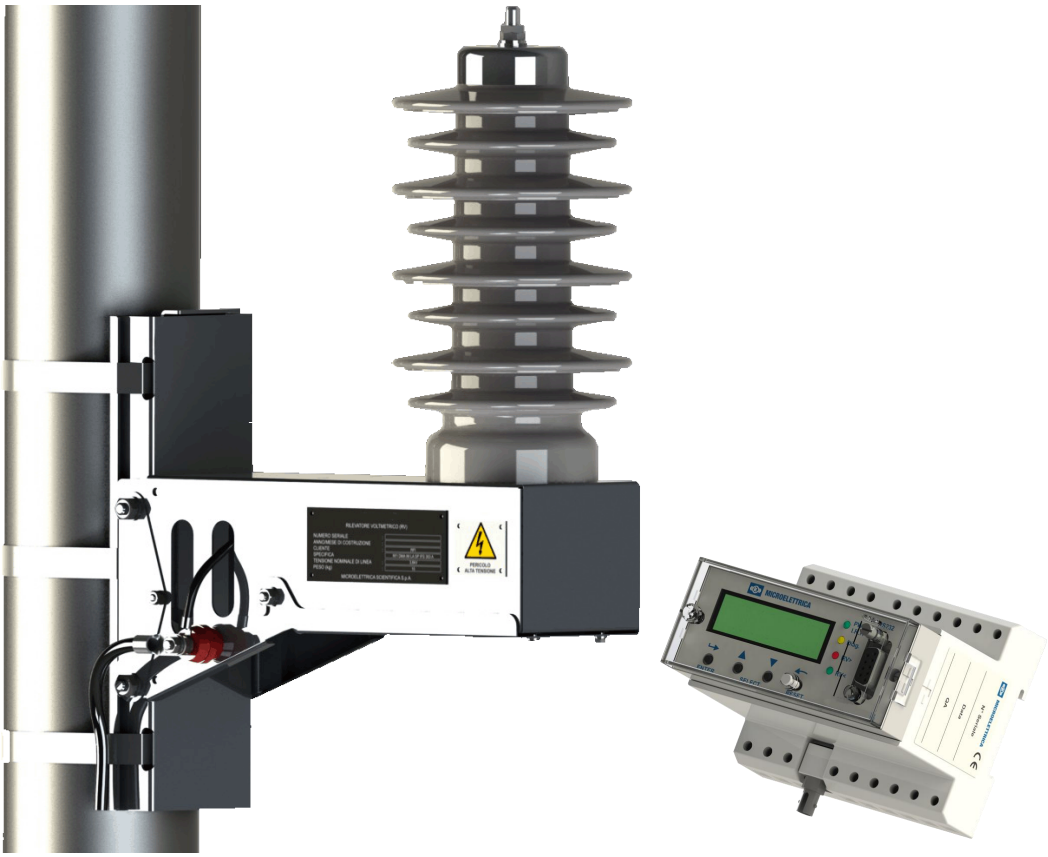
Voltage detector system
For protection and monitoring
of 3kVdc traction line

TYPE

"PV3000"

OPERATION MANUAL



1. General norms

1.1 - Storage and Transportation

Must comply with the environmental conditions stated in the product's specification or by the applicable IEC standards.

1.2 - Installation

Must be properly made and in compliance with the operational ambient conditions stated by the Manufacturer.

1.3 - Electrical Connection

Must be made strictly according to the wiring diagram supplied with the Product, to its electrical characteristics and in compliance with the applicable standards particularly with reference to human safety.

1.4 - Measuring Inputs and Power Supply

Carefully check that the value of input quantities and power supply voltage are proper and within the permissible variation limits.

1.5 - Outputs Loading

Must be compatible with their declared performance.

1.6 - Protection Earthling

When earthling is required, carefully check its effectiveness.

1.8 - Safety Protection

Carefully check that all safety means are correctly mounted, apply proper seals where required and periodically check their integrity.

1.9 - Handling

Notwithstanding the highest practicable protection means used in designing M.S. electronic circuits, the electronic components and semiconductor devices mounted on the modules can be seriously damaged by electrostatic voltage discharge which can be experienced when handling the modules.
The damage caused by electrostatic discharge may not be immediately apparent, but the design reliability and the long life of the product will have been reduced. The electronic circuits produced by M.S. are completely safe from electrostatic discharge (8 KV IEC 255.22.2) when housed in their case; dismounting the modules without proper cautions expose them to the risk of damage.

1.10 - Maintenance

Make reference to the instruction manual of the Manufacturer; maintenance must be carried-out by specially trained people and in strict conformity with the safety regulations.

2. General characteristics

Voltage detector system "PV3000", is installed to give support to supervision system, in order to protect the contact line (voltage protection) detecting if the contact line voltage in the section where the the device is installed, goes below the set threshold.

Voltage detector system "PV3000", acquires the voltage trend of contact line, allowing the monitoring in case of over voltages, overloads, and transient due to short-circuit.

The system is composed by two parts: transmitter and receiver, connected by fibre optic.

2.1 - Transmitter - PVT3000

Transmitter HV "PVT3000" is installed with and adapter on contact line pole.
The device is composed by an insulator/voltage divider, and one acquisition unit of the contact line voltage value, measurement is transmitter by fibre optic to the receiver unit
Transmitter HV is directly fed by the 4kVdc of contact line.

2.2 - Receiver - PVR3000

Receiver "PVR3000" is typically installed in SCADA area.
The device receive the the voltage value from transmitter unit, compare it with the threshold end send the voltage presence signalization.

2.3 – Connection between transmitter and receiver

Connection between transmitter "PVT3000" and receiver "PVR3000" is done with fibre optic.

2.3.1 – Fibre optic

Optical cable (double, one is spare) of connection between the two units is provided with a length of 5m (other lengths are optional) complete with ST connector.

Multimode fibre optic grade index 62.5/125µ

Attenuation	<= 3,5dB/km
bandwidth	>= 160MHz/km

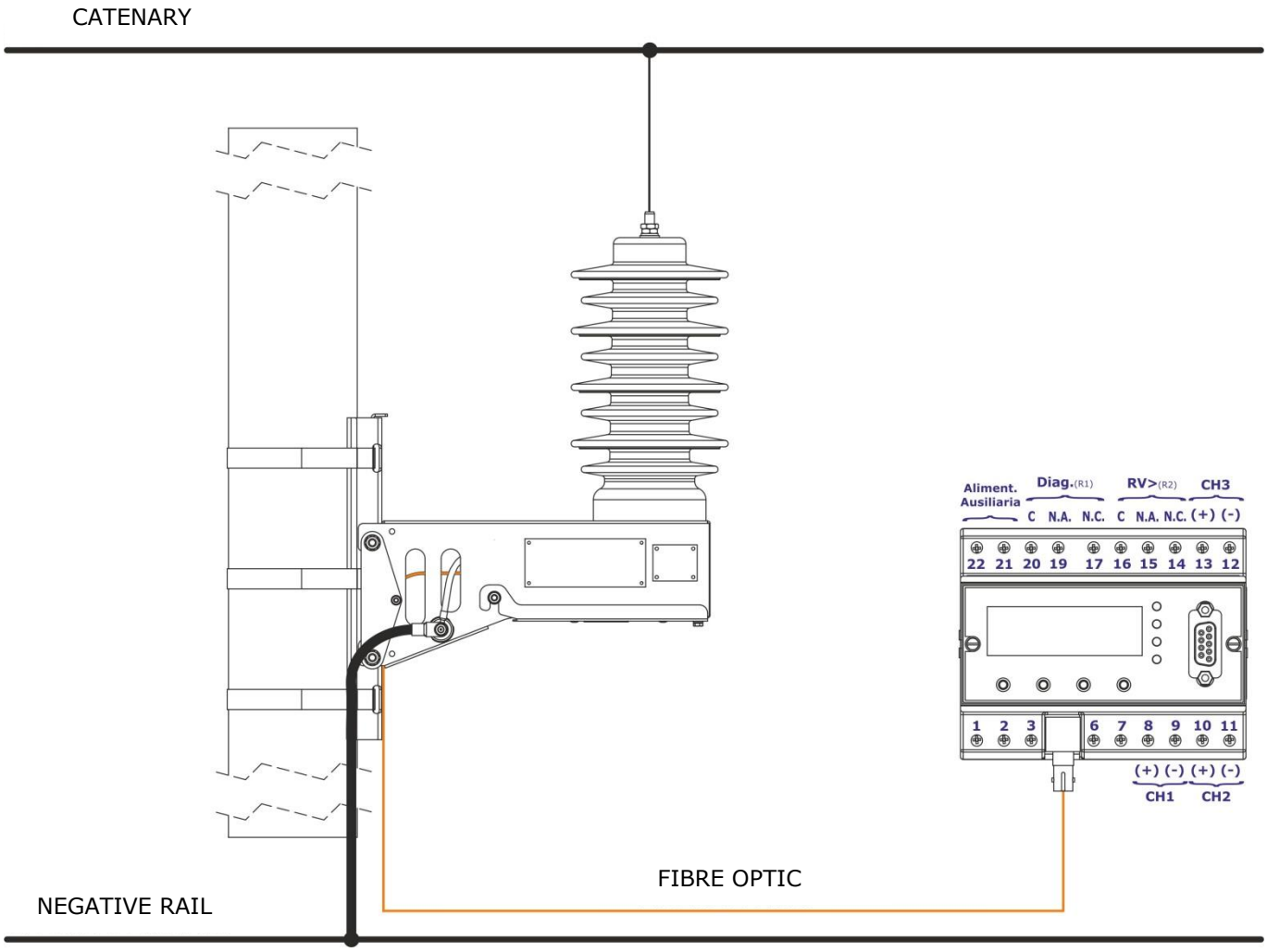
2.3.1.1 - Connector

Connectors for connection between transmitter, receiver and on the fibre optic, are equipped with protection cap, that must be removed before make the connection, and preserved in order to be applied in case of unit maintenance.
Absence of the cap for long period can damage quality of the communication.

2.3.1.2 – Bender radius

During the installation is necessary have care about the minimum bender radios, that cannot be lower than 60mm. a lower bender can cause fibre optic damage, and increase the attenuation, up to and overage value.

4. Connection scheme



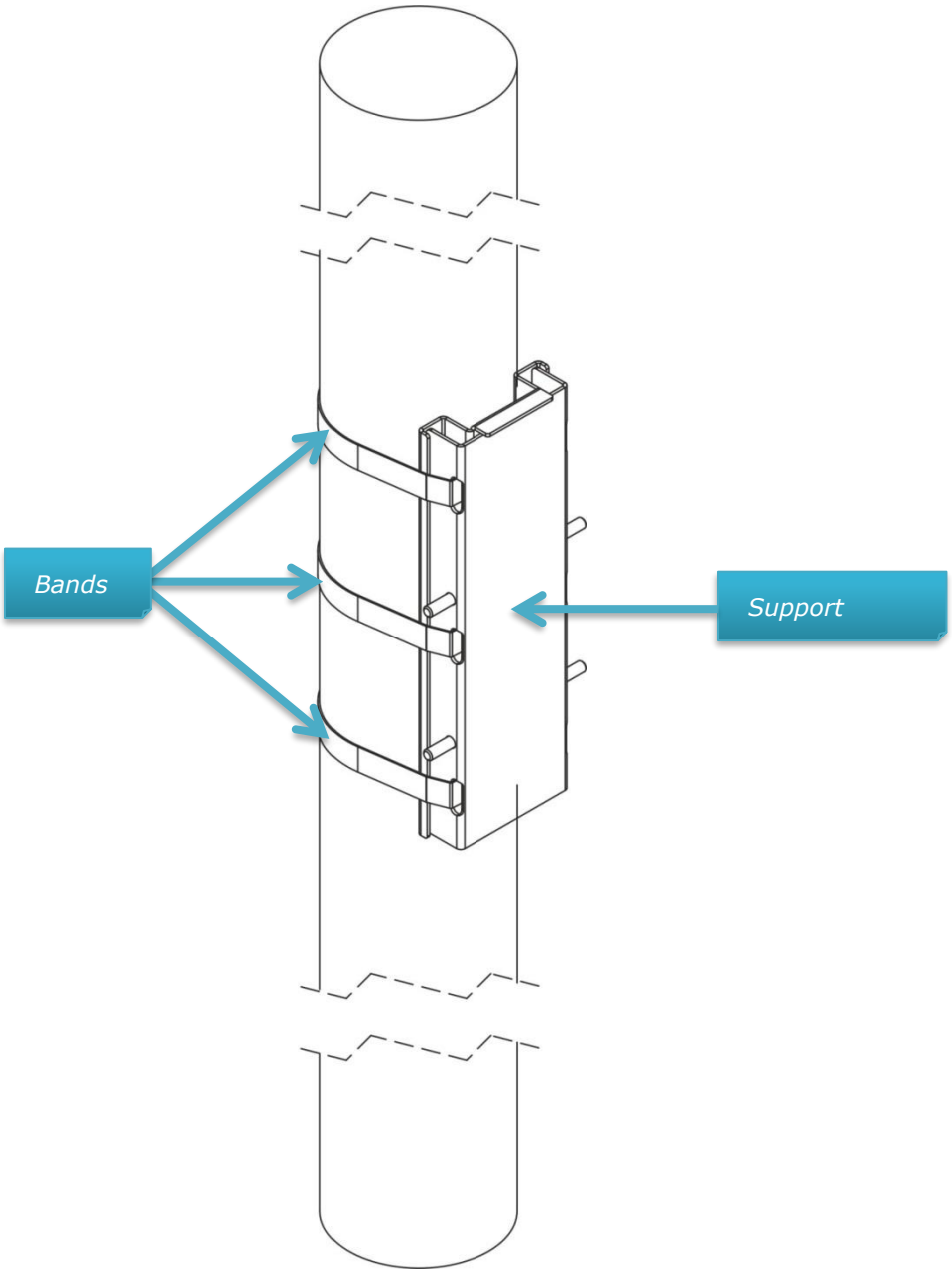
5. Transmitter Unit - PVT3000

Transmitter

"PVT3000"

5.1 – Support pole installation

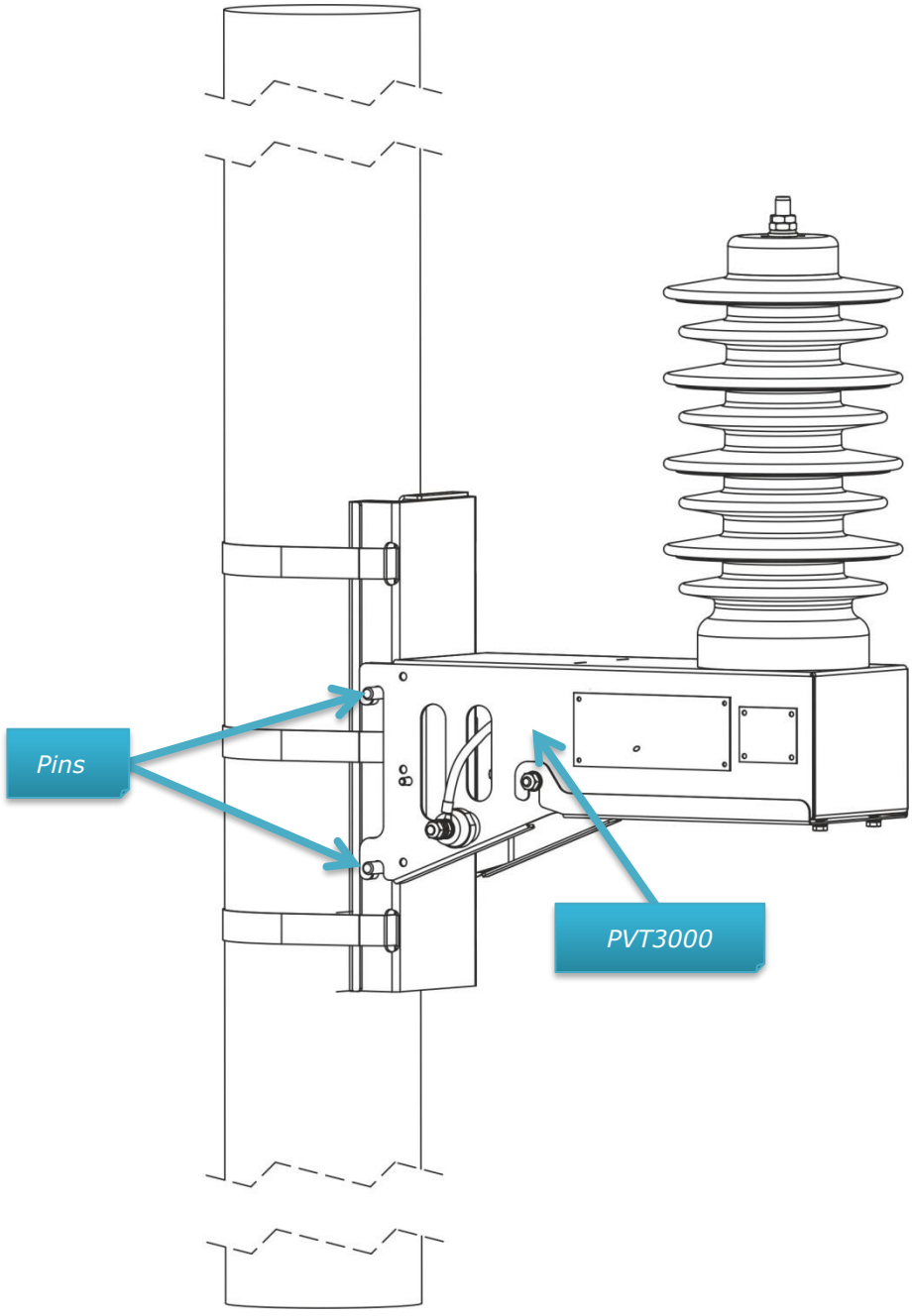
Mounting the transmitter " PVT3000" at the pole is made by stainless steel bands.
The bands and its clamping device is not provided.
support weight is 4 kg



5.2 – Transmitter installation

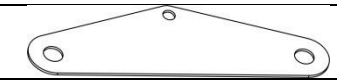
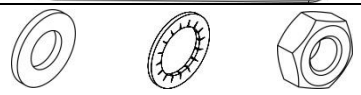
Mounting the transmitter " PVT3000" at the pole is done fixing the four pins on the at the pole support.

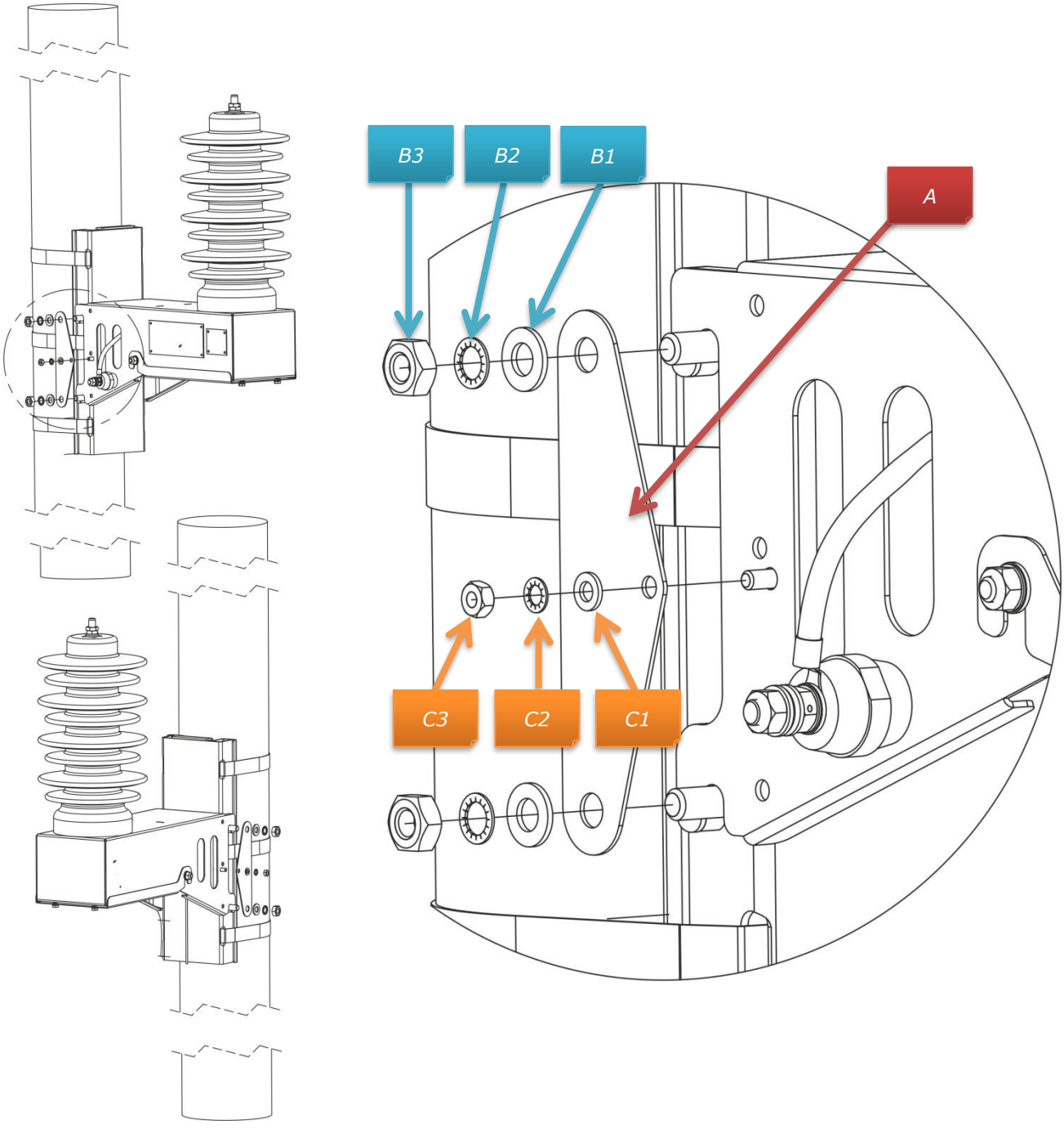
Transmitter weight is 15 kg.



5.3 – Transmitter fixing at the support

Transmitter fixing is done through the assembly of the supplied security plates on the left and right side (see drawing).

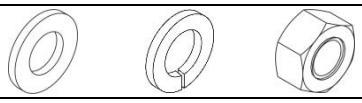
	N°2	Security plates		Stainless steel	A
	N°4	Flat ring	M10	Stainless steel	B1
	N°4	Grower ring	M10	Stainless steel	B2
	N°4	Nut	M10	Stainless steel	B3
	N°2	Flat ring	M6	Stainless steel	C1
	N°2	Grower ring	M6	Stainless steel	C2
	N°2	Nut	M6	Stainless steel	C3



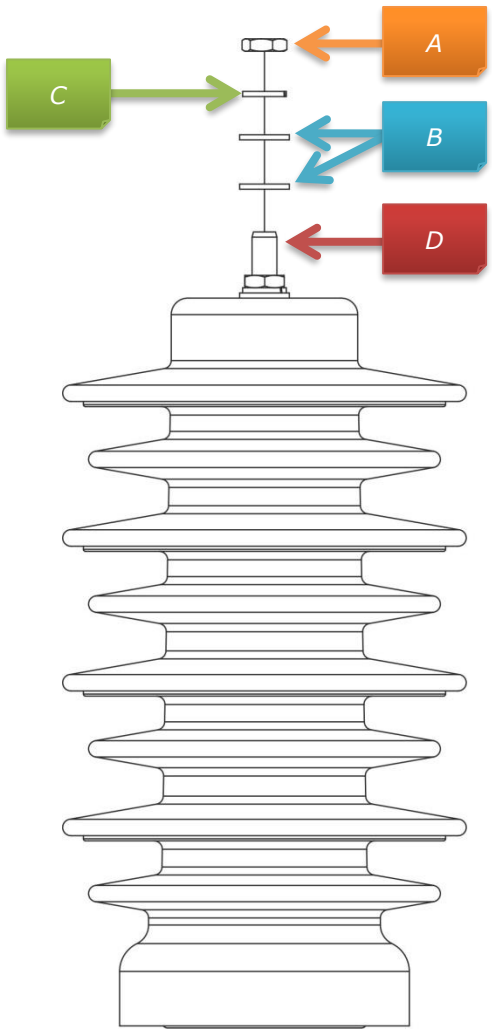
5.4 – Connection between transmitter and contact line

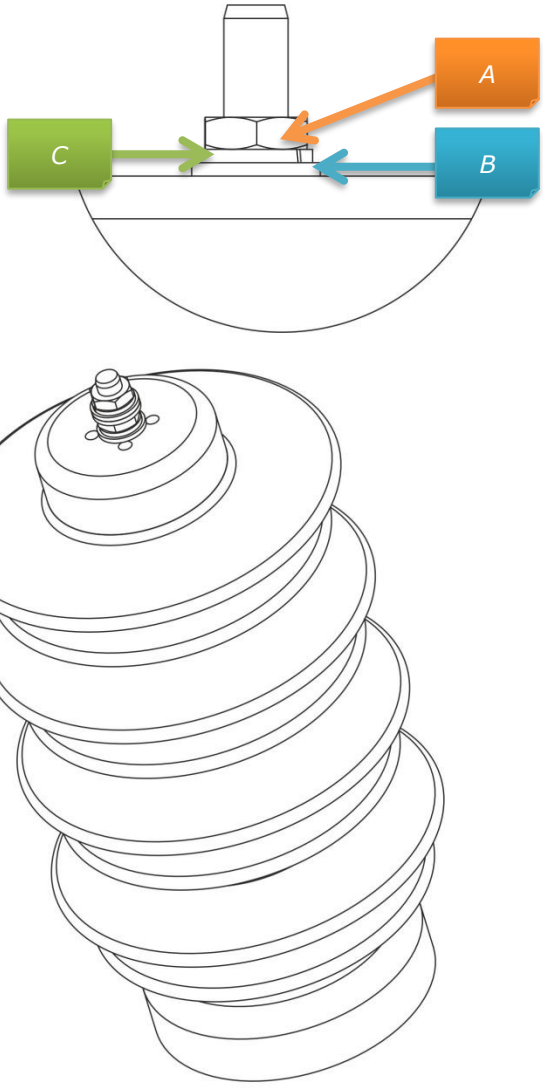
Connection between transmitter "PVT3000" and contact line is done through the isolator/Voltage divider.

The conductor is fixed to the stainless-steel isolator/voltage divider using the bolt "D", with its nut "A" "B" and "C" "grower ring.



N°2	Nut	M12	Stainless steel	A
N°3	Flat ring	M12	Stainless steel	B
N°2	Grower ring	M12	Stainless steel	C

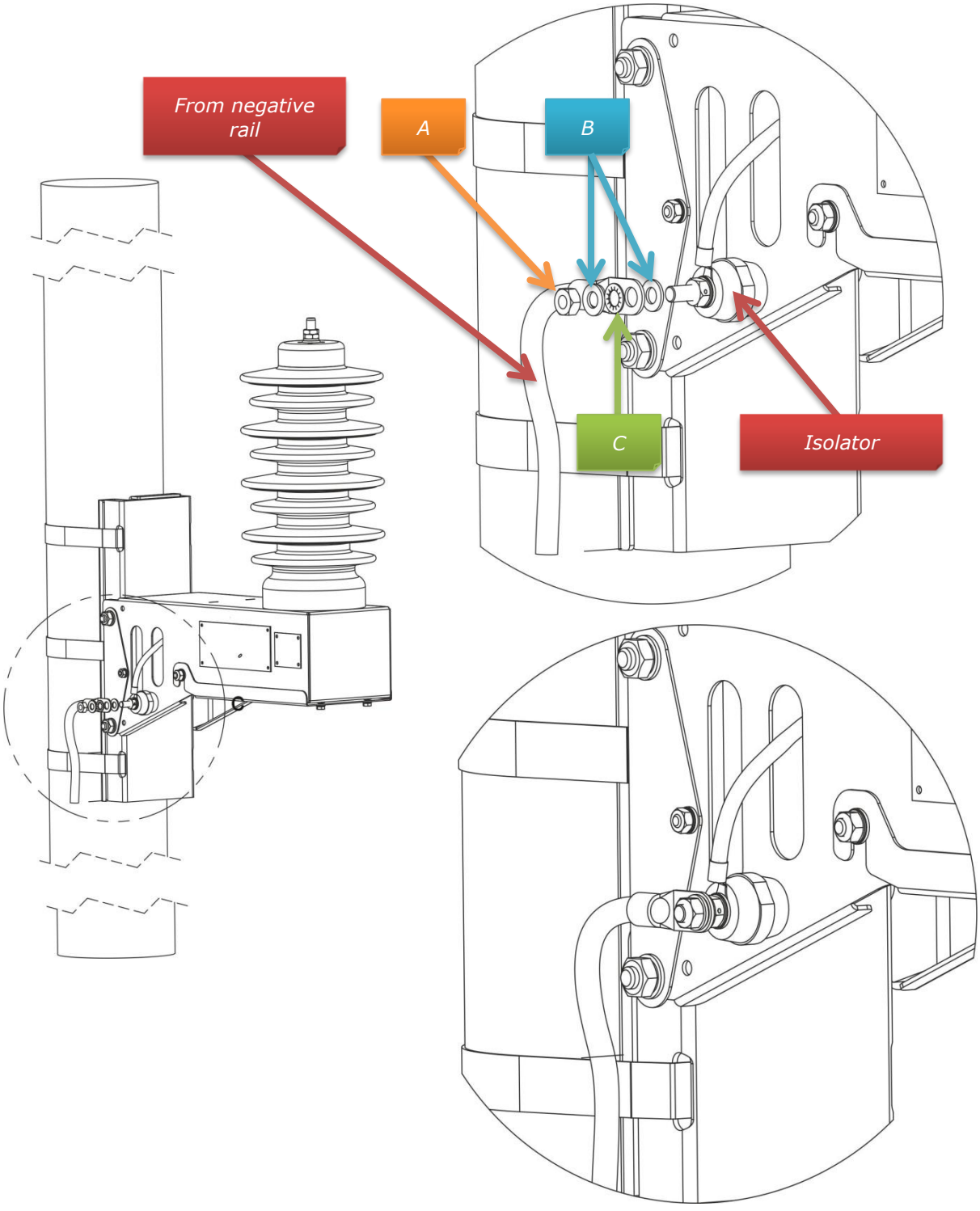




5.5 – connection between transmitter and negative rail

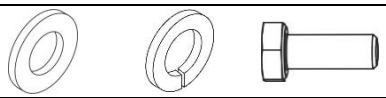
Connection between transmitter "PVT3000" and negative rail, occurs through a special insulator on the side.

N°1	Nut	M8	Stainless steel	A
N°2	Flat ring	M8	Stainless steel	B
N°1	Grower ring	M8	Stainless steel	C



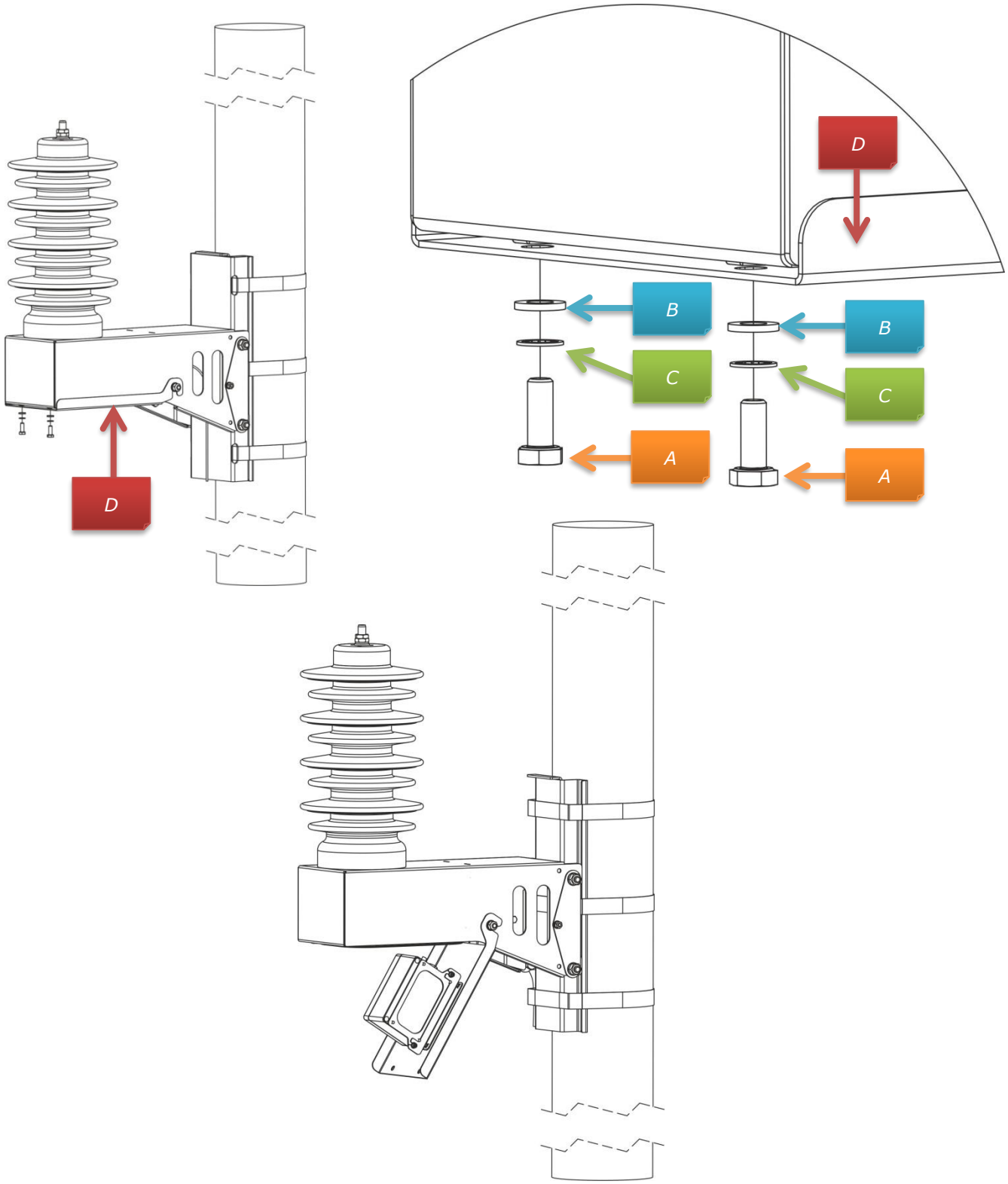
5.6 – Optical cable (fibre optic) connection

Connection between transmitter "PVT3000" and receiver "PVR3000", is done via fibre optic.

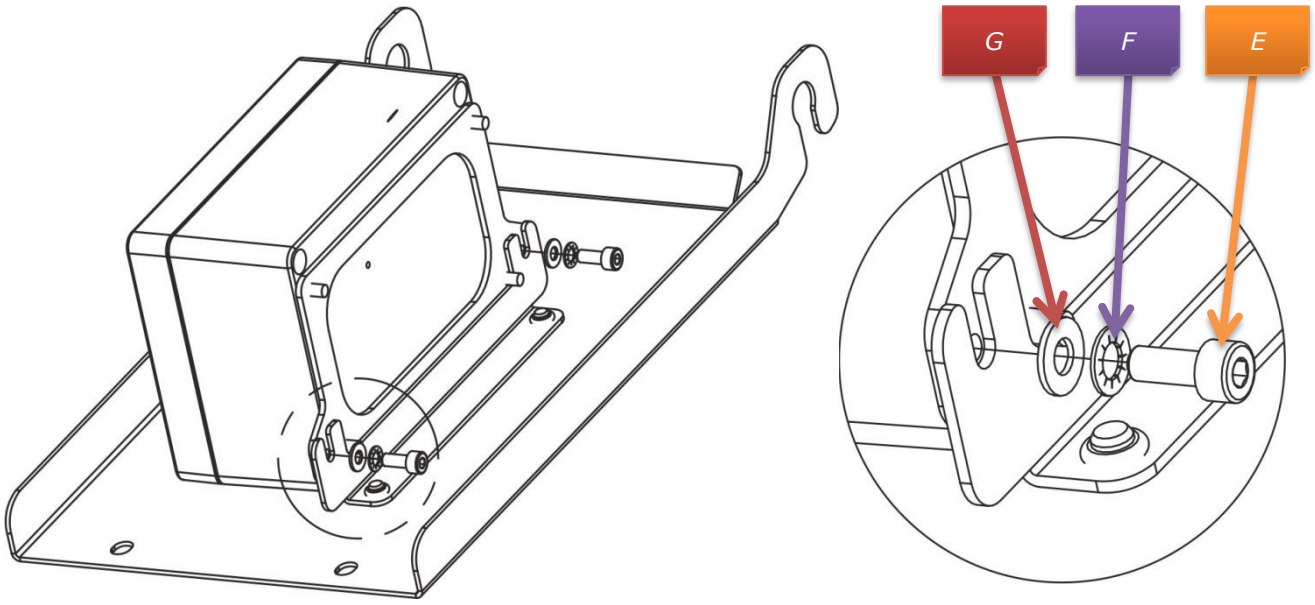


N°2	Screws	M6	Stainless steel	A
N°2	Flat ring	M6	Stainless steel	B
N°2	Grower ring	M6	Stainless steel	C

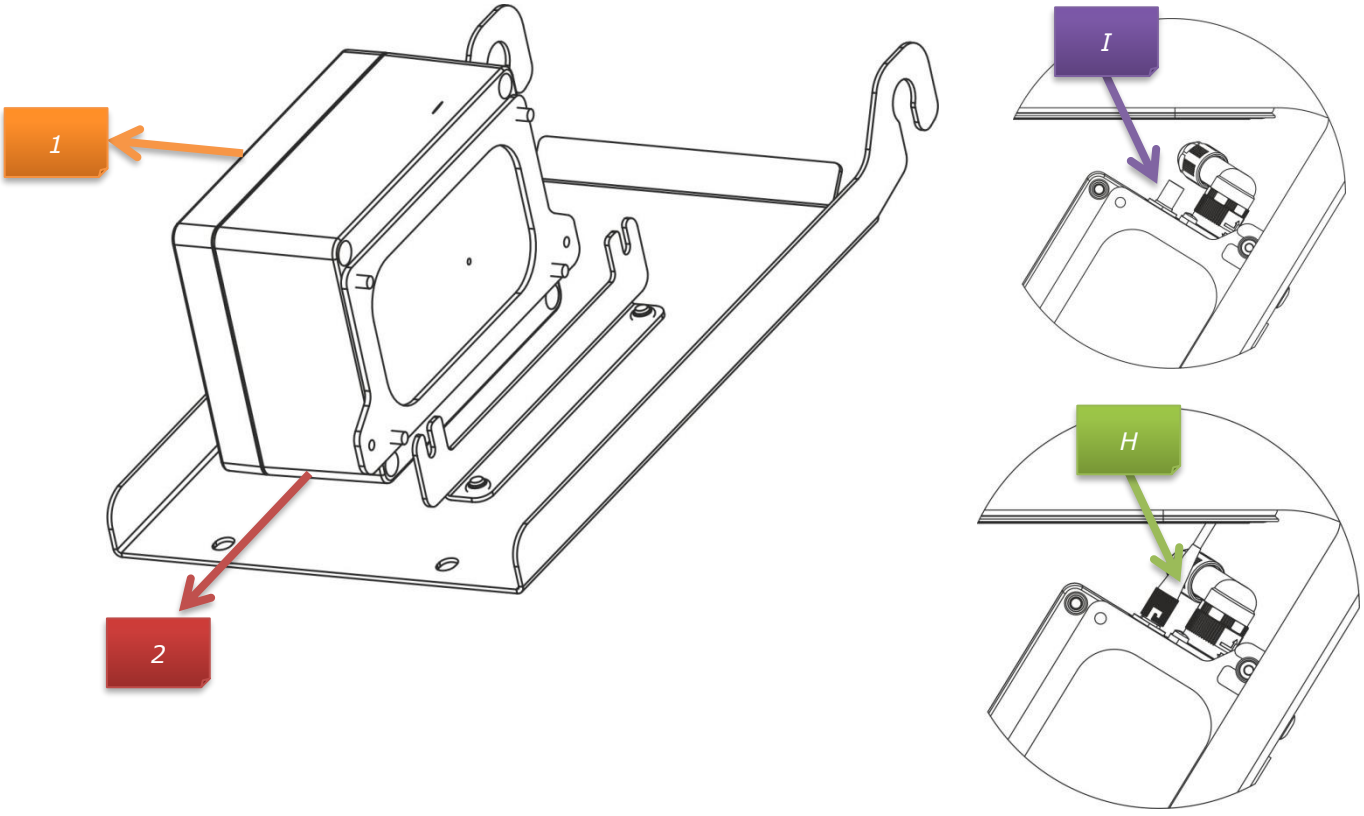
To connect the optical cable from the receiver "PVR3000", open the "D" key to access the transmitter "PVT3000".



Unscrew the screws "E", to unlock the transmitter box

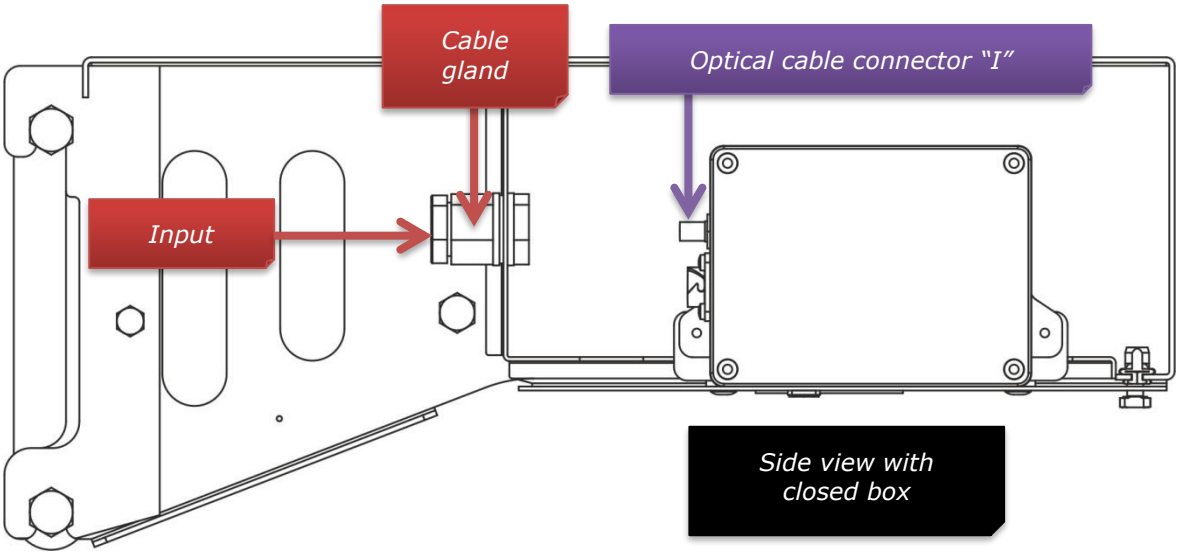


Slightly move the box in the direction of "1", and then later in the direction of "2" for a chance to connect the "H" in the optical cable to the connector on the Transmitter box place "I".

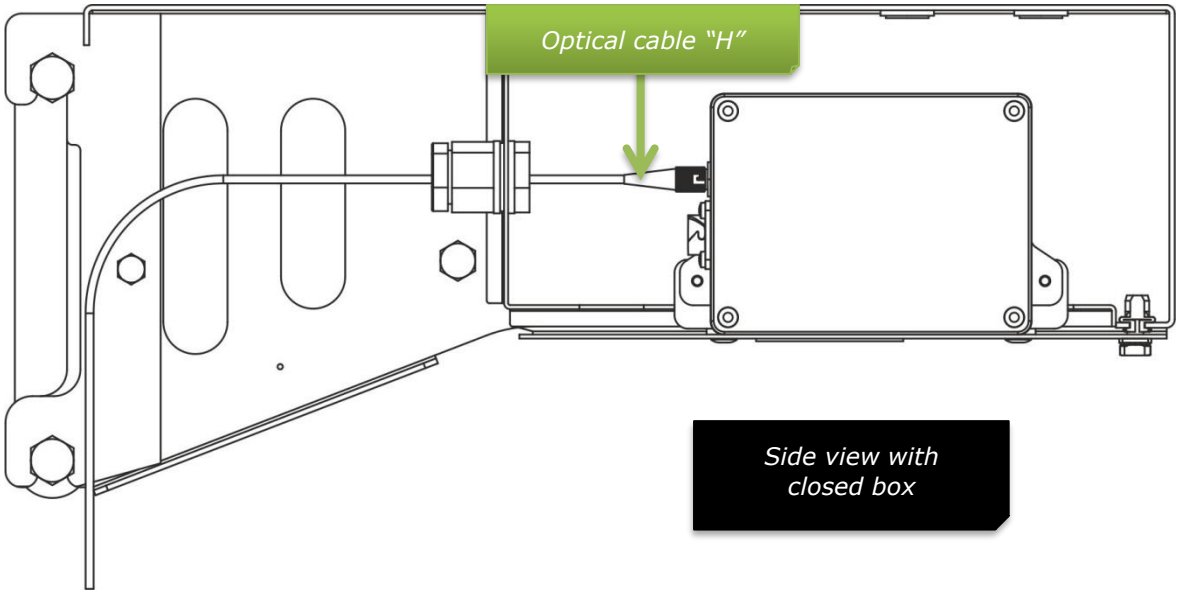


Over this, reposition the transmitter box in place, tighten the fixing screws and close the door.

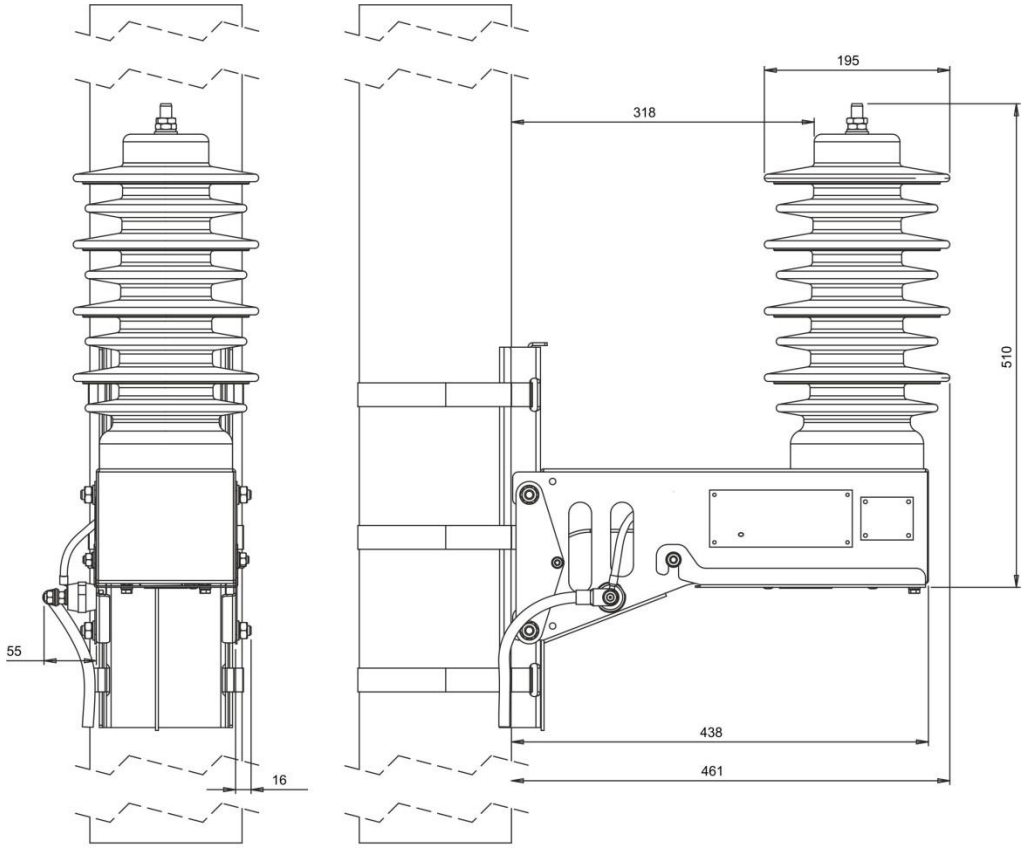
In the back of the "PVT3000" is installed a cable gland (M20-min/max cable 8/13 mm) used to carry the transmitter optical. Its size is such that the installation of the optical fibre is greatly facilitated.

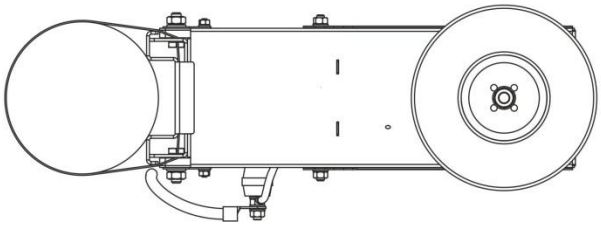


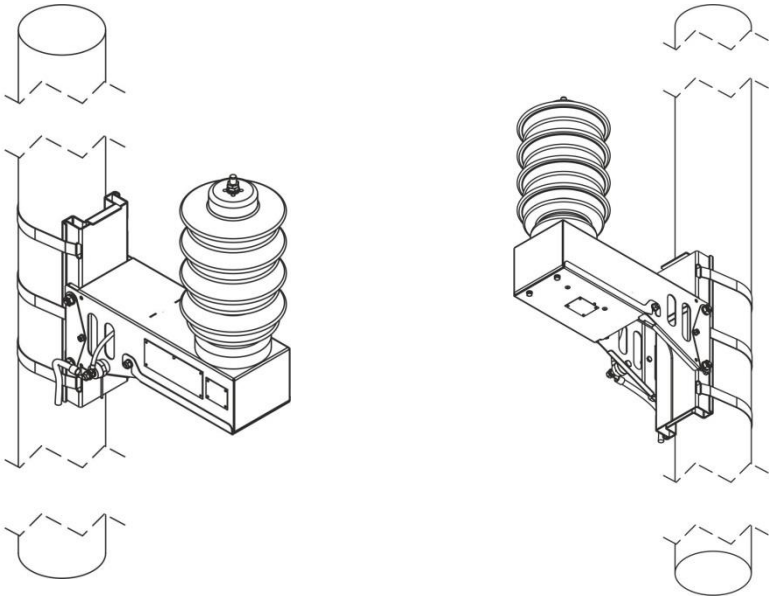
During installation you must ensure that the minimum bending radius **shall not be less than 6 cm.** Lower curvature may lead to breakage of the optical fibre or increase the loss in dB admitted causing an incorrect digital information transfer between transmitter and receiver.



5.8 – Overall dimension







5.9 - Characteristics

Electrical Characteristics	
Nominal voltage	4 kVdc
Aux. Voltage	From contact line 3 kVdc - (1200 ÷ 3900)Vdc
Maximum permanent voltage	3.9 kV
Minimum voltage	1.2 kV
Temporary voltage (t ≤ 10s)	4.5 kV
Transient maximum voltage (tmax ≤ 1s)	6 kV
Start-up time	> 700ms
Impedance	1 MΩ
Precision at nominal voltage	± 1 %
Thermal stability	± 0.01 %F.S./°C
Insulation (1.2/50 µs pulse atmospheric)	± 140 kV

Insulator/voltage divider	
Material	Silicone rubber
Insulation (1.2/50 µs pulse atmospheric)	± 140 kV
Dry power frequency insulation	60 kV; 1min. 50Hz

Auxiliary power supply	
Auxiliary power supply	None (powered by contact line)

Temperature	
Operation	-20 ÷ + 55° C
Storage	+70 -30 ÷° C

Enclosure	
Protection degree	IP65
Material	Stainless steel
Weight	15 kg
Connections	Screw (M12) for signal inputs/screw (M8) for earth connection/ST for the F.O.

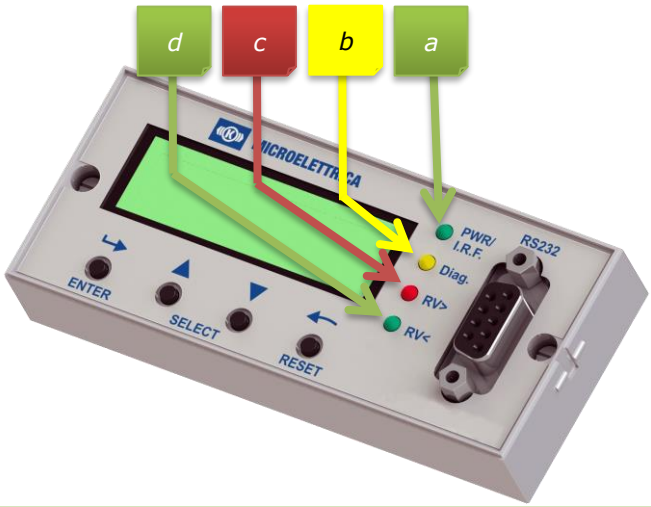
6. Receiver unit – PVR3000

Receiver

"PVR3000"

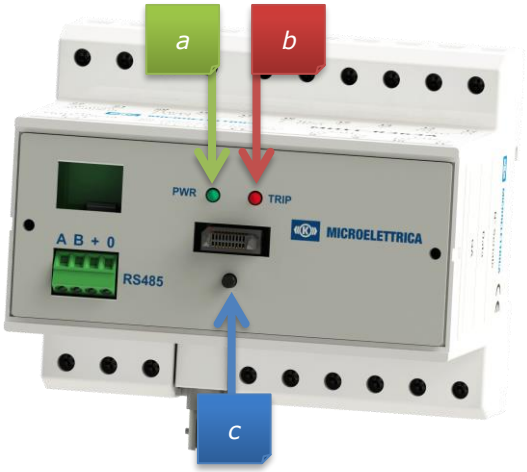
6.1 - Signalization

There are four LEDs on the front Front Face Panel (FFP):



a)	LED Green	**PWR/ I.R.F.**	*ON*	Receiver in normal operation
			Flashing	Internal fault Receiver
b)	LED Yellow	**Diag.**	*Flashing*	Presence Anomaly/alarms (Fibre optic Transmitter Failure, Absence Tension)
			OFF	No Anomaly
c)	LED Red	**RV >**	*ON*	Contact line voltage *Above* the threshold value set [Sup]
d)	LED Green	**RV <**	*ON*	Contact line voltage *lower than* the threshold fixed [Inf]

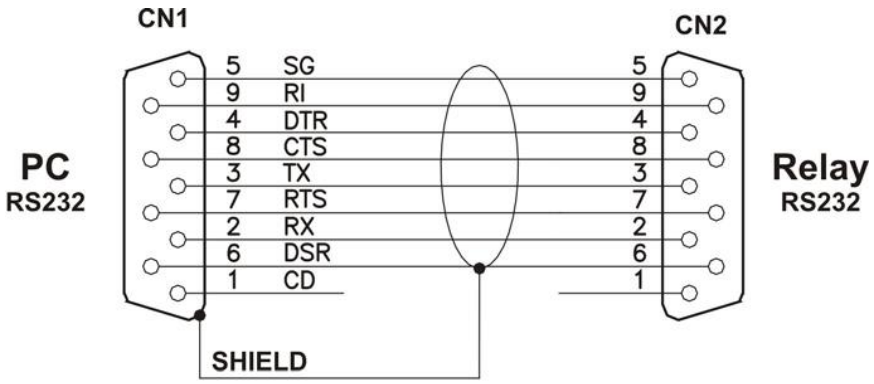
The base **R**elay **M**ain **B**ody (RMB) is equipped with two LEDs visible when the front panel is removed.



a)	LED Green	**PWR/ IRF**	*ON*	Receiver normal operation
			Flashing	Receiver internal fault
b)	LED Red	**TRIP**	*Flashing*	Presence Anomaly/alarms (Fibre optic Transmitter Failure, Absence Tension)
			OFF	No anomaly
c)	Button	**RESET**		Not used in this application

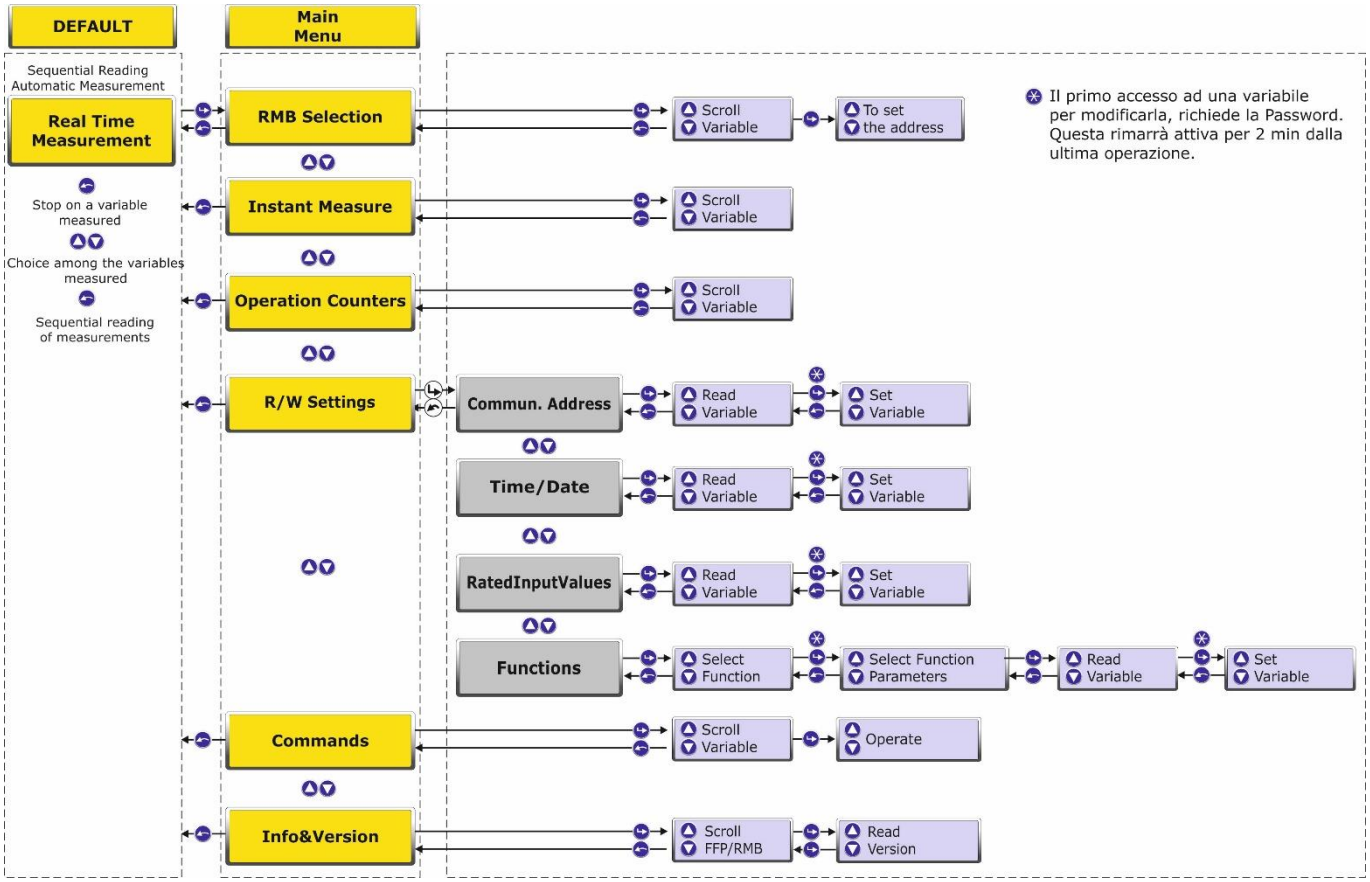
6.2 - Communication serial port on the front panel (FFP)

Physical RS232 connection is available on the front with a 9-pin D-sub female connector. Through this port, it is possible to control the relay RMB and acquire all available information.

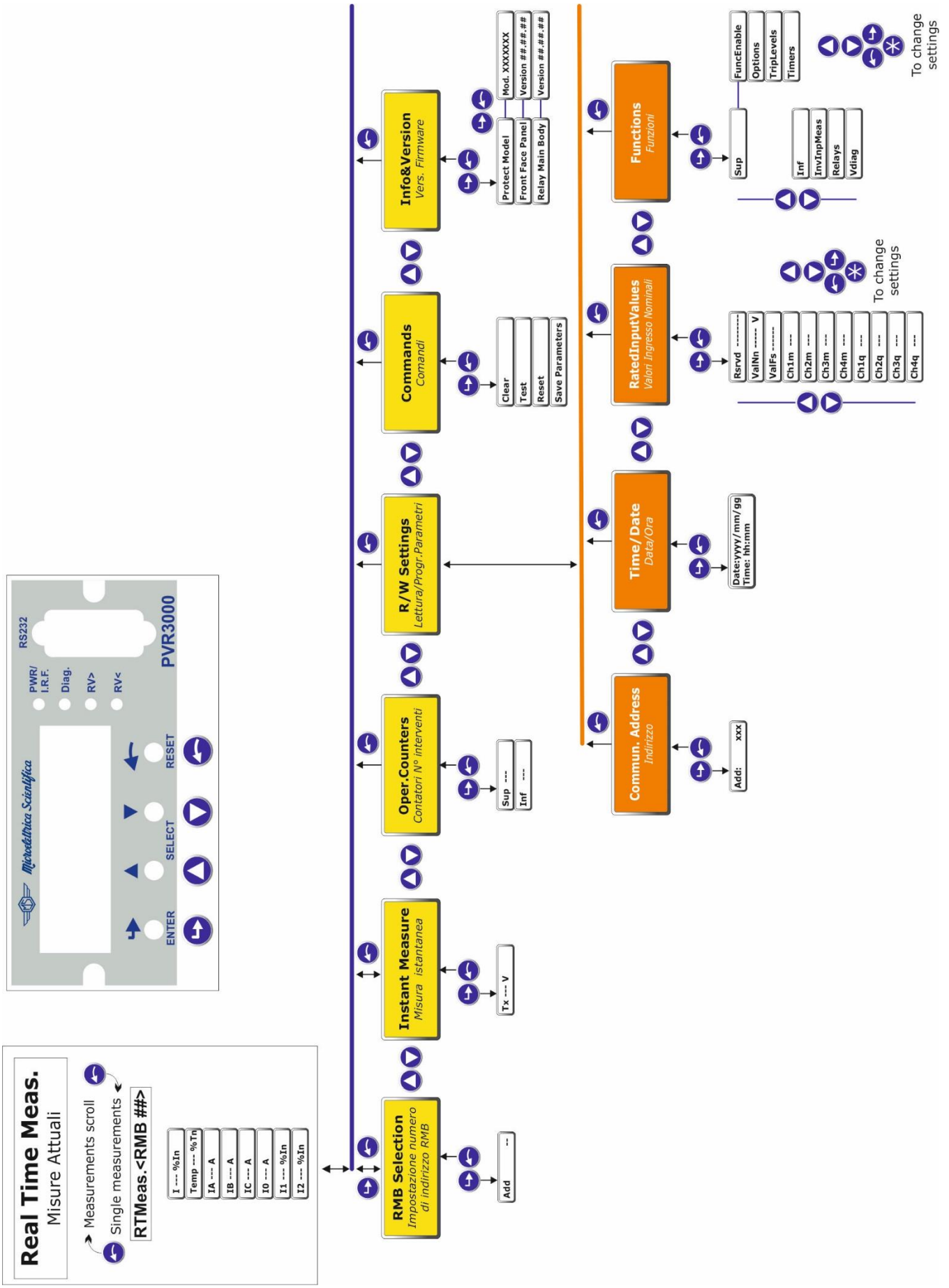


6.3 - Relay Management

The relay can be controlled either locally, through the 4 buttons and the LCD display, and remotely from a PC connected to the serial port (RS232).
The front panel is equipped with backlit LCD display 2 x 16 characters with all available information.
Command buttons operate according to the diagram below.



6.4 - Keyboard diagram



6.5 – Menu and programming

6.5.1 - Real Time Measurement

Default behaviour present the automatic selection of real time measurement
Scrolling can be stop on desiderate value and start again by pressing reset button .
When stop on one variable, a symbol appear on one measurement side, and the other variables can be selected with buttons.

6.5.2 - RMB selection

Select the address node on RMB base for communication and supervision.

"Real Time Meas"
"RMB Selection"
"Add ###"
Insert address node from 1 to250
To confirm
To return

		Display	*Description*
Add	=	1 ÷ 250	Serial communication address node of RMB

6.6 - Instantaneous Measure

Real time measurement can be fix in every time selecting the "Instant Measure" menu:

"Real Time Meas"
"Instant Measure"
"1st Measurement" To select other measurements
Return to "Real Time Meas".

		Display		Description
Tx	=	0 ÷ 65535	V	Real time measurement id contact line voltage

6.7 – Operation Counters

Operation of the functions here below are counted and recorded in "Operation Counters" menu.

"Real Time Meas"
"Oper.Counters"
"1° counters" To select other counter
return "Real Time Meas"

		Display	Description
Sup	=	----	
Inf	=	----	

6.8 – Read Write Setting

ATTENTION!

Before changing settings, disconnect the optical fibre from the receiver.

Once you have finished programming, send the command "Save Parameters", see section "commands (Commands)".

"Main Menu"
select "R/W Setting" →
Select one of following meu:

6.8.1 - Communication Address

"Communication Address" →
"Add: #" →
"Password ????" (If not inserted; see § password)
To select the address (1-250)
To Confirm.

Default address is 1.

	Display		Description	Setting range	Step	Unit
Add	1	-	Modbus address node	1 ÷ 250	1	-

6.9 - Time/Date

"Time/Date" → Date: current date, time: current time
"20YY/……" To set years,
"20XX/MM" To set months,
"20XX/XX/DD" To set days,
"20XX/XX/XX"
"hh/mm" To set hours,
"XX/mm" To set minutes,
To confirm
Exit

Date and time not available on receiver PVR3000.

6.9.1 - Rated Input Values

"Nominal input value"
1° Variable
To scroll the variables
To modify the selected variables
"Password ????"
To set the variable value,
To confirm.

Display			*Description*	*Setting range*			*Step*	*Unit*
Rsrvd	-	-	Reserved (not available)	-	÷	-	-	-
ValNm	4000	V	Rated Voltage	1	÷	5000	1	V
ValFs	2	-	The full scale of the measuring part unit nominal dynamic.	1	÷	20	1	-
Ch1m	200	-	Analog output channel 1 gain.	0	÷	2000	1	-
CH2m	200	-	Analog output channel 2 gain.	0	÷	2000	1	-
Ch3m	200	-	Analog output channel 3 gain.	0	÷	2000	1	-
Ch4m	200	-	Reserved (not available)	-	÷	-	1	-
Ch1q	10	-	Offset of the analog output channel 1.	10	÷	30	1	-
Ch2q	10	-	Offset of the analog output channel 2.	10	÷	30	1	-
Ch3q	10	-	Offset of the analog output channel 3.	10	÷	30	1	-
Ch4q	10	-	Reserved (not available)	-	÷	-	1	-

Programming example of outputs: voltage Receiver "PVR3000" values to enter for an output (0 ÷ 20) mA or (4 ÷ 20) mA, on channel 1 (CH1) with a nominal voltage "Vn" or "2Vn":

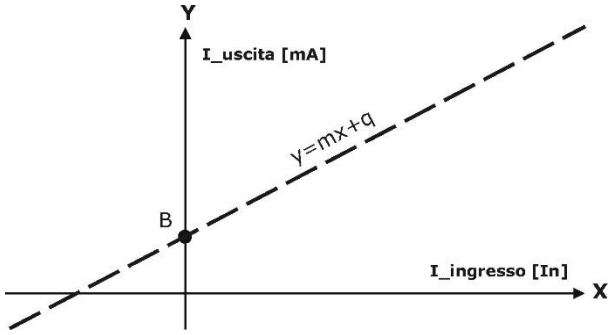
Channels Settings									*Dynamic Range*	
									Chm (gain)	*Chq (offset)*
(y_1)		(y_2)			(x_1)		(x_2)			
0	÷	20	but	≡	0	÷	2	VN	200	10
0	÷	20	but	≡	0	÷	1	VN	400	10
4	÷	20	but	≡	0	÷	2	VN	160	14
4	÷	20	but	≡	0	÷	1	VN	320	14

These values can be applied in any combination to channel "CH2, CH3."
For other settings contact Microelettrica Scientifica.

Other output channel values can be obtained by applying the following formulas:

CHm (gain) = $100 \cdot \frac{y_2 - y_1}{x_2 - x_1}$

CHq (offset) = $\frac{y_2 \cdot x_1 + y_1 \cdot x_2}{x_2 - x_1} + 10$



6.9.2 - Functions

"Functions",
1° function,
To scroll through the functions, variables,
To read write function parameters
To select different fields.

- Function enable
- Options
- Levels
- Delays

To access to selected fields and read parameter
To modify actual parameters;
To set a new value.

Function	*Type*	*Display*	*Variable*	*Default*	*Unit*	*Description*	*Setting range*	*Step*
Password		=	0000-9999	1111	-	Password for change setting		
Sup	*FuncEnable*	→	*Status*	Enable		Protection function enable	Enable/Disable	-
	Options	→		No Parameters		No parameters		
	TripLevels	→	*Sup*	2250	V	RV> threshold	1000 ÷ 6000	1
	Timers	→		No available		No parameters		
Inf	*FuncEnable*	→		No Parameters		No parameters		
	Options	→		No Parameters		No parameters		
	TripLevels	→	*Inf*	2150	V	RV< threshold	1000 ÷ 6000	1
	Timers	→		No available		No parameters		
InvInp Meas	*FuncEnable*	→	*Status*	Enable		Protection function enable	Enable/Disable	-
	Options	→		No Parameters		No parameters		
	TripLevels	→		No Parameters		No parameters		
	Timers	→		No Parameters		No parameters		
Relays	*FuncEnable*	→		No Parameters		No parameters		
	Options	→	*Op_R2*	N.D.		N.D. Norm. De energized/ N.E. Norm. energized	N.D./N.E.	-
	TripLevels	→		No Parameters		No parameters		
	Timers	→		No Parameters		No parameters		
Vdiag	*FuncEnable*	→	*Status*	Enable		Protection function enable	Enable/Disable	-
	Options	→		No Parameters		No parameters		
	TripLevels	→	*Vdiag*	1200	V	Permanent minimum voltage for operation.	900 ÷ 1500	1
	Timers	→		No Parameters		No parameters		

6.9.3 - Superior limit for contact line over threshold.

FunctEnable	→		Enable		[Disable / Enable]				
Options	→		No Parameters		No parameter				
TripLevels	→	***Sup***	2250	V	(1000 ÷ 6000)	step	1	V	
Timers	→		No available		No parameter				

FuncEnab	:	function status Disable/Enable
Sup	:	Superior limit for contact line over threshold.

Operation

When the contact line voltage exceeds the programmed value [Sup] threshold relay RV RV > > picks up and the corresponding led lights up.

6.9.4 - Inferior limit for contact line over threshold

FunctEnable	→		Enable		[Disable / Enable]				
Options	→		No Parameters		No parameter				
TripLevels	→	***Inf***	2150	V	(1000 ÷ 6000)	step	1	V	
Timers	→		No available		No parameter				

FuncEnab	:	function status Disable/Enable
Inf	:	inferior limit for contact line over threshold.

Operation

When the contact line voltage drops below the programmed value [Inf] threshold relay energizes and the corresponding led RV RV > < turn ON.

6.9.5 – Measurement inversion

FunctEnable	→	Enable	[Disable / Enable]
Options	→	No Parameters	No parameter
TripLevels	→	No Parameters	No parameter
Timers	→	No Parameters	No parameter

FuncEnab	:	function status Disable/Enable

Operation

Reverses the sign of the measure provided by the transmitter.

Note: the InvInpMeas parameter is programmed at the factory to work properly when installed on a pole.

6.9.6 – Output relays configuration

FunctEnable	→		No Parameters	[Disable / Enable]
Options	→	**Op_R2**	N.D.	[N.D. / N.E.]
TripLevels	→		No Parameters	No parameter
Timers	→		No Parameters	No parameter

FuncEnab	:	fuction status Disable/Enable
Op_R2	:	N.D. normally not energized / N.E. Normally energize

Operation

The OP_R2 parameter defines the configuration of output relay R2 (threshold relay RV >).
The relay R1 (alarms) is not configurable and is always excited in normal operation of the device.

6.9.7 - Vdiag – Minimum operation voltage

FunctEnable	→		Disable		[Disable / Enable]			
Options	→		No Parameters		No parameter			
TripLevels	→	***Vdiag***	1200	V	(900 ÷ 1500)	step	1	V
Timers	→		No available		No parameter			

FuncEnab	:	function status Disable/Enable
Vdiag	:	Permanent minimum threshold of operation

Operation

<u>If the function is enabled:</u>
If contact line voltage drops below the threshold [Vdiag] alarm relay (R1) is instantly (t < 30ms) energised to provide permanent faults signalization.
The alarm is reset automatically once the contact line voltage is above the threshold VDiag + 5%.

<u>If the function is disabled:</u>
Alarm relay (R1) is energised physical turns off the transmitter (transmitter remains turned on until about 700V and up to about 1 second after the contact line voltage has fallen to zero volts).
The alarm is reset automatically once the contact line voltage goes above the threshold voltage of switching on (about 900V).

6.10 - Commands

"Commands"
1° Control,
To select others control variables
To operate with selected control

Display	Description
Clear	Clear the memory with events counter, events recorder, etc.
Test	Start the internal diagnostic of the receiver
Reset	No used in this application
Save Parameters	Save in internal memory the set parameters

6.11 - Version & Info

The menu displays the protection model, the Firmware version of FFP and the RMB version currently in communication

"Real Time Meas"
"Info&Version",
"Proctect. Model",
"Mod. XXXXXX",
Ritornare a "Proctect. Model",
to "FrontFacePanel",
"Version ##.##.##",
Return to "FrontFacePanel",
to "RelayMainBody",
"Version ##.##.##",
Return to "RelayMainBody",
Return to "Info&Version".
Return to "Real Time Meas".

6.12 – Output relaus

Voltage presence signaling		
R2	Threshold relay (RV>)	The relay is Normally De-energized (N.C.), when the value of the contact line voltage is below the threshold value set [Inf]. The relay is energized (n.o.), when the value of the contact line voltage exceeds threshold set [Sup].

Alarm signaling		
R1	Alarm relay (Diag)	The relay is normally energized (n.o. contact). The relay de-energises (N.C.), in the presence of faults (operating Voltage < contact line voltage; Watchdog, receiver off or not powered, , fibre optic damaged)

6.13 - Password

In the system there are three different passwords: RMB, FFP, communication software

6.13.1 - Password FFP

This password will be required every time the user wants to write in the "R/W Settings" of FFP and/or send by FFP a command on the menu "Commands".

The default password is "**1111**"

When prompted for a password, proceed as follows:

The Display shows the message: "Password?"

→	▲▼	to choose 1st digit (1-9)	↵	To confirm
→	▲▼	to choose 2nd digit (1-9)	↵	To confirm
→	▲▼	to choose 3rd digit (1-9)	↵	To confirm
→	▲▼	to choose 4th digit (1-9)	↵	To complete the procedure

The password is required every time we try to change a variable to the first time weentry in menus "R/W Settings" and/or "Commands". Password remains valid for 2 minutes after the last operation, or until you return to viewing the current measures (RT Meas).
After enter your Password FFP, the "#" symbol appears before the variable that can be changed.

PASSWORD MODIFICATION:

TO MODIFY THE PASSWORD ON FFP:

→ Open the MS-Com software and connect the relay
→ Open the "Settings" menu
→ Type the desired password (other than the default one – Example: 1234) in the area "FFP Password" (see fig. 1)

N.B. Whenever you reopen the MSCom program, Password FFP is not displayed (see fig. 2) and cannot be changed until you entered the Password MSCom (see § 7.3) by selecting the button

→ Select the "Send" button to confirm the change to the relay

Fig.1

Fig.2

6.13.2 - Password MODBUS

This password will be required for a possible supervision system whenever the system is programmed in such a way as to change any parameter of relay calibration and/or send any command through the relay itself.

DEFAULT STATE (DISABLED): Password = 2295 ; Address = 8001

When set to 2295, the password is actually disabled and a DCS or any other supervisory system can be programmed to change the parameters of the relay, both to send commands through the relay itself without writing any password.

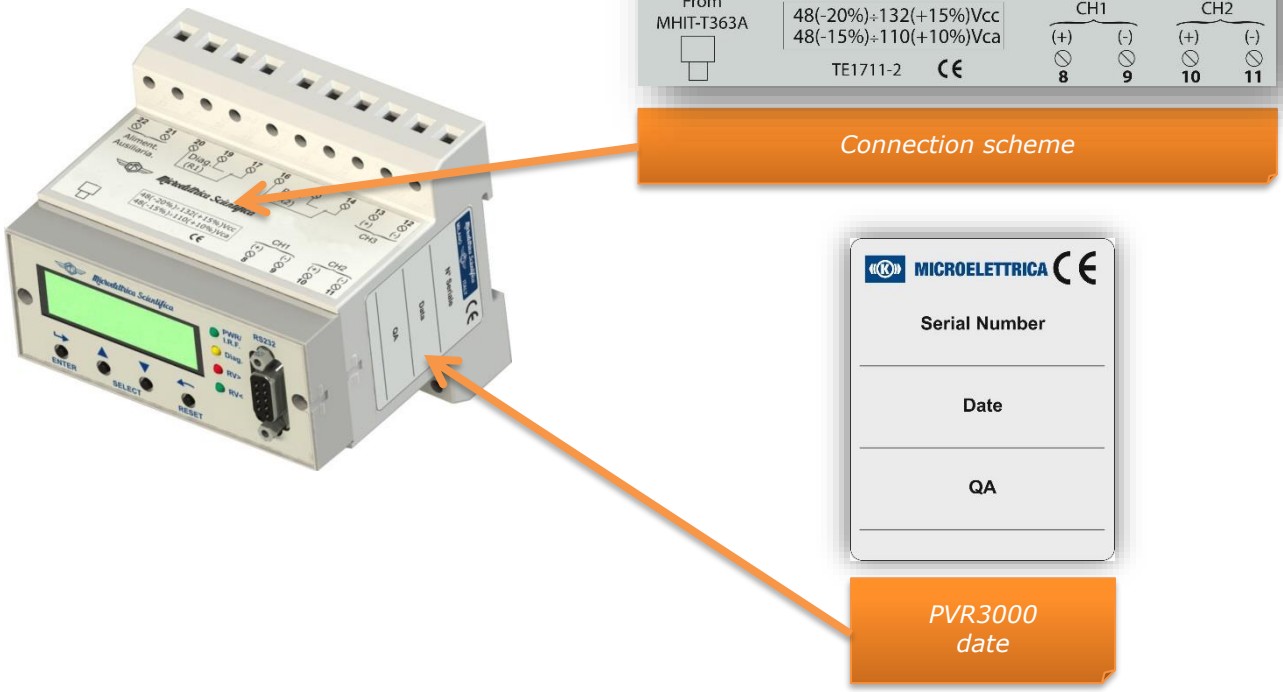
ENABLING/DISABLING PASSWORD:

To ENABLE Password Modbus supervision system must write the desired password (other than the default one) at 8001.
To DISABLE the Password Modbus supervision system should write once the DEFAULT password (2295) at 8001.

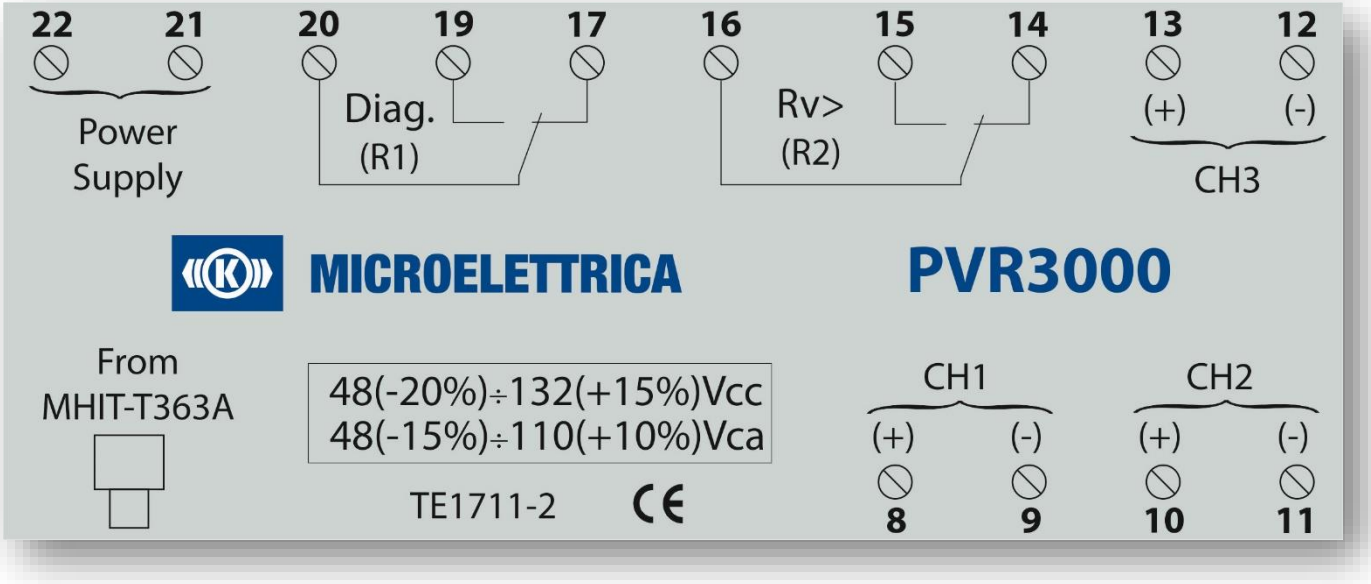
6.13.3 - Password MSCom

This password will be required every time you want to send it to a change in the calibration parameters or implement a command through the relay using the MSCom management software. The user can decide whether to enter a password (see Operating Manual MSCom) or if you leave the password disabled, simply by selecting the OK button when prompted for a password.

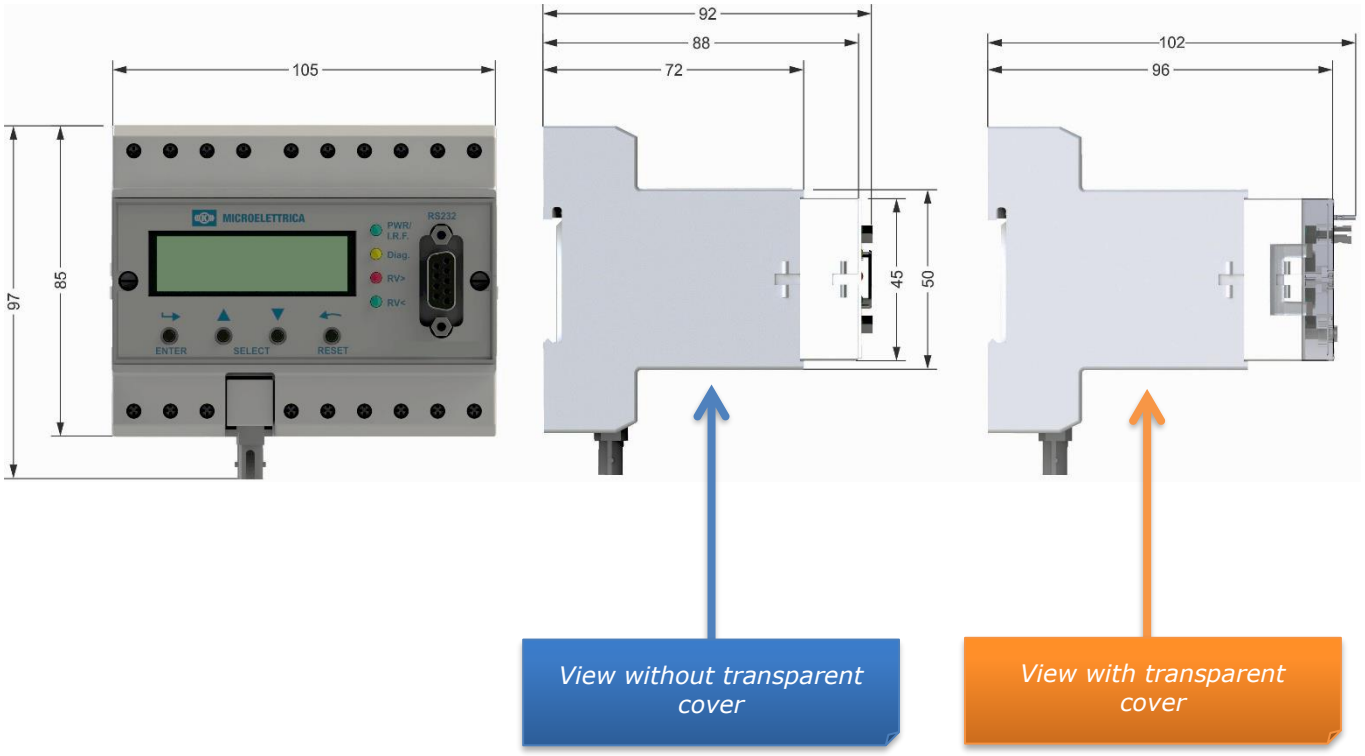
6.14 – identification label

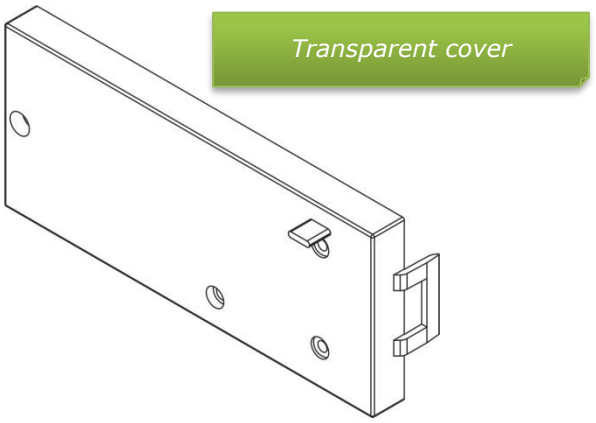


6.15 – Block diagram



6.16 – Overall dimension





6.18 -Receiver Characteristics

General Characteristics

Auxiliary Power Supply	48 (-20%) ÷ 132 (+15%) Vdc (class DC3) 48 (-15%) ÷ 110 (+10%) Vca (class AC2)
Voltage interruptions	20ms
Average power supply consumption	≤ 50mA
Operation ambient temperature	-20 ÷ +55 °C
Stock temperature	-30 ÷ +70 °C
Weight	0.5 Kg
Mounting	DIN rail 46277 (EN 50022)
Environmental conditions	indoor

Response time

Excitation (RV>)	≤ 20ms (typical ≤ 10ms)
De-exitation (RV<)	≤ 15ms
Start-up	
V line 1.3 kV	≤ 150ms
V line 2.2 kV	≤ 100ms

Output relay characteristics (RV>, Diag)

Output relays	rating 6 A; Vn = 250 V A.C. resistive switching = 1500VA (400V max) make = 30 A (peak) 0,5 sec.; break = 0.2 A, 110 Vcc, L/R = 40 ms (100.000 op.) – Meccanichal life 106op.

Analog output

Analog output	*CH1*	(0 ÷ 40)mA ≡ (0 ÷ 8000)Vcc - F(V/I) = 200V/mA
	CH2	(0 ÷ 40)mA ≡ (0 ÷ 8000)Vcc - F(V/I) = 200V/mA
	CH3	(0 ÷ 40)mA ≡ (0 ÷ 8000)Vcc - F(V/I) = 200V/mA
Maximum load	500 ohm	
Response time	≤ 1ms	
Measure stability	200ppm/°C	
Signal noise ratio	≤ 60db	

Measurement input

Measurement input	Fibre optic from PVT3000
Connection	ST for Fibra Ottica

Enclosure

Enclosure	ABS with IP42
Connection	Terminals for 2.5mm^2 cables

Voltage threshold:

Threshold value	(1000 ÷ 6000)V, step 1V
Precision	3%
Thermal stability	200ppm/°C
histeresys	(1000 ÷ 6000)V, step 1V

7. Electrical Characteristics

Reference Standard CE Directive - EN50123 – IEC60255 - RFI.DMA/IM.LA/SSE.360		
Dielectric test voltage	IEC60255-5 EN50123	cat IV – 2kV (EN50124-1 cat OV4 – 18.5kV)
Impulse test voltage	IEC60255-5 EN50123	cat IV – 5kV (EN50124-1 cat OV4 – 40kV)

Enviromental Rif.Std. (IEC 60068)			
Operation ambient temperature	EN 60870-2-2	class C1 (3k5)	-10 °C / +55 °C
Environmental testing (Cold)	IEC 60068-2-1		-10 °C ; 16h
(Dry heat)	IEC 60068-2-2		+55 °C ; U.R.<=35% ; 16h
(Change of temperature)	IEC 60068-2-14		+55 °C ; -10 °C ; 3h
(Damp heat, steady state)	IEC 60068-2-3		+40 °C ; U.R.=93% ; 96h
Resistance to vibration	IEC 60255-21-1	class 2	10-500 Hz ; 2g
Resistance to vibration and shock (bump-shock)	IEC 60255-21-2	class 1	10g - 15g
Sismatic stress resistance	IEC 60255-21-3	class 2	1 g (xy) , 2 g (z)

CE EMC Compatibility					
Electromagnetic emission	EN 55011		30-1000 MHz (tab1 EN50081-2)		A
Conducted disturbances immunity test	EN 55022	class B	0.15-30 MHz (tab1 EN50081-2)	10 V	A
Radiated electromagnetic field immunity test	EN60870-2-1 A.5.1 → IEC 61000-4-3	level 3	80-1000 MHz 80%AM	10 V/m	B
	EN50082-2 → EN 50140, EN 50204	level 3	900 MHz/200 Hz	10 V/m	A
	EN50082-2 → ENV 50140	level 3			A
Electrostatic discharge test	EN60870-2-1 A.3.1 → IEC 61000-4-2	level 3	6 kV contact / 8 kV air		B
Power frequency magnetic test	EN60870-2-1 A.4.1 → IEC 61000-4-8	level 5	Continuous 100 A/m	50/60 Hz	A
Conducted disturbances immunity test.	EN50082-2 → IEC 61000-4-6	level 3	(80 +/-5) % AM1 kHz sinwave		A
I Damped oscillatory magnetic field	EN60870-2-1 A.4.3 → IEC 61000-4-10	level 3	30 A/m, 0.1-1 MHz		B
Electrical fast transient/burst (Fast Trasient)	EN60870-2-1 A.2.3 → IEC 61000-4-4	level 3	2 kV(m.c.)		B
Dumped Oscillatory waves	EN60870-2-1 A.2.5 → IEC 61000-4-1	level 2	1 kV(m.c.)		
Residual power supply	IEC 60870-2-1	class DC3 class AC2			
Power supply tollerance	IEC 60870-2-1	VR3	<=5%		
Surge immunity test	EN60870-2-1 A.2.2 → IEC 61000-4-5	level 3	8/20us 2 kV(m.c.)		B
Voltage interruptions	EN60870-2-1 A.1.5 → IEC 61000-4-11		20 ms		
Voltage ripple	EN60870-2-1 A.1.4 → IEC 61000-4-11				A=B

Characteristics	
Accuracy at reference value of influencing factors	Class 0,2
Average power supply consumption TX	5 VA
Average power supply consumption RX	7 VA
Output relays	rating 6 A; Vn = 250 V A.C. resistive switching = 1500VA (400V max) make = 30 A (peak) 0,5 sec.; break = 0.2 A, 110 Vcc, L/R = 40 ms (100.000 op.) – Mechanical life 10^6op.

MICROELETTRICA
20090 Buccinasco (MI) · Via Lucania 2 · Italy · Tel.: +39 02 575731
E-Mail: info@microelettrica.com · www.microelettrica.com