INSTALLATION, OPERATION, CONFIGURATION AND MAINTENANCE MANUAL
July/2019

VTT10-FH

HART® TEMPERATURE TRANSMITTER

field model

VIVACE™ Process Instruments

HART® COMMUNICATION FOUNDATION

COPYRIGHT

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.

You 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".

SUMMARY

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.*

SYMBOLOGY

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.

1 EQUIPMENT DESCRIPTION

VTT10-FH is the field model for *Vivace*'s temperature transmitter family, projected to be installed directly on sensor or on a Ø 2" tube, panel or wall. It attends several sensor types, such as thermocouple, RTDs, resistance and millivoltage signals.

The transmitter is powered by a 12 to 45 Vdc voltage and modulates communication over a 4-20 mA output signal, according to NAMUR NE43 standard, using HART® protocol. The configuration uses HART® 7 (older versions compatible) communication protocol, already established on the world of industrial automation for configuration, calibration, monitoring and diagnostics.

Through a HART configurator or any EDDL or FDT/DTM-based tool it is possible to configure sensor type, measuring range, work unit, calibration and also monitoring measured variables with device status. Configuration via local adjust is also possible with an auxiliary magnetic screwdriver.

Focusing on high performance and robustness, it was projected with the most recent electronic component and material technology, offering long-term reliability for every scale systems.

1.1. BLOCK DIAGRAM

Component modularization for transmitter is described on the following block diagram.

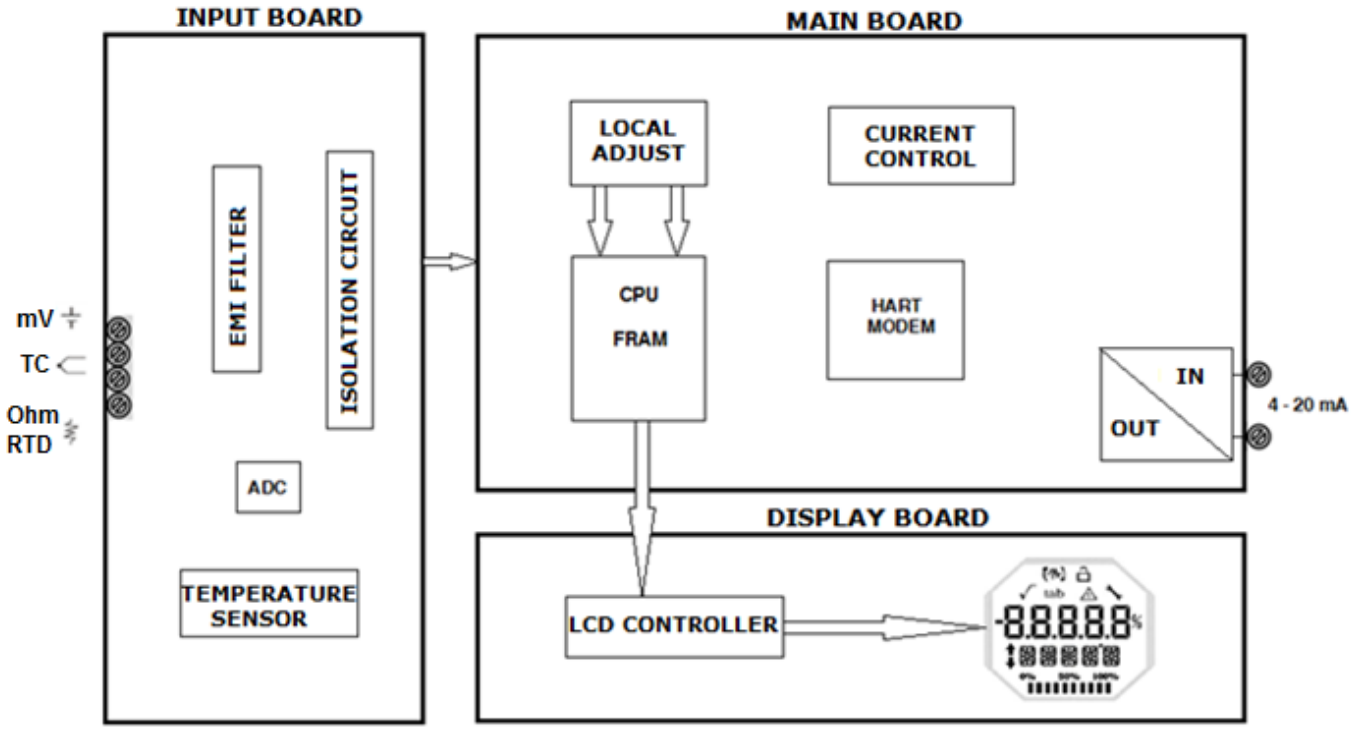

Figure 1.1 – Transmitter block diagram.

The sensor signal passes through RF EMI filter and goes to ADC block, where it is converted to a digital value. This digital value later will be converted in the temperature, according to selected sensor type. The temperature value is finally converted in a current signal, proportional to the calibrated range.

The sensor signal is galvanic isolated from output signal, avoiding ground loop.

The input block (DC power supply) is responsible for the electric source for all circuits. Current control block is composed by a circuit to transform digital values generated by microcontroller into 4-20 mA electric current, proportional to the primary variable value.

HART® channel and HART® modem blocks provide the interface between microcontroller signals and HART® bus connected to monitored device. Local adjust block enables local configurations by user.

The display board has the controller block to interface LCD and CPU communication signals, adapting all the messages to be shown on display.

Finally, the CPU block can be seen as the transmitter brain, where all the activities happen, such as time control, HART® machine, besides the common transmitter routines: configuration, calibration and generation of output current, proportional to the primary variable.

2 INSTALLATION

RECOMMENDATION

When taking the equipment to the installation location, transfer it in the original packaging. Unpack the equipment at the installation location to avoid damage during transportation.

RECOMMENDATION

Model and specification of equipment are indicated on identification plate, located at the top of the housing. Check if supplied specification and model correspond to application requirements.

STORAGE

The following precautions should be observed when storing the equipment, especially for a long period:

1) Select a storage area that meets the following conditions:
   a) No direct exposition to rain, water, snow or sunlight.
   b) No exposition to vibration and shocks.
   c) Normal temperature and humidity (around 20°C / 70°F, 65% RH).

However, it can also be stored under the following temperature and humidity intervals:

- Ambient Temperature: -40°C to 85°C (without LCD)* or -30°C to 80°C (with LCD)
- Relative Humidity: 5% to 98% RH (@ 40°C)

(2) For equipment storage, use original factory package (or similar).

(3) If storing an already used Vivace equipment, dry every moist part and clean all connections that was in contact with the process. Keep covers and connections closed and properly protected for its specific application and requirements.

** Only for general use. For explosion proof version, follow product certification requirements.*

2.1. MECHANICAL ASSEMBLY

VTT10-FH was developed to be installed in the field, thus supporting exposition to several environment situations, keeping good performance through any temperature, humidity and vibration variations.

The transmitter's housing is IP67 protected, being immune to water contact to electronic circuit and electrical connections, since cable gland or conduit for electrical connection is correctly assembled and sealed with non-hardening substance. Covers must also be tight to avoid humidity, since housing screws are not protected by painting.

The electronic circuit is protected by varnish but constant water or corrosion exposure may compromise this protection and damage the electronic components.

Figure 2.1 shows the dimensional drawing and mounting positions for VTT10-FH.

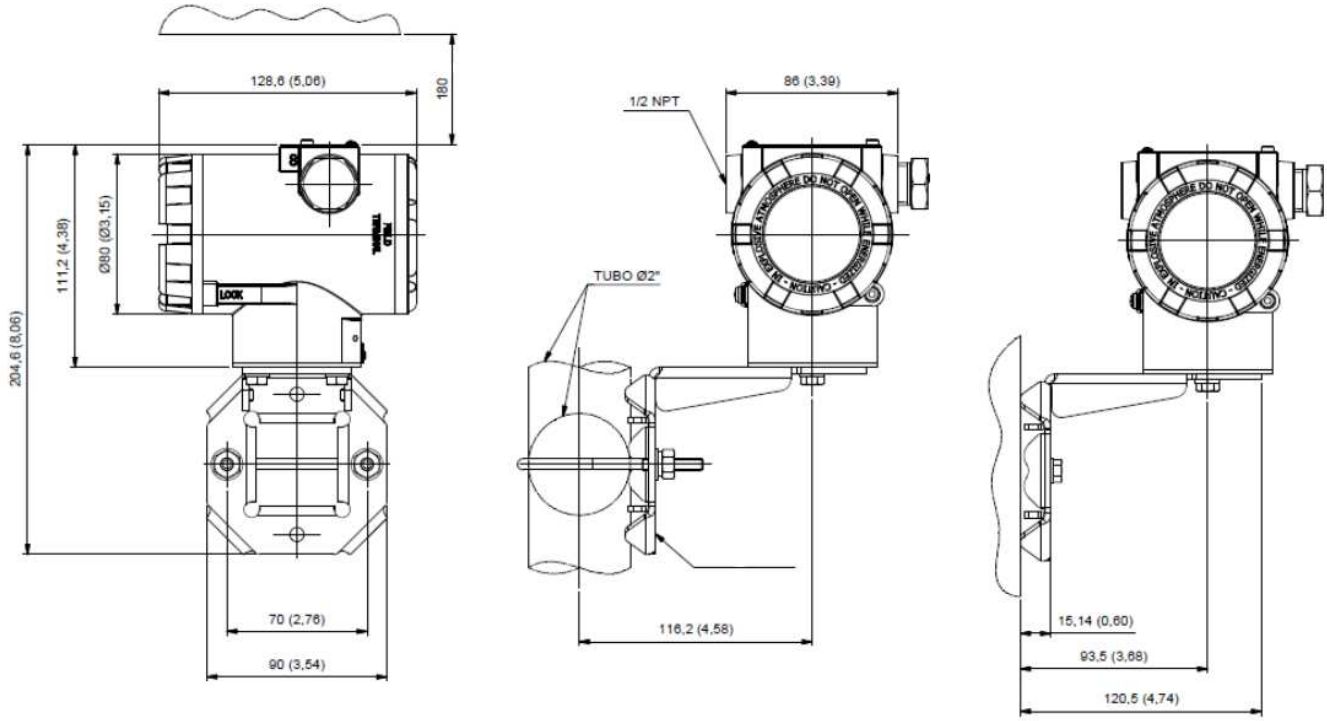

Figure 2.1 – Dimensional and mounting drawings for VTT10-FH.

To avoid the risk of involuntary loss of VTT10-FH covers due to vibration, for instance, it can be locked by screw, as shown on figure 2.2.

VTT10-FH is a field device, so it can be installed through a mounting bracket on a 2" tube attached with a U clip. For best LCD positioning device enables its display to be rotated 4 x 90°, according to figure 2.3. The transmitter can also be attached with the same mounting bracket to a wall or panel.

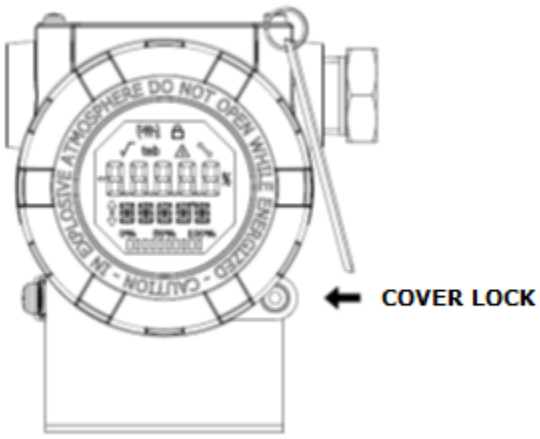

Figure 2.2 – Front cover lock.

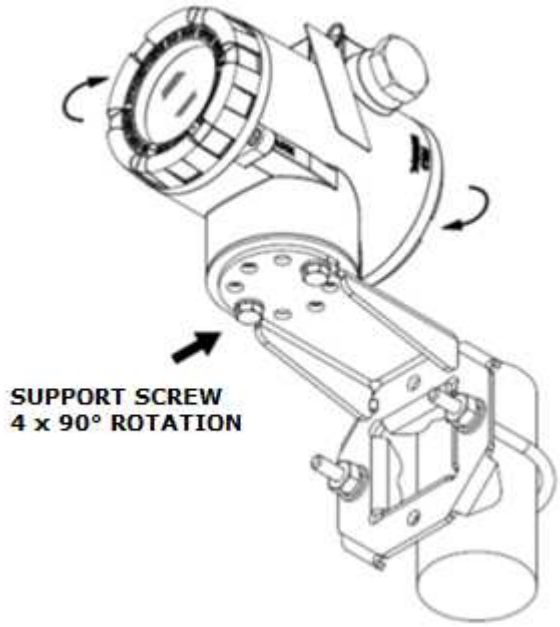

Figure 2.3 – Housing positioning.

VTT10-FH liquid crystal display can be rotate 4 x 90° so indication will be adequate for user visualization.

Figure 2.4 illustrates rotation possibilities for VTT10-FH LCD.

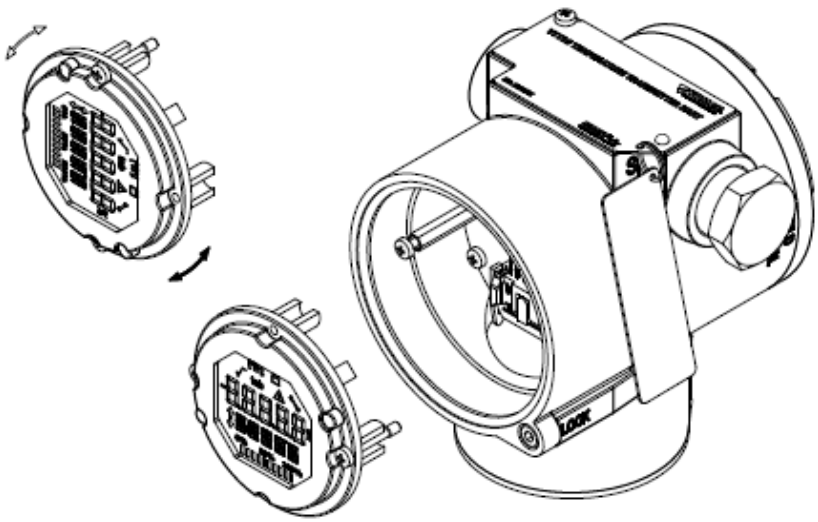

Figure 2.4 – 4 x 90° LCD rotation.

2.2. ELECTRICAL CONNECTION

In order to access the terminal block user must remove VTT10-FH rear cover. First, loose cover lock screw (see figure 2.5) by turning it clockwise.

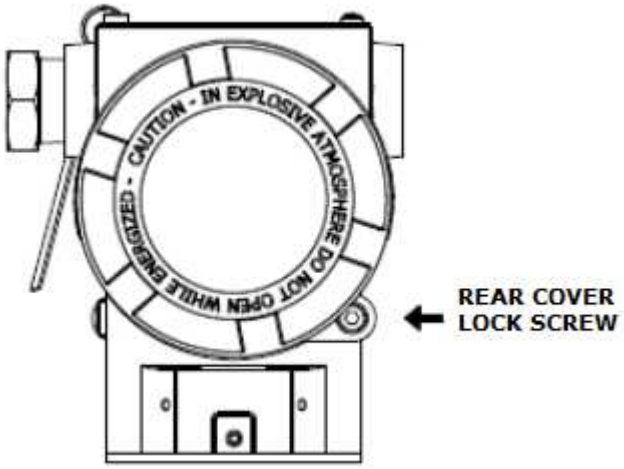

Figure 2.5 – Rear cover lock.

Figure 2.6 shows the terminals for power supply (PWR BUS) and the sensor terminals (1, 2, 3, 4). It also shows the grounding terminals (internal and external) and HART communication terminals for VTT10-FH. For powering the device, it is recommended to use a 22 AWG twisted pair cable.

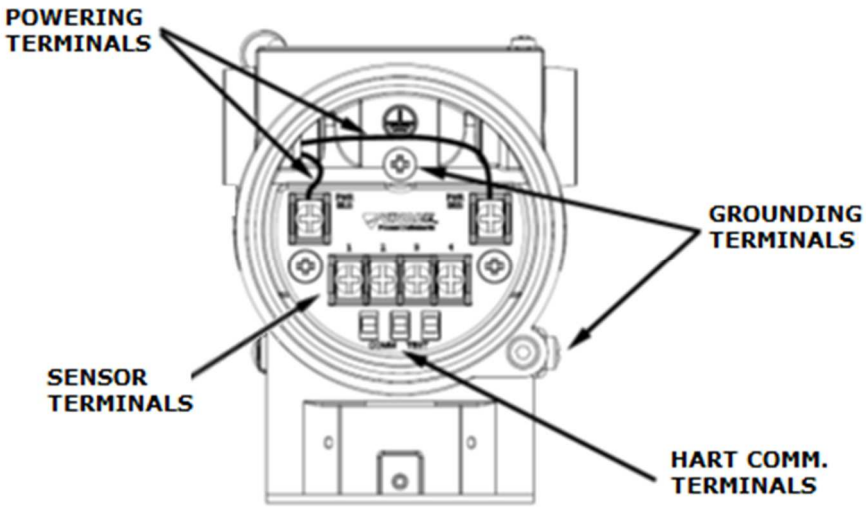

Figure 2.6 – Terminal connection and description.

Table 2.1 describes VTT10-FH terminal functions.

Terminal Description
Power Terminals – PWR BUS - 24 Vdc not polarized
Grounding Terminals – 1 internal and 1 external
Test Terminals – TEST – current loop measurement (4-20 mA) without open circuit
Communication Terminals – COMM – HART® communication with configurator
Sensor Terminals – temperature sensor connection terminals

Table 2.1 – Terminal description.

NOTE

All cables used for connecting VTT10-FH with HART® network must be shielded to avoid interference or noise.

NOTE

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

Conduits used for power cables must be assembled in order to avoid water entrance in the device terminal block. Conduit screws must be sealed according to specific area required standards.

Non-used electrical connection must be sealed with appropriate cover.

Figure 2.7 shows the correct installation for conduit, in order to avoid the entrance of water or any corrosive material that may cause damage to the device.

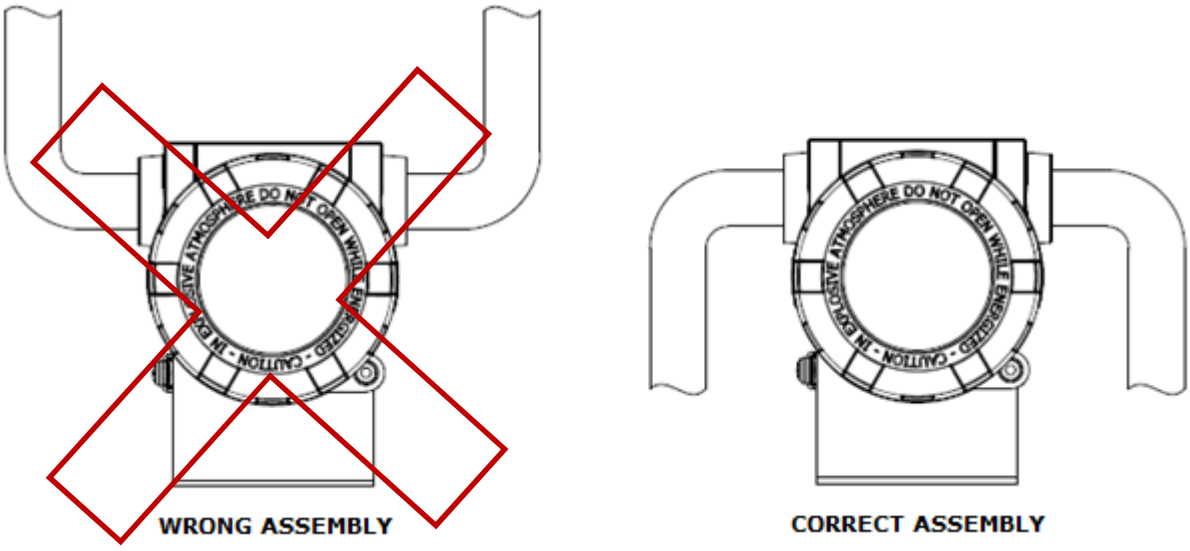

Figure 2.7 – Conduit installation.

2.3. PROCESS CONNECTION

Following are illustrated the VTT10-FH sensor connection for different sensor types:

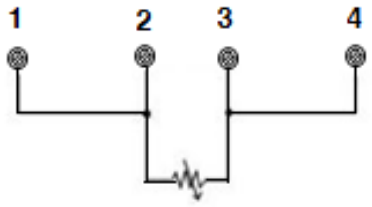

Figure 2.8 – 2-wire RTD or resistive sensor connection.

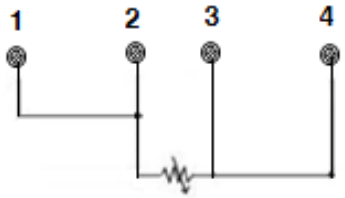

Figure 2.9 -3-wire RTD or resistive sensor connection.

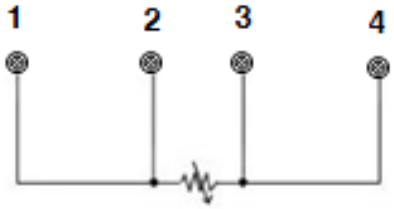

Figure 2.10 - 4-wire RTD or resistive sensor connection.

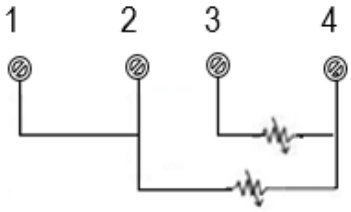

Figure 2.11 – Differential, maximum, minimum or backup RTD or resistive sensor connection.

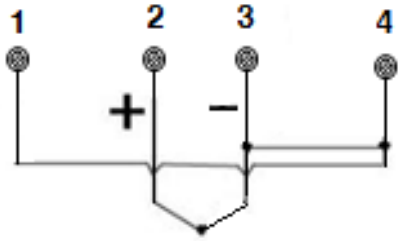

Figure 2.12 – Thermocouple or mV sensor connection.

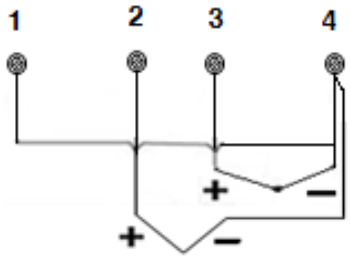

Figure 2.13 - Differential, maximum, minimum or backup thermocouple or mV sensor connection.

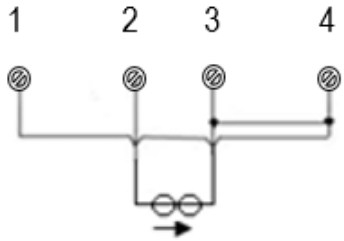

Figure 2.14 – 4–20 mA input connection

3 CONFIGURATION

The transmitter can be configured by any HART® compatible programmer. Vivace offers the interfaces VCI10-H (USB, Android and Bluetooth) as a solution for configuring and monitoring any HART® device. VTT10-FH can also be configured by local adjust using Vivace magnetic screwdriver.

3.1. LOCAL CONFIGURATION

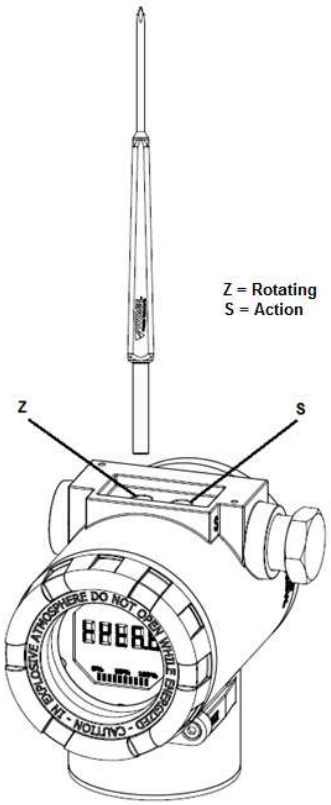

Figure 3.1 – Z and S orifices and magnetic screwdriver.

Transmitter's local configuration is executed by using Vivace's magnetic screwdriver on Z and S orifices, located at housing superior side, under identification plate. Orifice Z starts local configuration and changes the field to be configured. Orifice S is responsible for changing and saving the new value on the selected field. Saving after LCD value changing is automatic.

Figure 3.1 shows orifices Z and S for local configuration, stamped on device housing, and their functions on magnetic screwdriver actuation.

Insert the magnetic screwdriver on *Zero* orifice (Z). icon appears to indicate that device has recognized the screwdriver action. Keep the magnetic screwdriver inside until "LOCAL ADJST" message is shown on display, then remove it for 3 seconds. Insert the magnetic screwdriver into Z orifice again, so user can navigate through local adjust parameters.

Table 3.1 indicates actions executed by magnetic screwdriver when inserted on Z and S orifices.

ORIFICE	ACTION
Z	Select configuration tree function
S	Act on selected function

Table 3.1 – Z and S orifices actions.

Some parameters show the icon to allow user configuration on it by inserting the magnetic screwdriver into *Span* orifice (S). In case the parameter has pre-defined values, those will be rotate on display, while the magnetic screwdriver remains into *Span* orifice (S).

If the parameter is numerical, this field will enter on edition mode and decimal point will start blinking, and shifting to left. When user removes magnetic screwdriver from S, the least significant digit (in the right) starts blinking, indicating it is ready for edition. By inserting the magnetic screwdriver into S, user is enabled to increase the digit value, from 0 to 9.

After the least significant digit edition, user should remove magnetic screwdriver from S in order to start the edition of the next digit (in the left). User will be able to edit each digit independently, until the most significant digit (5th digit on the left) is complete. After the 5th digit edition, user can also change the signal for the numerical value still on S orifice.

During each step of edition, user is able to return to the previous digit (to the right) by inserting the magnetic screwdriver into Z orifice, so corrections can be made. By removing the magnetic screwdriver at any time, user will see the digits blinking until the final step, where the edition mode will be finished, saving the numerical value configured by user.

If the configured value is not acceptable by that device parameter (invalid value), it will be returned to the last valid value before edition. Depending on the parameter, some values can be shown on numerical or alphanumerical fields, adjusting the best option view to user.

With the magnetic screwdriver out of Z and S orifices, device will leave local adjust mode after some seconds and monitoring mode will be shown.

3.2. JUMPER CONFIGURATION FOR LOCAL ADJUST AND WRITE PROTECTION

VTT10-FH has two jumpers on its main board to protect data writing (WP1) and also enabling/disabling local adjust (ADJL1). Figure 3.2 presents those jumpers.

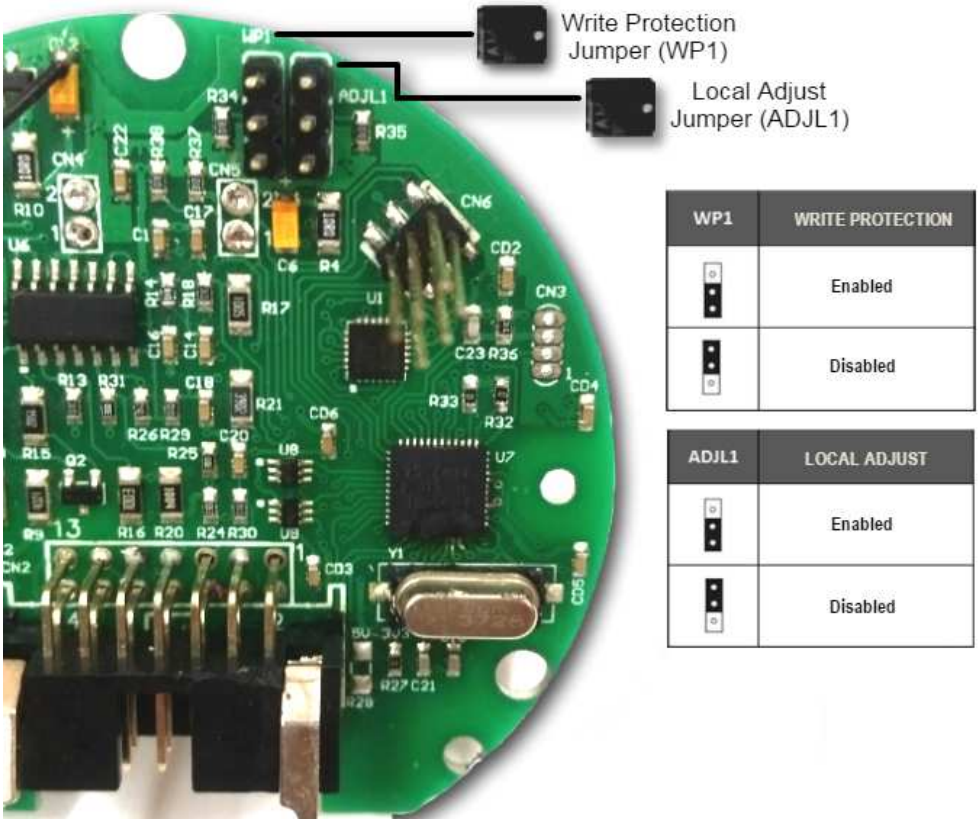

Figure 3.2 – Jumpers WP1 (write protection) and ADJL1 (local adjust) on VTT10-FH main board.

Default selection for these jumpers is Write Protection **DISABLED** and Local Adjust **ENABLED.**

3.3. LIQUID CRYSTAL DISPLAY (LCD)

Main information related to transmitter are indicated on its liquid crystal display (LCD). Figure 3.3 shows the LCD with all its indication fields. Numerical field has 5 digits and is used mainly for monitored variable indication. Alphanumerical field indicates which variable is being monitored, units or auxiliary messages. Each indication icon use is described on table 3.2.

Figure 3.3 – LCD fields and icons.

SYMBOL	DESCRIPTION
	Sending Communication
	Receiving communication
	Write protection enabled
√	Square root function enabled
tab	Characterization table enabled
	Diagnostic occurence
	Recommended maintenance
	Increment values in the local adjust
	Decrement values in the local adjust
°	Degrees symbol for temperature units
0% 50% 100%	Bargraph to indicate the measured variable range

Table 3.2 – LCD icon description.

3.4. LOCAL ADJUST CONFIGURATION TREE

Figure 3.4 shows available fields for local configuration and the sequence they are presented by magnetic screwdriver actuation on Z and S orifices.

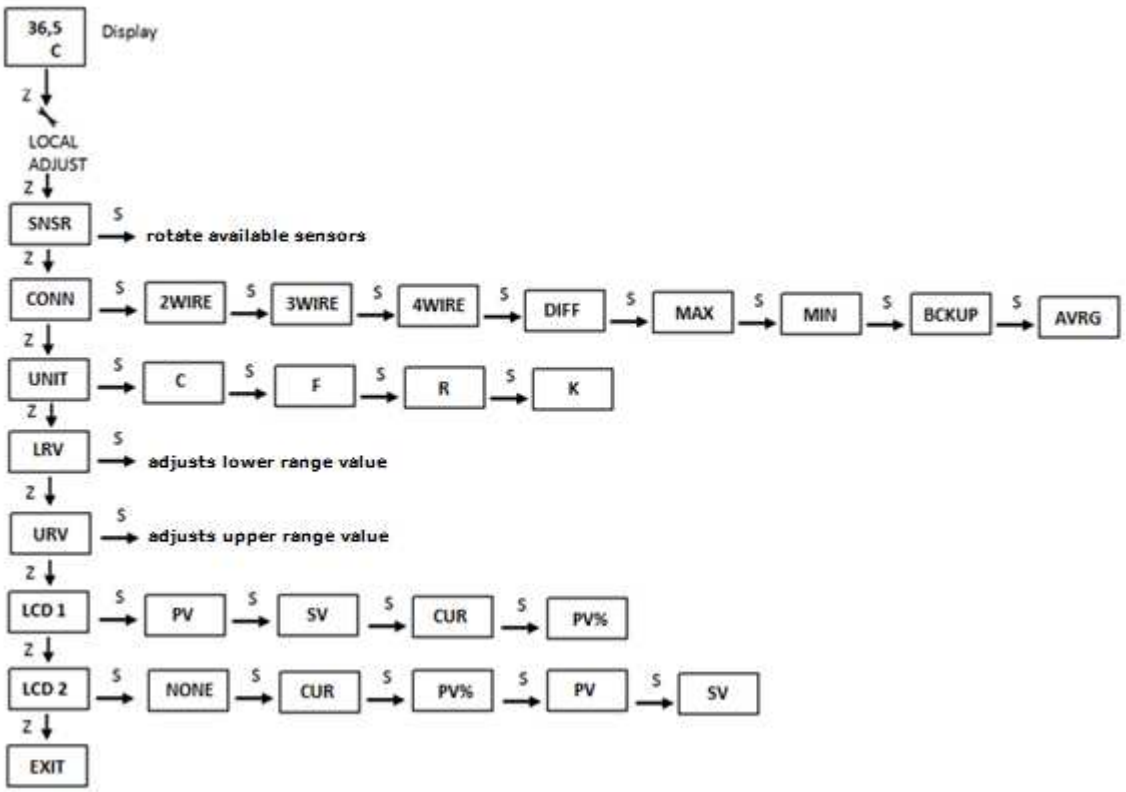

Figure 3.4 – Local adjust configuration tree.

3.5. HART® CONFIGURATOR

Figure 3.5 exemplifies the use of USB interface with a personal computer that has a HART® configurator installed. A 250Ω resistance must be serially connected with the power supply (for voltage supply and if the power supply does not have this resistance internally) in order to enable HART® communication over the 4-20 mA current (Figure 3.5). Vivace interface already has this resistance when used to power the field device (Figure 3.6).

Figure 3.5 – Transmitter installation for configuration with external power supply and 250 ohms resistance.

Figure 3.6 – Transmitter installation for configuration using VCI10-UH to power the device.

VTT10-FH multidrop connection must be executed according to Figure 3.7. Note that up to 63 devices can be paralleled connected on the same line. Caution must be taken when many transmitters are connected on the same power line due to voltage drop on 250 ohm resistor and guarantee power supply voltage is enough (Figure 3.8).

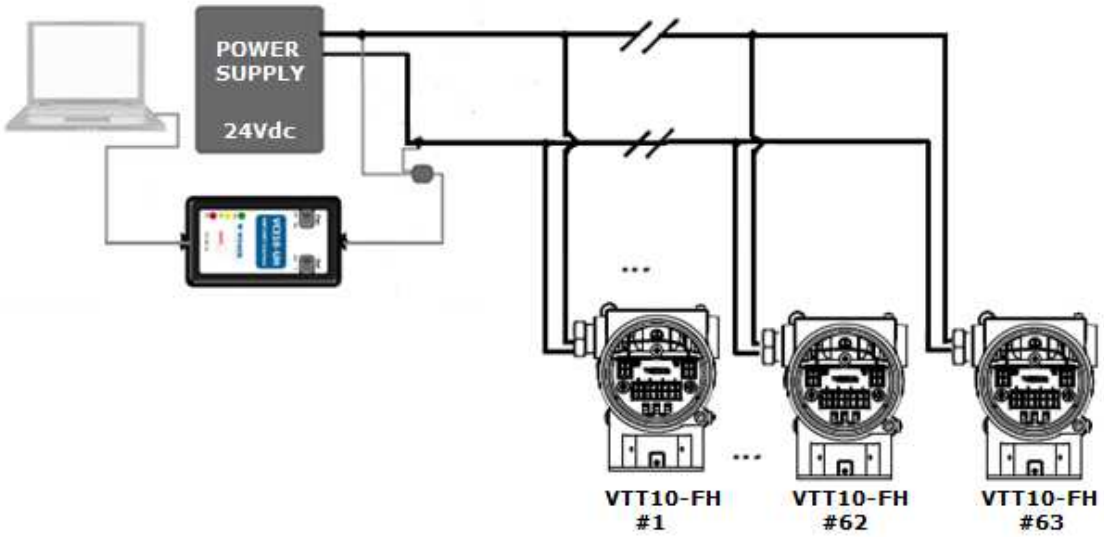

Figure 3.7 – Multidrop connection for VTT10-FH.

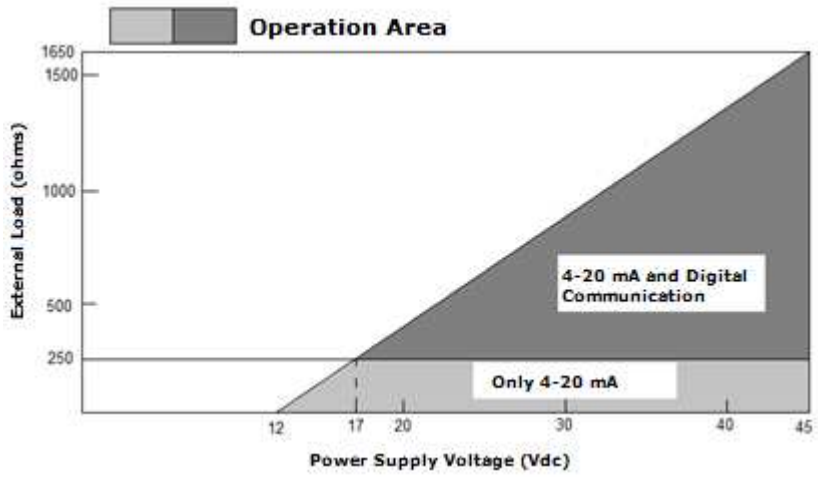

Figure 3.8 – VTT10-FH load curve.

3.6. HART CONFIGURATOR PROGRAMMING TREE

The configuration tree is a structure tree-shaped with the menus for all software resources available, as shown on figure 3.9.

For online configuration of the transmitter, check it is correctly installed, powered by the adequate voltage and with the minimum load of 250 Ω impedance on the line, necessary for communication.

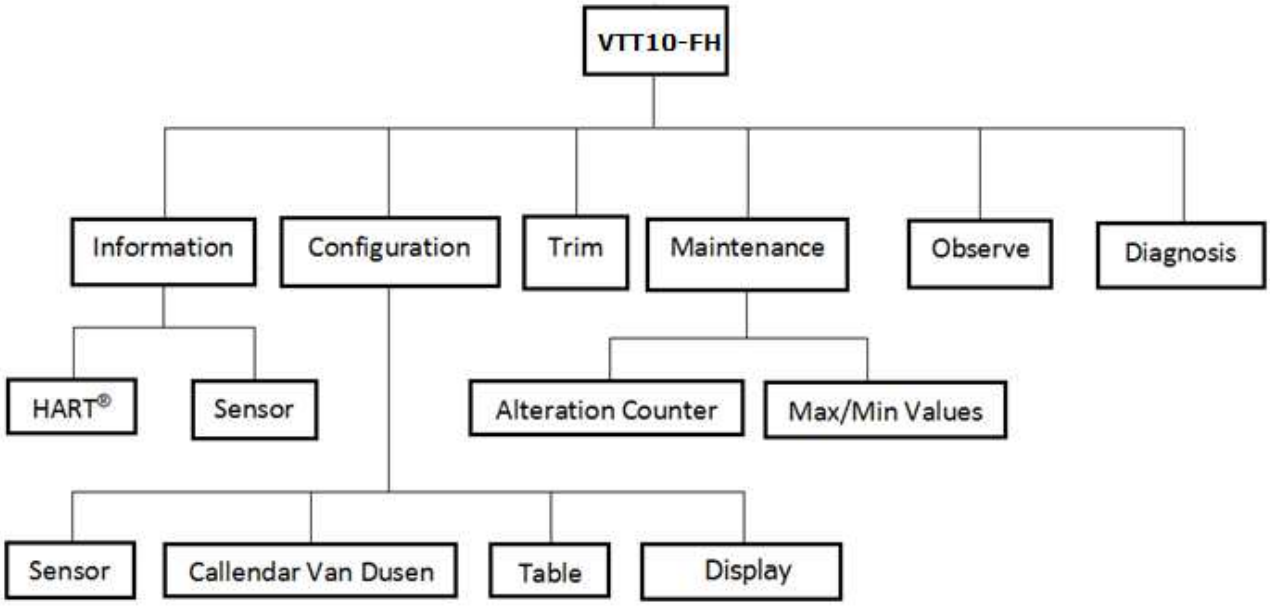

Figure 3.9 – VTT10-FH programming tree.

Information – Main device information can be accessed here.

- **HART® –** Main information about communication protocol are available here, such as: Manufacturer, Device Type, Device Profile, HART® Revision, Software Version etc.
- **Sensor –** Main information about the sensor are available here, such as: Sensor Type, Connection (2, 3 or 4 wires), Upper Range, Lower Range and Unit.

Configuration – Configuration of transmitter Work Ranges, Unit, Safe Mode and Damping are available here.

- **Damping** is an electronic filter for PV variable which changes transmitter response time in order to smooth output reading variations caused by input fast variations. Damping value can be configured between 0 and 60 seconds, and its appropriated value must be adjusted based on process response time, output signal stability and other system requirements. Default value for damping is 0 seconds.

The damping value affects transmitter response time. When this time is configured as zero, the damping function is disabled and transmitter output will react immediately to the input variations, so the response time will be as short as possible.

An increase to the damping value will result on an increase to transmitter response time.

As the settling time constant is defined, transmitter output will achieve 63% of the input variation and transmitter will continue to approach the input value according to damping curve.

- **Sensor –** Sensor Type, Sensor Connection and Cold Junction Mode.
- **Callendar van Dusen –** R0, A, B and C parameters of Callendar van Dusen for RTDs.

Callendar-Van Dusen is an equation which describes the relation between the resistance (R) and the temperature (t) of RTD platinum resistance thermo-elements.

- **Table –** Table function with its parameters.
- **Display –** Configure two variables to be displayed on LCD.

Trim – Enables the adjustment for transmitter output current, input temperature sensor (ohm or mV) and internal temperature sensor. Figure 3.10 shows the connection for current TRIM on VTT10-FH.

Maintenance – This menu enables transmitter reset, change counter verification/reset, write protection, data backup/restore and loop test function (fixed current mode).

- **Alteration Counter –** checks the number of changes executed in several parameters with the possibility of resetting them.
- **Max/Min Values –** Shows maximum and minimum values for PV and SV.

Observe – Monitoring view for output current, PV%, PV, SV, TV and QV.

Diagnosis – Monitoring view for device alarm status.

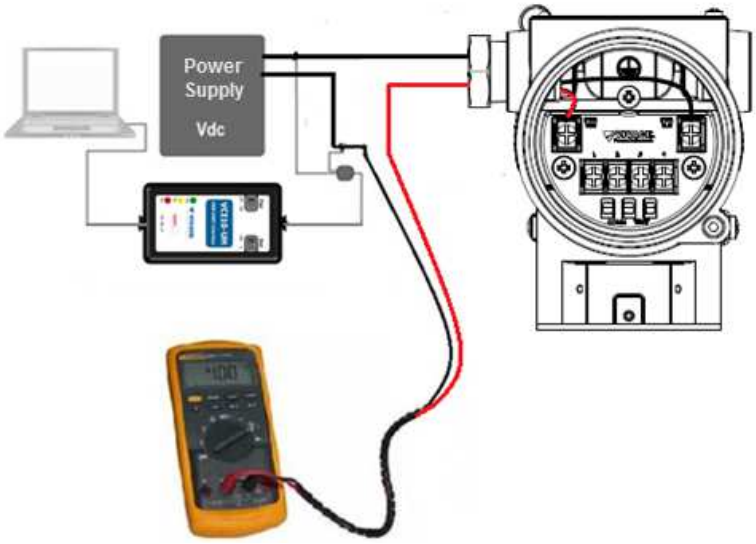

Figure 3.10 – VTT10-FH current trim configuration.

3.7. FDT/DTM CONFIGURATION

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

PACTware® is property of VEGA and can be found on http://www.vega.com/en/home_br/Downloads.

The following figures exemplifie DTM configuration screens for VTT10-FH using Vivace's VCI10-UH interface and PACTware®.

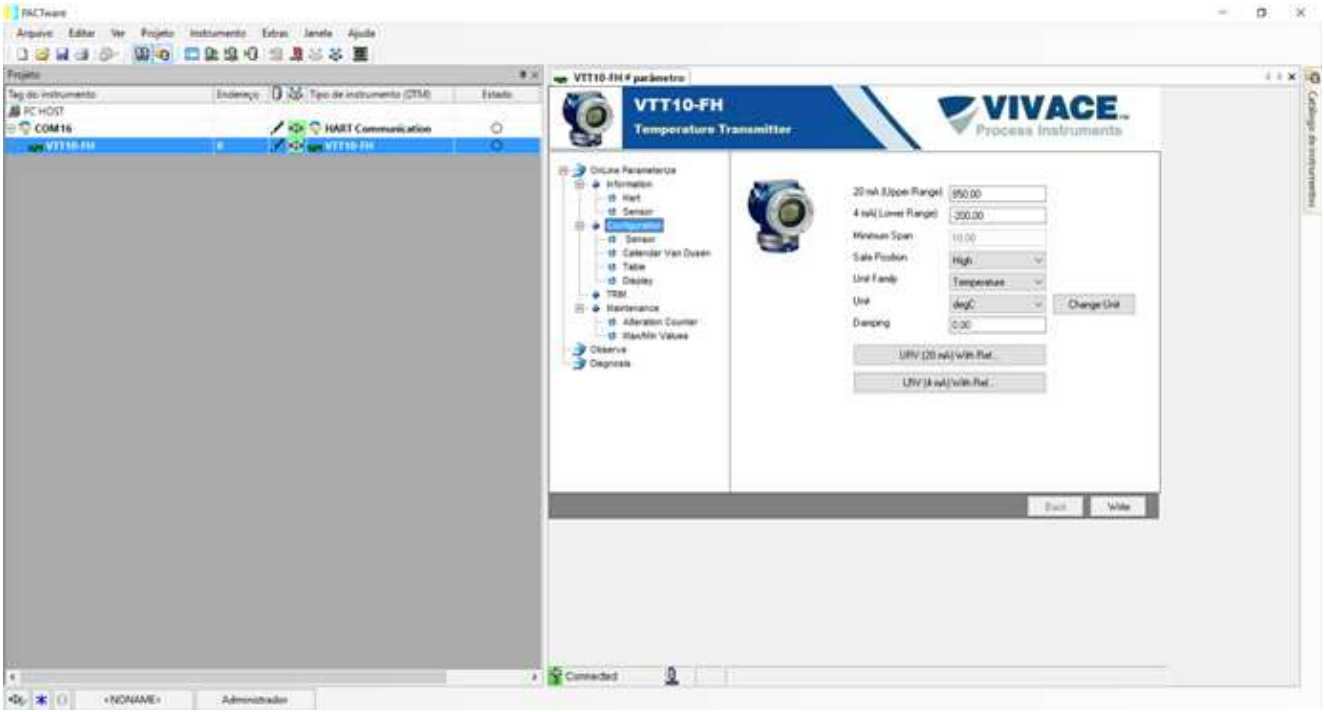

Figure 3.11 – DTM work range configuration screen for VTT10-FH.

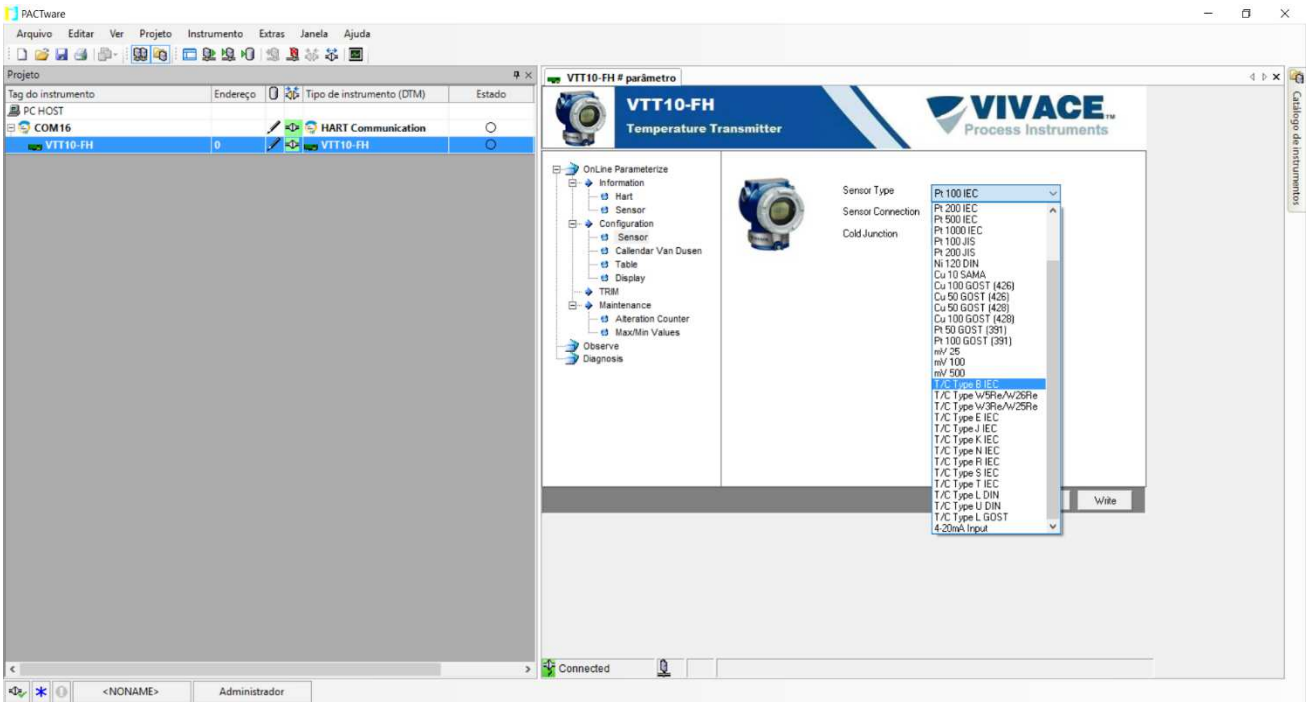

Figure 3.12– DTM sensor configuration screen for VTT10-FH.

4 MAINTENANCE

VTT10-FH, as all Vivace devices, suffers a several inspection before its shipping. However, some diagnostics are available in the case of malfunction in order to check problem cause (installation, configuration or on device itself).

4.1. HART PROGRAMMER DIAGNOSTICS

HART communication can indicate some diagnostics itself through “device status” byte.

- FIELD DEVICE MALFUNCTION – Informs device has a hardware or configuration problem.

- CONFIGURATION CHANGED – Informs a write command was executed.

- COLD START – Informs device has been restarted.

- MORE STATUS AVAILABLE – Informs there is more information available on command 48.

- PRIMARY VARIABLE ANALOG OUTPUT FIXED – Informs analog current is in constant mode.

- PRIMARY VARIABLE ANALOG OUTPUT SATURATED – Informs sensor is working out of its configured range.

- NON-PRIMARY VARIABLE OUT OF LIMITS – Informs internal sensor has a problem.

- PRIMARY VARIABLE OUT OF LIMITS – Informs connected sensor has a problem.

4.2. ADDITIONAL DIAGNOSTICS

Information related to diagnostics are available through command #48, according to the following table.

BIT #	DESCRIPTION	TRANSMITTER ACTION
7	HART® Default	HART default condition
6	TRD Default	Transducer default condition
5	Temp Sensor Fail	Device malfunction state
4	Acquisition Stopped	Device malfunction state
3	ADC Clamped	Device malfunction state
2	ADC Comm Fails	Device malfunction state
1	DAC Out of Limits	Device malfunction state
0	Trim Missing	Device malfunction state

Table 4.1 – Command 48 additional diagnostics.

4.3. ASSEMBLY AND DISASSEMBLY PROCEDURES

Figure 4.1 shows VTT10-FH component details. Before disassembling the device, make sure it is powered off. Maintenance on electronic boards must not be executed, under penalty of equipment warranty loss.

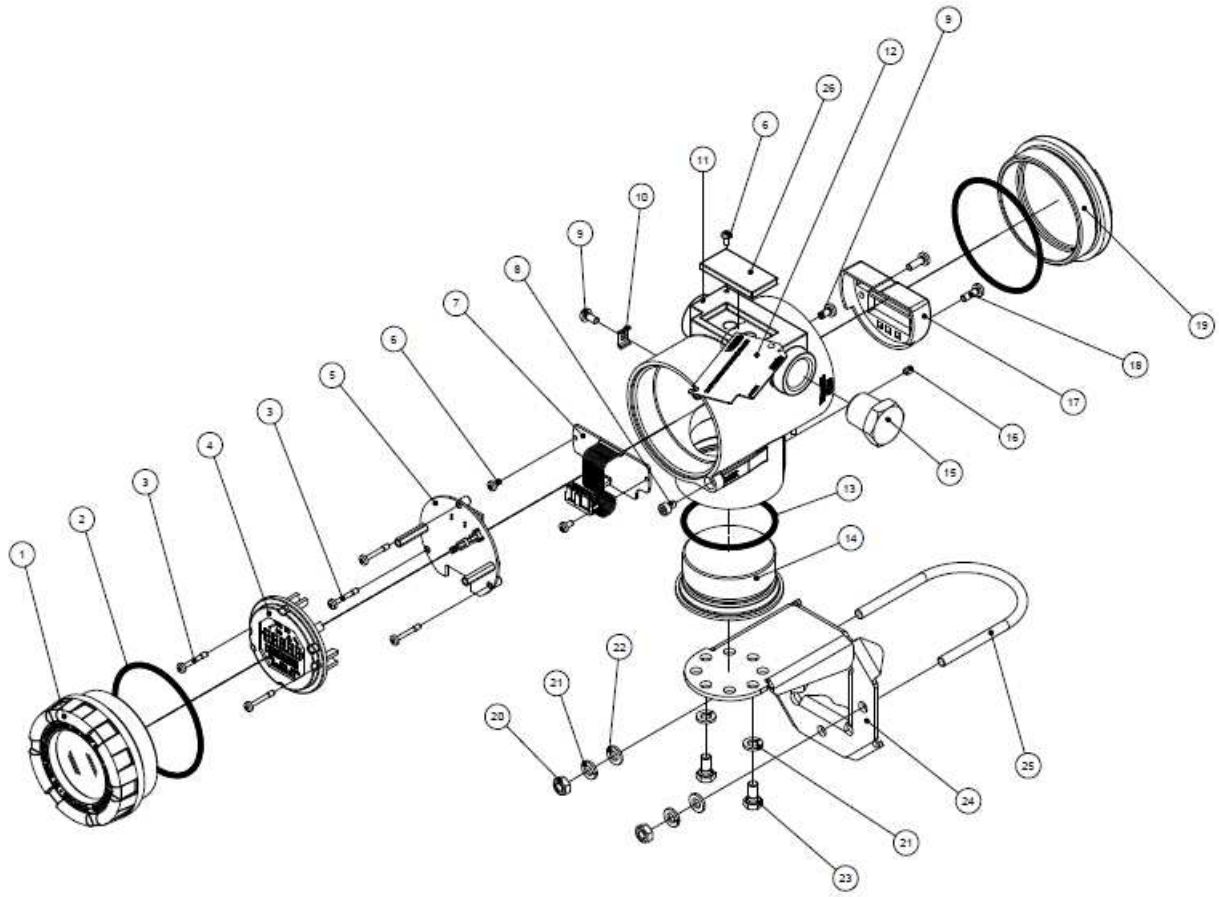

Figure 4.1 – VTT10-FH exploded view.

4.4. SPARE PARTS

All the spare parts available for VTT10-FH can be bought directly from *Vivace Process Instruments.* Those parts are listed on table 4.2.

SPARE PARTS LIST		
DESCRIPTION	**POSITION FIG. (4.1)**	**CODE**
FRONT COVER (includes o´ring)	1	2-10002
REAR COVER (includes o´ring)	19	2-10003
O´RING (cover)	2	1-10001
HOUSING	11	2-10011
DISPLAY (includes screws)	4	2-10006
MAIN BOARD (includes screws and spacers)	5	2-10012
ANALOG BOARD (includes screws and spacers)	7	2-10013
SCREWS FOR DISPLAY AND MAIN BOARD	3	1-10002
TERMINAL BLOCK (includes screws)	17	2-10014
SCREWS FOR TERMINAL BLOCK	18	1-10003
INFERIOR COVER (include o´ring)	14	2-10008
O´RING FOR INFERIOR COVER	13	1-10004
EXTERNAL GROUND (includes screws)	10	2-10010
HOUSING PLUG	15	1-10005
MOUNTING SUPPORT (includes U clip and screws)	24	2-10009
COVER LOCK SCREW	8	1-10006
Z/S PROTECTION COVER	26	2-10015
IDENTIFICATION PLATE SCREW	6	1-10007
HOUSING LOCK SCREW	16	1-10008

Table 4.2 – VTT10-FH spare parts.

5 CERTIFICATION

VTT10-FH was projected to attend national and international regulation for explosion proof and intrinsic safety.

The transmitter is certified by INMETRO for intrinsic safety and explosion proof – dust ignition (Ex tb) and flame (Ex db).

6 TECHNICAL CHARACTERISTICS

6.1. IDENTIFICATION

VTT10-FH has an identification plate fixed on the superior side of its housing, specifying model, manufacturer and serial number, as shown on figure 6.1.

Figure 6.1 – VTT10-FH identification plate.

6.2. TECHNICAL SPECIFICATION

The following table shows the technical specifications for VTT10-FH:

Accuracy	As tables 6.2, 6.3 and 6.4
Power Supply / Output Current	12 to 45 Vdc, no polarity / 4-20 mA according to NAMUR-NE43
Communication Protocol	HART® 7
Hazardous Area Certifications	Explosion Proof and Intrinsically Safe
Ambient Temperature Effects	For variation of 1 °C: - Resistive Sensors: ± 0.0052% of reading in Ohm - Millivoltage Sensors: ± 0.001% of reading in mV
Reading Stability	±0.1% of reading or 0.1°C (0.18°F) - whichever is greater. RTD: 3 years; Thermocouples: 2 years
Ambient Temperature Limits	- 40 to 85°C
Configuration	EDDL and FDT/DTM tools, as well as PALM and Android platform.
Assembly	In field, directly on the sensor, through a bracket on a 2” pipe or fixed on a wall or panel
Protection Degree	IP67
Electrical Isolation	Galvanic Isolation, 1.5 kVac
Housing Material	Aluminum
Approximate Weight with Bracket	1700 g

Table 6.1 – VTT10-FH technical specifications.

In the case of malfunction, NAMUR NE43 guarantees output current to 3.6 or 21 mA, according to user configuration. Also it goes to 3.8 or 20.5 mA when saturation occurs.

6.3. COMPATIBLE SENSORS

The following tables list sensor types and its work ranges for best performance and accuracy.

RTD – Temperature sensor based on resistance (2, 3 or 4-wire connection).

SENSOR OPTION	REFERENCE	INPUT RANGE (°C)	MINIMUM SPAN (°C)	ACCURACY (°C)
Pt100 (α=0.00385)	IEC751	-200 to 850	10	0.10
Pt200 (α=0.00385)	IEC751	-200 to 850	10	0.50
Pt500 (α=0.00385)	IEC751	-200 to 850	10	0.20
Pt1000 (α=0.00385)	IEC751	-200 to 300	10	0.20
Pt100 (α=0.003916)	JIS1604	-200 to 645	10	0.15
Pt200 (α=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 (α=0,00391)	GOST 6651-94	-200 to 850	10	0.20
Pt100 (α=0,00391)	GOST 6651-94	-200 to 850	10	0.12
Cu50 (α=0.00426)	GOST 6651-94	-50 to 200	10	0.34
Cu50 (α=0.00428)	GOST 6651-94	-185 to 200	10	0.34
Cu100 (α=0.00426)	GOST 6651-94	-50 to 200	10	0.17
Cu100 (α=0.00428)	GOST 6651-94	-185 to 200	10	0.17

Table 6.2 – Temperature RTD specification.

TC – Temperature sensor based on mV (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 – Temperature mV specification.

Ohm or mV – Linear resistive or mV sensor (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 – Ohm or mV specification.

6.4. ORDERING CODE

VTT10-F *Temperature Transmitter - Field*

Communication Protocol	**H**	HART
	P	PROFIBUS
Certification Type	**0**	NO CERTIFICATION
	1	INTRINSICALLY SAFE
	2	EXPLOSION PROOF
Certification Body	**0**	NO CERTIFICATION
	1	INMETRO
Housing Material	**A**	ALUMINUM
Electrical Connection	**1**	½ – 14 NPT
Painting	**1**	BLUE – RAL 5005
Mounting Bracket	**0**	NO MOUNTING BRACKET
	1	SS 304 MOUNTING BRACKET

Ordering Code Example:

VTT10-F	**H**	**-**	**0**	**0**	**A**	**1**	**1**	**0**

**Explosion Proof Certification Ex tb (dust ignition) and Ex db (flame)*

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

VIVACE Process Instruments	**FSAT** **Technical Analysis Solicitation Form**		
Company:		**Unit/Department:**	**Shipping Invoice nº:**
Standard Warranty: ( )Yes ( )No		**Extended Warranty: ( )Yes ( )No**	**Buying Invoice nº:**
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 (ºC)		**Work Temperature (ºC)**	
Min:	**Max:**	**Min:**	**Max:**
Operation Time:		**Fail Date:**	
FAIL DESCRIPTION: (Here user should describe in detail the observed behaviour of product, frequency of fail occurence and repeatability. Also, should inform operational system version and a quick description of control system architecture where the equipment was installed.			
ADDITIONAL OBSERVATION:			