

# ACTIVAL™

## Motorized Two-Way Valve with Flanged-End Connection Model VY51XXL (ISO PN16)

### General

ACTIVAL Model VY51XXL is a series of motorized two-way valves with flanged-end connections. The valve and actuator are integrated in a single unit.

The ACTIVAL is used to control chilled/hot water, and the body rating corresponds to ISO PN16. The actuator has a reversible synchronous motor, which operates at a low voltage of 24 V AC.

5 kinds of control signals are available to operate the ACTIVAL.

ACTIVAL Model VY51XXL series provides proportional control combined with a electric/electronic proportional controller or a direct digital controller (DDC).



### Features

- Valve of flanged connection type compliant with ISO.
- Compact and lightweight.
- Valve and actuator integrated in a single unit.
- A variety of control signals available:
  - Nominal 135  $\Omega$  feedback potentiometer
  - Nominal 135  $\Omega$  resistance input
  - 4-20 mA DC input
  - 2-10 V DC input
  - 0-10 V DC input
- High differential pressure, large Cv values, high rangeability and low leakage.
- Durable design.
- Low power consumption.
- Equal percentage characteristics.
- ACTIVAL Model VY51 conforms to all the standards related to CE Marking.



## Safety Instructions

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

### Usage Restrictions

This product is targeted for general air conditioning. Do not use this product in a situation where human life may be affected. If this product is used in a clean room or a place where reliability or control accuracy is particularly required, please contact Yamatake's sales representative. Yamatake Corporation will not bear any responsibility for the results produced by the operators.

### A CAUTION

- α • Installation must be performed by qualified personnel in accordance with all applicable safety standards.
- α • This product must be operated within its operating ranges specified in this manual. Failure to comply will cause equipment damages.
- α • Installation must be carried out under the operating conditions specified in this manual to prevent equipment damages.
- α • For storage, do not stack too many container boxes in which products are packed.
- α • Do not put heavy load on the actuator.
- α • Do not leave the controlled fluid frozen. Equipment damages and fluid leakage may occur.
- α • Make sure the flow direction and install the product in the direction and position specified in this manual. Excessively tight connection of piping and improper installation position may cause equipment damages.
- α • Flush the piping so that no foreign substance remains. Attach a strainer at upstream side of the piping to prevent equipment damages.
- α • After the piping installation, make sure no fluid leaks from the connecting parts.
- α • Do not install the product in a location close to a steam coil or a hot-water coil. High temperatures radiation may result in an actuator malfunction.
- α • Avoid instrumentation that keeps equipment operating cycle excessively frequent so as not to shorten the equipment operating life.
- α • When this product is used with a controller of another manufacturer, contact Yamatake sales representatives.
- α • All wiring must comply with local codes of indoor wiring and electric installation rules.
- α • Disconnect the power supply before performing any wiring to prevent electrical shock or equipment damage.
- α • Use crimp terminals with insulation for electric wires.
- α • Make sure all the wires are tightly connected to prevent heat generation and equipment damages.
- α • Do not disassemble the product at any time except when removing the cover to wire or replacing a part to prevent equipment damages.
- α • Do not remove or disassemble the cover except during wiring work or part replacement.
- α • Do not incinerate this product for waste disposal. Do not recycle all or a part of this product, either.

Trademark information:

ACTIVAL and Inflex are trademarks or registered trademarks of Yamatake Corporation in Japan or in other countries.

## Specifications

### Valve

Item	Specification		
Model	Two-way valve with flanged-end connection		
Body pressure rating	ISO PN16 (Max. pressure: 1.6 MPa )		
Size, Cv Maximum pressure drop	Nominal size ( in inch )	Cv	Maximum pressure drop ( close-off ratings )
	DN15 (1/2)	1.0	1.0 MPa
	DN15 (1/2)	2.5	1.0 MPa
	DN15 (1/2)	6.0	1.0 MPa
	DN15 (1/2)	1.6	1.0 MPa
	DN15 (1/2)	4.0	1.0 MPa
	DN25 (1)	10	1.0 MPa
	DN25 (1)	16	1.0 MPa
	DN40 (1 <sup>1</sup> / <sub>2</sub> )	25	1.0 MPa
	DN40 (1 <sup>1</sup> / <sub>2</sub> )	40	1.0 MPa
	DN50 (2)	65	1.0 MPa
DN65 (2 <sup>1</sup> / <sub>2</sub> )	95	1.0 MPa	
DN80 (3)	125	0.7 MPa	
Materials	Body: Gray cast iron Plug and stem: Stainless steel (equivalent to JIS* SCS) Seat ring: Heat-resistant PTFE Gland packing: Inorganic fiber Gasket: Non-asbestos joint sheet		
End connections	Flanged-end (ISO PN16 flange), large raised face		
Allowable fluid temperature	0 °C to 175 °C		
Flow characteristics	Equal percentage		
Rangeability	50 : 1		
Seat leakage	0.01 % or less of rated Cv value (0.0006 Cv or less for DN15 models)		
Paint	Gray (equivalent to Munsell 5B 4/1)		
Applicable fluids	Chilled/hot water or steam depending on the model numbers		
Installation orientation	Installable in any position ranging from upright (with the actuator mounted onto the valve) to sideways		
Actuator to be combined	Integrated with the valve		

\* JIS: Japanese Industrial Standards

## Actuator

Item	Specification			
Power supply	24 V AC $\pm$ 15 %, 50 Hz/60 Hz			
Applicable valve size	DN15 to DN80 of standard torque type			
Power consumption	Nominal 135 $\Omega$ feedback potentiometer type: 7 VA Other types (nominal 135 $\Omega$ resistance input, 4 mA DC to 20 mA DC input, 2 V DC to 10 V DC input, 0 V DC to 10 V DC input): 8 VA			
Timing	63 $\pm$ 5 sec. (50 Hz) / 53 $\pm$ 5 sec. (60 Hz)			
Control signal input	Nominal 135 $\Omega$ feedback potentiometer <div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">{</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>Feedback potentiometer</span> <span>Total resistance: Nominal 135 <math>\Omega</math></span> </div> <div style="text-align: right;">Max. applied voltage: 5 V DC</div> </div> </div> Nominal 135 $\Omega$ resistance input 4 mA DC to 20 mA DC input (input impedance: 100 $\Omega$ ) 2 V DC to 10 V DC input (input impedance: 150 k $\Omega$ or higher) 0 V DC to 10 V DC input (input impedance: 150 k $\Omega$ or higher)			
Analog output (only with 4 -20 mA DC, 2-10 V DC and 0-10 V DC inputs)	Range: 2 V DC (0 %) to 10 V DC (100 %) Max load: 10 k $\Omega$ or higher (max. 1 mA)			
Environmental conditions		Rated operating condition	Transport storage condition	
	Water	Ambient temperature*	-20 $^{\circ}$ C to 50 $^{\circ}$ C (Fluid temperature 0 $^{\circ}$ C to 150 $^{\circ}$ C)	-20 $^{\circ}$ C to 70 $^{\circ}$ C
			-20 $^{\circ}$ C to 40 $^{\circ}$ C (Fluid temperature 150 $^{\circ}$ C to 175 $^{\circ}$ C)	
	Steam			
		Humidity	5 %RH to 95 %RH	5 %RH to 95 %RH
	Vibration	5.0 m/s <sup>2</sup> (10 Hz to 150 Hz)	20.0 m/s <sup>2</sup> (10 Hz to 150 Hz)	
	(The actuator shall be packed during transport.) * Do not allow the fluid to freeze.			
Materials	Case: Aluminum alloy casting Cover: Plastic (polycarbonate resin) (color: gray) Yoke: Steel plate			
Surface finishing	Case: None Yoke: Electro-galvanizing (bright chromate finish)			
Installation locations	Indoor Outdoor (keep away from direct sunlight.)			
Installation orientation	Installable in any position ranging from upright to sideways. (If being installed outdoors, it must be installed in upright position.)			
Valve position indication	Pointer located at the bottom of the actuator shows the position by pointing at the value (0: close to 100: open) of the scale on front, rear, and bottom sides.			
Manual operation	Disconnect from the power supply. Using a wrench, rotate the rectangular part (joint) at the connection between the valve and the actuator.			
Wiring	Two knockout holes ( $\phi$ 22 mm) are located on bilateral sides. Cut out the required one and connect the wiring to the terminal block with screws (M3.5).			
Enclosure rating	Splash-proof (equivalent to IEC (International Electrotechnical Commission) IP54)			
Insulation	Between terminal and cabinet: 5 M $\Omega$ or higher at 500 V DC			
Dielectric strength	Between terminal and cabinet: 500 V AC/min with 5 mA or less leakage current			
Position for shipment	Fully open			

Note: For weight of the ACTIVAL, refer to the table shown in the section 'Dimensions'.



## Dimensions

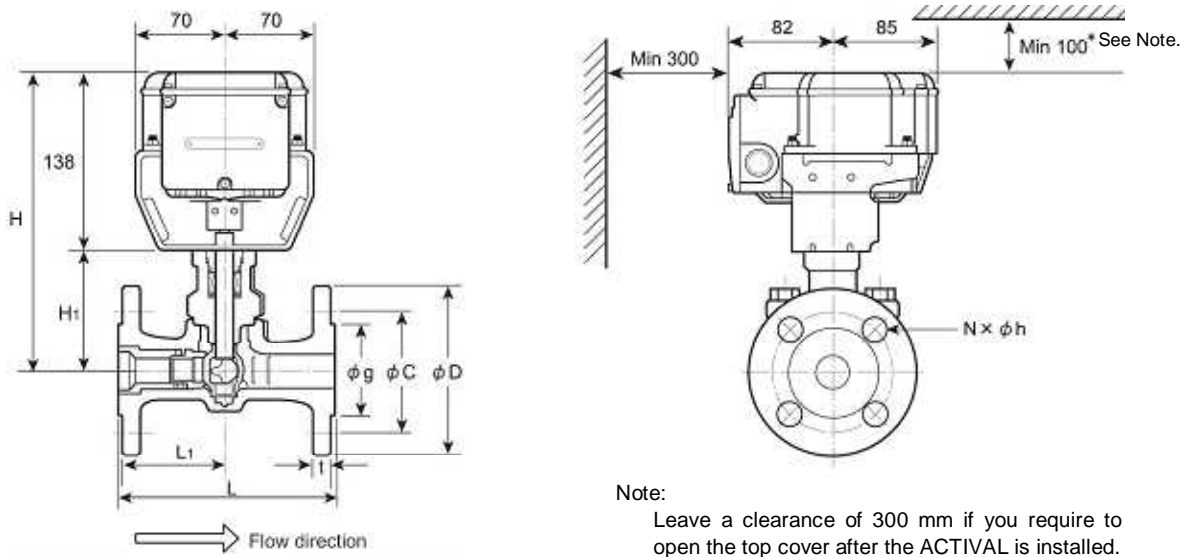


Figure 1. Dimensions (mm): Valve body

Nominal size (DN)	L (mm)	L1 (mm)	H (mm)	H1 (mm)	$\phi D$ (mm)	$\phi C$ (mm)	$\phi g$ (mm)	t (mm)	$\phi h$ (mm)	N	Weight (kg)
15	108	50	213	75	95	65	46	16	14	4	4.6
25	127	60	228	90	115	85	65	18	14	4	6.6
40	165	82.5	241	103	150	110	84	20	19	4	10.0
50	178	89	245	107	165	125	99	20	19	4	11.5
65	190	90	262	124	185	145	118	22	19	4	16
80	203	100	263	125	200	160	132	22	19	8	18.5

## Parts Identification

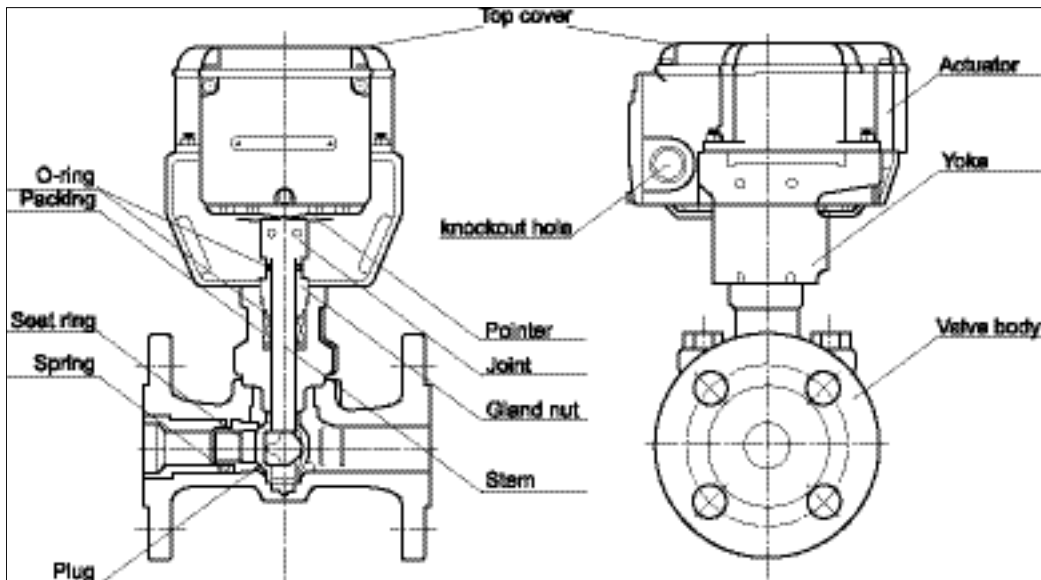


Figure 2. Parts identification

## Precautions for Installation

### Environment

A CAUTION	
$\alpha$	<ul style="list-style-type: none"> <li>• Avoid using the ACTIVAL in an atmosphere containing oxidizing or explosive gas since it may corrode the actuator, the valve or their components.</li> </ul>
$\alpha$	<ul style="list-style-type: none"> <li>• The cover might be corroded by some chemical and organic solvent. Do not expose the ACTIVAL to such substances.</li> </ul>
$\alpha$	<ul style="list-style-type: none"> <li>• The actuator may malfunction if being placed near by hot objects. Do not install it near by steam coil or hot water coil.</li> </ul>

### Piping

- 1) Do not mount Model VY51XXL ACTIVAL on a pipe where water hammer occurs, or where solid objects may accumulate.
- 2) Install the ACTIVAL in a position allowing easy access for maintenance and inspection. Fig. 1 shows the minimum clearance for maintenance and inspection. When installing the ACTIVAL in a ceiling space, place a drain pan under the valve.
- 3) Install a bypass pipe and gate valves on the inflow, outflow and bypass sides. Also, install a strainer on the inflow side. When the ACTIVAL is used in steam applications, a strainer with 80 or more meshes is recommended.

- 4) Do not apply heat insulation to the actuator and the yoke. Apply heat insulation only to gray area (squared with dashed line) shown in Fig. 3.
- 5) Before the installation, check the model number on the label attached to the yoke. The process fluid should flow in the direction indicated by the arrow marked on the valve body.
- 6) The actuator can be mounted in any position from upright to sideways. The ACTIVAL should be installed with its actuator vertically positioned above the valve body. (See Fig. 4.) However, the ACTIVAL must be installed always in upright position outdoors.

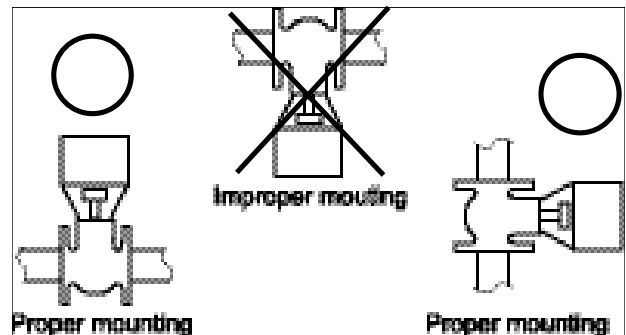


Figure 4. Actuator mounting position

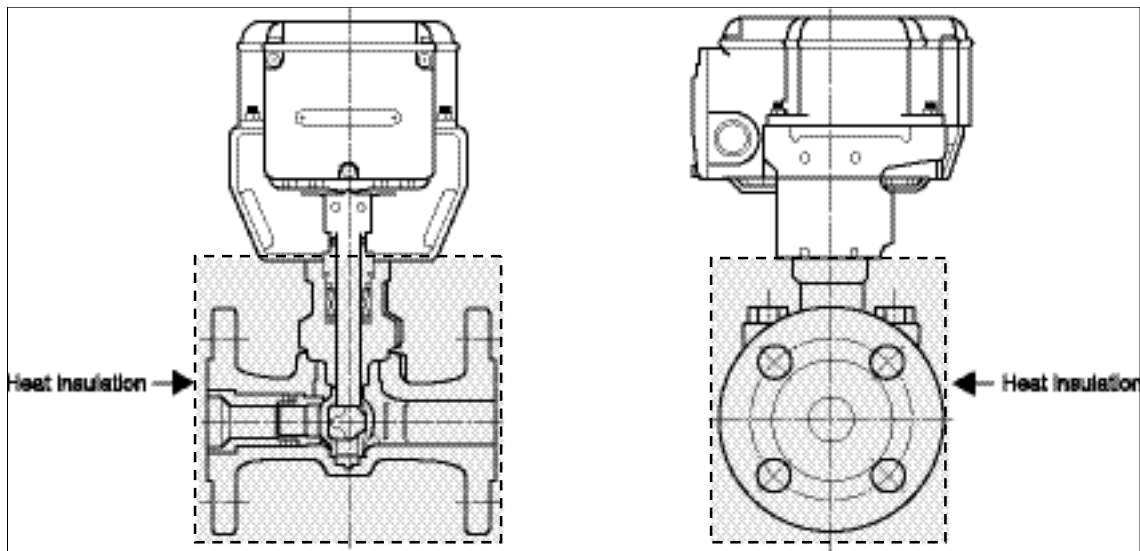


Figure 3. Heat insulation

## Actuator

### A CAUTION

- Although the ACTIVAL can be used in high humidity environments (max. 95 % RH), do not immerse the actuator in water.
- Although the ACTIVAL can also be used outdoors, be sure not to expose the ACTIVAL to direct sunlight.

The ACTIVAL features a single unit construction with the actuator and valve mounted together. Do not separate.

### Position for Shipment

The actuator shaft is positioned at 100% (in fully open position) for shipment. The shaft is completely turned counterclockwise, and the pointer points at "100". (See Fig. 5)

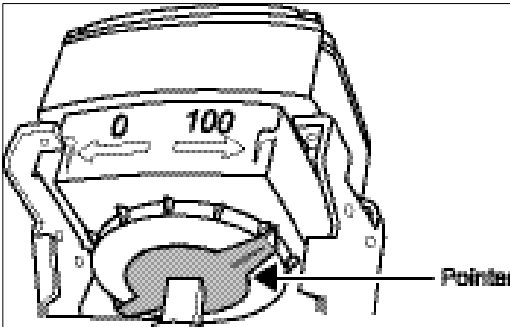


Figure 5. Position for shipment

### Changing the Actuator Mounting Position

- 1) Change the actuator mounting position only when the actuator is in fully open position.
- 2) Remove the screws connecting the actuator and the yoke. Lift the actuator and detach it from the yoke. (The groove at the top of the valve stem is parallel (in fully open position) to the piping.) <Step 1 in Fig. 6>
- 3) Remove the screws connecting the yoke and the valve body. <Step 2 in Fig.6>
- 4) Change the direction of the yoke to the desired direction. The actuator can be horizontally rotated every 90° to fit into the valve mounting position (0°/90°/180°/270° from the factory preset position). <Step 3 in Fig. 6>
- 5) A thermal insulation sheet is inserted between the yoke and the valve. If the mounting position is changed, reinsert the thermal insulation sheet to fit into position (1 sheet between valve body and yoke).
- 6) Before fixing the yoke to the valve with screws, check that the actuator engages correctly with the stem. (Check that the actuator pointer is in fully open position.)
- 7) Mount the actuator, with its direction changed, to the yoke. <Step 4 in Fig. 6>

### IMPORTANT:

Do not change the combination of valve body, yoke and actuator.

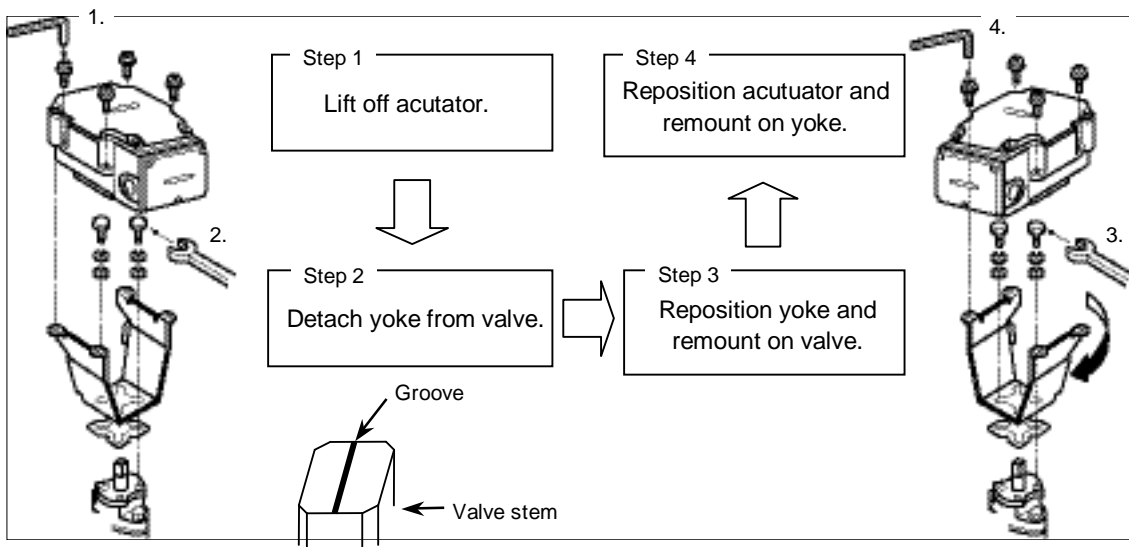


Figure 6. Changing the actuator mounting position

## Manually Opening/Closing Valve

### A CAUTION

- $\alpha$
- To manually open or close the valve, be sure to disconnect the ACTIVAL from the power supply (24 V AC). If the valve is manually opened or closed with the power applied, the actuator may be damaged.

As shown in Fig. 7, from the front of the ACTIVAL, hold the joint with a tool such as a hexagonal wrench, and turn the joint slowly toward the position to set up. Do not open/close the valve beyond the fully open mark or the fully closed mark.

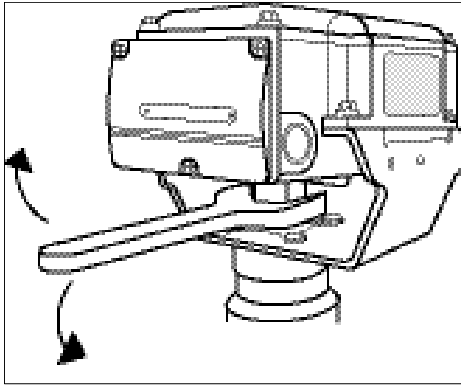


Figure 7. Manual open/close operation

## Auxiliary Switches / Auxiliary Potentiometer (Optional)

### A CAUTION

- $\alpha$
- The auxiliary switches and the auxiliary potentiometer are installed on site. (See Fig. 17.) Refer to the instructions attached to them.
- $\alpha$
- Do not open the top cover except when adjusting the auxiliary switches or auxiliary potentiometer.
- $\alpha$
- Do not put a load on the cover.

## Wiring

### A CAUTION

- $\alpha$
- Disconnect power supply before performing any wiring.
- $\alpha$
- This product is designed for 24 V AC power supply voltage. Do not apply mains power.
- $\alpha$
- For correct wiring of 4-20 mA DC input, 2-10 V DC input, and 0-10 V DC input, refer to Figs. 10 to 14 and make sure the polarity of power supply and 2-10 V DC output. Incorrect wiring may result in PCB (printed circuit board) burnout.
- $\alpha$
- To prevent equipment damage, cover the actuator except during wiring work.

## Wiring precautions

- Do not apply 24 V AC power to the terminals 4, 5 and 6. (Maximum applicable voltage: 5 V DC)
- To lead the wires into the actuator, cut out a knockout hole for a wiring port. There are two knockout holes on the bilateral sides of the actuator terminal block: one  $\phi 22$  mm knockout hole on each side. Select a knockout hole according to the conduit mounting direction and cut it out by lightly knocking with a screwdriver. (Refer to Fig. 8)

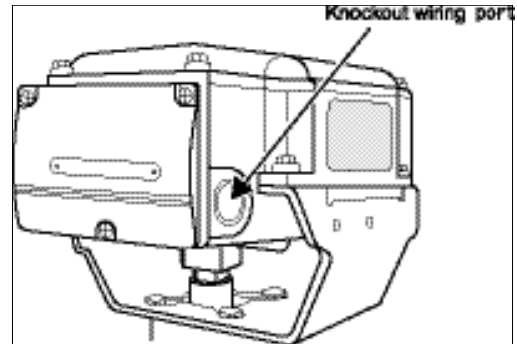


Figure 8. Knockout hole for wiring port

- Correctly connect the wiring to the terminals with M3.5 screws, referring to the wiring terminal diagrams shown in Figs. 10 to 14 and the wiring example shown in Figs 15 and 16.
- When the ACTIVAL is used in a high-humidity environment or outdoors, use a water-proof connector.

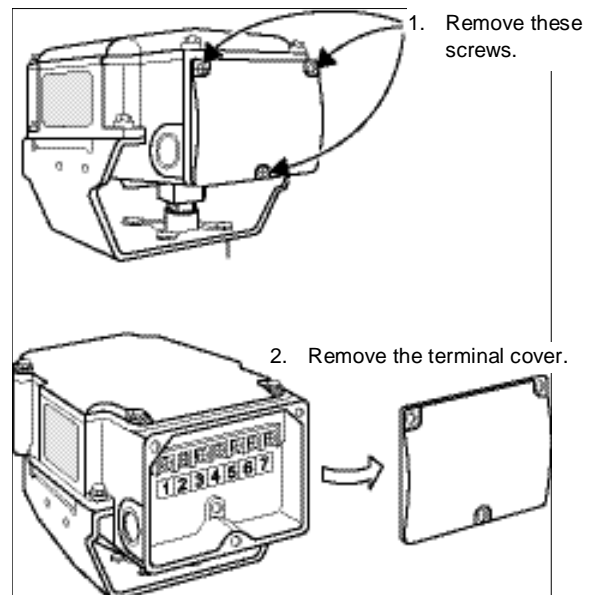


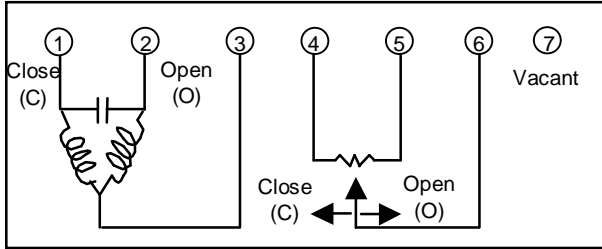
Figure 9. Terminal cover removal

Unscrew the three screws (M4 × 10) to remove the terminal cover.

**For splash-proof enclosure...**

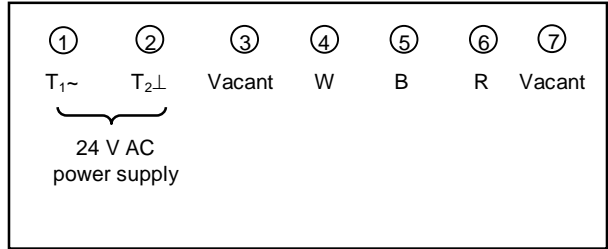
- 1) Be sure to completely close the terminal cover and the top cover.
- 2) Waterproof the wiring port.
  - For cable connection, use a water-proof connector.  
Recommended product:  
Seal connector (Part No. 83104346-003)
  - For conduit connection, use a water-proof plica tube or the like to ensure waterproofing.

**Wiring Terminals**



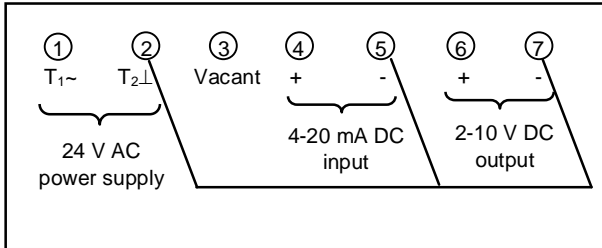
Model VY511XL00XX

Figure 10. Wiring terminal diagram  
Model VY511XL00XX:  
( Nominal 135 Ω feedback potentiometer type )



Model VY512XL00XX

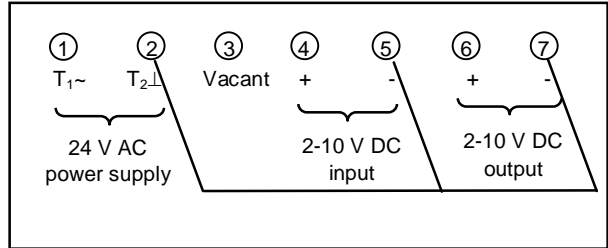
Figure 11. Wiring terminal diagram  
Model VY512XL00XX:  
( Nominal 135 Ω resistance input type )



Model VY513XL00XX

Note: The terminals 2, 5 and 7 are connected inside the actuator.

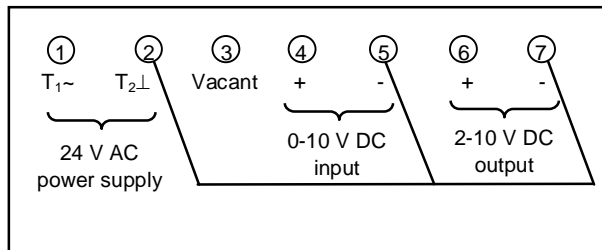
Figure 12. Wiring terminal diagram  
Model VY513XL00XX:  
( 4-20 mA DC input with 2-10 V DC output type )



Model VY514XL00XX

Note: The terminals 2, 5 and 7 are connected inside the actuator.

Figure 13. Wiring terminal diagram  
Model VY514XL00XX:  
( 2-10 V DC input with 2-10 V DC output type )



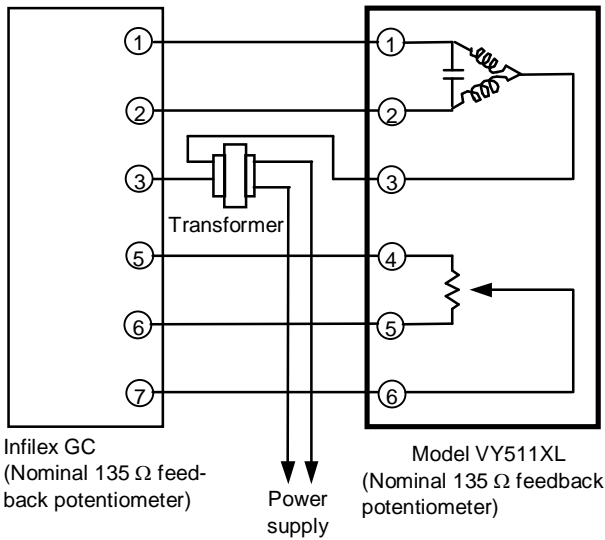
Model VY515XL00XX

Note: The terminals 2, 5 and 7 are connected inside the actuator.

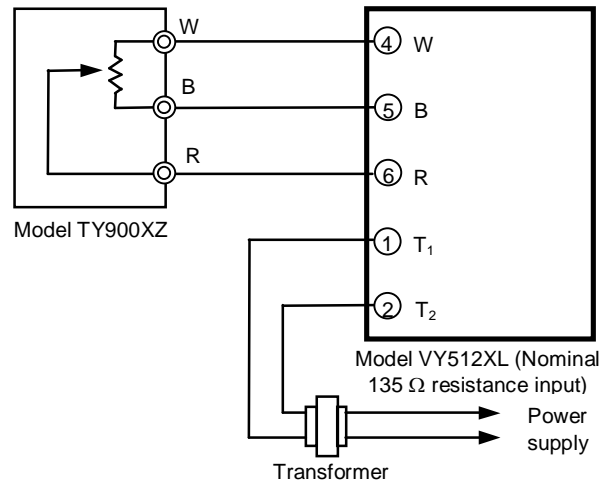
Figure 14. Wiring terminal diagram  
Model VY515XL00XX:  
( 0-10 V DC input with 2-10 V DC output )

**Connection Examples**  
**(Connection to Yamatake's Controllers)**

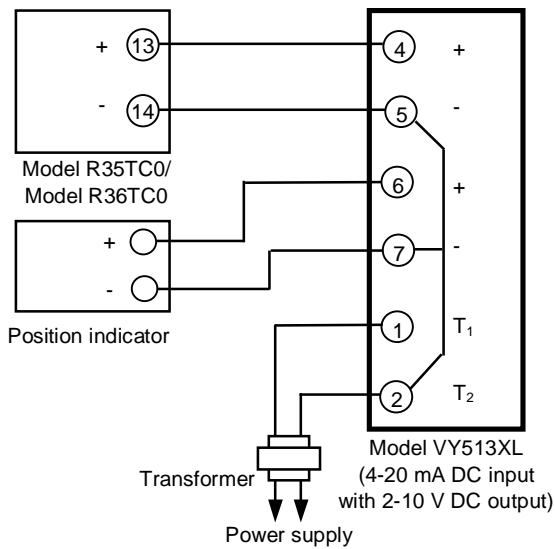
• **Connection to Infilex™ GC**



• **Connection to Neostat (Model TY900XZ)**

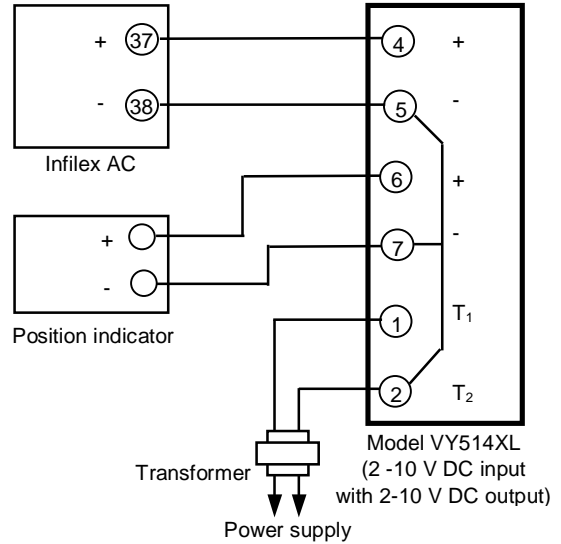


• **Connection to Model R35TC0 / R36TC0**



Note: Terminals 2, 5, and 7 are connected inside the actuator.

• **Connection to Infilex™ AC**



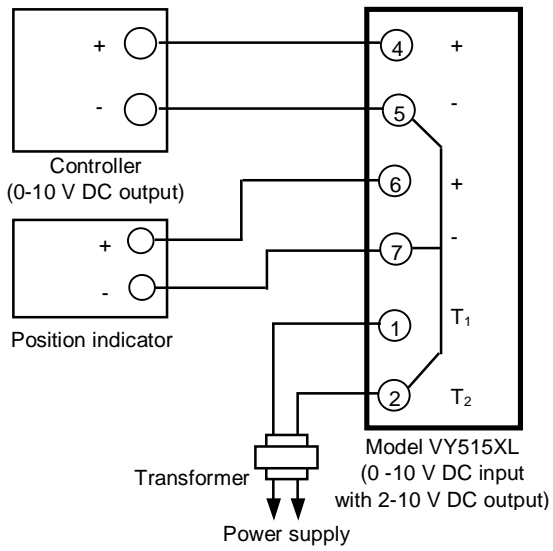
Note: Terminals 2, 5, and 7 are connected inside the actuator.

Figure 15-1. Connection examples

## Connection Example

(Connection to a controller with 0-10 V DC output)

- Connection to a controller with 0-10 V DC output

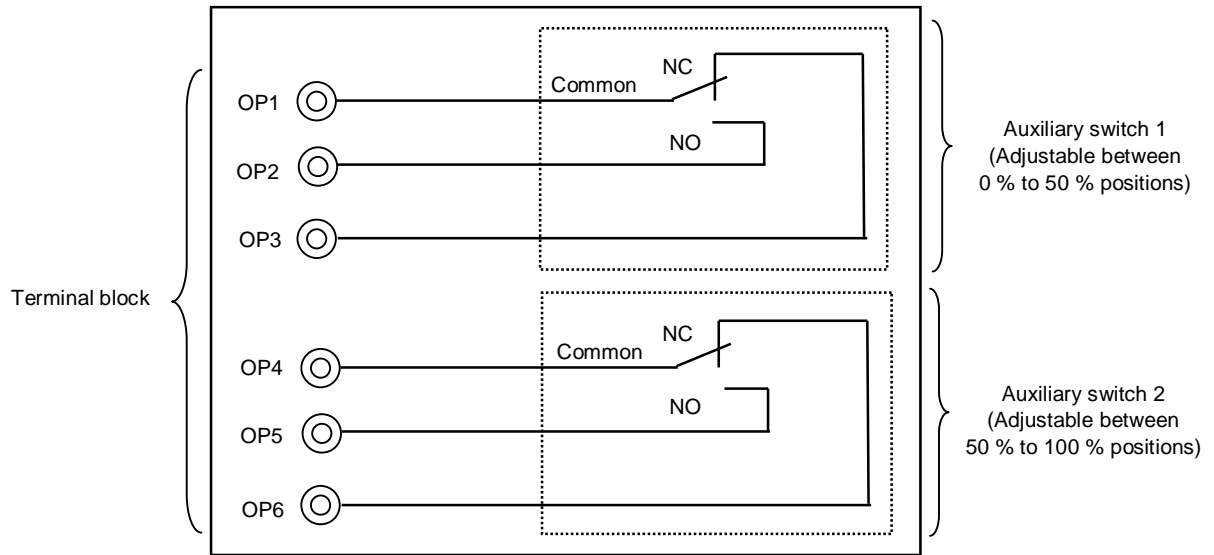


Note: The terminals 2, 5 and 7 are connected inside the actuator.

Figure 15-2. Connection example

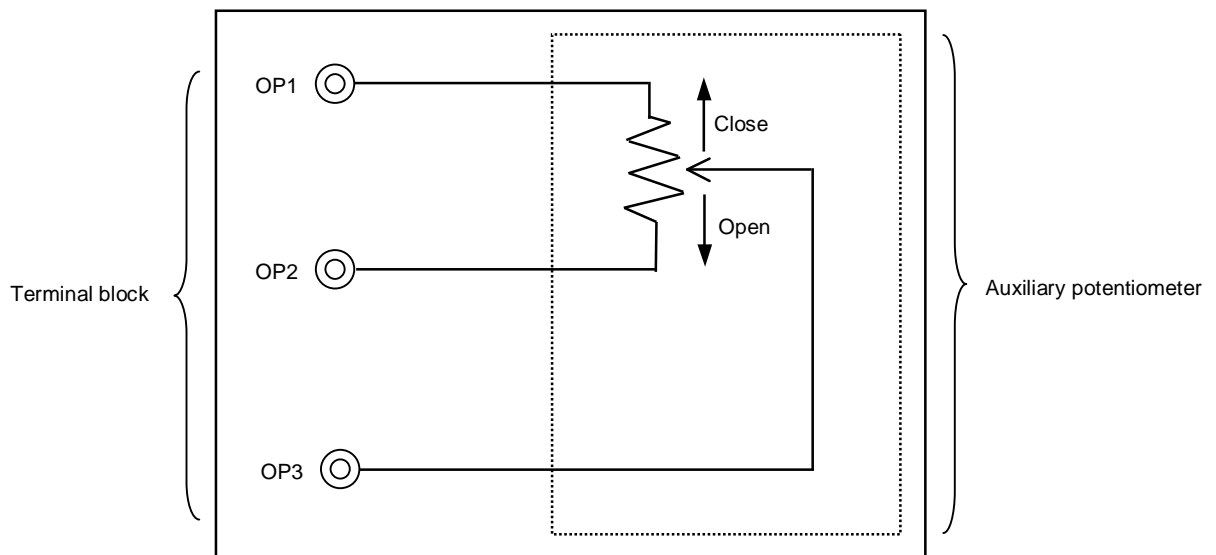
## Connection of Auxiliary Switches / Auxiliary Potentiometer

### • Connection of auxiliary switches



Part No. 83161792-001

### • Connection of auxiliary potentiometer



Part No. 83161793-001

Figure 16. Wiring connection of auxiliary switches / auxiliary potentiometer

## Inspection and Maintenance

### A CAUTION

- $\alpha$
- Avoid touching the installed ACTIVAL (valve body, yoke, joint). When being used to control hot water, it reaches high temperature and may cause burn injury.

- Inspection

Inspect the ACTIVAL according to Table 1.

Manually open/close the ACTIVAL at least once a month if it is left in inactive state for a long period.

- Maintenance

Visually inspect the fluid leakage of the valve and the actuator operations every six months. If any of the problems described in Table 2 are found, take corresponding actions shown in the table.

Table 1. Inspection items and details

Inspection item	Inspection interval	Inspection detail
Visual inspection	Semiannual	<ul style="list-style-type: none"> <li>• Fluid leakage from the gland and the flange face</li> <li>• Loosened bolts</li> <li>• Valve and actuator damages</li> </ul>
Operating status	Semiannual	<ul style="list-style-type: none"> <li>• Unstable open/close operation</li> <li>• Abnormal noise and vibration</li> </ul>
Routine inspection	Any time	<ul style="list-style-type: none"> <li>• Fluid leakage to the outside</li> <li>• Abnormal noise and vibration</li> <li>• Unstable open/close operation</li> <li>• Valve hunting</li> </ul>

Table 2. Troubleshooting

(If your problem is not solved by the corresponding action, please contact Yamatake near you.)

Problem	Part to check	Action
<ul style="list-style-type: none"> <li>• Fluid leaks from the flange face.</li> </ul>	Loosened flange bolts Gasket on the flange face Misaligned piping	Tighten the flange bolts. Replace the gasket. Redo piping.
<ul style="list-style-type: none"> <li>• Fluid leaks from the gland part.</li> </ul>	Loosened gland packing	Tighten the gland nut.
<ul style="list-style-type: none"> <li>• Fluid leaks from the bonnet.</li> </ul>	Loosened bolts	Tighten the bolts.
<ul style="list-style-type: none"> <li>• Valve does not operate smoothly / valve stops halfway / valve does not operate at all.</li> </ul>	Conditions of the power applied and of the input signal applied Loosened terminals Wiring condition / disconnected wires	Check the power supply and the controller connected to. Tighten the terminals. Check the wiring.
<ul style="list-style-type: none"> <li>• Fluid leaks to the outside of the ACTIVAL when the valve is in fully closed position.</li> </ul>	Actuator pointer not pointing to fully closed position	Fully close the ACTIVAL.
<ul style="list-style-type: none"> <li>• The valve vibrates or produces an abnormal noise.</li> </ul>	Primary pressure condition Differential pressure condition	Adjust the mounting position and installation location.
<ul style="list-style-type: none"> <li>• The auxiliary switch does not operate.</li> </ul>	Auxiliary switch (cam switch) condition Loosened terminals Wiring condition / disconnected wires	Redo the cam switch setting. Tighten the terminals. Check the wiring.
<ul style="list-style-type: none"> <li>• The auxiliary potentiometer does not operate.</li> </ul>	Condition of resistance Loosened terminals Wiring condition / disconnected wires	Check the resistance value (1 k $\Omega$ ). Tighten the terminals. Check the wiring.
<ul style="list-style-type: none"> <li>• Valve hunting occurs.</li> </ul>	Secondary pressure condition Differential pressure condition	Adjust the mounting position and installation location. Correct the control parameter setting of controller.





*Specifications are subject to change without notice.*

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