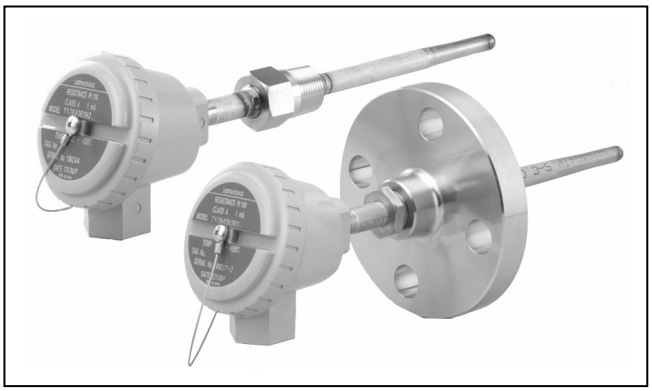
Pipe Temperature Sensor
Model TY783

General

Model TY783 is a pipe-mount (insertion type) temperature sensor. Its Pt100 resistance (equivalent to JIS* C1604 Class A) output is used for temperature reading, control, and recording of the media of a pipe, tank, or heat exchanger.

Model TY783 is also applicable to temperature sensing of a duct or chamber.

* JIS: Japanese Industrial Standards

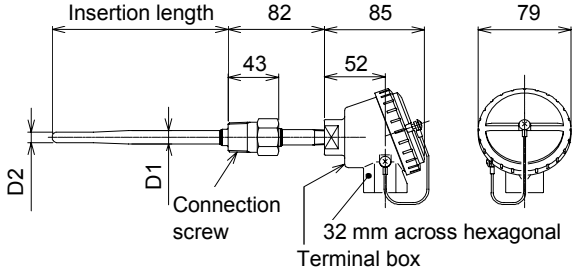


Specifications

Item	Specification
Sensing range	-50 °C to 200 °C
Applicable measuring fluid	Different depending on the materials of thermowell. Refer to “Corrosiveness of the Sensor Thermowell” section.
Sensing accuracy	± (0.15 + 0.002|t|) °C t: temperature measured
Time constant	Models TY7830A to TY7830F, TY7830J, TY7830K, TY7831A to TY7831F, TY7831J, TY7831K (weld thermowell): Approx. 50 s (in agitated water) Models TY7830G, TY7830H, TY7830M, TY7830N, TY7831G, TY7831H, TY7831M, TY7831N, TY7832G, TY7832H, TY7832M, TY7832N (hollow thermowell): 20 s (in agitated water)
Rated current	1 mA
Wiring	3-wired (for single element) / 6-wired (for double elements)
Withstand pressure	Screwed connection: 1.47 MPa Flanged connection: equivalent to JIS 20K
Enclosure rating	IEC IP55 with the cables connected (Note that cable connectors complied with IP55 are used for the cable connection.)
Insulation resistance	20 MΩ or higher at 500 V DC
Dielectric strength	1 mA or lower leakage at 500 V AC for 1 minute.
Materials of the terminal box	Aluminum alloy
Applicable flow velocity of measuring 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: Applicable flow velocity differs depending on the mounting types and the insertion length. Refer to “Applicable fluid flow velocity and thermowell insertion length by mounting types”.

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 TY7830G, TY7830H, TY7831G, TY7831H, TY7832G, TY7832H

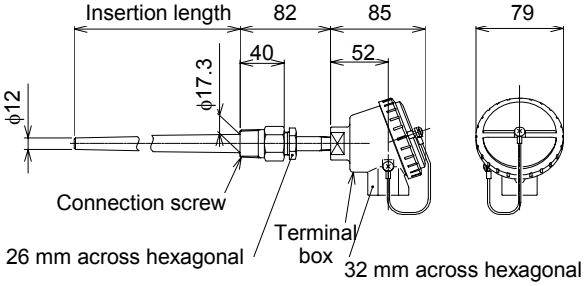
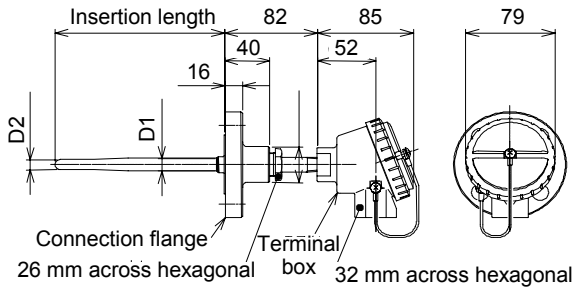


Figure 2. Dimensions (mm): Models TY7830G, TY7830H, TY7831G, TY7831H, TY7832G, TY7832H

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 TY7830M, TY7830N, TY7831M, TY7831N, TY7832M, TY7832N

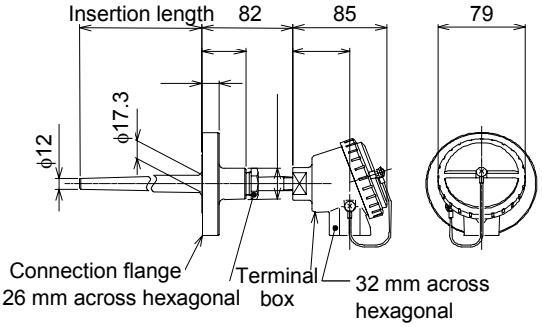


Figure 4. Dimensions (mm): Models TY7830M, TY7830N, TY7831M, TY7831N, TY7832M, TY7832N

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 Yamatake's sales representative. Yamatake Corporation will not bear any responsibility for the results produced by the operators.

⚠ WARNING

- Do not disassemble the product. Electrical shock or equipment damage may result.

⚠ CAUTION

- Installation and wiring must be performed by qualified personnel in accordance with all applicable safety standards.
- All wiring must comply with local codes of indoor wiring and electric installation rules.
- Use crimp terminal lugs with insulation for electric wires to be connected to the screw terminals.
- This product must be operated under the operating conditions (power, temperature, humidity, vibration, shock, installation position, atmospheric condition, etc) specified in this manual to prevent equipment damages.
- This product must be operated within its rated operating ranges specified in this manual. Failure to comply will cause equipment damages.
- Pipe insertion part of the product is the thermowell. Do not remove the insertion part unless it is necessary. Water leakage may result.
- Avoid touching the product. When being used for steam application, the product body reaches high temperature and may cause burn injury.
- Dispose of this product as an industrial waste in accordance with your local regulations. Do not recycle all or part of this product.

Model Numbers

Base model number	Applicable to	Thermowell				Validation	Description
		Material	Connec-tion	Element	Insertion length		
TY78							Pipe temperature sensor
	3						Pipe-mount
		0					JIS SUS304
		1					JIS SUS316
		2					Titanium*
			A				R1/2 screwed connection, weld thermowell (150 mm insertion length) for Model TY7830/TY7831
			B				R3/4 screwed connection, weld thermowell (150-2000 mm insertion length) for Model TY7830/TY7831
			C				R1 screwed connection, weld thermowell (150-2000 mm insertion length) for Model TY7830/TY7831
			D				G1/2 screwed connection, weld thermowell (150 mm insertion length) for Model TY7830/TY7831
			E				G3/4 screwed connection, weld thermowell (150-2000 mm insertion length) for Model TY7830/TY7831
			F				G1 screwed connection, weld thermowell (150-2000 mm insertion length) for Model 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 Model TY7830/TY7831
			K				JIS 20K flanged connection (DN25, RF), weld thermowell (150- 400 mm insertion length) for Model TY7830/TY7831
			M				JIS 20K flanged connection (DN20, RF), hollow tapered thermowell (150-400 mm insertion length) for Model TY7830/TY7831
			N				JIS 20K flanged connection (DN25, RF), hollow tapered thermowell (150-400 mm insertion length) for Model TY7830/TY7831
			Y				Element for replacement (Models TY7830G/H/M/N, TY7831G/H/ M/N, TY7832G/H/M/N)
			Z				Element for replacement (Models TY7830A to F/J/K, TY7831A to F/J/K)
				1			Single element
				2			Double elements
					015		150 mm insertion
					020		200 mm insertion
					025		250 mm insertion
					030		300 mm insertion
					050		500 mm insertion for Models TY7830B/C/E/F, TY7831B/C/E/F
					xxx		xxx cm (screwed weld thermowell: max. 2000 mm, flanged (RF) hollow tapered thermowell: 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.)

∗ Note: All of the titanium thermowell (Model TY7832) are hollow tapered.

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

Installation procedure

1. To prevent condensation, mount the pipe temperature sensor into a pipe as shown in the figure below.

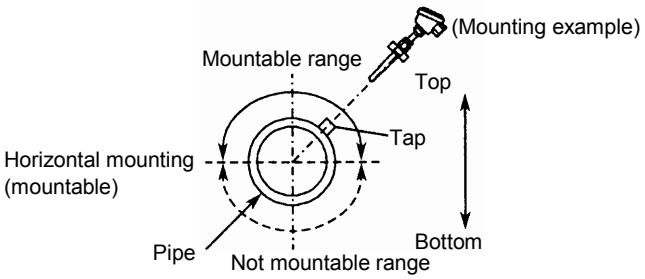


Figure 5. Mounting example

2. Select the mounting position available for detecting the typical temperature of the measured fluid.
3. Mount the sensor so that the whole sensor thermowell contacts the measured fluid.
4. To mount the sensor into the flow path of the liquid, insert the thermowell horizontally to the flow so that the tip of the thermowell points to the opposite direction of the flow (opposed mounting). If the thermowell cannot be horizontally installed, insert the thermowell angular or perpendicular to the flow (angular mounting or perpendicular mounting). Refer to the following figures of mounting types.
5. Do not mount in a location where a pipe vibrates.
6. To reduce natural vibration of the tap, make the tap as short as possible.
7. Pipe sealing is necessary for screwed connection.

⚠ CAUTION

- Do not step on the pipe temperature sensor.

Mounting types

a) Mounting on a elbow pipe (top view)

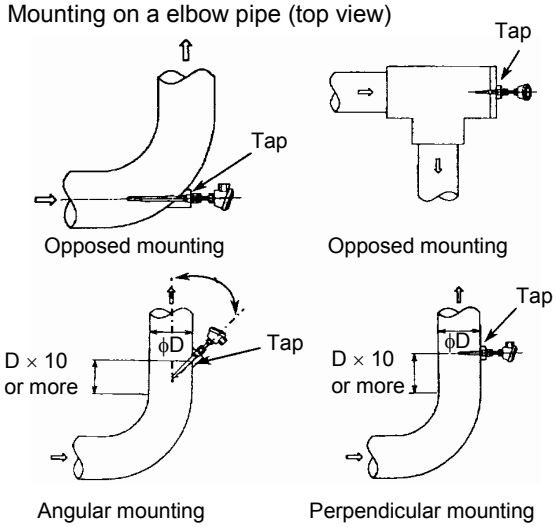


Figure 6. Mounting on a elbow pipe

b) Mounting on a straight pipe

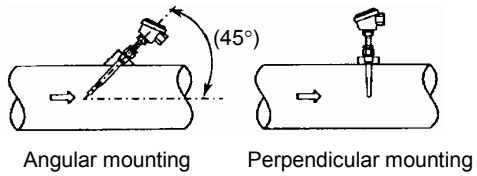


Figure 7. Mounting on a straight pipe

c) Mounting on a T-joint + straight pipe

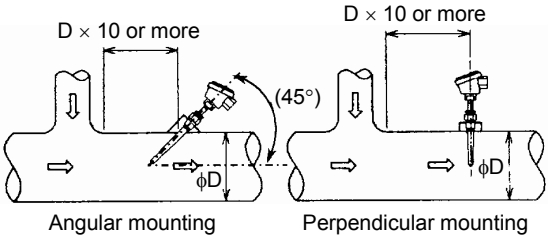


Figure 8. Mounting on a T-joint + straight pipe

d) Mounting on a choking pipe

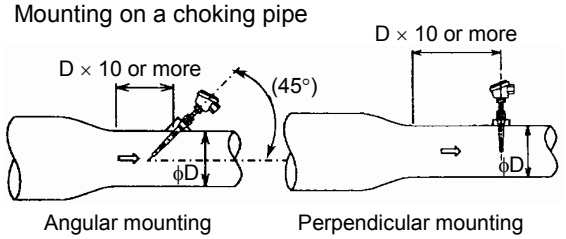
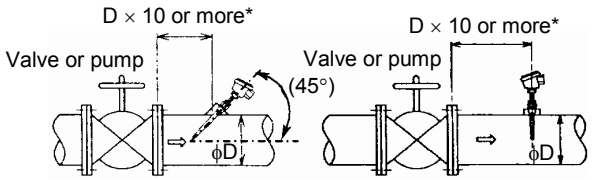


Figure 9. Mounting on a choking pipe

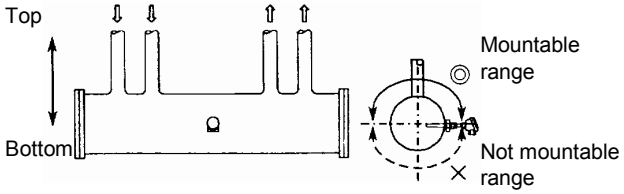
e) Mounting on a pipe or joint with other equipment mounted



∗ Even if the distance between the sensor and valve/pump is larger than the rated, confirm that there is not interference including swirl and shock flow (pulse flow) before mounting.

Figure 10. Mounting on a pipe or joint with other equipment mounted

f) Mounting on a header



∗ Max. insertion length of the thermowell should be 300 mm.

Figure 11. Mounting on a header

Applicable fluid flow velocity and thermowell insertion length by mounting types

Flow velocity	Insertion length for angular / perpendicular mounting	Insertion length for opposed mounting
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	

Wires Connection

⚠ CAUTION

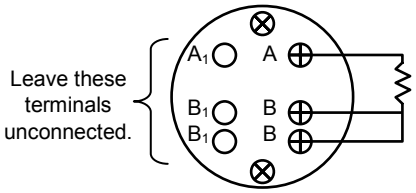
- All wiring must comply with local codes of indoor wiring and electric installation rules.

Before connecting cables to the sensor, be sure to turn off the power of the unit to be connected to the sensor.

If temperature of the measured fluid ranges from -50 °C to 100 °C, use 1.25 mm^2 or greater JIS IV or CVV cable.
If temperature of the measured fluid ranges from 100 °C to 200 °C, use 1.25 mm^2 or greater silicon or fluoroplastic cable.

Seal connectors are necessary for connecting cables. Be sure to separately order the seal connectors. Refer to "Part Numbers" section.

Wire connection for single element



Wire connection for double elements

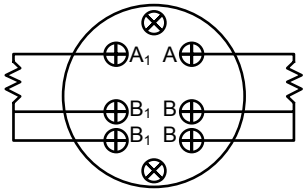


Figure 12. Wires connection

Maintenance and Calibration

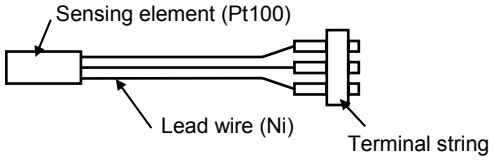
⚠ CAUTION

- Pipe insertion part of the product is the thermowell. Do not remove the insertion part unless it is necessary. Water leakage may result.
- Avoid touching the product. When being used for steam application, the product body reaches high temperature and may cause burn injury.

A terminal box is included in the weld tapered thermowell (in a single unit). To replace or calibrate the sensing element, follow the procedure below.

1. If the sensing element is required to be replaced, provide an element for replacement. The sensing element for replacement is composed of an element and a terminal strip.
2. Turn off the power of the unit connected to the sensor.
3. Remove the cover and disconnect the cables from the sensor.
4. Unscrew and remove the screws fixing the terminal strip. Then, pull out the sensing element with the terminal strip from the sensor thermowell.
5. Check the resistance of the sensing element. Digital multi-meter is recommended for resistance check.
6. Follow the steps 2-4 in reverse (4→3→2) to place the sensing element back in the position.

Sensing element assembly of Models TY783XA to F, J, K



Sensing element assembly of Models TY783XG, H, M, N

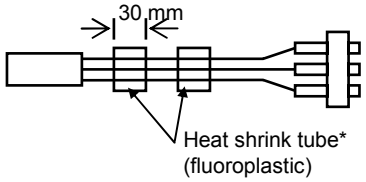


Figure 13. Sensing element assembly

∗ Note:
Number and installation location of the heat shrink tubes differ depending on the insertion length of the sensor.

Corrosiveness of the Sensor Thermowell

Category	Corrosive medium	Composition (%)	Temperature (°C)	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_2SO_4)	1	25	A	A	A
			Boiling point	D	C	D
		10	25	B	B	B
			Boiling point	D	D	D
	Nitric acid (HNO_3)	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_3COOH)	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 ($(COOH)_2$)	10	25	B	B	B
		25	60	C	B	D
	Lactic acid ($CH_3CH(OH)COOH$)	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_2CO_3)	5	Boiling point	A	A	A
		20	Boiling point	A	A	A
Inorganic chloride	Sodium chloride (NaCl)	25	25	B*	B*	A
			Boiling point	B*	B*	A*
	Ammonium chloride (NH_4Cl)	40	25	B*	B*	A
			Boiling point	C*	B*	A*
	Zinc chloride ($ZnCl_2$)	25	Boiling point	D	D	A*
		50	Boiling point	D	D	A*
	Magnesium chloride ($MgCl_2$)	42	25	A*	A*	A
			Boiling point	A*	A*	A*
	Ferric chloride ($FeCl_3$)	30	25	D	D	A
			Boiling point	D	D	A*
Inorganic salt	Sodium sulfate (Na_2SO_4)	20	25	A	A	A
			Boiling point	A	A	A
	Sodium sulfide (Na_2S)	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_2CO_3)	30	25	A	A	A
			Boiling point	A	A	A
Organic compound	Methyl alcohol (CH_3OH)	95	25	A	A	A
	Carbon tetrachloride (CCl_4)	100	Boiling point	B	B	A
	Phenol (C_6H_5OH)	Saturated	25	A	A	A
	Formaldehyde (HCHO)	37	Boiling point	A	A	A
Gas	Chlorine (Cl_2)	Dry	25	A	A	D
		Wet	25	D	D	A*
	Hydrogen sulfide (H_2S)	Dry	25	C	B	A
		Wet	25	B	A	A
	Ammonia (NH_3)	100	40	A	A	A
			100	A	A	A
Others	Seawater	—	25	A*	A*	A
			100	B*	B*	A*
	Naphtha	—	80	A*	A*	A
			180	A*	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

* Pitting or crevice corrosion may occur.

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Specifications are subject to change without notice.

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