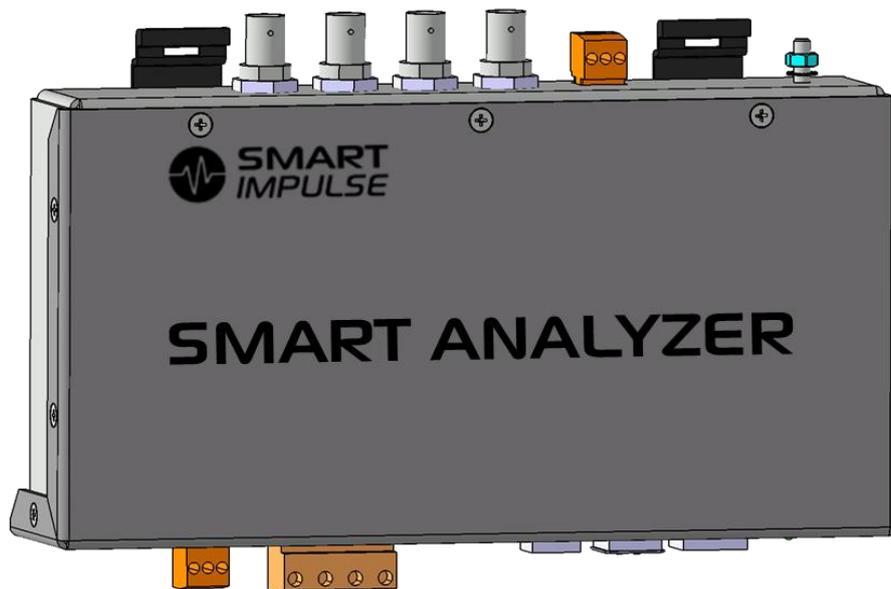


INSTALLATION MANUAL



Model: Smart Analyzer®

Manufacturer: Smart Impulse

Power meter with consumption breakdown by use

30/09/13

Table of contents

Table of contents	3
1. Introduction	4
2. Installation precautions	4
2.1. Symbols used on the device and in this manual.....	4
2.2. General installation precautions	4
2.3. Measurement category	4
3. Presentation	5
3.1. Box.....	5
4. Installation	6
4.1. Box set-up	6
4.2. Sensors set-up	7
4.3. Connection to the telecommunication network	8
4.4. Connection diagram.....	9
5. Commissioning.....	11
5.1. Switching on.....	11
5.2. Configuration	11
6. General features.....	13
6.1. Sizes and weight.....	13
6.2. Power supply.....	13
6.3. Climatic conditions.....	13
6.4. Compliance with standards.....	13
7. Functional features	14
7.1. Reference conditions	14
7.2. Electrical features.....	14
8. Maintenance	15

1. Introduction

The Smart Analyzer is a power consumption analyser allowing to breakdown the consumption by use, with one and only metering device.

In addition to the usual information on quality of the energy, it also provides a percentage breakdown of the electrical consumption by type of component, equipment or use.

In order to be available, these data will need to be retrieved from the Smart Impulse server, either in real time thanks to an Internet connection, either at the end of the installation period, when returning the device to Smart Impulse.

2. Installation precautions

2.1. Symbols used on the device and in this manual



Protective conductor, section 2.5 mm² minimum



WARNING! Danger! Read carefully all the notes designated by this symbol.

2.2. General installation precautions

- Read carefully this manual.
- The facilities safety in which the Smart Analyzer® is installed remains the responsibility of these systems' assemblers.
- Improper installation of the device non compliant with this document's specifications may compromise the safety of the device as well as other equipments or people located in its environment.
- For your safety, only use the accessories provided with the Smart Analyzer® or approved by Smart Impulse.
- This device can be installed in category III facilities, for voltages not exceeding 300 V_{AC} isolated from ground (according to the standard EN 60664-1).

2.3. Measurement category

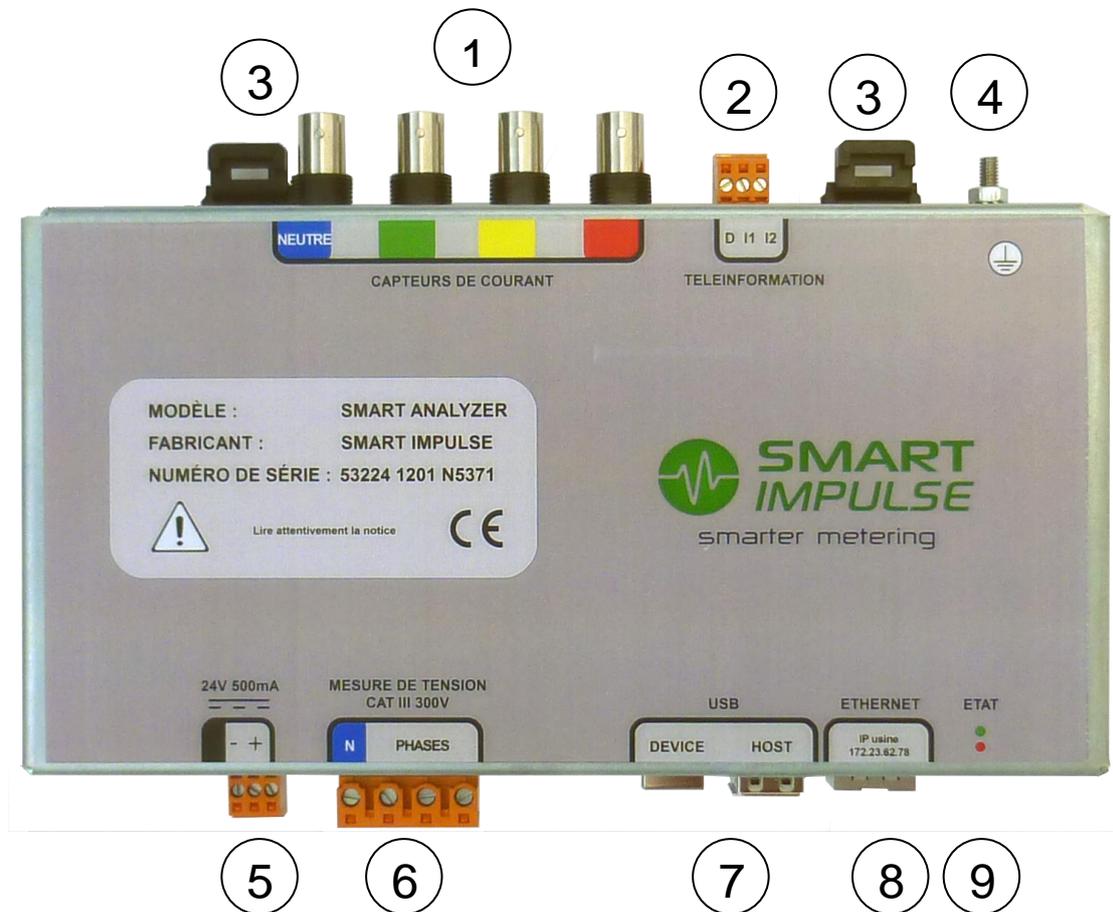
The Smart Analyzer® installation is designed for a Category III 300 V environment.

The measurement category III corresponds to measurements made in the building's installation.

Example: measurements on the switchboards, the wiring ...

3. Presentation

3.1. Box



- 1) BNC connector to plug the current sensors. From l. to r.: Neutral, phase 1, phase 2, phase 3.
- 2) Connector to plug the output Customer Information Port of the electricity network meters. From l. to r.: drain conductor, I1, I2.
- 3) Retaining clips on DIN rail.
- 4) Ground connector, screw M4.
- 5) Smart Analyzer® power connector. From l. to r.: N.C., Ground, 24 V.
- 6) Voltage measure connector. From l. to r.: Neutral, Phase 1, Phase 2, Phase 3.
- 7) USB device and USB Host connectors (x2). For direct connection of USB Storage devices or remote access keys (Wi-Fi, 3G, ...).
- 8) Ethernet RJ45 connector. For direct connection to wired data processing networks.
- 9) Light-emitting diodes (LED) indicating the status of the Smart Analyzer®.

4. Installation

The Smart Analyzer® installation is made under the responsibility of the electric technician (Smart Impulse or certified installer).

The latter will need to ensure he has the appropriate training and certifications to deal with material installations in the Smart Analyzer® installation environment, without compromising its safety, the safety of any person accompanying him or the facilities' safety on which or next to which he must work.

 The selection of the protection and cut-off devices will be done in accordance with electrical standards, more specifically regarding the cascading and the selection of the sizes and breaking capacities.

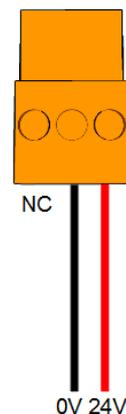
4.1. Box set-up

The Smart Analyzer® has a DIN rail standardized fastening system.

Please respect the following indications:

- 1) Set-up a tetrapolar differential circuit breaker with the appropriate breaking capacities.
- 2) Implement, downstream from the differential circuit breaker a power supply 230 V_{AC} towards 24 V_{DC} (500 mA) and its protective circuit breaker with the appropriate breaking capacities.
- 3) First connect the ground cable (section 2.5 mm²) to the pin located at the top of the box to ensure its electric protection (tightening 1.2 N.m).
- 4) Put the Smart Analyzer® on the DIN rail by engaging first the inferior dogs then turn the box by retaining the locking tabs.
- 5) Then, connect the two power wires (ground and 24 V, shielded twisted pair)

Power supply connector

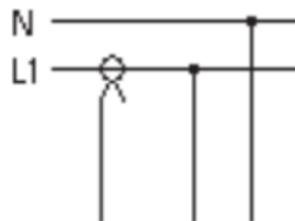


4.2. Sensors set-up

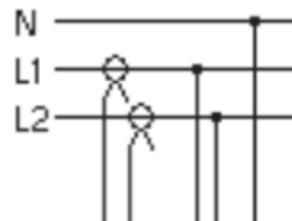
Voltage measurement

The voltage measurement is done directly by connecting the Smart Analyzer® to neutral and to each of the phases with wires of minimum 0.75 mm² section. The phases order is not important, the Smart Analyzer® will restore it automatically in case of defect.

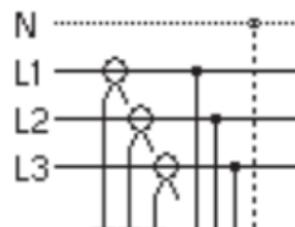
Down below, you will find the different possible situations.



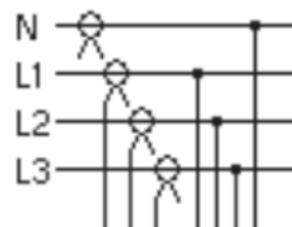
Single phase



Two phase



Three-phase 3 leads



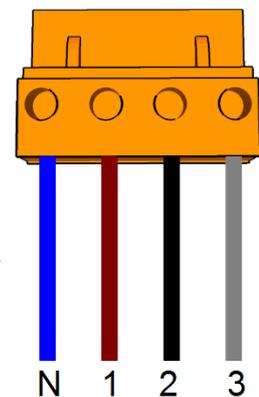
Three-phase 4 leads

In order to install the voltage probes, it is recommended to complete the following steps in this order:

- 1) Implement the cables routing.
- 2) Connect the metering wires on the differential circuit breaker.
- 3) Connect the metering wires on the dedicated terminal block (4 pins).

The neutral must be positioned on the far left. The phase order may not be respected.

- 4) Connect the terminal block to the Smart Analyzer®



 The voltage metering inputs must be protected in upstream by a differential circuit breaker 2A 3P+N.

 The Smart Analyzer® is not suitable for facilities with IT neutral point connection, except protection by a control relay of the voltage phase – ground or neutral- ground.

 Never manipulate the terminal block (much less the metering wires) when they are in contact with the potential to measure, in order to prevent any electrocution. In particular, during the installation, install without fail the terminal block before switching the metering wires on. On the contrary, when uninstalling, activate the cut-off system before manipulating the box.

Current measurement

The Smart Analyzer® supports several types of probes such as the “Rogowski coils” type.

 The order of phases and sensors direction are not important, the Smart Analyzer® will restore them automatically in case of defect. Nevertheless, if used, the neutral current sensor must absolutely be linked to the neutral wire.

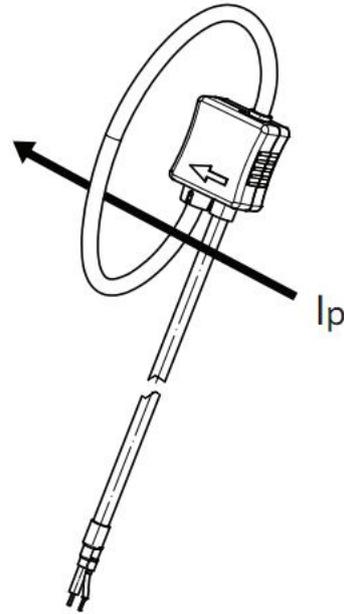
To ensure a good installation of the sensors, it is recommended to complete the following steps:

- 1) Install the coils around the conductors of the different phases to measure: open the coil, pass it around the conductor, and close it making sure it is well locked.
- 2) Route the connection cables
- 3) Connect the BNC plugs and ensure they are well locked by quarter turn and clockwise.

Note 1: No need to short-circuit the secondary of the Rogowski coils.

Note 2: if several wires ensure the current's transit for a given phase, the current sensor must link all these wires.

Note 3: For a single-phased installation, do not connect phases 2 and 3.



4.3. Connection to the telecommunication network

The Smart Analyzer® must be connected to the Internet in order to have a continued access to the processing server.

Local Area Network connection (LAN)

Connect an Ethernet cable of minimum category 5e S/FTP (shielded cable) on the RJ45 plug located at the bottom of the box. The configuration is automatic in order to allocate an IP address (by DHCP) and open a virtual private network (VPN) on the port 80.

 The Ethernet communication speed of the Smart Analyzer® is 10/100 Mbps.

For any specific configuration or for the Wifi option, check page 10 of this manual.

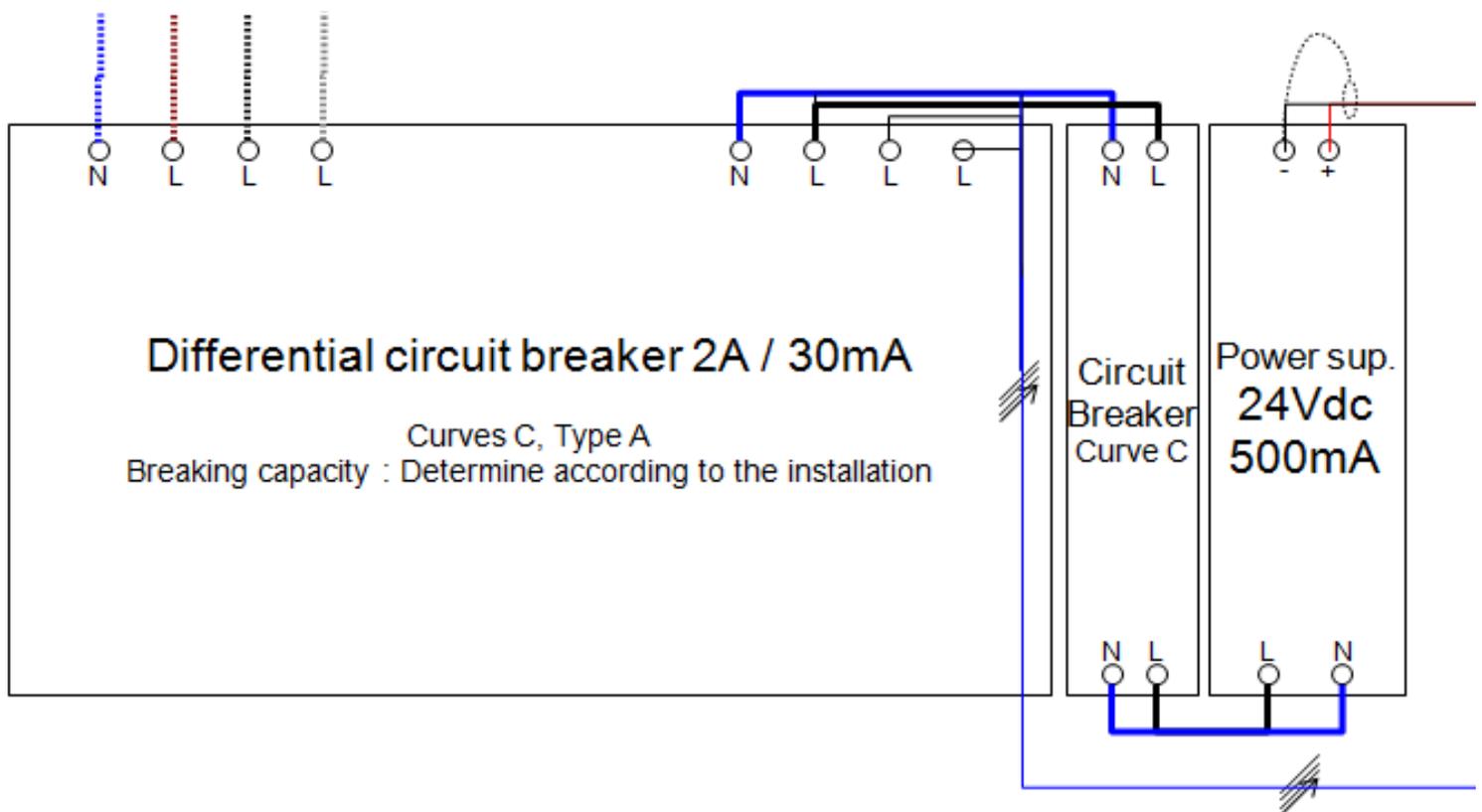
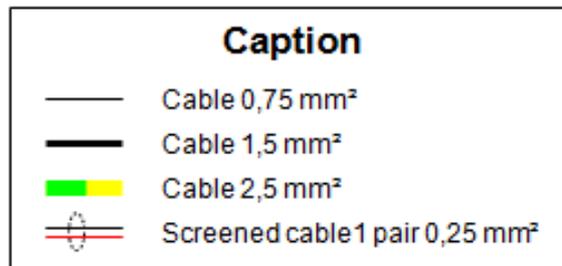
3G modem connection

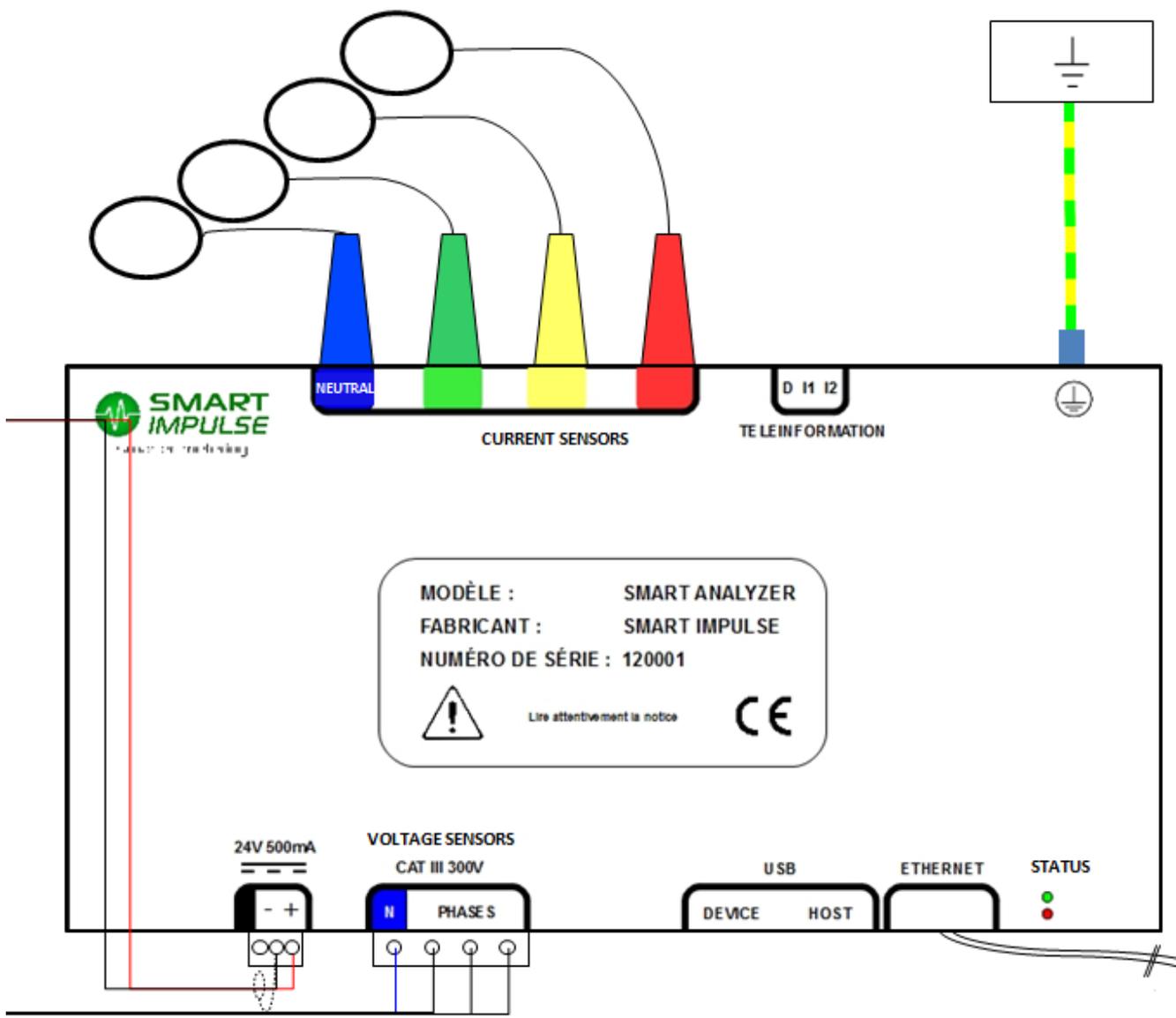
If the connection to the company's LAN isn't possible, install an Ethernet/3G router. In order to do that, connect the Smart Analyzer® to the router with an Ethernet cable of minimum category 5e S/FTP.

 The 3G coverage in electrical rooms can be random. A study can be made to position the radiocommunication antenna correctly.

4.4. Connection diagram

Note: this diagram is not valid for IT neutral point connections.





5. Commissioning

5.1. Switching on

The device starts automatically as soon as it is supplied with power.

After a start-up time, its proper functioning is indicated by a green light (LED).

The green light-emitting diode is continuous if the Smart Analyzer® has access to the network and communicates with the Smart Impulse server. The light flashes if the Smart Analyzer® can't reach the server. The data are then stored in the local memory, within the limit of the available space (48 hours approx.).

5.2. Configuration

The device has a web administration interface that enables to set up certain parameters according to the installation.

Connection:

- 1) Connect a computer (Windows XP or Linux) to the USB Host interface
- 2) Select the correct driver to connect yourself in *Ethernet over USB* (contact Smart Impulse to obtain it)
- 3) Once the interface is configured (it appears as a network card), choose an IP address in the range 172.23.62.xyz (for example 172.23.62.1) and the sub-network mask 255.255.255.0. Gateway is optional (172.23.62.255 if requested)
- 4) Open a web browser and go on <http://172.23.62.78/index.html>. The following page is displayed :

Page de configuration du Smart Analyzer

- **Configuration réseau**
Type de configuration réseau :
- **Tests du réseau**
Le bouton suivant va lancer 4 requêtes de "ping" sur google.com pour tester la connectivité :

Le bouton suivant va essayer de lancer le VPN et afficher le résultat :
- **Numéros de série des capteurs**
Boucle de neutre bleue :
Boucle de phase verte :
Boucle de phase jaune :
Boucle de phase rouge :

Attention : ne pas mettre d'espace dans les numéros de série
- **Tests du branchement des capteurs**
- **Mode apprentissage**
Nom de l'équipement mesuré : Durée :

Network configuration

If you have a DHCP network, choose « DHCP » and click on “Confirm”.

If you have fixed IP parameters, choose “Fixed IP”, then click on “Confirm” and fill in the new proposed fields.

Note: The DNS addresses are optional.

Connectivity test

- Test the IP configuration by clicking on the corresponding button. This will send « ping » requests to google.com to check the Internet network access.
- Test the connectivity to Smart Impulse by testing the VPN (Virtual Private Network)

Warning: the message can show “failed” because the VPN is already launched, this is a normal functioning. The indicated status will then be: “VPN ... : Already running”.

Contact Smart Impulse when these tests are validated in order to check the correct functioning.

Current sensors association

This configuration is carried out in the factory. Do not modify it except for maintenance operations.

For each current coil, enter the model and serial number (last line on the RT 2000, code with bars on the i430 Flex). Click on “Confirm” once these eight information are entered.

Current sensors connection order check

Make sure you connect the blue coil on the neutral (if it is provided). In contrast, the order of the other coils is detected automatically. This button enables to check the result of this detection.

Whatever the result, the necessary adjustments are made by the software, no need to modify the installation.

Learning mode

The learning mode enables to save the parameters of an electrical outlet for a variable duration (1, 2, 5, 10 or 30 minutes).

In order to do this, enter a name that enables to recognise later the completed measure (name of the equipment, outlet description...).

Then click on the button to launch the analysis, which will launch a metering process. It is then possible to uninstall the Smart Analyzer® to go to the next measure or to the permanent installation.

6. General features

6.1. Sizes and weight

- 212 x 142 x 46 mm
- 1,0 kg

6.2. Power supply

By external supply module

Operating voltage: 24 V DC

Maximum consumed current: 500 mA

6.3. Climatic conditions

Altitude

Use: 0 ... 2000m

Storage: 0 ... 10 000m

6.4. Compliance with standards

Electrical safety (according to NF EN 61010-1: 2001)

- Measurement category: III
- Pollution category: 2
- Rated voltage: 300 V_{RMS}
- Indoor use

Electromagnetic compatibility (cat A, non-industrial environment)

- Conducted and radiated emissions according to EN 55011: 2009 / A1: 2010
- Near-field radiated emissions according to EN 62311: 2008
- Immunity to radiated electromagnetic fields according to EN 61000-4-3 / A1: 2008 / A2: 2011
- Immunity to induced or conducted disturbances according to EN 61000-4-6: 2009
- Immunity to fast transients and bursts according to EN 61000-4-4: 2004 / A1: 2010
- Immunity to electrostatic discharges according to EN 61000-4-2: 2009

7. Functional features

7.1. Reference conditions

Influence quantity	Reference conditions
Room temperature	40°C
Humidity rate	Relative humidity of 45 % to 75 %
Atmospheric pressure	860 to 1060 hPa
Neutral voltage value	230 V _{RMS} ±2 % dc-free
Input voltage of the current circuit	0 V _{RMS} < I < 1 V _{RMS} dc-free
Electrical network frequency	50 ± 0,5 Hz
Phase shifting V / I	0 degree or 90 degrees
Harmonics	< 0,1 %

7.2. Electrical features

Voltage inputs

- Operating range:
 - Phases - neutral: ≤ 253 V_{RMS}
- Input impedance: 52 kΩ between phase and neutral
- Tolerable overload: 275 V_{RMS} in continuous by varistor

Current inputs

- Operating range: 0 – 1 V
- Input impedance: 100 Ω
- Tolerable overload: ± 15 V

Features of the device alone (without current sensors)

Influence quantity	Measuring range		Theoretical/ practical Resolution	Error in the reference range
	Minimum	Maximum		
Voltage	0 V	715 V _{dc}	10 mV / 100 mV	0.1 %
Density	Values depending on the used current sensors Typ. 16 kA _{RMS} and 3.7 MVA max.		Typ. 1 A or less	0.1 % + sensor
Active powers			Typ. 200 W or less	0.1 % + sensor
Reactive powers			Typ. 200 VAR or less	0.1 % + sensor
Apparent powers			Typ. 200 VA or less	0,1 % + sensor
Power factors	0	1	0.01 / 0.01	0.1 %

Nominal operating range

Frequency:		40 to 70 Hz
Harmonics:	THD(I):	0 to 40 %
	THD(U):	0 to 20 %
Magnetic field:		0 to 400 A/m
Electrical field:		0 to 3 V/m
Relative humidity:		10 to 90 %, without condensation.

8. Maintenance

No cleaning is required for the proper operation of the device. If necessary, use a dry cloth.

For any maintenance operation, contact Smart Impulse. The company will deal with the necessary operations:

Smart Impulse
96 bis boulevard Raspail
75006 PARIS
FRANCE
+33(0)1 84 17 31 24
technique@smart-impulse.com

Notes

SMART IMPULSE

96 bis boulevard Raspail
75006 PARIS

+33(0)1 84 17 31 20 – contact@smart-impulse.com