WISE® WISE Control Inc.
www.wisecontrol.com

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

Thermowell

A50X, A51X, A60X, A61X, A62X, A63X, A64X, A65X series

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

Contents

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

1. General items

1.1 Introduction

WISE Control Inc. temperature sensors and thermowells are precisely fabricated according to customer specifications. The products must be tested and stored in appropriate locations, and the requirements provided in the documentation, test reports and handling manuals, etc., must be adhered to in order to maintain optimum state during the duration of use.

1.2 Application

The thermowell is designed to protect a thermometer or temperature sensor from fluid flow velocity, pressure and corrosion, etc., inside pipes. The design prevents leakage of fluid from inside the pipe when a malfunctioning sensor is being replaced. The user is responsible for selecting the appropriate thermowell for the process at hand. WISE Control Inc. may provide advice when selecting products, but will not be held liable for mis-selection of product.

1.3 Warranty

If one causes damage to the product due to failures to comply with the user manual, or if one arbitrarily remodels it, changes or repairs the product, the manufacturer will not be responsible for it, and the product warranty period will expire.

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

2. Warning

Guide on handling for safe use

For the safe and correct use of the product, make sure to read the handling guide carefully before use. Handling errors can cause device malfunctions, and it can lead to injury, accidents, etc..

Warning 

1) For the safety, only a worker with professional skills in electronics and electrical construction is allowed to install the product.
2) Install the product in the environment of use indicated in the specifications.
3) Use the product in the permissible temperature range.
4) Do not apply excessive loads, vibrations, or impacts.
5) When selecting a thermowell for the product, select a thermowell appropriate to the usage conditions and environment.
6) The customer is responsible for mis-selection of thermowells.

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

3. Main specs

3.1 Types of thermowell

3.1.1 Types of process connection

1) Thread type: Most widely used and least costly method. Screw type attachments allow for easy installation and removal from pipes or tanks. Welding or soldering may be used to provide additional strength.
2) Flange type: This type comes with a flange on the upper edge, and the flange is secured to the pipe using nuts and bolts. Flange type thermowells are commonly used in environments requiring frequent replacement, such as high-temperature applications.
3) Welded type: The welded type is preferred for the food and pharmaceuticals industry where keeping foreign matter or contaminants out of thermowells is critical. Welded type thermowells are welded directly onto pipes and can be used indefinitely. Socket weld type thermowells are used for applications involving extremely high temperatures and pressures.

3.1.2 Classification by material

1) Protection tube type
2) Drilled bar type

3.1.3 Classification by thermowell shape

1) Straight type: Straight type thermowells have uniform diameter throughout the entire insertion length. Straight type thermowells are simple to manufacture and have outstanding strength, and provide protection against erosion and corrosion.
2) Taper type: Diameter gradually decreases along the insertion length. Taper type thermowells are suitable for high-speed, medium-load processes, and provide fast response times.
3) Stepped type: Diameter varies in stepwise fashion along the insertion length. Reduced thermal inertia at the end of the process means faster response to temperature changes using a stepped type thermowell.

※Strength cannot be calculated for a protection tube type thermowell. Protection tube type thermowells are typically used for applications without pressure or flow rate.

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

3.2 Thermowell material

Thermowells can be made of various materials depending on the composition, temperature and flow rate of the fluid medium. Typically, increased temperature and concentration of the fluid medium causes the corrosive effect to increase. Simultaneously, particles suspended in the fluid medium cause erosion. All of these parameters must be given consideration when selecting a thermowell material. See the table below for details on thermowell materials.

Non-metal				
Material	Symbol	Usage temperature (℃)	Max. temperature (℃)	Characteristic
SSA-S (Recrystallized alumina)	PT-0	1700	1800	Temperatures up to 1900(℃) can be measured. For use in measuring slag, molten steel and molten glass temperatures. High resistance to thermal shock
HB (Mulite)	PT-1	1500	1600	Can measure up to 1550(℃). Used for measuring temperatures in high-temperature areas of heating furnaces and thermal energy storage chambers.
Recrystallized siliconcarbide	GK-Sic	1650	-	Can measure up to 2200(℃) in neutral atmospheres. Used for measuring molten zinc, aluminum and copper, etc. Deposition of acids and alkalis difficult.
Self-bonded silicon carbide	Y2-Sic	1650	2300	High resistance against heat shock in airtight environments, with outstanding wear and corrosion resistance at high temperature. Can measure up to 1700(℃) in oxidizing and reducing atmospheres
Clay-bonded silicon carbide	Y3-Sic	1500	1700	High thermal conductivity for more accurate temperature measurement compared to oxide-based. High thermal shock resistance to rapid heating and chilling

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

Metal			
Material	Usage temperature (℃)	Max. temperature (℃)	Characteristic
304SS	900	1000	Typically used in thermowells to protect against heat and corrosion. Direct use in sulfurous environments or reducing flame is not recommended.
316SS	900	1000	Contains Mo for outstanding heat, acid and alkaline resistance.
316L SS	950	1050	Less carbon content than 316. Better acid and alkaline resistance than 316SS.
321SS	900	1000	Weak sulfur and reducing heat resistance. Outstanding corrosion and heat resistance
310SS	950	1050	High Ni and Cr content, with optimal high-temperature strength with high heat and oxidation resistance.
347SS	900	1000	Contains Nb-Ta for better corrosion resistance than 304SS. Outstanding resistance to fine surface corrosion.
446SS	1050	1125	High Cr steel with outstanding resistance to oxidizing and reducing atmospheres containing sulfur. Suitable for salt baths, castings and other high-temperature environments.
Inconel600	1180	1250	High Cr and Ni steel with outstanding resistance to oxidizing and reducing atmospheres at high temperature. Cannot be used in sulfurous atmospheres.

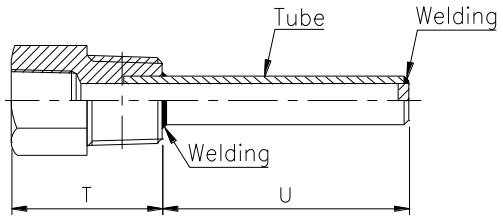
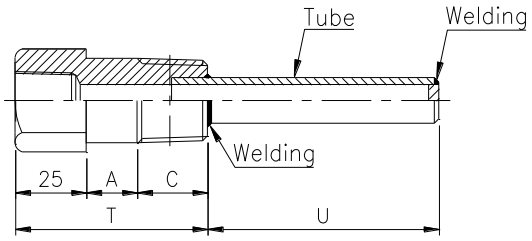
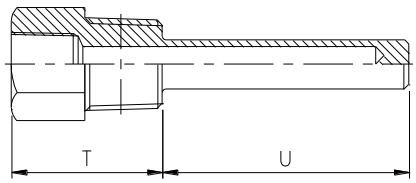
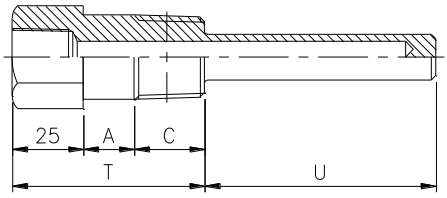
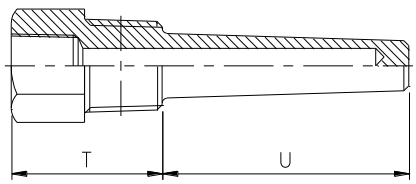
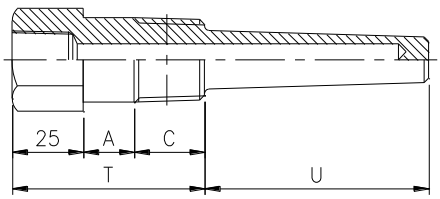
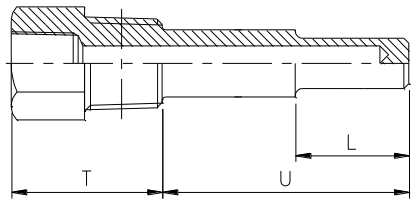
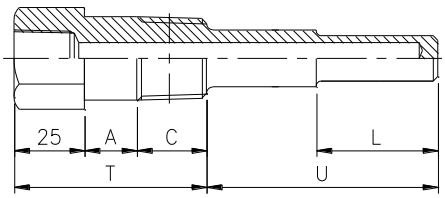
Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

3.3 The insertion length of a thermowell

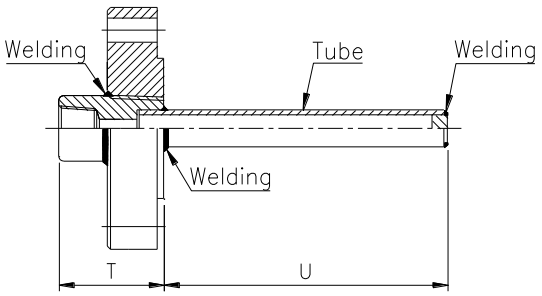
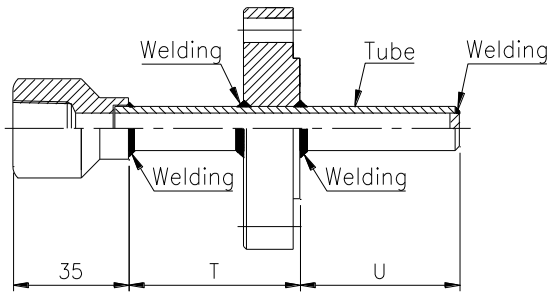
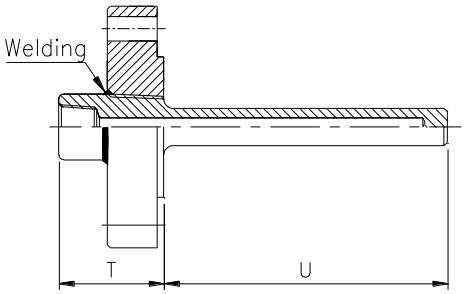
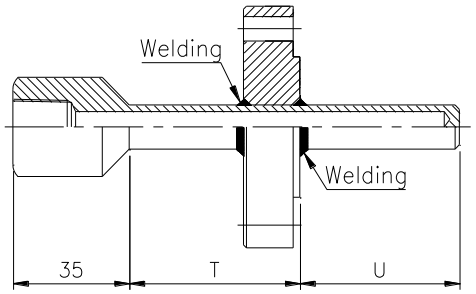
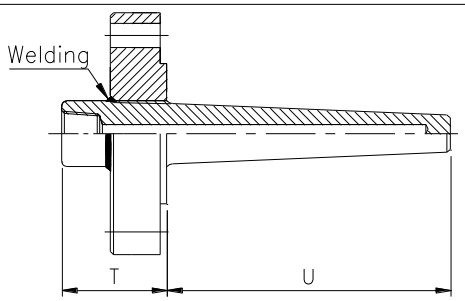
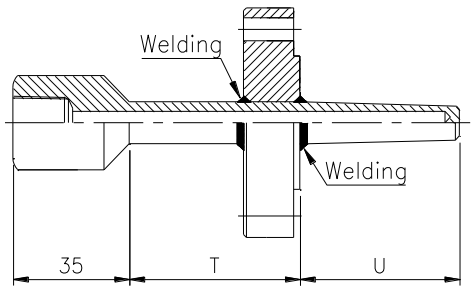
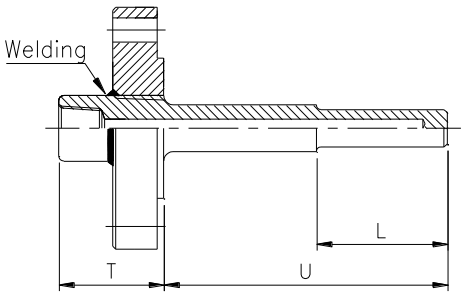
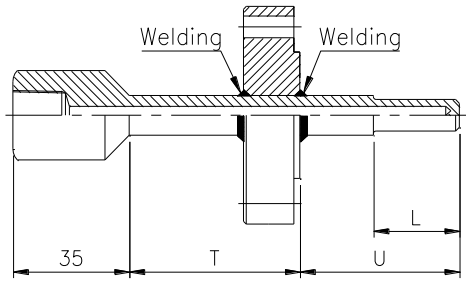
The insertion length of a thermowell is the distance from beneath the process connection to the tip of the thermowell. (Dimension ‘U’ in 3.4 External drawing of thermowell) While there are no standards designating the insertion length of a thermowell, thermowell insertion depth is typically designated by the process engineer. There are also a number of general rules that apply. To increase measurement accuracy, all thermowells are inserted to a length of 1/3 or 1/2 of the pipe diameter. The American Petroleum Institute (API) recommends a thermowell insertion length of the temperature sensor plus 2 inches (50mm). As for the optimum insertion length for measuring liquids using temperature sensors, 5 times the root diameter of the thermowell is recommended. The recommended insertion length for gases is 10 times the root diameter of the thermowell.

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

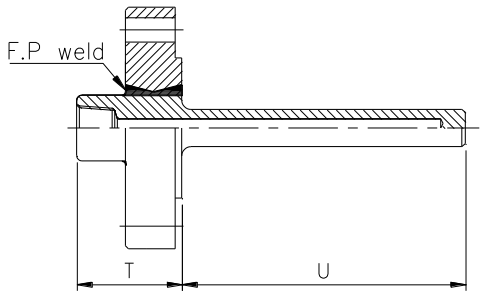
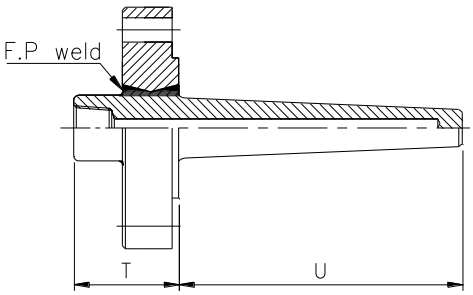
3.4 External drawing of thermowell

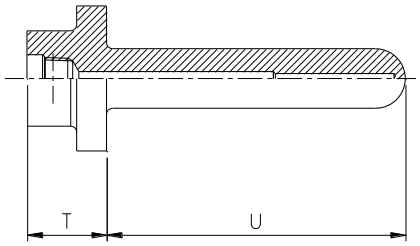
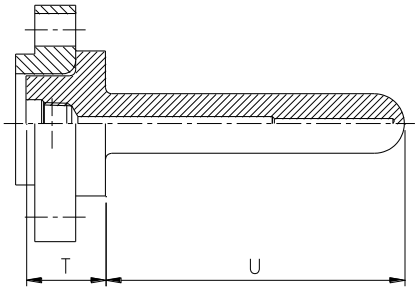
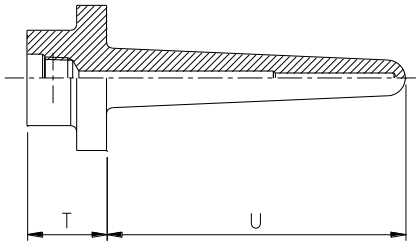
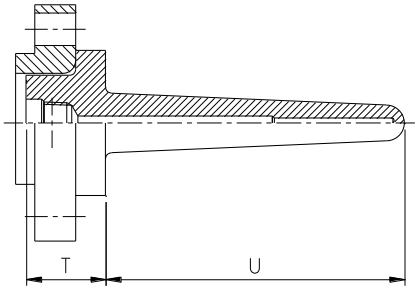
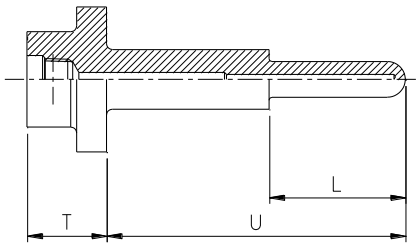
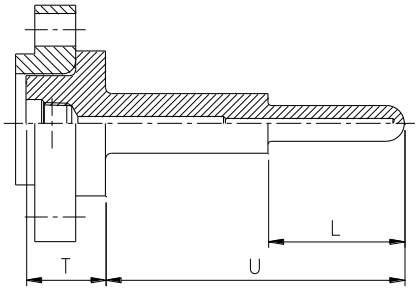
	Thread type	
	Standard type	Extension type
Closed end tube staraight type		
	A5000	A5001
Drilled bar stock staraight type		
	A6000	A6001
Drilled bar stock taper type		
	A6010	A6011
Drilled bar stock step type		
	A6020	A6021

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

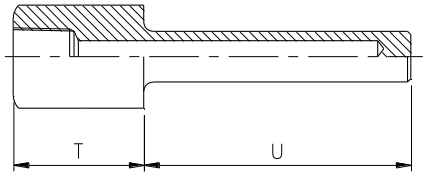
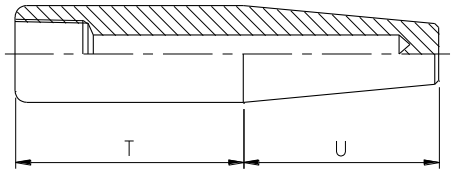
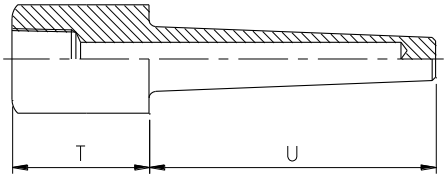
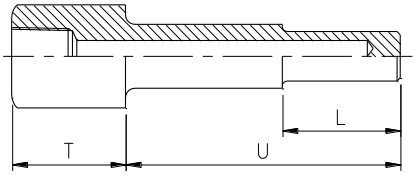
	Flange type	
	Standard type	Extension type
Closed end tube staraight type	 A5100	 A5101
Drilled bar stock staraight type	 A6100	 A6101
Drilled bar stock taper type	 A6110	 A6111
Drilled bar stock step type	 A6120	 A6121

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

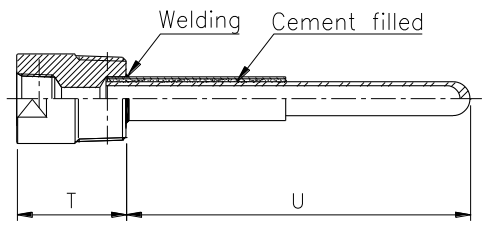
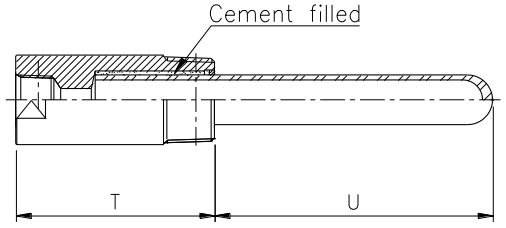
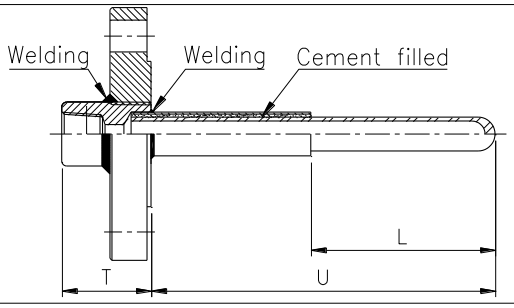
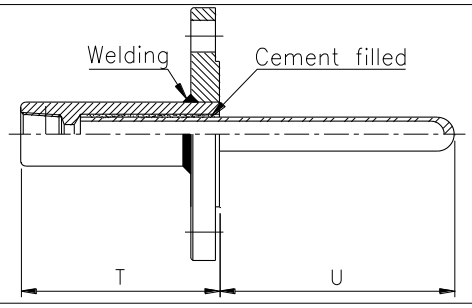
	Flange type	
	Straight type	Taper type
Drilled bar stock full penetration welding		
	A6231	A6230

	Vanstone type	
	Without flange	With flange
Straight type		
	A6400	A6401
Taper type		
	A6410	A6411
Step type		
	A6420	A6421

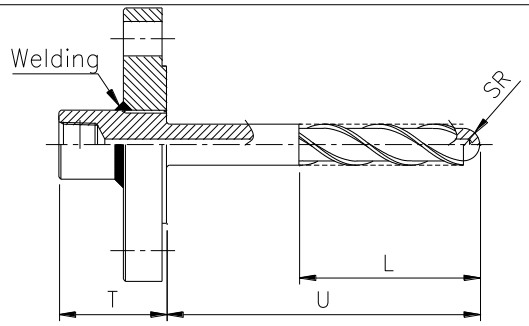
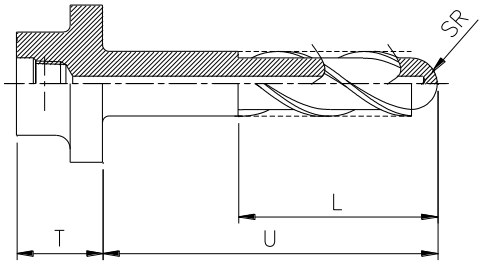
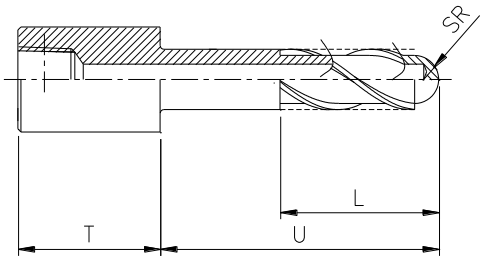
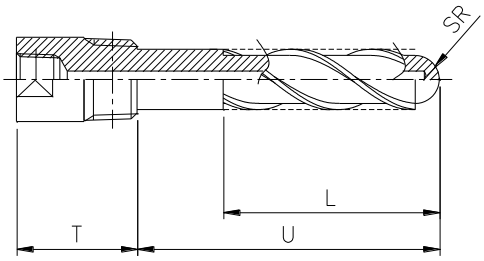
Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

	Weld type	
	Weld-in type	Socket weld type
Drilled bar stock straight type		
		A6300
Drilled bar stock taper type		
	A6311	A6310
Drilled bar stock step type		
		A6320

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

	Non-metalic type	
	Standard type	Extension type
Thread type		
	A5000	A5001
Flange type		
	A5100	A5101

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

<table>
<tr><td colspan="2">Helical type</td></tr>
<tr><td>Flange type</td><td>Vanstone type</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>A6510</td><td>A6520</td></tr>
<tr><td>Socket weld type</td><td>Thread type</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>A6530</td><td>A6540</td></tr>
</table>

*Note.

For helical type thermowells, please refer your design for strength calculation and check the results before placing your order.

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

4. Installation guide

4.1 Pre-installation checks and precautions

1) Be careful not to damage during storage or transport.
2) Check the product for damage prior to installation.Please inquire with the manufacturer is the product is damaged.
3) Do not remove packaging until immediately before installing the product.

4.2 Installation requirement

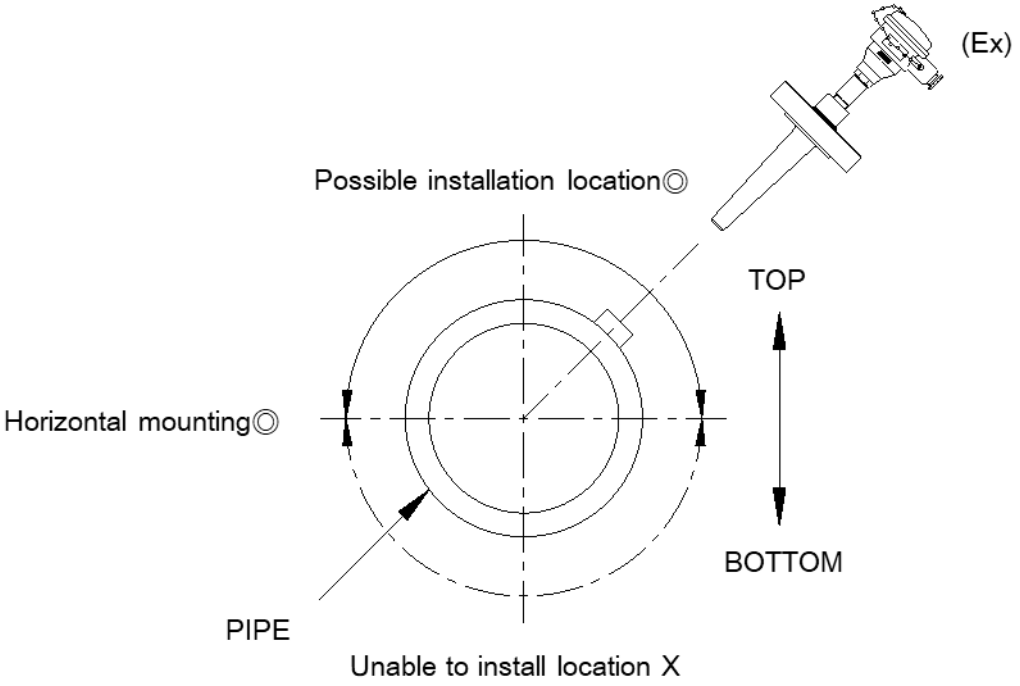
1) Protect the thermowell from heat shock or mechanical impact.
2) Do not apply excessive force when inserting or installing the thermowell.
3) Do not bend or deform the thermowell when installing.
4) The end user must ensure that the instrumental has been appropriately installed so that the allowed limits are not exceeded.

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

4.3 Location for installation of temperature sensors and thermowells

4.3.1 Installation

1) Install pipe temperature sensors as shown in the figure below to prevent condensation.



2) Install in a location where a representative temperature of the process fluid can be measured.
3) The sensor should be installed to be completely submerged in the fluid being measured.
4) On lines where the pipes are subject to vibration, install as far away from vibration as possible.
5) Minimize the impact of natural frequencies, and keep the insertion length as short as possible
6) If the process connection is of the screw type, fasten using a sealing agent.
7) When installing on lines with a flow rate, install the sensor in a direction opposite the flow direction. If this is not possible, install in a diagonal direction. If both options are infeasible, install perpendicularly to the direction of flow. (See installation conditions below)

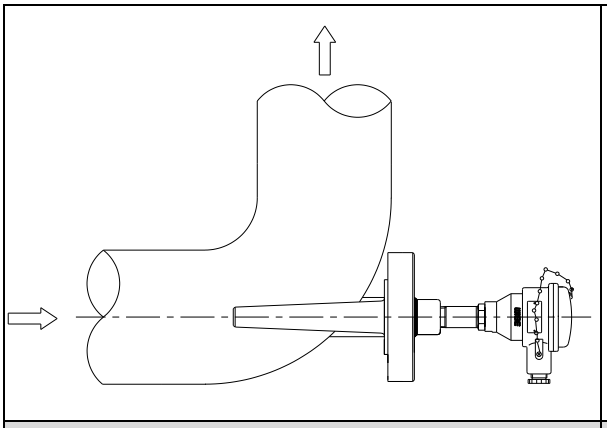
※Caution

When installing on a line with a flow rate, use a drilled bar type thermowell even if the flow rate is low. If needed, please refer your design for strength calculation and check the results before placing your order.

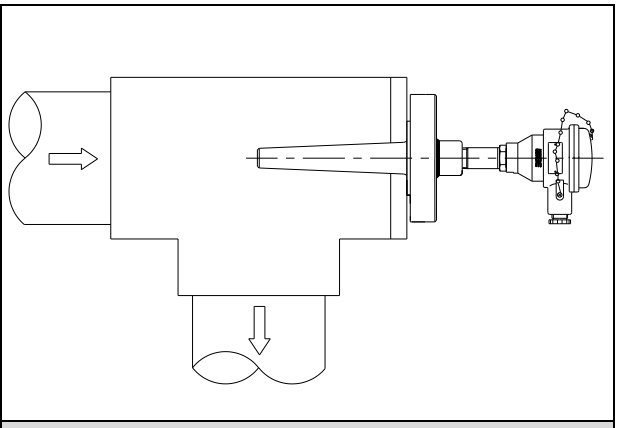
Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

4.3.2 Installation conditions

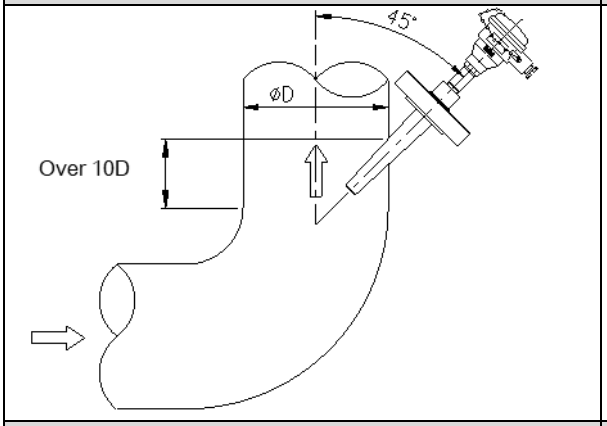
1) Installation on curved pipe



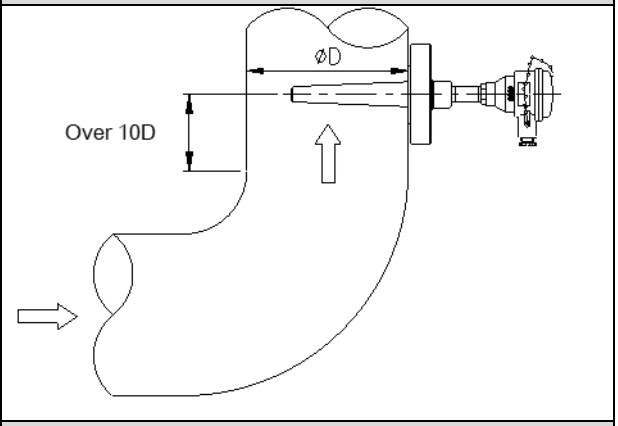
Installation in direction opposite flow direction



Installation in direction opposite flow direction

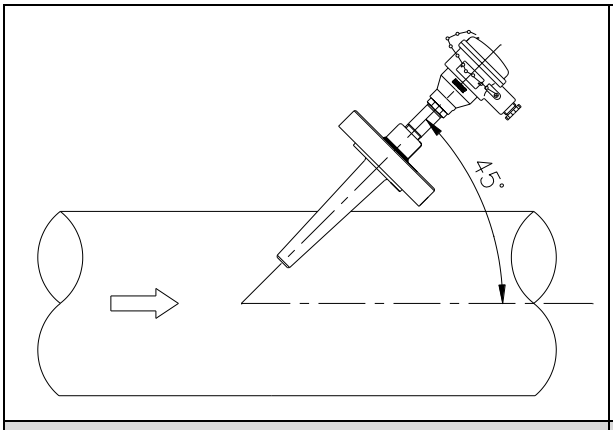


Installation diagonal to flow direction

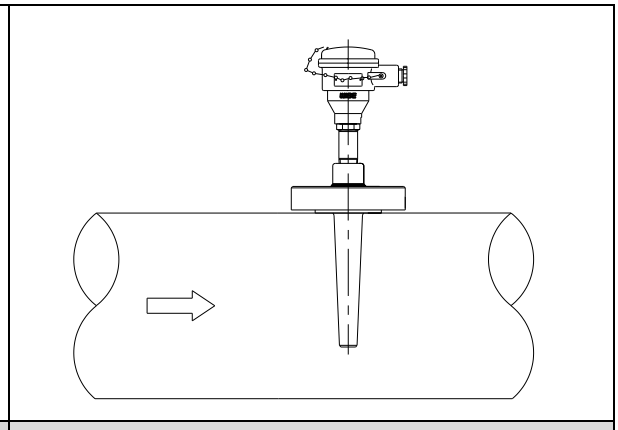


Installation perpendicular to flow direction

2) Installation on straight type section



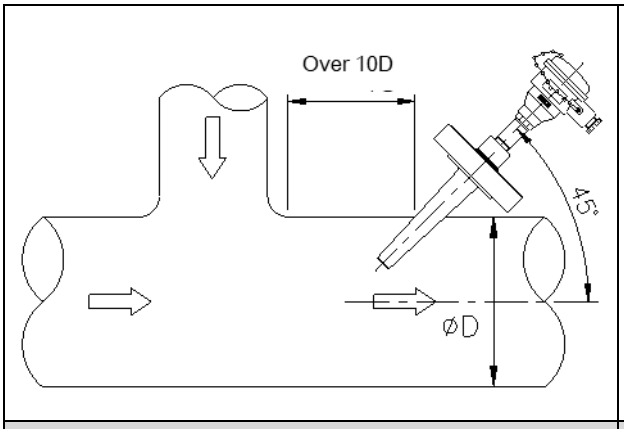
Installation diagonal to flow direction



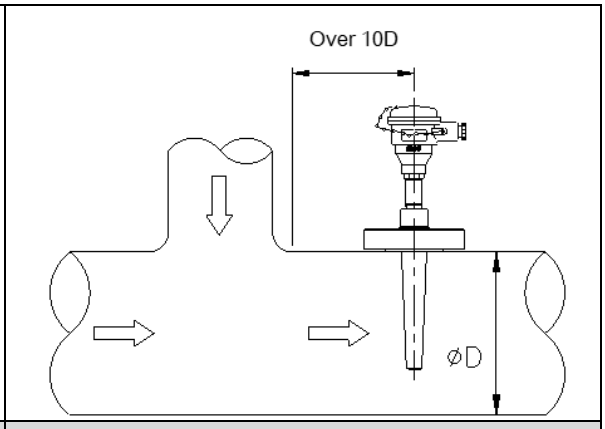
Installation perpendicular to flow direction

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

3) Installation on T-junction

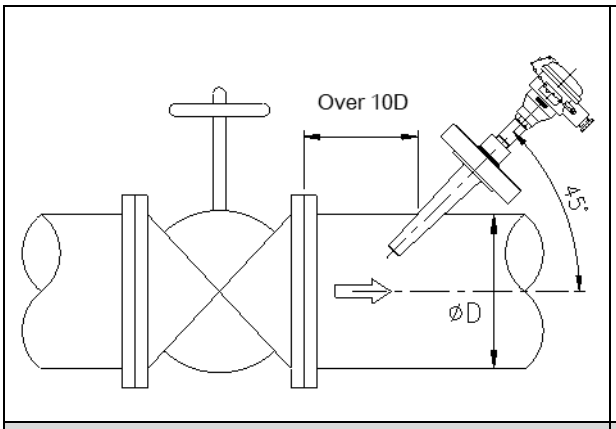


Installation diagonal to flow direction

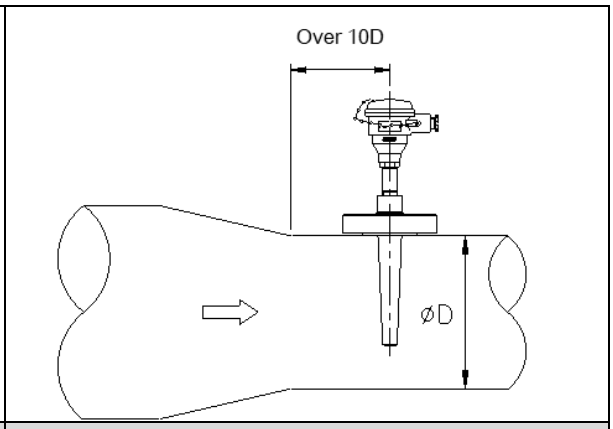


Installation perpendicular to flow direction

4) Installation on tapering pipe

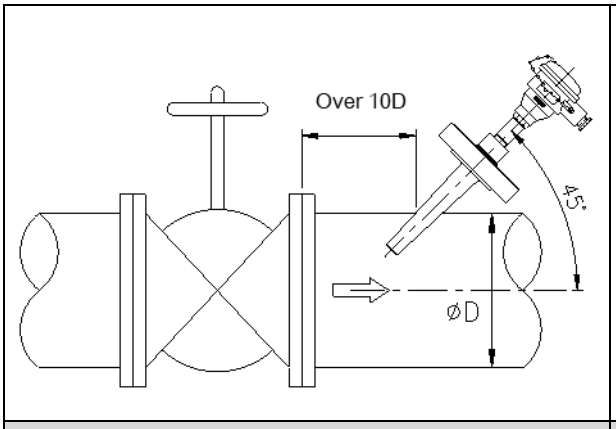


Installation diagonal to flow direction

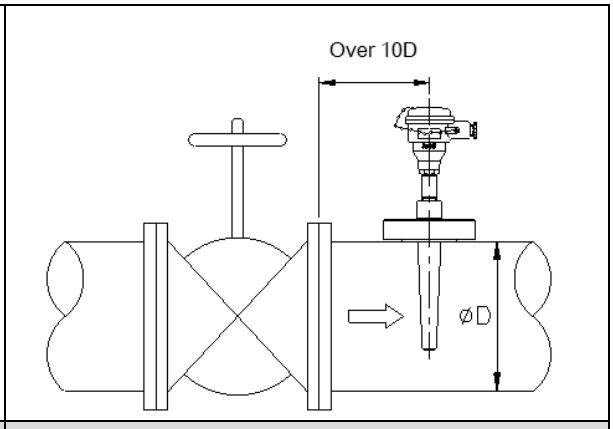


Installation perpendicular to flow direction

5) Installation on pipe with other devices installed



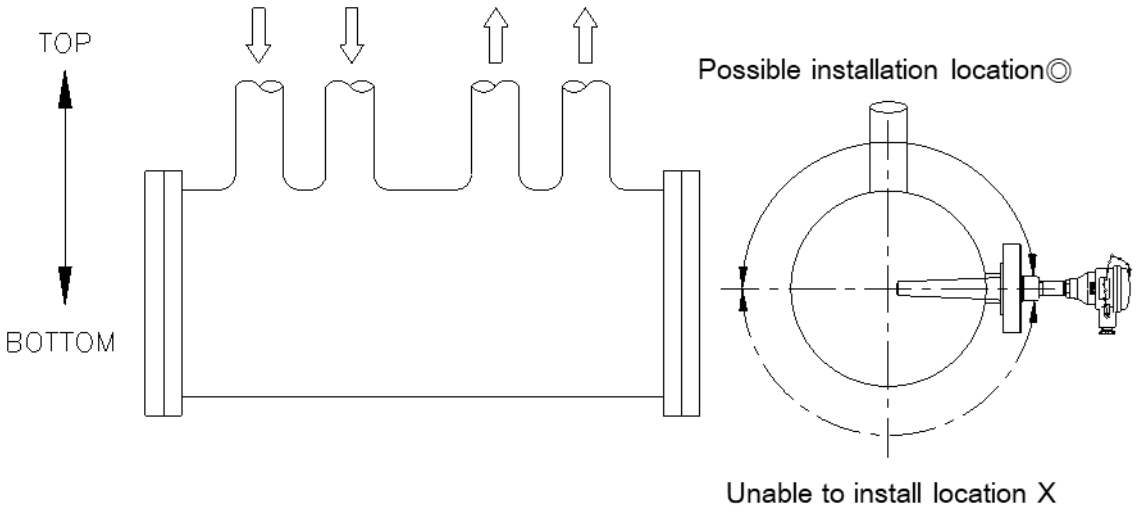
Installation diagonal to flow direction



Installation perpendicular to flow direction

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

6) Installation on header



*Note.

The insertion length and diameter of the thermowell varies depending on process conditions, especially the flow rate of the fluid being measured.

Thermowell guidelines are provided in accordance with ASME PTC 19.3.

The system operator is responsible selecting the right thermowell and material to ensure safe operation within the plant or machinery.

WISE Control Inc. can only provide recommended specifications based on experience in similar applications.

The installation conditions given above are recommendations for accurate temperature measurement, and are intended as a reference for installation.

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

5. Repair and maintenance

Perform regular visual inspection for thermowell leaks or damage. Also confirm that thermowells are properly sealed and secured.

6. Defect

Defect	Cause	Response
Interference by process screws at installation	Selection of inappropriate material	Select appropriate material or use appropriate lubricant
Cannot insert temperature sensor into thermowell	Foreign matter inside thermowell Damaged thermowell or damage to process connection of temperature sensor Mismatch between sensor dimensions and inner diameter of thermowell	Remove foreign material Remachine thermowell or wash connection screws Check dimensions and re-fabricate Return for repairs
Leak of process fluid	error or sealing defect during thermowell installation	Inspect sealings

If the defect cannot be removed through the measures listed above, immediately shut down the equipment. Confirm that all pressure has been released and no signal is output, and protect the equipment to prevent restarting. In this case, please contact the manufacturer.

If it is necessary to return the equipment, please follow the instructions in Chapter 11, “Returns”.

7. User’s duties

Temperature sensor products are used in high temperatures and corrosive environments. The right product must be selected based on various safety considerations. For all temperature sensors designs, proper installation is the most important.

Incorrect installation can eventually lead to an inaccurate reading of temperature.

Wise Co., Ltd. can support users’ selection but will not be responsible for them in any sort of way.

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

8. Product return

1) If the product gets returned for recalibration or repair work, make sure to use the original packaging or safe packaging method, and also make sure to return the related documents.
2) Make sure to prevent exposures of the product to dust, wetness, or other sources of pollution during the conveyance.
3) Pack it properly to prevent vibration or any kind of impact during the conveyance.
4) If the product gets damaged during the conveyance, make sure to record it on paper, and if there is some kind of loss due to a delayed installation, one may demand compensation from the conveyance company.

Tel +82-2-300-2300
Fax +82-2-300-2400
webmaster@wisecontrol.com

The content of the user manual is prepared with the best efforts, but it might contain typos, or errors requiring fixes, so we kindly ask for understanding. The product spec or exterior can be changed without a pre-notice for the quality improvement purposes, thus Wise Co., Ltd. has the rights to change them. Figures used in the user manual are for just illustration purposes, and they can differ from the actual shapes

Yongin Factory
2022 Deogyeong-daero,Giheung-gu,Yongin-si,Gyeonggi-do (Sanggal-dong)

www.wisecontrol.com

A/S related Inquiries
2022 Deogyeong-daero,Giheung-gu,Yongin-si,Gyeonggi-do (Sanggal-dong)
webmaster@wisecontrol.com
Home page: Service center>Technology/Quote Inquiry

Wise Co., Ltd. Seoul Office
181, Gasan digital 1-ro, Geumcheon-gu, Seoul (Gasan-dong, Gasan W CENTER) F19
T. 02-300-2300
F. 02-300-2400