INSTALLATION, OPERATION, CONFIGURATION AND MAINTENANCE MANUAL
October/2019

VTP10-P

PROFIBUS PA POSITION TRANSMITTER

VIVACE™ Process Instruments

PROFIBUS®

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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.

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.

DATA SAVING

Whenever static data is changed via configuration, LCD will display ⚠ icon, which will be blinking until the save process is complete.

If user wishes to shut down the equipment, he must wait for the process to be finished.

If the equipment is shut down during saving process, a default will be performed, setting default values in device parameters and the user must subsequently check and configure those parameters according to his needs.

ERROR ON SAVING DATA

If a data execution or saving operation was incorrectly performed, message "BlkEr" will be displayed when the equipment is powered up.

In this case, user must perform factory initialization using two magnetic tool units as described below. Application-specific settings should be performed again after this procedure (except for the physical address and the "GSD Identifier Number Selector" parameter).

- With the equipment off, access "Z" and "S" holes of local adjustment, located under the equipment nameplate;
- Insert one of the tools inside "Z" hole and the other inside "S" hole;
- Energize the equipment and keep both magnetic tool units until icon ⚠ is displayed;
- Do not turn off power while icon ⚠ is displayed. If this happens, restart the procedure.

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

PROFIBUS-PA position transmitter **VTP10-P** integrates *Vivace Process Instruments* field device family, being developed to monitor linear and rotative length systems, such as valve actuators.

The transmitter can be powered by a 9 to 32 Vdc voltage (bus powered) and uses the Profibus-PA communication protocol for configuration, calibration, monitoring and diagnostics. VTP10-P generates a position proportional value, externalizing it via Analog Input Block (AI) for Profibus-PA systems, allowing movement totalization through Totalizer Block (TOT).

The measurement sensor used on VTP10-P has no mechanical contact with the installed system whatsoever, since it works on magnetic field effect, which guarantees high precision and immunity to mechanical variations. Easy to install and to initialize, the transmitter also measures ambient temperature and executes several diagnostics for system predictive maintenance, such as reversal, strokes and mileage counters, and position histogram.

Through a Profibus-PA configurator, Android platform or tools based on EDDL or FDT/DTM user can configure measurement scales, work units and calibration, also monitoring measuring values and device status. User can also execute configurations via local adjustment using a 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.

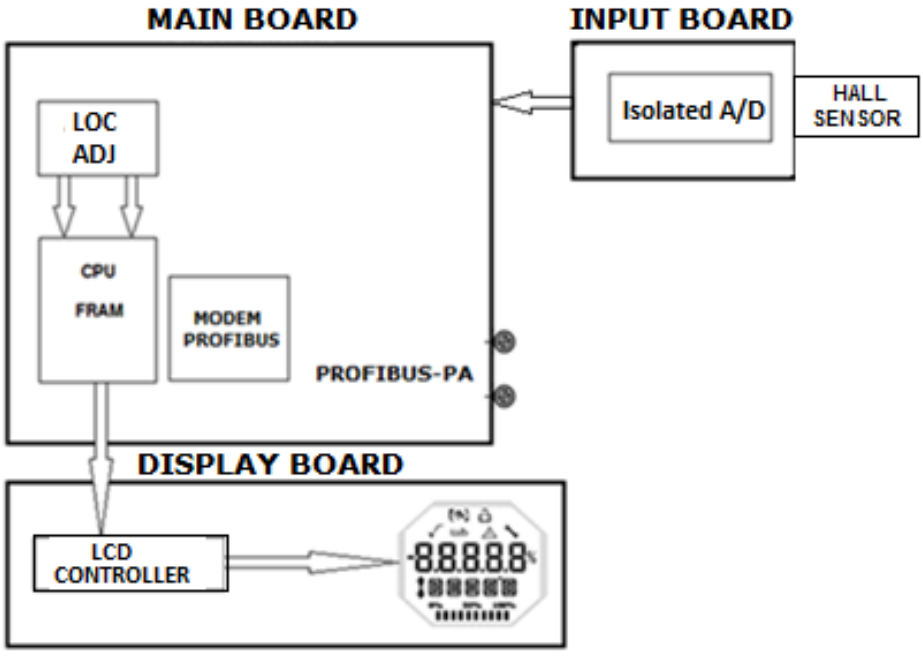


Figure 1.1 - VTP10-P block diagram.

The main board controls position transmitter main functions. The input board receives Hall Effect sensor signal and converts it to a digital signal through the isolated A/D converter. This signal is sent to main board CPU, which performs all the logic of conversion and configuration control through its firmware, characterizing the magnetic sensor signal for position.

CPU also receives local adjustment block inputs for transmitter local configuration via magnetic screwdriver. Profibus Modem block interfaces CPU with Profibus-PA signals of communication network.

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

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.*

Every device installation process must be executed by qualified personnel, following the procedures demanded by safety rules. It is highly recommended to begin with transmitter mechanics installation on plant, by correctly positioning the magnet and appropriate bracket for transmitter. Only after that, the electrical installation must be performed, connecting the power supply and communication cables to the transmitter.

2.1. INSTALLATION CONDITIONS

Environment conditions must always be considered on transmitter installation, since its performance can be affected by bad conditions of temperature, vibration and humidity. Temperature can affect some electronics behavior. Thus, care must be taken when placing transmitter to avoid high temperatures exposure.

As VTP10-P sensor is magnetic with no mechanical contact, light vibrations should not affect transmitter performance. It is very important that excessive magnetic field variations are avoided though, what might happen when excessive vibration exists on the transmitter. For the cases where considerable mechanical vibrations exist, Vivace offers a remote sensor (code xxxx), which separates transmitter body from magnetic sensor, avoiding measurement interference by those vibrations.

2.2. MECHANICAL ASSEMBLY

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.

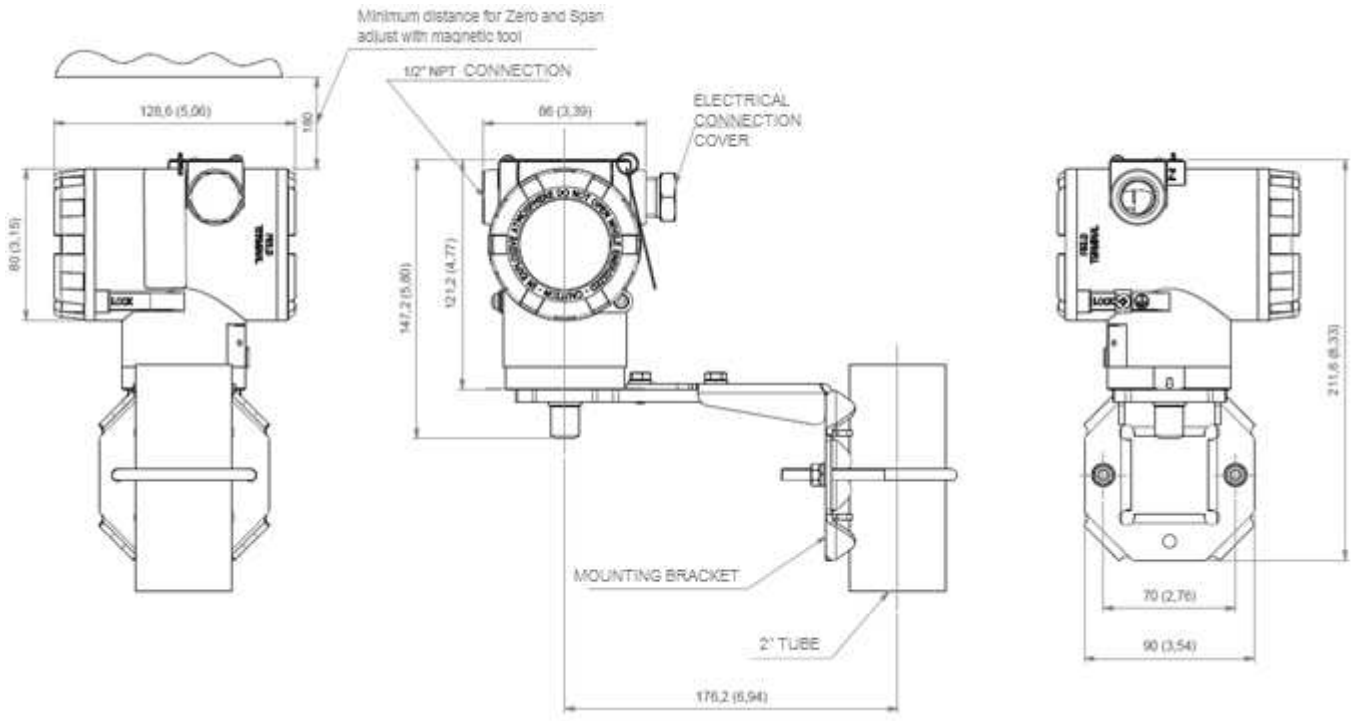


Figure 2.1 – Dimensional and mounting drawings for VTP10-P.

Figure 2.1 shows the dimensional drawing and mounting positions for VTP10-P on standard bracket. Magnets dimensional drawings can be found on section 2.4.

To avoid the risk of involuntary loss of VTP10-P covers due to vibration, for instance, it can be locked by screw, as shown on figure 2.2.

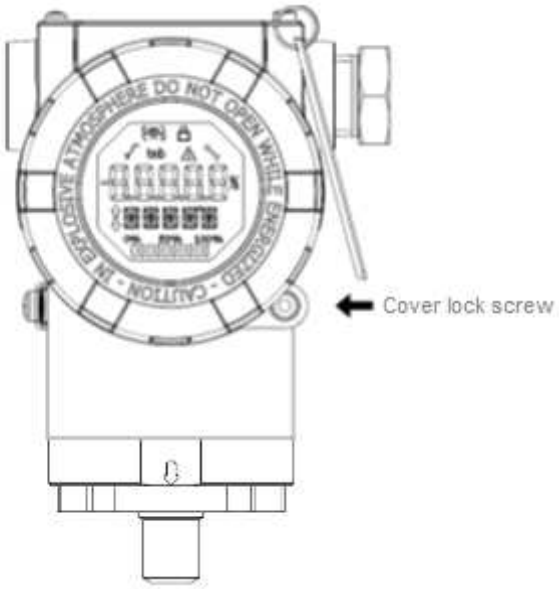


Figure 2.2 – Front cover lock.

VTP10-P is a field device, so it can be installed through a mounting bracket on a 2” tube attached with a U clip. The transmitter can also be attached with the same mounting bracket to a wall or panel.

For best LCD positioning device enables 4 x 90° housing rotation, as shown on figure 2.3

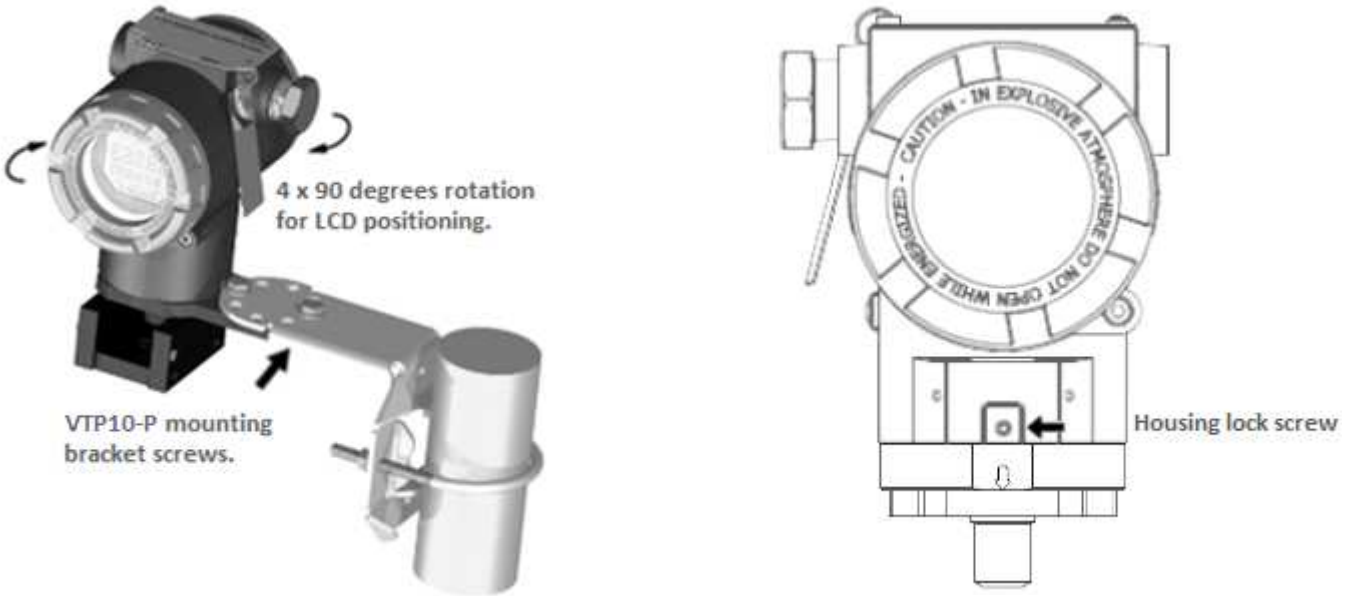


Figure 2.3 – VTP10-P bracket fixation and housing 4 x 90° rotation.

VTP10-P liquid crystal display can also be rotated 4 x 90° so indication will be adequate for user visualization. Figure 2.4 illustrates rotation possibilities for VTP10-P LCD.

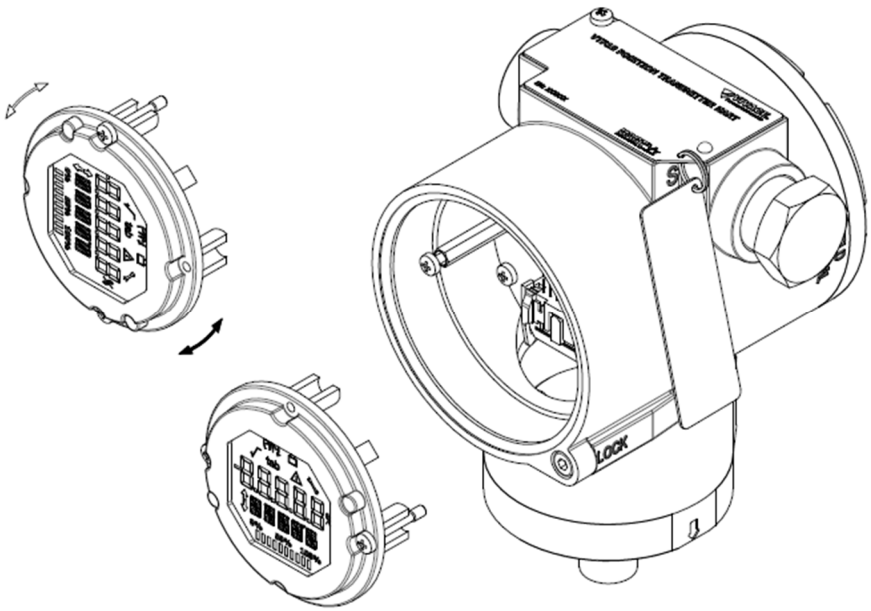


Figure 2.4 – 4 x 90° LCD rotation.

VTP10-P reference magnet installation must begin by positioning it on user system, in order to allow sensor to move through the entire extension to be measured, and aligning magnet indication arrow with transmitter indication arrow on system's central position (50% of length), where sensor will be located (indication arrow located on inferior part of transmitter housing).

After magnet positioning, it must be screwed to user system in order to avoid reference position dislocation, causing measurement failure. Figure 2.5 exemplifies VTP10-P installation on a rotative system, while figure 2.6 shows the installation on a linear system. Note that a minimum and maximum gap (2 mm to 4 mm) between magnet superior face and transmitter inferior face is necessary in order to guarantee sensor performance.

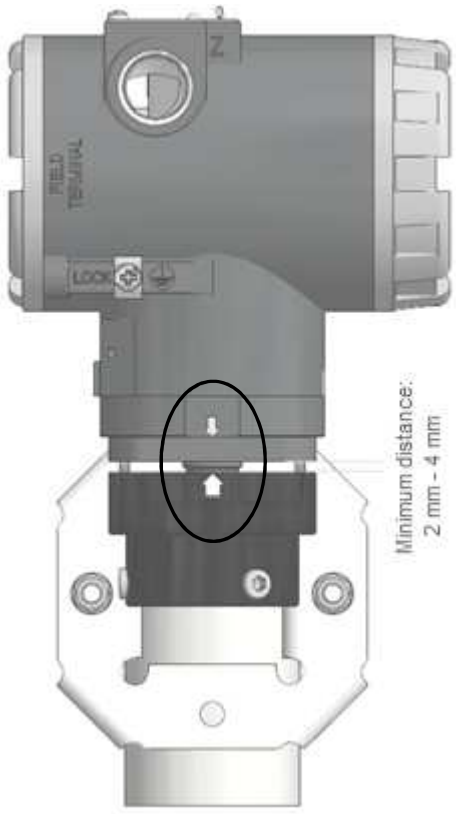


Figure 2.5 – VTP10-P assembly on rotative system.

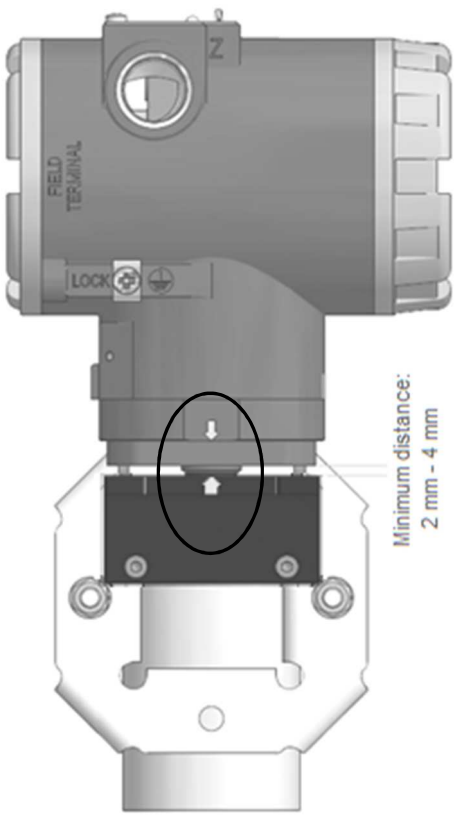


Figure 2.6 –VTP10-P assembly on linear system.

Figure 2.7 shows VTP10-P installed on both linear and rotative valve actuators. For more details on magnet types, check section 2.4.

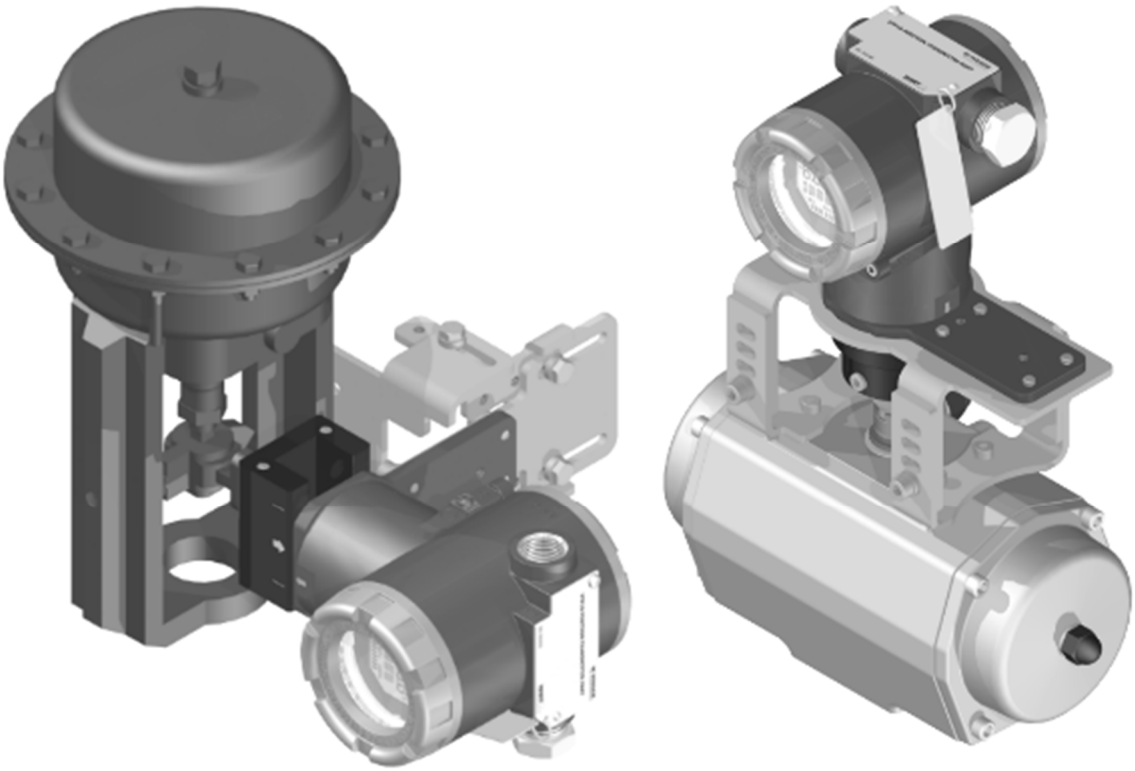


Figure 2.7 – VTP10-P assembly on valve actuators.

2.3. ELECTRICAL CONNECTION

To access the terminal block user must remove VTP10-P rear cover. First, loose cover lock screw (see figure 2.8) by turning it clockwise.

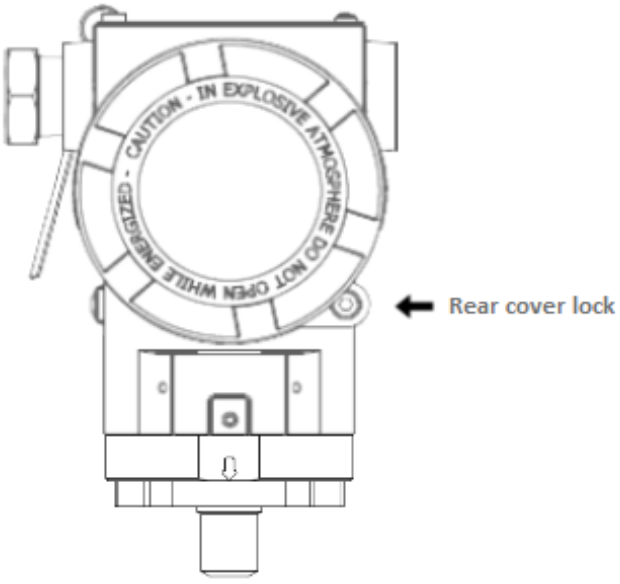


Figure 2.8 – Rear cover lock.

Terminal Description
Power Terminals - PWR BUS 9-32 Vdc not polarized
Grounding Terminals 1 internal and 1 external
Communication Terminals – PROFIBUS-PA communication with configurator

Table 2.1 – VTP10-P terminal description.

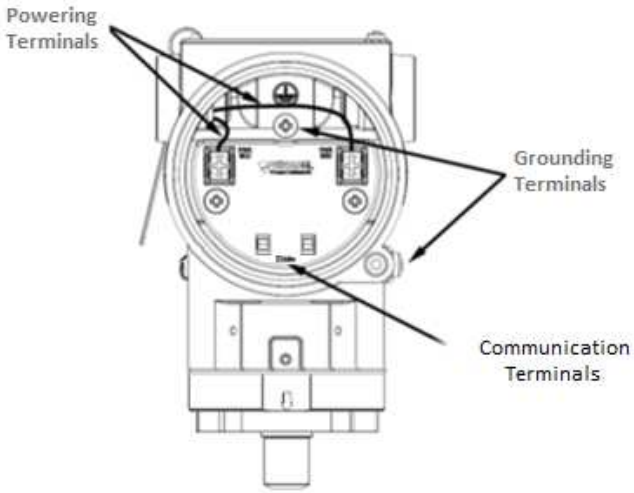


Figure 2.9 – VTP10-P connections and terminal description.

Figure 2.9 shows power supply (PWR BUS), grounding (internal and external) and PROFIBUS communication terminals for VTP10-P. For powering the device, it is recommended to use a 18 AWG twisted pair cable with shield (capacitance < 30 pF).

Table 2.1 describes VTP10-P terminal functions.

NOTE

All cables used for connecting VTP10-P with PROFIBUS-PA 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 Profibus-PA 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.

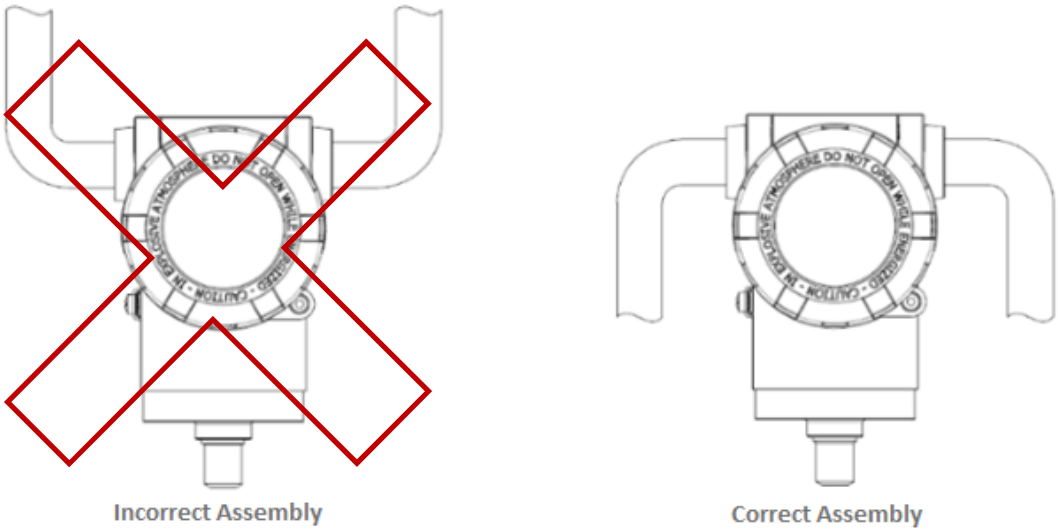


Figure 2.10 – Conduit installation.

Figure 2.10 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.

2.4. MAGNET SPECIFICATION

Correct magnet dimensioning is a primordial for perfect performance of position measurement, allowing sensor to achieve all system length with the highest magnetic field variation possible.

User must consider installation environment, type of movement (rotative or linear) and amplitude (length), in addition to mounting bracket to be used, among other parameters.

Vivace offers the following magnet options for the position transmitter:

Rotative *Option **0** on Ordering Code*

Used on rotative systems, it has a standard diameter with measurement from 0º to 120º (minimum span of 5º between inferior and superior points).

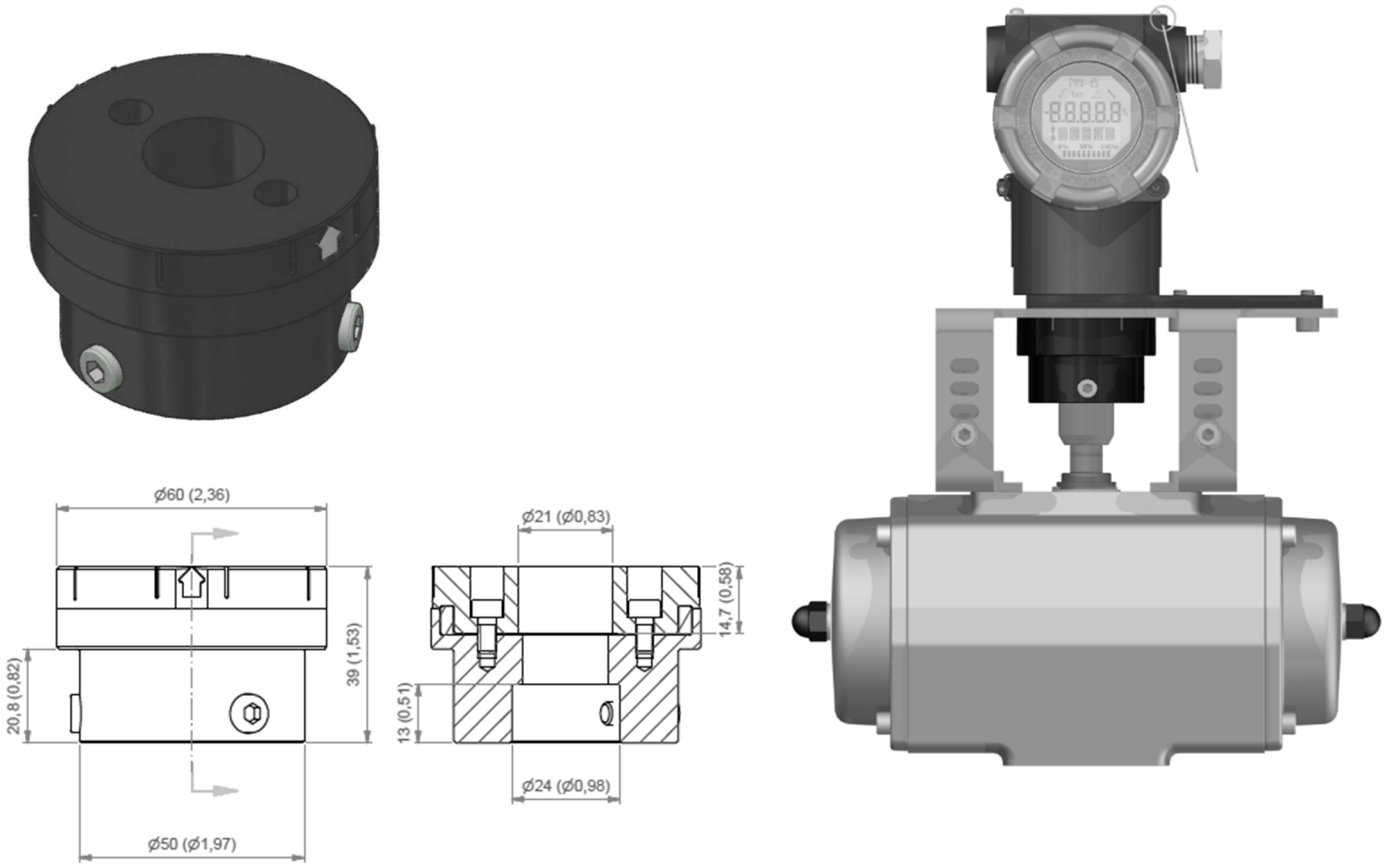


Figure 2.11 – Dimension and assembly of rotative magnet.

Linear 40 *Option **1** on Ordering Code*

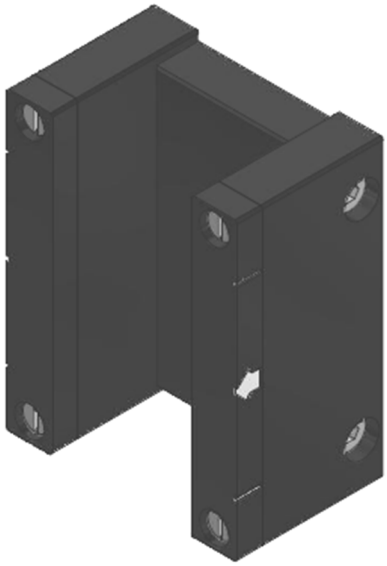
Used on linear systems up to 40 mm, with measurement from 0 to 40 mm (minimum span of 10 mm between inferior and superior points).

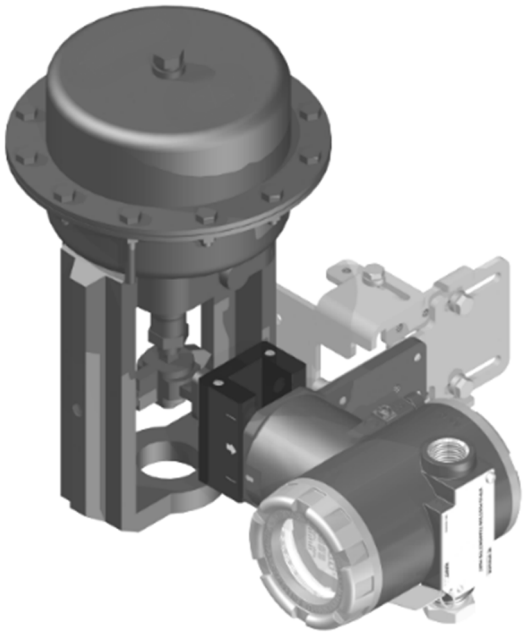
Linear 70 *Option **2** on Ordering Code*

Used on linear systems of 40 mm to 70 mm, with measurement from 0 to 70 mm (minimum span of 40 mm between inferior and superior points).

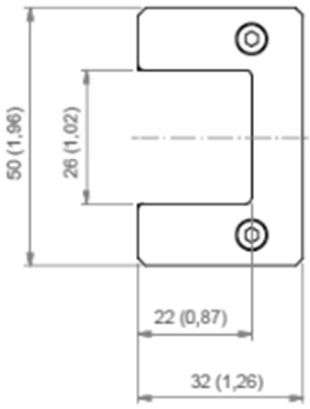
Linear 100 *Option **3** on Ordering Code*

Used on linear systems of 70 mm to 100 mm, with measurement from 0 to 100 mm (minimum span of 70 mm between inferior and superior points).





DIMENSIONS	A
40mm (1,57")	64mm (2,52")
70mm (2,76")	102mm (4,02")
100mm (3,94")	140mm (5,51")



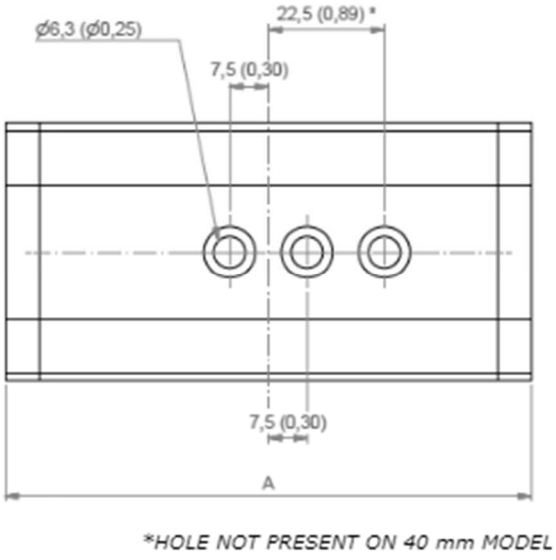


Figure 2.12 – Dimension and assembly of the three linear magnet models.

2.5. REMOTE SENSOR

For applications where excessive vibration or high temperatures (up to 105 ºC) exists on the measuring system or when the transmitter can not be installed due to its size, Vivace offers a remote sensor (optional) that works as an extension of the transmitter sensor, connected by a cable which has three length options to best adjust device mounting to user process.

Figure 2.13 shows the dimensional drawing of VTP10-P remote sensor components. At the left we can see the transmitter size that receives remote sensor signal, while on the right side we can find the opposite cable side, containing the magnetic sensor already adapted to a fixation support.

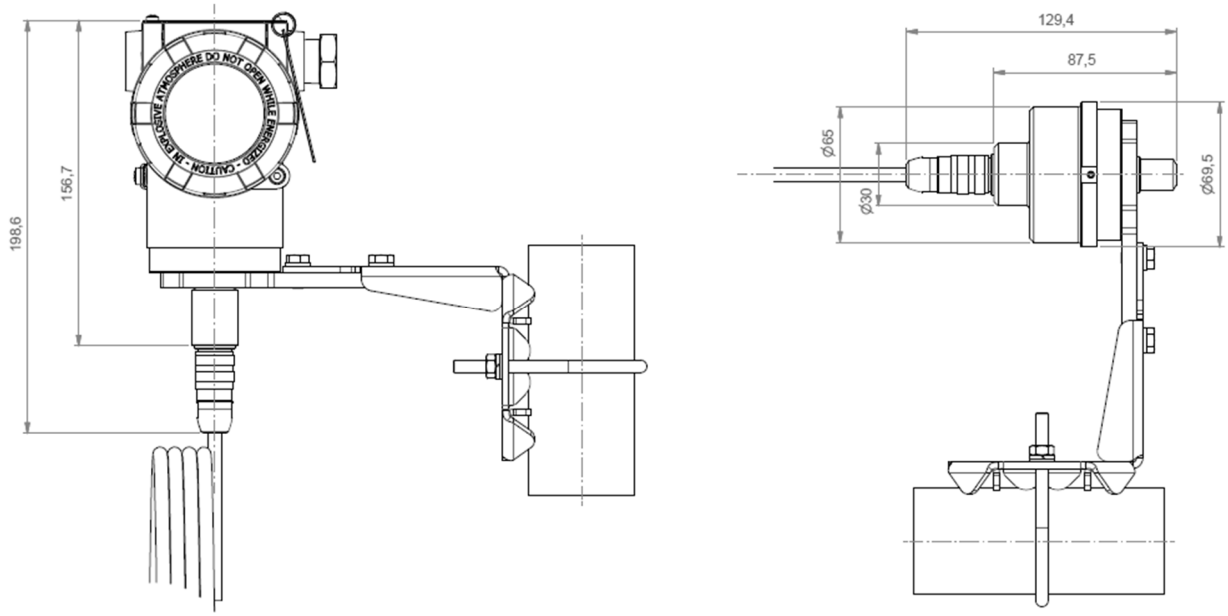


Figure 2.13 – Remote sensor dimensional drawing.

The remote sensor set is composed by three parts:

- Sensor itself, responsible for receiving the magnetic signal and sending it to transmitter as a milivoltage via sensor cable;
- Signal transmission cable from sensor to transmitter input board;
- Transmitter inferior base prepared for transmission cable connection.

An example of transmitter mounting using the remote sensor for a linear system measuring is shown on figure 2.14.

Figure 2.14 – VTP10-P remote sensor mounting.

2.5. PROFIBUS-PA NETWORK CONNECTION

Figure 2.15 illustrates the installation of a number of Profibus network elements and the connection of Profibus-PA devices to the Profibus network.

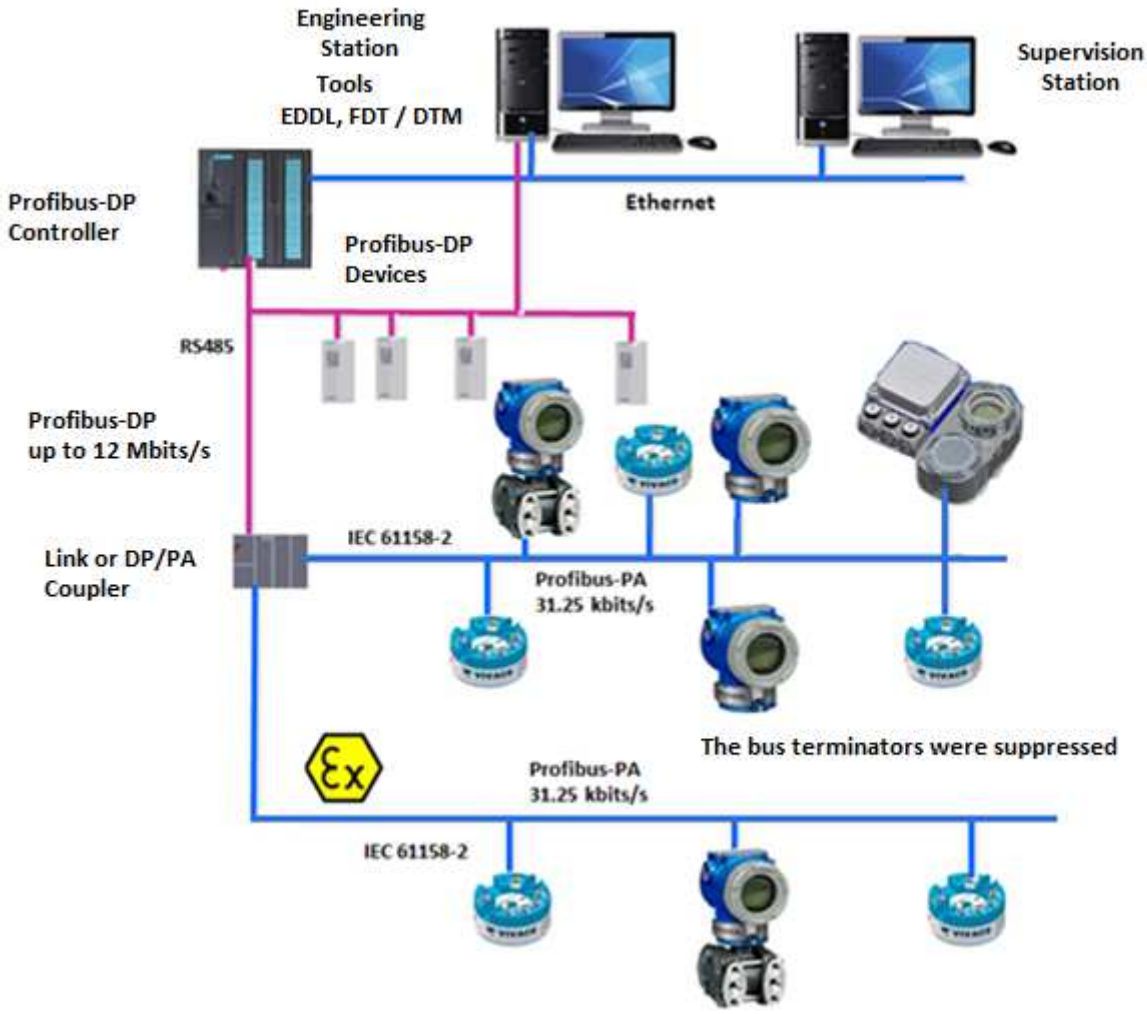


Figure 2.15 - Connecting a Profibus-PA device to the bus.

3 CONFIGURATION

The transmitter can be configured by any Profibus-PA compatible programmer. Vivace offers the interfaces VCI10-P (USB and Bluetooth) as a solution for configuring and monitoring any Profibus-PA device. VTP10-P can also be configured by local adjust using Vivace magnetic screwdriver.

3.1. LOCAL CONFIGURATION

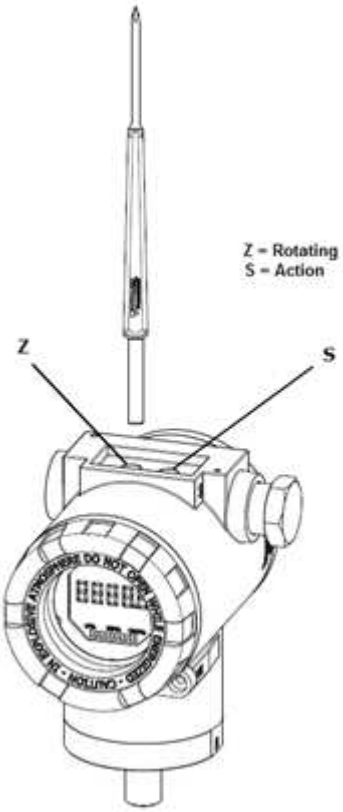


Figure 3.1 – Z and S orifices and magnetic screwdriver.

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, and 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

VTP10-P has two jumpers on its main board to protect data writing (WP) and enabling/disabling local adjust (ADJL). Figure 3.2 presents those jumpers.

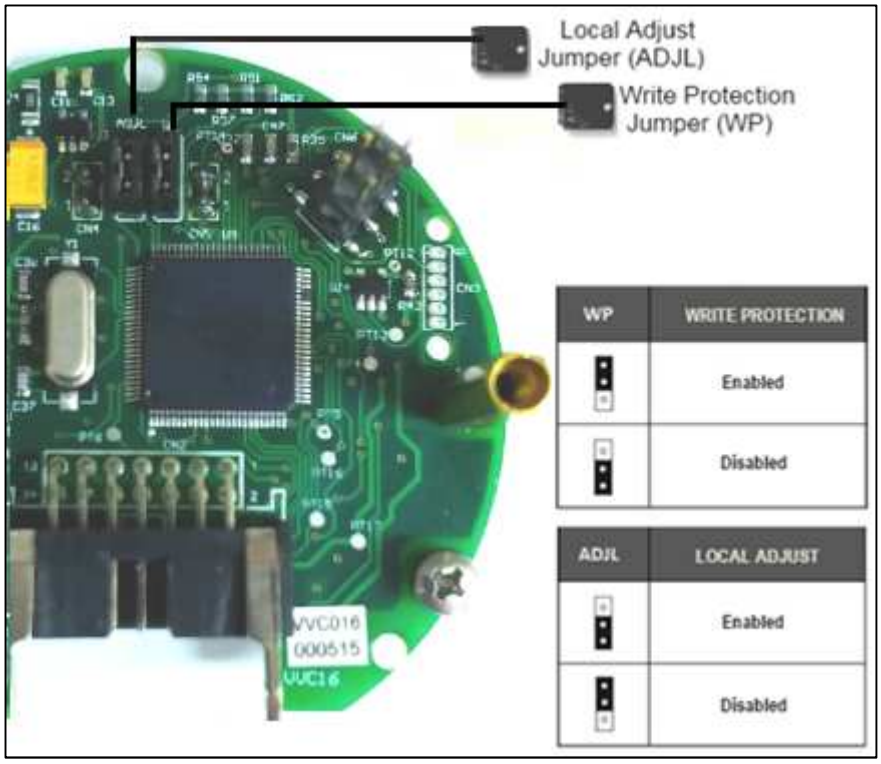


Figure 3.2 – Jumpers WP (write protection) and ADJL (local adjust) on VTP10-P main board.

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.

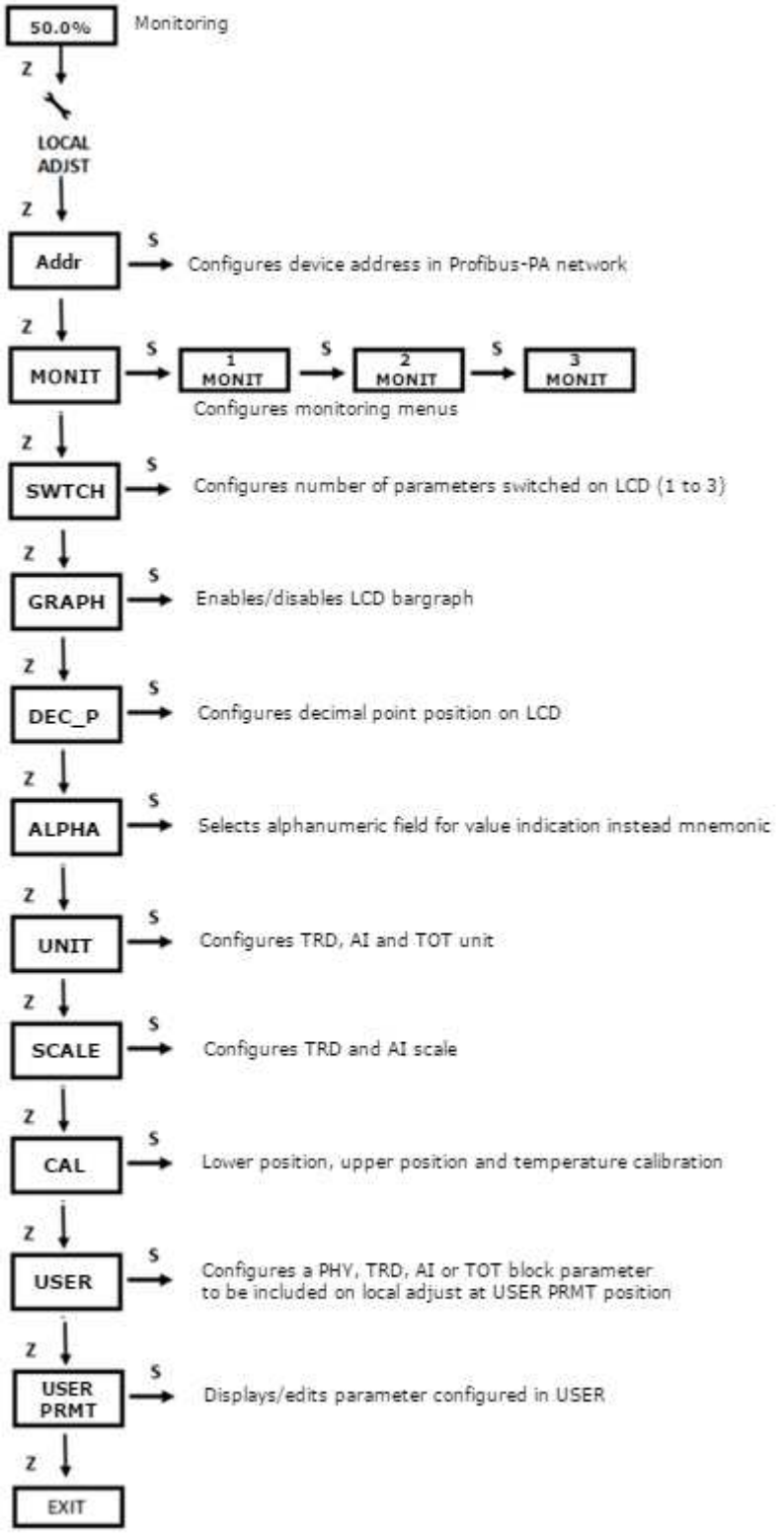


Figure 3.4 – Local adjust configuration tree.

3.5. PROFIBUS-PA CONFIGURATOR

Transmitter configuration can be executed via PROFIBUS-PA compatible programmer. Vivace offers the interfaces of the VCI10-P line (USB and Bluetooth) as a solution for identification, configuration and monitoring of the Profibus-PA line equipment.

Figure 3.5 shows the connection scheme for configuring VTP10-P using Vivace VCI10-UP USB interface, which powers the device in local mode, with a personal computer that has PACTware configurator software.

Figure 3.5 – VTP10-P configuration diagram with VCI10-UP.

3.6. PROFIBUS-PA CONFIGURATOR PROGRAMMING TREE

The configuration tree is a structure tree-shaped with the menus for all software resources available, as shown on figure 3.6.

For online configuration of the transmitter, check it is correctly installed, powered by the adequate voltage.

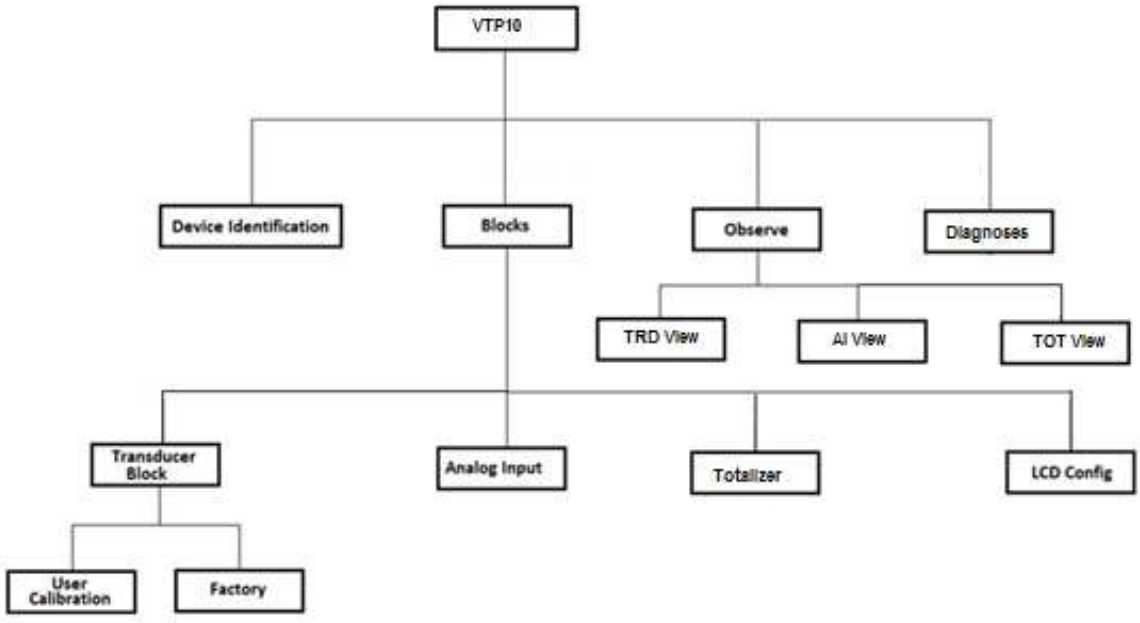


Figure 3.6 – VTP10-P programming tree.

Device Identification - The main device information can be accessed here, such as Tag, Manufacturer ID, Device ID, Order Code and Firmware Version.

Transducer Block - In this menu the transducer block is configured.

- **Basic Settings** - In this menu the user can configure scales, type of movement, etc.
- **Scales** - In this menu the output scale (EU0% and EU100%) is set and the unit of measurement
- **Backup Restore** - This parameter allows to restore factory calibration, last calibration, default data and sensor data, and back up the factory calibration, last calibration and sensor data.
- **User Calibration** - In this menu the lower and upper position adjustment is performed, as well as the user can see the value of the position and the Hall sensor.
- **Factory** - In this menu the user can select the GSD file identifier number (Profile Specific or Manufacturer Specific) and perform the factory reset.

Analog Input Block - In this the user can configure the parameters of the analog input block.

- **Basic Settings** - In this menu the Operation Mode (automatic, manual or out of service), Output Scale (EU0% and EU100%), Unit, Channel and Damping are configured.
- **Damping** is an electronic filter for the PV, which changes the response time of the transmitter 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 damping default 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 immediately react to changes in the input of the equipment, so the response time will be as short as possible. The increased damping value leads to an increase in the equipment response time.

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

Alarm / **Warning** - The upper and lower warning and alarm limits 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. The default graphic of the process variable boundaries is also shown.

- **Fail Safe** - This menu configures the fail safe type and fail safe value and displays the unit of measurement selected in the "Basic Settings".
- **Simulate** - This menu enables or disables the Simulation function, sets the position value, shows the unit selected in the "Basic Settings" and the status.
- **Mode Block** - This menu shows the Target Operation Mode (manual, automatic or out of service) and Actual, the value of the output variable in the unit selected in "Basic Settings" and the status is set. The alarm status of the position is also checked.

Totalizer – In this menu the totalizer block parameters are configured.

Totalizer block (TOT), as well as the AI block, receives a process value via the channel with the transducer block. This value is summed over time, for example in mass or volumetric flow measurements, common in pressure transmitters or as totalization of displacement, in the position transmitter VTP10-P.

TOT block supports the following modes of operation:

- **Auto:** In this mode the block output is calculated and made available via cyclic communication to the controller, Profibus Master Class 1;
- **OOS (Out of Service):** In this mode, the block algorithm is not processed.

The algorithm of TOT block is applied to the value measured by the transducer block when the mode is in Auto. This algorithm includes the treatment of errors and failures, selection of signals of the value to be totalized, as well as the treatment of alarms.

TOT block totalizes the process variable as a function of time and its unit is supplied by the transducer block. Its algorithm converts the time units into units per second.

TOTALIZATION

The selection of the totalized value signal is controlled by the MODE_TOT parameter. The resulting totalization is obtained by summing the values, considering their signals and what is configured in MODE_TOT:

- **Balanced** - Negative and positive values will be totaled;
- **Positive only** - only positive values are totalized. Negative values will be considered zero;
- **Negative only** - only negative values are totalized. Positive values will be considered zero;
- **Hold** - The algorithm is kept constant.

The parameter TOTAL is the quantity totalized by the block, whose unit is in accordance with the UNIT_TOT parameter and must be compatible with the input unit provided by the Transducer block.

RESET AND PRESET

Totalization can be configured by the parameter SET_TOT, where the user can reset it with the Reset option, initialize it with a value pre-defined by the PRESET_TOT parameter, by choosing the Preset option, or start the totalization by setting SET_TOT to the Totalize option.

LCD Config - the LCD display can be configured for up to 3 variables: Monit 1, Monit 2 and Monit 3.

- **Monit x** - In these menus the user can configure the monit menu at LCD selecting the Function Block (Physical, Transducer, Analog Input or Totalizer), Relative Index (Target Mode, Primary Value or User Index), Structure Element, Mnemonic, 3 or 4), the alphanumeric field (if it is enabled or disabled and the value of the monitored parameter is displayed).
- **User Prmt** – similar to Monit x but the user can choose its configuration.
- **LCD Switch** - This selects how many parameters to switch on the LCD (1, 2 or 3).
- **LCD Bargraph** - In this menu the bargraph of the display is enabled or disabled.

Observe - In this menu the values and status of the parameters of the Transducer, AI and TOT blocks are monitored.

Diagnosis - Here the user has access to the VTP10-P diagnostics. The VTP10-P has several diagnostics in order to assist in the predictive maintenance of the measurement system. By setting the parameters according to the specific application, the user can count on a series of indicators that will assist in the decision to perform the necessary maintenance in the system.

- **Position Diagnostics** - Enables / disables, configures and reports Reversion diagnostics ff the movement (Reversals), Strokes, Total Travel (odometer) and Position Histogram:
  - **Reversals**: Set Dead Band Zone and Limit Counter.
  - **Odometer** (Total Travel): sets the Dead Band Zone and Movement Limit (Summation).
  - **Strokes**: Set the Count Zone (close to 100% and 0%) and the Beat Counter Limit within this zone.
  - **Position Histogram**: reports the percentage of time in each position range (5%) Of the transmitter's total operating hours.

User can enable, disable and reset diagnostic conditions. Alarm conditions are shown in the Diagnosis Status parameter.

User Calibration: In this menu the user can access position or temperature sensor calibration

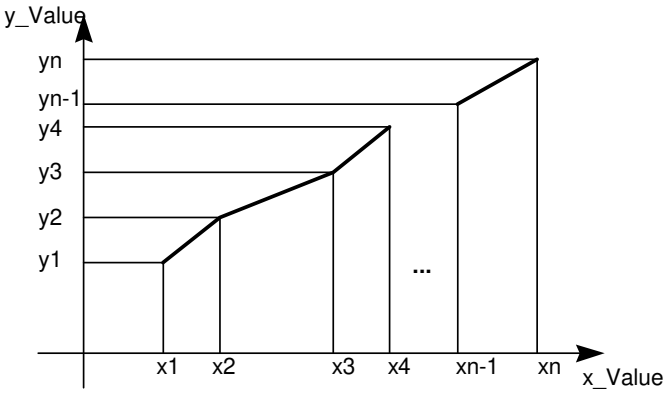
Position - Allows user to adapt the movement range to transmitter magnetic sensor references. With the moving system on inferior position, user should execute the inferior position trim. After that, move the system to superior position and execute superior position trim. This procedure can be executed via local adjustment.

With those two calibrations, transmitter can refer to 0% and 100% of user system with the offered accuracy. Position value can be displayed on percentage (%) or according to range and unit configured by user on the parameters

Temperature: Temperature calibration is the simpler process offered by VTP10, where user only needs to send the current temperature value (measured by a specific thermometer, for example). Transmitter will automatically adjust the internal temperature measurement based on the difference with the temperature sent by user. This process may be repeated as much as user wishes, until the correct value for temperature is read.

User Table: The VTP10-P has a user table with 21 points with output in percentage (%). Set a minimum of two points. These points will define the characterization curve. The maximum number of points is 21. It is recommended to select equally distributed pointes over the desired range or over a part of the range where better precision is required. The table has to be monotonically increasing, that is, the points in increasing order of x.

Index	x_Value	y_Value
1	x1	y1
2	x2	y2
3	x3	y3
4	x4	y4
...	...	...
n	xn	yn



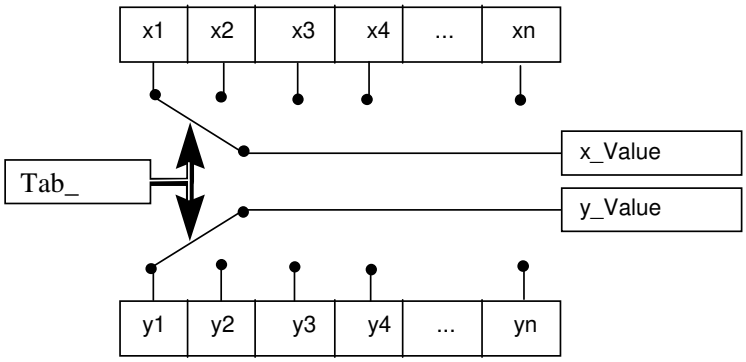


Figure 3.7 – User table example.

3.7. PREDICTIVE DIAGNOSIS

REVERSAL

Diagnostic for checking the transitions of the measurement system. With each inversion of sense of movement a counter is incremented. The reversal of direction is considered based on the Reversal Deadband parameter, configured by the user. In addition, user can set a maximum counter value in order to generate an alarm when it is exceeded. Its alarm is activated in the Diagnose Status parameter. The user can disable this diagnosis as well as reset the Reversals counter.

In the graph of figure 3.8, considering the variations d1 and d2, where d1 < Reversal Deadband and d2 > Reversal Deadband, the reversals counter will be incremented only in the occurrence of d2, ignoring the small reversal of d1, since it is less than the minimum value of configured dead band zone.

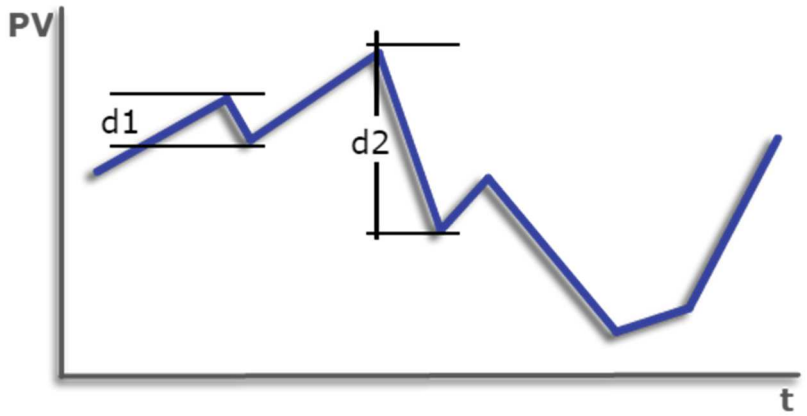


Figure 3.8 – Example of occurrences of reversals in VTP10-P.

STROKE

Diagnostic to check achievement of measuring system edges. To each entry in the end-of-course region a counter is incremented. The definition of the end-of-course region is configured in regions close to 0% and 100%. In addition, user can set a maximum value for counter in order to generate an alarm when it is exceeded. Its alarm is activated in the Diagnose Status parameter. User can disable this diagnosis as well as reset the Strokes counter.

In the graph of figure 3.9, the end-of-stroke beat counter will be activated in regions P1 and P2, considering the values of the configured ends in the black horizontal lines. Note that the counter will not be incremented more than once in each region as long as the variation does not exceed 1%.

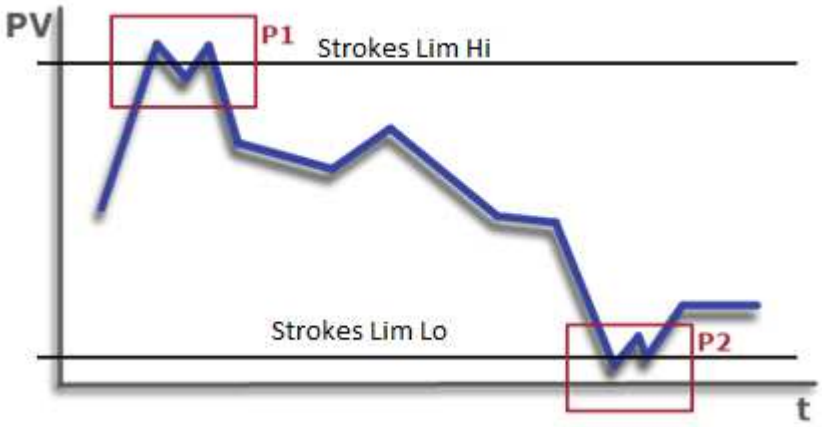


Figure 3.9 Example of occurrences of beats at end of course in VTP10-P.

TOTAL TRAVEL (ODOMETER)

Diagnostic for checking the total path of the measuring system. All the movement performed by the system above a minimum user defined value (Travel Deadband) is added to Total Travel accumulator. In addition, user can set a maximum value for the odometer accumulator in order to generate an alarm when it is exceeded. Its alarm is activated in the Diagnose Status parameter. User can disable this diagnosis as well as clear the Travel accumulator.

In the graph of figure 3.10, the variation located within the range d1 will not be taken into account, where d1 is the dead band zone of the variation (Total Travel Deadband). As soon as the movement difference exceeds this value (up or down), travel accumulator will be incremented by this difference.

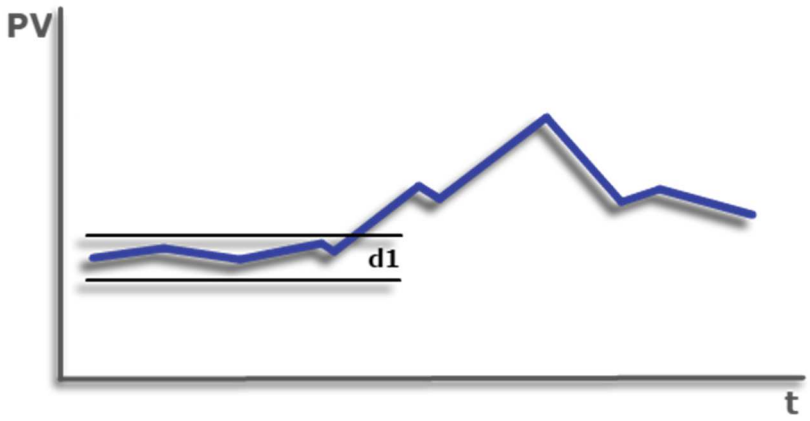


Figure 3.10 - Example of travel counting in VTP10-P.

POSITION HISTOGRAM

This diagnostic allows user to read a position history for the several position ranges along the measuring system through working time. In possession of these data user can visualize a bar-shaped graphic indicating the amount of time (in percentage of total working time) that transmitter remained on each of 5% range of system course. In addition, user can check the time taken since the histogram was started and also reset the histogram.

In this diagnostic user can configure the time base (seconds, minutes, hours, days or %) and monitors system behavior for future analysis and conclusions. Figure 3.11 shows an example graph of the positions traveled by a system over time.

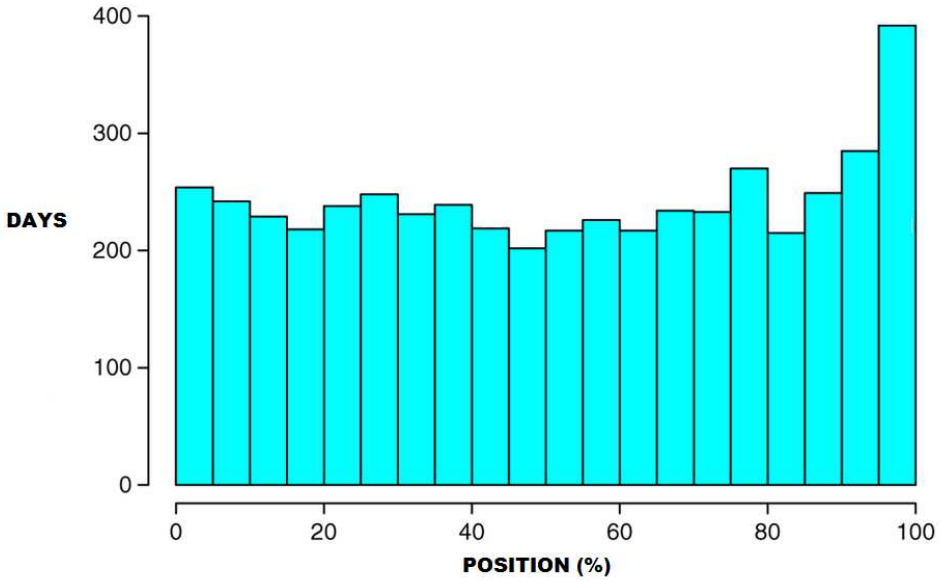


Figure 3.11 – Example of position history graphic on a system.

TEMPERATURE

The temperature diagnosis simply informs user if the measured temperature value is outside -40 °C and 85 °C range and its alarm is activated in the Diagnose Status parameter.

Attention! All diagnostics also have the option of *Enable/Disable* and *Reset*, allowing user to reset each diagnostic references, individually.

Attention! All diagnostics are DISABLED by default.

3.8. 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 VTP10-P using Vivace's VCI10-UP interface and PACTware®.

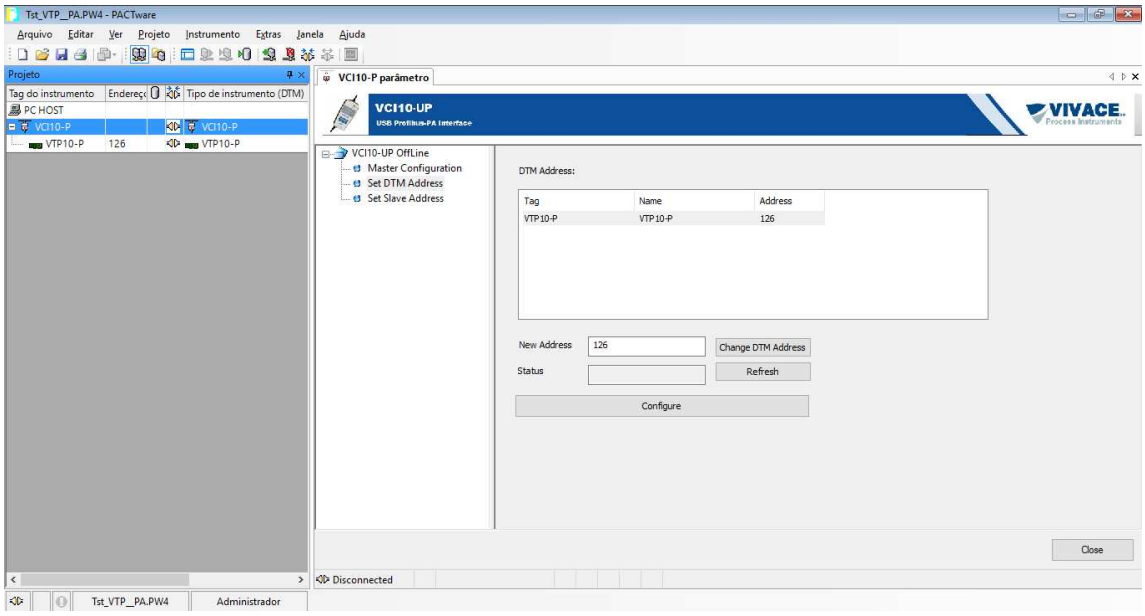


Figure 3.12 – Configuration screen of the communication interface in PACTware.

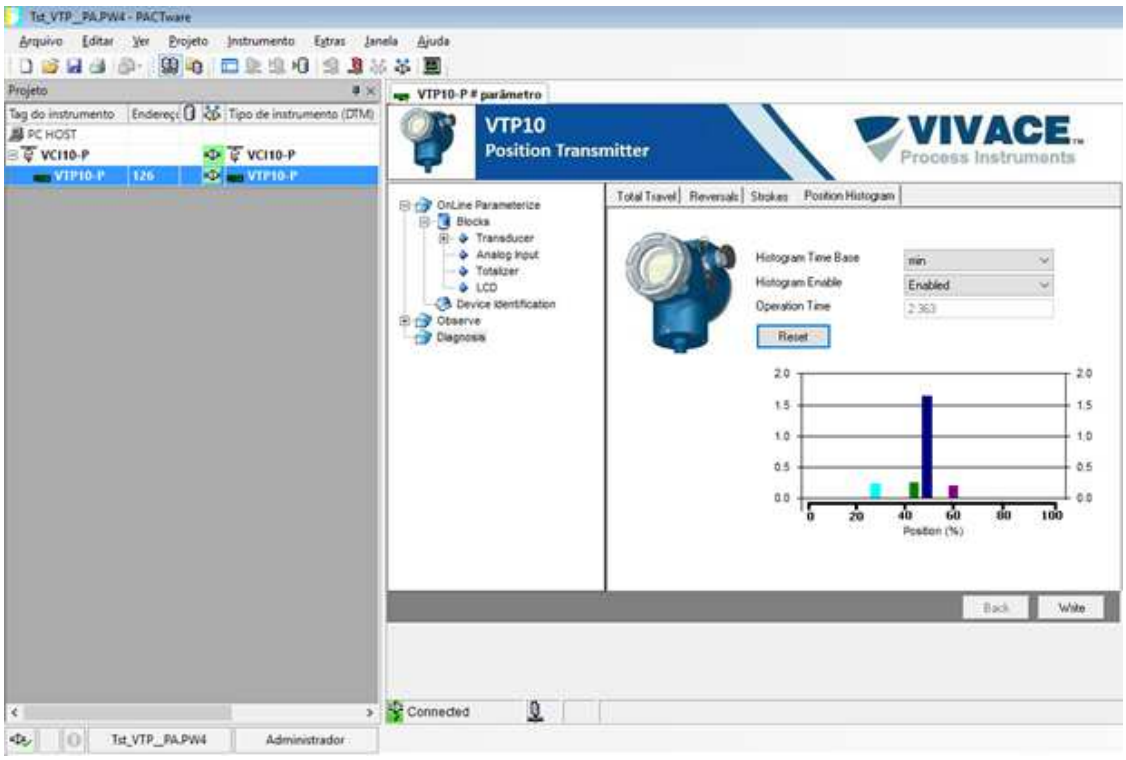


Figure 3.13 – Graph example of the history of positions of a system.

3.9. CYCLIC CONFIGURATION

VTP10-P has one AI (Analog Input Block) and one TOT (Totalizer Block). It also has the empty module (Empty Module) for applications where user wants to configure only one block.

According to the type of application, the convenient cyclic configuration must be performed, respecting the following cyclic order of blocks: AI and TOT. When the user does not work with some functional block, for example, it will only work with the AI, and then it should use the empty module: AI, Empty Module

Most Profibus configurators use two directories where GSD and BITMAP files from various manufacturers are located. The GSD and BITMAPS for Vivace equipment are available on its website (www.vivaceinstruments.com.br).

Follow the procedure below to integrate VTP10-P into a Profibus system (these steps apply to all Profibus-PA Vivace line devices):

- Copy the GSD file from the VTP10-P to the directory where all the GSD files of the Profibus configurator are located, usually called "GSD";
- Copy the BITMAP file from VTP10-P 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), P+F (SK1: 93.75 kbits/s and Sk2/Sk3: up to 12 Mbit /s). The IM157 device link can work up to 12 Mbits/s;
- Add the VTP10-P and specify its address on the bus;
- Choose the cyclic configuration via parameterization, according to the GSD file, which depends on the application, as previously seen. For the AI block, the VTP10-P 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.
- For the TOT block, you can choose the value of the totalization (Total) and also, totalizing is done taking into account the operating mode by selecting the parameter Mode_Tot, where you can define how the totalization will be done (Only positive values of flow, only negative values of flow, both values). You can also reset totalization and set an initial value (preset) via the Set_Tot parameter.
- If necessary activate the watchdog condition, which causes the device to assume a safe fail condition by detecting 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.

The VTP10-P has the GSD identifier number equal to 0x0FB4 (Manufacturer Specific) and can still work with the value 0x9740 (Profile Specific).

DDL, DTM and GSD files for VTP10-P can be found on Vivace website: www.vivaceinstruments.com.br

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

4 MAINTENANCE

VTP10-P as all Vivace devices, suffers several inspections 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. ASSEMBLY AND DISASSEMBLY PROCEDURES

Figure 4.1 shows VTP10-P 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 4.2 shows remote sensor components.

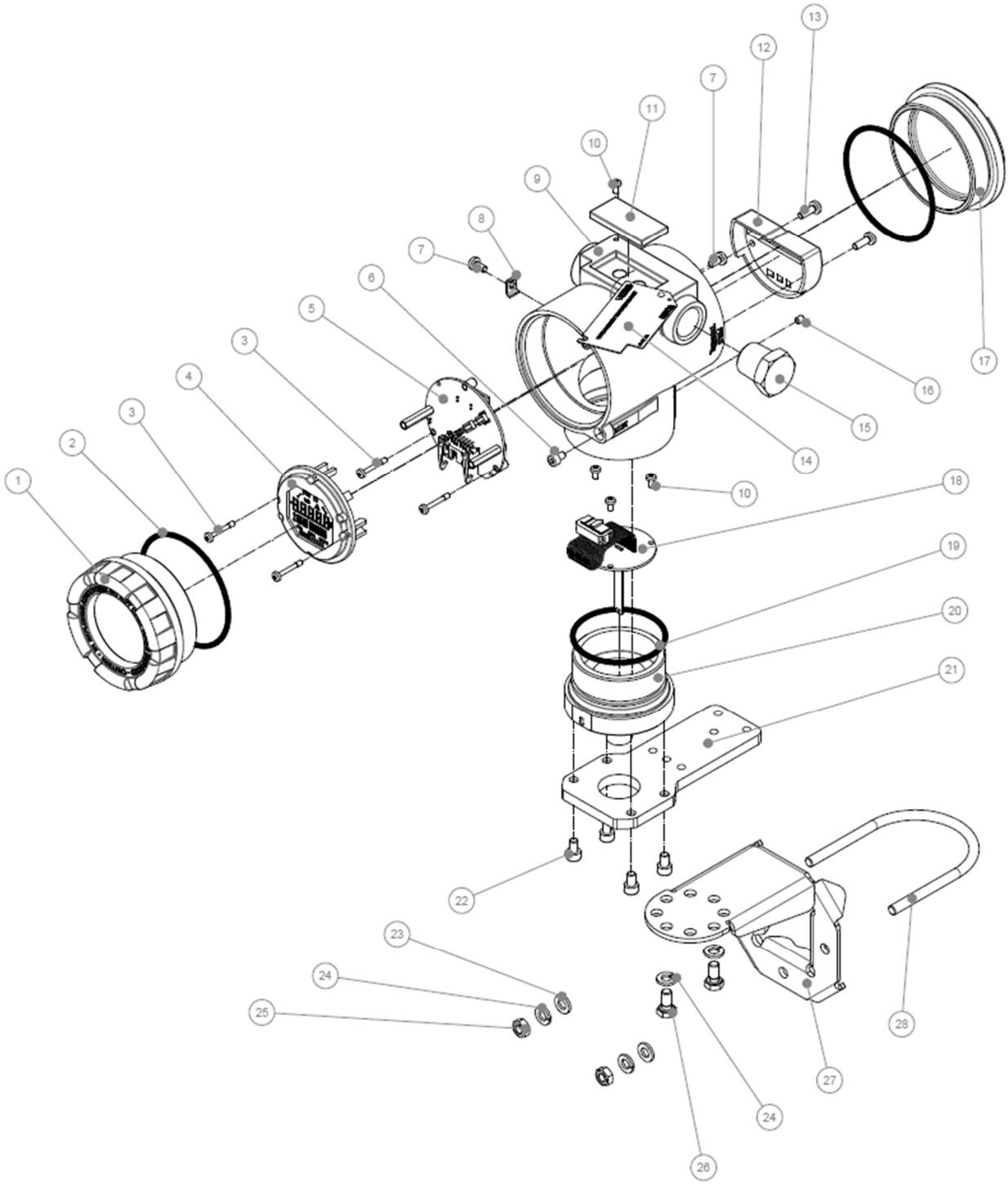


Figure 4.1 – VTP10-P exploded view.

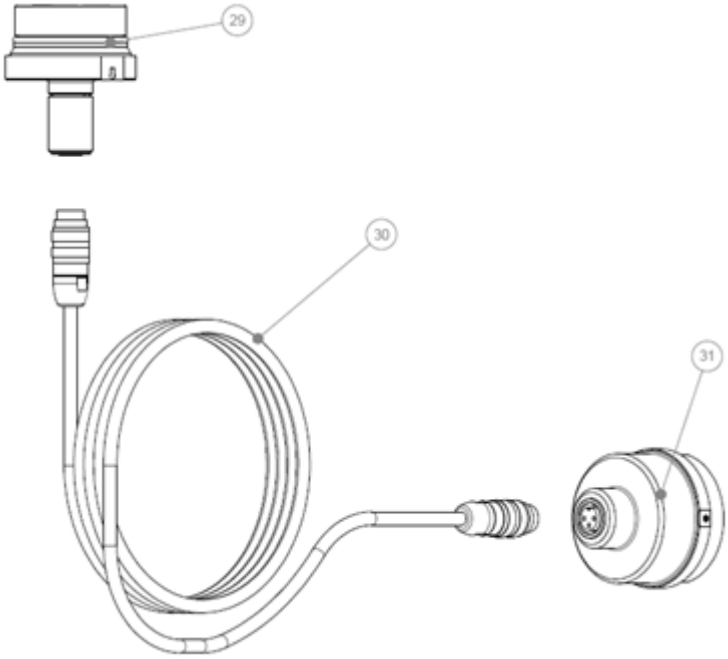


Figure 4.2 – Exploded view for VTP10-H remote sensor.

Following are the steps for VTP10-P maintenance and repair disassembly. Values between brackets identify the parts on the exploded view (Figure 4.1). For transmitter assembly, just follow the inverse sequence of previous steps.

1 Remove rear cover (17);
2 Disconnect power from transmitter, removing all cabling through side orifices;
3 Remove front cover (1) and loose main board screws (3);
4 Disconnect energy and sensor cables from main board (5);
5 Remove inferior cover (with magnetic sensor) from housing (20);
6 Loose analog board (18) fixation screws (10).
7 Carefully remove analog board with magnetic sensor (18) from housing inferior cover (20).

4.2. SPARE PARTS

All the spare parts available for VTP10-P can be bought directly from *Vivace Process Instruments.* Those parts are listed on table 4.1.

VTP10-P - SPARE PARTS LIST		
DESCRIPTION	**REFERENCE FIG. 4.1**	**CODE**
FRONT COVER (includes o'ring)	1	2-10002
REAR COVER (includes o'ring)	17	2-10003
O'RING (cover)	2	1-10001
HOUSING WITH TERMINAL BLOCK AND FILTERS	9	2-10033
DISPLAY (includes screws)	4	2-10006
MAIN BOARD (includes screws and spacers)	5	2-10043
ANALOG BOARD WITH SENSOR (includes screws)	18	2-10018
TERMINAL BLOCK COVER (includes screws)	12	2-10044
HOUSING INFERIOR COVER FOR MAGNETIC SENSOR (includes o'ring)	20	2-10021
INFERIOR COVER O'RING	19	1-10004
FIXATION ADAPTER (includes screws)	21	2-10020
MOUNTING SUPPORT (includes U clip and screws)	27	2-10009
Z/S PROTECTION COVER	11	2-10015
HOUSING PLUG	15	1-10005
EXTERNAL GROUND (includes screws)	7 e 8	2-10010
COVER LOCK SCREW	6	1-10006
IDENTIFICATION PLATE AND ANALOG BOARD SCREW	10	1-10007
HOUSING LOCK SCREW	16	1-10008
TERMINAL BLOCK COVER SCREW	13	1-10003
DISPLAY AND MAIN BOARD SCREW	3	1-10002
MAGNETIC TOOL	-	3-10001
ROTATIVE MAGNET	-	2-10022
LINEAR 40 MAGNET	-	2-10023
LINEAR 70 MAGNET	-	2-10024
LINEAR 100 MAGNET	-	2-10025
REMOTE SENSOR INFERIOR BASE	29	2-10038
REMOTE SENSOR 5 METER CABLE	30	2-10039
REMOTE SENSOR 10 METER CABLE	30	2-10040
REMOTE SENSOR 20 METER CABLE	30	2-10041
REMOTE SENSOR EXTENSION	31	2-10042

Table 4.1 – VTP10-P spare parts.

5 CERTIFICATION

VTP10-P 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

VTP10-P has an identification plate fixed on the superior side of its housing, specifying model, manufacturer and serial number, as shown on figure 6.1.

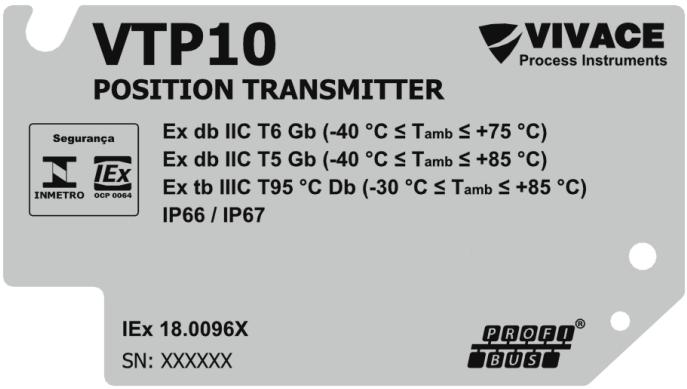


Figure 6.1 – VTP10-P identification plate.

6.2. TECHNICAL SPECIFICATION

The following table shows the technical specifications for VTP10-P:

Precision	±0.05% (Full Scale, not considering non-linearity and hysteresis effects).
Power Supply / Quiescent Current	9 to 32Vdc / 12 mA (Bus powered)
Communication Protocol/ Function Blocks	PROFIBUS-PA / VTP10 has 1 Analog Input (AI) e 1 Totalizer (TOT) block.
Classified Areas	Explosion Proof and Intrinsically Safe
Environment Temperature Limits	- 40 to 85°C (105°C for remote sensor)
Configuration	Local Adjust, EDDL, FDT/DTM, PALM and Android® Tools
Indication	5-digit, rotative, multifunctional LCD display.
Mounting	On field, with bracket for 2" tube. Remote sensor mounting is optional.
Measurement	Hall Effect Magnetic Sensor. Linear: 0 to 100 mm / Rotative: 0º to 120º (minimum span 10 mm or 5º)
Protection Degree	IP67
Housing Material	Aluminum
Weight without Bracket	1.5 Kg

Table 6.1 – VTP10-P technical specification.

6.3. ORDERING CODE

VTP10 *Position Transmitter*

Communication Protocol	**H**	HART
	P	PROFIBUS
Sensor Type	**0**	STANDARD
	1	REMOTE 05 M
	2	REMOTE 10 M
	3	REMOTE 20 M
Movement Type	**0**	ROTATIVE
	1	LINEAR 0 - 40 MM
	2	LINEAR 40 - 70 MM
	3	LINEAR 70 - 100 MM
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 BRACKET
	1	SS 304 BRACKET

Ordering Code Example:

VTP10-	**P**	**-**	**0**	**0**	**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:			