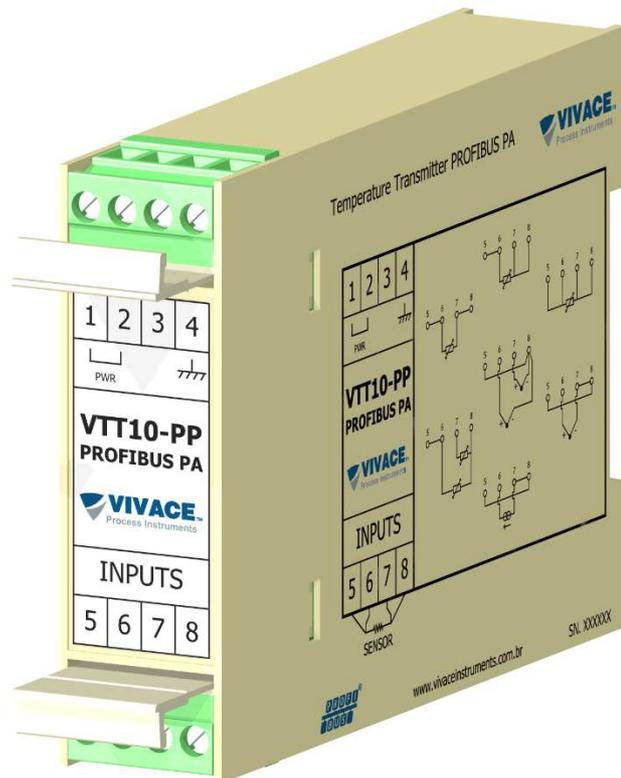


VTT10-PP

TEMPERATURE TRANSMITTER AND 4-20 mA TO PROFIBUS PA CONVERTER

panel model



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NOTE

We have reviewed this manual with great care to maintain compliance with the hardware and software versions described herein. However, due to the dynamic development and version upgrades, the possibility of technical deviations cannot be ruled out. We cannot accept any responsibility for the full compliance of this material.

Vivace reserves the right to, without notice, make modifications and improvements of any kind in its products without incurring in any circumstances, the obligation to make those same modifications to products sold previously.

The information in this manual is frequently updated. Therefore, when using a new product, please check the latest version of the manual on the Internet through our website www.vivaceinstruments.com, where it can be downloaded.

Your customer is very important for us. We will always be grateful for any suggestions for improvements as well as new ideas, which can be sent to the e-mail: contato@vivaceinstruments.com preferably with the title "Suggestions".

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WARNING

It is extremely important that all the safety instructions, installation and operation in this manual are followed faithfully. The manufacturer is not liable for damage or malfunction caused by improper use of this equipment.

It is recommended to strictly following the rules and good practice relating to installation, ensuring correct grounding, noise insulation and good quality cables and connections in order to provide the best performance and durability to the equipment.

Special attention must be considered in relation to installations in hazardous areas, where applicable.

SAFETY PROCEDURES

- *Appoint only skilled people, trained with process and equipment;*
- *Install equipment only in operation compatible areas, with the proper connections and protections;*
- *Use proper safety equipment for any handling device in field;*
- *Turn area power off before equipment installation.*

SIMBOLOGY



Caution - indicates risk or error source



Important Information



General or Specific Risk



Electric Shock Danger

GENERAL INFORMATION



Vivace Process Instruments ensures the operation of this equipment, according to the descriptions contained in its manual, as well as technical characteristics, not guaranteeing its full performance in particular applications.



The operator of this equipment is responsible for observing all aspects of safety and prevention of accidents applicable during the execution of the tasks in this manual.



Failures that might occur in the system, causing damage to property or injury to persons, shall additionally be prevented by external means to a safe outlet for the system.



This equipment must be used only for the purposes and methods proposed in this manual.

SIMATIC PDM CONFIGURATION

When using SIMATIC PDM tool for configuration/parameterization of this equipment, do not use "Download to Device" option. This function could incorrectly configure the equipment.



It is recommended for user to use "Download to PG/PC" option, to read the equipment parameters and then access the "Menu Device" option, where one can find specific menus for transducers, functional and LCD blocks, plus calibration, maintenance, factory etc. According to each menu, user will then be able to change the parameter or function as desired, in a fast and direct form.

1 EQUIPMENT DESCRIPTION

VTT10-PP, Profibus PA Panel Temperature Transmitter, is a member of the Vivace Process Instruments family of temperature transmitters, designed for panel installation using a standard T-type DIN rail. It serves a variety of sensors, such as thermocouples and RTDs, plus resistance and millivoltage signals.

VTT10-PP can also receive a 4-20 mA input signal, converting it to Profibus-PA, facilitating the integration of conventional 4-20 mA equipment into Profibus systems.

The transmitter is connected to the Profibus-PA network via a DP/PA coupler using a pair of twisted and shielded wires. The Profibus-PA technology allows the interconnection of several equipment in a network, allowing the implementation of large control systems. VTT10-PP works with the concept of functional blocks, such as Analog Input (AI) and Transducer (TRD).

Using a Profibus-PA configurator or tools based on EDDL or FDT/DTM, user can configure sensor type, measuring scales, work units and calibration, and monitor the measurement variables and check the equipment status.

Prioritizing high performance and robustness, it was designed with the latest electronics and materials technologies, ensuring long-term reliability for systems of any scale.

1.1. BLOCK DIAGRAM

The modularization of VTT10-PP components is described in the block diagram of Figure 1.1.

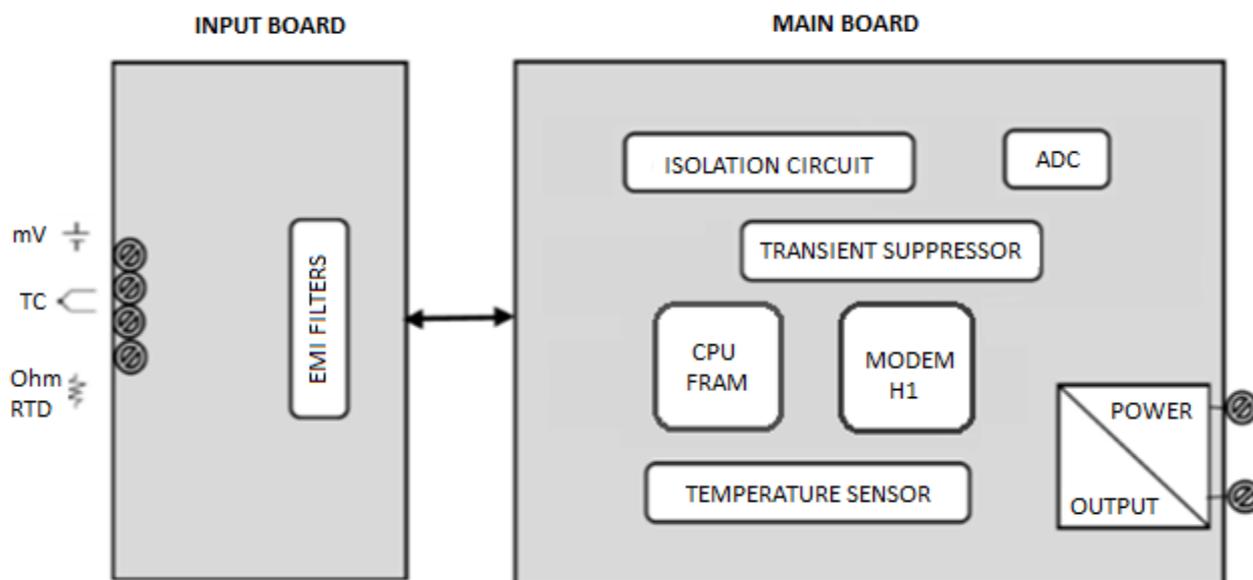


Figure 1.1 – Block diagram for VTT10-PP.

The signals from the sensors pass through RF filter and follow to ADC converter, where are converted into digital values. These values are converted to temperature according to the selected sensor. The sensor signal is galvanically isolated from the output signal, avoiding ground loop.

The H1 modem block interfaces the microcontroller signals with the Profibus-PA network to which the transmitter connects.

Finally, the microcontroller block can be related to the brain of the transmitter, where all the machine and Profibus-PA time communication control occur, besides routines common to the transmitters, such as configuration, calibration and acquisition of the monitored variables.

2 INSTALLATION

2.1. MECHANICAL ASSEMBLY

VTT10-PP Temperature Transmitter is designed for panel installation using DIN rail.

The electronic circuit is coated with a moisture-proof lacquer, but constant exposures to moisture or corrosive media can compromise its protection and damage the electronic components.

Figure 2.1 shows the dimensional design and the form of assembly of the VTT10-PP.

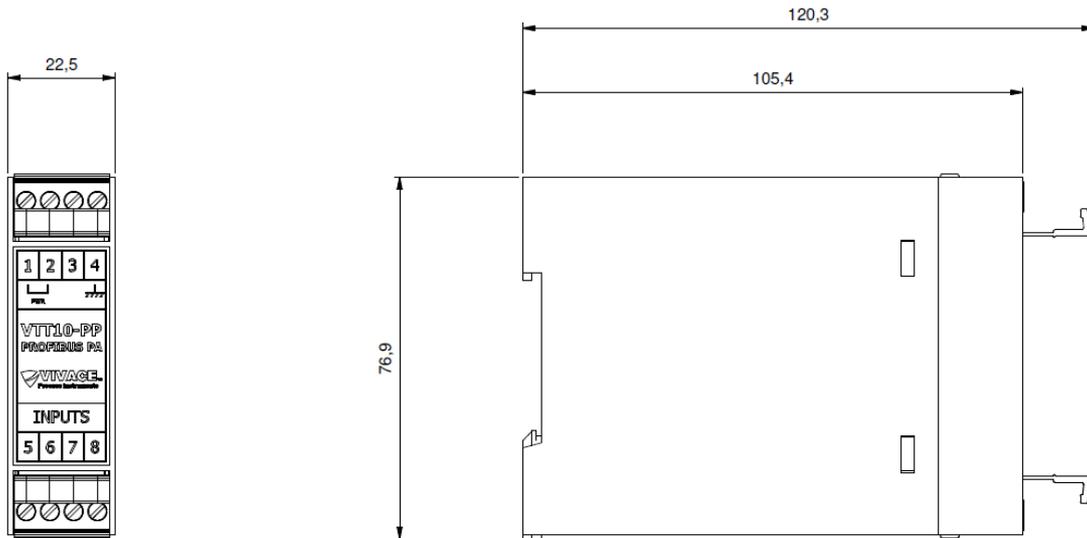


Figure 2.1 – Dimensional drawing and assembly for VTT10-PP.

2.2. ELECTRICAL CONNECTION

Figure 2.2 shows the terminals of the electrical connections and the sensors in the VTT10-PP. Table 2.1 shows the description of its terminals.

Terminal Description
Power Terminals (1 and 2) – PWR BUS – 9 to 32 Vdc not polarized
Grounding Terminal (4) – external
Sensor Terminals (5,6,7 and 8) – temperatura sensor connection

Table 2.1 – Terminal description for VTT10-PP.

NOTE

All cables used to connect VTT10-PP to the sensor and Profibus-PA network must be shielded to avoid interference and noise.

NOTE

It is extremely important to ground the equipment for complete eletromagnetic protection and also to ensure the correct performance of transmitter on Profibus-PA network.

Figure 2.2 – Terminal connection for VTT10-PP.

2.3. PROCESS CONNECTION

Following are the connections of VTT10-PP with the different types of possible sensors:

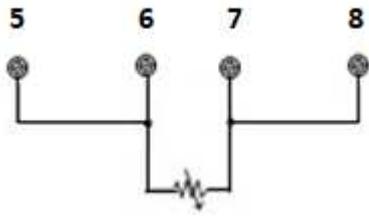


Figure 2.3 - RTD or 2-wire resistive connection

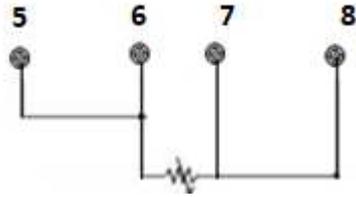


Figure 2.4 - RTD or 3-wire resistive connection

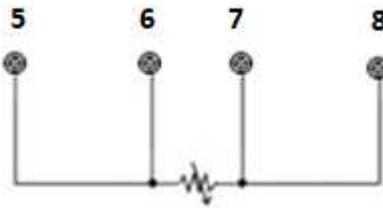


Figure 2.5 - RTD or 4-wire resistive connection

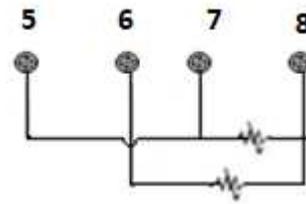


Figure 2.6 - RTD or double resistive, differential and backup connections

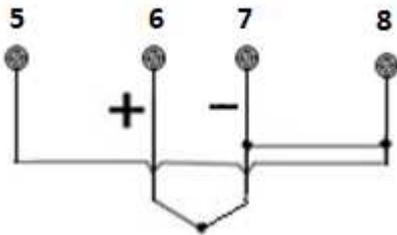


Figure 2.7 - Thermocouple or mV connection

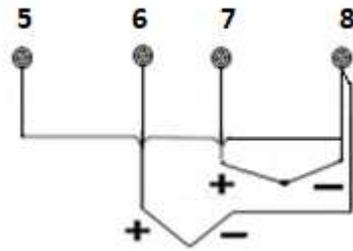


Figure 2.8 - Thermocouple or double mV, differential and backup connections

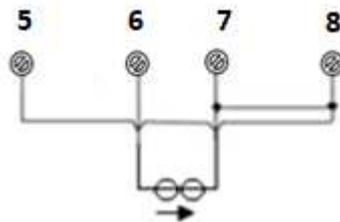


Figure 2.9 – 4–20 mA input connection.

2.4. PROFIBUS-PA NETWORK CONNECTION

Figure 2.10 illustrates the installation of the elements of a Profibus network and the connection of Profibus PA devices to the network bus.

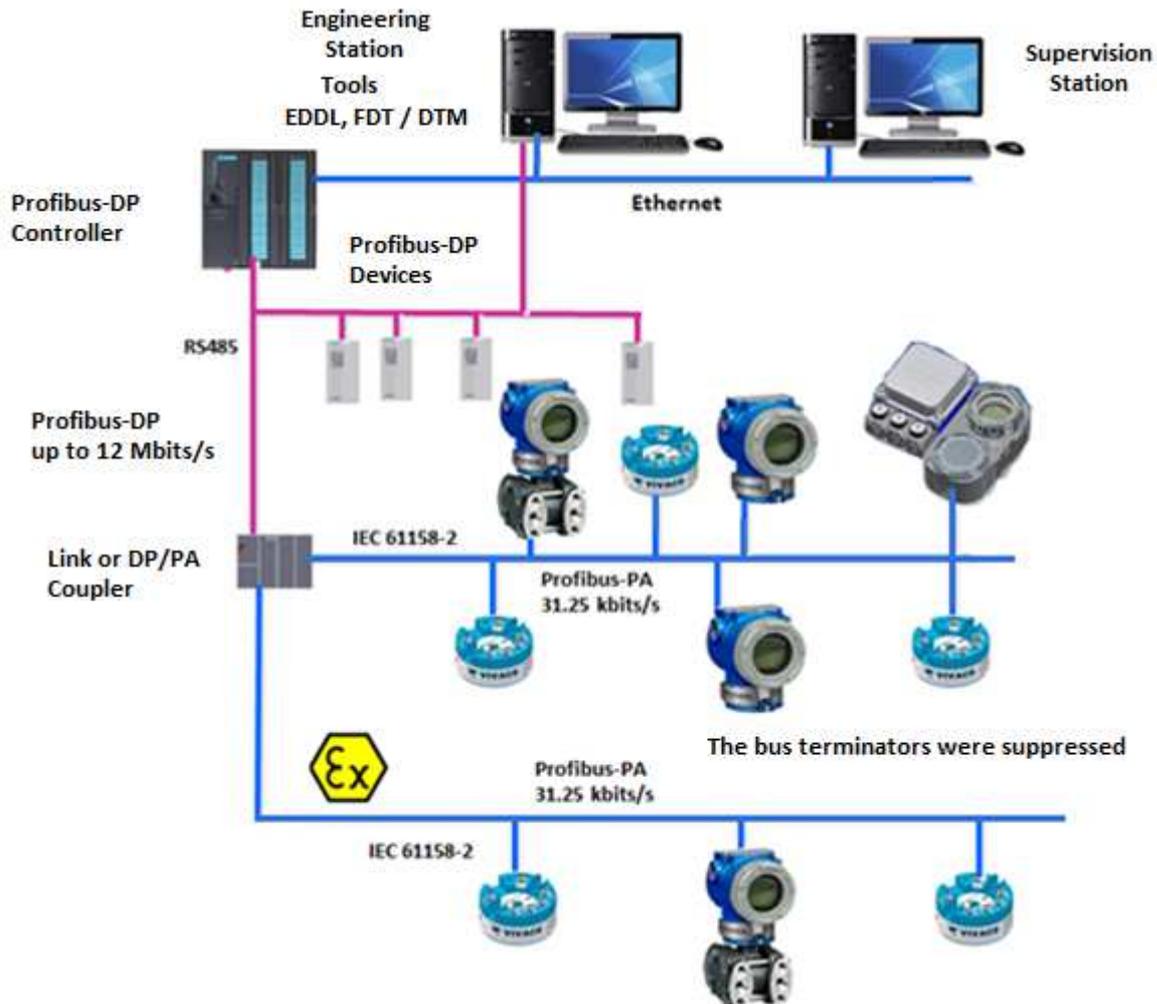


Figure 2.10 – Connecting a Profibus-PA device to the bus.

3 CONFIGURATION

VTT10-PP temperature transmitter configuration can be performed with a Profibus-PA programmer or with EDDL and FDT/DTM-based tools. User can also use a tablet, Android-powered mobile phone, SIMATIC PDM or PC via FDT/DTM tools.

3.1. PROFIBUS PROGRAMMER

The equipment configuration can be carried out by means of a PROFIBUS-PA compatible programmer. Vivace offers the interfaces of VCI10-P (USB and Bluetooth) line as a solution for identification, configuration, monitoring and visualization of diagnostics of the equipment of the Profibus-PA line.

Figure 3.1 shows the connection diagram for configuring VTT10-PP using a Vivace VCI10-UP USB interface, which feeds the device in local mode, with a personal computer that has PACTware configurator software.



Figure 3.1 - Configuration diagram of VTT10-PP with VCI10-UP.

3.2. PROFIBUS-PA CONFIGURATOR PROGRAMMING TREE

The programming tree is a tree-shaped structure with a menu of all available software features, as shown in Figure 3.2.

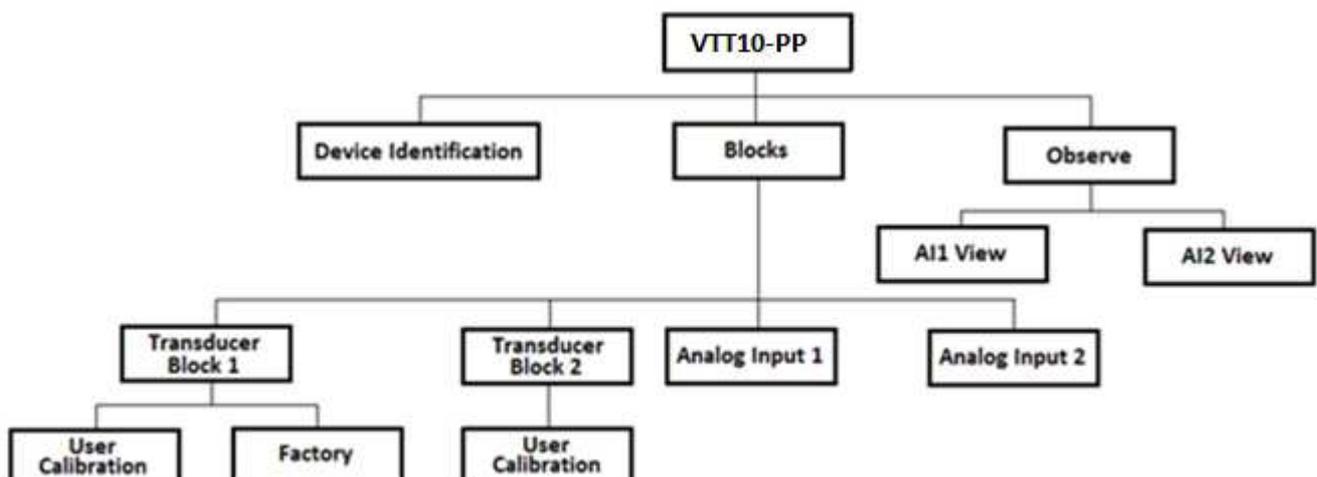


Figure 3.2 – VTT10-PP programming tree.

Device Identification – The main information about the transmitter can be accessed here, such as: Tag, Manufacturer ID, Device ID, Order Code and Firmware Version.

Transducer Block 1 / 2 – Here the transducer block 1 or 2, respectively, is configured.

- **Basic Settings** – In this menu the following basic settings are configured: Measurement Type, Sensor Transducer Channel, Sensor Type, Sensor Connection Type, and enable or disable the second variable.
- **Scales/Bias** – Here the output scale (EU0% and EU100%), the unit of measurement and the offset between channels 1 and 2.
- **Compensation** – This enables or disables the cold joint compensation and the 2-wire compensation.
 - **User Calibration** – In this menu the lower and upper PV setting is executed.
 - **Factory** – In this menu the user can perform the backup/restore, select the identification of the GSD file or perform the factory reset.

Analog Input 1 / 2 – Here, the parameters of the analog input block 1 or 2 are set respectively.

- **Basic Settings** – In this menu you configure the Operation Mode, Output Scale (EU0% and EU100%), Unit, Channel and Damping.

Damping is an electronic filter for the PV, which changes the response time of the equipment to smooth the variations in the output readings caused by rapid variations in the input. The damping value can be set between 0 and 60 seconds, and its appropriate value must be adjusted based on process response time, output signal stability and other system requirements. The default damping value is 0 seconds.

The value chosen for damping affects the response time of the equipment. When the value is set to zero, the damping function is disabled and the output of the equipment will react immediately to changes in the input of the equipment, so the response time will be as short as possible.

Increasing the value of damping leads to an increase in the response time of the equipment.

At the time the damping time constant is set, equipment output will go to 63% of input change and the equipment will continue to approach the input value according to the damping equation.

- **Alarm/Warning** – The upper and lower limits of Warning and Alarms are set in this menu. The Hysteresis limit is also set. The measuring unit selected in the "Basic Settings" is indicated in this menu, as well as checking the current alarm status. Also shown is the standard graphic of the process variable limits.
- **Fail Safe** – In this menu, you configure the fault safety type and the fault safety value, and display the selected measuring unit in the "Basic Settings".
- **Simulate** – In this menu the Simulation function is enabled or disabled, the temperature value is set, the unit selected in the "Basic Settings" is displayed and the status.

Mode Block – In this menu it shows the Target Operation Mode (manual, automatic or out of service) and Real, the value of the output variable in the unit selected in "Basic Settings" and the status is set. The current alarm status is also checked.

3.3. FDT/DTM CONFIGURATION

FDT/DTM-based tool (Ex. PACTware®, FieldCare®) can be used for device information, configuration, monitoring, calibration and diagnosis with Profibus-PA technology. Vivace offers the DTM files for all of its devices (HART® and Profibus-PA).

PACTware® is property of PACTware Consortium and can be found on <http://www.vega.com/en/home br/Downloads>.

The following figures exemplify DTM configuration screens for VTT10-PP using Vivace’s VCI10-UP interface and PACTware®

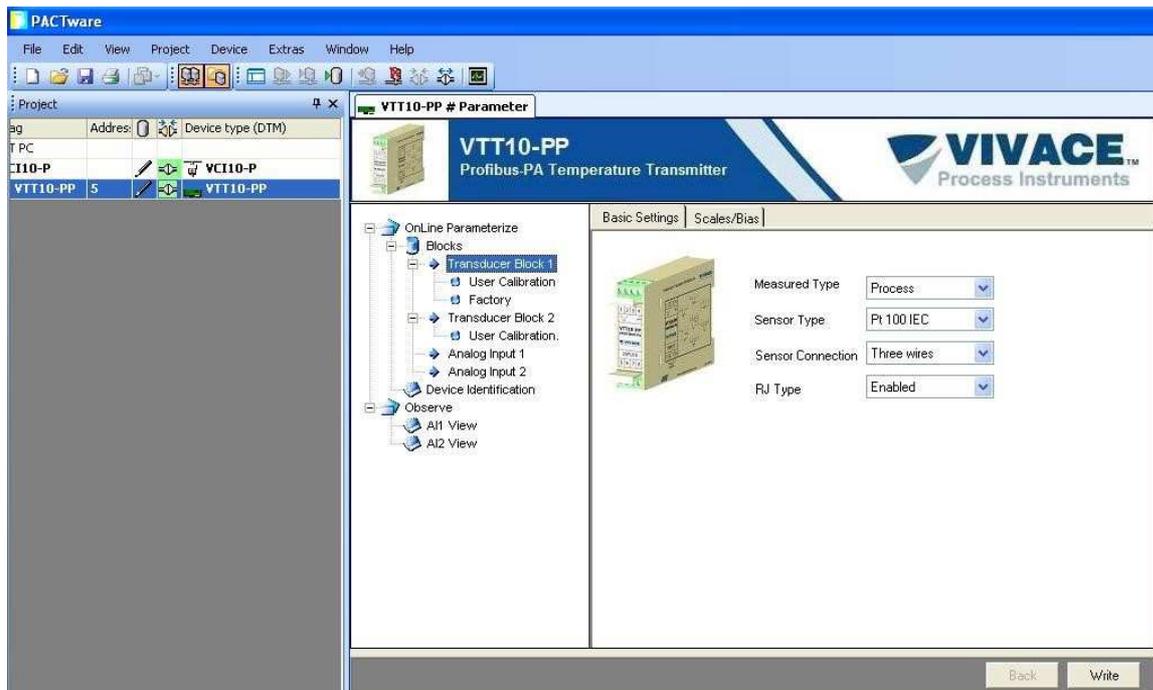


Figure 3.3 –VTT10-PP configuration screen on PACTware.

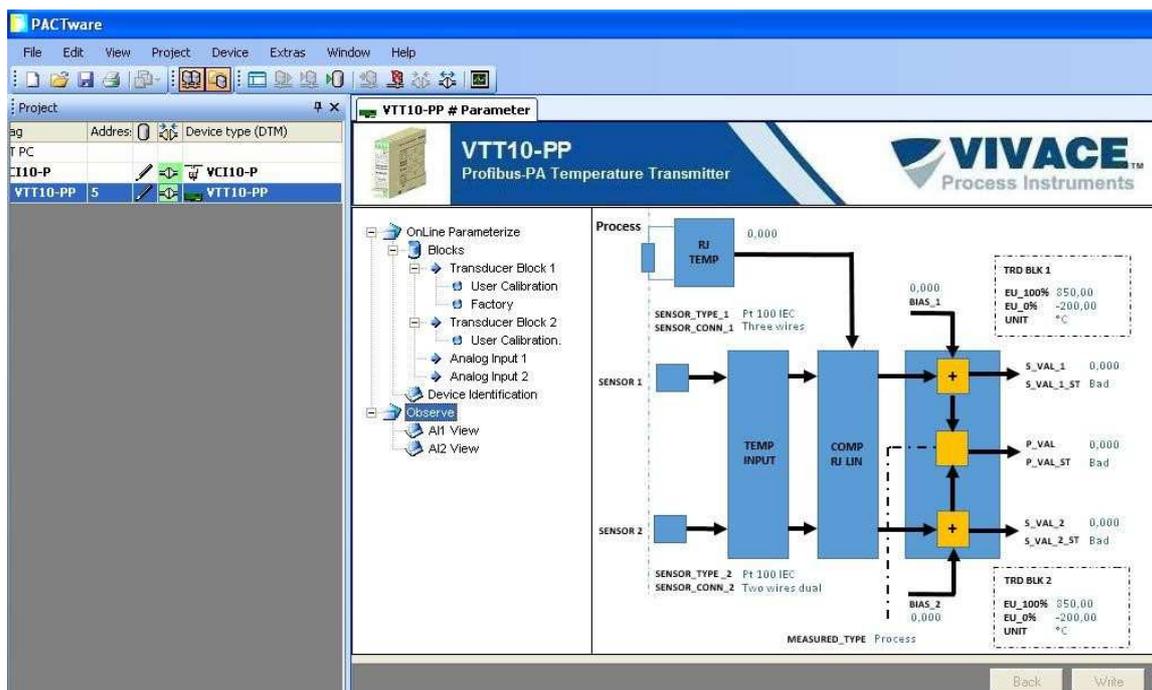


Figure 3.4 – Information view for VTT10-PP on PACTware.

3.4. CYCLIC CONFIGURATION

VTT10-PP has 2 functional blocks of analog input (02 AI - Analog Input Block). It also has the empty module (Empty Module) for applications where you want to configure only one block.

You can work with the following measurement types:

- Simple Measurement;
- Double Measurement;
- Differential Measurement;
- Backup measurement.

Depending on the type of measurement, the appropriate cyclic configuration must be performed. The VTT10-PP allows simple temperature measurement (AI + Empty_Module), differential measurement (AI + Empty_Module), double measurement (AI + AI) and simple measurement with a backup sensor (AI + Empty_Module). The following cyclic order of blocks must be respected: AI1 and AI2.

Most Profibus configurators use two directories where the GSD and BITMAP files from various manufacturers are located. The GSD and BITMAPS for Vivace equipment are available on the Vivace website.

Follow the procedure below to integrate the VTT10-PP into a Profibus system (these steps apply to all Profibus-PA Vivace line devices).

- Copy the GSD file from the VTT10-PP to the directory where all the GSD files of the Profibus configurator, usually called "GSD", are located;

- Copy the BITMAP file from the VTT10-PP to the directory where all the BMP files of the Profibus configurator equipment are located, usually called "BMP";

- After choosing the PROFIBUS-DP master, set the communication rate. Do not forget that DP / PA couplers can have the following communication rates: 45.45 kbits / s (Siemens), 93.75 kbits (s) and 12 Mbit / s , SK3). The IM157 device link can have up to 12 Mbits / s;

- Add the VTT10-PP and specify its address on the bus;

- Choose the cyclic configuration via parameterization, according to the GSD file, which depends on the application, as seen previously. For each AI block, the VTT10-PP provides the master with the process variable value in 5 bytes, the first four in the floating point format (IEEE-754) and the fifth byte forming the status that brings the quality information of this measurement.

- Some devices support the cyclic modules in the "long" and "short" formats. If there is a failure in the cyclic communication, check if by changing the chosen format, the communication is established successfully.

- If necessary activate the watchdog condition, which causes the equipment to assume a safe fault condition when it detects a loss of communication between the slave device and the Profibus-DP master.

Check byte swap condition (MSB with LSB inversion and, in some cases, nibble inversion), as for some systems it will be necessary on handling cyclic data.

VTT10-PP has the GSD identifier number equal to 0x0FB5 (Manufacturer Specific) and can still work with the value 0x9701 (Profile Specific).

The DDT, DTM and GSD files of the VTT10-PP can be found on the website: www.vivaceinstruments.com.br

For further information on Profibus PA technology, please refer to the Vivace web page for installation, operation and configuration manual - Profibus PA - blocks, parameters and structure.

Link DP/PA

In a Profibus-DP network it is common to have Link Devices DP/PA to increase the communication rate up to 12 Mbit/s and to increase the addressing capacity, since these devices are slaves in the Profibus-DP network and Profibus-PA network. Each Link Device may have connected several DP/PA couplers.

Siemens has a Link device DP/PA which is the IM157 model. This device works with DP/PA coupler at a communication rate of 31.25 kbits/s and in the Profibus-DP network from 9.6 kbits/s to 12 Mbits/s. The IM157 and each coupler must be supplied with 24 Vdc. The maximum number of field devices per link is limited to 30 or 64 devices, but this depends on the model and the number of bytes exchanged cyclically.

When using the Link Device it is necessary to verify that the cyclic modules for Vivace Process Instruments equipment are included in your GSD file.

If they are not, they should be included. To do so, access the Siemens website and download the GSD tool. This is a tool that allows you to extend the GSD file from Siemens links devices (IM157, IM53) by adding the modules of new Profibus-PA devices that are not in the GSD file. You must have the GSD of the link device and the Vivace device in the directory where the GSD Tool was installed and when running, choose the option to extend the GSD file of the link device, choose the link model and GSD of the device and run. After execution, note that a section has been created for the Vivace equipment with its cyclic modules.

4 MAINTENANCE

VTT10-PP Temperature Transmitter, like all Vivace products, is rigorously evaluated and inspected before being shipped to the customer. However, in case of a malfunction, a diagnosis can be made to check whether the problem is located in the sensor installation, the equipment configuration or if it is a transmitter problem.

5 CERTIFICATIONS

VTT10-PP is designed to meet national and international intrinsic safety standards.

6 TECHNICAL CHARACTERISTICS

6.1. IDENTIFICATION

VTT10-PP has an identification label attached to its front, specifying the model and the identification of the terminals. Another label engraved on the side of the box shows the sensor connection forms and the serial number of the equipment, as shown in figure 6.1.

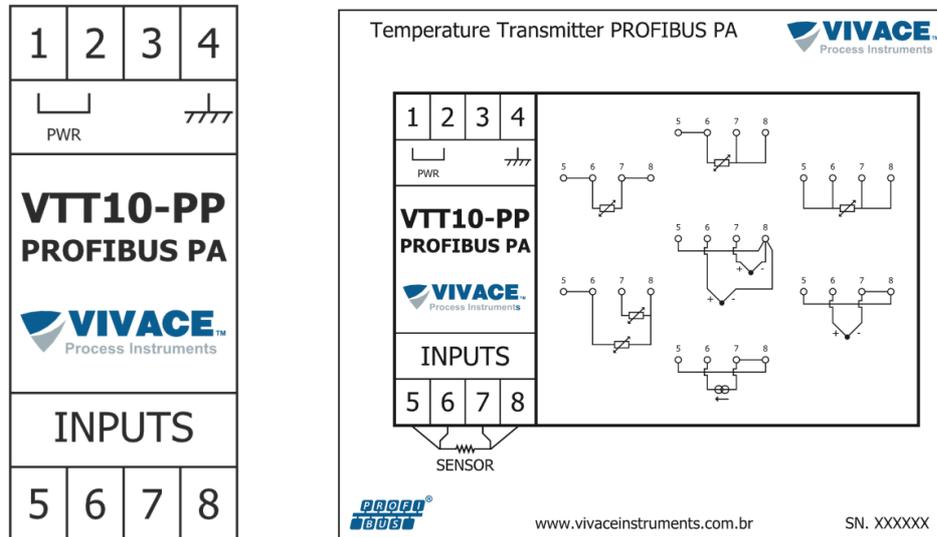


Figure 6.1 –VTT10-PP identification.

6.2. TECHNICAL SPECIFICATION

The table below shows the technical specifications of the VTT10-PP:

Accuracy	As tables 6.2, 6.3 and 6.4
Power Supply / Current	9 to 32 Vdc (no polarity) / 12 mA
Communication Protocol	Profibus-PA, according to IEC 61158-2 (H1)
Hazardous Area Certifications	Intrinsically Safe
Ambient Temperature Limits	- 40 to 85°C
Configuration	EDDL and FDT/DTM tools, as well as Android platform.
Assembly	DIN rail
Protection Degree	IP00 / IP66 (Installed)
Electrical Isolation	Galvanic Isolation, 1.5 kVac
Housing Material	Injected ABS Plastic
Dimension / Approximate Weight	76 x 23 x 105 mm / 105 g

Table 6.1 – Technical specification for VTT10-PP.

6.3. COMPATIBLE SENSORS

The following tables list the types of sensors and their proper working ranges, plus the minimum range for correct operation and accuracy.

RTD – Temperature sensors based on resistance with 2, 3 or 4-wire connection:

SENSOR OPTION	REFERENCE	INPUT RANGE (°C)	MINIMUM SPAN (°C)	ACCURACY (°C)
Pt100 ($\alpha=0.00385$)	IEC751	-200 to 850	10	0.10
Pt200 ($\alpha=0.00385$)	IEC751	-200 to 850	10	0.50
Pt500 ($\alpha=0.00385$)	IEC751	-200 to 850	10	0.20
Pt1000 ($\alpha=0.00385$)	IEC751	-200 to 300	10	0.20
Pt100 ($\alpha=0.003916$)	JIS1604	-200 to 645	10	0.15
Pt200 ($\alpha=0.003916$)	JIS1604	-200 to 645	10	0.70
Ni120	Edison Curve #7	-70 to 300	10	0.08
Cu10	Edison Copper Winding #15	-50 to 250	10	1.00
Pt50 ($\alpha=0.00391$)	GOST 6651-94	-200 to 850	10	0.20
Pt100 ($\alpha=0.00391$)	GOST 6651-94	-200 to 850	10	0.12
Cu50 ($\alpha=0.00426$)	GOST 6651-94	-50 to 200	10	0.34
Cu50 ($\alpha=0.00428$)	GOST 6651-94	-185 to 200	10	0.34
Cu100 ($\alpha=0.00426$)	GOST 6651-94	-50 to 200	10	0.17
Cu100 ($\alpha=0.00428$)	GOST 6651-94	-185 to 200	10	0.17

Table 6.2 – RTD technical characteristics.

TC - Temperature sensors based on millivoltage with 2-wire connection:

SENSOR OPTION	REFERENCE	INPUT RANGES (°C)	MINIMUM SPAN(°C)	ACCURACY (°C)
Thermocouple B	IEC584	100 to 1820	25	0.75
Thermocouple E	IEC584	-50 to 1000	25	0.20
Thermocouple J	IEC584	-180 to 760	25	0.25
Thermocouple K	IEC584	-180 to 1372	25	0.25
Thermocouple N	IEC584	-200 to 1300	25	0.40
Thermocouple R	IEC584	0 to 1768	25	0.60
Thermocouple S	IEC584	0 to 1768	25	0.50
Thermocouple T	IEC584	-200 to 450	25	1.00
Thermocouple L	DIN43710	-200 to 900	25	0.35
Thermocouple U	DIN43710	-200 to 600	25	0.35
Thermocouple W3	ASTM E988-96	0 to 2000	25	0.70
Thermocouple W5	ASTM E988-96	0 to 2000	25	0.70
Thermocouple L	GOST R 8.585	-200 to 800	25	0.45

Table 6.3 – TC technical characteristics.

Ohm or mV – Resistive linear or millivoltage sensor with 2, 3 or 4-wire connection:

SENSOR OPTION	INPUT RANGES	ACCURACY
mV Input	-10 mV to 100 mV	0.015 mV
Ohm Input	0 Ohm to 2000 Ohm	0.45 Ohm

Table 6.4 – Technical characteristics for resistive or mV sensors.

6.4. ORDERING CODE

VTT10-P *Temperature Transmitter - Panel*

Communication Protocol	H	HART
	P	PROFIBUS
Certification Type	0	NO CERTIFICATION
	1	INTRINSICALLY SAFE
Certification Body	0	NO CERTIFICATION
	1	INMETRO
Discrete Output	0	NO DISCRETE OUTPUT
	1	WITH DISCRETE OUTPUT

Ordering Code Example:

VTT10-P	P	-	0	0	0
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7 WARRANTY

7.1 GENERAL CONDITIONS

Vivace ensures its equipment from any defect on manufacturing or component quality. Problems caused by misuse, improper installation or exposure to extreme conditions are not covered by this warranty.

The user can repair some equipment by replacing spare parts, but it is strongly recommended to forward it to *Vivace* for diagnosis and maintenance in cases of doubt or impossibility of correction by the user.

For details about the product warranty, see the general term warranty on *Vivace* website: www.vivaceinstruments.com.br.

7.2 WARRANTY PERIOD

Vivace ensures the ideal operating conditions of their equipment by a period of two years, with full customer support regarding to installation, operation and maintenance for the best use of the equipment.

It is important to note that even after warranty period expires, *Vivace* assistance team is ready to assist customer with the best support service, offering the best solutions for the installed system.

APPENDIX

		FSAT	
		Technical Analysis Solicitation Form	
Company:		Unit/Department:	Shipping Invoice n°:
Standard Warranty: ()Yes ()No		Extended Warranty: ()Yes ()No	Buying Invoice n°:
COMMERCIAL CONTACT			
Complete Name:		Position:	
Phone and Extension:		Fax:	
e-mail:			
TECHNICAL CONTACT			
Complete Name:		Position:	
Phone and Extension:		Fax:	
e-mail:			
EQUIPMENT DATA			
Model:		Serial Num.:	
PROCESS INFORMATION			
Environment Temperature (°C)		Work Temperature (°C)	
Min:	Max:	Min:	Max:
Operation Time:		Fail Date:	
FAIL DESCRIPTION: Here user should describe in detail the observed behaviour of product, frequency of fail occurrence and repeatability. Also, should inform operational system version and a quick description of control system architecture where the equipment was installed.			
ADDITIONAL OBSERVATION:			

