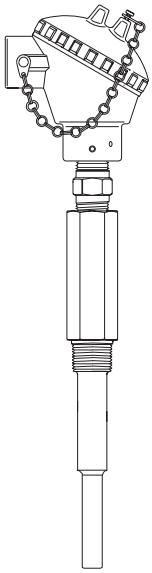
Compact Instructions
Thermocouple Assembly in Thermowell TH53



Measuring System

Thermocouple assembly provided with thermowells and connection head for heavy industries process applications. They are made up of a MgO insulated thermocouple as a measurement probe and a thermowell made of bar-stock material.
The thermocouple sensor complies with the ASTM E-230 and IEC60584 specifications. The sensor is designed to ensure highest accuracy and long term stability.

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Important Notice

CAUTION
Electrical shock could cause death or serious injury. If the sensor is installed in a high voltage environment and a fault or installation error occurs, high voltage may be present on the connection terminals or the probe itself.

Safe and secure operation of the temperature sensor can only be guaranteed if the operating instructions of the used transmitters and all included safety notes are read, understood and followed. For Endress+Hauser temperature transmitters see enclosed CD–ROM.

Correct use
The manufacturer cannot be held responsible for damage caused by misuse of the unit. The installation conditions and connection values indicated in the operating instructions must be followed!

Installation Guidelines and Safety instructions

1. Install the unit according to the relevant NEC Code and local regulations.
2. Avoid any spark due to impact, friction and installation. Anti-sparkling wrenches should be utilized.
3. The temperature sensor should be connected to the power supply or other external circuit using the appropriate cable glands and wire entries.
4. For ambient temperature higher than 158 °F, suitable cables, conduit and conductors must be used. Only use approved wire entries.
5. When utilized in dust atmospheres, the connection between the housing, fittings and thermowell should provide a minimum degree of Ingress Protection. Liquid/gas sealants should be used. Local regulations need to be respected.

CAUTION
Do not disconnect equipment unless power has been switched off or the area is not hazardous.

Material	Max. temp. rating	Application notes
316SS	1700 °F (927 °C)	Superior corrosion resistance. Duplex version of type N is not available with 316SS sheats.
Inconel 600	2100 °F (1149 °C) [1]	Excellent oxidation and corrosion resistance at high temperature. Not to be used in sulphurous atmospheres over 1000 °F (538 °C). Types T & J are not available with Inconel 600 sheats.

1) Max. working temperature under oxidizing conditions: reducing conditions reduce max. temp. to 1900 °F (1038 °C).

Performance Characteristics

Maximum measured error

Type	Temperature range		Standard Tolerance in % and °C* (whichever is greater)	
	°C	°F	IEC class 1	IEC class 2
E	0 to 870	32 to 1600	± 1 or ± 0.4%	± 1.7 or ± 0.5%
J	0 to 760	32 to 1400	± 1.1 or ± 0.4%	± 2.2 or ± 0.75%
K	0 to 1260	32 to 2300	± 1.1 or ± 0.4%	± 2.2 or ± 0.75%
T	0 to 370	32 to 700	± 0.5 or ± 0.4%	± 1 or ± 0.75%
N	0 to 1260	32 to 2300	± 1.1 or ± 0.4%	± 2.2 or ± 0.4%

* For measurement errors in °F, calculate using equation above in °C, then multiply the outcome by 1.8.

Insulation resistance = 1,000 MΩ at 77 °F (25 °C).
Insulation resistance for MgO insulated TC with ungrounded hot junction between terminals and probe sheath, test voltage 500 V DC. Value applies also between each TC wire at single and duplex construction with ungrounded hot junction.

Supplementary documentation

All important Temperature Operating Instructions, particularly with regard to head and field transmitters are available on CD–ROM, find enclosed or order by order number: **SONDTT-AG**.

www.addresses.endress.com

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The accessories for pipe connections and the appropriate gaskets and sealing rings are not supplied with the sensors. These are the customer's responsibility.
Depending on temperature and pressure operating conditions, the gaskets, the sealing and the applicable torques must be selected by the user.
For further information regarding connections, please refer to the corresponding Standards.

Installation and operation
The unit is constructed using the most up to date production equipment and complies with the safety requirements of the local guidelines. However, if it is installed incorrectly or misused, certain application dangers can occur. Installation, wiring and maintenance of the unit must only be completed by trained, skilled personnel who are authorized to do so by the plant operator. The plant operator must make sure that the measurement system has been correctly wired to the connection schematics. Procedures indicated in these instructions must be followed.

Returns
Please follow the Return Authorization Policy which is attached with this manual.

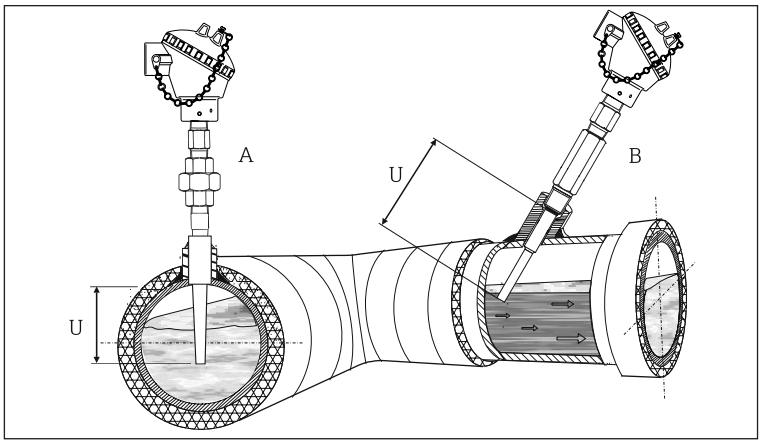
Safety pictograms and symbols

Notes draw attention to activities or procedures that can have a direct influence on operation or trigger an unforeseen device reaction if they are not carried out properly.

CAUTION
Cautions draw attention to activities or procedures that can lead to persons being seriously injured, to safety risks or to the destruction of the device if they are not carried out properly.

Installation

Installation locations



Examples of pipe installation. In pipes of a small section the axis line of the duct must be reached and if possible slightly exceeded by the tip of the probe (=U).

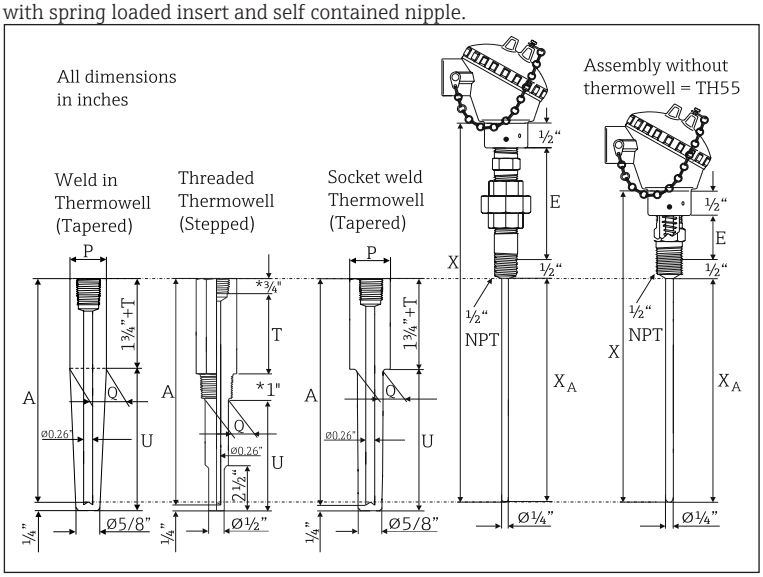
A: Socket weld installation
B: Threaded, tilted installation

For installation proceed as follows:

1. Attach thermowell to pipe (see A and B) or process container wall. Install and tighten the Thermowell before applying process pressure.
2. Make sure that the process fitting matches the maximum specified process pressure.
3. Seal the extension nipples with TFE tape before screwing the sensor into the thermowell.
4. Thermowells are used in measuring the temperature of a moving fluid in a conduit, where the stream exerts an appreciable force. The limiting value for the thermowells is governed by the temperature, the pressure and the speed of the medium, the immersion length, the materials of the thermowell and the medium, etc.
   For operating conditions, a stress calculation should be carried out.

Dimensions

with spring loaded insert and self contained nipple.



U	*Thermowell Immersion length (see table)*	*T*	*Lag dimension (3" or specified length 1" to 6" in ½" increments)*
E	*Extension (see table before)*	$X_A = A$	*Immersion length RTD sensor, thermowell drilled depth, (A = U + 1½" + T)*
Q	*Thermowell diameter*	*X*	*Insert overall length (X = A + E)*
P	*Pipe size (Nom. ¾"; Dia. = 1.050" - Nom. 1"; Dia. = 1.315")*		

*For wells with ½" NPT - 1" Process thread length and ¾" Hex length dimensions are reversed.

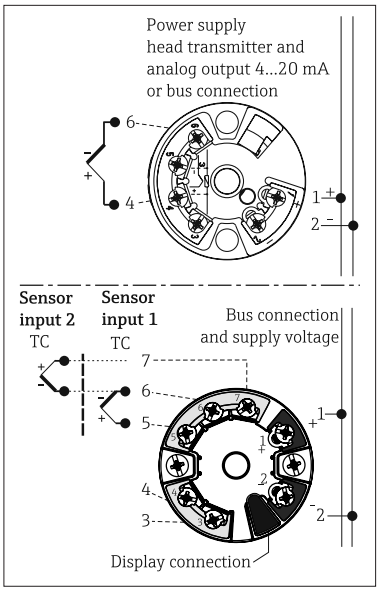
For spare parts insert, TU121, please contact Endress+Hauser!

Recommended minimum immersion for thermowell:

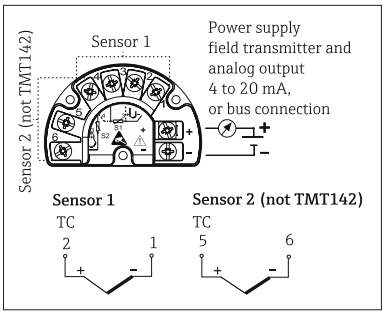
Stepped TW = 2½"	Tapered TW = 4½"	Weld in TW = 4½"

Electrical connection-wiring diagrams

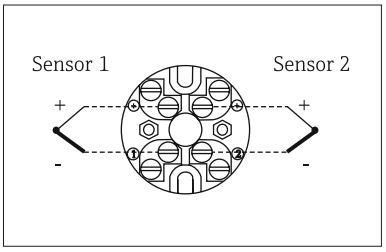
Head mounted transmitter (single/dual)



Field mounted transmitter



Terminal block mounted



Wire specifications: Thermocouple grade, TFE insulated 20AWG, 7 strands with stripped ends

Flying leads, standard 3" for wiring in terminal head, head transmitter or terminal block mounted
Flying leads, 5½" for wiring with field housing or field transmitter assembly

The blocks and transmitters are shown as they will sit inside the heads in reference to the conduit opening. ALWAYS terminate leads to the outside screw!

U	E (nom. dimension)	Process connection	Shape of Thermowell	øQ
2½", 4½", 7½", 10½"; specified length 2" to 18" in ½" increments	Hex nipple = 1" or Nipple Union Nipple (NUN) = 4" or 7" Material: Steel or 316SS	½" NPT	Stepped (Standard duty) Tapered (Heavy duty)	5/8" 11/16"
		¾" NPT	Stepped (Standard duty) Tapered (Heavy duty)	¾" 7/8"
		1" NPT	Stepped (Standard duty) Tapered (Heavy duty)	7/8" 1 1/16"
		¾" Socket weld	Stepped (Standard duty) Tapered (Heavy duty)	¾" ¾"
2½", 4½", 7½", 10½"; specified length 2" to 18" in ½" increments	Hex nipple = 1" or Nipple Union Nipple (NUN) = 4" or 7" Material: Steel or 316SS	1" Socket weld	Stepped (Standard duty) Tapered (Heavy duty)	7/8" 1"
		¾" weld in	Tapered (Heavy duty)	1.050"
		1" weld in	Tapered (Heavy duty)	1.315"

Technical data

Upper temperature limits for various thermocouple types in °F (°C)					
Sheath OD	Type T	Type J	Type E	Type K	Type N
ø¼"	700 °F (370 °C)	1330 °F (720 °C)	1510 °F (820 °C)	2100 °F (1150 °C)	

Thermocouple color codes as per ASTM E-230

Weight — From 1 to 10 lbs
Shock and vibration resistance — 4g/2 to 150 Hz as per IEC 60 068-2-6
Ambient temperature limits*

Housing without head-mounted transmitter	
Aluminium pressure die-cast housing	-40 to 300 °F (-40 to 150 °C)
Plastic housing	-40 to 185 °F (-40 to 85 °C)
Deep drawn SS housing without display	-40 to 300 °F (-40 to 150 °C)
Housing with head-mounted transmitter	-40 to 185 °F (-40 to 85 °C)
Deep drawn SS housing with display	-4 to 160 °F (-20 to 70 °C)
Field transmitter	
with display	-40 to 158 °F (-40 to 70 °C)
without display	-40 to 185 °F (-40 to 85 °C)

*For hazardous areas refer to the transmitter control drawing