

ABB MEASUREMENT & ANALYTICS | TECHNICAL DESCRIPTION

Temperature measurement from ABB

Precise and flexible – reliable and future-proof



Temperature sensor and temperature transmitter for a broad range of industrial applications

Measurement made easy

—
SensyTemp TSP100
SensyTemp TSP300
TSP341-N
SensyTemp TSH200
SensyTemp TSC400
SensyTemp TSW200
SensyTemp TSW300
SensyTemp TSA101
TTH200
TTF200
TTR200
TTH300
TTF300
SensyTemp TSP300-W
TTF300-W

Introduction

Many industrial processes require precise temperature measurement. ABB offers a comprehensive selection of products for this purpose.

The reliable devices and solutions meet the requirements set and have proven themselves in many instances of use in various industries. ABB has extensive technological experience in this field and supports a selection of customized solutions.

The innovative temperature sensors and temperature transmitters are characterized by low cost of investment and standardized modules with high long-term stability.

The wide-ranging product offering for temperature measurement is based on a flexible modular principle. Owing to it, standard modules can be delivered on shortest notice. The clear portfolio structure ensures a meaningful product selection, simplifying this the entire ordering process.

1 Temperature sensors in modular design



Ⓐ Measuring inset

The measuring inset protects the temperature sensor and increases the measuring accuracy. The measuring inset can always be replaced (e.g. for calibration) at any time, without opening the process or shutting down the plant. This allows for easy calibration of the measuring inset.

① Connection head

Connection heads for temperature sensors comply with the EN 50446 industry standard, which sets the electric and mechanical connection requirements for thermowells, measuring insets, transmitter and connection cables. For decades, ABB has been continuously improving the design of connection heads for one and two transmitters.

② Extension tube

The extension tube protects the electronics from high process temperatures. When process lagging is used, the extension tube enables accessibility of the connections above the lagging.

③ Process connection

Measuring elements can be connected directly into the process using compression fittings. When a thermowell is used it can be connected to the process via a screwed connector or a flange to any of a number of international standards. Additionally a thermowell may also be provided in a design suitable for welding into position.

④ Thermowell

A conventional thermowell consists of a seamless tube, to which a base is welded on process-side. A solid drilled thermowell is manufactured from a single piece of bar material with a hole drilled to within a few millimeters of the tip. A hole is cut in the rod, ending a few millimeters below the top. Both of these thermowell types provide protection for the temperature sensor.

Figure 1: Temperature sensor components

2 Non-invasive temperature measurement

The non-invasive temperature sensor TSP341-N* is designed for surface mounting. By taking the environmental conditions into account, high-precision and reliable temperature measurement is possible without any interference in the process. Plant safety is significantly increased as a result. At the same time, thanks to quick and easy surface mounting and by eliminating the thermowell and the need to open the process, substantial cost reductions are achieved.

For decades, temperature measurement in process technology has usually been conducted by directly inserting a temperature sensor with a thermowell into the medium to be measured. While chemically aggressive measuring media can damage thermowells, therefore requiring regular inspections and replacement as needed, an undersized thermowell can also burst in flowing measuring media due to vortex formation and resulting oscillations.

To minimize this risk and possible personal injury or damage to the plant and environment, in part a great effort is required already in the plant planning phase as well as during operation.

The TSP341-N temperature sensor with integrated transmitter minimizes such risks and therefore significantly reduces costs, since it allows for temperature measurement beyond the process.

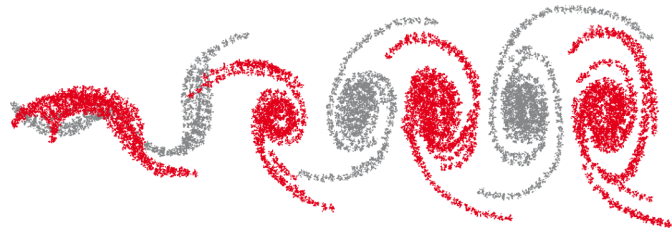


Figure 2: Vortex build-up in the area of a thermowell in flowing media

With its high level of precision and short response time, it is exceptionally suited for a number of applications. The basis for the high accuracy of the sensor is the consideration of the ambient conditions and specifically the ambient temperature in the calculation algorithms developed by ABB for the non-invasive temperature measurement.

Short response time is achieved through its optimized mechanical structure.

Aside from reducing hazards and their associated costs, the TSP341-N increases flexibility within the plant at the same time. The sensor can be installed at any time, later on or even temporarily for additional measurements, without the need for an unavoidable standstill during modification of the plant.

Also see: Whitepaper WP/TSP341-N (TSP341-N | High-precision non-invasive temperature measurement).



Figure 3: TSP341-N, with and without LCD indicator

* The temperature sensor TSP341-N is part of the product series SensyTemp TSP from ABB. It is listed as SensyTemp TSP341-N in the type examination certificates for explosion protection to be used.

3 Overview of temperature sensor product lines

SensyTemp TSP100 and TSP300



Applications

Process measurement

- Chemical industry
- Energy industry
- General process engineering
- Container and pipeline construction
- Mechanical engineering and plant construction

Approvals

- ATEX, IECEx, GOST / EAC-Ex
- Other approvals on request.

Specifications

Process connections

- Installation in existing thermowell
- Screw-in thread
- Flange
- Compression fitting
- Weld-in spud
- TSP341-N*: surface mounting for non-invasive temperature measurement

Measuring ranges

Resistance thermometer:

–196 to 800 °C (–320.8 to 1472 °F)

Thermocouples:

–40 to 1600 °C (–40 to 2912 °F)

Functional safety

Up to SIL2 / SIL3 according to IEC 61508 with integrated transmitters

SensyTemp TSH200



Applications

High-temperature measurement

- Industrial furnaces
- Garbage and hazardous waste incineration
- Reheating and tempering furnaces
- Cement and brick production
- Porcelain and ceramics industry
- Glass industry
- Smelting operations
- Blast furnaces, air-circulation furnaces

Approvals

GOST

Specifications

Process connections

- Metal thermowell
- Ceramic thermowell
- Stop flange with counterflange, threaded socket, welded standard flange

Measuring ranges

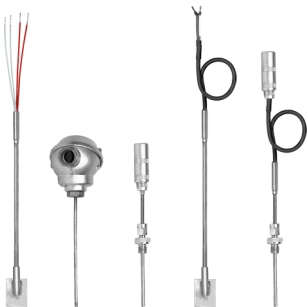
Metal thermowell:

max. 1300 °C (2372 °F)

Ceramic thermowell:

max. 1800 °C (3272 °F)

SensyTemp TSC400



Applications

Industrial thermometers

- General process engineering
- Container and pipeline construction
- Mechanical engineering and plant construction
- Motor and gear manufacturing

Approvals

ATEX, IECEx, GOST / EAC-Ex

Specifications

Process connections

- Compression fitting
- Fixed connection
- Weld-on plate
- Molded part

Measuring ranges

Resistance thermometer:

–196 to 600 °C (–320.8 to 1112 °F)

Thermocouples:

–40 to 1200 °C (–40 to 2192 °F)

* see footnote on page 3.

SensyTemp TSW200 and TSW300



Applications

Welded and drilled thermowells

- Chemical industry
- Energy industry
- General process engineering
- Container and pipeline construction
- Mechanical engineering and plant construction
- Offshore and coastal areas
- Petroleum and natural gas production and transport
- Petrochemical industry

Specifications

Process connections

- Screw-in thread
- Flange
- Weld-in spud

Profiles

- Straight shaft
- Tapered tip (conical)
- Stepped tip (tiered)

SensyTemp TSA101



Applications

Exchangeable measuring insets

- Offshore and coastal areas
- Petroleum and natural gas production and transport
- Petrochemical industry
- Chemical industry
- Power generation
- Mechanical engineering and plant construction
- General process engineering
- Container and pipeline construction

Specifications

Measuring ranges

- Resistance thermometer:
 -196 to 800 °C (-320.8 to 1472 °F)
- Thermocouples:
 -40 to 1600 °C (-40 to 2912 °F)

Functional safety

SIL2 with appropriately classified transmitter SIL3 can be implemented when using redundant operated transmitters.





Approvals

ATEX, IECEx, GOST / EAC-Ex, installation in approved TSP temperature sensors

4 Temperature sensors for process measurement

SensyTemp TSP100

SensyTemp TSP series sensors allow for measuring inset replacement during operation. With their short response time and high vibration resistance these devices meet the most demanding process requirements. The temperature sensor TSP341-N allows for high-precision non-invasive temperature measurement. No intervention in the process is necessary.

Product types	TSP111	TSP121	TSP131				
							
Process connections	<ul style="list-style-type: none"> Without thermowell Installation in existing thermowell 	<ul style="list-style-type: none"> With welded tubular thermowell <ul style="list-style-type: none"> Screw-in thread Flange Compression fitting 	<ul style="list-style-type: none"> With drilled barstock thermowell <ul style="list-style-type: none"> Screw-in thread Flange Weld-in spud 				
Design	<ul style="list-style-type: none"> Modular construction, flexible <ul style="list-style-type: none"> Measuring inset (replaceable), thermowell, extension tube, connection head, transmitter Connection heads <ul style="list-style-type: none"> BUZ, BUZH, BUZHD: Aluminum, with hinged cover, integrated LCD display optional BUS, BUSH: Aluminum, with hinged cover with snap fastener BUKH: plastic, with tall hinged cover BEG: CrNi stainless steel, with screw-on cover Other heads in various designs and materials Transmitter in the connection head (4 to 20 mA HART®, PROFIBUS PA®, FOUNDATION Fieldbus®) Suited for type of protection Intrinsic Safety 						
Measuring ranges	<ul style="list-style-type: none"> Resistance thermometer: -196 to 800 °C (-320.8 to 1472 °F) Thermocouples: -40 to 1600 °C (-40 to 2912 °F) 						
Measuring insets	Replaceable, in accordance with DIN 43735						
Integral LCD display (optional)	Optional <ul style="list-style-type: none"> with a clear display function for process value, sensor value or actual value with an additional configuration function for the buttons 						
Functional safety	Up to SIL2 / SIL3 according to IEC 61508 with integrated transmitters						
Approvals	ATEX, IECEx, GOST / EAC-Ex, other approvals on request						
Connection heads							
	BUZ	BUZH	BUZHD	BUS	BUSH	BUKH	BEG
Data sheet	DS/TSP1X1						

SensyTemp TSP300 – For top requirements

Product types	TSP311	TSP321	TSP331	TSP341-N*
				
Process connections	<ul style="list-style-type: none"> Without thermowell Installation in existing thermowell 	<ul style="list-style-type: none"> With welded tubular thermowell <ul style="list-style-type: none"> Screw-in thread Flange Compression fitting 	<ul style="list-style-type: none"> With drilled barstock thermowell <ul style="list-style-type: none"> Screw-in thread Flange Weld-in spud 	<ul style="list-style-type: none"> No thermowell required due to non-invasive surface measurement
Design	<ul style="list-style-type: none"> Modular design, sturdy and versatile <ul style="list-style-type: none"> Measuring inset, thermowell, extension tube, connection head, transmitter Interchangeable measuring inset Connection heads <ul style="list-style-type: none"> AGL: aluminum, with screw-on cover AGLH: aluminum, with tall screw-on cap AGLD: aluminum, with screw-on cover and integral LCD display AGS: CrNi stainless steel, with screw-on cover AGSH: CrNi Stainless steel, with upper screw-on cover AGSD: CrNi stainless steel, with screw-on cover and integral LCD display Transmitter in the connection head (4 to 20 mA HART®, PROFIBUS PA®, FOUNDATION Fieldbus®) Suited for explosion protection level Intrinsic Safety, dust and flameproof (enclosure) 			<ul style="list-style-type: none"> Robust modular design Connection heads <ul style="list-style-type: none"> AGL: aluminum, with screw-on cover AGLD: Aluminum, with screw-on cover and integrated LCD indicator AGS: CrNi stainless steel, with screw-on cover AGSD: CrNi Stainless steel, with screw-on cover and LCD indicator Transmitter in the connection head (4 to 20 mA / HART®), integrated calculation algorithms for the high-precision non-invasive temperature measurement Suited for intrinsic safety types of protection and flameproof enclosure
Measuring ranges	<ul style="list-style-type: none"> Resistance thermometer: -196 to 800 °C (-320.8 to 1472 °F) Thermocouples: -40 to 1600 °C (-40 to 2912 °F) 			Resistance thermometer: -40 to 400 °C
Measuring insets	Replaceable, in accordance with DIN 43735			According to DIN 43735, optimized for non-invasive surface measurement
Integral LCD display (optional)	Optional <ul style="list-style-type: none"> with a clear display function for process value, sensor value or actual value with an additional configuration function for the buttons 			Graphic (alphanumeric) LCD indicator for viewing process, sensor and actual values display
Functional safety	Up to SIL2 / SIL3 according to IEC 61508 with integrated transmitters			—
Approvals	ATEX, IECEx, GOST / EAC-Ex, other approvals on request			ATEX, IECEx, other approvals on request
Connection heads				
		AGL / AGS	AGLH** / AGSH**	AGLD / AGSD
Data sheet	DS/TSP3X1			DS/TSP341-N







* See footnote on page 3.

** Not for TSP341-N

5 High-temperature measurement equipment for up to 1800 °C

SensyTemp TSH200

The temperature sensors of the SensyTemp TSH product series are especially suited for the application range from 600 to 1800 °C. ABB supports a selection of thermowells appropriate for temperature measurements at high temperatures in combustion, annealing and smelting processes.

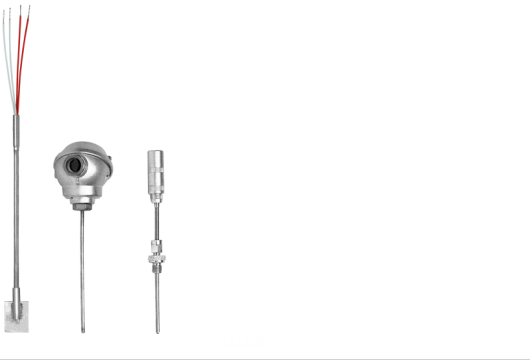

Product types	TSH210	TSH220		
				
Process connections	Metal thermowell Stop flange with counterflange, threaded socket, welded standard flange	Ceramic thermowell		
Design	<ul style="list-style-type: none"> Modular construction, numerous applications <ul style="list-style-type: none"> In accordance with EN 50446 and ABB standard Connection heads <ul style="list-style-type: none"> AUZ: Aluminum, with hinged cover AUZH: Aluminum, with tall hinged cover BUZ: Aluminum, with hinged cover BUZH: Aluminum, with tall hinged cover Other heads in various designs and materials Transmitter in the connection head (4 to 20 mA HART®, PROFIBUS PA®, FOUNDATION Fieldbus®) 			
Standard thermowell materials	1.4571, 1.4749, 1.4762, 1.4841, Kanthal® AF, Inconel® 601, Incoloy® 800	C530 ceramic, C610 ceramic, C799 ceramic, AL23 aluminum oxide, SiC silicon carbide		
Standard inner tube materials	C610 ceramic, C799 ceramic,			
Max. operating temperature	1300 °C	1800 °C		
Approvals	GOST			
Connection heads (selection)	   			
	AUZ	AUZH	BUZ	BUZH
Data sheet	DS/TSH200			

6 Industrial thermometers

SensyTemp TSC400

The temperature sensor of the SensyTemp TSC400 series deliver the fastest possible measurement results via the mineral insulated cable in direct contact with the measuring medium, with high vibration resistance.

Due to the optimal sheath materials selected, the widest possible range of applications is covered, with the possibility of later installation via surface attachment.

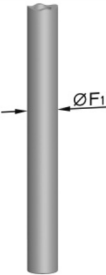

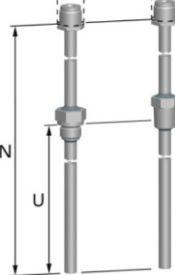
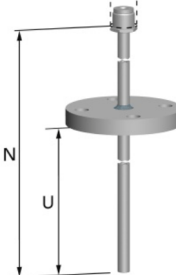
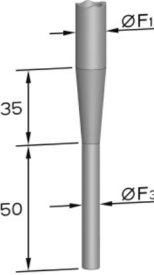
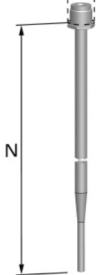
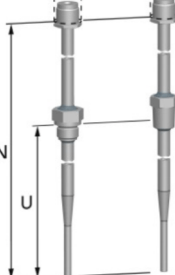
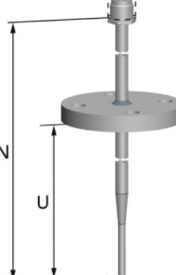
Product types	TSC420	TSC430
		
Process connections	<ul style="list-style-type: none"> • Without process connection • With fixed screw connection • With sliding screw connection • With weld-on plate for surface measurement • With molded part for tension clip mounting • Temperature sensor for use with or without thermowell 	
Design	Bendable MI-cable with sealing sleeve and direct electrical connection	Bendable MI cable with sealing sleeve and connection cable
Connections	<ul style="list-style-type: none"> • Open cable ends • Form F connecting head • Plug, socket 	<ul style="list-style-type: none"> • Open cable ends • Plug, socket
Measuring ranges	<ul style="list-style-type: none"> • Single and double thermocouples, measuring range -40 to 1200 °C (-40 to 2192 °F) • Single and double resistance thermometer Pt100 / two-wire, three-wire or four-wire circuit, measuring range -196 to 600 °C (-320.8 to 1112 °F) 	
Approvals	ATEX, IECEx, GOST / EAC-Ex	
Data sheet	DS/TSC400	

7 Thermowells for process measurement

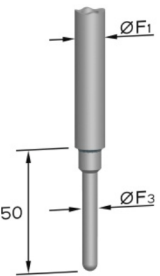
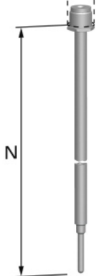
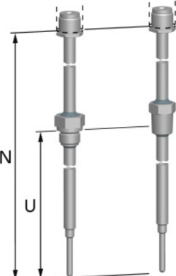
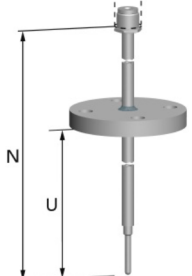
Interchangeable thermowells for industrial temperature sensors of the SensyTemp TSW200 series (welded thermowells) and SensyTemp TSW300 series (drilled thermowells) have been designed for installation in sensors of the SensyTemp TSP series.

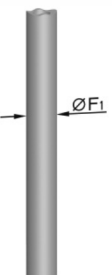
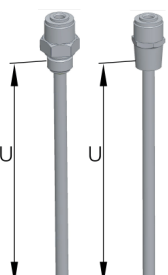
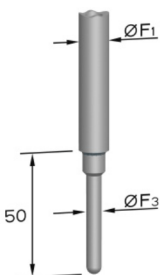
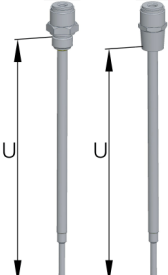
The use of these thermowells allows for fast preparation and process sealing of a plant. Temperature sensors of the types SensyTemp TSP111 or TSP311 that are delivered without a thermowell can be inserted in the plant at a later point.

SensyTemp TSW200 – Welded thermowells

Straight shaft	DIN 43772 – form 2	DIN 43772 – form 2G	DIN 43772 – form 2F
M24 x 1.5 head connection			
			
1.4571/316Ti	F1 = 12, 14 mm	F1 = 9, 11, 12, 14 mm	F1 = 11, 12, 14 mm
1.4404/316L	F1 = 12, 14 mm	F1 = 12, 14 mm	F1 = 12, 14 mm
2.4819/C-276	-	F1 = 13.7 mm*	F1 = 13.7 mm*
Measuring inset	Ø 6 mm	Ø 6 mm	Ø 6 mm
Tapered tip*	DIN 43772 – form 3	DIN 43772 – form 3G	DIN 43772 – form 3F
M24 x 1.5 head connection			
			
1.4571/316Ti	F1/F3 = 12/9, 16/10 mm	F1/F3 = 12/9 mm	F1/F3 = 12/9, 16/10 mm
1.4404/316L	F1/F3 = 12/9 mm	F1/F3 = 12/9 mm	F1/F3 = 12/9 mm
Measuring inset	Ø 6 mm	Ø 6 mm	Ø 6 mm

* With a diameter of the tapered tip of 9 mm, the bottom plug is welded in accordance with the NAMUR recommendation. The effective diameter is approx. 10 mm.

Stepped tip	ABB – form 2S	ABB – form 2GS	ABB – form 2FS
M24 x 1.5 head connection			
			
1.4571/316Ti	F1/F3 = 12/6, 14/6 mm	F1/F3 = 11/6, 12/6, 14/6 mm	F1/F3 = 11/6, 12/6, 14/6 mm
1.4404/316L	F1/F3 = 12/6, 14/6 mm	F1/F3 = 12/6, 14/6 mm	F1/F3 = 12/6, 14/6 mm
2.4819/C-276	–	F1/F3 = 13.7/6 mm*	F1/F3 = 13.7/6 mm**
Measuring inset	Ø 3 mm	Ø 3 mm	Ø 3 mm

Straight shaft, without extension tube	ABB – form 2G0	Recessed tip, without extension tube	ABB – form 2GS0
M24 x 1.5 head connection		M24 x 1.5 head connection	
			
1.4571/316Ti	F1 = 9, 11, 12 mm*	1.4571/316Ti	F1/F3 = 11/6, 12/6 mm*
Measuring inset	Ø 6 mm	Measuring inset	Ø 3 mm

* Only with G1/2A, 1/2" NPT thread

** Flange 1.4571/316Ti, flange disc 2.4819/C-276

Other diameters and materials available on request.

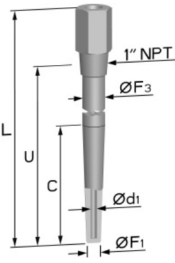
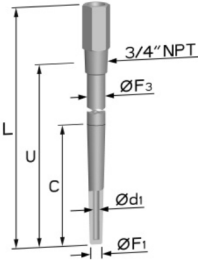
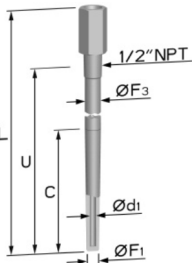
... 7 Thermowells for process measurement

SensyTemp TSW300 – drilled thermowells

Weld-in thermowell		DIN 43772 – form 4		DIN 43772 – form 4		ABB – form PW	
Extension tube connection		M18 x 1.5		M14 x 1.5		½ in NPT	
Material		1.4404/316L; 1.4571/316Ti; 1.7335/13CrMo4-5; 1.5415/15Mo3		1.4876/Incoloy® 800; 2.4360/Monel® 400		1.4404/316L; 1.4571/316Ti 2.4816/Inconel® 600; 2.4819/C-276	
F3/F2/F1	d1	24h7/12.5 mm	7 mm	18h7/9 mm	3.5 mm	32/23/13.5 mm	7 mm
Measuring inset		Ø 6 mm		Ø 3 mm		Ø 6 mm	

Flange thermowell		DIN 43772 – form 4F		DIN 43772 – form 4FS		ABB – form PF	
Extension tube connection		M18 x 1.5		M14 x 1.5		½ in NPT	
Material		1.4404/316L; 1.4571/316Ti		1.4404/316L; 1.4571/316Ti		1.4404/316L; 1.4571/316Ti 1.4876/Incoloy® 800; 2.4360/Monel® 400* 2.4816/Inconel® 600; 2.4819/C-276*	
F3/F2/F1	d1	24/12.5 mm	7 mm	18/9 mm	3.5 mm	32/23/13.5 mm	7 mm
Measuring inset		Ø 6 mm		Ø 3 mm		Ø 6 mm	

* 1.4876/Incoloy® 800; 2.4360/Monel® 400; 2.4816/Inconel® 600; 2.4819/C-276 with flange in 1.4571/316Ti and flange disc

Screw-in thermowell	ABB – form PS		ABB – form PS		ABB – form PS		
Extension tube connection	½ in NPT; WAF 36		½ in NPT; WAF 27		½ in NPT; WAF 27		
							
Material	1.4404/316L; 1.4571/316Ti; 1.4876/Incoloy® 800; 2.4360/Monel® 400; 2.4816/Inconel® 600; 2.4819/C-276						
F3/F1	d1	25/16 mm	7 mm	20/13.5 mm	7 mm	17/13.5 mm	7 mm
Measuring inset		Ø 6 mm		Ø 6 mm		Ø 6 mm	




Other diameters and materials available on request.

8 Exchangeable measuring insets

SensyTemp TSA101

Exchangeable measuring insets of the SensyTemp TSA101 series are designed for installation in the SensyTemp TSP series of temperature sensors, allowing for an efficient and prolonged use of these sensors.

The measuring inset can always be replaced (e.g. for calibration) at any time, without interrupting the operation of the plant.

Product types	TSA101		
			
Design	Ceramic base with terminals	Permanently-mounted transmitter	Open connection wires
Design	<ul style="list-style-type: none"> Flexible and vibration-resistant ABB mineral insulated cable. Sheath material for resistance thermometer made of stainless steel 1.4571 (316Ti), 1.4404 (316L) or nickel-basis alloy 2.4816 (Alloy600) for thermocouples. Type S thermocouple in an accuracy class of 0 to 1600 °C (32 to 2912 °F). Fitted with single- or double sensors. Optimum clamping at the measuring inset's holding plate is assured by generous spring travel (10 mm (0.39 inch)) on the part of the clamping springs. Measuring inserts are available with outer diameters of 3 mm (0.12 in), 4.5 mm (0.24 in), 6 mm (0.24 in) and for thermocouples also 8 mm (0.32 in). 8 mm (0.32 in) tip with sleeve and 10 mm (0.39 in) tip with sleeve 		
Sensors/Measuring ranges	<ul style="list-style-type: none"> Resistance thermometers: <ul style="list-style-type: none"> -196 to 400 °C (-320.8 to 752 °F), thin film resistor (SMW) -196 to 800 °C (-320.8 to 1472 °F), wire wound resistor (DMW) Thermocouples: <ul style="list-style-type: none"> -40 to 1600 °C (-40 to 2912 °F) 		
Functional safety	<ul style="list-style-type: none"> SIL2 with appropriately classified transmitter. SIL3 can be implemented when using redundant operated transmitters. 		
Approvals	ATEX, IECEx, GOST / EAC-Ex, other approvals on request		
Data sheet	DS/TSA101		

9 Temperature sensors

Temperature sensor for process measurement

Process-oriented customized full sensors produced for installation in piping or in containers. The SensyTemp TSP series models comply with almost all requirements that an industrial environment can set. This includes both the selection of materials that must be adapted to the medium measured, and the special forms for process connections, which can include even special designs.

Comprehensive certificate for explosion protection and the SIL declaration of conformity for functional safety is offered as a matter of course.

High-temperature measurement

The high temperature thermometer of the SensyTemp TSH series offer a broad range of applications and meet the highest requirements.

For aggressive environments, ABB offers precious metal thermocouples with ceramic thermowells, which can withstand temperatures of up to 1800 °C.

Industrial thermometers

The SensyTemp TSC sensor series delivers the fastest possible measurement results via mineral insulated cables in direct contact with the measuring medium. Subsequent installation is possible via surface mounting. The combination of mechanical and electrical interfaces makes the maximum variety of applications possible.

Exchangeable measuring insets

The measuring insets are fitted with resistance thermometers or thermocouples as sensors. The connectable area can be optionally made as a terminal block with open connecting wires or built-in transmitters.

Installation instructions

The best results with regard to accuracy and response time are achieved when the sensor element is located at the point of the greatest medium velocity, i.e. the center of the pipe.

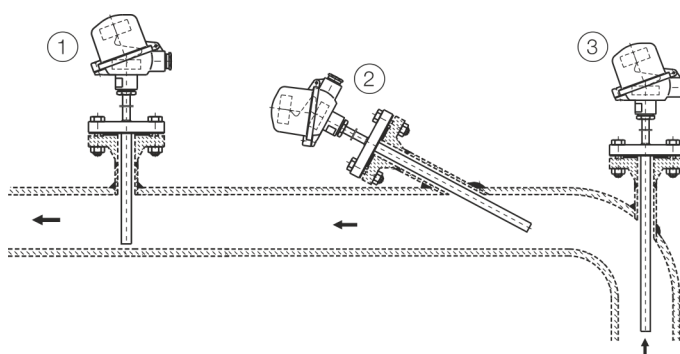
Depending on the pipe diameter or pipe curvatures, various installation requirements can be set.



Figure 4: High temperature thermometer in the furnace



Figure 5: High temperature measurements for up to 1800 °C



- ① Standard installation
- ② Inclined against the flow direction for small pipe diameters
- ③ Vertical installation in pipe bends

Figure 6: Installation recommendations for temperature sensors in piping

10 LCD displays

ABB operation concept

Temperature sensors and transmitters are optionally equipped with an LCD indicator. With it, all the relevant parameters can be viewed on the spot.

The LCD indicator is offered in two variants: with and without push buttons for configuring device parameters. The menu navigation takes place via the integrated display and four buttons. It is intuitive and user-friendly. Buttons and LCD display are located under a housing cover with a viewing window for protection.

The following functions and parameterization can be set

- Sensor type, connection type
- Measuring ranges
- Warning and alarm thresholds
- Reaction on error (HART-Version)
- Software write protection
- Device address for fieldbus communication
- Diagnostic information



Figure 7: LCD indicator



Figure 8: LCD display with push buttons for configuration

11 ABB Service worldwide

ABB is the competent partner in process automation. The large number of globally installed products and solutions speaks for itself.

ABB always provides its knowledge and experience in establishing stable processes and optimizing safety and precision in industrial plants.

From installation and commissioning to dismantling and disposal, the ABB expert team supports its clients over the entire lifecycle of their plant, with a comprehensive selection of service and support activities.



Figure 9: The ABB Service – globally on the spot

12 PSA (Product Selection Assistant)

The PSA is an Internet-based tool for simpler selection and engineering of temperature measuring devices.

By entering application-oriented boundary conditions, the optimization towards the desired requirements gradually takes place.

The result is a measuring device that is ideally suited to the process in question.



www.abb.de/temperature-selector

13 Temperature transmitters

Temperature transmitters for sensor head-mount, field-mount and rail-mount installation

With a universal sensor input, which allows connecting two temperature sensors.

Further equipment features:

- sensor redundancy and sensor drift monitoring
- software and hardware write protection
- multiple diagnosis features
- for designs with LCD displays, directly configurable with buttons on the instrument
- extensive certifications list
- SIL-Declaration of Conformity



Figure 11: Transmitter in field mount housing

Transmitters for fieldbus applications

The 200 series models are suited for 4 to 20 mA / HART® protocol.

The 300 series also covers the PROFIBUS PA® and FOUNDATION Fieldbus® models.

WirelessHART® is available for use on transmitters TTF300-W for field mounting via wireless networks.



Figure 12: Transmitter for rail mounting






Figure 10: Transmitter installed in a head-mount

... 13 Temperature transmitters

200 series – For standard requirements



Temperature transmitters of the TTX200 series are available in different housing variants. The well-proven technology with integrated sensor and self monitoring as well as SIL declaration of conformity supports the 4 to 20 mA / HART® communication protocol.

Product types	TTH200	TTF200	TTR200
			
Communication protocol	HART		
Device type	Head-mount	Field-mount	Rail-mount
Input	<ul style="list-style-type: none"> One sensor input: <ul style="list-style-type: none"> Resistance thermometer, resistance-type remote sensor (0 to 5000 Ohm) Thermocouples, voltages, mV-voltages (-125 to 1100 mV) 		
Sensor connection	Resistance thermometers in two-wire, three-wire or four-wire circuits, all common thermocouples with internal reference junction		
Features	<ul style="list-style-type: none"> Continuous sensor monitoring and self- monitoring Sensor error adjustment Electrical isolation 		
Indicator (optional)	Transmitter-controlled, graphic (alphanumeric) LCD indicator for viewing process, sensor without and actual values display		
Configuration	Via DTM, EDD, FDI package via Field Information Manager FIM		
Functional safety	SIL2, SIL3 in redundant configuration in accordance with IEC 61508		
Approvals	ATEX, IECEx, FM, CSA, GOST / EAC-Ex, other approvals on request		
Data sheet	DS/TTH200	DS/TTF200	DS/TTR200

300 series – For top requirements

Temperature transmitters of the TTX300 series offer two sensor inputs. Apart from the 4 to 20 mA / HART® Protocol (HART 5 and HART 7), FOUNDATION Fieldbus® and PROFIBUS PA® communication is optionally supported.

The devices allow for a specific linearization of characteristics. They are available with SIL declaration of conformity (HART® version).

Product types	TTH300	TTF300
		
Communication protocol	HART® communication, PROFIBUS PA®, FOUNDATION Fieldbus®	
Device type	Head-mount	Field-mount <ul style="list-style-type: none"> • Single-chamber housing equipment • 2 × cable glands
Input	<ul style="list-style-type: none"> • Two sensor inputs <ul style="list-style-type: none"> – Resistance thermometer, resistance-type remote sensor (0 to 5000 Ohm) – Thermocouples, voltages, mV-voltages (–125 to 1100 mV) 	
Sensor connection	Resistance thermometers in two, three or four-wire circuits, all common thermocouples with internal reference junction. <ul style="list-style-type: none"> • Optional: <ul style="list-style-type: none"> – 2 × resistance thermometers in two-wire and three-wire circuits – 2 × thermocouples – 1 × resistance thermometers in two-wire, three-wire or four-wire circuits and 1 × thermocouple 	
Features	<ul style="list-style-type: none"> • Continuous sensor monitoring and self- monitoring • Sensor error adjustment • Electrical isolation • Specific linearization (Callendar Van Dusen coefficients, table of variate pairs / 32 points) 	
Indicator (optional)	<ul style="list-style-type: none"> • Transmitter-controlled, graphical (alphanumeric) LCD indicator with dual function: <ul style="list-style-type: none"> – Configuration of the transmitter via buttons – Process, sensor and actual values display 	
Configuration	Via HART® (DTM, EDD, HMI, FDI package via Field Information Manager FIM), PROFIBUS PA® (DTM, EDD, HMI, GSD), FOUNDATION Fieldbus® (EDD, HMI)	
SIL-functional safety	HART®, SIL2, SIL3 in redundant configuration in accordance with IEC 61508	
Approvals	ATEX, IECEx, FM, CSA, GOST / EAC-Ex, other approvals on request	
Data sheet	DS/TTH300	DS/TTF300

14 WirelessHART temperature measuring devices

Wireless temperature measurement

The electronics in ABB's wireless measuring devices are extremely low in power consumption leading to high efficiency. The significantly extended battery life increases the reliability of the network. Thus it is possible to achieve faster update rates and tremendously reduce the battery replacement intervals.

Energy Harvester

The WirelessHART temperature sensor of the TSP300-W series can be equipped with an Energy Harvester. With it, the power supply is provided via an integrated thermoelectric microgenerator (micro-TEG). It uses the temperature difference between the process and the environment. The micro-TEG provides a robust and compact solution for energy harvesting from either hot or cold processes.

With many industrial processes having an abundance of heat, the power that can be delivered by TEGs is sufficient to fully operate wireless temperature sensors.



Figure 13: Temperature sensor with Energy Harvester

Temperature sensors and transmitters

The selection of WirelessHART temperature sensors comprises a large number of designs. These include all the common thermowell types, as well as the entire selection of process connections.

With the surface mount option of the SensyTemp Energy Harvester it is possible to add a new temperature measuring point to an existing installation within five minutes.




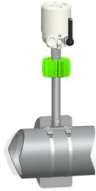

A field-mount temperature transmitter completes the product portfolio.



Figure 14: Temperature sensor for surface mounting, with integrated Energy Harvester

WirelessHART® temperature measuring devices – Measure autonomously with the Energy Harvester

The WirelessHART® temperature sensor TSP300-W with Energy Harvester is the world's first self-powered wireless measurement devices requiring no wiring, no external power supply and ideally no battery replacement.

Product types	TSP311-W	TSP321-W	TSP331-W	TSP341-W	TTF300-W
					
Design	Temperature sensor				Temperature transmitter
Device type	Battery supply with Energy Harvester		Battery supply with Energy Harvester	Battery supply with Energy Harvester	
Thermowell	without	Welded	Drilled	without	—
Input	Two sensor inputs: <ul style="list-style-type: none"> Resistance thermometer, resistance-type remote sensor (0 to 5000 Ohm) Thermocouples, voltages, mV-voltages (-125 to 1100 mV) 				
Process connection	Insertion in an existing thermowell.	<ul style="list-style-type: none"> Screw-in thread Flange Weld-in spud Compression fitting 	<ul style="list-style-type: none"> Screw-in thread Flange Weld-in spud 	Surface mounting	Field-mount
Sensor connection	<ul style="list-style-type: none"> Pt100, two-wire, three-wire, four-wire, thermocouple with internal reference junction 2× Pt100 two-wire and three-wire circuit, 2× thermocouple or 1× Pt100 two-wire, three-wire, four-wire circuit and 1× thermocouple 				
Features	<ul style="list-style-type: none"> Continuous sensor monitoring and self- monitoring Sensor error adjustment Electrical isolation Specific linearization (Callendar Van Dusen coefficients, table of variate pairs / 32 points) Innovative energy management 				
Integral LCD display (optional)	<ul style="list-style-type: none"> Optional: <ul style="list-style-type: none"> with a clear display function for process value, sensor value or actual value with an additional configuration function for the buttons 				
Configuration	Via DTM, EDD, HMI, FDI package via Field Information Manager FIM				
Approvals	ATEX, IECEx, GOST, other approvals on request.				
Data sheet	DS/TSP300-W				DS/TTF300-W

Trademarks

Kanthal is a registered trademark of Kanthal AB, Sweden

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Notes

ABB Limited**Measurement & Analytics**

Howard Road, St. Neots
Cambridgeshire, PE19 8EU
UK

Tel: +44 (0)870 600 6122

Fax: +44 (0)1480 213 339

Email: enquiries.mp.uk@gb.abb.com

ABB Inc.**Measurement & Analytics**

125 E. County Line Road
Warminster, PA 18974
USA

Tel: +1 215 674 6000

Fax: +1 215 674 7183

ABB Automation Products GmbH**Measurement & Analytics**

Schillerstr. 72
32425 Minden
Germany

Tel: +49 571 830-0

Fax: +49 571 830-1806

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