

PowerCompact3020



Manual de usuario User's manual



PowerCompact3020



 **KPS**


RoHS

CE

EN

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1. INTRODUCTION

PowerCompact3020 is a leading device equipped with a wide range of functions for measuring and monitoring power consumption and for advanced power and power quality analysis. This device can measure, display, process and transmit all the parameters of an electrical system.

PowerCompact3020 is a measuring tool designed for those in need of an accurate and easy-to-use product. It is aimed at both users who want to understand their systems better, and Energy Managers, system installers, electricians, and maintenance workers, for diagnosis and intervention, or for the provision of integral consulting services on electrical power.

PowerCompact3020 allows users to:

- monitor loads, consumption and related costs;
- check if the new systems are dimensioned correctly;
- prevent overheating and lack of insulation due to high harmonics content;
- solve any power factor correction problems;
- identify and eliminate load peaks and excess demand, thereby reducing contractual power consumption;
- monitor power and consumption in the different time bands;
- check and assess the performance of UPSs, with AC/DC measurements;
- measure signals - including asymmetrical signals - for PWM controls on inverters;
- identify the cause of problems resulting from low quality power (presence of harmonics, interruptions, overloads, dips, unbalance in voltage phases, etc.), which may bring about a production standstill, and which may affect or reduce the life cycle of equipment and systems;
- identify fast fluctuations and variations in current and voltage signals;
- measure inrush current of electrical engines and equipment

2 . SAFETY

PowerCompact3020 has been designed and tested in accordance with the latest directives in force, and complies with all technical and safety requirements. To preserve the product and ensure its safe operation, follow the instructions and the CE markings contained herein.

CAUTION! Please read these instruction carefully before using the device.

2.1. Operator's safety

- The instrument described herein must only be used by trained personnel.
- Connection and maintenance operations must only be carried out by qualified and authorised personnel, as they may result in electrocution, burns or explosions.
- For the correct and safe use of the instrument, as well as for all installation and maintenance purposes, operators must always comply with standard safety procedures. The manufacturer shall in no way be liable if such procedures are not complied with.
- Before connecting the instrument to the electrical system, as well as before handling, maintaining or repairing the instrument, the instrument and the electrical cabinet to which it is connected must be disconnected from any voltage source.
- Before turning on the instrument, make sure the maximum voltage at the voltmeter inputs is 1000VAC phase/phase or 600VAC phase/neutral.
- If the instrument can no longer be operated safely, it must be discarded and measures must be taken to prevent accidental use. Safe operation is no longer possible in the following cases:
 - if damage to instrument is clearly visible;

- if instrument is no longer working;
- after being stored for an extended period under unfavourable conditions;
- if instrument is badly damaged during transportation.

The symbol shown here on the right - when found on the product or elsewhere - means that the user manual must be consulted.



3. INSTRUMENT OVERVIEW AND CONNECTION TO THE ELECTRICAL INSTALLATION

PowerCompact3020 has been designed to perform both real-time measures, both of prolonged measurement campaigns. It has therefore been equipped with special shock-resistant and non-slip rubber which allow a practical handle to one or two hands and has also been provided with a support for resting on flat surfaces.

The instrument is connected to the system by means of suitable voltage and current inputs. In the imagen below, you can see three voltage input channels **U1**, **U2** e **U3** with one neutral (**N**) in common, and Four independents current inputs **I1**, **I2**, **I3**, **In**.



The marks indicated in the terminals help the user to identify the correct inputs.

CURRENT INPUTS

**VOLTAGE INPUTS
(600V CAT III)**



Besides, an independent auxiliary voltage input voltage (**Uaux**) and a current input (**Iaux**) are available. Cables and the current clamp for that channel are optional (refer to ACCESSORIES).



3.1. Power supply

The Analyzer is equipped with an external power supply which can be connected to any socket (USA/JP, UK, EU, AU) with voltage $100\pm 240V \sim \pm 10\%$ and frequency 47 ± 63 Hz.

The output jack of the power supply is to be connected to the special 7.5VDC connector of the device.

The instrument is also equipped with a NiMh rechargeable battery pack, which guarantees more than 24 hours of use, without having to connect it to the main line. Batteries are recharged by the external power supply (supplied with the instrument). Batteries cannot be recharged through the USB connection.

If PowerCompact3020 is not used for a long period of time, then perform a charge cycle every two months (approximately) to prevent the batteries from going almost completely flat, in which case you will no longer be able to recharge them.

If the battery runs out you will lose date and time. In this case, PowerCompact3020 alerts the user to set the correct date and time, with a display message "Set date and time".

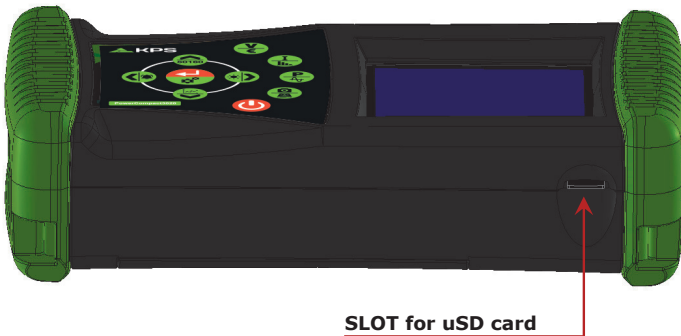
3.2. USB Port

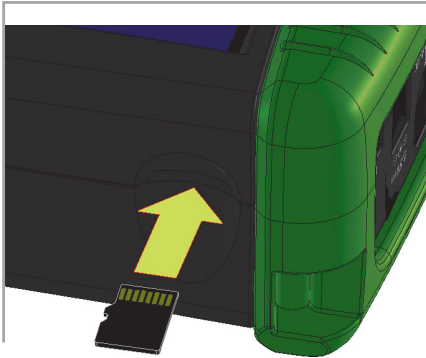
PowerCompact3020 can be connected to a PC through the USB port and the supplied cable. This connection allows the user to download the measurement registers using the PowerCompact/Studio software.

The USB communication may also allow easy upgrade of the firmware (internal software) of the instrument.

3.3. Memory card

PowerCompact3020 is equipped with a slot for a 16 GB uSD memory card, which can be used to store measurement campaigns data, fast transients and inrush currents.





The memory card must be inserted as shown in the picture, with the contacts facing up.

NOTES: The slot is push-push type (the card is both inserted and removed by pressing it). Do not try to remove the card by pulling it, as this will damage the connector.

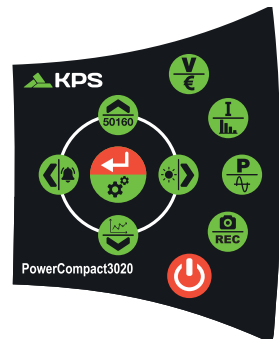
Do not remove the uSD card whilst a measurement campaign is being performed, as all data will be lost.

3.4. Keyboard











The PowerCompact3020 keypad is equipped with 9 double-function keys, i.e. the function of each key varies depending on whether it is pressed once or pressed and held for approximately 3 seconds.

Therefore, the instrument has 12 function keys, a central pad with the Enter function and arrow keys, and a key to access the Setup Menu directly, which allow for a more immediate and effective use of the instrument.

The Power (⏻) key must also be pressed for approximately 3 seconds to be activated.



3.5. Keyboard commands

KEY	FUNCTION	
	Single pressure	Pressure over 3"
		SWITCH ON/OFF
	Enter into VOLTAGES	Enter into COUNTERS
	Enter into CURRENTS	Enter into HARMONICS
	Enter into POWERS	Enter into WAVES FORM
	Function "snapshot": it freezes values at a certain time for a better analysis; it does not stop measurements.	Enter into CAMPAIGNS
	<ul style="list-style-type: none"> Access to AUX channel. It scrolls all related menus, after pressure of ←, of: harmonics, trend, dips, interruptions, alarms. 	Enter into EXTRA FUNCTIONS
	<ul style="list-style-type: none"> Descending scroll of measurements menu pages. It moves the cursor toward lower part of setup pages. It decreases a setup parametr value. 	Enter into TRANSIENTS
	<ul style="list-style-type: none"> Exit from AUX channel. It scrolls all related menus, after pressure of ←, of: harmonics, trend, dips, interruptions, alarms. 	Enter into ALARMS
	<ul style="list-style-type: none"> Ascending scroll of measurements menu pages. It moves the cursor toward upper part of setup pages. It increases a setup parameter value. 	Enter into EN 50160
	<ul style="list-style-type: none"> It selects a parameter to be modified in setup. Enter into a sub-page or measurement sub-menu. In this case the text ENTER will appear on le lower right corner. 	Enter into SETUP

3.6. User Interface

For ease of use, PowerCompact3020 is equipped with a graphic LCD and a membrane keypad detailed above.

The software architecture of the instrument is divided into MENUS, more specifically SETUP and MEASUREMENT Menus. Each menu consists of a number of pages, which are described further on.

3.7. Setup and measurement menus

A typical **SETUP** menu consists of:

The screenshot shows the 'Connections Set-up' menu with the following data:

Connections Set-up	
Grid:	3PH+N
VT:	AC 230:230
VT AuX:	AC 230:230
Generation:	OFF
Zero Adj Check	

Callouts from the image:

- Green box: a heading showing the name/title of the screen
- Red box: an area with the fields to be selected - and possibly modified - by means of the **cursor**
- Yellow box: cursor

A typical **MEASUREMENT** menu consists of:

The screenshot shows the 'Voltage L-II (V) I (A)' measurement menu with the following data:

Voltage L-II (V) I (A)		
L1	227.6	16.4
L2	226.6	24.7
L3	225.2	30.2
3PH	392.2	
Vrms 3F: 392.2		

Callouts from the image:

- Green box: a heading showing the name/title of the screen
- Yellow box: an area displaying related parameters (according to type of menu, it could be omitted)
- Orange box: main parametrs area
- Purple box: a bottom bar displaying alternating information (according to type of menu, it could be omitted)

3.8. Bottom bar

This area displays information regarding the status of the instrument and it can be customized by user via Setup.

3.8.1. Main bar

Main bar shows global device informations:



- 1) Battery level
- 2) Micro SD inserted if highlighted or not

In addition to the above information, the bottom bar will alternate between 3 parameters of the user's choice and indicate the type of electrical connection selected by user through setup



4. START-UP

Make sure the electrical cabinet is off before connecting the instrument. Only when the connection is complete and safety set, switch on the electrical cabinet.



Switch on the instrument by pressing and holding down the **POWER** key for approximately 3 seconds (the same action switches off the instrument).

At start-up, the following screen will be displayed for a few seconds where following data are shown:

PowerCompact3020 ← product;
 Rel.1.00 ← firmware version;

KPS

PowerCompact3020

s.n.: 02/17-0916 ← serial number of the instrument.

Auto setup clamp

11: CLAMP 1000A/IV
 12: CLAMP 1000A/IV
 13: CLAMP 1000A/IV
 1N: No clamp
 1AUX: No clamp

ENTER to continue

A few seconds later it will show the page with the automatic detection of current probes. PowerCompact3020 is able to detect which current clamps are connected to its inputs and to configure itself accordingly, storing such data in the appropriate setup.

If the detection is consistent, after about 20 seconds, or in the case where the user presses the button ←, the instrument will automatically position on first page of voltage menu.

Conversely, if inconsistencies are detected, PowerCompact3020 will stop, showing the message "Clamps error".

Error can be shown if one or more probes are missing or are different in a three-phase connection.

Auto setup clamp

11: No clamp ←

12: CLAMP 5A/IVAC
 13: Clamps error AC
 1N: CLAMP 5A/IVAC
 1AUX: FLEX 3000A

ENTER to continue

Clamps error: L1 missing

Auto setup clamp

11: FLEX 3000A ←

12: CLAMP 5A/IVAC
 13: Clamps error AC
 1N: CLAMP 5A/IVAC
 1AUX: FLEX 3000A

ENTER to continue

Clamps error: L1 different


Auto setup clamp

11: Not recognized ←

12: CLAMP 5A/IVAC
 13: Clamps error AC
 1N: CLAMP 5A/IVAC
 1AUX: FLEX 3000A

ENTER to continue


Clamps error: L1 not recognize

The user can always skip this check by pressing the button  and directly accessing the landing page of voltage menu and subsequently accessing the setup menu of the amperometric clamps, to perform manual configuration required.





Once completed the start-up and the clamp settings, system will move to the page of voltages.

5. SETUP

5.1. Main setup menu

Press  for approximately 3 seconds to access the setup menu:










Use  and  keys to select the proper section and press  to access it. To return to the main setup menu, press  from the main section page.

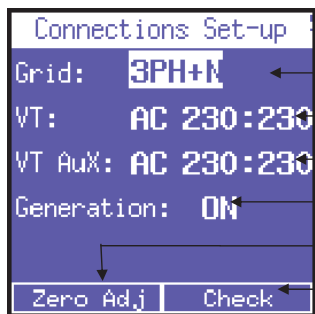
To exit from the setup, press again  for approximately 3 seconds.

5.2. Parameter setting

When entered into desired section, parameters can be browsed and edited using following main keys:

- Use  and  keys to select the parameter to be configured.
- Press  and the cursor will start to flash. Use  and  keys to modify the selected value.
- Press  again to confirm the value. The cursor will stop flashing.
- Press  from the main section page to return to the setup menu

5.2.1. Connection setup.



Connections setup menu allows the user to set the following parameters:

- type of electrical network to which the instrument is connected.
- type of voltage and voltage ratio for phases L1, L2, and L3.
- type of voltage and voltage ratio for U AUX
- activate/deactivate measurements in cogeneration mode.
- automatically adjust the zero level of measuring channels.
- check if the instrument and relevant probes are connected to the electrical system correctly.

5.2.1.1. Type of electrical connections setup.

To set the type of connection, enter the **CONNECTIONS SETUP** Menu, place the cursor on **GRID TYPE** and select one of the following options:

- **3PH+N-BL** = balanced three-phase system with neutral
- **3PH-BL** = balanced three-phase system without neutral
- **3PH** = unbalanced three-phase system without neutral
- **3PH+N** = unbalanced three-phase system with neutral
- **2PH** = two-phase system
- **1PH** = single-phase system

5.2.1.2. Type of voltage and voltage ratio setup for the main channel.

PowerCompact3020 can measure both alternate and direct currents. The user must set the type of voltage to be analysed, selecting among **AC** (alternate) y **DC** (direct).

Besides, When a voltmeter transformer has to be connected, i.e. when voltages higher than 600VAC must be measured, the corresponding transformation ratio must be set (default value 230:230), changing the values as needed.

5.2.1.3. Type of voltage and voltage ratio setup for auxiliar channel.

As described in the previous section, the same settings can be applied to the auxiliary voltage channel U Aux.

5.2.1.4. Cogeneration setup.

PowerCompact3020 can also be configured to measure the power and energy that might be generated. To do so, place the cursor on **GENERATION** and select **ON**.

By selecting **OFF**, the instrument will stop measuring the power generated, which will be considered absorbed power.

NOTE: when changing from Generation ON to Generation OFF, the counters of generated power are not reset.

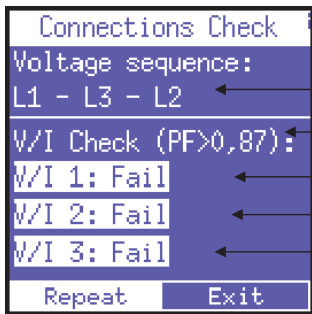
5.2.1.5. Zero adjustment.

After disconnecting the voltage and current input channels from the measuring grid, place the cursor on **START** and press **←** to correct the offset, in case the latter has deviated. A page with numerical values will be displayed for the duration of the zero adjustment procedure (10-20"). When the procedure is complete, the system will automatically return to the CONNECTIONS SETUP page.

5.2.1.6. Connection check.

Once the instrument has been configured and connected to the system, the instrument can check if the connection to the electrical system has been performed correctly (to perform this check, the PF value must comply with the value indicated on the screen).

Place the cursor on **Check** and press **←** to perform the check. The related outcome will then be displayed.



← Voltage phase sequence

• Threshold of the measured PF which allows for a correct analysis (if the PF is lower than this value, the check cannot provide valid information)

• Check of the correspondence between voltage and current of each phase and possible error message:

Ok = Connection is correct

Invertir CT = Invert the direction of the current clamp indicated

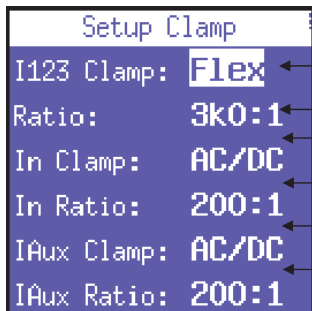
Fallada = No correspondence between voltage and current or the PF value is lower than the threshold displayed.

Select "Repeat" to perform a new check.

Select "Exit" to return to the CONNECTIONS SETUP page.

5.2.2. Current probes setup.

Due to automatic recognition of current probes, the setup values will be those detected at power up. If you need to use different clamps from those recognized in power on, you will have to manually change the setup as shown below, or alternatively, make a new power on after connecting the new probes.



This page allows the users to select:

• the type of probe used for I1, I2, I3, selecting among **Flex** (non-amplified flexible sensors) or **AC/DC** (clamp);

• the sensor transformation ratio on I1, I2, I3 (press and hold down **▲** or **▼** to increase scrolling speed);

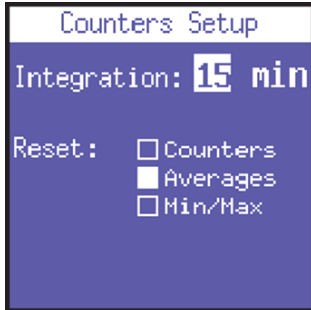
• the type of probe used for In, selecting among **Flex** (non-amplified flexible sensors) or **AC/DC** (clamp);

• the sensor transformation ratio on In (press and hold down **▲** or **▼** to increase scrolling speed);

• the type of probe used for Iaux selecting among **Flex** (non-amplified flexible sensors) or **AC/DC** (clamp);

• the sensor transformation ratio on Iaux (press and hold down **▲** or **▼** to increase scrolling speed);

5.2.3. Counters setup

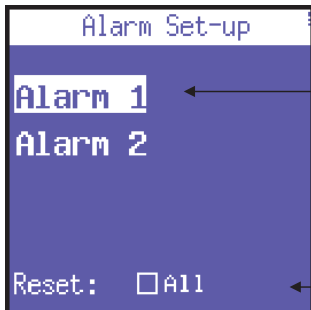


This page allows the user to:

- 1) Set the integration time, i.e. the time at which the average values and maximum demand are calculated.
- 2) Reset the counters and/or averages and/or Min/Max values by selecting the desired ones; when page will be left, the required parameters will be reset.

5.2.4. Alarms

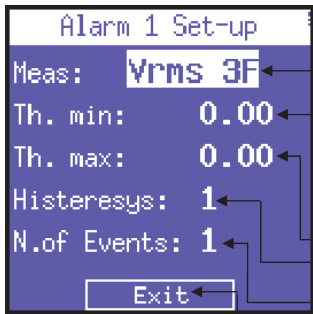
Two alarms can be set and configured with PowerCompact3020.



Place the cursor on either alarm and press \leftarrow to access the relevant configuration submenu.

Select **ALL** and press \leftarrow to reset all the stored alarms.

5.2.4.1. Alarm setup



In the Alarm 1 or 2 configuration submenu, select OFF to disable the alarm or set the desired parameter to enable the alarm. The following parameters are available:

Vrms 3F, Vrms L1, Vrms L2, Vrms L3, Irms 3F, Irms L1, Irms L2, Irms L3, Prms 3F, Prms L1, Prms L2, Prms L3, Qrms 3F, Qrms L1, Qrms L2, Qrms L3, Srms 3F, Srms L1, Srms L2, Srms L3, pf 3F, pf L1, pf L2, pf L3, thdv 3F, thdv L1, thdv L2, thdv L3, thdi 3F, thdi L1, thdi L2, thdi L3, Freq, In, Unbal, Vaux, Iaux, Paux, Qaux, Saux, PFaux, FRaux, CosPhi L1, CosPhi L2, CosPhi L3.

Set the minimum threshold value.

Set the maximum threshold value.

Set the hysteresis percentage (valid for both the minimum and maximum threshold)

Set the number of event after which the alarm should go off.

Return to the "Alarm setup and reset" page.

Voltage L-n (V)	I (A)
L1 218.2	0.02
L2 218.4	0.01
L3 218.4	0.01
3PH 378.2	
Alm. Vrms 3F=378.2	

NOTE:

If one of the alarms set goes off, it will be indicated in the bottom bar of the measurement pages, where the alarm will be displayed permanently until it is cleared.

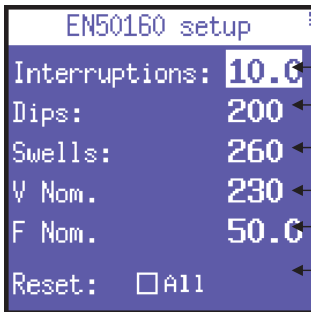
The last 5 alarms which have gone off are stored and can be displayed in the relevant menu.

5.2.5. EN 50160 setup and reset

As described in Standard EN 50160, the phenomenon "voltage disturbances" (swells, dips, interruptions, etc.) does not feature standard values by means of which power quality can be evaluated.

Therefore, it is the user's responsibility to evaluate whether the voltage disturbances of the system are actually harmful or if they can be disregarded, based on the type of installation, production, connected instrument, etc.

The **EN 50160 SETUP** page allows the user to set the values necessary for performing the 50160 TEST correctly, i.e. for evaluating the power quality of the system.



Specially, the following parameters can be set:

Vrms value below which an interruption is defined

Vrms value below which a dip is defined

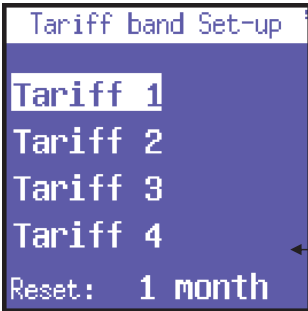
Vrms value above which a swell is defined

nominal voltage

nominal frequency

reset the stored data related to all the grid disturbances that have been recorded

5.2.6. Tariffs setup.

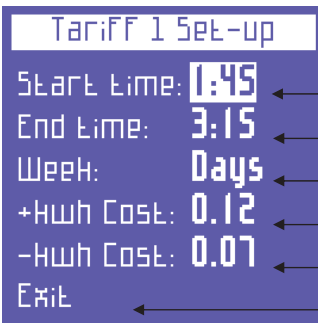


Chose the tariff band to be set by selecting it with the cursor.

One selecting the tariff band, press ← to access the relevant configuration and reset submenú.

This function resets the measurements previously performed (for all 4 tariffs). The following options are available: **NEVER - 1 MONTH - 2 MONTHS - 3 MONTHS**

5.2.6.1. Tarif configuration and resetting.

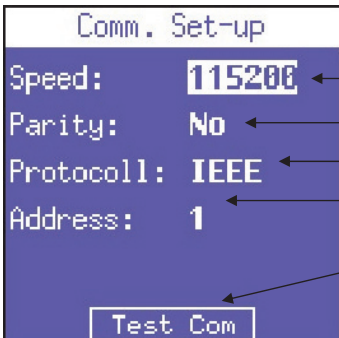


This page allows the user to set the following parameters for each tariff:

- start time (with 15 minute intervals)
- end time (with 15 minute intervals)
- access to the subpage to select the days on which the tariff is to be applied
- the cost of the kWh consumed (in the relevant currency)
- the yield of the kWh generated (in the relevant currency)
- return to the "Tariffs setup" page

NOTE: avoid time of the different tariff bands to overlap. When the time of a tariff is changed, always make sure that it does not overlap with the time of another tariff. **To set 12:00 am, select 0:00.**

5.2.7. Communication setup and test



This page allows the user to set the following parameters:

- data transfer speed (baud rate): **4800, 9600, 19200, 38400, 57600, 115200** bps.
- type of parity: **No, Even, Odd.**
- protocol type: **BCD or IEEE.**
- address of the instrument (which must be unique) if the latter is connected to a PC with PowerCompact/Studio software.
- press ← to Access the communication test page

5.2.7.1. Serial communication test



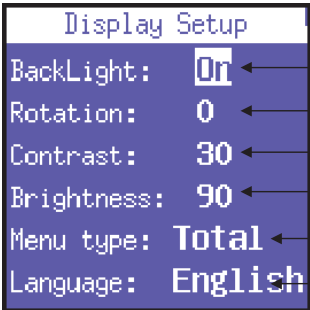
Test communication page is helpful when connecting the instrument to a device to check if communication is correct, as well as to check if the instrument is working correctly.

This field shows the current status (No communication, Comm. OK) or the type of error (Checksum error, framing error, etc.) occurring during communication.

Return to the "Communication setup" page.

NOTE: in case of a permanent error, check that the parameters have been configured correctly (PC and instrument)

5.2.8. Display setup



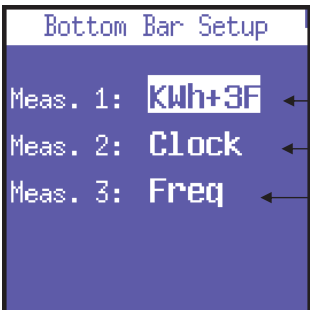
In the **Display Setup** it is possible to customize:

- backlight time of the display: **ON** (always on), **15 sec** or **1 Min**.
- LCD display orientation. It may be practical when the instrument must be placed in a vertical position.
- contrast.
- brightness.
- menu type. Partial menu only displays the main measurements and not the secondary measurements. It only affects the displayed information.
- language selection: English, Italian, Spanish, French, German.

Obviously, with time, LCD efficiency will depend on the number of hours of operation and the level of brightness selected. Therefore, unless strictly necessary, we advise against the level of brightness being higher than 70 and keeping the backlight ALWAYS ON.

NOTE: the display turns on automatically if a fan alarm goes off.

5.2.9. Bottom bar setup.

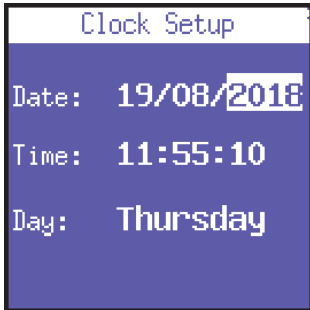


This page allows the user to choose 3 parameters (out of 63) to be displayed alternately in the bottom part of the measurement screens, in addition to the battery level. The following parameters are available for visualization:

Vrms 3F, Vrms L1, Vrms L2, Vrms L3, Irms 3F, Irms L1, Irms L2, Irms L3, Prms 3F, Prms L1, Prms L2, Prms L3, Qrms 3F, Qrms L1, Qrms L2, Qrms L3, Srms 3F, Srms L1, Srms L2, Srms L3, pf 3F, pf L1, pf L2, pf L3, thdv 3F, thdv L1, thdv L2, thdv L3, thdi 3F, thdi L1, thdi L2, thdi L3, kWh+3F, kWh L1, kWh L2, kWh L3, KVArh+3F, KVArhL1, KVArhL2, KVArhL3, kWh-3F, KVArh3F, kWh+F1, kWh+F2, kWh+F3, kWh+F4, Clock, Freq, In, Unbal, n.dip, n.swell, n.int, Vaux, Iaux, Paux, Qaux, Saux, PFaux, FRaux, CosPhi L1, CosPhi L2, CosPhi L3.

NOTE: to display only one parameter, select the same parameter for all 3 options.

5.2.10. Clock setup.



This page allows user to set the date and time.

The format is: **DD/MM/YYYY**

5.2.11. Device info
















Last Setup menu section is aimed to report main information concerning the device.

Model, serial number and firmware version are showed in this page.

6. INSTRUMENT USE AND CONSULTATION

The PowerCompact3020 keypad allows user to access all the menus of the instrument directly, thanks to its practical function keys.

Press the desired key to access the relevant menu. Use the arrow keys to scroll through the different pages of a menu.

1) VOLTAGES Menu (V), press once	
2) CURRENTS Menu (I), press once	
3) POWER Menu (P), press once	
4) COUNTERS Menu (€), press and hold down during 3 seconds	
5) HARMONICS Menu (I...), press and hold down during 3 seconds	
6) WAVEFORMS Menu (V~), press and hold down during 3 seconds	
7) AUX CHANNEL Menu (▶), press once	
8) SNAPSHOT Function (📷), press once	
9) EN 50160 Menu (50160), press and hold down during 3 seconds	
10) ALARMS Menu (🔔), press and hold down during 3 seconds	
11) TRANSIENTS Menu (⚡), press and hold down during 3 seconds	
12) CAMPAIGNS Menu (REC), press and hold down during 3 seconds	
13) EXTRA FUNCTIONS Menu (☀️), press and hold down during 3 seconds	

6.1. Navigation through measurement menus

When accessing a measurement menu, the first page of the selected menu is displayed. Press ▲ or ▼ to scroll through the pages of the menu up and down, respectively.

In the Voltage, Currents, Power, Counters, Harmonics, and Waveforms Menus, press ► to access the relevant Auxiliary Channel Menu. Use ▲ or ▼ arrows to scroll the relevant auxiliary channel menu. Press ◀ to exit the auxiliary channel menu. Certain pages (e.g. harmonic histograms) allow the user to access internal sub-functions by pressing ◀.

NOTE: entire menus or specific pages/parameters may not be displayed or changed, depending on the menu type which has been set in the LCD configuration (FULL or PARTIAL) and/or the type of electrical connection (e.g. if the single-phase connection has been set, the screens regarding three-phase data will not be displayed, and the structure of many other pages will be modified).

6.2. Measurement menu

When switching on the instrument or exiting the Setup Menu, PowerCompact3020 displays the first page of the Voltages Menu. The menus have a loop-type structure, i.e. when the end of the last page is reached, the menu automatically returns to the first page. You can scroll through the menus in either direction. The information displayed will then vary, depending on the type of connection that has been set in the Setup Menu.





6.2.1 - Voltage menu

6.2.1.1. Three-phase or two-phase connection

Voltage L-N [V]			I [A]
L1	227.6	16.4	
L2	226.6	24.7	
L3	225.2	30.2	
3PH	392.2		
Vrms 3f: 392.2			

If the 3PH+N, 3PH+N-BL or 2PH connection is set (unbalanced/balanced three-phase with neutral connection or two-phase connection), the first page will display the phase-neutral voltages, the relevant phase currents, and the three-phase (or two-phase) voltage.

NOTE: if another type of electrical connections without neutral is set, this page will not be displayed.

Voltage L-L [V]			I [A]
L12	391.6	16.8	
L23	391.1	24.9	
L31	395.0	31.6	
3PH	392.6		
Vrms 3f: 392.6			

Line voltages and relevant phase currents




Freq. - Unbalance	
Freq. (Hz)	50.03
U Unb. (%)	0.410
Vrms 3f: 393.7	

Frequency (measured on L1) and unbalance.

NOTE: in a three-phase system, the unbalance value is a parameter indicating a condition in which the effective values of phase voltages or the phase angles between consecutive phases differ. This parameter is one of the values which serve as an indication of power quality. The lower the percentage value, the better the power quality.

▼ ▲

Avg. Voltage L-N [V]	
L1	228.0
L2	226.9
L3	225.5
pF L1: 0.85	

Average voltage levels (calculated on the basis of the integration time which has been set. Values can be reset).

▼ ▲

Min. Voltage L-N [V]	
L1	22.61
L2	22.08
L3	21.95
Orms 3F: 415.2	

Minimum instant voltage values (Values can be reset).

▼ ▲

Max. Voltage L-N [V]	
L1	229.4
L2	231.3
L3	229.4
pF L1: 0.85	

Maximum instant voltage values (Values can be reset).

6.2.1.2. Single-phase connection

V[V]/F[Hz]	I[A]
Rms 228.8	12.2
Max 229.3	584
Avg 228.3	20.8
Min 0.000	0.00
F 49.97	
Vrms 3F: 394.7	

This page displays the RMS voltage, maximum, average and minimum value, and frequency, and the relevant currents. Minimum and maximum voltage values can be reset as well as the average value.

6.2.1.3. Auxiliary channel

On any of the Voltages Menu pages, press ► to access the page containing all the information regarding auxiliary channel voltage. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Currents, Power, Counters, Harmonics, Waveforms) by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.

►

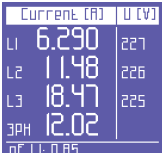
V[V]/F[Hz]	AUX	I[A]
Rms 228.8		12.2
Max 229.3		584
Avg 228.3		20.8
Min 0.000		0.00
F 49.97		
Vrms 3F: 394.7		

◀



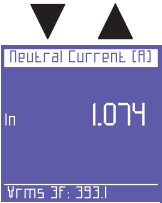
6.2.2. Current menu

6.2.2.1. Three-phase or two-phase connection



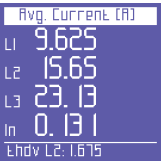
The first page of this menu displays the currents in each phase, as well as in the three-phase current (or two-phase current, depending on the electrical connection) and corresponding voltages.

When scrolling through the pages, the following pages will be displayed.

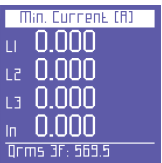


Neutral current or, in general, 4th current channel.

NOTE: if a connection other than 3PH+N or 3PH+N-BL (unbalanced or balanced three-phase with neutral) is used, the value will always be 0.000.



Average current values in each phase (calculated on the basis of the integration time set. Values can be reset).



Minimum instant current values in each phase (values can be reset).



Maximum instant current values in each phase (values can be reset).



Max Dem. Current (A)	
L1	19.70
L2	29.11
L3	34.58
In	0.146
Vrms 3F: 392.0	

Load peaks, i.e. the highest average current (calculated on the basis of the integration time set. Values can be reset).

6.2.2.2. Single-phase connection

I (A)	V (V)
Rms	17.68
Max	584.7
Avg	18.30
Min	0.000
MO	31.15
Lhdv L2: 1.291	

This page displays the RMS current, maximum, average and minimum value, and maximum demand (load peaks are calculated on the basis of the integration time set), and the relevant voltages.

Minimum and maximum current values can be reset as well as the average value and the maximum demand.

6.2.2.3. Auxiliary channel

Press ► to access the page containing all the information regarding auxiliary channel current. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Power, Counters, Harmonics, Waveforms) by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.

I (A) Aux	V (V)
Rms	17.68
Max	584.7
Avg	18.30
Min	0.000
MO	31.15
Lhdv L2: 1.291	




6.2.3. Power menu

6.2.3.1. Three-phase or two-phase connection

Active (W)	PF
L1	3.637
L2	5.538
L3	6.818
3PH	15.99
Lhdv L2: 1.646	

The first page of this menu displays the active power (W) in each phase and in the three-phase (or two-phase) connection and the corresponding PF values.


NOTE: as a norm, active power is shown as a negative when generated and a positive when absorbed.



Reactive (var)		PF
L1	1.224 k	0.94
L2	1.525 k	0.96
L3	2.516 k	0.93
3PH	5.266 k	
Ehdv L2: 1.630		


Reactive power (Var) in each phase and in the three-phase (or two-phase) connection and the corresponding PF values.

NOTE: as a norm, reactive power is shown as a negative when capacitive and a positive when inductive.



Apparent (VA)		PF
L1	3.788 k	0.94
L2	5.700 k	0.96
L3	6.801 k	0.94
3PH	16.28 k	
Ehdv L2: 2.085		


Apparent power (VA) in each phase and in the three-phase (or two-phase) connection and the corresponding PF values.



Power Factor	Load
L1	0.947 Cap
L2	0.968 Ind
L3	0.975 Ind
3PH	0.993 Ind
Ehdv L2: 1.941	


PF values in each phase and in the three-phase (or two-phase) connection and the relevant type (Ind = Inductive load; Cap = Capacitive load).

NOTE: the PF is always positive. As a norm, it is shown as a negative when active power is generated and a positive when absorbed.




Avg. W-var-VA-PF	
Ptot	18.37 k W
Qtot	5.18 k var
Stot	19.15 k VA
PF	0.959
Vrms 3F: 399.5	

Average total power and PF (calculated on the basis of the integration time set. Values can be reset).



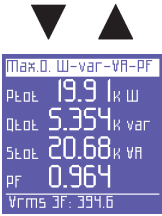
Min. W-var-VA-PF	
Ptot	0.000 W
Qtot	8.418 k var
Stot	0.000 VA
PF	0.000
Vrms 3F: 399.5	

Minimum instant values of total power and PF (values can be reset).

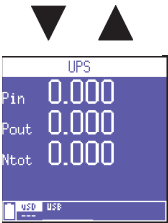


Max. W-var-VA-PF	
Ptot	168.1 k W
Qtot	58.56 k var
Stot	174.2 k VA
PF	1.000
PF L1: 0.82	

Maximum instant values of total power and PF (values can be reset).



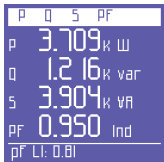
Load peaks and relevant PF, i.e. the highest average power (calculated on the basis of the integration time set. Values can be reset).



If Grid Type is set to **UPS 3-3** or **UPS 3-1** the efficiency page will be shown reporting following realtime values:

- Pin: instantaneous power entering the UPS
- Pout: instantaneous power exiting from UPS
- Ntot: efficiency of UPS system

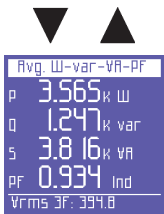
6.2.3.2. Single-phase connection



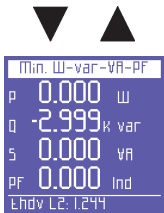
This page displays active, reactive and apparent power, and the PF (including a note whether the latter is inductive or capacitive).

NOTE: As a norm:

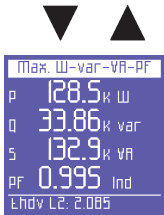
- Active power and the PF are shown as a negative when generated and a positive when absorbed.
- Reactive power is shown as a negative when capacitive and a positive when inductive.



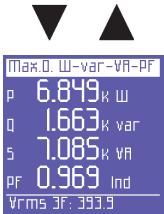
Average power and PF (calculated on the basis of the integration time set. Values can be reset).



Minimum instant values of power and PF (values can be reset).



Maximum instant values of power and PF (values can be reset).

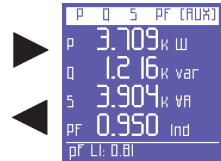


Load peaks of power and PF, i.e. the highest average values (calculated on the basis of the integration time set. Values can be reset).

6.2.3.3. Auxiliary channel

On any of the Power Menu pages, press **▶** to access a series of pages containing all the information regarding auxiliary channel power. The first page displays active, reactive and apparent power, as well as the PF. Use **▲** and **▼** arrows to scroll through the pages (See below). In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Counters, Harmonics, Waveforms), by selecting them with the relevant function keys.

Press **◀** to exit the Auxiliary Menu and return to the first page of the relevant menu.



Average power and PF (calculated on the basis of the integration time set. Values can be reset) related to the auxiliary channel.



Minimum instant values of power and PF (values can be reset) related to the auxiliary channel.



Maximum instant values of power and PF (values can be reset) related to the auxiliary channel.

Max. P-Q-S-PF (AUX)	
P	128.5 k W
Q	33.86 k var
S	132.9 k VA
PF	0.995 Ind
Ehdv L2: 2.085	



Load peaks and relevant PF, i.e. the highest average power (calculated on the basis of the integration time set. Values can be reset) related to the auxiliary channel.

Max.O. P-Q-S-PF (AUX)	
P	6.849 k W
Q	1.663 k var
S	7.085 k VA
PF	0.969 Ind
Vrms 3F: 393.9	



x3" 6.2.4. Counters menu

6.2.4.1. Three-phase or two-phase connection

Active E. (+kWh)	
L1	118.72
L2	176.61
L3	237.05
3PH	532.39
Vrms 3F: 393.9	

The first page of this menu shows the counters of the active power **absorbed** (+kWh) in each phase and three- or two-phase connections.



Reactive E. (+kVarh)	
L1	44.37
L2	63.44
L3	132.62
3PH	240.44
PF L1: 0.94	

The counters of the reactive power **absorbed** (+kVarh) in each phase and in three- or two-phase connections.



Total E. (kVAh)	
L1	136.98
L2	190.26
L3	276.24
3PH	603.50
PF L1: 0.93	

The counters of the apparent power (kVAh) in each phase and in the three- or two-phase connections.



Active E. - (kWh)	
L1	00.00
L2	00.00
L3	00.00
3PH	00.00
Vrms 3F: 331.5	

The counters of the active power **generated** (-kWh) in each phase and in three- or two-phase connections.



Reactive E. - (kVarh)	
L1	17.73
L2	01.74
L3	00.84
3PH	20.32
Lhdv L2: 1.968	

The counters of the reactive power **generated** (-kVarh) in each phase and in the three- or two-phase connections.



Avg. PF (Counters)	
PFL1	0.869
PFL2	0.932
PFL3	0.859
PF Tot	0.886
Vrms 3F: 333.4	

The average PFs calculated as kWh/kVAh ratio (only the real part of the counters is taken into account; the decimal part is not considered).



Band Count. P+(kWh)	
T1	00.00
T2	00.00
T3	00.00
T4	00.00
Qrms 3F: 451.4	

The next pages display the absorbed and/or generated power, and the related costs for the time bands selected in the Setup Menu.

The first page displays the kWh absorbed during the various time bands.



Band Count. Q+ (kVarh)	
T1	00.00
T2	01.36
T3	01.71
T4	00.00
Srms 3F: 717.4	

The kVAh absorbed during the various time bands.



Band Count. P-(kWh)	
T1	00.00
T2	00.67
T3	00.84
T4	00.00
Qrms 3F: 539.3	

The kWh generated during the various time bands.



Band Count. 0- kvarh	
T1	00.00
T2	00.00
T3	00.00
T4	00.00
Qrms 3F: 531.9	

The kvarh generated during the various time bands.



Tariff band Costs P-	
T1	0.00
T2	0.00
T3	0.00
T4	0.00
Qrms 3F: 977.0	

The cost of the kWh absorbed during the various tariff bands, expressed in the currency selected in the Setup Menu.



Tariff band Costs P+	
T1	0.00
T2	0.01
T3	0.01
T4	0.00
Qrms 3F: 970.9	

The income expressed in the set currency unit of the kWh generated during the different tariff bands.

6.2.4.2. Single –phase connection


ENERGY COUNTERS		
P+	196.56	Wh
Q+	204.14	varh
S	428.73	VAh
P-	52.57	Wh
Q-	88.12	varh
PF AVG	0.458	
25/07/2012 14:20:51		

Counters of absorbed (P+ Q+) and generated (P- Q-) power, and average value of the PF calculated as kWh/kVAh ratio.




Band Count. P+(kWh)	
T1	00.00
T2	00.00
T3	00.00
T4	00.00
Qrms 3F: 451.4	

The next pages display the absorbed and/or generated power, and the related costs for the time bands selected in the Setup Menu.
The first page displays the kWh absorbed during the various time bands.




Band Count. 0+ Hvarh	
T1	00.00
T2	01.36
T3	01.71
T4	00.00
Qrms 3F: 111.4	

The kVArh absorbed during the various time bands.




Band Count. P-(kWh)	
T1	00.00
T2	00.67
T3	00.84
T4	00.00
Qrms 3F: 539.3	

The kWh generated during the various time bands.




Band Count. 0- Hvarh	
T1	00.00
T2	00.00
T3	00.00
T4	00.00
Qrms 3F: 531.9	

The kVArh generated during the various time bands.



Tariff band Costs P+	
T1	0.00
T2	0.00
T3	0.00
T4	0.00
Qrms 3F: 477.0	

The cost of the kWh absorbed during the various tariff bands, expressed in the currency selected in the Setup Menu.



Tariff band Costs P-	
T1	0.00
T2	0.01
T3	0.01
T4	0.00
Qrms 3F: 470.9	

The income expressed in the set currency unit of the kWh generated during the different tariff bands.

6.2.4.3. Auxiliary channel

On any of the Counters Menu pages, press ► to access the page containing all the information regarding auxiliary channel counters. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Power, Harmonics, Waveforms) by selecting them with the relevant function keys. Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



AUXILIARY COUNTERS		
P+	44.54	Wh
Q+	11.01	varh
S	47.35	VAh
P-	00.00	Wh
Q-	04.30	varh
PF AVG	0.936	
ENDV L2	1.247	



x3" 6.2.5. Harmonics menu

6.2.5.1. Three-phase or two-phase connection

Voltage THD %	THD1%
L1 1.774	19.4
L2 1.844	15.0
L3 1.758	11.5
3PH 1.792	
Vrms 3f: 393.0	

The first page of this menu displays the THD% (Total Harmonic Distortion) of the voltage of each phase and the three-phase (or two-phase) connection, as well as the THD% of the relevant phase currents.



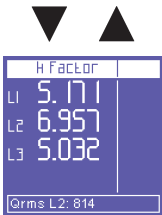
Current THD %	THDv%
L1 19.23	1.84
L2 14.85	1.78
L3 14.06	1.81
3PH 16.05	
Ihdv L2: 1.784	

This page displays the THD% of the current of each phase and the three-phase (or two-phase) connection, as well as the THD% of the relevant phase voltages.

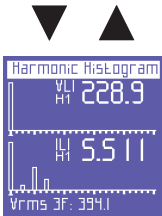


COsφ	φ
L1 0.730	43.1
L2 0.991	-7.55
L3 0.952	17.8
[Signal strength] [uSD] [3PH+N]	

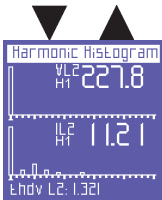
This page displays the cosφ of the 3 phases with the relevant angles expressed in degrees (the negative sign indicates that current comes before voltage; thus, the load is capacitive).



This page display the K factors of the phases.



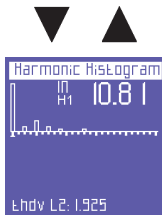
This page displays the harmonic histogram of the voltage and current of phase L1. Press **←** to access the function for selecting and scrolling through the single harmonics. Press **▶** and **◀** to select each single harmonic of the histogram (up to the 50th) and check the relevant RMS values. Press **←** again to return to the function that allows you to scroll through the pages of the Harmonics Menu.



This page displays the harmonic histogram of the voltage and current of phase L2.



This page displays the harmonic histogram of the voltage and current of phase L3.



This page displays the harmonic histogram of the neutral current.

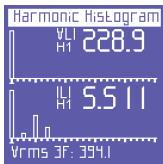
6.2.5.2. Single-phase connection



THD% (Total Harmonic Distortion) for voltage and current, $\text{Cos}\phi$ value and relevant angle expressed in degrees (the negative sign indicates that current comes before voltage and that the load is capacitive).



K factor

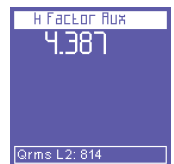
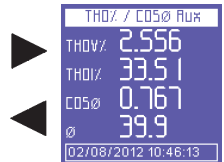


Harmonic histogram of current and voltage. Press \leftarrow to access the function for selecting and scrolling through the single harmonics. Press \rightarrow and \leftarrow to select each single harmonic of the histogram (up to the 50th) and check the relevant RMS values. Press \leftarrow again to return to the function that allows you to scroll through the pages of the Harmonics Menu.

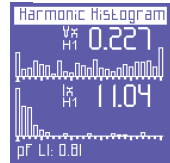
6.2.5.3. Auxiliary channel

On any of the Harmonics Menu pages, press \rightarrow to access two pages containing all the information regarding auxiliary channel harmonics. The first page displays the THD% of V and I. Use \uparrow or \downarrow to view the other page (see below). In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Counters, Harmonics, Waveforms), by selecting them with the relevant function keys.

Press \leftarrow to exit the Auxiliary Menu and return to the first page of the relevant menu.



K factor of the auxiliary channel



Harmonic histogram of auxiliary voltage and current.

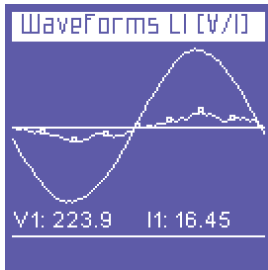
Press \leftarrow to access the function for selecting and scrolling through the single harmonics.

Press \blacktriangleright and \blacktriangleleft to select each single harmonic of the histogram (up to the 50th) and check the relevant RMS values. Press \leftarrow again to return to the function that allows you to scroll through the pages of the Harmonics Menu.



x3" **6.2.6. Waveforms menu**

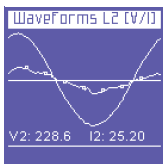
6.2.6.1. Main channel (single-phase, three-phase or two-phase)



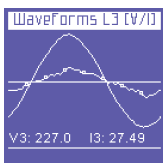
This menu shows the real-time waveforms and the relevant system voltage and current values.

NOTE: current tracing can be distinguished from voltage tracing by little square markers. Waveform amplitude is purely indicative and is automatically adjusted to screen size.

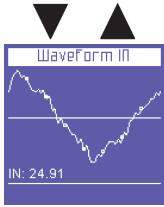
The first page of the menu displays the L1 voltage and current waveforms and relevant RMS values.



L2 voltage and current waveforms and relevant RMS values (only in three-phase and two-phase connections).



L3 voltage and current waveforms and relevant RMS values (only in three-phase and two-phase connections).

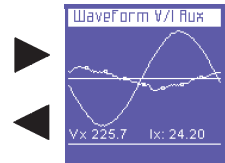


Neutral current waveform and relevant RMS value (only in three-phase and two-phase connections).

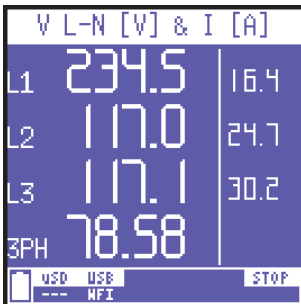
6.2.6.2. Auxiliary channel


On any of the Waveforms Menu pages, press ► to access the auxiliary channel tracing page. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Power, Counters, Harmonics) by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



6.2.7. Snapshot function



During measurements, press the  key to block all measurements immediately (not only those currently displayed). By doing so, the measurements will remain "frozen" on screen until the same key is pressed again.

After blocking the measurements, all other menus can be scrolled through to check the status of the other parameters captured at the same time.

The word STOP appears on the bottom bar to indicate that measurements have been blocked.

NOTE: Blocking not only interrupts what appears on the display, but also the entire measurement process. This means that the data during the block will not be recorded.



x3" 6.2.8 - EN 50160 menu

This menu allows the user to monitor main power quality parameters.



The first page displays the outcome of the EN50160 compliance test (Reference Standard for power quality), according to the parameters selected in the Setup Menu.

A test is performed to check whether frequency, voltage, harmonic voltage distortion, and unbalance comply with the above-mentioned reference Standard and the nominal values which have been set.

A table also shows the number of interruptions, dips and swells which have occurred during the period monitored.



```

INTERRUPTIONS
-----
Interruption 1 of 5
Beginning on:
27/01/2005 - 00:49:38
Duration:
0 min. e 9 sec
I rms LI: 0.02
    
```

These pages display the last 5 interruptions recorded (if any occurred).
NOTE: according to Standard EN50160, an "interruption" is defined as the simultaneous drop of all phase voltages below 5% of nominal V. However, a different threshold may be set by the user.
 The Start Date and Time and Duration of each interruption are displayed.
 The page of the most recent interruption is displayed automatically. To view any previous interruptions, scroll through the relevant pages using the ◀ and ▶ keys.



```

DIPS
-----
Dip 1 of 5
Beginning on:
15/09/2009 - 10:28:18
V-Min: 133 (L1)
V-Min: 218 (L2)
V-Min: 218 (L3)
Duration:
8.7 sec
I rms LI: 0.02
    
```

These pages display the last 5 dips recorded (if any occurred).
NOTE: according to Standard EN50160, a "dip" is defined as a drop of one or more phase voltages below 90% of nominal V. However, a different threshold may be set by the user.
 The Start Date and Time, Affected Phase(s), and Duration of each dip are displayed.
 The page of the most recent dip is displayed automatically. To view any previous dips, scroll through the relevant pages using the ◀ and ▶ keys.



```

SWELLS
-----
Swell 1 of 5
Beginning on:
55/00/2009 - 00:25:01
V-Max: 0.00 (L1)
V-Max: 0.00 (L2)
V-Max: 0.00 (L3)
Duration:
21 h e 50 min
I rms LI: 0.01
    
```

These pages display the last 5 swells recorded (if any occurred).
NOTE: according to Standard EN50160, a "swell" is defined as an increase of one or more phase voltages above 110% of nominal V. However, a different threshold may be set by the user.
 The Start Date and Time, Affected Phase(s), and Duration of each swell are displayed.
 The page of the most recent swell is displayed automatically. To view any previous swells, scroll through the relevant pages using the ◀ and ▶ keys.



```

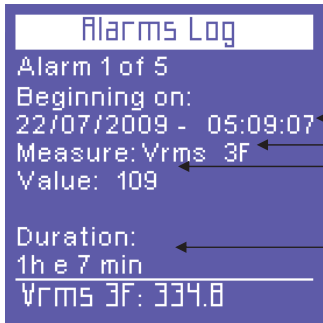
EN50160 params
-----
Start: 25/03/16 22:47:26
Freq: 50.00 Hz [49.99 Hz]
Failed: 0 on 50
V1: 235.74 V [233.24 V]
Failed: <8% or >110%
V2: 117.62 V [116.10 V]
Failed: <8% or >110%
V3: 117.77 V [116.67 V]
Failed: <8% or >110%
USB USB
--- MFT
    
```

This page report EN50160 test progress since last reset of counters or survey start.



x3" 6.2.9. Alarms menu

This menu stores and displays the last 5 alarms to go off.



The menu automatically displays the page of the most recent alarm.

Each alarm is identified by:

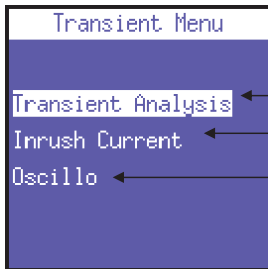
- start date and time
- type of parameter that exceeded the thresholds set
- value of the parameter which caused the alarm to go off
- duration of the event.

To view any previous alarms, scroll through the relevant pages using the ◀ and ▶ keys.

NOTE: Alarms are stored - hence displayed - only at the end of the event, i.e. when the parameter in question falls within the set values again.



x3" 6.2.10. Transients menu

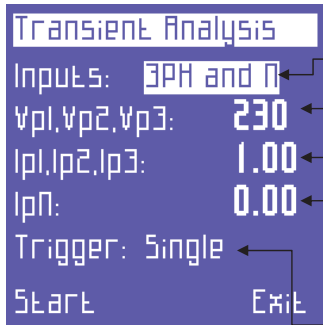


This menu can be used to capture and analyse temporary signal-specific phenomena and variations, such as:

- fast transient events
- inrush currents
- oscillo measures

6.2.10.1. Transients setup

This page allows the user to set the thresholds that the instrument will use to identify the transient event (i.e. the instant swell or overcurrent of peak). Thus, the following parameters must be set:



The screenshot shows the 'Transient Analysis' menu with the following settings and annotations:

- Inputs:** 3PH and N → channels to be measured: **3PH+N** (for main channel, no matter the connection) ó **Auxiliary** (auxiliary channel)
- Vp1,Vp2,Vp3:** 230 → the voltage peak threshold, over which the instrument will identify the presence of a transient. Set "0" to disable this transient function.
- Ipl,Ip2,Ip3:** 1.00 → the phase current peak threshold, over which the instrument will identify the presence of a transient. Set "0" to disable this function.
- IpN:** 0.00 → the neutral current peak threshold. It is not present if the "Inputs" field is set to "Auxiliary". Set "0" to disable this transient search function.
- Trigger:** Single → The capturing mode.
- Start** and **Exit** buttons are visible at the bottom.

Transients can be detected in 4 different modes:

- **SINGLE TRIGGER:** only one transient (the first to occur) will be detected and displayed, but not stored.
- **SINGLE TRIGGER+MEM:** same as single trigger, but the transient will also be stored on the uSD card.
- **AUTO TRIGGER:** the instrument will detect all transients and display the last one.
- **AUTO TRIGGER+MEM:** same as auto trigger, but all transients will also be stored on the uSD card

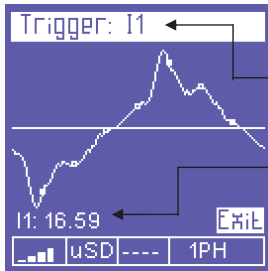
NOTES:

- Do not set thresholds lower than the nominal peak value of the signal, as this will result in the continuous recording of events.
- In detection modes with storage on USD, it is necessary that the date and time are set correctly. If they are not, the PowerCompact3020 prevents the initiation of the detection, displaying the message "Set date and time".

After setting all the parameters, select START to start the transient search. Select "Exit" to return to the Transient Menu.



A waiting page will then appear. The instrument will stay in this state until a transient actually occurs or the user presses **EXIT** (Exit) to exit and return to the Transient Setup page.



If transient is detected, event graph is displayed with following information:

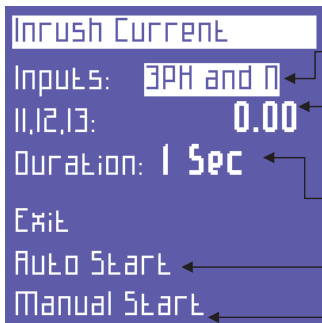
- Channel(s) in which the transient has occurred.
- Transient waveform.
- Relevant peak value.

To scroll through the transients that occurred at the same time as the one being displayed, use the ▲ and ▼ keys.

To exit and return to the Transients Menu, press ← (Exit).

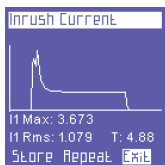
6.2.10.2. Inrush current setup

On the Transients Menu page, select "Inrush Current" to access the configuration page for analysing said phenomenon.



The following parameters can be set:

- channels to be measured: **3PH+N** (for main channel, no matter the connection) ó **Auxiliary** (auxiliary channel)
- the current RMS threshold, over which the instrument will identify current as "inrush current". A threshold slightly higher than the nominal current of the connected device should be set.
- the maximum duration of the inrush current analysis (in seconds).
- automatic start. The instrument will wait for the inrush current to occur, and then detect it automatically.
- manual start. The instrument will detect any current during the time period selected.



When an inrush current is detected, the following information will be displayed:

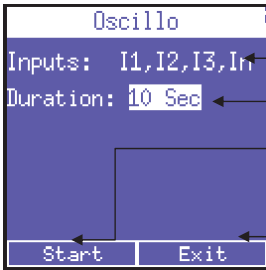
- Waveform;
- Maximum value;
- RMS value;
- Duration.

This screen will be displayed until the user:

- exits (Exit = return to the setup page)
- repeats the measurement using the same settings (Repeat);
- stores the measurement on the uSd card (Store)

6.2.10.3. Oscillo measures setup

By selecting the Oscillo function the device shows the Oscillo setup measure menu:

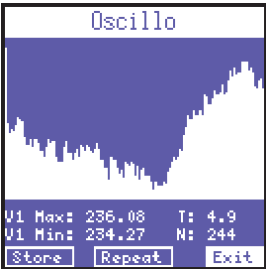


inputs to be measured: Currents or Voltages and frequency.

duration of the measure: **1 sec, 2 sec, 5 sec or 10 sec.**

start measure. During measurement keyboard, display and communication will be temporarily suspend for the whole measure duration. A "Measuring...." message will be shown on display.

leave oscillo function.



At the end of measure display will report the L1 parameter, reporting its maximum and minimum detected values, the sampling time and the number of samples taken.

The user could decide between:

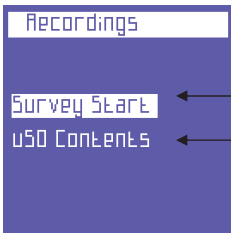
- exit (Exit = return to the oscillo setup)
- repeat measure using the same settings (Repeat);
- store data on uSd card (Store)

Use the ▲ and ▼ keys to scroll through channels (L1, L2 and L3) and to select the proper button.



x3"

6.2.11. Measurements campaigns menu



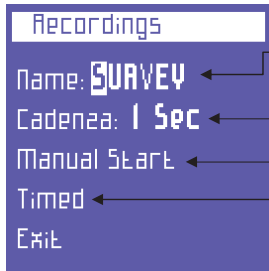
This menu allows the user to:

set a measurement campaign.

view the data store don the uSD card.

6.2.11.1. Measurements campaigns

Select "Start Campaign" to view the Measurement Campaign configuration page.



The following parameters can be set:

- campaign name. Press **←** to access a page with an alphanumeric keypad in order to enter the desired name.
- storing rate. The following options are available: **1" - 5" - 30" - 1' - 5' - 15'**.
- manual start. A campaign is started automatically and the first page of Voltage menu is displayed. "Rec" is displayed in the bottom bar. To stop the campaign, return to the campaigns menu and press "Stop".
- Scheduled start. Select "Scheduled" to access the page for scheduling a campaign and the start and end dates and times can be set.

By selecting "Start" the instrument will automatically display the first page of the Voltage menu. "Prog" is displayed in the bottom bar. To stop the campaign, return to the campaigns menu and press "Stop".

From the choice of memorization frequency and duration of the campaign, will depend the MB employed by the campaign on uSD. It is clear that a storage every second for a long period of time, would produce a campaign very heavy and therefore not practical to analyze. To properly tune these parameters we recommend that you refer to the following main criteria.

Campaign duration	Suggested rate	File size
Up to 12h	1 second	217 Mbyte
From 12 to 48h	5 seconds	174 Mbyte
From 48h to 2 weeks	30 seconds	204 Mbyte
From 2 weeks to 1 month	60 seconds	217 Mbyte
From 1 to 6 months	5 minutes	264 Mbyte
From 6 months to 1 year	15 minutes	176 Mbyte

If the number of records stored exceeds 50.000, the instrument closes the storage file and it automatically opens another one, identified with the same name but with an increased progressive number (eg: filename01, filename02, etc.), to avoid they yield files too large, which later would jeopardize the proper consultation by the software.

6.2.11.2. uDS content

Select "uSD Content" to review all stored data.



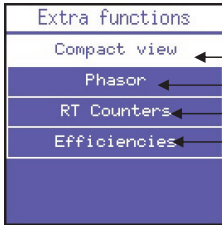
There are three types of recordings:

- manual or scheduled measurement campaigns.
- fast transients.
- inrush currents.

Measurement campaigns are identified by the name assigned to them, whereas transients and inrush currents are identified by the abbreviations TRANS (transients) or INRU (inrush) respectively, which are numbered progressively. To scroll through the various recordings, use the **▲** and **▼** keys.



x3" 6.2.12. Extra functions menu



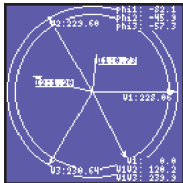
This page will display the following functions:

- ← compact view of the system data
- ← phasor diagram of the system
- ← realtime counters
- ← efficiency between main and auxiliary channel

6.2.12.1. Compact view

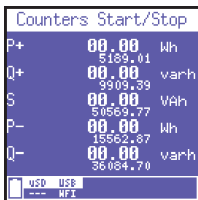
This page displays the values of the main parameters of the main channel. Press ► to access the page with the values of the main parameters of the auxiliary channel.

6.2.12.2. Phasor diagram



Phasor page visualize Tension and Current vectors relative positions in realtime.

6.2.12.3. Realtime counters

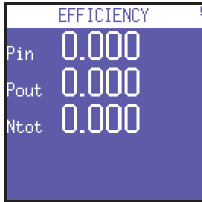


Realtime counters page offers the possibility to measure a limited time frame counters progression without resetting them compromising a running survey. Per each counter two separate values are shown: partial (big font) and absolute (small font).

Press ← to start counting partial values and press ← again to stop partial counting. Third pressure of ← will reset partial counters and restart calculation.

Once partial counting is launched, user can freely move to other pages and partial calculation will proceed normally. Return to the Realtime counters to stop partial counters.

6.2.12.4. Efficiencies

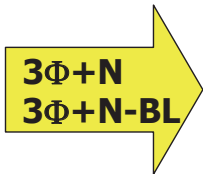


This page reports Power balance between Threephase channel (Pin) and Aux channel (Pout).

NOTE: in case of UPS 3-1 or UPS 3-3, refer to Power measurement pages to get the proper efficiency ratio related to the selected connection.

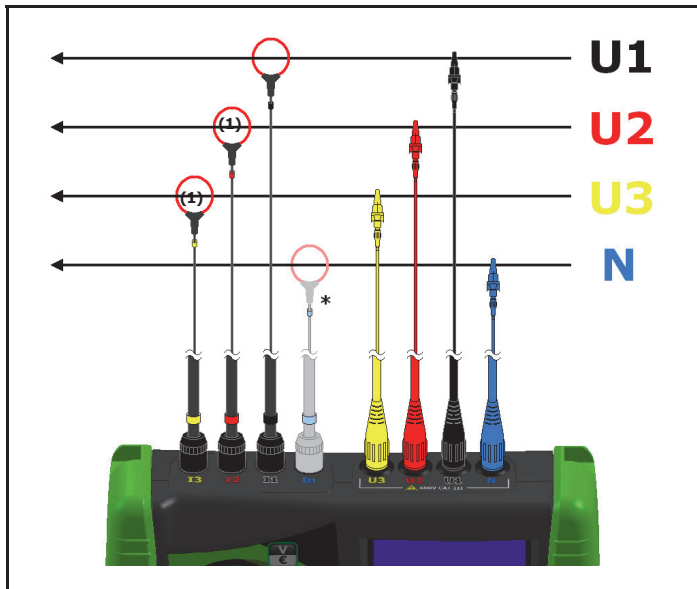
7. CONNECTION SCHEMES

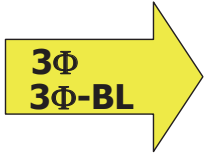
This chapter resume main usual connection schemes that can be applied to PowerCompact3020 analyzer.



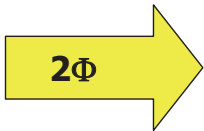
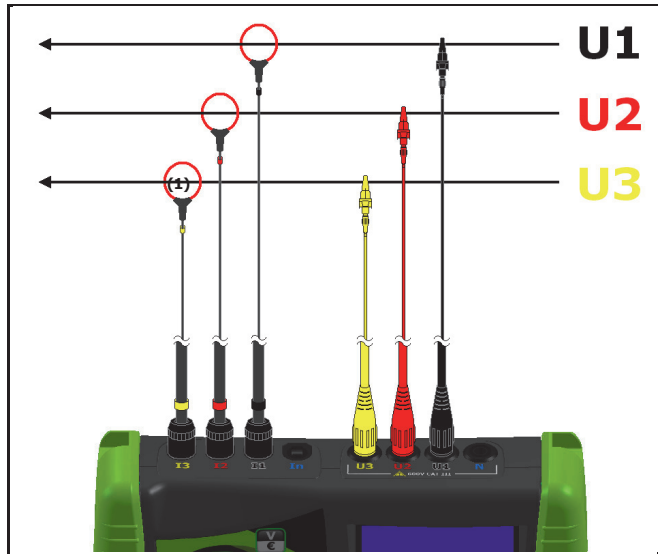
* The 4th current clamp is optional

(1) It is not necessary in a balanced three-phase system (**3Φ+N-BL**)

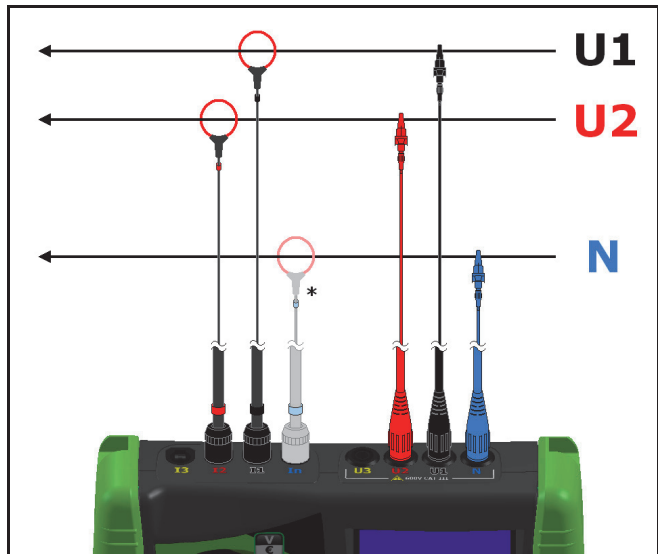


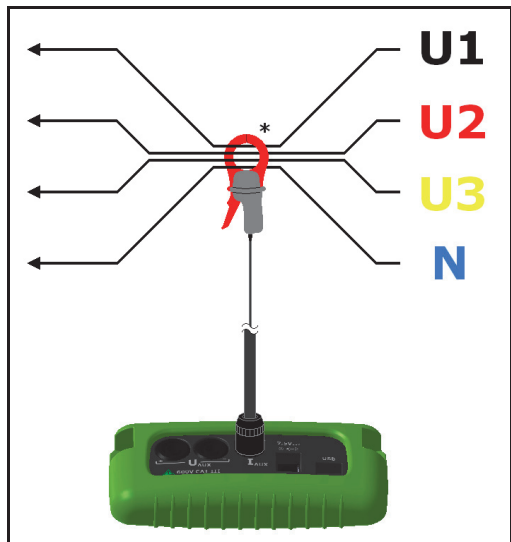
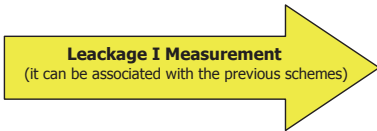
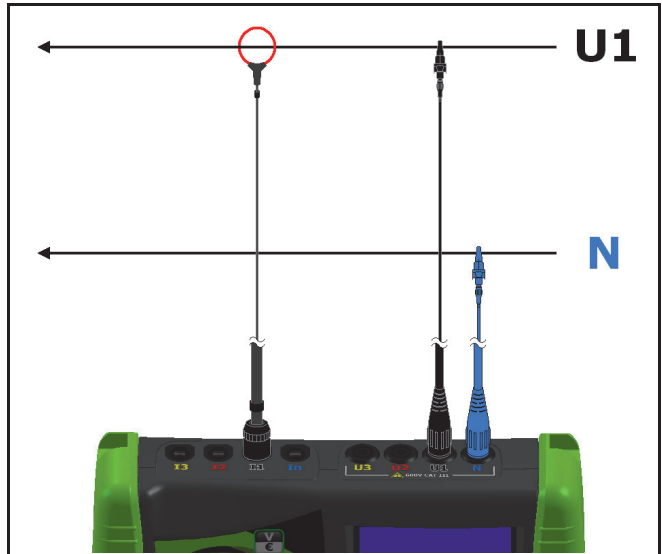
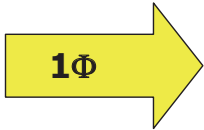


⁽¹⁾ It is not necessary in a balanced three-phase system (**3Φ-BL**)

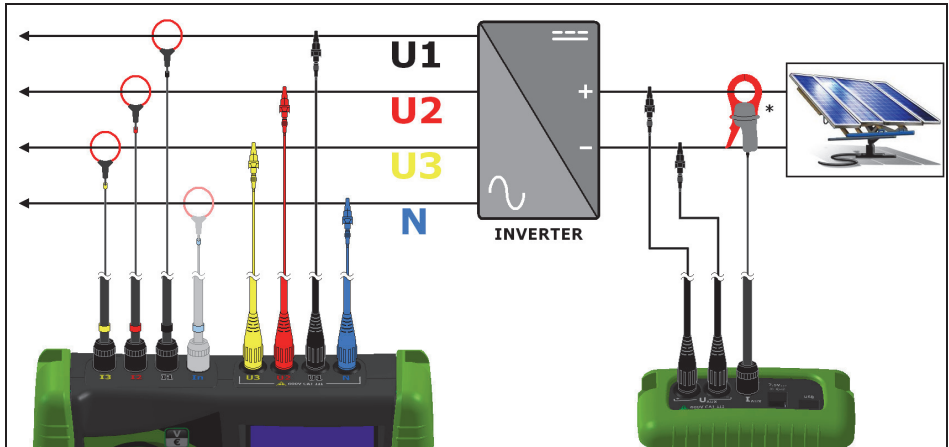


* the neutral current clamp is optional.





Example of Inverter
measurement (UPS 3-1)



* DC clamp

8. MAINTENANCE

PowerCompact3020 requires basic maintenance according to common rules that apply to any electronic device:

- Clean the instrument with a soft and clean cloth (the edges must not be frayed);
- Do not use detergents or corrosive or abrasive substances;
- Do not store the instrument in areas where the humidity and temperature levels exceed the ranges prescribed below.

8.1. Accuracy check.

The manufacturer cannot determine in advance the frequency at which an accuracy check should be performed, as instrument performance will depend on the conditions of use (heavy- or light-duty, environmental conditions, etc.).

Therefore, the user should perform periodical performance checks, using a sample instrument (of a higher category). At first, accuracy checks should be performed yearly, and thereafter increased or decreased based on the outcome of the checks.

If new calibration is required, the instrument can be sent to the manufacturer's in-house laboratory.

8.2. Repair.

PowerCompact3020 is a sophisticated electronic product..

Any attempt to repair the instrument without the necessary know-how may pose a safety risk.

Therefore, no unauthorised personnel or laboratories should carry out repair, maintenance or calibration operations. The warranty shall no longer be valid if the instrument is tampered with by third parties.

8.3. Troubleshooting.

- Instrument does not switch on.

The battery run out. Connect instrument to power supply.

- Instrument does not perform correct measurement.

Make sure the current and voltage ratios match the current clamps and VTs connected to the system.

Make sure the current clamps are not connected inversely.

Make sure the phase sequence is correct.

- The display is blurry.

Go to LCD Setup page and check brightness and contrast levels of the LCD.

- The display dims after few seconds.

Go to LCD setup and check Backlight parameter setting.

- The display stays on permanently, even though it has been set-up differently.

Check if there is an active video alarm.

- Certain pages or entire menus are not displayed.

Go to LCD setup page and set Menu type parameter to Total.

Go to Connection setup menu and check that Grid type parameter is set according to your needs.

- A significant number of alarms have gone off.

Go to Alarm setup page and verify a proper Histeresys parameter value has been set.

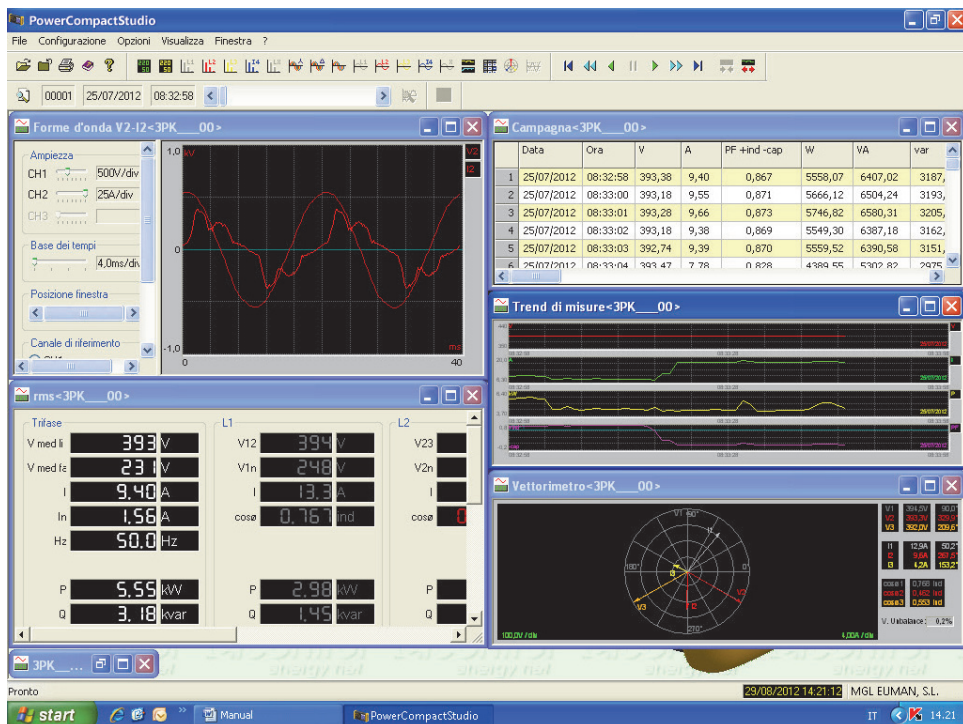
9. POWERCOMPACT/STUDIO SOFTWARE

PowerCompact/Studio Software is a powerful and versatile analysis tool of the measurement campaigns performed with PowerCompact3020.

The software is compatible with WINDOWS XP, WINDOWS VISTA, WINDOWS7 operating systems and it is necessary to execute the file SETUP.EXE and follow the instructions displayed in the screen in order to install it.

With PowerCompact/Studio, user will be able to analyse all the events recorded in the campaign, export the measurements performed to an EXCEL file, create reports, etc.

For the use of the PowerCompact / Studio software, refer to the manual in the installation package.



Download the software from the website <http://www.kps-intl.com>

10. TECHNICAL SPECIFICATIONS

DISPLAY:

Dimensions	68x68mm
Type	128x128 FSTN Negative dot matrix graphic LCD
Backlight	White LED
Languages	English - Spanish - Italian - German - French

POWER SUPPLY:

External power supply	wall-plug switching; input 100-240VAC $\pm 10\%$ 47-63Hz with interchangeable plug; output 7.5VDC - 12W
Battery pack	4 x AA NiMH 2100mAh
Duration of the battery charge	>24h

CONNECTIONS:

Voltages	Flexible cables L = 1.5m; 2.5mm ² - 36A; 1000V CAT III - 600V CAT IV with a 4mm, 90° protected blade plug connector, crocodile clips with a 45mm opening
Currents	Clamp meters

FUNCTIONS:

Traditional electrical analysis	V, I, P, Q, S, F, PF, THD(V)%, THD(I)%, $\cos\phi$, ϕ , peaks, minimums, maximums, averages, max. demands, etc.
Neutral current	Measured
Three-phase counters	kWh, kVAh, kVAh both absorbed that generated
Counters for each single phase	kWh, kVAh, kVAh both absorbed that generated
Cogeneration	✓
Waveforms	V & I
Harmonics	Values and histograms up to the 50th order
Events	Dips, swells & interruptions
Transients	Overvoltages & overcurrents
Unbalance	✓
Test EN 50160	✓
Inrush current	✓
DC measures	✓
K factor	Up to the 25th order
Alarms	Displayed
Tariff bands	4
Energy costs	✓
Measurement campaigns	unlimited, up to fill the memory card

MEASUREMENTS:

Display refresh rate	1 sec.
Type of connections available	Three-phase (3 or 4 leads), two-phase, and single phase grid
Type of grid which can be connected	Low and medium voltage (LV and MV)
VOLTAGE (TRMS)	
Channels	3 channels with common neutral + 1 independent, auxiliary channel
Input impedance	4Mohm
Scales	2
Direct measurement	Phase-phase: 7-1000VCA 40-70Hz Phase-neutral: 5-600VCA 40-70Hz Aux: 5-1000VCA 40-70Hz 10-1400VCC
Measurement with VT	Ratio: 1-60000 Maximum value which can be displayed: 20MV
Permanent overload	Phase-phase: 1200VCA Phase-neutral: 700VCA Aux: 1200VCA 1700VCC
Sensitivity	5VCA Phase-neutral, 7VCA Phase-phase 10VCC
CURRENT (TRMS)	

Channels	5 independent channels
Input impedance	10KOhm
Scales	4
Measurement with current clamps	Ratio: 1-60000 Maximum value which can be displayed: 500KA
Sensitivity	0,2% of F.S.
POWERS	
Single phase power	Values < 999 GW,Gvar,GVA
Total power	Values < 999 GW,Gvar,GVA
POWER COUNTERS	
Maximum value before reset	99999999 kWh, kvarh, kVAh
ACCURACY	
RMS Voltages:	
Scale 1	$\pm 0,25\% + 0,1\%FS^{(2)}$ @ V RMS < 350VCA ⁽¹⁾
Scale 2	$\pm 0,25\% + 0,05\%FS^{(2)}$ @ V RMS > 350VCA ⁽¹⁾
RMS Currents:	
Scale 1	$\pm 0,25\% + 0,1\%FS^{(2)}$ @ I RMS < 5% IN clamp ⁽¹⁾
Scale 2	$\pm 0,25\% + 0,05\%FS^{(2)}$ @ 5% < I RMS < 20% IN clamp ⁽¹⁾
Scale 3	$\pm 0,25\% + 0,05\%FS^{(2)}$ @ 20% < I RMS < 50% IN clamp ⁽¹⁾
Scale 4	$\pm 0,25\% + 0,05\%FS^{(2)}$ @ > 50% IN clamp ⁽¹⁾
Power	$\pm 0,5\% + 0,05\%FS^{(2)}$
Power Factor (PF)	$\pm 0,5^\circ$
Frequency	$\pm 0,01$ Hz (40-70Hz)
Active power count (kW)	Class 0,5
Reactive power count (kVar)	Class 1
HARMONIC ANALYSIS	
ANALYSIS OF EN50160 PARAMETERS	
Interruptions	>500mS
Dips	>500mS
Swells	>500mS
TRANSIENT ANALYSIS	
Swells and overcurrents	>150uS
Inrush current analysis	RMS continuous sampling every 2 periods. Duration 1, 2, 5, 10 sec
COMMUNICATION:	
USB	To PC
DATA STORAGE:	
Internal memory	64kB
External memory	Micro SD (8GB included)
OPERATING CONDITIONS:	
Operating temperature	from -10 to +55 °C
Storage temperature	from -20 to +85 °C
Relative humidity	Max 95%
Maximum altitude a.s.l. (600V CAT III)	2000 m
EC COMPLIANCE:	
Directives	93/68/EEC (Low Voltage Electrical Equipment); 89/336/EEC and 2004/108/EC (EMC - Electromagnetic Compatibility); 2006/95/EC - 72/23/EEC (LVD - Low Voltage Directive); 2002/95/EC (RoHS - Restriction of Hazardous Substances); 2002/96/EC and 2003/108/EC (WEEE - Waste Electrical and Electronic Equipment);
REFERENCE STANDARDS:	
Safety	EN 61010-1
Electromagnetic Compatibility (EMC)	EN 61326 EN 61326/A1 EN 61326/A2

	EN 61326/A3
Temperature	IEC 60068-2-1 (operating temperature) IEC 60068-2-2 (Storage temperature)
Vibrations	IEC 60068-2-6
Humidity	IEC 60068-2-30 (humidity)
Overload	IEC 60947-1

- (1) The instrument changes the voltage and current scale automatically when the values of the signals detected by the analogue-to-digital converter exceed a pre-set threshold. Therefore, the thresholds provided are purely indicative.
- (2) The instrument error must be added to that of the used current probes.

11. PACKAGE CONTENT

The PowerCompact3020 set includes the components indicated below:

- n. 1 PowerCompact3020 analyzer,
- n. 1 battery pack,
- n. 4 voltage cables (yellow, black, red, blue),
- n. 4 voltage alligators (yellow, black, red, blue),
- n. 3 clamp meters (ULTRAFLEX3000),
- n. 1 communication cable USB-A/miniUSB-B,
- n. 1 microSD card (16GB),
- n. 1 external power supply with interchangeable plugs,
- n. 1 calibration certificate,
- n. 1 instruction manual,
- n. 1 carrying case

The PowerCompact3020 may be equipped with different accessories, listed in the following table, that extend the use for particular purposes or measurement conditions less frequent than the standard.

Description optional accessories
1000A Clamp PowerCompact-CL1000A
200A Clamp PowerCompact-CL200A
5A Clamp PowerCompact-CL5A
600A AC/DC Clamp PowerCompact-CL600A
3000A Flexible clamps Ultraflex 3000A
Set of 4 magnetic voltage captors PowerCompact/MAGTL
Description spare parts
Battery pack PowerCompact/BAT
External power supply PowerCompact/PS
Carrying case
Voltage cables (Yellow, black, red, blue) PowerCompact/VTL
Alligators (Yellow, black, red, blue) PowerCompact/AL



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