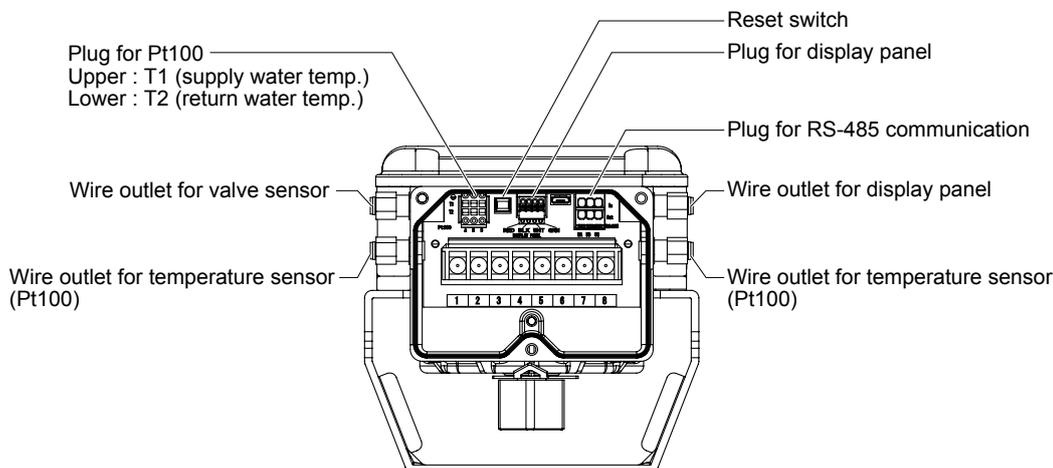
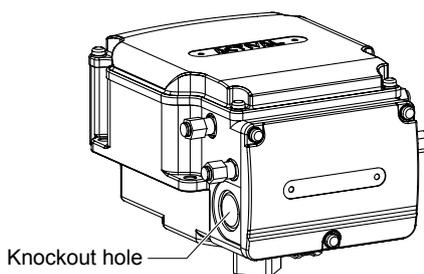


Figure 12. Wire outlets and plug position

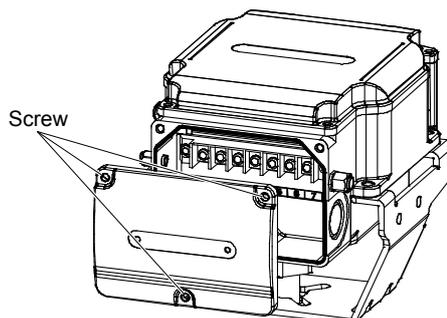
If a cable gland with three ports unit is used, refer to ● “Cable gland with three ports unit” for wiring.

(1) Open knockout holes.

- There are two knockout holes on the right and left sides of the product. The knockout holes can be easily opened by hitting a screwdriver.
- Separate the signal wires such as control, DI (cooling/heating switching), totalizing pulse, and RS-485 communication from the power cable.
- Also separate the knockout holes and wire outlets for the signal wires and power cable. If the signal wires and power cable are not separated, noise generated in the power supply will affect the signal wires and result in malfunction or device failure.



(2) Loosen the terminal cover screws (M4x10, 3 pcs) to detach the terminal cover.



(3) Pull the power cable through the wire outlet.

- (4) Pull the signal wires and RS-485 communication cable through the wire outlet on the opposite side of the one used for the power cable.
- To connect 2 or more wires, use a 4/6-core cable.
 - To connect the totalizing pulse output, observe the following cautions.
 - Do not connect the DC power directly to the output terminal.
 - The applied voltage (+ V), shown in Fig. 29, “Totalizing pulse output (open collector output),” should be 30 V DC or less.

If the magnetic counter that uses a relay coil is used, provide a protection diode at the input port of the counter.

Ref.: To connect the totalizing pulse output, refer to ■ “Connection examples”, ● “Totalizing pulse output.”

Note: To connect the RS-485 communication lines, connect them with other signal wires using a cable gland with three ports unit (order Model No. DY7000A1000).

Ref.: ● “How to use the cable gland with three ports”

- (5) Connect the wires to the terminals by the screws (M3.5).
Refer to Fig. 13, “Connections to the terminals.”

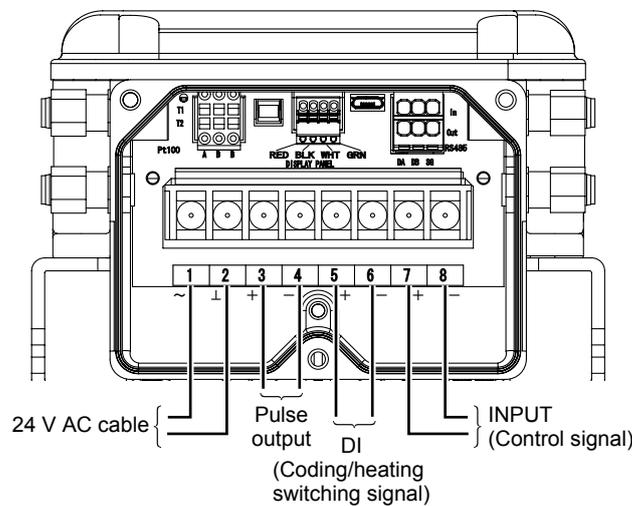
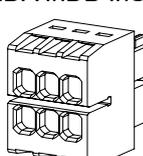


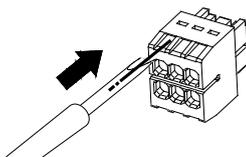
Figure 13. Connections to the terminals

- (6) Connect the RS-485 communication lines.
- To connect the RS-485 communication lines, observe the following cautions.
- Do not use a terminator.
- Do not short the terminal DA and terminal DB. Shielded cable should be grounded by one side.
- Connect “SG.” (Communication will be stabilized.)
- If a daisy chain connection is applied, connect wires to “terminals In DA, In DB, In SG” and then connect to slave’s “terminals Out DA, Out DB, Out SG.”
1. Strip 7 mm from the wire sheath.
 2. Detach the RS-485 communication plug on the product from the socket.

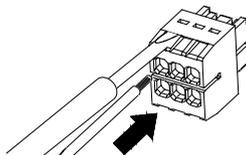
Table 1. RS-485 communication plug terminals

Terminal No.		Description
	In DA	DA
	In DB	DB
	In SG	SG
	Out DA	DA
	Out DB	DB
	Out SG	SG

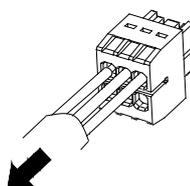
3. Insert a flathead screwdriver (blade width: 2.5 x 0.4 mm or less) into the plug detached by step 2. When the driver is inserted, it stays as it is.



4. Insert the wires whose sheath striped by step 1.



5. Pull the screwdriver out and lightly pull the wires to check that they do not come out.



6. Insert the plug, in which wires were inserted by steps 3 and 4, deeply into the RS-485 communication socket on the product.

Note: If the plug is not deeply inserted, it may fall out of the socket by vibration, etc.

- (7) Connect the wires for the temperature sensor for pipe surface or the insertion-type pipe temperature sensor (Pt100).

1. Pass the cable for the temperature sensor for pipe surface or the insertion-type pipe temperature sensor (Pt100) through the wire outlet for the temperature sensor (Pt100).

Ref.: Fig. 12, "Wire outlets and plug position"

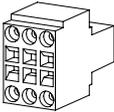
2. Strip 7 mm from the wire sheath.

Stripping length : 7 mm

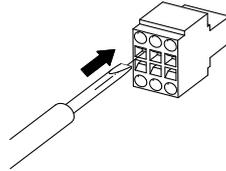


3. Detach the temperature sensor (Pt100) connection plug on the product from the socket.

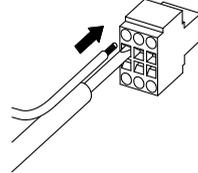
Table 2. Temperature sensor (Pt100) connection plug terminals

Terminal No.	Color of cable		Description	
	Pipe surface temperature sensor	Pt100 (Pipe-insertion temperature sensor)		
	T1A	Red	Red	Pt100A (supply water temperature)
	T1B	White	Black	Pt100B (supply water temperature)
	T1B	White	White	Pt100B (supply water temperature)
	T2A	Red	Red	Pt100A (return water temperature)
	T2B	White	Black	Pt100B (return water temperature)
T2A T2B T2B	T2B	White	White	Pt100B (return water temperature)

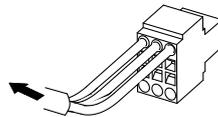
4. Insert a flathead screwdriver (blade width: 2.5 x 0.4 mm or less) into the plug detached by step 3. When the driver is inserted, it stays as it is.



5. Insert the wires whose sheath striped by step 2.



6. Pull the screwdriver out and lightly pull the wires to check that they do not come out.



7. Insert the plug, in which wires were inserted by steps 4 and 5, deeply into the temperature sensor (Pt100) connection socket.

Note: If the plug is not deeply inserted, it may fall out of the socket by vibration, etc.

8. For the temperature sensor for pipe surface, apply a caulking process or wrap the tape twice around the waterproof connector.

This is because that the 3-core cable is thin and IP54 will not be assured only with the waterproof connector provided with the product.

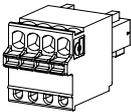
(8) Connect the display panel cable

1. Pass the display panel cable through the wire outlet for the display panel connection.

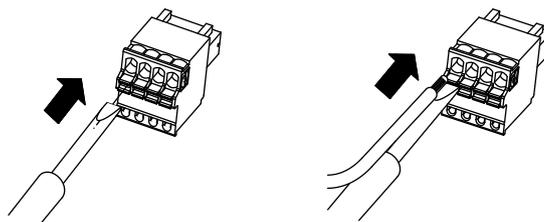
Ref.: Fig. 12, "Wire outlets and plug position"

2. Strip 8 mm from the wire sheath.
3. Detach the display panel connection plug on the product from the socket.

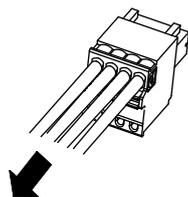
Table 3. Display panel plug terminals

Terminal No.				Color of cable	Description
RED	BLK	WHT	GRN	RED	12V
				BLK	0V
				WHT	AP-bus+
				GRN	AP-bus-

4. Push the lever on the plug detached by step 3 using a flathead screwdriver, and then insert the wires whose sheath striped by step 2.



5. Pull the screwdriver out of the lever and lightly pull the wires to check that they do not come out.

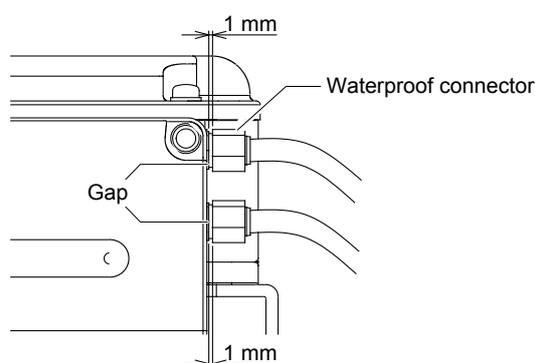


6. Insert the plug, in which wires were inserted by steps 4 and 5, deeply into the display panel socket on the product.

Note: If the plug is not deeply inserted, it may fall out of the socket by vibration, etc.

(9) Tighten the waterproof connectors.

Tighten the waterproof connectors for the wire outlets of the temperature sensor (Pt100) and display panel connection as shown by the following figure so that the gap is 1 mm or less.



(10) Ensure the cable is not twisted. When the connectors are tightened, the cable may be twisted.

If the cable is twisted, detach the waterproof connectors and straighten the cable, and then tighten the connectors again.

● How to use the cable gland with three ports

⚠ CAUTION



Tighten the terminal screws with the specified torque.
Insufficient tightening of the terminal screws may cause fire or overheating.

This product is categorized as a low voltage circuit (input voltage is 60 V or less).

IMPORTANT:

- Check that the O-ring is attached.
If the O-ring is detached, waterproof is not secured.

«How to maintain IP54 (dust-proof, splash-proof)»

In order to maintain IP54 performance, use waterproof connectors etc. when the product is used in high humidity environment or outdoor.

- Close the terminal cover and top cover firmly.
- Apply a waterproofing treatment for the knockout holes.
- Use waterproof connectors to pull out the cables.

In accordance with the diameter of the cable used, select a suitable waterproof connector from ■ “Model Numbers,” ● “Parts ordered separately.”

- If cables are connected by cable glands, use waterproof plica tubes etc.

«How to detach the cover from the base»

Release the 3 latches on the cover to detach it from the base.
Push the latches as described below.

IMPORTANT:

- Of the 3 latches, the last one is the hardest to release.
So first release the latches that cannot be seen directly.

- (1) Press the upper part of latch (②).
- (2) Press hard the tip of latch (①).
- (3) While pressing the tip (①) and upper part (②) of latch with 2 fingers, slightly slide the finger that presses ② toward the direction (③) to detach the cover.

Note: Do not use a tool such as screwdriver.
Doing so may damage the latches.

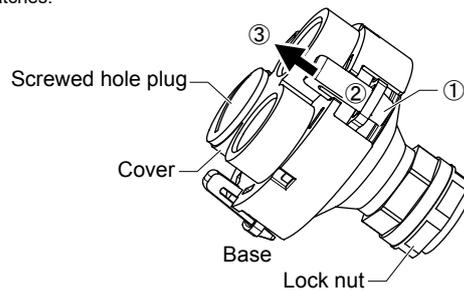


Figure 14.

«How to attach the cover to the base»

The cover and base are joined by the 3 latches.

- (1) Push the cover straight onto the base with even force taking care that it is not crooked.
Otherwise, the latches may be damaged.
- (2) Join the latches on the cover to the base.
Push the cover until a clicking sound can hear.
- (3) Make sure that the latches are definitely joined to the base.
If they are not definitely joined, apply force in the direction to press the cover and base to make a complete joint.

«Attach it to the actuator»

- (1) Referring the tightening torque for the cable gland with three ports unit, mount it to a device.

Place to tighten	Appropriate tightening torque
Locknut	1.8 N•m ± 10 %
Waterproof connector to attach on the cover	1.8 N•m ± 10 %
Screwed hole plug	1.7 N•m ± 10 %
Cable fixing part of the waterproof connector	1.0 N•m ± 20 %

- (2) Open a knockout hole on the actuator, and attach the locknut and base.

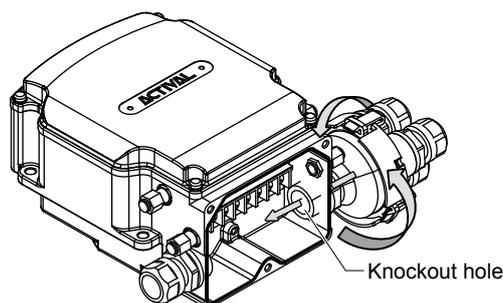


Figure 15.

(3) Attach the waterproof connectors (ordered separately) to the cover.

IMPORTANT:

- Be sure not to tighten the waterproof connectors with excessive force.

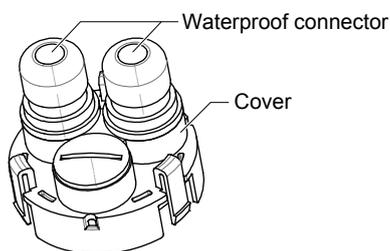


Figure 16. Connection of the cover and waterproof connectors

(4) Secure sufficient length of cables and strip the sheath of all cables.

1. Strip the sheath slightly longer.

Note: Recommended length of stripping the sheath is 170 mm or more.

It is better to change the stripping length for each cable because it will make slightly easy to route the cables in the device.

2. When wiring, adjust the cable length properly between the terminal block and the connector and cut extra length of cables.

IMPORTANT:

- Be sure not to damage the insulated wires.

(5) Loosen the tightening caps.

(6) Pass all the cables from the waterproof connector side into the cover.

(7) Tighten the tightening caps so that the stripped part of cables is located inside of the cover.

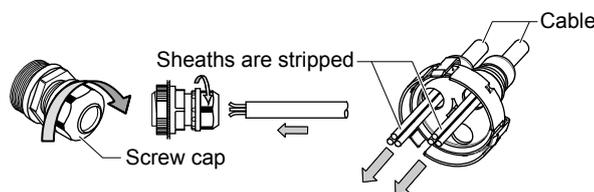


Figure 17.

(8) Route the cables inside the device.

Ref.: ■ "Wiring"

(9) Attach the cover to the base.

IMPORTANT:

- Check that the O-ring is attached.
If the O-ring is detached, waterproof is not secured.

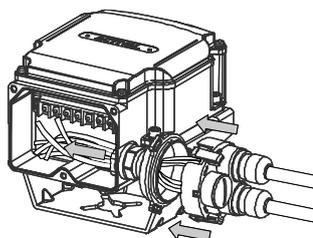


Figure 18.

(10) Adjust length of cables in accordance with the placement or terminal block or connectors in the device and connect the wires to them.

Ref.: ■ "Wiring"

Note:

- Adjust the length of cables so as not to leave extra length of cables.
- If the cover is closed pressing the extra length of cables, the printed circuit board etc. may be stressed.

IMPORTANT:

- If crimp terminal lugs without insulated sleeve are used, protect them with mark tubes for safety.
- Wire termination treatment will be executed nearby the device, so be sure not to let the chippings or wire waste be inside the device.

(11) Close the device cover (lid).

(12) Fix the cables come out of the device using cable ducts etc.

Note: When the device needs to be replaced, if the cables are thick or there are too many cables, it will be necessary to cut off the crimp terminal lugs and attach the lugs again. So fix the cables allowing margin for length of the cables.

IMPORTANT:

- Do not apply excess stress on the joint between the device and the cable gland with three ports unit.

«Detach it from the actuator»

(1) Remove the connected cables from the terminal block or connectors.

(2) Release the 3 latches on the cover to detach it from the base.

Note:

- If the cover and base cannot be detached because the cables are fixed nearby the device, make the cables free by removing the cable ties etc.
- If the cables are thick or there are too many cables, it may be hard to pull the cables out of the wire outlets.
Cut off the crimp terminal lugs from the cables and separate the cover from the base.

(3) Detach the base.

IMPORTANT:

- O-rings are used for attaching the cable gland with three ports unit next time.
Be sure not to lose the O-rings.
Check that there are 3 O-rings when the units is detached.

■ **Wiring Examples**

● **Model FVY513 (4–20 mA DC input)**

Notes:

- A power transformer is shared

If a power transformer is shared by two products, connect the terminal **1** of each actuator to the transformer with the same polarity. Connect the terminal **2** in the same way.

If the terminals are connected with different polarities, this product may break down (see Fig. 22).

- Control signals (4–20 mA input) are shared

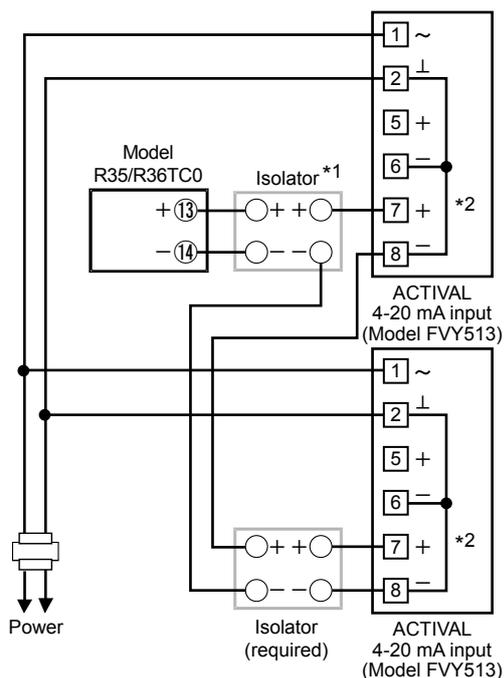
The 4–20 mA input signals of the product are not isolated from the power.

Input impedance of 4–20 mA signals is 282 Ω. For connecting a controller, the relations among the input impedance of the product, the output load resistance of the controller, and the output load resistance and input impedance of an isolator (if necessary) must meet the following formula.

Applicable load resistance > Total of input impedance

To operate the two products with a controller, configure the system so that they are powered by a shared transformer (see Fig. 19) or powered by the two transformers (see Fig. 21). To share a transformer, connect an isolator to the 4–20 mA input terminal of the second product. Otherwise, the products will malfunction.

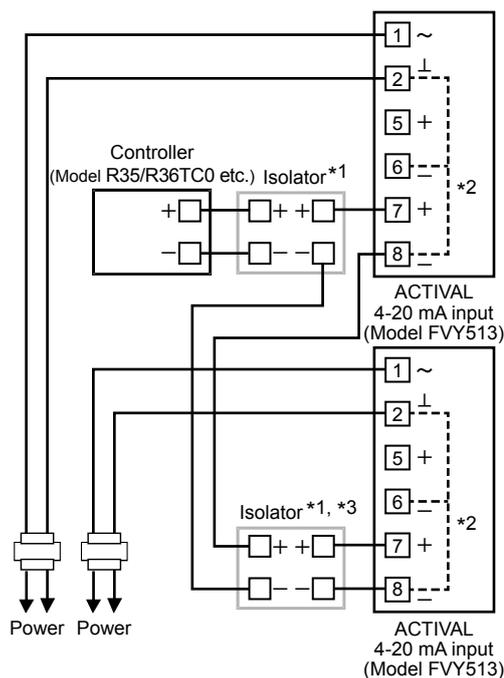
«Input signals and transformer are shared»



- *1 Provide an isolator for the controller not internally isolated.
- *2 Terminals 2, 6, and 8 are internally connected.

Figure 19.

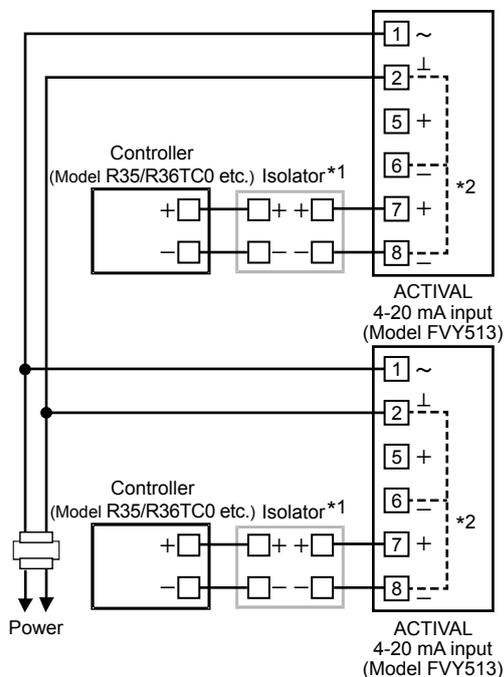
«Input signals and transformer are shared»



- *1 Provide an isolator for the controller not internally isolated.
- *2 Terminals 2, 6, and 8 are internally connected.
- *3 Provide an isolator if an isolator is not provided to the 4–20 mA input of the first product AND the applicable load resistance of controller is less than 600 Ω.

Figure 21.

«A transformer is shared»



- *1 Provide an isolator for the controller not internally isolated.
- *2 Terminals 2, 6, and 8 are internally connected.

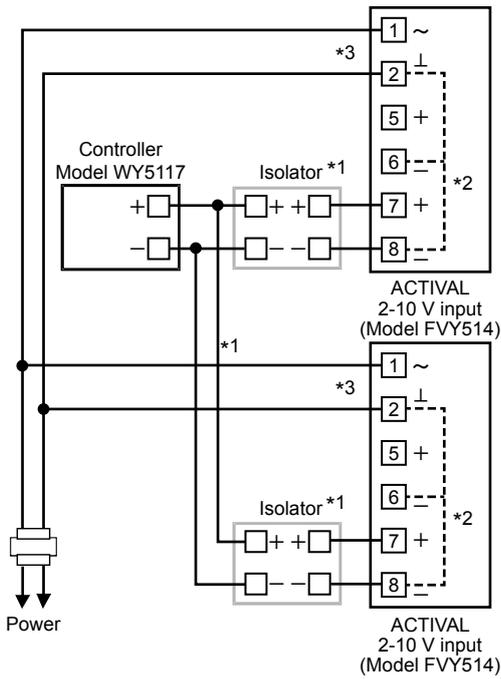
Figure 20.

● Model FVY514 (2–10 V DC input)

Notes:

- A power transformer is shared
If a power transformer is shared by two products, connect the terminal 1 of each actuator to the transformer with the same polarity. Connect the terminal 2 in the same way.
If the terminals are connected with different polarities, this product may break down (see Fig. 25).

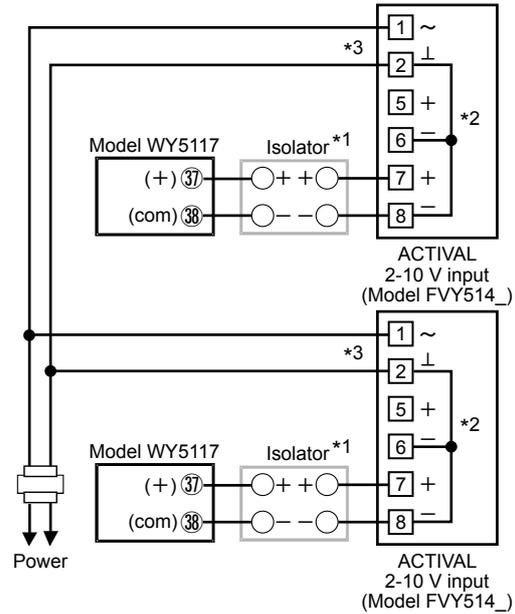
«Input signals and transformer are shared»



- *1 Provide an isolator for the controller not internally isolated.
- *2 Terminals 2, 6, and 8 are internally connected.
- *3 Refer to notes under “A power transformer is shared.”

Figure 22.

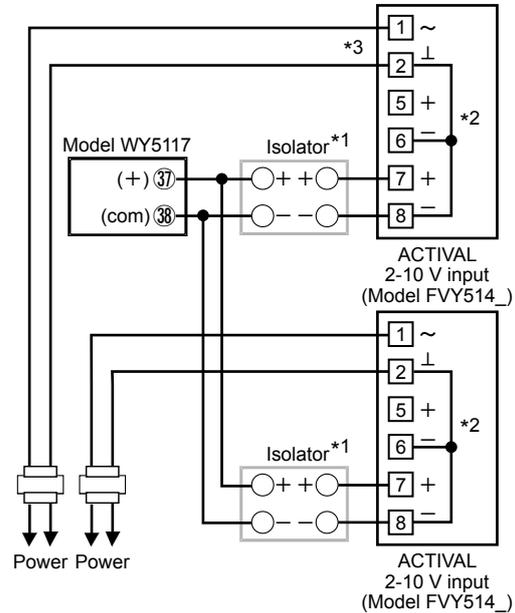
«A transformer is shared»



- *1 Provide an isolator for the controller not internally isolated.
- *2 Terminals 2, 6, and 8 are internally connected.
- *3 Refer to notes under “A power transformer is shared.”

Figure 23.

«Input signals are shared»



- *1 Provide an isolator for the controller not internally isolated.
- *2 Terminals 2, 6, and 8 are internally connected.

Figure 24.

● For RS-485 communication

«3-wire communication»

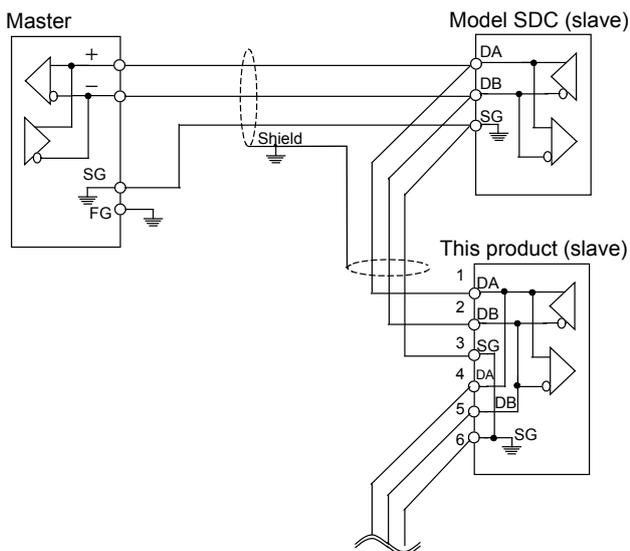
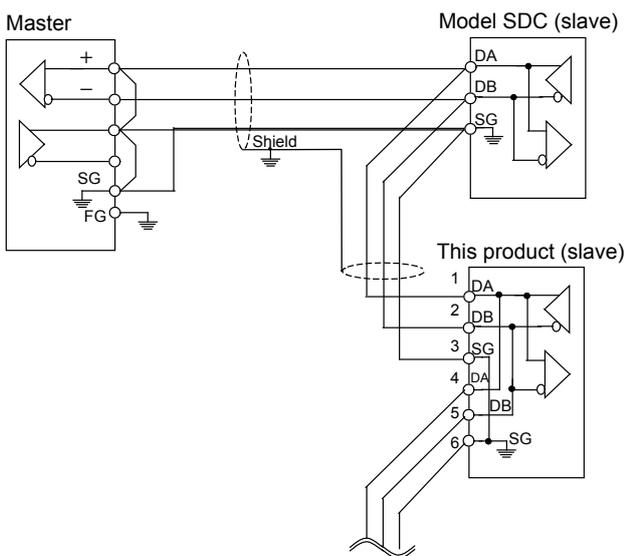


Figure 25. 3-wire RS-485 communication

«5-wire communication»



Note: This product has 3-wire communication.
This example shows the line connections if the master has 5-wire communication.

Figure 26. 5-wire RS-485 communication

● Totalizing pulse output

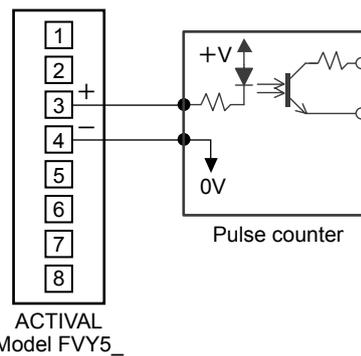


Figure 27. Totalizing pulse output (open collector)

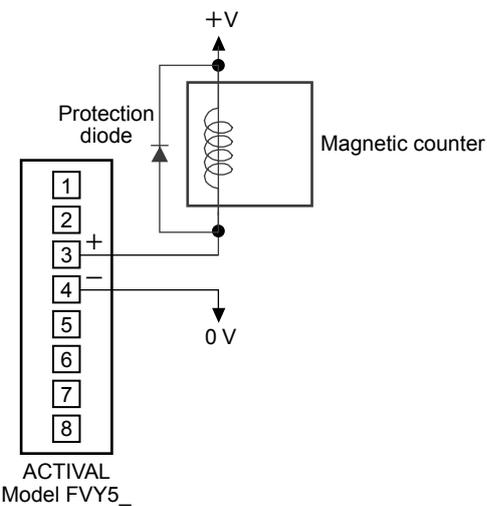


Figure 28. Magnetic counter with relay coil

■ Maintenance

 CAUTION	
	Before wiring or maintenance, be sure to turn off the power to this product. Failure to do so may result in electric shock or device failure.
	After wiring or maintenance, be sure to reattach the cover. Failure to do so may result in electric shock.
	Do not touch the moving parts of this product. Doing so may result in injury.
	Do not carelessly touch this product when it is used to control hot water. Doing so may result in burns, because the product reaches a high temperature.

- (1) After the product is connected to pipes, if the product is not operated for a long period, execute valve open and close operations once a month.
- (2) Execute regular inspection according to Table 5.
Especially accuracy of flow control is an important factor affecting effectiveness of the energy management and energy conservation applications. Be sure to inspect the product regularly. And, the display panel is required to inspect it.
- (3) Once every six months or so, visually check that there is no leakage of fluid to the outside of the valve and the actuator operates smoothly.
if any trouble occurs, take measures according to Table 6. Although the measures have are taken, if the trouble cannot be recovered, please contact Azbil Corporation.

IMPORTANT:

- Do not wipe the cover by various chemicals and organic solvents.
- Do not disassemble this product.
Doing so may cause device failure.

Table 4. Inspection items and methods

Item	Inspection cycle	Inspection method
Visual check	6 months	<ul style="list-style-type: none"> • There is no leakage from the grand and flange. • Loose bolts. • There is no damage on the valve and actuator.
Operation status	6 months	<ul style="list-style-type: none"> • The valve is smoothly opened or closed. • There is no abnormal sound or vibration during operation. • There is no abnormality with the valve differential pressure (Pvin-Pvout) when the valve is fully open or fully closed.
Daily inspection	Any time	<ul style="list-style-type: none"> • There is no leakage of fluid to the outside of the valve. • There is no abnormal sound or vibration. • The valve is smoothly opened or closed. • There is no hunting of valve.
Accuracy of flow measuring* ¹	Any time (once a year)	<ul style="list-style-type: none"> • Measuring accuracy of differential pressure across valve Measure and compare the valve inlet pressure and outlet pressure. Compare the detected valve when the valve inlet and outlet pressures are equal, if the difference is within ± 3 kPa, flow measuring accuracy satisfies the factory preset value. Situations when both pressures are equal: <ul style="list-style-type: none"> - No water flows (valve is open). - When the supply water pump stops - When the valve is open and the hand valves before and after the valve are fully closed (or one of the hand valve is closed) • Valve position detecting accuracy: Select the position control*², and check the position of the actuator pointer when 50 % position signal is input. If the pointer points out of 1 cm range from the 50 % scale (the center of the lower setscrew of the terminal cover) (See Fig. 36). If it is true, replace the product.

*1 It is a simplified inspection method for the flow measuring accuracy.

For an accurate inspection, a reference flow meter is required.
The flow measuring accuracy cannot be calibrated or adjusted at the field.

*2 For details, refer to AB-7044, ACTIVAL +™ Modbus™ Protocol Model Instruction Manual.

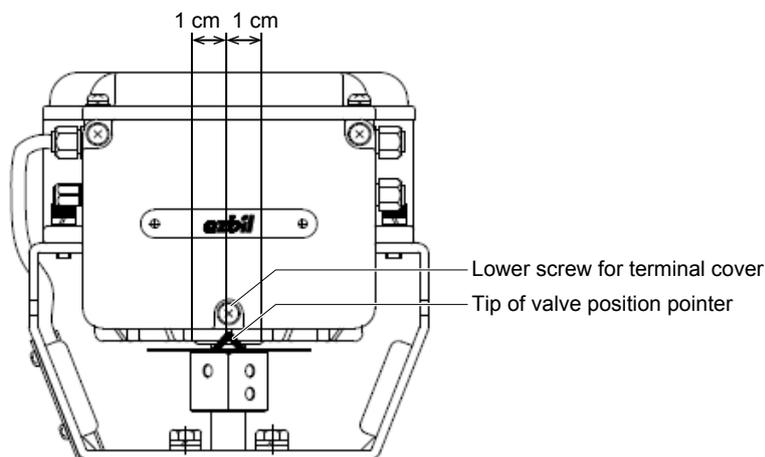


Figure 29. Check of the valve position detecting accuracy

Table 5. Troubleshooting

Abnormal phenomenon	Where to inspect	Measure
Leakage from the flange	Loose flange bolts Flange gasket Misaligned pipes	Retighten the flange bolts. Replace the gasket. Do piping again.
Leakage from the gland	–	Contact Azbil Corporation.
For FVY51_7J00_ _: Leakage from the joint between the bonnet and the valve body	Loose connecting bolts	Retighten the bolts on the bonnet.
For FVY51_7J01_ _: Leakage from the joint between the bottom lid and the valve body	Loose connecting bolts	Retighten the bolts on the bottom lid.
Valve does not move smoothly. Valve stops moving in the middle. Valve does not move.	Check the power supply status and communication status. Loose terminals Wiring status, disconnected wire	Check the power supply. Retighten the terminals. Check the wirings.
Leakage when the valve is fully closed	Pointer position when the valve is fully closed	Fully close the valve.
Abnormal sound or vibration observed	Check if air exists in the pipes. Check the valve primary pressure (Pvin). Check the valve differential pressure (Pvin-Pvout).	Thoroughly evacuate air from the pipes. Adjust the valve mounting conditions.
Hunting observed (When valve position control is applied)	Check the valve differential pressure (Pvin-Pvout). Check that the controller outputs stable PID control signals.	Adjust the valve mounting conditions. Adjust the PID settings.
Hunting observed (When flow rate control is applied)	Check the operation status such as the actuator does not stop, once it stops but starts immediately. Check that the controller outputs stable PID control signals.	Adjust the actuator's parameter settings. Ref.: AB-7044, ACTIVAL +™ Modbus™ Protocol Model Instruction Manual Adjust the PID settings.
Poor accuracy for measuring flow rate	Check the differential pressure detecting accuracy and the valve position detecting accuracy in accordance with the inspection items.	Contact Azbil Corporation.

■ Disposal

Dispose of the product as industrial waste in accordance with your local regulations.
Do not reuse all or part of this product.

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This product complies with the following harmonised standards of the Electromagnetic Compatibility Directive (EMCD).

EMCD: EN 61000-6-2
EN 61000-6-4

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Azbil Corporation
Building Systems Company

1-12-2 Kawana, Fujisawa, Kanagawa
251-8522 JAPAN

<https://www.azbil.com/>

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