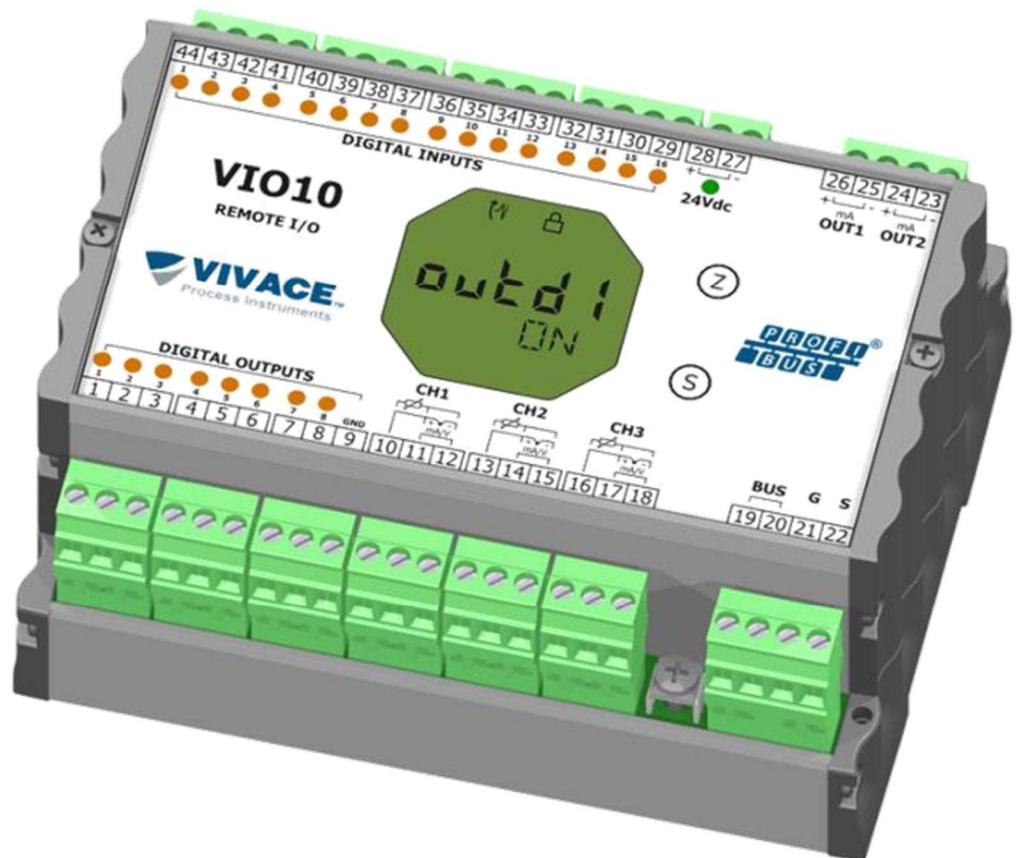


# VIO10-P

## PROFIBUS-PA REMOTE I/O



## COPYRIGHT

*All rights reserved, including translations, reprints, complete or partial reproduction of this manual, patent concession or model register of use/project.*

*No part of this publication may be reproduced, copied, processed or transmitted on any manner or any medium (photocopy, scanning, etc.) without the express permission of **Vivace Process Instruments Inc.**, not even for training or electronic systems.*

*PROFIBUS® is a registered mark of PROFIBUS International.*

## 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](http://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](mailto:contato@vivaceinstruments.com) preferably with the title "Suggestions".*

## SUMMARY

<b>1</b>	<b><u>EQUIPMENT DESCRIPTION</u></b>	<b><u>7</u></b>
1.1.	BLOCK DIAGRAM	7
<b>2</b>	<b><u>INSTALLATION</u></b>	<b><u>9</u></b>
2.1.	MECHANICAL ASSEMBLY	9
2.2.	ELECTRICAL CONNECTION	10
2.3.	CONNECTIONS	10
2.4.	PROFIBUS NETWORK CONNECTION	14
<b>3</b>	<b><u>CONFIGURATION</u></b>	<b><u>15</u></b>
3.1.	LOCAL CONFIGURATION	15
3.2.	JUMPER CONFIGURATION FOR LOCAL ADJUST AND WRITE PROTECTION	16
3.3.	LIQUID CRYSTAL DISPLAY	17
3.4.	LOCAL ADJUST CONFIGURATION TREE	17
3.5.	PROFIBUS PROGRAMMER	18
3.6.	PROFIBUS CONFIGURATOR PROGRAMMING TREE	18
3.7.	FDT/DTM CONFIGURATION	21
3.8.	CYCLIC CONFIGURATION	22
<b>4</b>	<b><u>MAINTENANCE</u></b>	<b><u>25</u></b>
4.1.	ASSEMBLY AND DISASSEMBLY PROCEDURES	25
4.2.	SPARE PARTS	26
<b>5</b>	<b><u>CERTIFICATION</u></b>	<b><u>27</u></b>
<b>6</b>	<b><u>TECHNICAL CHARACTERISTICS</u></b>	<b><u>28</u></b>
6.1.	IDENTIFICATION	28
6.2.	TECHNICAL SPECIFICATION	29
6.3.	TEMPERATURE SENSORS	30
6.4.	ORDERING CODE	31
<b>7</b>	<b><u>WARRANTY</u></b>	<b><u>32</u></b>
7.1	GENERAL CONDITIONS	32
7.2	WARRANTY PERIOD	32
	<b><u>APPENDIX</u></b>	<b><u>33</u></b>

## 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.*

## SYMBOLOLOGY



*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

VIO10-P remote I/O is a member of *Vivace Process Instruments* Profibus-PA family, designed for field installation or DIN rail panel.

The equipment is powered by a voltage of 9 to 32 Vdc, offers 16 inputs and 8 open-collector discrete outputs, plus 3 inputs for two or three-wire temperature sensors (several sensor types such as thermocouples and RTDs), as well as voltage signals (0 - 5 Vdc) or current (4 - 20 mA), configured by the user. In addition, it offers two analog 4 - 20 mA outputs or open-collector for actuation, according to user settings.

Through a Profibus-PA configurator, user can configure the remote I/O parameters as well as the input and output channels, check calibrations, diagnostics and monitoring. In addition, it is possible to configure VIO10-P via local adjustment using a magnetic screwdriver.

VIO10-P is connected to the Profibus-DP network via a DP/PA coupler, using a pair of twisted and shielded wires. Profibus-PA technology allows the interconnection of several equipment in a single network, allowing the construction of large control systems. VIO10-P works with the concept of functional blocks such as Discrete Input and Output, Analog Input and Output, and Transducer.

Prioritizing its high performance and robustness, VIO10-P was designed with the latest electronics and materials technologies, ensuring long-term reliability for systems of any scale.

## 1.1. BLOCK DIAGRAM

The modularization for VIO10-P components is described in the following block diagram.

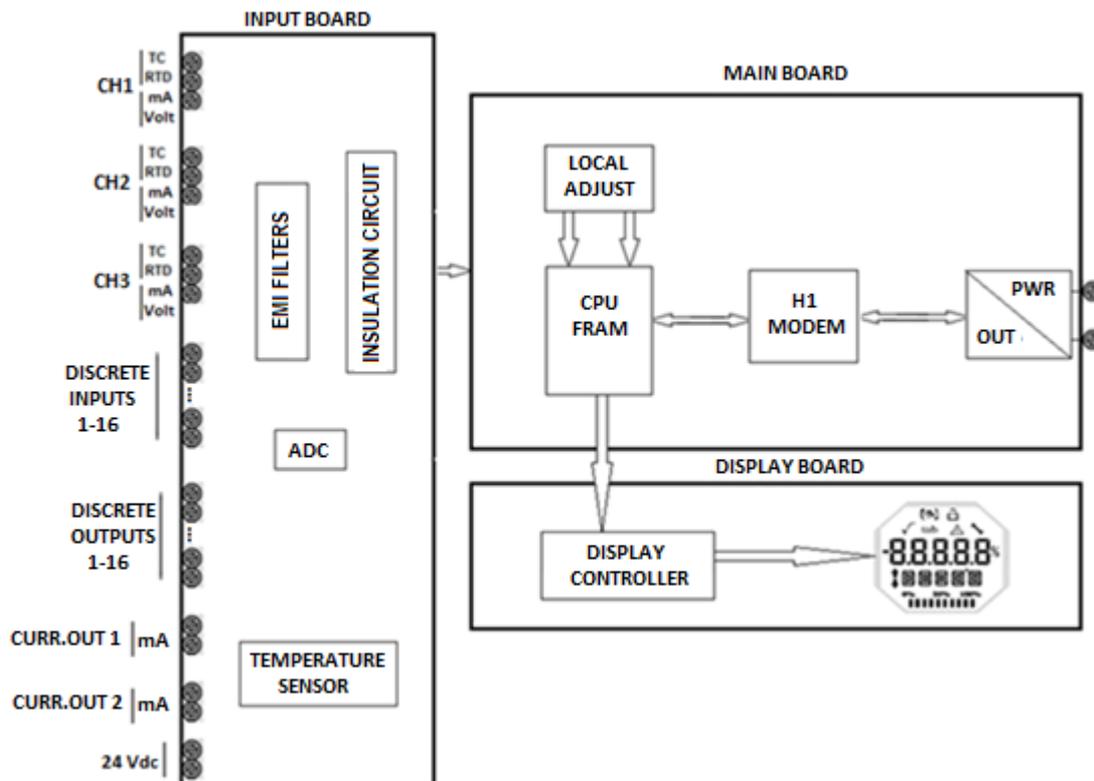


Figure 1.1 – Block diagram for VIO10-P.

The signals from the temperature sensors or 4-20 mA inputs pass through the RF filter and follow to the ADC converter, where they are converted into digital values. These values are converted to temperature or current, according to the selected channel. The 4-20 mA outputs are generated according to user settings.

The sensor signals are galvanically isolated from the power supply, but are not insulated from each other.

Digital inputs and outputs have latches that store their logic states. They are isolated, guaranteeing the integration of the signals. The outputs use open-collector NPN transistors. User must work with relays, solenoids and other loads DCs with maximum current of 0.5 A per output. All outputs share the same ground and are isolated from each other, as well as from Profibus-PA network. The digital inputs and outputs share the same DC source.

The H1 Modem Block interfaces the microcontroller signals with the Profibus-PA network to which the equipment is connected.

The display board has the controller module responsible for adapting the messages to be displayed on the LCD.

Finally, the microcontroller block can be related to the brain of the equipment, where all the time controls, communication control, plus routines common to the equipment such as configuration, calibration and monitoring take place.

#### NOTE



*The sensor signals are galvanically isolated from the power supply, but are not insulated from each other. Therefore, isolated sensors must be used to prevent noise from one sensor from interfering with the other. There is also no insulation between the temperature channels and the output current channels.*

## 2 INSTALLATION

### 2.1. MECHANICAL ASSEMBLY

Profibus-PA VIO10-P remote I/O is designed for panel mounting with DIN rail, but maintains good performance in temperature, humidity and vibration variations.

The electronic circuit is coated with a moisture-proof varnish, 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 mounting forms for VIO10-P.

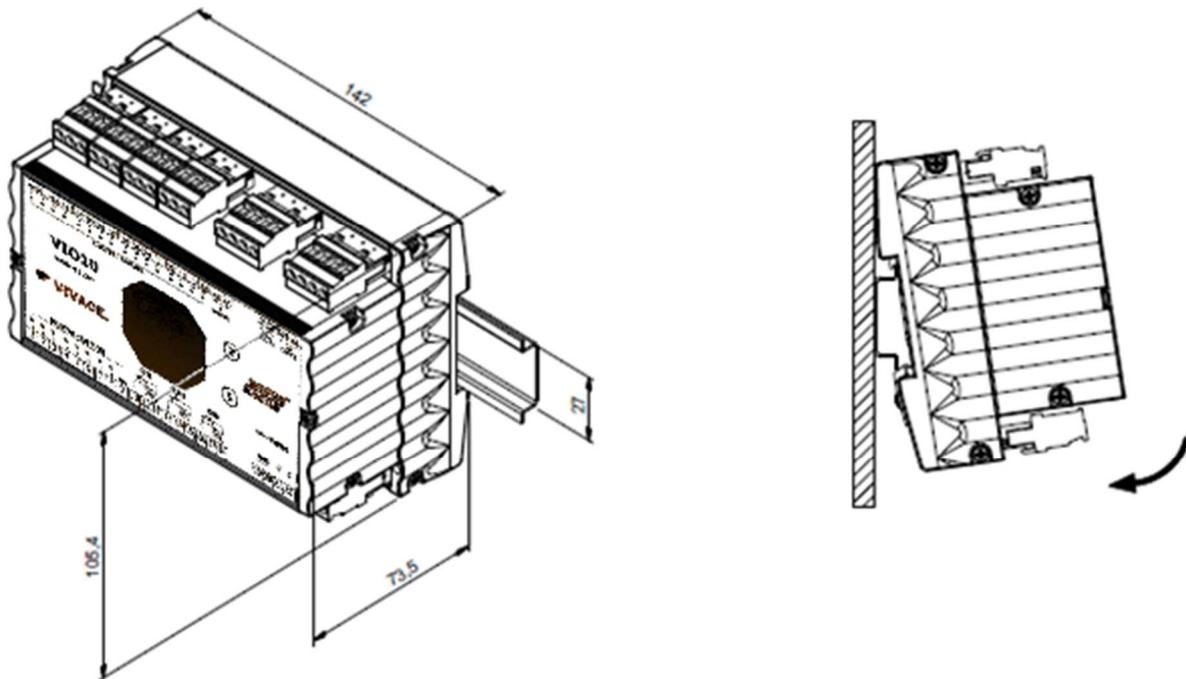


Figure 2.1 – Dimensional drawing and assembly for VIO10-P.

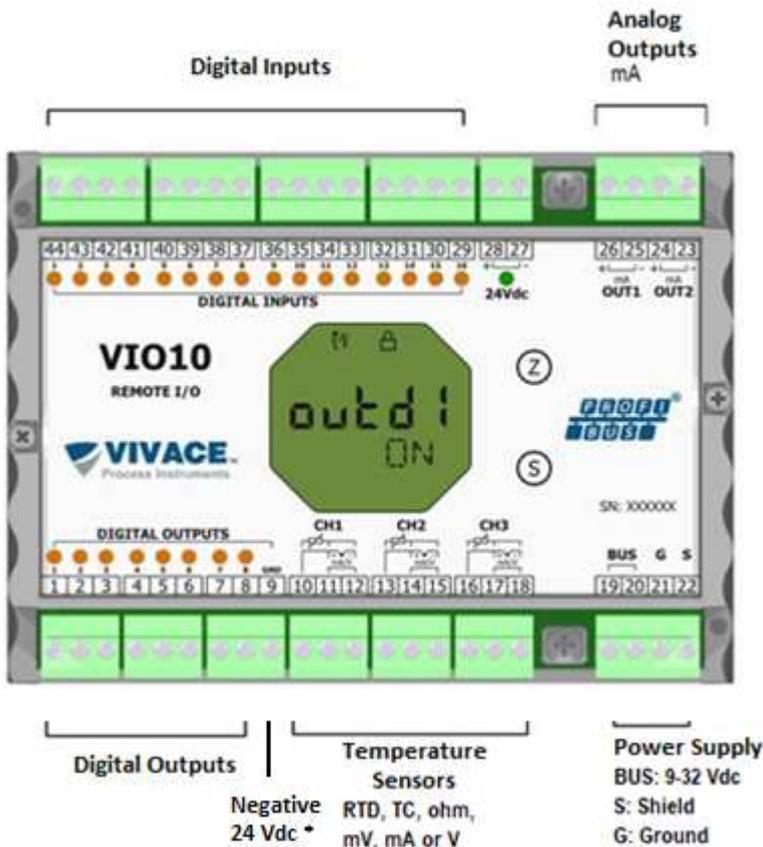
When mounting VIO10-P on the DIN rail, the upper part of the rail must be attached to the rail bracket and lightly pressed down on the bottom until it clicks into place.

To remove VIO10-P from the DIN rail, press it up and tilt its top side out of the rail bracket.

## 2.2. ELECTRICAL CONNECTION

The electrical connection for VIO10-P occurs through its side connectors, reserved for discrete inputs and outputs, sensors, analog outputs and electrical powering of the equipment.

The following figure identifies VIO10-P connectors.



\* When using 24 Vdc external power for digital outputs (DO1 to DO8), connect the source negative to terminal 9.

If the same source is connected to terminals 27 and 28, it will not be necessary to connect terminal 9, since this connection is already made internally in the VIO10 circuit.

Figure 2.2 – Connection and terminal description for VIO10-P.

Terminal Description
Power Supply Terminals – PWR BUS – 9 - 32 Vdc not polarized
Grounding Terminals – G
Shield Terminals – S
Discrete Input Terminals – DI1 to DI16
Discrete Output Terminals – DO1 to DO8
Output Current 4–20 mA Terminals – OUT1 and OUT2
Sensor Terminals – temperature sensor or 4-20 mA/0-5 Vdc signal connections, CH1 to CH3

Table 2.1 – Terminal description for VIO10-P.

**NOTE**

 All cables used to connect VIO10-P to Profibus-PA sensors and network must be shielded to avoid interference and noise.  
All temperature sensors shall be isolated from the process to avoid interference or noise between the channels.

**NOTE**

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

**NOTE: SWITCHING INDUCTIVE LOAD**

 For inductive DC load, it is recommended to insert a 1N4148 diode in reverse mode for close-load protection to avoid noise coupling to other cables in the same conduit.

### 2.3. CONNECTIONS

Following are the VIO10-P connections to several sensor types:

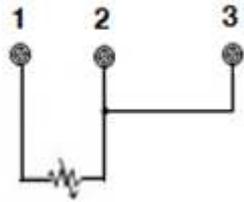


Figure 2.3 - RTD or 2-wire resistive connection.

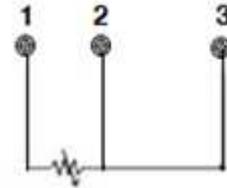


Figure 2.4 - RTD or 3-wire resistive connection.

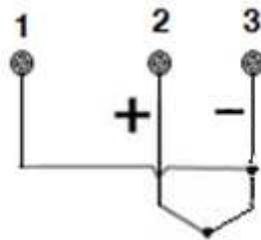


Figure 2.5 - TC or millivoltage connection.

#### NOTE



The unused temperature sensor channels should be short-circuited to avoid the induction of noise.

For control of equipment using the 4-20 mA generation or discrete drive, the connection must be made according to the following diagram.

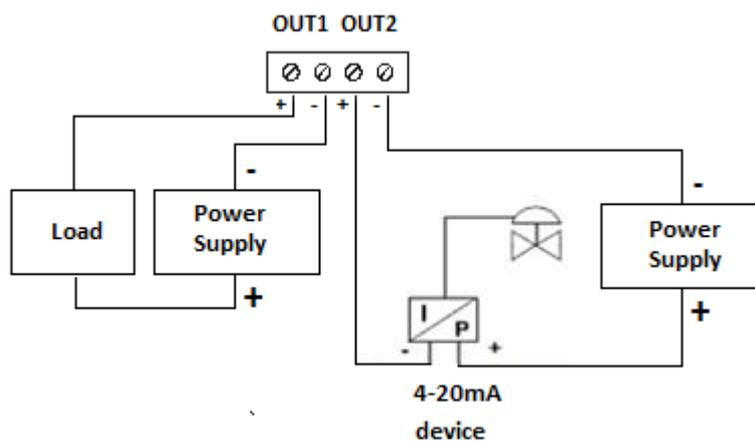


Figure 2.6 – Connection between 4-20 mA output and I/P device or discrete action.

For 4-20 mA or 0-5 Vdc measurement, the connection must be made according to the following figures.

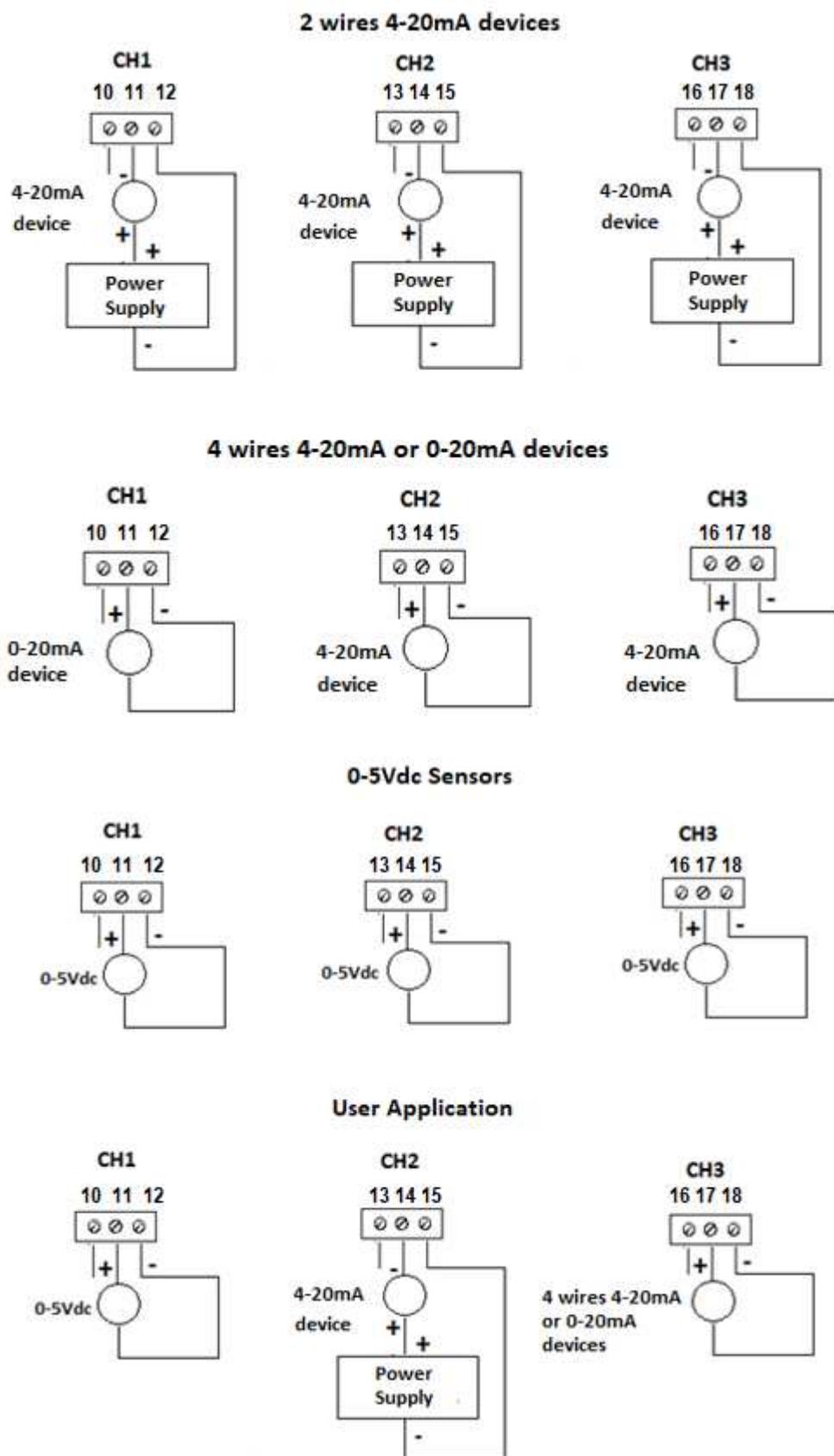


Figure 2.7 - 4-20 mA or 0-5 Vdc input connections.

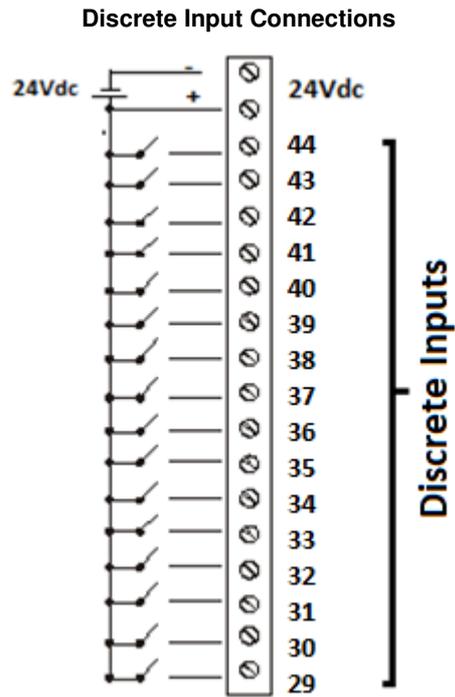


Figure 2.8 – Discrete input connections.

### Discrete Output Connections (*Open-Collector*)

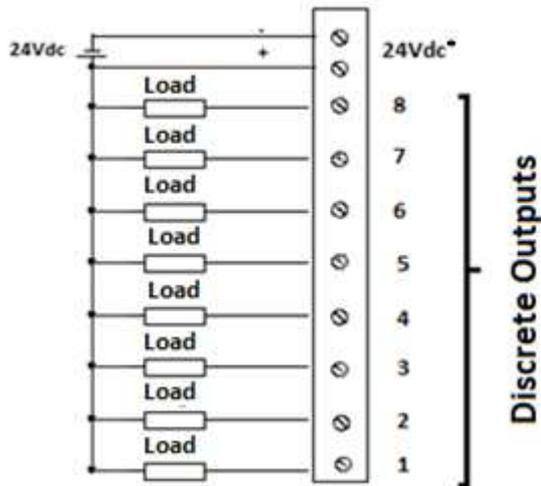


Figure 2.9 – Discrete output connections.

\* When using 24 Vdc external power for digital outputs (DO1 to DO8), connect the source negative to terminal 9. If the same source is connected to terminals 27 and 28, it will not be necessary to connect terminal 9, since this connection is already made internally in the VIO10 circuit.

## 2.4. PROFIBUS NETWORK CONNECTION

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

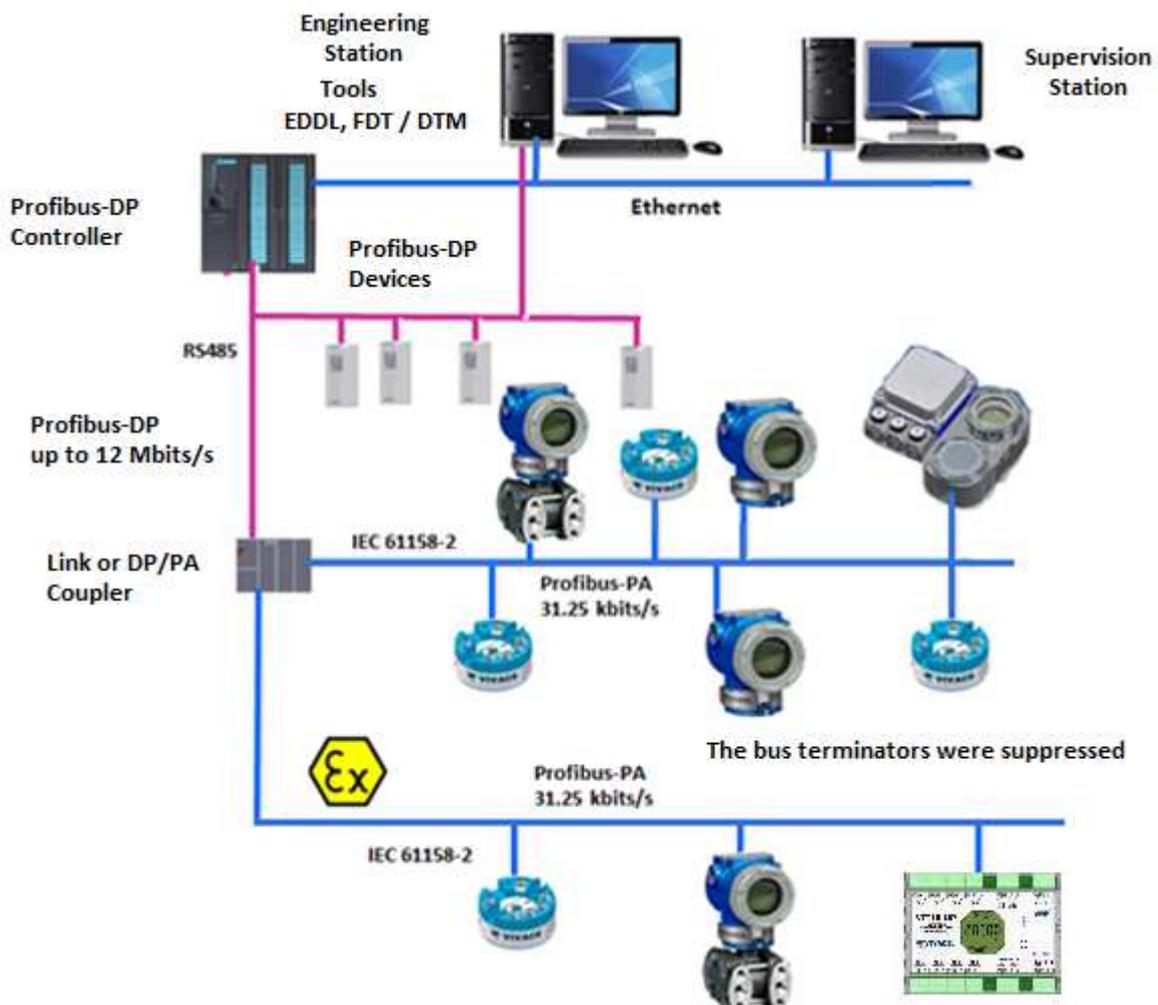


Figure 2.10 – Connection of Profibus-PA devices on the Profibus network.

### 3 CONFIGURATION

Configuration of VIO10-P Profibus-PA remote I/O can be performed with tools based on EDDL (SIMATIC PDM) and FDT/DTM (eg PACTware). Vivace offers VMT-PROFIBUS configurator to be used on an Android tablet or mobile phone. Another way to configure VIO10-P is through local adjustment using a magnetic tool.

#### 3.1. LOCAL CONFIGURATION

The local configuration of the equipment is realized by actuating the magnetic tool in the marks Z and S, located in the top of the box. Acting on letter Z starts the local configuration and switches the fields to be configured. The marking with the letter S is responsible for changing and saving the values for selected fields. Saving when changing the value on the LCD is automatic.

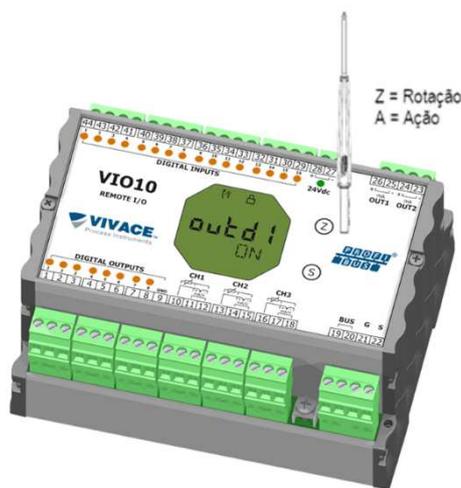


Figure 3.1 – Z and S markings and magnetic screwdriver.

Figure 3.1 shows Z and S markings for local configuration, stamped on device enclosure tag and their functions on magnetic screwdriver actuation.

Touch the magnetic screwdriver on *Zero* marking (Z).  icon appears to indicate that device has recognized the screwdriver action. Keep the magnetic screwdriver until “LOCAL ADJUST” message is shown on display, then remove it for 3 seconds. Touch the magnetic screwdriver on Z marking again, so user can navigate through local adjust parameters.

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

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

Table 3.1 – Z and S marking actions.

Some parameters show the icon  to allow user configuration on it by touching the magnetic screwdriver into *Span* marking (S). In case the parameter has pre-defined values, those will be rotated on display, while the magnetic screwdriver remains on *Span* marking (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 touching magnetic screwdriver on 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 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 can return to the previous digit (to the right) by touching the magnetic screwdriver on Z marking, 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 alphanumeric fields, adjusting the best option view to user.

With the magnetic screwdriver out of Z and S markings, 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

Figure 3.2 shows jumper positions on main board for enabling/disabling write protection and local adjustment.

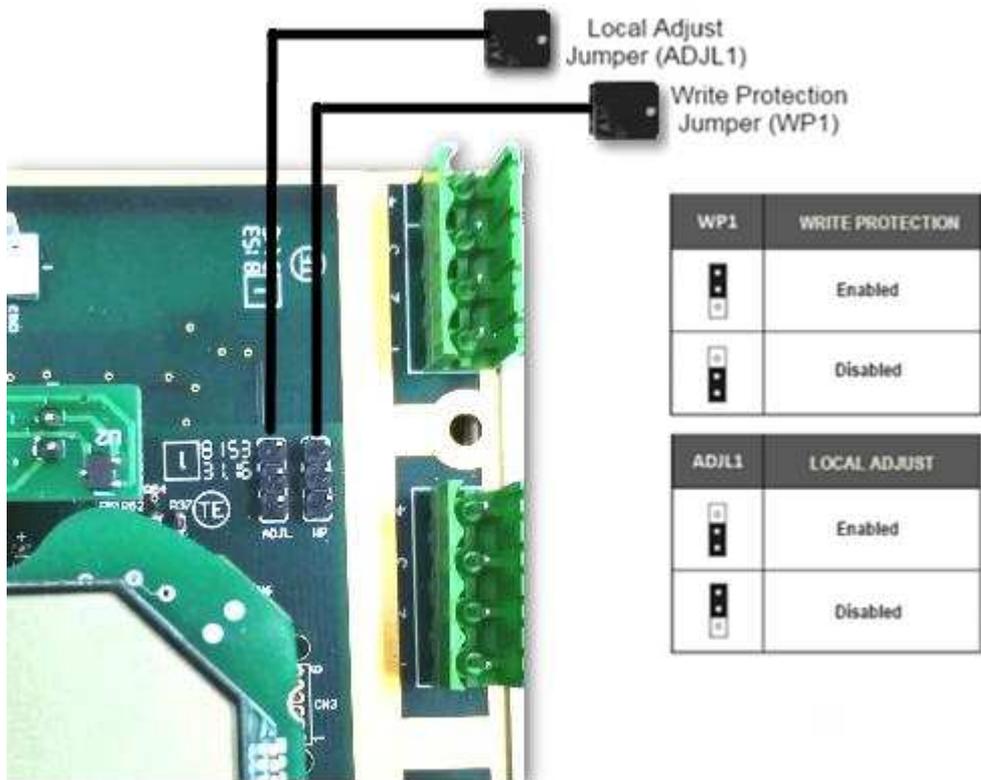


Figure 3.2 – Main board detailing jumpers.

**!** The default positions for jumpers are write protection **DISABLED** and local adjust **ENABLED**.

### 3.3. LIQUID CRYSTAL DISPLAY

The main information regarding the equipment is available on the LCD display. Figure 3.3 shows the LCD with all its display fields. The numerical field is mainly used to indicate the values of the monitored variables. The alphanumeric indicates the currently monitored variable, units, or auxiliary messages. The meanings of each of the icons are described in table 3.2.



Figure 3.3 – LCD fields and icons.

SYMBOL	DESCRIPTION
	Sending Communication
	Receiving communication
	Write protection enabled
	Square root function enabled
	Characterization table enabled
	Diagnostic occurrence
	Recommended maintenance
	Increment values in the local adjust
	Decrement values in the local adjust
	Degrees symbol for temperature units
	Bargraph to indicate the measured variable range

Tabela 3.2 - Descrição dos ícones do display.

### 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 markings.

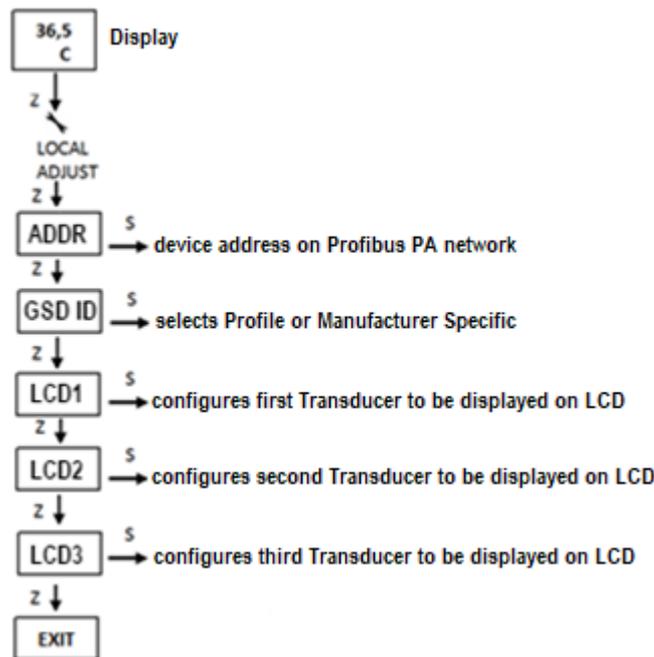


Figure 3.4 – Local adjust configuration tree.

### 3.5. PROFIBUS PROGRAMMER

The configuration of the equipment can be made through a programmer compatible with Profibus PA technology. Vivace offers the interfaces VCI10-P (USB and Bluetooth) as a solution for the identification, configuration and monitoring of the equipment of the Profibus PA line.

Figure 3.5 shows the connection diagram for configuring the VIO10-P via Vivace VCI10-UP USB interface, which feeds the device in local mode, with a personal computer that has the PACTware configuration software installed.

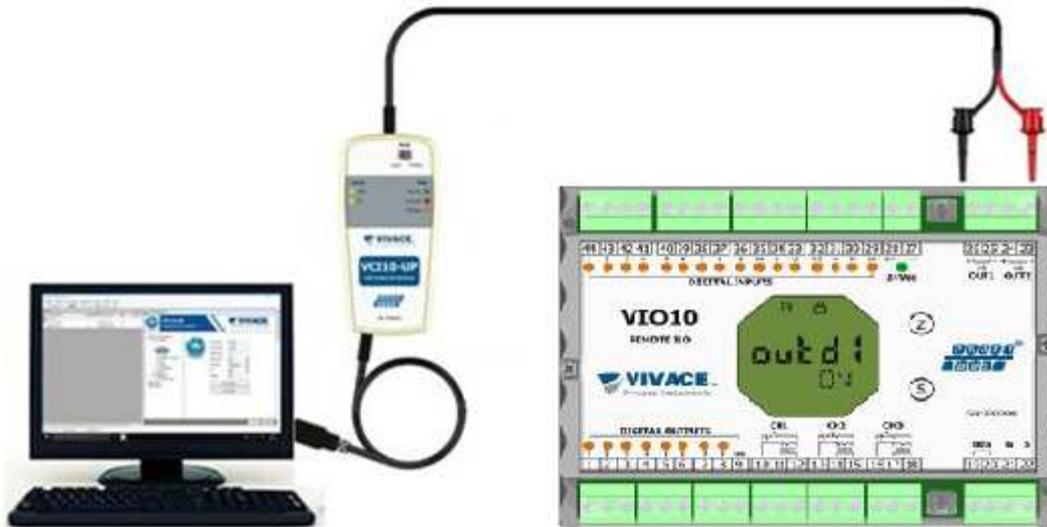


Figure 3.5 – Connection of VCI10-UP to VIO10-P.

### 3.6. PROFIBUS CONFIGURATOR PROGRAMMING TREE

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

For online configuration of the equipment, check it is correctly installed and powered by the adequate voltage necessary for communication.

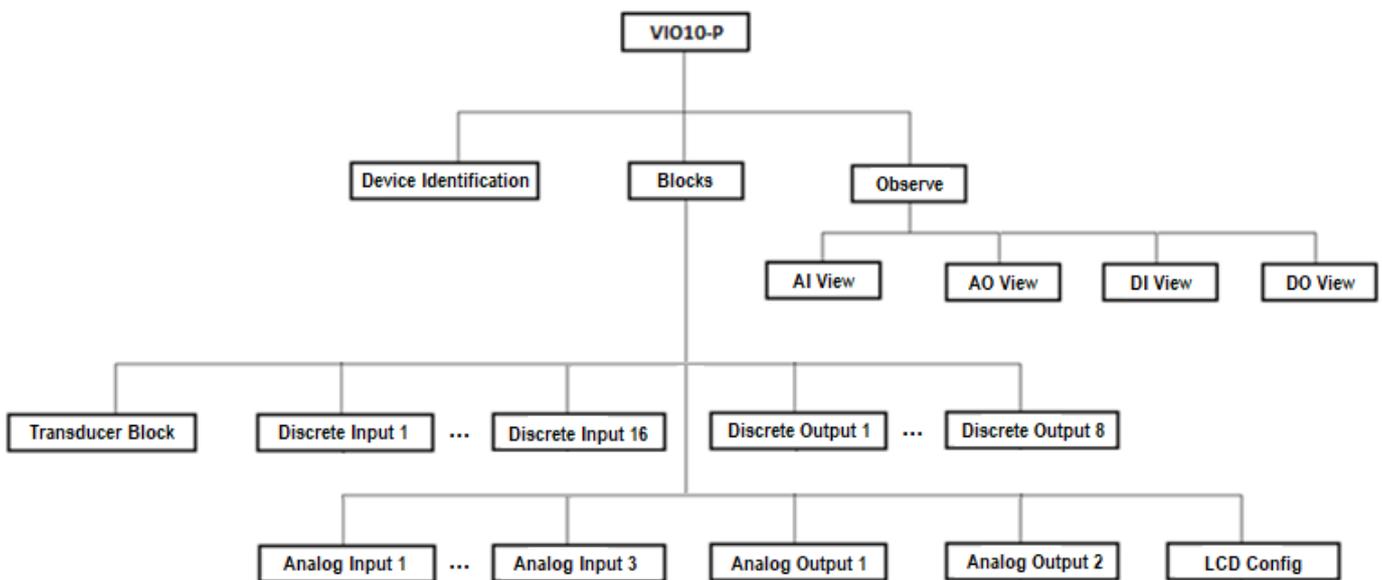


Figure 3.6 – VIO10-P programming tree.

**Device Identification** – Main information regarding to the equipment can be found here, such as: Tag, Device ID, Ordering Code and Firmware Version.

**Transducer Block** – Menu to configure Transducer Block.

- **Basic Settings** – Parameters to configure basic adjustments: Sensor Type and Connection Type, for instance.

**Analog Input 1 to 3** – Menu to configure the parameters from 4-20 mA/0-5 Vdc Analog Input Block and temperature measurement.

- **Basic Settings** – Parameters to configure Operation Mode, Output Scale (EU0% and EU100%), Unit, Channel and Damping.

*Damping* is an electronic pressure reading filter that 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 based on the process response time, the stability of the output signal and other system requirements. The default damping value is 0 s.

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

Increasing the damping value leads to an increase in the transmitter response time. At the time the damping time constant is defined, the output of the transmitter will go to 63% of the value of the change in the input and the transmitter will continue to approach the input value according to the damping equation.

- **Alarm/Warning** - This menu sets the Upper and Lower Warning and Alarms Limits. The Hysteresis Limit is also configured. The measuring unit selected in "Basic Settings" is indicated in this menu, in addition to checking the current alarm status. The standard graphic of the process variable limits is also displayed.
- **Fail Safe** - This menu sets the fault safety type, the fault safety value and displays the unit of measure selected in "Basic Settings".
- **Simulate** - This menu enables or disables the Simulation function, sets the value of the position, shows the unit selected in "Basic Settings" and status.
- **Mode Block** - This menu shows Target operation mode (manual, automatic or out of service) and Real, the value of the output variable is set to the unit selected in "Basic Settings" and status. The alarm status of the position is also observed.

**Analog Output 1/2** – Menu to configure the parameters from Analog Output Blocks 1 or 2.

- **Basic Settings** – Parameters to configure Operation Mode, Input Scale (EU0% and EU100%) and Unit.

**Discrete Input 1/16** – Menu to configure the parameters from Discrete Input Block.

The DI block receives a digital value of the process through the transducer block (TRD) in its channel and processes it according to its configuration, making the Profibus Class 1 Master available via the OUT\_D parameter.

It has operating mode, inversion, simulation and error handling. The DI block also allows user to simulate a digital process value via the SIMULATE\_D parameter. This parameter is used to facilitate testing, for example, when doing the control plant startup. When active, the transducer block value and status will be superimposed by the simulated value and status. When disabled, the process value will be provided by the transducer block to the DI block.

The DI block also allows the input logic level to be inverted through the INVERT parameter, which also happens during the simulation. With INVERT active, the parameter PV\_D will be inverted before the output OUT\_D is updated. The algorithm of the DI block includes the handling of errors and faults as well as seen for the previous blocks.

**Discrete Output 1/8** – Menu to configure the parameters from Discrete Output Blocks.

The DO block can receive a discrete setpoint value (SP\_D) via cyclic communication or via user, when its operation mode is automatic (Auto). In this case, it receives value and status through SP\_D parameter. In this condition it is important to note that the status must be greater than or equal to Good (0x80).

When its operating mode is in cascade (RCas), setpoint value and status are supplied via parameter RCAS\_IN\_D by the Profibus Class 1 master, through cyclic communication. In this condition, the status must equal Initialization Acknowledge (0xC4). This setpoint value is processed according to the algorithm of the block and made available to the transducer block (TRD) that will act on the final control element, such as by actuating an on/off valve.

Similar to the AO block, the DO block supports the following operating modes: O/S, MAN, RCAS, LO and AUTO. As the other blocks, DO allows simulation. This parameter is used to facilitate testing, for example, when doing the control plant startup. The DO block provides the discrete value as well as the status to the TRD block through the READBACK\_D parameter.

Similarly to the DI block, it has the parameter INVERT, where you can invert the discrete value of the setpoint, either in Auto or RCas mode. The DO block also has error and fault handling. If there is a loss of cyclic communication with the Profibus Class 1 master and the discrete setpoint is no longer up-to-date, you can configure the type of treatment that should happen with the output of the DO block.

**LCD Config** – Menu to configure LCD for up to 3 variables: Monit 1, Monit 2 and Monit 3.

- **Monit x** – On these menus user can configure Function Blocks (Physical, Transducer, Analog Input 1 to 3 or Analog Output 1 to 2), Relative Index, Structure Element, Mnemonic, decimal point number (1, 2, 3 or 4) and enable/disable the alphanumeric field.

**Observe** - In this menu, the values and the status of the parameters of the TRD, AI, AO, DI and DO blocks are monitored.

### 3.7. FDT/DTM CONFIGURATION

FDT/DTM-based tools (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](http://www.vega.com/en/home_br/Downloads).

The following figures exemplify DTM configuration screens for VIO10-P using Vivace’s VCI10-UP interface and PACTware®.

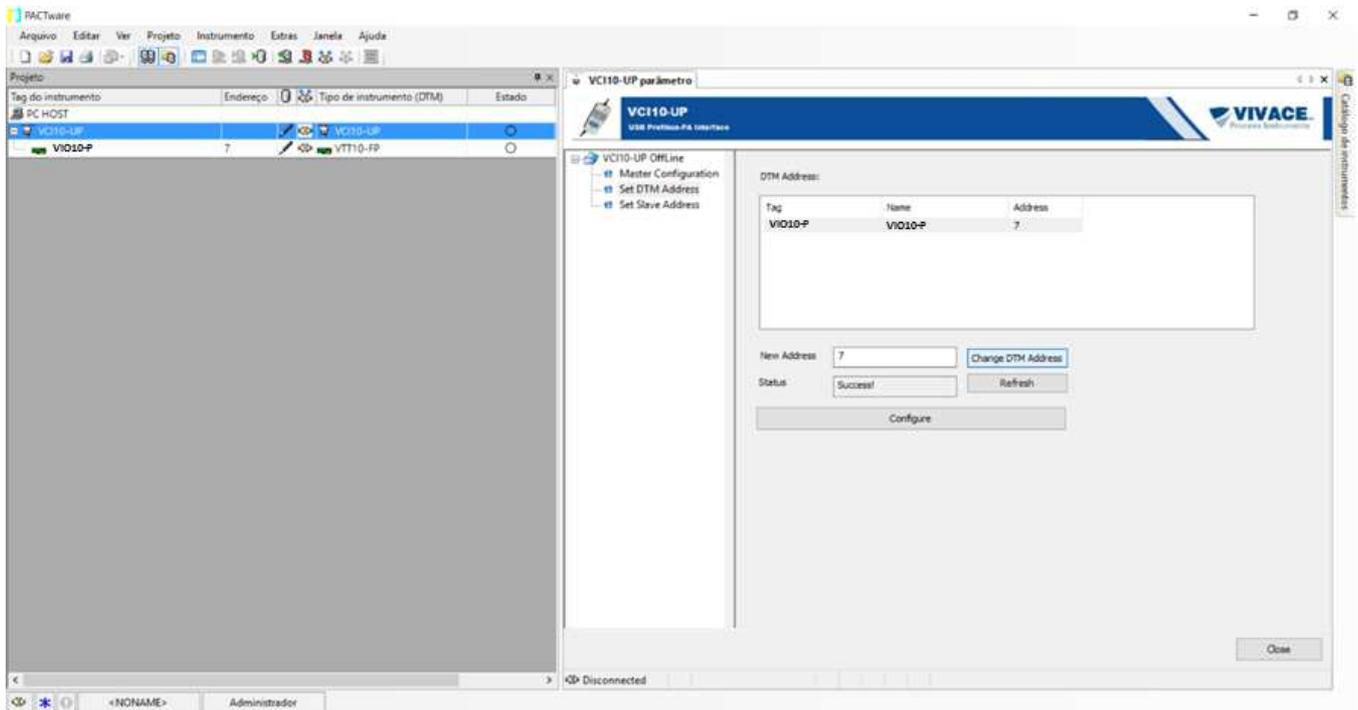


Figure 3.7 – Configuration for communication interface using PACTware.

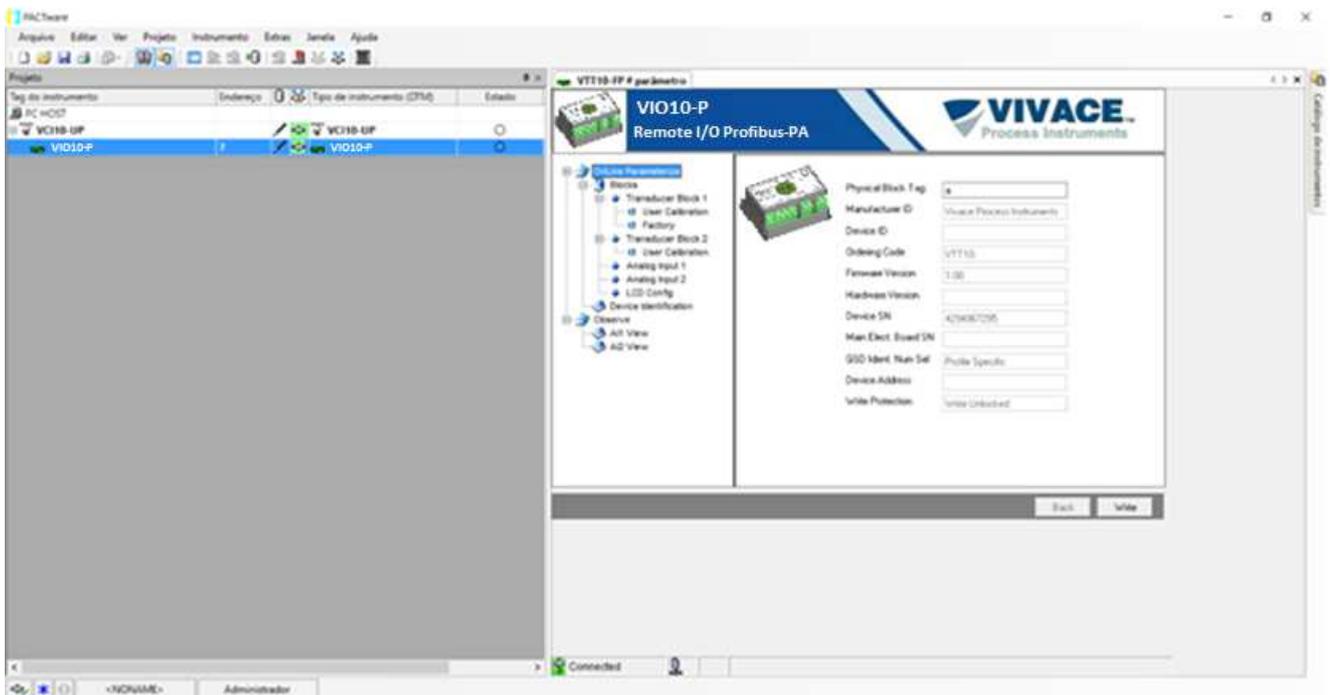


Figure 3.8 – Screen for VIO10-P information view on PACTware.

### 3.8. CYCLIC CONFIGURATION

VIO10-P has 16 function blocks for discrete input (16 DI – Discrete Input), 8 blocks for discrete output (8 DO – Discrete Output), 3 function blocks for analog input (3 AI - Analog Input Block) and 2 blocks for analog output (2 AO - Analog Output Block). It also has an Empty Module for applications where only some of the blocks will be configured.

The 3 input blocks (AI) are destined to temperature or current/voltage input measurement (0–20 mA; 4–20 mA; 0–5 Vdc). The 2 output blocks (AO) are used to generate the analog current outputs: 4–20 mA.

The following cyclic block order must be respected: AO1, AO2, AI1 to AI3, DO1 to DO8, DI1 to DI16. When any block is not used, user must fill it with the Empty Module.

Most Profibus configurators use two directories where the GSD and BITMAP files from the various manufacturers are located. The GSD and BITMAPS for Vivace equipments are available on the website ([www.vivaceinstruments.com.br](http://www.vivaceinstruments.com.br)).

Follow the procedure below to integrate the VIO10-P into a Profibus system (these steps apply to all Profibus PA Vivace line devices).

- Copy the GSD file of the VIO10-P to the directory where all the GSD files of the Profibus configurator, usually called "GSD" are located;
- Copy the BITMAP file of the VIO10-P to the directory where all the BMP files of equipment of the Profibus configurator, 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 (P+F) and 12 Mbit/s, SK3). The IM157 device link can have up to 12 Mbits/s;
- Add the VIO10-P and specify its address on the bus;
- Select the cyclic configuration through the parameterization, according to the GSD file, which depends on the application, as seen previously. For the AI block, the VIO10-P provides master the value of the process variable in 5 bytes, the first four in the floating point format (IEEE-754) and the fifth byte forming the status that the information of the quality 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 Block AO, it is possible to have several options, according to GSD file. Through analog output block (AO) Class 1 master executes cyclic services. User must choose the most adequate configuration for his application.

If VIO10-P Block AO is in AUTO, it will receive value and status from Class 1 master setpoint. In addition, user may change this value via Class 2 master, if setpoint status is 0x80 ("Good"), where the following configurations can be chosen:

```
SP;
SP/CHECKBACK;
SP/READBACK/POSD;
SP/READBACK/POSD/CHECKBACK
```

If Block AO is in RCAS, VIO10-P will receive value and status from setpoint (RCAS\_IN) only via Class 1 master, where status will equal 0xC4 ("IA"). The following configurations can be chosen:

```
SP;
SP/CHECKBACK;
SP/READBACK/POSD;
SP/READBACK/POSD/CHECKBACK;
RCASIN/RCASOUT;
RCASIN/RCASOUT/CHECKBACK;
SP/READBACK/RCASIN/RCASOUT/POSD/CHECKBACK
```

- On DO and DI Blocks, user can choose the following options, where for DO Block, only one of them is allowed per block.

If DO Blocks are in AUTO mode, VIO10-P will receive value and status from Profibus Class 1 master discrete setpoint. User can write this value through Class 2 master. In this case, setpoint status must equals 0x80 (“Good”) and user can choose any of the following options:

- SP\_D
- SP\_D+RB\_D
- SP\_D+RB\_D+CB\_D

If DO Blocks are in RCAS, the equipment will receive value and status from discrete setpoint only via Class 1 master, where status equals 0xc4 (“IA”). User can choose any of the following configurations:

- SP\_D
- SP\_D+RB\_D
- SP\_D+RB\_D+CB\_D
- RIN\_D+ROUT\_D
- RIN\_D+ROUT\_D+CB\_D
- SP\_D+RB\_D+RIN\_D+ROUT\_D+CB\_D

- If necessary, activate the watchdog condition, which causes the equipment to assume a safe fault condition upon detection of 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.

VIO10-P has the GSD identifier number equal to 0x0FF9 (Manufacturer Specific) and can still work with the value 0x9760 (Profile Specific).

DD, DTM and GSD for VIO10-P can be found on the website: [www.vivaceinstruments.com.br](http://www.vivaceinstruments.com.br)

For further information on the Profibus PA technology, refer to the Vivace website in the Installation, Operation and Configuration Manual - Profibus PA - blocks, parameters and structure.

#### NOTE



This equipment has several functional blocks, so it is recommended to set the **number of retries to 3 or more**, in addition to increasing the slot time (indicates how long the PROFIBUS-DP master will wait for a response from the slave before resending a frame) in order to avoid retransmissions.

## DP/PA Link

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

Siemens has a Link device DP/PA which is the model IM157. This device works with a DP/PA adapter at a communication speed 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 are powered with 24 Vdc. The maximum number of field devices per link is limited to 30 or 64 computers, 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 not, these 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 of Siemens link 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 Vivace team 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 template and the GSD of the team and run. After execution, note that a section has been created for the Vivace device with its cyclic modules.

## 4 MAINTENANCE

VIO10-P remote I/O, like all Vivace products, is rigorously evaluated and inspected before being sent to the customer. However, in case of a malfunction, a diagnosis can be made to check whether the problem is located in the installation, in the configuration of the equipment or if there is a problem with the device.

### 4.1. ASSEMBLY AND DISASSEMBLY PROCEDURES

Figure 4.1 shows in detail all components of the VIO10-P. Before disassembling the equipment, it must be switched off. Maintenance of electronic boards should not be performed under penalty of loss of equipment warranty.

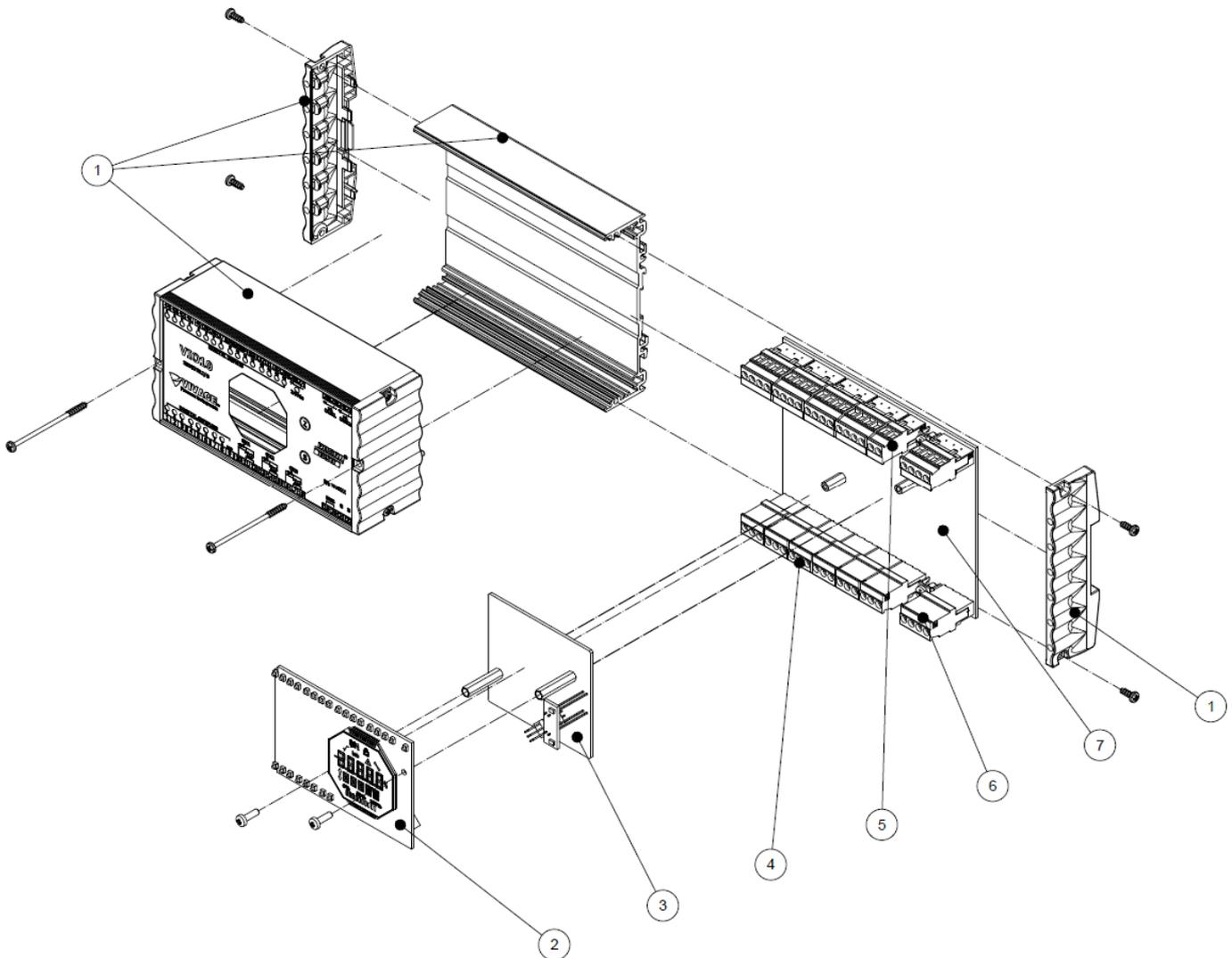


Figure 4.1 – Explosion view for VIO10-P.

## 4.2. SPARE PARTS

VIO10-P spare parts that can be purchased directly from Vivace Process Instruments are listed in table 4.1.

VIO10-P - SPARE PARTS CODES		
DESCRIPTION	REFERENCE FIG. 4.1	CODE
ENCLOSURE (includes screws)	1	2-10092
DISPLAY WITH LED BOARD (includes screws)	2	2-10093
MAIN BOARD (includes spacers)	3	2-10094
TERMINAL BLOCK PLUG 3 BORNES	4	1-10013
TERMINAL BLOCK PLUG 2 BORNES	5	1-10022
TERMINAL BLOCK PLUG 4 BORNES	6	1-10012
ANALOG BOARD (includes headers, spacers and grounding terminals)	7	2-10091

Table 4.1 – List of spare parts for VIO10-P.

## 5 CERTIFICATION

VIO10-P was projected to attend national and international regulation for intrinsic safety.

Certificates are pending.

## 6 TECHNICAL CHARACTERISTICS

### 6.1. IDENTIFICATION

VIO10-P has a label that identifies the equipment connections, its model and serial number, as well as showing the Z and S positions where the magnetic switch must be positioned to carry out the local adjustment, as shown in figure 6.1.

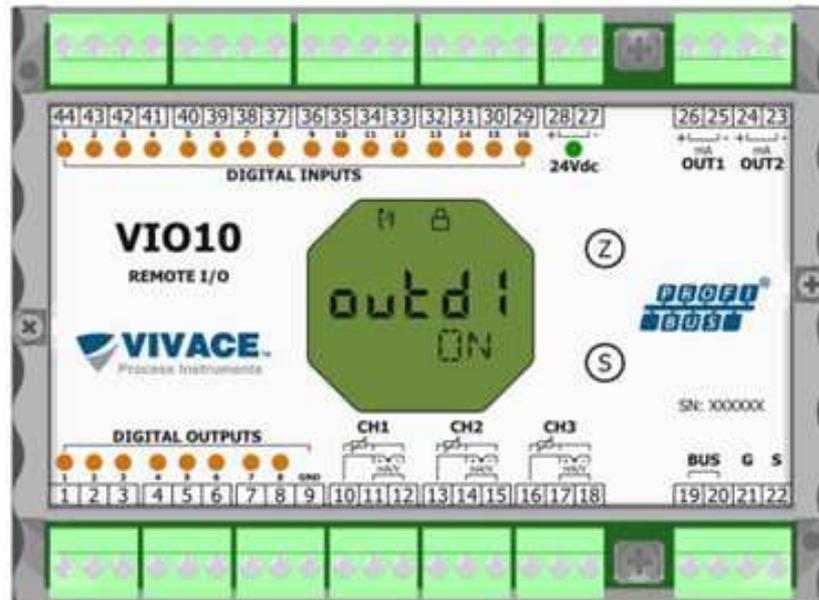


Figure 6.1 – Identification label for VIO10-P.

## 6.2. TECHNICAL SPECIFICATION

The table below shows Technical specifications for VIO10-P.

Accuracy	Temperature: According to Tables 6.2, 6.3 and 6.4 Inputs/Outputs: $\pm 0.1\%$ Calibrated Span
Supply Voltage / Quiescent Current Output Load Limit	9 to 32 Vcc, no polarity / 12 mA
Protocol of Communication / Function Block	Profibus-PA / 16 Discrete Input (DI) 08 Discrete Output (DO) 03 Analog Input (AI) 02 Analog Output (AO)
Certification in Hazardous Area	Intrinsically Safe (pending)
Ambient Temperature Limit	-20 to 70°C
Configuration	Remote configuration through tools based on EDDL or FDT / DTM. Local configuration via magnetic key.
Mounting	In field or panel, using DIN rail
Degree of Protection	IP20
Type of Electrical Insulation (between Profibus-PA bus, inputs and outputs)	Galvanic Isolation, 1,5 kVac
Housing Material	Aluminum / Plastic
Approximate weight	500 g
Discrete Inputs	16 Inputs Typical external power supply: 24 Vdc (18 to 30 Vdc, maximum consumption 120mA) Optical Isolation of 5,000 Vac. Level in ON state (True Logical) 15 - 30 Vdc. Level in OFF state (Logical False) 0 - 5 Vdc Typical Impedance 3.9 k $\Omega$ .
Discrete Outputs	8 Outputs: NPN transistors, open collector. They work with relays, solenoids and other DC loads with maximum current of 0.5 A per output. All outputs share the same ground and are isolated from each other, as well as from the Profibus-PA network. Typical external power supply 24 Vdc (18 to 30 Vdc, max. 40mA) - same source of inputs, 24Vdc Optical Isolation of 5,000 Vac Maximum switching voltage: 30 Vdc Maximum Saturation Voltage: 0.55 V at 0.5 A Maximum Output Current: 0.6 A Indication logic: ON when the transistor is on. Power-Up Condition: OFF Thermal Protection: Thermal Shutdown: 150-200 °C; Thermal Hysteresis 10 at 25 °C; Over current protection: 1.3 A at 24 Vdc maximum * With inductive loads use RC filters or diode in reverse mode as filter.

Table 6.1 – Technical specifications for VIO10-P.

### 6.3. TEMPERATURE SENSORS

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

**RTD** – Temperature sensor based on resistance for 2 or 3-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

Table 6.2 – RTD's technical characteristics.

**TC** – Temperature sensor based on millivoltage for 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's technical characteristics.

**Ohm or mV** – Linear resistive or millivoltage sensor for 2 or 3-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

### VIO10 *Remote I/O Profibus-PA*

Communication Protocol	P	PROFIBUS
Certification Type	0	NO CERTIFICATION
	1	INTRINSICALLY SAFE
	2	EXPLOSION PROOF
Certification Body	0	NO CERTIFICATION
	1	CEPEL
	2	FM
	3	EXAM
Protection Housing	0	NO HOUSING
	1	IP67 HOUSING

Ordering Code Example:

VIO10-	P	-	0	0	0
--------	---	---	---	---	---

## 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](http://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**

		<b>FSAT</b> <b>Technical Analysis Solicitation Form</b>	
		<b>Company:</b>	
<b>Unit/Department:</b>		<b>Shipping Invoice n°:</b>	
<b>Standard Warranty: ( )Yes ( )No</b>		<b>Extended Warranty: ( )Yes ( )No</b>	
<b>Buying Invoice n°:</b>			
<b>COMMERCIAL CONTACT</b>			
<b>Complete Name:</b>		<b>Position:</b>	
<b>Phone and Extension:</b>		<b>Fax:</b>	
<b>e-mail:</b>			
<b>TECHNICAL CONTACT</b>			
<b>Complete Name:</b>		<b>Position:</b>	
<b>Phone and Extension:</b>		<b>Fax:</b>	
<b>e-mail:</b>			
<b>EQUIPMENT DATA</b>			
<b>Model:</b>		<b>Serial Num.:</b>	
<b>PROCESS INFORMATION</b>			
<b>Environment Temperature (°C)</b>		<b>Work Temperature (°C)</b>	
<b>Min:</b>	<b>Max:</b>	<b>Min:</b>	<b>Max:</b>
<b>Operation Time:</b>		<b>Fail Date:</b>	
<b>FAIL DESCRIPTION:</b> 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.			
<b>ADDITIONAL OBSERVATION:</b>			

