



WIRELESS TEMPERATURE TRANSMITTER **TT400** SERIES

- *WirelessHART™ Technology*
- *± 0,2% Accuracy*
- *Accept thermocouples, RTDs, mV, and Ohms*
- *Battery life up to 6 years*
- *Works as network repeater*
- *Distance up to 250 m from others network devices*
- *Sensor linearization via Callendar Van Dusen function*
- *Maximum use with Smar DF100 gateway*



WirelessHART™

HART
COMMUNICATION PROTOCOL



WirelessHART™

TT400 WirelessHART™

Imagine all the advanced features of temperature transmitters Smar, but now wireless. The TT400 WirelessHART™ has the same features as the series TT300 Series, but following the standard of HART Communication Foundation for wireless device.

smar
Technology Company

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), which 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:** Workstation that allows interaction with the process. Through the *WirelessHART™* Gateway, the host gathers data from instruments connected to the network in question. It uses protocols such as Profibus, High Speed Ethernet (HSE), among others.
- ***WirelessHART™* Gateway:** It converts data from the host to the *WirelessHART™* protocol, used by the devices connected to the *WirelessHART™* network. Use Gateway DF100.

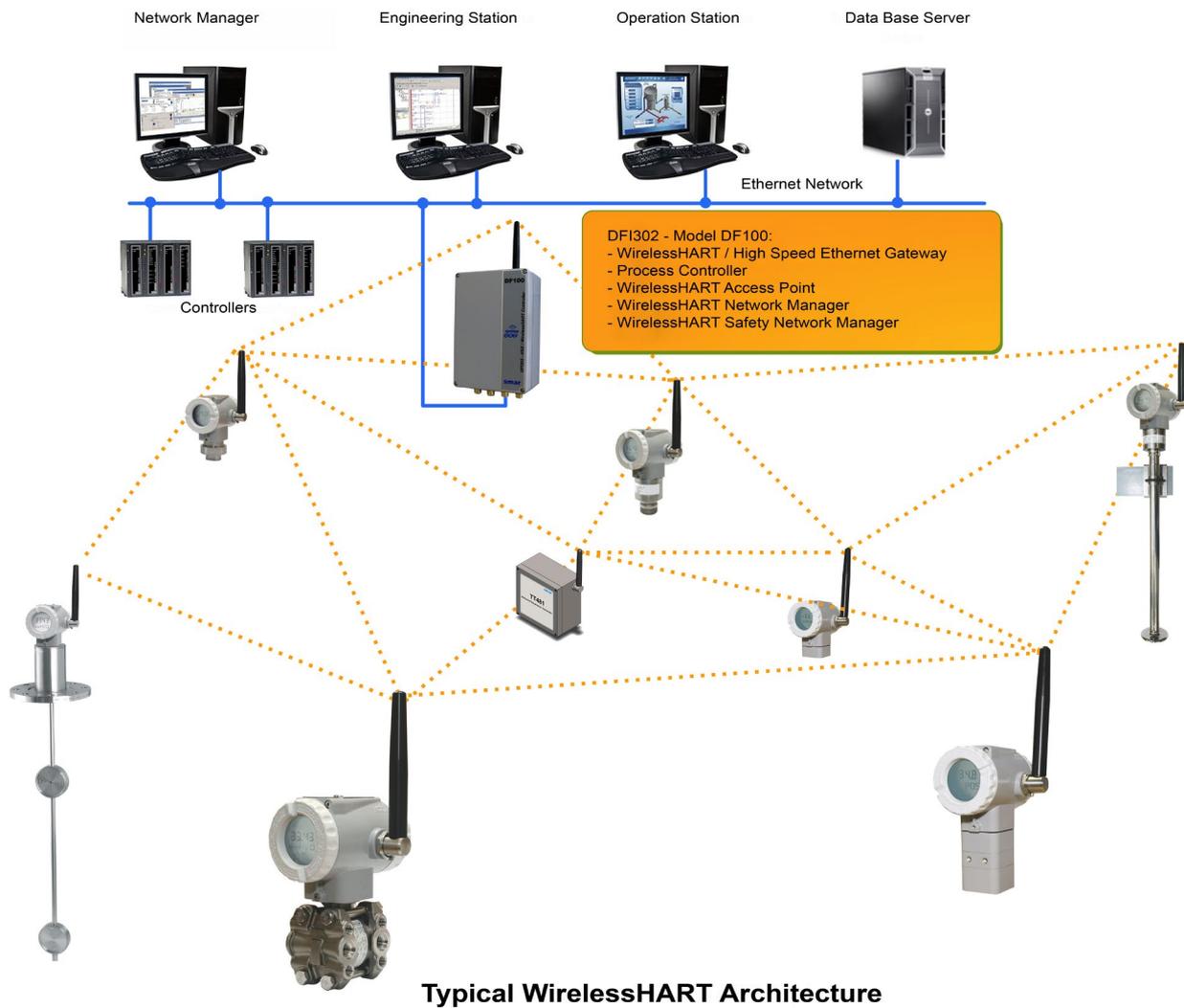


Figure 1 - MESH Network, wireless

- **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.

TT400 *WirelessHART™*

Imagine all the advanced features of temperature transmitters Smar, but now wireless. The **TT400 *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:

- 0.2% accuracy in A/D converter;
- HART protocol version 7 with commands of *WirelessHART™* standard;
- Accept several type of sensors: thermocouples, RTDs, mV sign, and Ohms;
- Linearization of sensor via Callendar Van Dusen equation;
- Outputs for two sensors: minimum, maximum, difference and average types;
- Sensor backup: if one fail, other acts and the transmitter warns about this condition;
- Indication in the display about wireless network status;
- Battery life up to six years;
- Specific support which facilitates mounting and positioning of the transmitter;
- Rotative display;
- Configurable via DD using handhelds and PC.

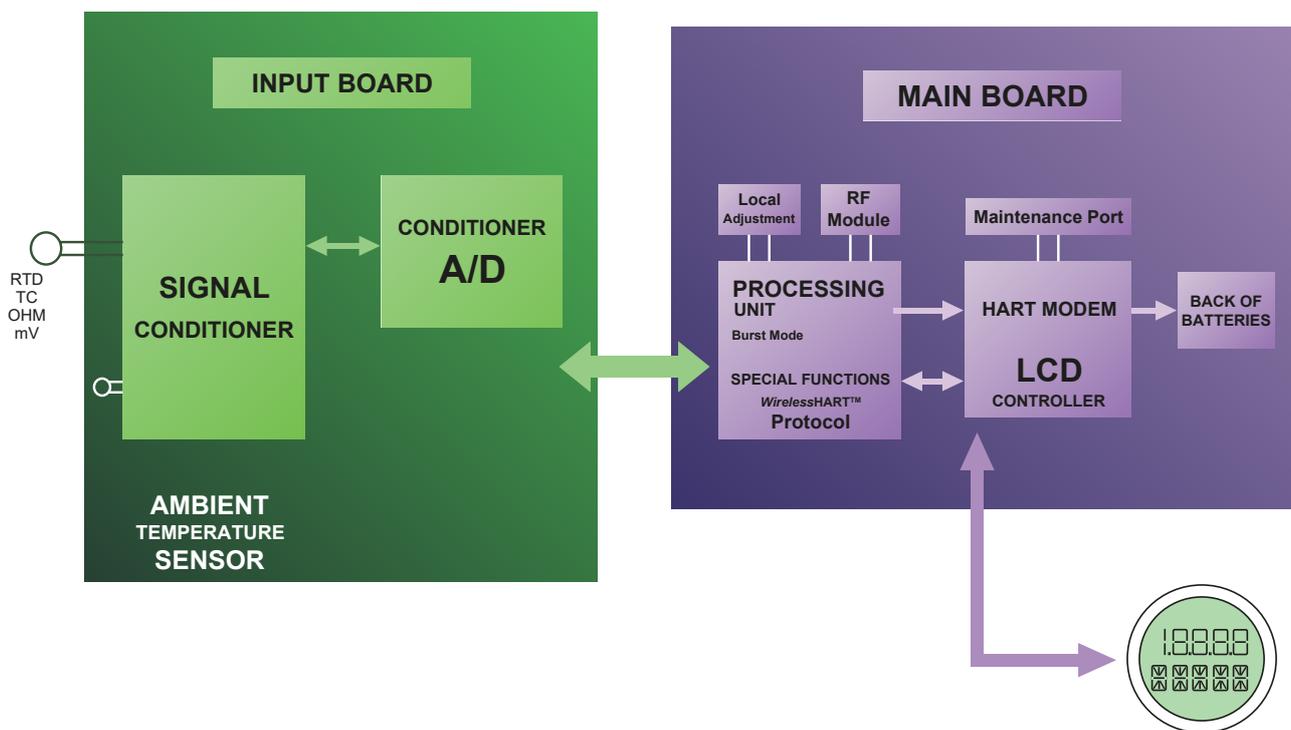


Figure 2 - TT400 *WirelessHART™* Block Diagram

The **TT400WH** has its connection to the sensors on its bottom, and the back of the transmitter reserved for the battery. The dimensional drawing of the transmitter can be seen below.

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.



Dimensional Drawing

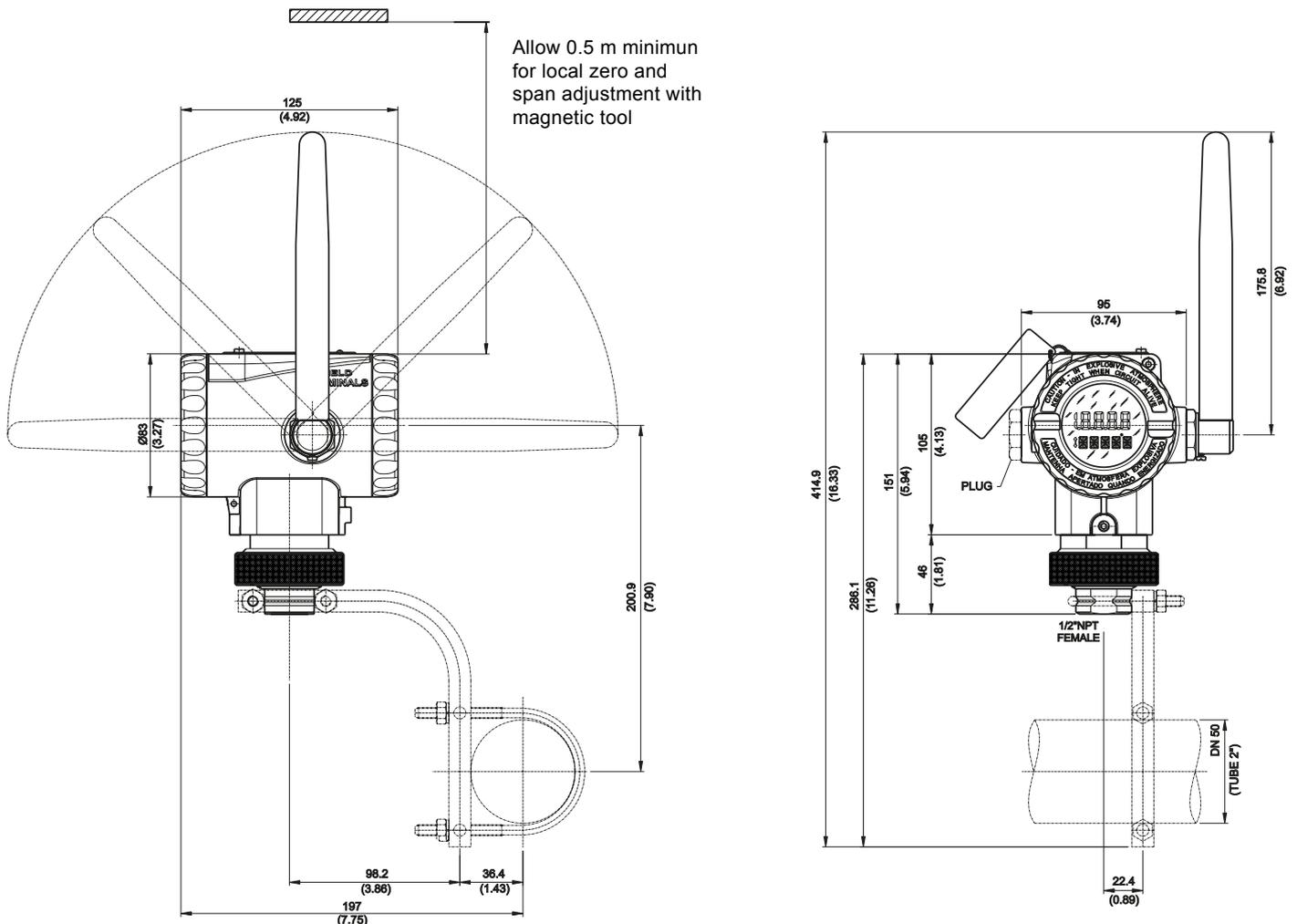


Figure 3 - TT400 WirelessHART™ Dimensional Drawing

Functional Specifications

Architecture	See Tables 1, 2 and 3.
Battery	<p>The pack consists of 2 primary lithium batteries (Li-SOCl₂) of 3.6 V, totaling 7.2 V.</p> <p>Battery Life: - Burst Mode eight seconds, @25 °C, network at least three device neighbors: six years</p> <p>The batteries module used in the transmitters must be provided exclusively by Smar (PACK BATTERY - Code 400-1209) and must be replaced in full when necessary.</p>
Display	<p>4½ - digit numerical and 5-character alphanumerical LCD indicator (optional). Function and status icon. Indication on the display of sensor failure or saturation.</p>
Communication Protocol	<p>HART Protocol Version 7, with set of commands TT400 WirelessHART™;</p> <p>A specific review of the HART transmitter must be managed according to the transmitter TT400 WirelessHART™;</p> <p>Wireless standard IEEE 802.15.4-2006 @ 250 kbps;</p> <p>Frequency band 2.4 GHz;</p> <p>Network topology: Mesh, Star and both;</p> <p>HART® is a trademark of HART Communication Foundation.</p>
Measurement Type	<p>Temperature with one sensor; Differential Temperature between two sensors; Temperature with two sensors considering the highest; Temperature with two sensors considering the lowest; Average temperature with two sensors; Backup temperature with two sensors; Temperature generated by Callendar Van Dusen Equation.</p>
Configuration	Remote configuration with external configurator via HART protocol, using DDL/EDDL.
Temperature Limits	<p>Ambient, process and storage: -40 to 85 °C (-40 to 185 °F)</p> <p>Digital Display: -20 to 80 °C (-4 to 176 °F) (Operation) -40 to 85 °C (-40 to 185 °F) (Without damage)</p>

Performance Specification

Accuracy	See Tables 1, 2, and 3.
Response Time	2 s.
Sensor Reading	A/D Converter Accuracy: ±0.02% of span.
Stabilization Time after Energizing - warm start	Less than 17 seconds.

2, 3, and 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
	L	GOST 8.585-01	-200 to 800	-328 to 1472	60	± 0,4
	W5Re/W26Re	ASTM E 988-06	0 to 2200	-32 to 3992	60	± 0,5

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

* Reading accuracy on display and accessed via communication.

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

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

Table 2 - Characteristics of mV Sensor

SENSOR	RANGE Ohm	MINIMUM SPAN Ohm	* DIGITAL ACCURACY %
Ohm	0 to 100	1	± 0.02% or ± 0.01 Ohm
	0 to 400	4	± 0.02% or ± 0.04 Ohm
	0 to 2000	20	± 0.02% or ± 0.20 Ohm

Table 3 - Characteristics of Ohm Sensor

MODEL TT400		SMART TEMPERATURE TRANSMITTER	
CODE	Communication Protocol		
W	WirelessHART™		
CODE	Safety Option		
0	For use in measurement and control		
CODE	Local Indicator (1)		
0	Without Indicator	1	With Digital Indicator
CODE	Conexões Elétricas		
0	1/2 - 14 NPT	A	M20 X 1.5
1	3/4 - 14 NPT (with 316 SST adapter for 1/2 - 14 NPT)	B	PG13.5 DIN
2	3/4 - 14 BPS (with 316 SST adapter for 1/2 - 14 NPT)	Z	User's specification
3	1/2 - 14 BPS (with 316 SST adapter for 1/2 - 14 NPT)		
CODE	Blanket Plug		
I	316 SST	C	Carbon Steel (3) (2)
CODE	Mounting Bracket		
0	Without Bracket	2	316 SST Bracket and accessories
1	Carbon Steel Bracket and accessories	7	Carbon Steel Bracket with 316 SST accessories
CODE	Housing Material		
A	Aluminium (default) (IP/TYPE)	B	Aluminium – saline atmospheres (IPW/TYPEX) (4)
I	316 SST – CF8M (ASTM – A351) (IP/TYPE)	H	Aluminium Copper Free (IPW/TYPEX) (4)
J	316 SST – saline atmospheres (IPW/TYPEX) (4)		
CODE	Painting		
0	Gray Munsell N 6.5 Polyester (Default)		
8	Without Painting (5)		
9	Safety Blue Epoxy – Electrostatic Painting		
C	Safety Blue Polyester – Electrostatic Painting		
Z	Special Painting		
CODE	Certification Type		
N	Without Certification		
CODE	Certifying Body		
0	None		
CODE	Tag Plate		
0	With TAG, when specified	1	Blank
		2	User's specification
CODE	Sensor Type		
1	RTD Cu10 - GE	F	Thermocouple type S - NBS
2	RTD Ni120 - DIN	G	Thermocouple type T - NBS
3	RTD Pt50 - IEC	K	Thermocouple type L - DIN
4	RTD Pt100 - IEC	P	Thermocouple type U - DIN
5	RTD Pt500 - IEC	M	22 mV
6	RTD Pt1000 - IEC	N	100 mV
7	RTD Pt50 - JIS	O	500 mV
8	RTD Pt100 - JIS	R	100 Ohm
9	Thermocouple type B - NBS	S	400 Ohm
A	Thermocouple type E - NBS	U	2k Ohm
B	Thermocouple type J - NBS	Z	Other
C	Thermocouple type K - NBS		
D	Thermocouple type N - NBS		
E	Thermocouple type R - NBS		
CODE	Sensor Connection		
2	2-wire		
3	3-wire		
4	4-wire		
F	2-wire (two sensors) (6)		

TT400 - W 0 1 - 0 C 1 - A 0 N 0 0 - 4 3

← TYPICAL MODEL

Notes:

- (1) Values limited to 4 ½ digits; units limited to 5 characters.
- (2) Not applicable for saline atmosphere.
- (3) Only available for electrical connections 1/2".
- (4) IP66/68W tested for 200h to according with NBR IEC 60529 standard
- (5) Not available for aluminium housing.
- (6) For sensor choice, see HART table, Measurement Mode item in the **TT400 WirelessHART™** manual.

** OPTIONAL HART CONFIGURATION (1).

MODEL TT400W	MAIN CODE OF HART TRANSMITTER (CONTINUATION)						
	CODE	Burn-out					
	BD	Start Scale (According NAMUR NE43 specifications) (Default)					
	BU	End Scale (According NAMUR NE43 specifications)					
	CODE	LCD1 Indication					
	Y0	LCD1: Percentage (Default)					
	Y1	LCD1: Current - mA					
	Y2	LCD1: Temperature (Engineering Unit)					
	CODE	LCD2 Indication					
	Y0	LCD2: Percentage (Default)					
	Y1	LCD2: Current - mA					
	Y2	LCD2: Temperature (Engineering Unit)					
	CODE	PID Availability					
	P0	PID not available					
	CODE	Measurement Type (2)					
	F3	Callendar Van Dusen					
	CODE	Measurement Mode (3)					
	T0	Differential					
	T1	Backup					
	T2	Average					
	T3	Maximum					
	T4	Minimum					
	CODE	Special Features					
	ZZ	User's specifications					

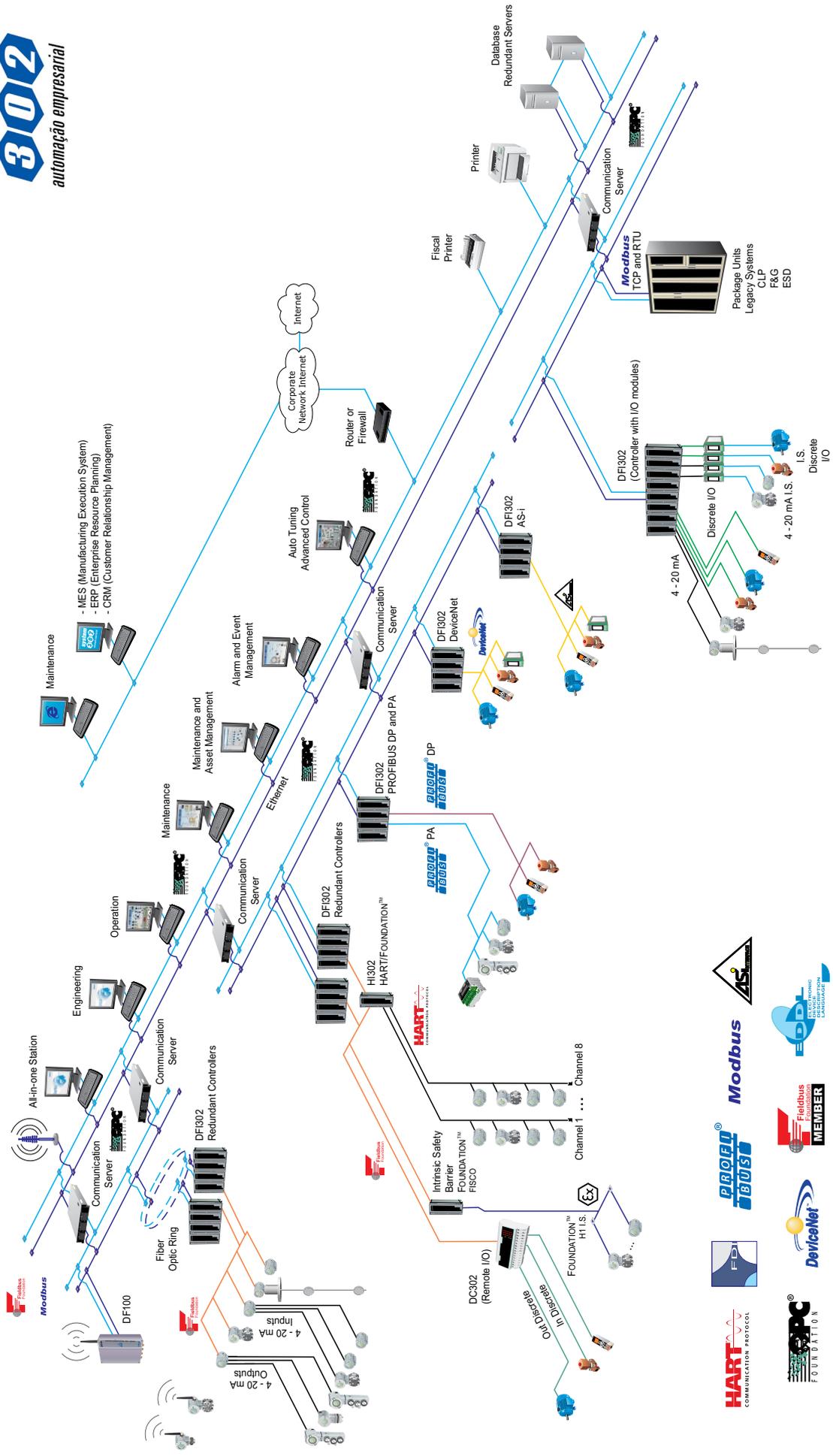
TT400-W01-0C1-A0N00-43	BD	Y0	Y0	P0	F3	T0	*
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← TYPICAL MODEL NUMBER

* Leave it blank for no optional items

Notes:

- (1) Fill out with optional codes only if different from default.
- (2) Callendar Van Dusen defines user-specific linearization of resistance temperature sensor.
- (3) When working with two sensors connected to the terminal block.



TT400 Series

Wireless Temperature Transmitter



Consult our
representatives



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