

VRI10-I

4-20 mA REMOTE INDICATOR AND TOTALIZER



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

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

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WARNING

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

It's 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.

SECURITY PROCEDURES

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

SIMBOLOGY



Caution - indicates risk or error source



Important Information



General or Specific Risk



Electric Shock Danger

GENERAL INFORMATION



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



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



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



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

1 EQUIPMENT DESCRIPTION

VRI10-I is a 4-20 mA Remote Indicator with up to two channels, loop-powered, very low consumption and to be connected serially with a 4-20 mA device. It configures current characterization for each channel independently, indicating this value on LCD according to user-selected unit.

It is suitable to work with any 4-20 mA device that needs remote indication of its measured variable. Thus, devices that do not have LCD or are installed on places with difficult access to user's reach can be connected to VRI10-I and have their variable monitored in a favorable location.

Remote Indicator can also protect operator in case the device to be monitored is installed in high places or in hazardous areas.

VRI10-I requires no external power supply since it uses the loop 4-20 mA as the power source, with a minimum of 3.6 mA operating current.

Channel 1 is connected in series between the 24 Vdc power supply and the device that generates 4-20 mA, which is desired to read the output signal. Channel 2, when used, is connected to the second device to read its output signal. Through the Copy function, it is possible to copy channel 1 configuration to channel 2 and vice versa. If 4-20 mA signal on channel 1 is discontinued, channel 2 will continue working properly. To power on VRI10-I with 2 channels is necessary that channel 1 is active with its current signal (see figure 1.1).

In addition to the several engineering units available for pressure, level, flow, temperature and density, there is an option for user unit, where it is possible to write the desired unit. Another option available is the square root function.

1.1. BLOCK DIAGRAM

VRI10-I – Remote Indicator components modularization is shown in the block diagram in figure 1.1.

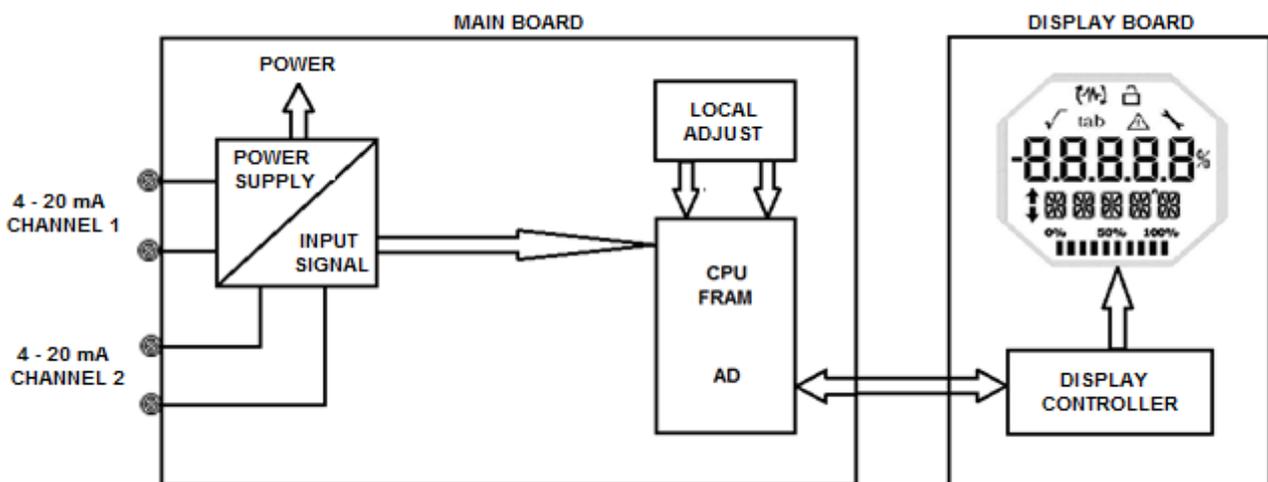


Figure 1.1 – VRI10-I block diagram.

2 INSTALLATION

RECOMMENDATION



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

RECOMMENDATION



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

STORAGE

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

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

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

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

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

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

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

2.1. MECHANICAL ASSEMBLY

VRI10-I was developed to be installed in the field, thus supporting exposition to several environment situations, keeping good performance through any temperature, humidity and vibration variations.

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

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

Figure 2.1 shows the dimensional drawing and mounting positions for VRI10-I.

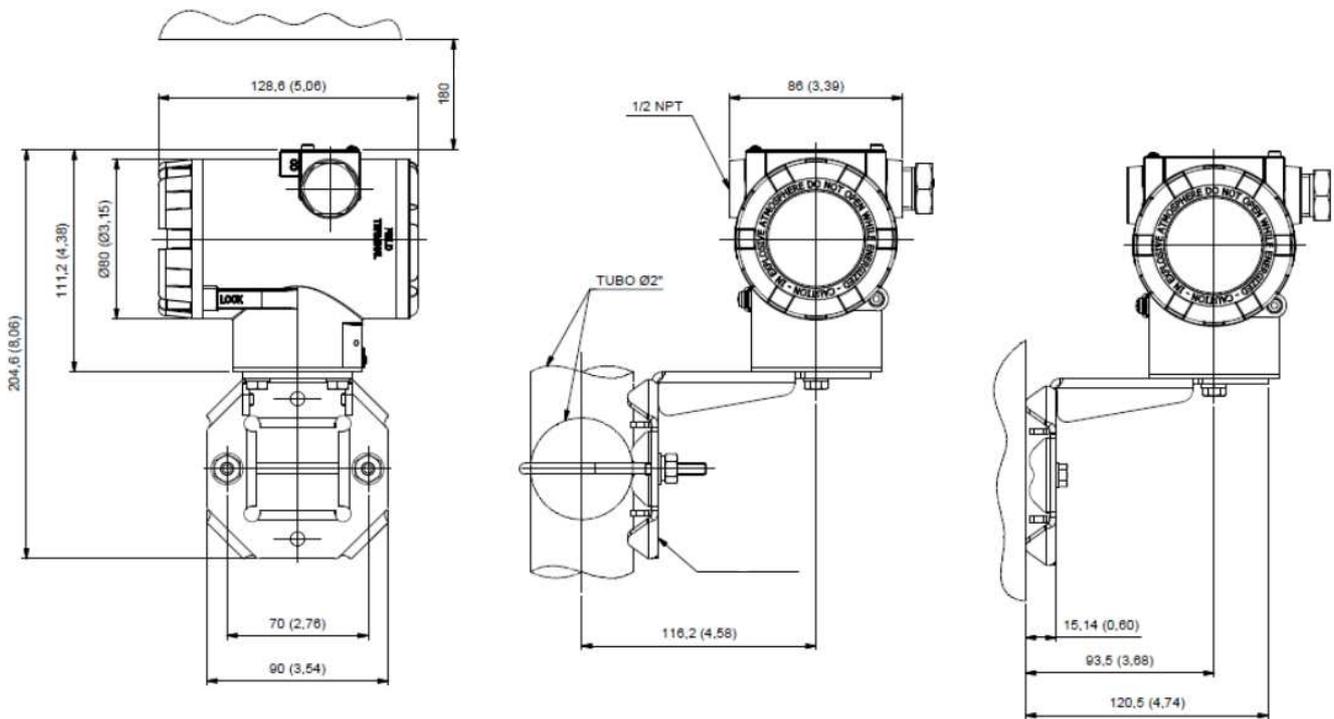


Figure 2.1 – Dimensional and mounting drawings for VRI10-I.

To avoid the risk of involuntary loss of VRI10-I covers due to vibration, for instance, it can be locked by screw, as shown on figure 2.2.

VRI10-I is a field device, so it can be installed through a support on a 2” tube attached with a U clip. For best LCD positioning device enables its display to be rotated 4 x 90°, according to figure 2.3. The converter can also be attached with the same support to a wall or panel.

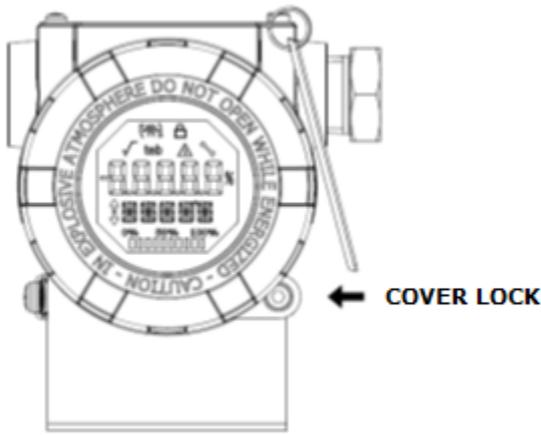


Figure 2.2 – Front cover lock.

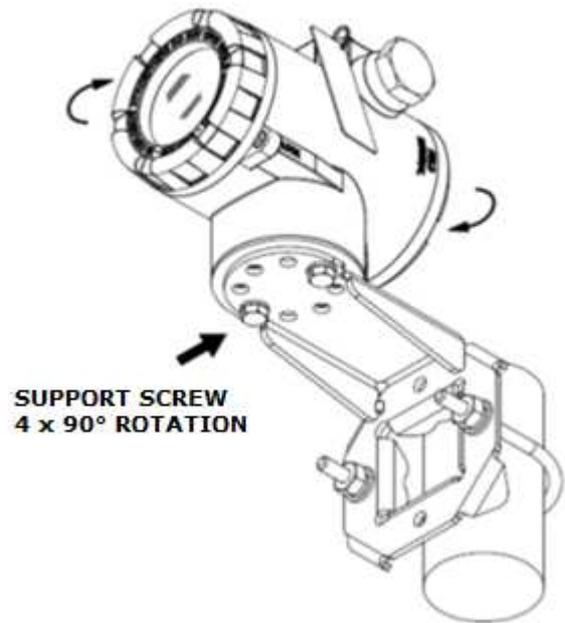


Figure 2.3 – Housing positioning.

VRI10-I liquid crystal display can be rotate 4 x 90° so indication will be adequate for user visualization. Figure 2.4 illustrates rotation possibilities for VRI10-I LCD.

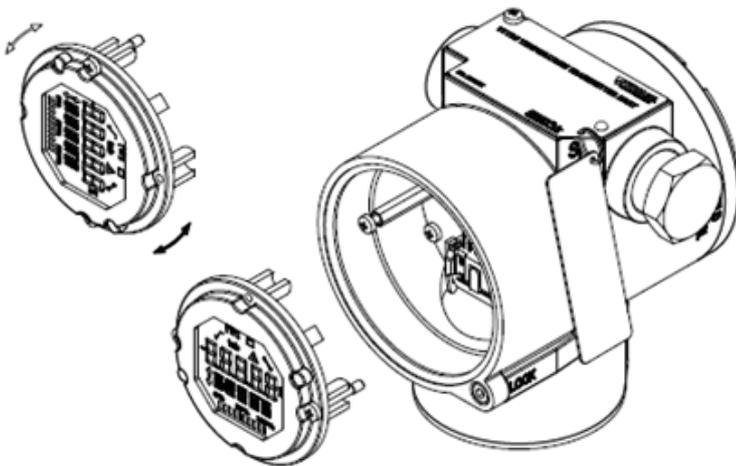


Figure 2.4 – 4 x 90° LCD rotation.

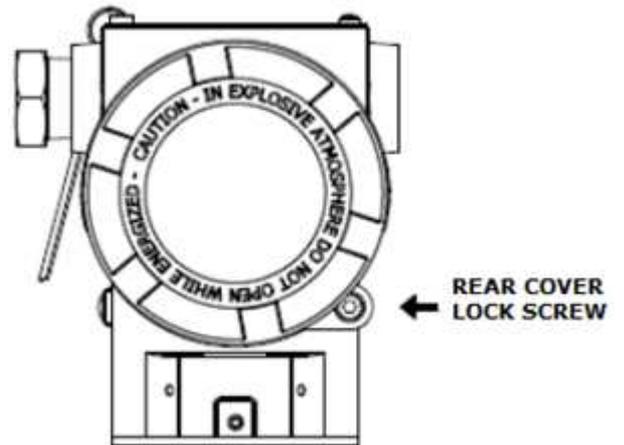


Figure 2.5 – Rear cover lock.

In order to access the terminal block user must remove VRI10-I rear cover. First, lose cover lock screw (see figure 2.5) by turning it clockwise.

VRI10-I requires no external power supply, since it is powered by the loop of 4-20 mA. The minimum current for operation is 3.6 mA.

Two models of VRI10-I are available: one channel and two channels. Terminal block for one channel model is shown on figure 2.6 and for two channels model on figure 2.7. Terminal block of VRI10-I has screws to receive fork or ring terminals, see figures 2.6 and 2.7.

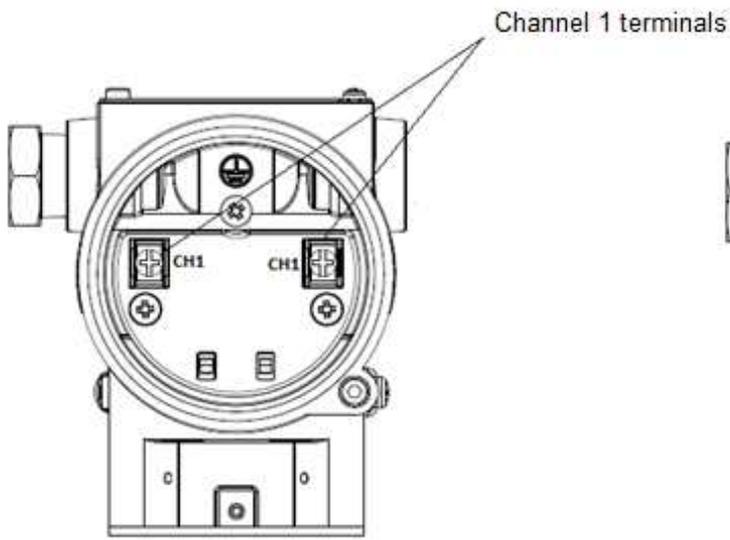


Figure 2.6 – VR10-1 Channel terminal block.

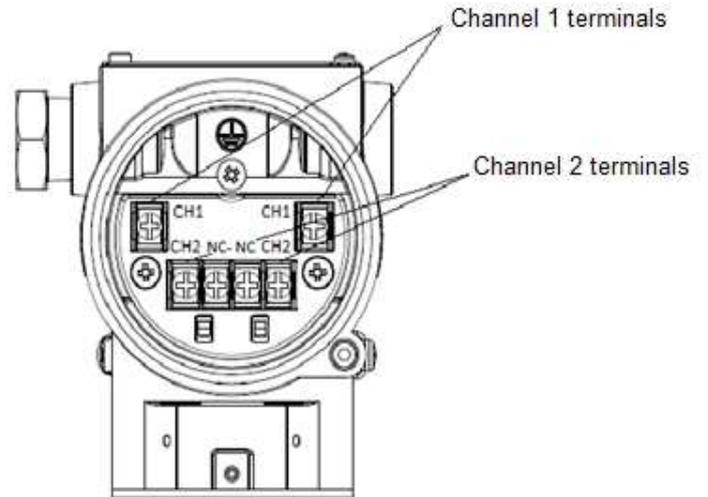


Figure 2.7 – VR10-2 Channel terminal block.

It is recommended to use twisted pair cable of minimum gauge 22 AWG.

Figure 2.8 exemplifies the wiring for VR10-I 1-channel and 2-channels.

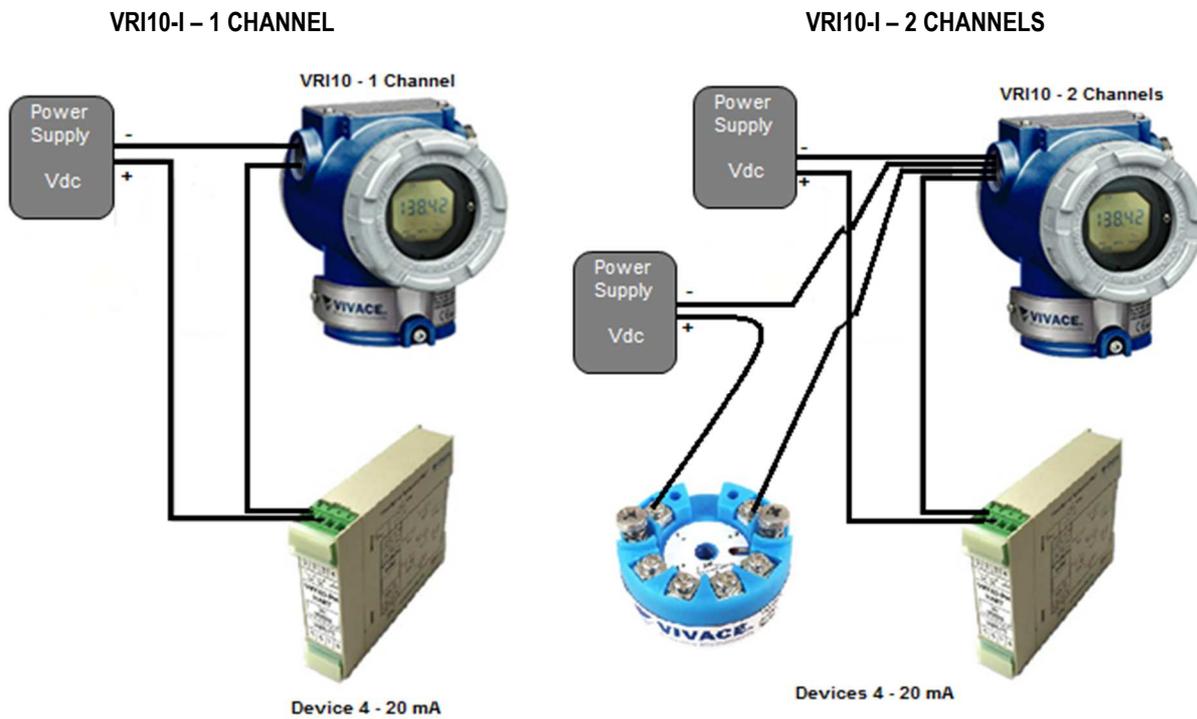


Figure 2.8 – Connection for VR10-I 1-Channel and 2-Channels.

There are two terminals for grounding to assist user on installation. One is internal and the other external, near electrical connection entrance, as shown in figure 2.9.

Test terminals, shown in figure 2.8, enable to measure 4-20 mA current loop, simply by connecting an amperimeter on those terminals.

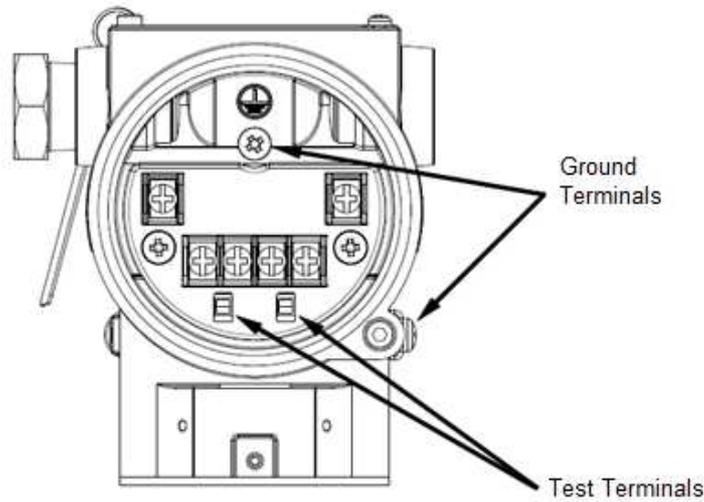


Figure 2.9 – Ground and test terminals.

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

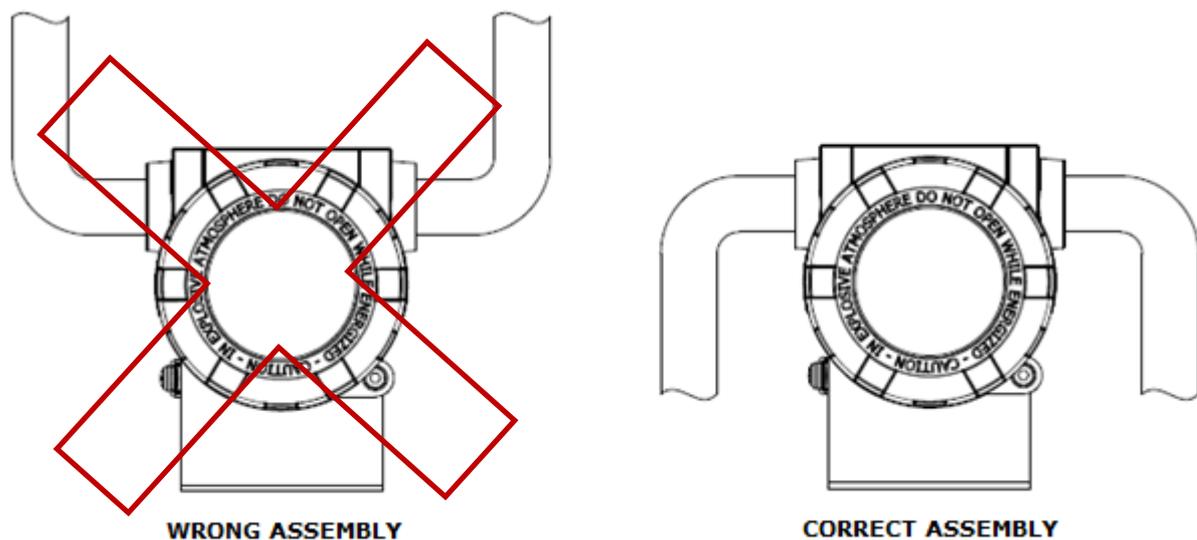


Figure 2.10 – Conduit installation.

2.2. APPLICATION EXAMPLE

Figure 2.11 shows the wiring diagram for a valve positioner connected to a VHC10-P (HART to 4 - 20 mA converter), which is connected to VRI10-I Remote Indicator and thus it is possible to see the actual valve position on VRI10-I LCD display.

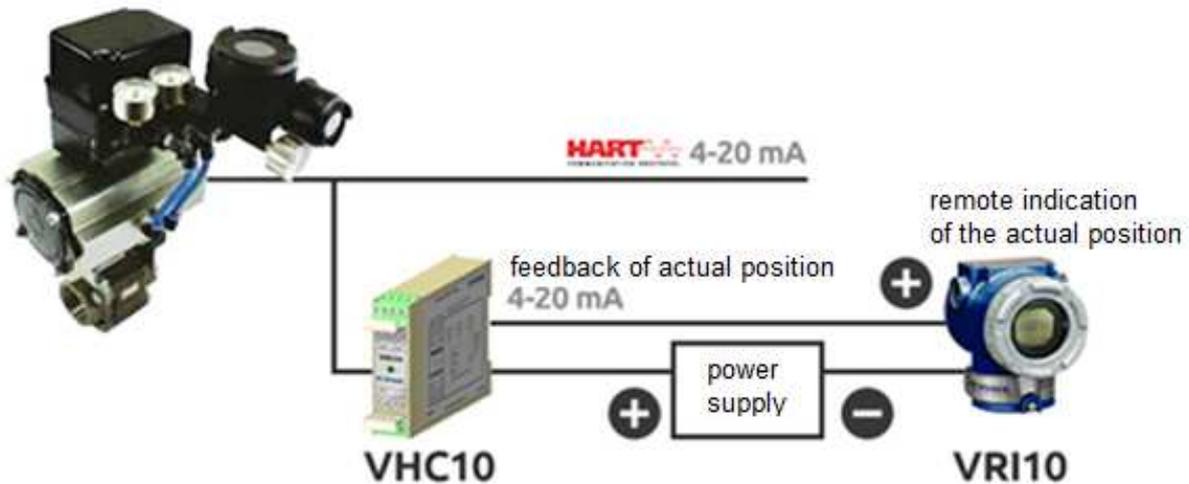


Figure 2.11 – VRI10-I connected to a VHC10-P for showing the actual valve position.

In some cases the place where a 4-20 mA device is installed is inaccessible or difficult to be accessed by the operator. In these cases VRI10-I Remote Indicator facilitates visualization of the monitored variable (see Figure 2.12).

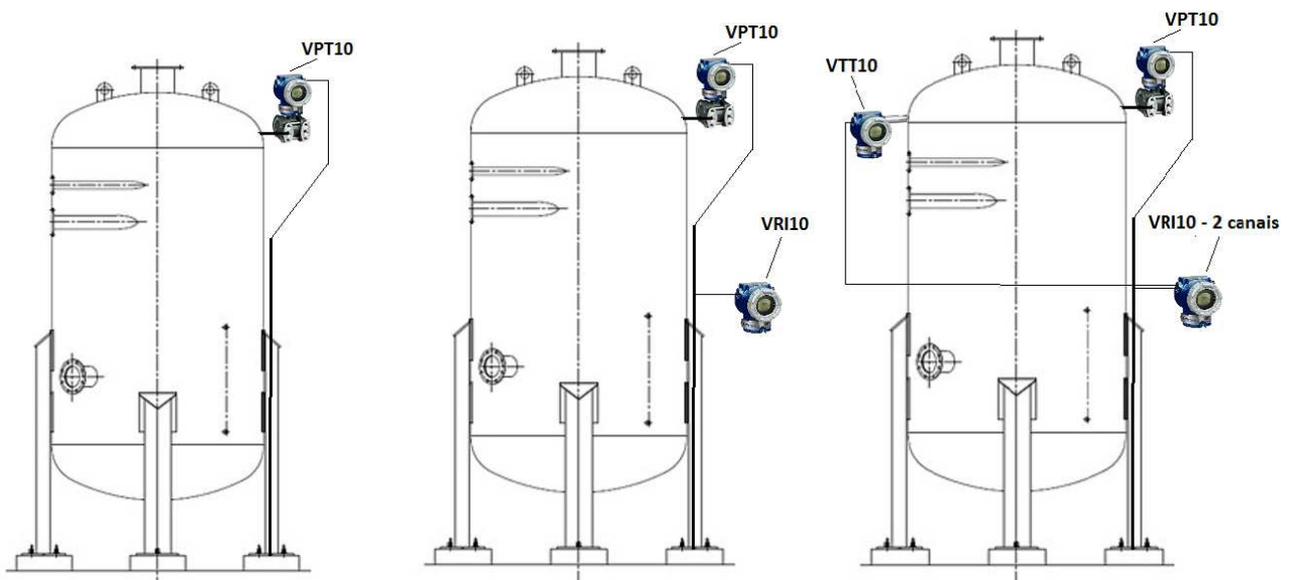


Figure 2.12 – VRI10-I connected to devices in hard to reach places.

3 CONFIGURATION

3.1. LOCAL CONFIGURATION

VRI10-I local configuration is executed by using Vivace 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.

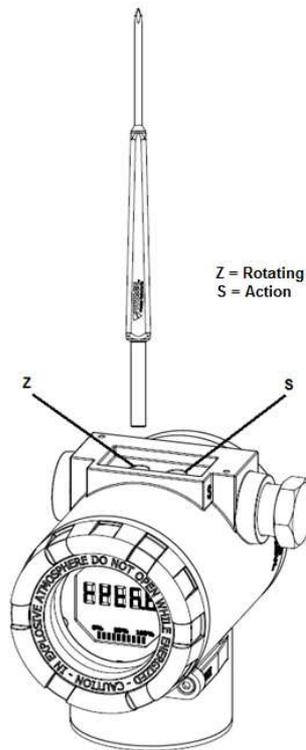


Figure 3.1 – Z and S orifices and magnetic screwdriver.

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

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

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

Table 3.1 – Z and S orifices actions.

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

If the parameter is numerical, this field will enter on edition mode and decimal point will start blinking, and shifting to left. When user removes magnetic screwdriver from S, the least significative 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 significative 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 significative 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 alphanumeric 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

VRI10-I has two *jumper*s on its main board to protect converter data writing (WP1) and also enabling/disabling local adjust (ADJL1). Figure 3.2 presents those *jumper*s.

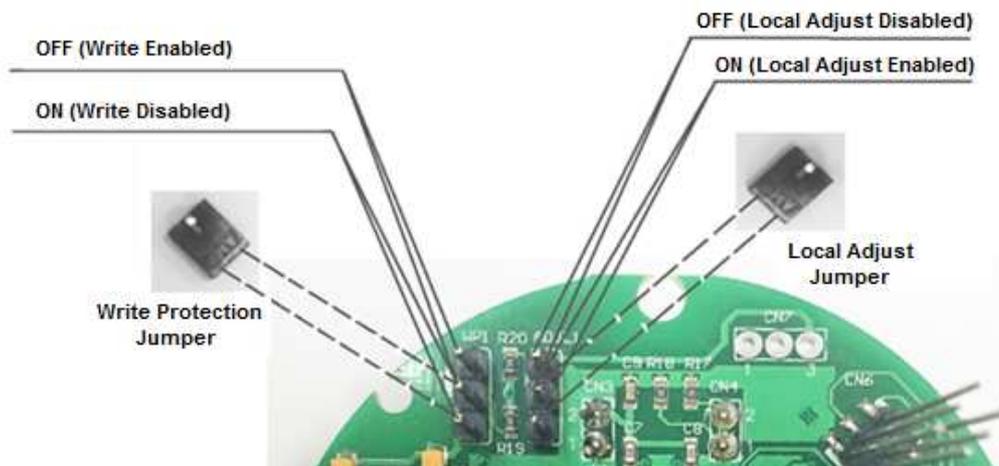


Figura 3.2 – Detalhe da placa principal com jumpers.

Figure 3.2 – *Jumpers* WP1 (write protection) and ADJL1 (local adjust) on VRI10-I main board.

Table 3.2 shows *jumper* positions on main board to enable/disable write protection and local adjust.

WP1	WRITE PROTECTION	ADJL1	LOCAL ADJUST
	Enabled		Enabled
	Disabled		Disabled

Table 3.2 – Write protection and local adjust selection.

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

3.3. LIQUID CRYSTAL DISPLAY (LCD)

Main information related to converter 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 3.3.



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

Table 3.3 – LCD icon description.

3.4. LOCAL ADJUST CONFIGURATION TREE

Local configuration is performed by acting Vivace magnetic screwdriver in the orifices located in the top of the housing. The orifice Z starts local configuration and switches the field to be configured. Orifice S is responsible for changing the value of the selected field.

Figure 3.5 shows the available fields for local configuration and the sequence in which they are shown by using magnetic screwdriver on orifice Z.

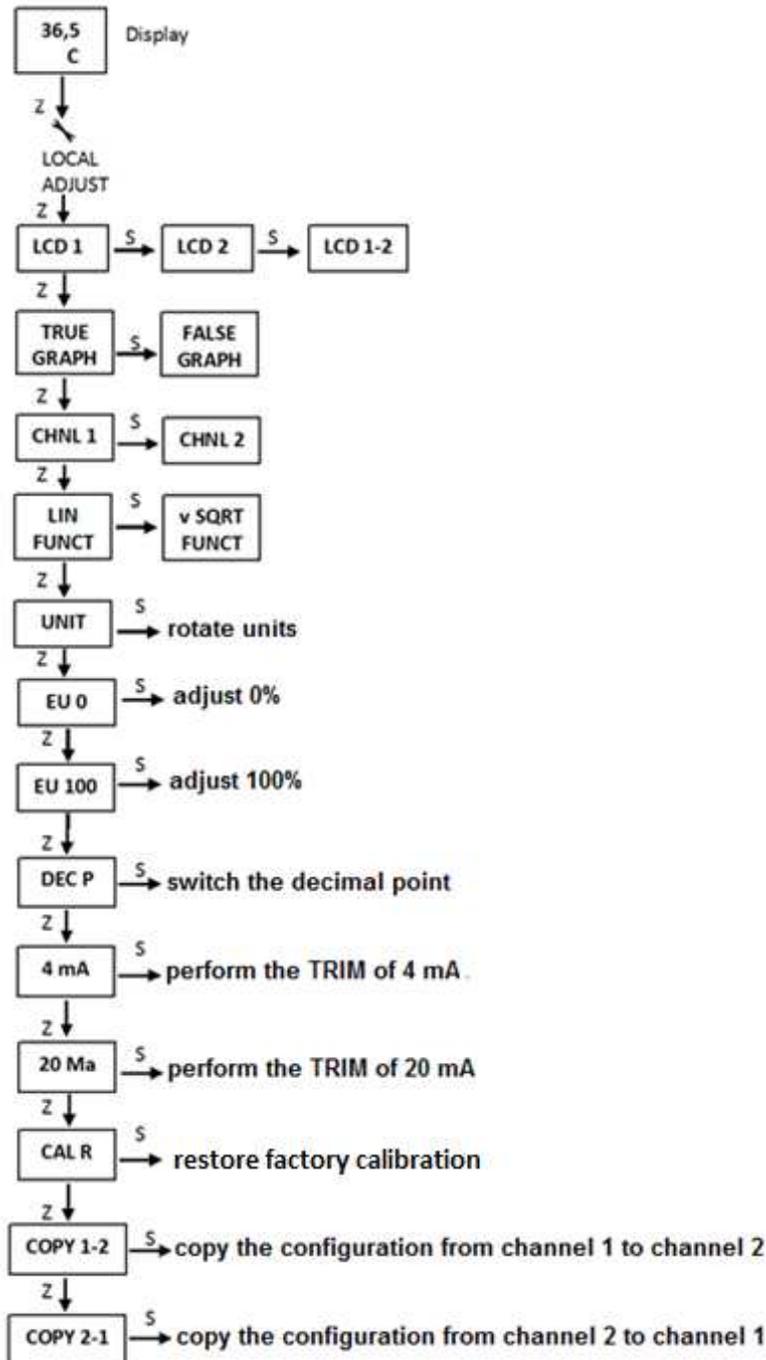


Figure 3.5 – Local adjust configuration tree.

To start local adjust insert the magnetic screwdriver on orifice Z. Icon  appears on display, followed by LOCAL ADJUST message. Remove magnetic screwdriver, wait one second and return it to orifice Z. VR110-I configuration fields will start rotating on display.

When desired field is on display, change magnetic screwdriver from orifice Z to orifice S to change the parameter.

Table 3.4 lists VRI10-I units in the sequence they are shown on display.

VRI10 UNITS TABLE			
Display Inscription	Description	Display Inscription	Description
%	Percentage	lb/h	Pounds per hour
mA	Milliampere	lb/d	Pounds per day
C	Celsius degree	m ³ /s	Cubic meter per second
F	Fahrenheit degree	m ³ /min	Cubic meter per minute
K	Kelvin	m ³ /h	Cubic meter per hour
R	Rankine degree	m ³ /d	Cubic meter per day
mmH ₂ O	Millimeter of water	L/s	Liter per second
mca	Metre of water column	L/min	Liter per minute
Psi	Pounds per square inch	L/h	Liter per hour
bar	Bar	CFS	Cubic feet per second
mbar	Millibar	CFM	Cubic feet per minute
Kg/cm ²	Kilogram per square centimetre	CFH	Cubic feet per hour
Pa	Pascal	ft ³ /d	Cubic feet per day
MPa	Megapascal	gal/s	Gallon per second
KPa	Kilopascal	GPM	Gallon per minute
Torr	Torricelli	gal/h	Gallon per hour
atm	Atmosphere	gal/d	Gallon per day
g/cm ²	Grams per square centimetre	bbbl/s	Barrels per second
inH ₂ O	Inches of water	bbbl/m	Barrels per minute
ftH ₂ O	Feet of water	bbbl/h	Barrels per hour
inHg	Inches of mercury	bbbl/d	Barrels per day
mmHg	Millimeter of mercury	Kg/m ³	Kilogram per cubic metre
mV	Millivolts	g/cm ³	Gram per cubic metre
V	Volts	lb/ft ³	Pounds per cubic feet
Ohm	Ohms	Baumé	Baumé degree
g/s	Grams per second	Brix	Brix degree
g/min	Grams per minute	%Sol	Solids %
g/h	Grams per hour	Plato	Plato degree
Kg/s	Kilograms per second	GL	Gay Lussac degree
Kg/min	Quilograma por minuto	INPM	INPM degree
Kg/h	Kilograms per minute	API	API degree
Kg/d	kilograms per day	Conc	Concentration
T/min	Tonnes per minute	T/m ³	Tonnes per cubic meter
T/h	Tonnes per hour	m	Meter
T/d	Tonnes per day	cm	Centimeter
lb/s	Pounds per second	mm	Millimeter
lb/min	Pounds per minute	user	User unit

Table 3.4 – VRI10-I units list.

To rotate the available units, being on the UNIT menu, put the magnetic screwdriver in the orifice S. Units start rotating in the sequence shown in the table above. To rotate them in the opposite direction remove the magnetic screwdriver, wait 5 seconds and return it to orifice S.

4 MAINTENANCE

VRI10-I, as all Vivace devices, suffers a several inspection before its shipping. However, some diagnostics are available in the case of malfunction in order to check problem cause (installation, configuration or on device itself).

Table 4.1 shows some diagnostics to identify failure causes and possible solutions through display.

DIAGNOSIS	
INDICATION	PROBABLE CAUSE OF ERROR
No Current in Line	- VRI10 Connection
	Check polarity and continuity of wiring;
	Check if the connection between the voltage source, the current generating equipment and VRI10 is correct.
	- Power Supply Connection
	Check the input current signal.
Wrong Indication	- Failure of Electronic Board
	Check if the main board is in faulty, replace it by a spare.
	- VRI10 Connection
	Check if the connection in series with the signal 4 - 20 mA is correct.
	- 0 and 100% Settings
Check EU0 e EU100 configuration, verifying the proportional value to the current signal.	
Display without Indication	- TRIM of the Device
	Check if the current TRIM is correct, putting 4 mA and 20 mA and verifying if the indication is correct.
	- Display Connection on Main Board
	Check the LCD connection to the main board.

Table 4.1 – VRI10-I fault diagnostics.

4.1. ASSEMBLY PROCEDURE

Figure 4.1 shows VRI10-I exploded view.

- Fix main board (5) in its position in housing;
- Place LCD (4) in housing (9) paying attention to the correct position for a better visualization;
- Tight the screws (3);
- Close device covers properly (1 and 18).

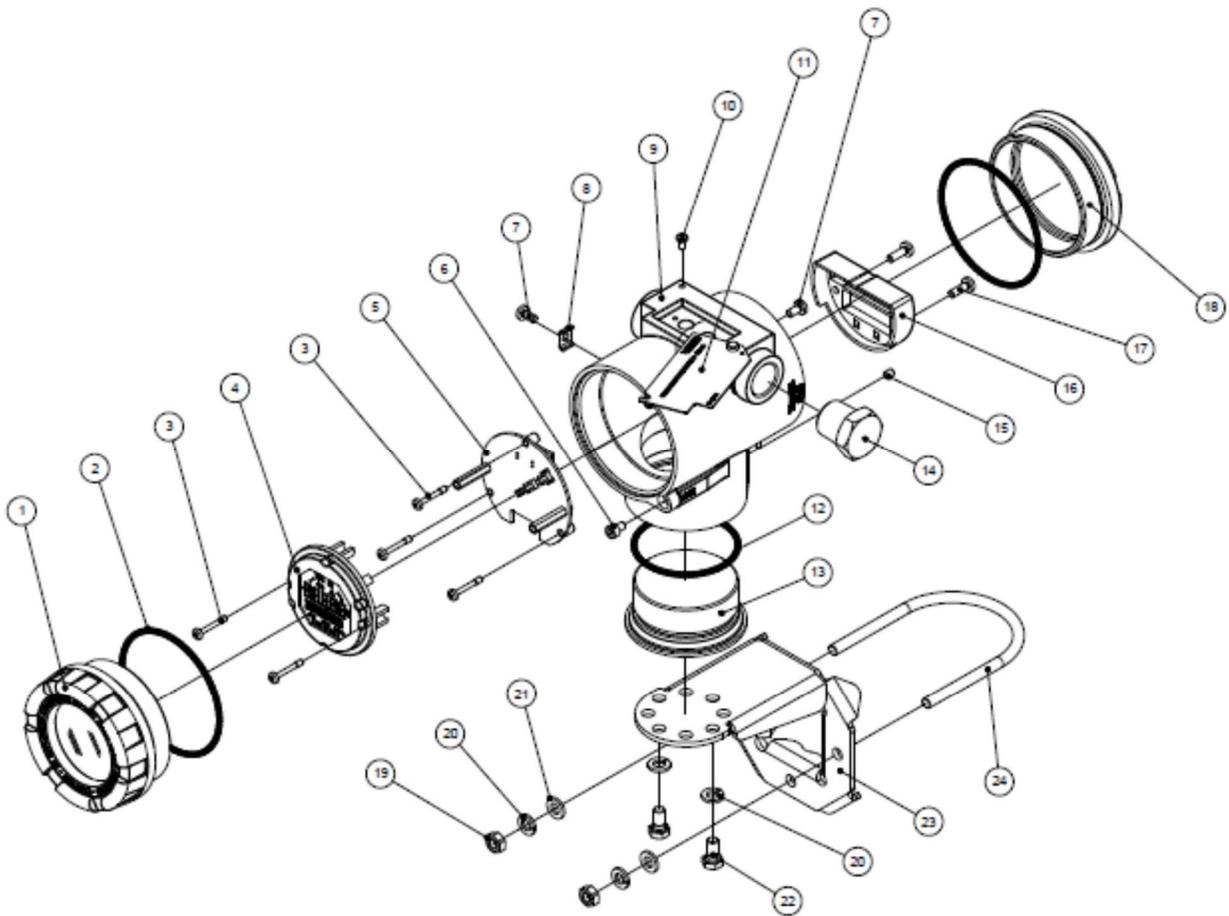


Figure 4.1 – VRI10-I exploded view.

4.2. SPARE PARTS

All the spare parts available for VRI10-I can be bought directly from *Vivace Process Instruments*. Those parts are listed on table 4.2.

VRI10 - SPARE PARTS LIST		
DESCRIPTION	POSITION	CODE
	FIG. (4.1)	
COVER WITH WINDOW (o'ring included)	1	2-10002
COVER(o'ring included)	18	2-10003
COVER O'RING	2	1-10001
HOUSING	9	2-10001
LCD (screws included)	4	2-10006
MAIN BOARD VRI 1 CHANNEL (screws and spacers included)	5	2-10004
MAIN BOARD VRI 2 CHANNELS (screws and spacers included)	5	2-10005
LCD AND MAIN BOARD SCREWS	3	1-10002
TERMINAL BLOCK (screws included)	16	2-10007
TERMINAL BLOCK SCREWS	17	1-10003
HOUSING PLUG (o'ring included)	13	2-10008
HOUSING PLUG O'RING	12	1-10004
EXTERNAL GROUND TERMINAL (screw included)	8	2-10010
HOUSING ELECTRICAL CONNECTION PLUG	14	1-10005
MOUNTING BRACKET (U-clamp, screws, nuts and washers included)	23	2-10009
COVER LOCKING SCREW	6	1-10006
IDENTIFICATION PLATE SCREW	10	1-10007
HOUSING LOCKING SCREW	15	1-10008

Table 4.2 – VRI10-I 1 and 2 Channels spare part list.



O-rings and screws are shipped in 10-piece packages.

5 CERTIFICATION

VRI10-I was designed to meet national and international standards for intrinsic safe and explosion proof.

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

6 TECHNICAL CHARACTERISTICS

6.1. IDENTIFICATION

VRI10-I has an identification plate fixed on the superior side of its housing, specifying model, manufacturer and serial number, as shown on figure 6.1.

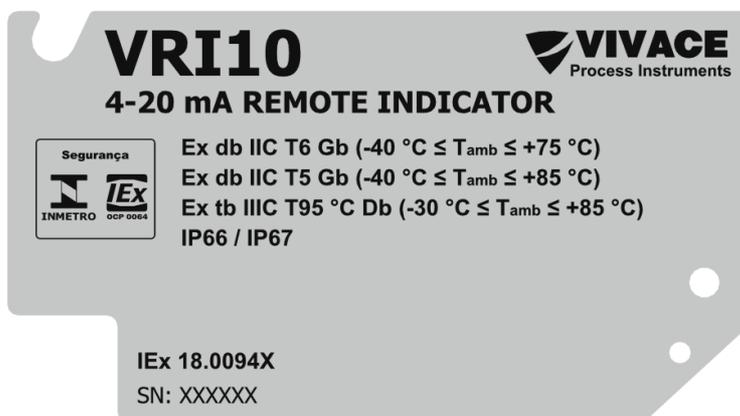


Figure 6.1 – VRI10-I identification plate.

6.2. TECHNICAL SPECIFICATIONS

VRI10-I technical and physical specifications are shown in table 6.1.

Accuracy	± 0.2% of Calibrated Span
Power Supply	4-20 mA (via loop of current)
Resolution	± 0.02%
Indication	5-digits display LCD with bargraph
Indication Options	Linear and Square Root
Voltage Drop	1.0 Vdc (maximum)
Operation Temperature	- 40 to 85°C
Configuration	Local Adjustment with Magnetic Screwdriver
Hazardous Area Certification	Explosion Proof and Intrinsically Safe
Protection Degree	IP67
Number of Indication Channels	1 and 2 Channels
Housing Material	Injected Aluminum with Polyester Paint
Sealing O-rings Material	Buna-N
Approximate Weight (with mounting bracket)	1.8 Kg

Table 6.1 – VRI10-I technical and physical specifications.

6.3. ORDERING CODE

VR10 *Remote Indicator*

Communication Protocol	I	4 – 20 mA
	P	PROFIBUS-PA
Channels	0	NOT APPLICABLE (ONLY PROFIBUS)
	1	ONE CHANNEL (ONLY 4 – 20 mA)
	2	TWO CHANNELS (ONLY 4 – 20 mA)
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:

VR10	-	I	1	-	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

	<p>FSAT</p> <p>Technical Analysis Solicitation Form</p>
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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 (°C)		Work Temperature (°C)	
Min:	Max:	Min:	Max:
Operation Time:		Fail Date:	

FAIL DESCRIPTION: Here user should describe in detail the observed behaviour of product, frequency of fail occurrence and repeatability. Also, should inform operational system version and a quick description of control system architecture where the equipment was installed.

ADDITIONAL OBSERVATION:

