



TT481

WirelessHART®

TEMPERATURE TRANSMITTER
WITH 4 OR 8 INPUTS



- $\pm 0.03\%$ accuracy
- RTDs and thermocouples linearization
- Lightweight and compact
- Several type of sensors, 2 or 3-wire
- Supports DD/EDDL and FDT/DTM
- Current input 4-20mA.

WirelessHART™ Technology

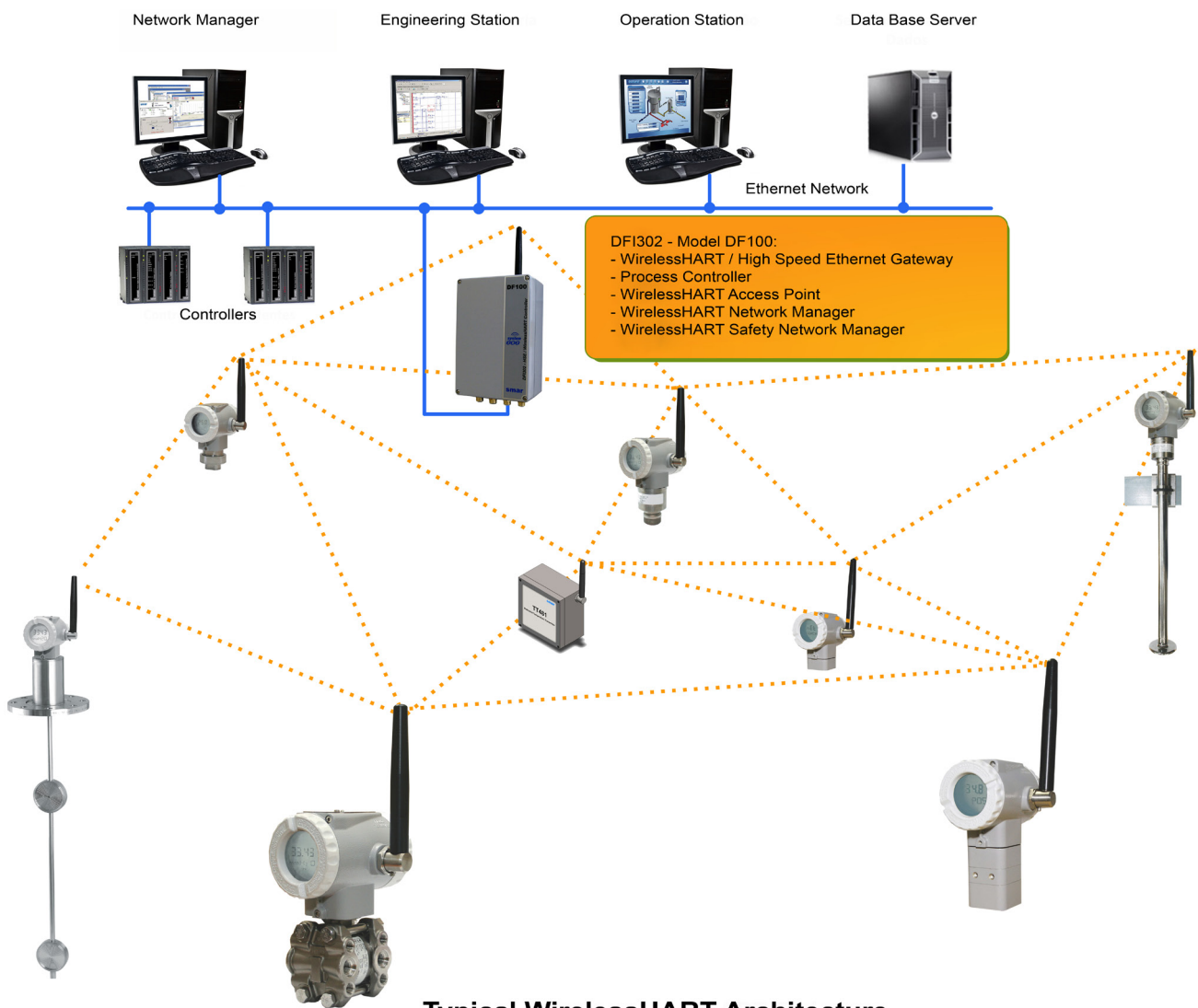
The world dedicated HART technology now offers a robust protocol designed for numerous applications, with the advantage of the wireless feature. Economy installation and efficient management of energy, quick access to information from the field, strength in communication and information integrity, network security: and so many other advantages that make *WirelessHART™* technology (more on www.hartcomm.org), who came to the world of automation to innovate and revolutionize.

Based on a communication protocol for wireless mesh network, the *WirelessHART™* protocol ensures compatibility between instruments, controls and existing HART tools. Basically, a network *WirelessHART™* is composed of elements as the one shown below.

The picture elements in the network, constitute the so-called mesh network. They are:

- **Host:** The host, usually connected to the control network, is a workstation in which, e.g., can be installed an Human Machine Interface application, which allows an operator to interact with the process. Use a communication protocol, for example, HSE, H1, Profibus or Modbus.
- **WirelessHART™ Gateway:** It converts data from the host to the *WirelessHART™* protocol, used by the devices connected to the *WirelessHART™* network. Use Gateway DF100.

MESH Network, wireless

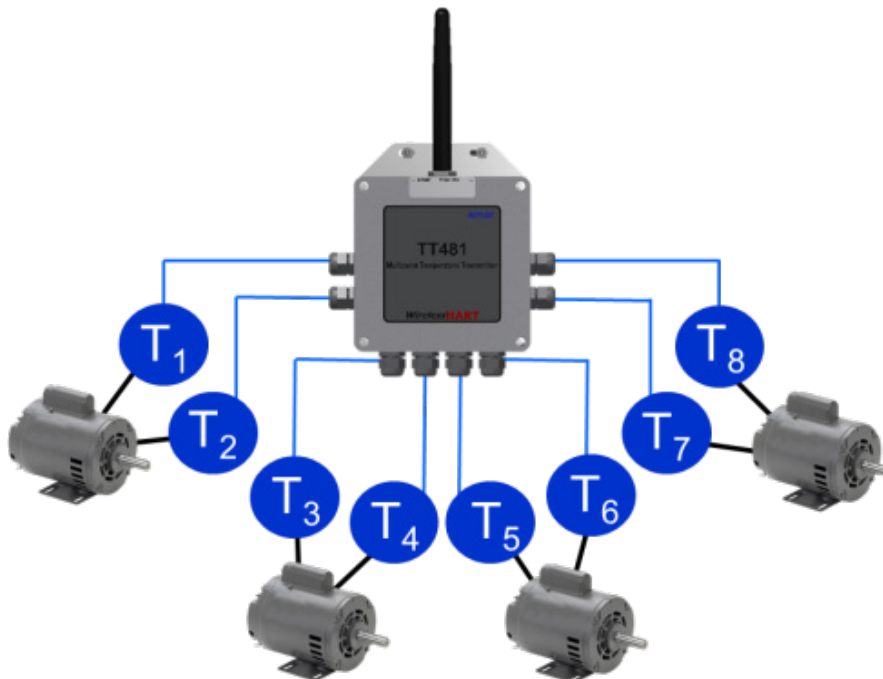


- **Network Manager:** The Network Manager is an application that can be embedded in the *WirelessHART™ Gateway*. Among its responsibilities, the Network Manager distributes network identity (advertisement) publishing its existence, manages and authenticates the addition (joining) of devices to the network.
- **Access Point:** in a simple way, can be understood as a radio installed in the wireless gateway.
- **WirelessHART™ device:** The *WirelessHART™* field device is the device that connects to the process, being able to receive and/or transmit data on the *WirelessHART™* network. It is a *WirelessHART™* router (repeater) by nature, i.e., it is able to retransmit messages to/from other devices on the *WirelessHART™* network.
- **WirelessHART™ Adapter:** It is a bridge-type device, because it is able to provide data of HART + 4 to 20mA field device, legacy, to the host via *WirelessHART™*. The adapter uses HART FSK standard communication, wired, to access data from HART field devices. And the adapter also uses the *WirelessHART™* communication to provide data of the field device to the host. The adapter thus enables a HART field device to work on *WirelessHART™* network.

The *WirelessHART™* devices should be installed in field and configured the same way as conventional HART devices. This is possible with files of DD type (Device Description) updated and uploaded to your configurator. This, in turn, can also be used normally.

Depending on the architecture, usage conditions and obstacles, elements as repeaters can be necessary. Smar offers, for these cases, the RP400 - *WirelessHART™* network repeater.

It is noteworthy also that these tools can be either configured previously, bench, as at the time of installation.



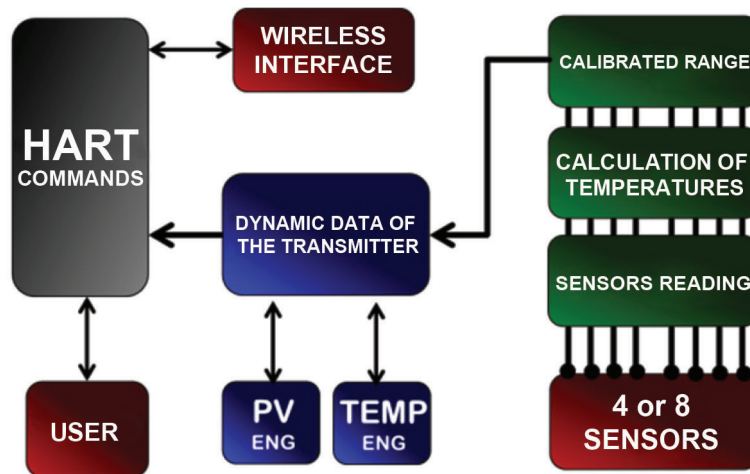
TT481 *WirelessHART™*

Imagine all the advanced features of temperature transmitters Smar, but now wireless. The **TT481 *WirelessHART™*** has the same features as the series TT300 Series, but following the standard of HART Communication Foundation for wireless device. Here are some of its features:

- Current input in 4-20 mA;
- $\pm 0.03\%$ accuracy in A/D converter;
- HART protocol version 7 with commands of *WirelessHART™* standard;
- Accept several type of sensor: thermocouples, RTDs, mV sign, Ohms and others;
- Indication in the display about wireless network status;
- Battery life up to seven years;
- Specific support which facilitates mounting and positioning of the transmitter;
- Configurable via DD using handhelds and PC.



TT481 WirelessHART™ Block Diagram



The TT481 *WirelessHART™* has its sensor connections on the bottom for connecting up to four sensors, or bottom and sides, for connection up to eight sensors.

Sensor Connections in TT481 WirelessHART™



DF100 - HSE WirelessHART™ Controller with 2 Ethernet ports 100 Mbps, 1 RS-485 Port and 1 WirelessHART™ channel

The DF100 controller is a key element in the distributed architecture of field control systems. Gathers powerful communication features with access to field equipment via *WirelessHART™* protocol.

This controller has totally innovative aspects with respect to the line of modular DF1302. The DF100 can be used outdoors, open, since it has degree of protection IP66. Furthermore, it allows to work with the new specification HSE RIO of the Fieldbus Foundation and Modbus communication via RS-485 port.



Functional Specifications	
Input	See tables in page 6.
Battery	The pack consists of 2 primary lithium batteries (Li-SOCI2) of 3.6 V, totaling 7.2 V. Battery Life: - Burst Mode eight seconds, @25 °C, network at least three device neighbors: 4 years NOTE: The battery used in Smar transmitters must be provided exclusively by Smar.
Display	Internal, for sensors and network status calibration.
Communication Protocol	HART® Protocol Version 7, with set of commands TT481 <i>WirelessHART</i> ™; A specific review of the HART transmitter must be managed according to the transmitter TT481 <i>WirelessHART</i> ™; HART® is a trademark of HART® Communication Foundation.
Configuration	Remote configuration with external programmer via HART® protocol, using DDL/EDDL or via FDT/DTM tools.

Performance Specifications	
Accuracy	See tables in page 6.
Response Time	8 s.
Reading Sensor	A/D Converter Accuracy: ±0.02% of span.
Stabilization Time after Energizing - warm start	Less than 17 seconds.

Sensors	
Terminal Block	Three terminals per sensor (in both models: four ou eight inputs).
Mounting	Default: wall or panel (screws not included). For mounting in tubes 2 inches, support (accessory) in AISI316 or Steel Carbon surface treatment.
Weight	~ 2,5 kg ~2,8 kg without mounting bracket
Identification Plate	Plate in Stainless Steel 316 (with serial number and option TAG). Sticker with product identification.

Characteristics per Sensor Type

2, 3 or 4-wire						
SENSOR	TYPE		RANGE °C	RANGE °F	MINIMUM SPAN °C	* DIGITAL ACCURACY °C
RTD	Cu10	GE	-20 to 250	-4 to 482	50	± 1.0
	Ni120	Edison Curve #7	-50 to 270	-58 to 518	5	± 0.1
	Pt50	IEC 751-83 (0,00385)	-200 to 850	-328 to 1562	10	± 0.25
	Pt100	IEC 751-83 (0,00385)	-200 to 850	-328 to 1562	10	± 0.2
	Pt500	IEC 751-83 (0,00385)	-200 to 450	-328 to 842	10	± 0.2
	Pt1000	IEC 751-83 (0,00385)	-200 to 300	-328 to 572	10	± 0.2
	Pt50	JIS 1604-81 (0,003916)	-200 to 600	-328 to 1112	10	± 0.25
	Pt100	JIS 1604-81 (0,003916)	-200 to 600	-328 to 1112	10	± 0.25
	Pt100	MILT-T24388C (0,00392)	-40 to 540	-40 to 1000	10	± 0.2
	Ni120	MILT-T24388C (0,00672)	-40 to 205	-40 to 400	5	± 0.13
	Pt100	IEC 751-95 (0,00385)	-200 to 850	-328 to 1562	10	± 0.2
	Pt100	GOST 6651-09 (0,003911)	-200 to 850	-328 to 1562	10	± 0.2
	Pt50	GOST 6651-09 (0,003911)	-200 to 850	-328 to 1562	10	± 0.2
	Cu100	GOST 6651-09 (0,00426)	-50 to 200	-58 to 392	10	± 0.15
	Cu50	GOST 6651-09 (0,00426)	-50 to 200	-58 to 392	10	± 0.15
Thermocouple	B	NBS Monograph 125	100 to 1800	212 to 3272	50	± 0.5**
	E	NBS Monograph 125	-100 to 1000	-148 to 1832	20	± 0.2
	J	NBS Monograph 125	-150 to 750	-238 to 1382	30	± 0.3
	K	NBS Monograph 125	-200 to 1350	-328 to 2462	60	± 0.6
	L	DIN 43710	-200 to 900	-328 to 1652	35	± 0.35
	N	NBS Monograph 125	-100 to 1300	-148 to 2372	50	± 0.5
	R	NBS Monograph 125	0 to 1750	32 to 3182	40	± 0.4
	S	NBS Monograph 125	0 to 1750	32 to 3182	40	± 0.4
	T	NBS Monograph 125	-200 to 400	-328 to 752	15	± 0.15
U	DIN 43710	-200 to 600	-328 to 1112	50	± 0.5	

Table 1 - Sensor Characteristics of 2, 3 and 4-wire

* Not applicable for the first 20% of the range (up to 440 °C).

Sensor Characteristics mV			
SENSOR	RANGE mV	MINIMUM SPAN mV	DIGITAL ACCURACY %
mV	-6 to 22	0.40	± 0.02% or ± 2 µV
	-10 to 100	2.00	± 0.02% or ± 10 µV
	-50 to 500	10.00	± 0.02% or ± 50 µV

Sensor Characteristic Ohm			
SENSOR	RANGE mV	MINIMUM SPAN Ohm	DIGITAL ACCURACY %
Ohm	0 to 100	3	± 0.02% or ± 0.01 Ohm
	0 to 400	12	± 0.02% or ± 0.04 Ohm
	0 to 2000	60	± 0.02% or ± 0.20 Ohm

MODEL		SMART TEMPERATURE TRANSMITTER	
TT481		WirelessHART®	
COD.	Input Number	8	8 Inputs
COD.	Telecommunication Certification	A	Anatel Certification
COD.	Certification Type	N	Without Certification
COD.	Certifier Organ	0	Without Certification
COD.	Sensor Type (Sensor 1)	1	FM
COD.	Sensor Connection (Sensor 1)	5	CEPEL
COD.	Sensor Type (Sensor 1)	1	RTD Cu10-GE
COD.	Sensor Type (Sensor 1)	2	RTD Ni120 – Edison Curve 7
COD.	Sensor Type (Sensor 1)	3	RTD Pt50 – IEC
COD.	Sensor Type (Sensor 1)	4	RTD Pt100 – IEC
COD.	Sensor Type (Sensor 1)	5	RTD Pt500 – IEC
COD.	Sensor Type (Sensor 1)	6	RTD Pt50 – JIS
COD.	Sensor Type (Sensor 1)	7	RTD Pt100 – JIS
COD.	Sensor Type (Sensor 1)	8	100 Ohm
COD.	Sensor Type (Sensor 1)	9	400 Ohm
COD.	Sensor Type (Sensor 1)	A	2K Ohm
COD.	Sensor Type (Sensor 1)	B	Thermocouple type B – NBS
COD.	Sensor Type (Sensor 1)	C	Thermocouple type E – NBS
COD.	Sensor Type (Sensor 1)	D	Thermocouple type J – NBS
COD.	Sensor Type (Sensor 1)	E	Thermocouple type K – NBS
COD.	Sensor Type (Sensor 1)	F	Thermocouple type N – NBS
COD.	Sensor Type (Sensor 1)	G	Thermocouple type R – NBS
COD.	Sensor Type (Sensor 1)	H	Thermocouple type S – NBS
COD.	Sensor Type (Sensor 1)	I	Thermocouple type T – NBS
COD.	Sensor Type (Sensor 1)	J	Thermocouple type L – DIN
COD.	Sensor Type (Sensor 1)	K	Thermocouple type U – DIN
COD.	Sensor Type (Sensor 1)	L	22 mV
COD.	Sensor Type (Sensor 1)	M	100 mV
COD.	Sensor Type (Sensor 1)	N	500 mV
COD.	Sensor Type (Sensor 1)	O	4 - 20mA
COD.	Sensor Connection (Sensor 1)	2	2-wire
COD.	Sensor Connection (Sensor 1)	3	3-wire
COD.	Sensor Type (Sensor 2)	1	RTD Cu10 – GE
COD.	Sensor Type (Sensor 2)	2	RTD Ni120 – Edison Curve 7
COD.	Sensor Type (Sensor 2)	3	RTD Pt50 – IEC
COD.	Sensor Type (Sensor 2)	4	RTD Pt100 – IEC
COD.	Sensor Type (Sensor 2)	5	RTD Pt500 – IEC
COD.	Sensor Type (Sensor 2)	6	RTD Pt50 – JIS
COD.	Sensor Type (Sensor 2)	7	RTD Pt100 – JIS
COD.	Sensor Type (Sensor 2)	8	100 Ohm
COD.	Sensor Type (Sensor 2)	9	400 Ohm
COD.	Sensor Type (Sensor 2)	A	2K Ohm
COD.	Sensor Type (Sensor 2)	B	Thermocouple type B – NBS
COD.	Sensor Type (Sensor 2)	C	Thermocouple type E – NBS
COD.	Sensor Type (Sensor 2)	D	Thermocouple type J – NBS
COD.	Sensor Type (Sensor 2)	E	Thermocouple type K – NBS
COD.	Sensor Type (Sensor 2)	F	Thermocouple type N – NBS
COD.	Sensor Type (Sensor 2)	G	Thermocouple type R – NBS
COD.	Sensor Type (Sensor 2)	H	Thermocouple type S – NBS
COD.	Sensor Type (Sensor 2)	I	Thermocouple type T – NBS
COD.	Sensor Type (Sensor 2)	J	Thermocouple type L – DIN
COD.	Sensor Type (Sensor 2)	K	Thermocouple type U – DIN
COD.	Sensor Type (Sensor 2)	L	22 mV
COD.	Sensor Type (Sensor 2)	M	100 mV
COD.	Sensor Type (Sensor 2)	N	500 mV
COD.	Sensor Type (Sensor 2)	O	4 - 20mA
COD.	Sensor Connection (Sensor 2)	2	2-wire
COD.	Sensor Connection (Sensor 2)	3	3-wire
COD.	Tipo de Sensor (Sensor 3)	1	RTD Cu10 – GE
COD.	Tipo de Sensor (Sensor 3)	2	RTD Ni120 – Edison Curve 7
COD.	Tipo de Sensor (Sensor 3)	3	RTD Pt50 – IEC
COD.	Tipo de Sensor (Sensor 3)	4	RTD Pt100 – IEC
COD.	Tipo de Sensor (Sensor 3)	5	RTD Pt500 – IEC
COD.	Tipo de Sensor (Sensor 3)	6	RTD Pt50 – JIS
COD.	Tipo de Sensor (Sensor 3)	7	RTD Pt100 – JIS
COD.	Tipo de Sensor (Sensor 3)	8	100 Ohm
COD.	Tipo de Sensor (Sensor 3)	9	400 Ohm
COD.	Tipo de Sensor (Sensor 3)	A	2K Ohm
COD.	Tipo de Sensor (Sensor 3)	B	Termopar tipo B – NBS
COD.	Tipo de Sensor (Sensor 3)	C	Termopar tipo E – NBS
COD.	Tipo de Sensor (Sensor 3)	D	Termopar tipo J – NBS
COD.	Tipo de Sensor (Sensor 3)	E	Termopar tipo K – NBS
COD.	Tipo de Sensor (Sensor 3)	F	Termopar tipo N – NBS
COD.	Tipo de Sensor (Sensor 3)	G	Termopar tipo R – NBS
COD.	Tipo de Sensor (Sensor 3)	H	Termopar tipo S – NBS
COD.	Tipo de Sensor (Sensor 3)	I	Termopar tipo T – NBS
COD.	Tipo de Sensor (Sensor 3)	J	Termopar tipo L – DIN
COD.	Tipo de Sensor (Sensor 3)	K	Termopar tipo U – DIN
COD.	Tipo de Sensor (Sensor 3)	L	22 mV
COD.	Tipo de Sensor (Sensor 3)	M	100 mV
COD.	Tipo de Sensor (Sensor 3)	N	500 mV
COD.	Tipo de Sensor (Sensor 3)	O	4 - 20mA
COD.	Sensor Type (Sensor 3)	2	2-wire
COD.	Sensor Type (Sensor 3)	3	3-wire
COD.	Tipo de Sensor (Sensor 4)	1	RTD Cu10 – GE
COD.	Tipo de Sensor (Sensor 4)	2	RTD Ni120 – Edison Curve 7
COD.	Tipo de Sensor (Sensor 4)	3	RTD Pt50 – IEC
COD.	Tipo de Sensor (Sensor 4)	4	RTD Pt100 – IEC
COD.	Tipo de Sensor (Sensor 4)	5	RTD Pt500 – IEC
COD.	Tipo de Sensor (Sensor 4)	6	RTD Pt50 – JIS
COD.	Tipo de Sensor (Sensor 4)	7	RTD Pt100 – JIS
COD.	Tipo de Sensor (Sensor 4)	8	100 Ohm
COD.	Tipo de Sensor (Sensor 4)	9	400 Ohm
COD.	Tipo de Sensor (Sensor 4)	A	2K Ohm
COD.	Tipo de Sensor (Sensor 4)	B	Thermocouple type B – NBS
COD.	Tipo de Sensor (Sensor 4)	C	Thermocouple type E – NBS
COD.	Tipo de Sensor (Sensor 4)	D	Thermocouple type J – NBS
COD.	Tipo de Sensor (Sensor 4)	E	Thermocouple type K – NBS
COD.	Tipo de Sensor (Sensor 4)	F	Thermocouple type N – NBS
COD.	Tipo de Sensor (Sensor 4)	G	Thermocouple type R – NBS
COD.	Tipo de Sensor (Sensor 4)	H	Thermocouple type S – NBS
COD.	Tipo de Sensor (Sensor 4)	I	Thermocouple type T – NBS
COD.	Tipo de Sensor (Sensor 4)	J	Thermocouple type L – DIN
COD.	Tipo de Sensor (Sensor 4)	K	Thermocouple type U – DIN
COD.	Tipo de Sensor (Sensor 4)	L	22 mV
COD.	Tipo de Sensor (Sensor 4)	M	100 mV
COD.	Tipo de Sensor (Sensor 4)	N	500 mV
COD.	Tipo de Sensor (Sensor 4)	O	4 - 20mA
COD.	Sensor Connection (Sensor 4)	2	2-wire
COD.	Sensor Connection (Sensor 4)	3	3-wire

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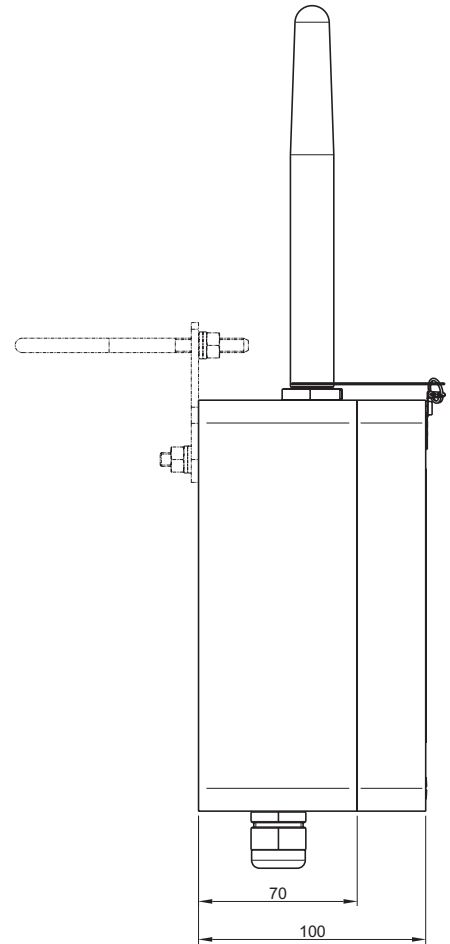
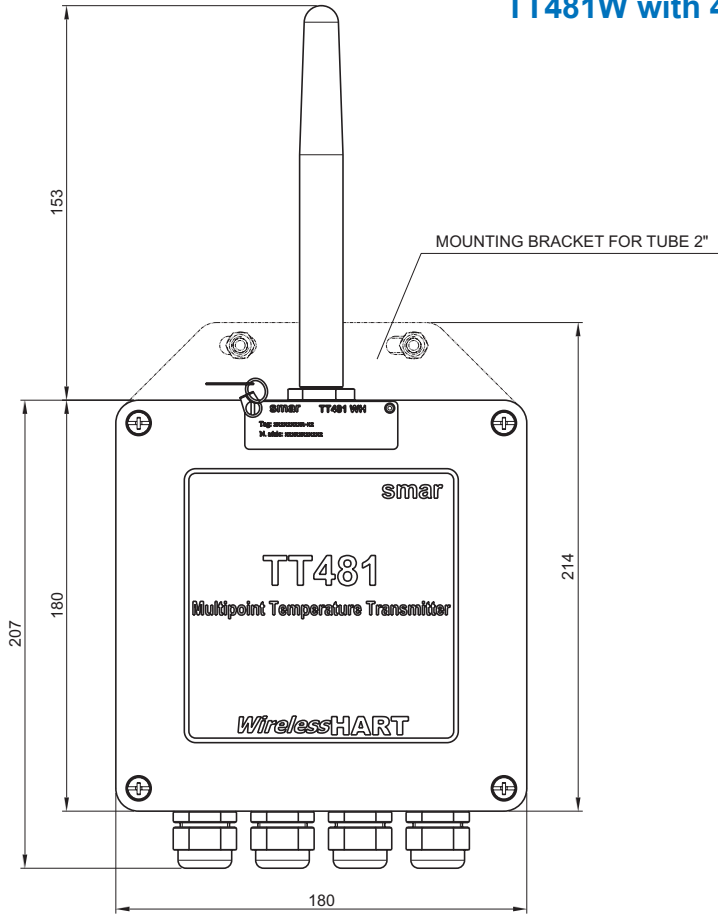
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TT481		SMART TEMPERATURE TRANSMITTER (CONTINUATION)	
COD. Sensor Type (Sensor 5. Not applicable to 4 input option)			
1	RTD Cu10 – GE	D	Thermocouple type J – NBS
2	RTD Ni120 – Edison Curve 7	E	Thermocouple type K – NBS
3	RTD Pt50 – IEC	F	Thermocouple type N – NBS
4	RTD Pt100 – IEC	G	Thermocouple type R – NBS
5	RTD Pt500 – IEC	H	Thermocouple type S – NBS
6	RTD Pt50 – JIS	I	Thermocouple type T – NBS
7	RTD Pt100 – JIS	J	Thermocouple type L – DIN
8	100 Ohm	K	Thermocouple type U – DIN
9	400 Ohm	L	22 mV
A	2K Ohm	M	100 mV
B	Thermocouple type B – NBS	N	500 mV
C	Thermocouple type E – NBS	O	4 - 20mA
COD. Sensor Connection (Sensor 5. Not applicable to 4 Inputs option)			
2	2-wire		
3	3-wire		
COD. Tipo de Sensor (Sensor 6. Não aplicável para opção de 4 canais)			
1	RTD Cu10 – GE	D	Thermocouple type J – NBS
2	RTD Ni120 – Edison Curve 7	E	Thermocouple type K – NBS
3	RTD Pt50 – IEC	F	Thermocouple type N – NBS
4	RTD Pt100 – IEC	G	Thermocouple type R – NBS
5	RTD Pt500 – IEC	H	Thermocouple type S – NBS
6	RTD Pt50 – JIS	I	Thermocouple type T – NBS
7	RTD Pt100 – JIS	J	Thermocouple type L – DIN
8	100 Ohm	K	Thermocouple type U – DIN
9	400 Ohm	L	22 mV
A	2K Ohm	M	100 mV
B	Thermocouple type B – NBS	N	500 mV
C	Thermocouple type E – NBS	O	4 - 20mA
COD. Sensor Type (Sensor 6. Not applicable to 4 Inputs option)			
2	2-fios		
3	3-fios		
COD. Sensor Connection (Sensor 7. Not applicable to 4 Inputs option)			
1	RTD Cu10 – GE	D	Thermocouple type J – NBS
2	RTD Ni120 – Edison Curve 7	E	Thermocouple type K – NBS
3	RTD Pt50 – IEC	F	Thermocouple type N – NBS
4	RTD Pt100 – IEC	G	Thermocouple type R – NBS
5	RTD Pt500 – IEC	H	Thermocouple type S – NBS
6	RTD Pt50 – JIS	I	Thermocouple type T – NBS
7	RTD Pt100 – JIS	J	Thermocouple type L – DIN
8	100 Ohm	K	Thermocouple type U – DIN
9	400 Ohm	L	22 mV
A	2K Ohm	M	100 mV
B	Thermocouple type B – NBS	N	500 mV
C	Thermocouple type E – NBS	O	4 - 20mA
COD. Sensor Type (Sensor 7. Not applicable to 4 Inputs option)			
2	2-wire		
3	3-wire		
COD. Sensor Type (Sensor 8. Not applicable to 4 Inputs option)			
1	RTD Cu10 – GE	D	Thermocouple type J – NBS
2	RTD Ni120 – Edison Curve 7	E	Thermocouple type K – NBS
3	RTD Pt50 – IEC	F	Thermocouple type N – NBS
4	RTD Pt100 – IEC	G	Thermocouple type R – NBS
5	RTD Pt500 – IEC	H	Thermocouple type S – NBS
6	RTD Pt50 – JIS	I	Thermocouple type T – NBS
7	RTD Pt100 – JIS	J	Thermocouple type L – DIN
8	100 Ohm	K	Thermocouple type U – DIN
9	400 Ohm	L	22 mV
A	2K Ohm	M	100 mV
B	Thermocouple type B – NBS	N	500 mV
C	Thermocouple type E – NBS	O	4 - 20mA
COD. Sensor Connection (Sensor 8. Not applicable to 4 Inputs option)			
2	2-wire		
3	3-wire		
COD. Tag Plate			
0	With Tag, when specified		
1	Blanket		
2	User's specification		

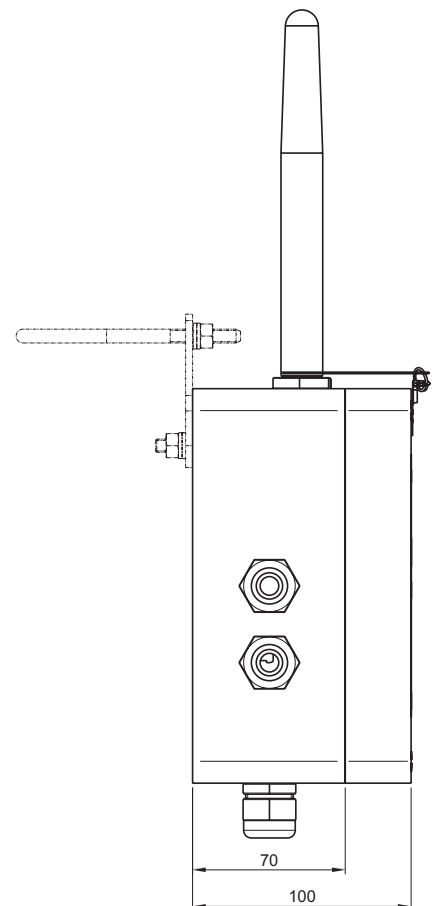
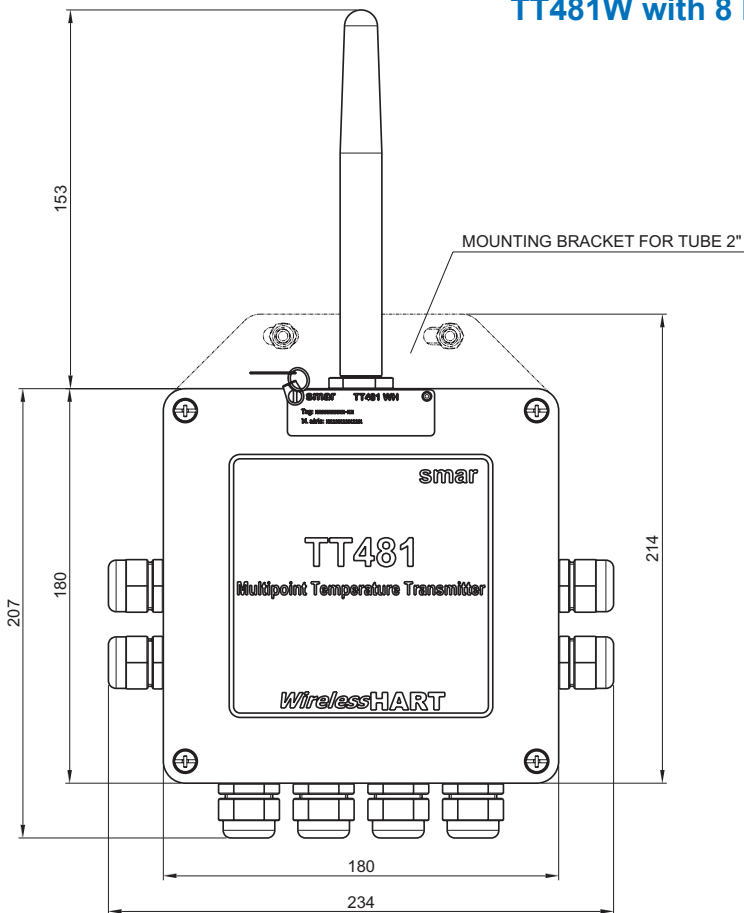
TT481-8A-N0-12-12-12-12 - 1 | 2 - 1 | 2 - 1 | 2 - 1 | 2 - 0 ← TYPICAL MODEL

Note
Inputs not configured will be Pt100 3-wire.

TT481W with 4 Inputs



TT481W with 8 Inputs



smar
www.smar.com

Specifications and information are subject to change without notice.
Up-to-date address information is available on our website.

web: www.smar.com/contactus.asp

