

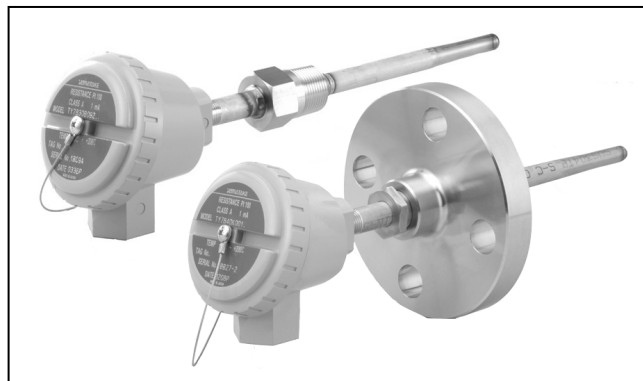
## Pipe Temperature Sensor

### General

Model TY783 is an immersion temperature sensor. Its Pt100 resistance (equivalent to JIS\* C1604 Class A) output, in combination with a electronic device with Pt100 input, is used for temperature control, indication, and recording of the process fluid in a pipe, tank, or heat exchanger.

Model TY783 is also used as a temperature sensor for a duct or chamber.

\* JIS: Japanese Industrial Standards.



### Specifications

Item	Specification
Sensing range	-50 °C to 200 °C
Process fluid	Different depending on the materials of thermowell. Refer to the <b>Corrosiveness of the Thermowell</b> section.
Sensing accuracy	$\pm (0.15 + 0.002 t )$ °C t: temperature measured
Time constant	<ul style="list-style-type: none"> <li>Weld thermowell (Models TY7830A to TY7830F, TY7830J, TY7830K, TY7831A to TY7831F, TY7831J, TY7831K): Approx. 50 s (in agitated water)</li> <li>Hollow tapered thermowell (Models TY7830G, TY7830H, TY7830M, TY7830N, TY7831G, TY7831H, TY7831M, TY7831N, TY7832G, TY7832H, TY7832M, TY7832N): Approx. 20 s (in agitated water)</li> </ul>
Rated current	1 mA
Wiring	3-wired (for single element) / 6-wired (for dual element)
Withstand pressure	Screwed connection: 1.47 MPa Flanged connection: equivalent to JIS 20K
Degree of protection	IEC IP55 in wired state (Note that cable connectors complied with IP55 must be used for wiring to an external device.)
Insulation resistance	20 MΩ or higher at 500 V DC
Dielectric strength	1 mA or less leakage at 500 V AC for 1 minute.
Materials of the terminal box	Aluminum alloy
Allowable flow velocity of process fluid	150 mm to 300 mm insertion length: 4 m/s or less 150 mm to 400 mm insertion length: 2.5 m/s or less 150 mm to 2000 mm insertion length: 0.3 m/s or less (e.g., in a heat storage tank) Note: Allowable flow velocity differs depending on the mounting types and the insertion length. Refer to <b>Fluid flow velocity and thermowell insertion length by mounting orientation.</b>



## Safety Instructions

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 our sales representative. Azbil Corporation will not bear any responsibility for the results produced by the operators.


### Warnings and Cautions


	<b>WARNING</b>	Alerts users that improper handling may cause death or serious injury.
	<b>CAUTION</b>	Alerts users that improper handling may cause minor injury or material loss.


### Signs


	Alerts users possible hazardous conditions caused by erroneous operation or erroneous use. The symbol inside $\triangle$ indicates the specific type of danger. (For example, the sign on the left warns of the risk of electric shock.)
	Notifies users that specific actions are prohibited to prevent possible danger. The symbol inside $\otimes$ 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 $\bullet$ graphically indicates the actual action to be carried out. (For example, the sign on the left indicates general instructions.)


 **WARNING**


 Do not loosen the connection screw/flange unless it is necessary.  
Failure to do so might let the thermowell jump out of the pipe due to the fluid pressure, causing personal injury or fluid leakage.


 **CAUTION**


 Use the product under the operating conditions (temperature, humidity, power, vibration, shock, mounting direction, atmospheric condition, etc.) as listed in the specifications.  
Failure to do so might cause fire or device failure.


 Use the product within the rated operating ranges as listed in the specifications.  
Failure to do so might cause device failure.


 Installation and wiring must be performed by qualified personnel in accordance with all applicable safety standards.


 All wiring must comply with applicable codes and ordinances.

 To connect the wires to the screw terminals, use crimp terminal lugs with insulation.  
Failure to do so might cause short circuit or electric shock.

 Do not disassemble the product.  
Doing so might cause electric shock or device failure.

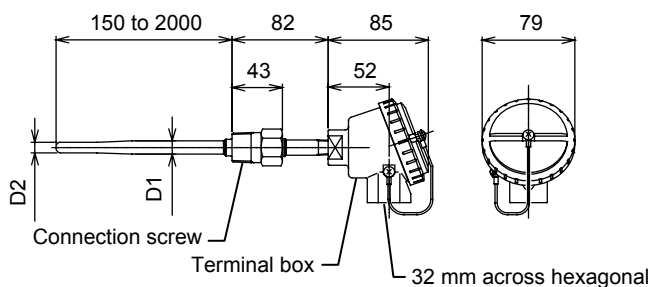
 Pipe insertion part of the product is the thermowell. Do not remove the insertion part unless it is necessary.  
Failure to do so might cause fluid leakage.

 Do not carelessly touch the product when being used for hot fluid.  
Its temperature becomes high, and you might get burned.

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

**Dimensions**

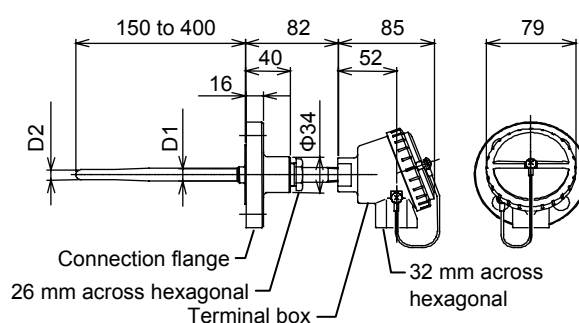
**Models TY7830A to TY7830F, TY7831A to TY7831F**



Insertion length (mm)	D1 (mm)	D2 (mm)
150	Φ12	Φ9.6
160 to 400	Φ17.3	Φ12.5
410 to 2000	Φ12	Φ9.6

Figure 1. Dimensions (mm): Models TY7830A to TY7830F, TY7831A to 7831F

**Models TY7830J, TY7830K, TY7831J, TY7831K**



Insertion length (mm)	D1 (mm)	D2 (mm)
150	Φ12	Φ9.6
160 to 400	Φ17.3	Φ12.5

Figure 3. Dimensions (mm): Models TY7830J, TY7830K, TY7831J, TY7831K

**Models TY7830G, TY7830H, TY7831G, TY7831H, TY7832G, TY7832H**

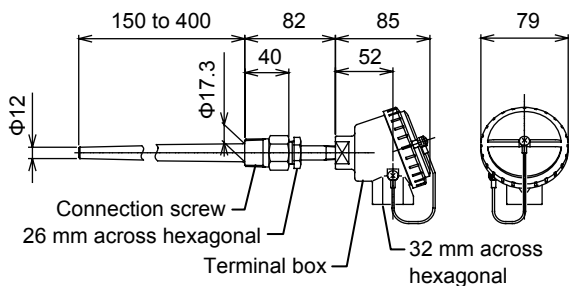


Figure 2. Dimensions (mm): Models TY7830G, TY7830H, TY7831G, TY7831H, TY7832G, TY7832H

**Models TY7830M, TY7830N, TY7831M, TY7831N, TY7832M, TY7832N**

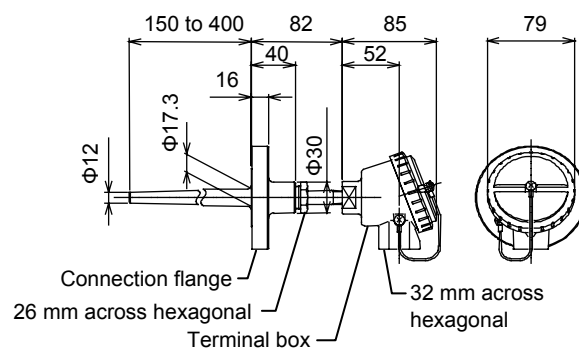


Figure 4. Dimensions (mm): Models TY7830M, TY7830N, TY7831M, TY7831N, TY7832M, TY7832N

## Model Numbers

Base model number	Installation	Thermowell				Validation	Description
		Material	Connec-tion	Element	Insertion length		
TY78	3						Pipe temperature sensor
							Immersion
		0					JIS SUS304
		1					JIS SUS316L
		2					Titanium (only for hollow tapered thermowell)
			A				R1/2 screwed connection, weld thermowell (150 mm insertion length) for Models TY7830, TY7831
			B				R3/4 screwed connection, weld thermowell (150-2000 mm insertion length) for Models TY7830, TY7831
			C				R1 screwed connection, weld thermowell (150-2000 mm insertion length) for Models TY7830, TY7831
			D				G1/2 screwed connection, weld thermowell (150 mm insertion length) for Models TY7830, TY7831
			E				G3/4 screwed connection, weld thermowell (150-2000 mm insertion length) for Models TY7830, TY7831
			F				G1 screwed connection, weld thermowell (150-2000 mm insertion length) for Models TY7830, TY7831
			G				R1/2 screwed connection, hollow tapered thermowell (150-400 mm insertion length)
			H				R3/4 screwed connection, hollow tapered thermowell (150-400 m insertion length)
			J				JIS 20K flanged connection (DN20, RF), weld thermowell (150- 400 mm insertion length) for Models TY7830, TY7831
			K				JIS 20K flanged connection (DN25, RF), weld thermowell (150- 400 mm insertion length) for Models TY7830, TY7831
			M				JIS 20K flanged connection (DN20, RF), hollow tapered thermowell (150-400 mm insertion length) for Models TY7830, TY7831
			N				JIS 20K flanged connection (DN25, RF), hollow tapered thermowell (150-400 mm insertion length) for Models TY7830, TY7831
			Y				Replacement element for hollow tapered thermowell (Models TY783XG, TY783XH, TY783XM, TY783XN)
			Z				Replacement element for weld thermowell (Models TY7830A to TY7830F, TY7830J, TY7830K, TY7831A to TY7831F, TY7831J, TY7831K)
				1			Single element
				2			Dual element
					015		150 mm insertion
					020		200 mm insertion
					025		250 mm insertion
					030		300 mm insertion
					050		500 mm insertion for Models TY7830B, TY7830C, TY7830E, TY7830F, TY7831B, TY7831C, TY7831E, TY7831F
					xxx		xxx cm (weld thermowell with screwed connection: max. 2000 mm, hollow tapered thermowell with flanged (RF) connection: max. 400 mm)
						-A	With standard validation (0 °C, 100 °C)
						-BX	With custom-order validation (X indicates the number of testing items. 2 or more items are required.)

## Part Numbers

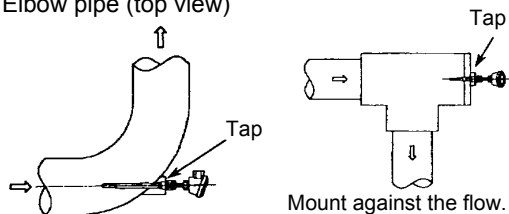
Separate order is required for the following parts.

Part number	Description
83104098-003	Seal connector (-30 to 60 °C measuring range, Φ8.5-12.5 mm cable outer sheath, plastic)
83104098-004	Seal connector (-30 to 60 °C measuring range, Φ10.5-14.5 mm cable outer sheath, plastic)
PA1-A3PFH	Heat-resistant seal connector (-40 to 120 °C measuring range, Φ12-16 mm cable outer sheath, metallic)

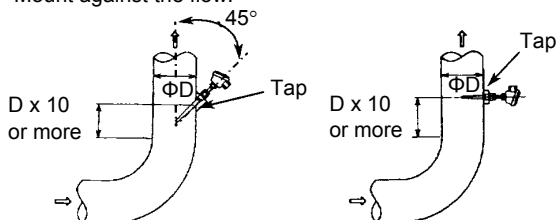
**Installation**

**Mounting orientations by pipe shape**

a) Elbow pipe (top view)



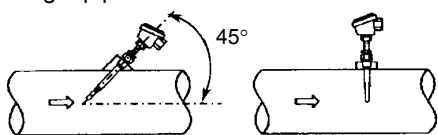
Mount against the flow.



Mount diagonally to the flow. Mount perpendicularly to the flow.

Figure 5. Mounting on an elbow pipe

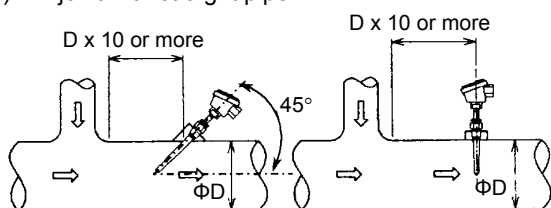
b) Straight pipe



Mount diagonally to the flow. Mount perpendicularly to the flow.

Figure 6. Mounting on a straight pipe

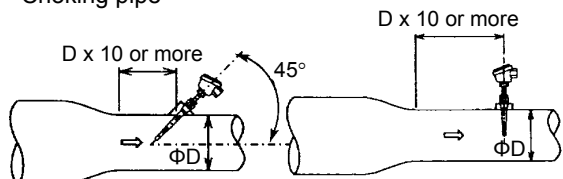
c) T-joint with straight pipe



Mount diagonally to the flow. Mount perpendicularly to the flow.

Figure 7. Mounting on a T-joint + straight pipe

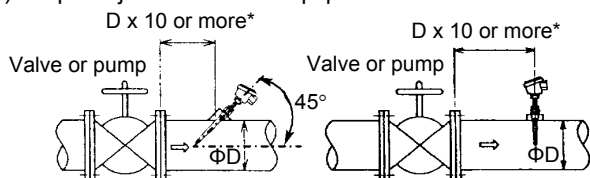
d) Choking pipe



Mount diagonally to the flow. Mount perpendicularly to the flow.

Figure 8. Mounting on a choking pipe

e) Pipe or joint with other equipment mounted

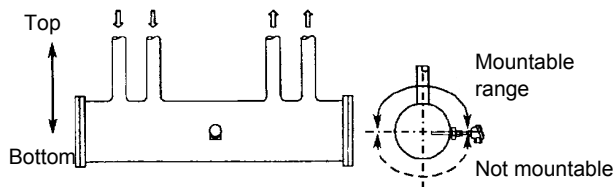


Mount diagonally to the flow. Mount perpendicularly to the flow.

\* Even if the distance between the sensor and valve/pump is larger than the specified above, confirm that there is no interference including swirl and shock flow (pulse flow) before mounting.

Figure 9. Mounting on a pipe or joint with other equipment mounted

f) Header



\* Max. insertion length of the thermowell should be 300 mm.

Figure 10. Mounting on a header

Allowable fluid flow velocity and thermowell insertion length by mounting orientation

Flow velocity	Insertion length for mounting perpendicularly / diagonally to the flow	Insertion length for mounting against the flow
4 m/s or less	150 mm to 200 mm	150 mm to 300 mm
2.5 m/s or less	150 mm to 300 mm	150 mm to 400 mm
0.3 m/s or less	150 mm to 2000 mm	

**Installation precautions**

- To prevent condensation, install the pipe temperature sensor into a pipe within the mountable range as shown in the figure below.

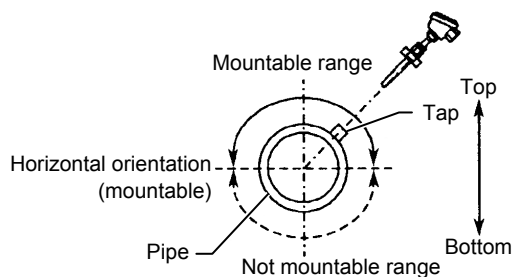


Figure 11. Mounting example

- Select the mounting position available for detecting the typical temperature of the process fluid.
- Mount the temperature sensor to immerse the whole thermowell of the temperature sensor in the process fluid.
- To mount the sensor into the flow path of the liquid, insert the thermowell against the flow. If the thermowell cannot be inserted against the flow, insert the thermowell diagonally to the flow. If the thermowell cannot be inserted diagonally, insert it perpendicularly to the flow. Refer to the **Mounting orientations by pipe shape** section.
- Do not install the pipe temperature sensor in a position where a pipe vibrates.
- To reduce natural vibration of the tap, make the tap as short as possible.
- Pipe sealing is necessary for the pipe temperature sensor with screwed connection.

**IMPORTANT:**  
Do not step on the product.

## Corrosiveness of the Thermowell

Category	Corrosive medium	Composition (%)	Temperature (°C)	Level of corrosiveness			
				JIS SUS304	JIS SUS316L	Titanium	
Inorganic acid	Hydrochloric acid (HCl)	1	25	B	A	A	
			Boiling point	D	D	D	
		10	25	D	D	B	
				Boiling point	D	D	D
	Sulfuric acid (H <sub>2</sub> SO <sub>4</sub> )	1	25	A	A	A	
			Boiling point	D	C	D	
		10	25	B	B	B	
			Boiling point	D	D	D	
	Nitric acid (HNO <sub>3</sub> )	10	25	A	A	A	
Boiling point			A	A	A		
65		25	A	A	A		
		Boiling point	B	B	A		
Organic acid	Acetic acid (CH <sub>3</sub> COOH)	10	Boiling point	A	A	A	
		60	Boiling point	B	B	A	
	Formic acid (HCOOH)	10	25	C	B	A	
		30	Boiling point	D	D	D	
	Oxalic acid ((COOH) <sub>2</sub> )	10	25	B	B	B	
		25	60	C	B	D	
	Lactic acid (CH <sub>3</sub> CH(OH)COOH)	10	Boiling point	B	B	A	
		85	Boiling point	D	D	A	
Alkali	Caustic soda (NaOH)	10	100	A	A	A	
		40	Boiling point	B	B	D	
	Potassium carbonate (K <sub>2</sub> CO <sub>3</sub> )	5	Boiling point	A	A	A	
		20	Boiling point	A	A	A	
Inorganic chloride	Sodium chloride (NaCl)	25	25	N/A	N/A	A	
			Boiling point	N/A	N/A	N/A	
	Ammonium chloride (NH <sub>4</sub> Cl)	40	25	N/A	N/A	A	
			Boiling point	N/A	N/A	N/A	
	Zinc chloride (ZnCl <sub>2</sub> )	25	Boiling point	D	D	N/A	
			50	Boiling point	D	D	N/A
	Magnesium chloride (MgCl <sub>2</sub> )	42	25	N/A	N/A	A	
			Boiling point	N/A	N/A	N/A	
Ferric chloride (FeCl <sub>3</sub> )	30	25	D	D	A		
		Boiling point	D	D	N/A		
Inorganic salt	Sodium sulfate (Na <sub>2</sub> SO <sub>4</sub> )	20	25	A	A	A	
			Boiling point	A	A	A	
	Sodium sulfide (Na <sub>2</sub> S)	10	25	A	A	A	
			Boiling point	B	B	A	
	Sodium hypochlorite (NaOCl)	5	25	C	C	A	
			15	25	C	C	A
Sodium carbonate (Na <sub>2</sub> CO <sub>3</sub> )	30	25	A	A	A		
		Boiling point	A	A	A		
Organic compound	Methyl alcohol (CH <sub>3</sub> OH)	95	25	A	A	A	
	Carbon tetrachloride (CCl <sub>4</sub> )	100	Boiling point	B	B	A	
	Phenol (C <sub>6</sub> H <sub>5</sub> OH)	Saturated	25	A	A	A	
	Formaldehyde (HCHO)	37	Boiling point	A	A	A	
Gas	Chlorine (Cl <sub>2</sub> )	Dry	25	A	A	D	
		Wet	25	D	D	N/A	
	Hydrogen sulfide (H <sub>2</sub> S)	Dry	25	C	B	A	
		Wet	25	B	A	A	
	Ammonia (NH <sub>3</sub> )	100	40	A	A	A	
			100	A	A	A	
Others	Seawater	—	25	N/A	N/A	A	
			100	N/A	N/A	N/A	
	Naphtha	—	80	N/A	N/A	A	
			180	N/A	N/A	A	

Levels of corrosiveness

A: 0.125 mm/year or less

B: 0.125 to 0.5 mm/year

C: 0.5 to 1.25 mm/year

D: 1.25 mm/year or more

N/A: Not available since pitting or crevice corrosion may occur on the thermowell.

## Wiring

### ⚠ CAUTION

⚠ All wiring must comply with applicable codes and ordinances.

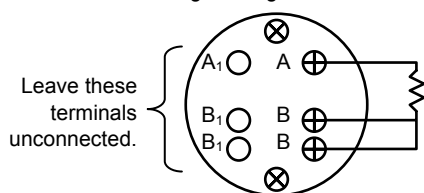
Before wiring, be sure to turn off the power to the device to be connected to the pipe temperature sensor.

If the process fluid temperature ranges from -50 °C to 100 °C, use 1.25 mm<sup>2</sup> or greater JIS IV or CVV cable.

If the process fluid temperature ranges from 100 °C to 200 °C, use 1.25 mm<sup>2</sup> or greater silicon or fluoroplastic cable.

Seal connectors are necessary. Be sure to separately order the seal connectors. Refer to the **Part Numbers** section.

Wiring for single element



Wiring for dual elements

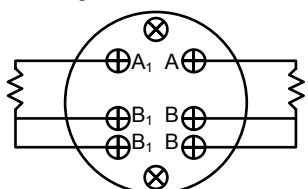


Figure 12. Wiring to the pipe temperature sensor

## Maintenance and Calibration

### ⚠ WARNING

⚠ Do not loosen the connection screw/flange unless it is necessary.  
 ⚠ Failure to do so might let the thermowell jump out of the pipe due to the fluid pressure, causing personal injury or fluid leakage.

### ⚠ CAUTION

⚠ Pipe insertion part of the product is the thermowell.  
 ⚠ Do not remove the insertion part unless it is necessary.  
 ⚠ Failure to do so might cause fluid leakage.  
 ⚠ Do not carelessly touch the product when being used for hot fluid.  
 ⚠ Its temperature becomes high, and you might get burned.

To replace or calibrate the element, follow the procedure below.

Note:

\* For the weld thermowell with screwed connection (Models TY7830A to TY7830F, TY7831A to TY7831F), the thermowell is integrated in the terminal box. Do not loosen the connection screw. Doing so might let the process fluid leak from the pipe.

- 1) Order the replacement element (only when the element needs to be replaced). The replacement element is composed of the element and terminal strip.
- 2) Turn off the power to the device connected to the pipe temperature sensor.
- 3) Remove the cover and disconnect the cables from the pipe temperature sensor.
- 4) Unscrew and remove the terminal strip and sensing element from the thermowell.
- 5) Check the resistance of the sensing element. Digital multi-meter is recommended for resistance check.
- 6) Follow the steps 2) to 4) in reverse (4)→3)→2)) to set the replacement element in the thermowell and attach the cover to the thermowell.

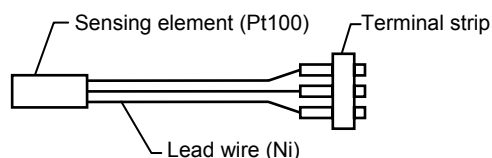
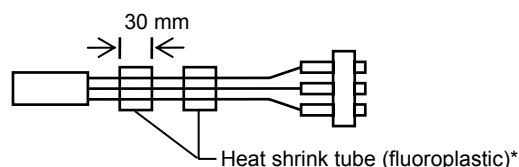


Figure 13. Replacement element for the weld thermowell (Models TY7830Z and TY7831Z)



Note:

\* Number and location of the heat shrink tubes to attach differ depending on the insertion length of the thermowell.

Figure 14. Replacement element for the hollow tapered thermowell (Models TY7830Y, TY7831Y, TY7832Y)

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*Specifications are subject to change without notice.*

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