INSTALLATION AND OPERATING MANUAL

PHASYS

1.5-18 kVA

IOMPH-LTXX00-GB_02

socomec
Innovative Power Solutions UPS

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WARRANTY CERTIFICATE.

This SOCOMEC UPS Phasys Inverter TLC is guaranteed against any manufacturing and material defects.

The period of validity of the warranty is 12 (twelve) months from the date of commissioning, if said activation is carried out by SOCOMEC UPS personnel or personnel from a support centre authorised by SOCOMEC UPS, and not however more than 15 (fifteen) months from the date of shipment by SOCOMEC UPS.

The warranty is recognized within national territory. If the Phasys Inverter TLC is exported out of national territory, the warranty shall be limited to the cover of the parts used to repair the fault.

The warranty is valid ex-works and covers labour and parts used to repair the fault.

The warranty shall not apply in the following cases:

- Failures due to fortuitous circumstances or force majeure (lightning, floods, etc.);
- Failures due to negligence or improper use (use out of tolerance: temperature, humidity, ventilation, electric power supply, applied load, batteries);
- Insufficient or inadequate maintenance;
- Attempted maintenance, repairs or modifications not carried out by SOCOMEC UPS personnel or personnel from a support centre authorised by SOCOMEC UPS.
- If the battery has not been recharged in accordance with the terms indicated on the packaging and in the manual, in cases of extended storage or Phasys Inverter TLC inactivity.

SOCOMEC UPS may, at its own discretion, opt for the repair of the product or for the replacement of the faulty or defective parts with new parts or with used parts that are equivalent to new parts with regard to functions and performance.

Defective or faulty parts replaced free of charge are to be put at the disposal of SOCOMEC UPS who becomes the sole owner.

Replacements or repairs of parts and any modifications to the product during the warranty period cannot extend the duration of the warranty.

In no case will SOCOMEC UPS be responsible for damages (including, without limitations, damage for loss of earnings, interruption of activity, loss of information or other economic losses) deriving from the use of the product.

The present conditions are subject to Italian law. Any dispute falls under the province of the Court of Vicenza.

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1. OVERVIEW

We would like to thank you for purchasing the Power System of the **PHASYS** series, a product of advanced technological design from **SOCOMEC UPS**. The Manufacturers are committed to carrying out continuous intense professional research and development with the aim of improving their products. All parts of the PHASYS Power System have been designed and produced to provide enhanced performance and the most constant levels of quality. In order to obtain optimum performance and for the correct use of the Power System, we recommend you read this manual carefully and completely. The Manufacturers, with the aim of continuously improving the quality of their products, reserve the right to make any modification and/or improvement without previous notice. Our specialised technical personnel are at your complete disposal for advice and explanations for any kind of problem.

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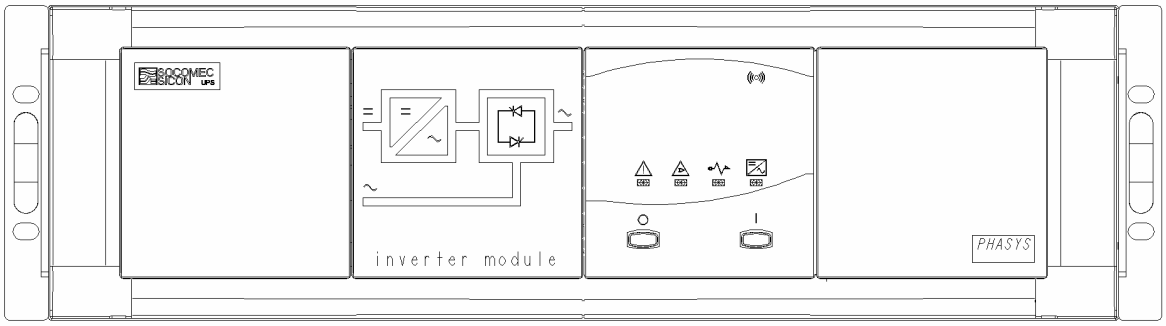
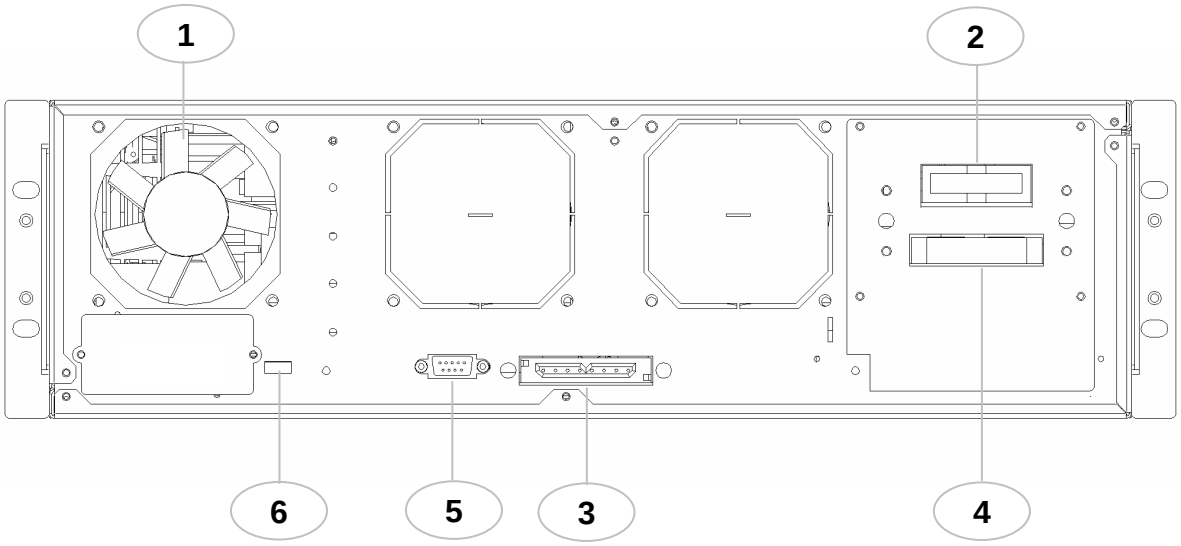
2. VERSIONS AVAILABLE

PHASYS 1500-3000-4500 VA Plug-in inverter module

Front view



Rear view



PHASYS 1500

KEY:

1 Fan
2 Parallel bus plug-in connector
3 Input plug-in connector
4 Output / by-pass input plug-in connector
5 RS232 serial interface
6 Dip-switch for module numbering

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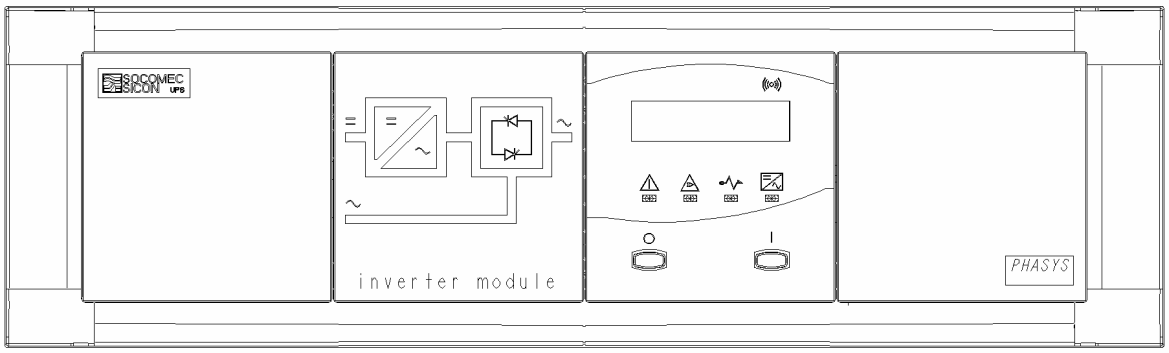
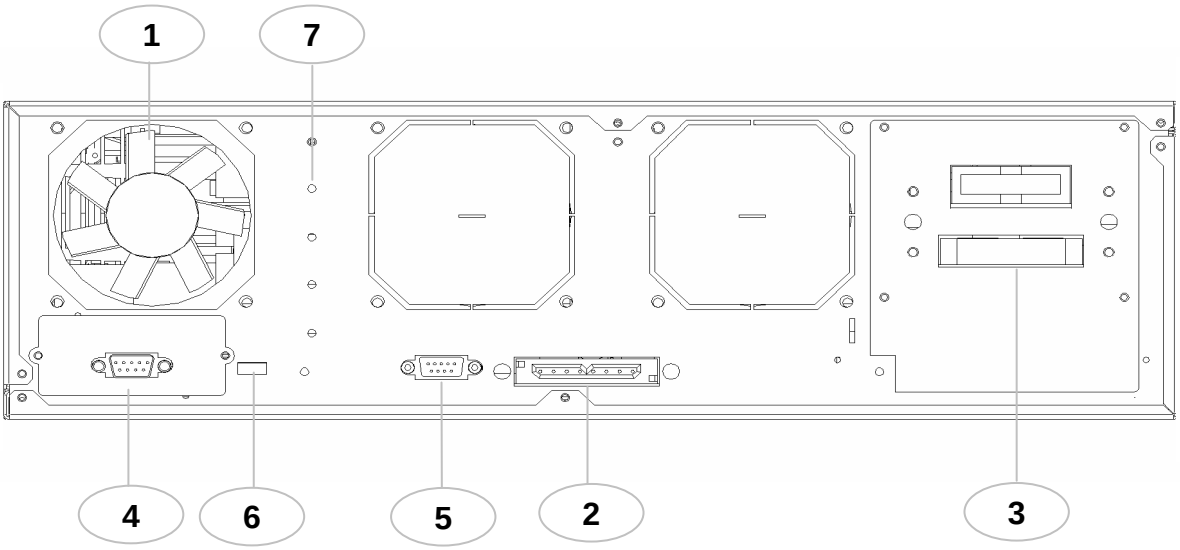
PHASYS 1500-3000-4500 VA inverter module “Stand alone” version

Front view



Rear view



KEY:

1 Fan
2 Input plug-in connector
3 Output / By-pass input plug-in connector
4 Dry contacts interface
5 RS232 serial interface
6 Configuration dip-switch
7 Earth connection (secured by screw and bracket)

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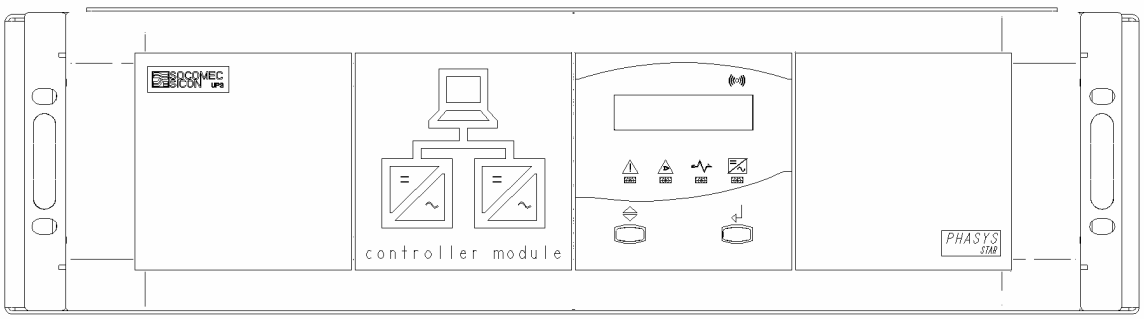
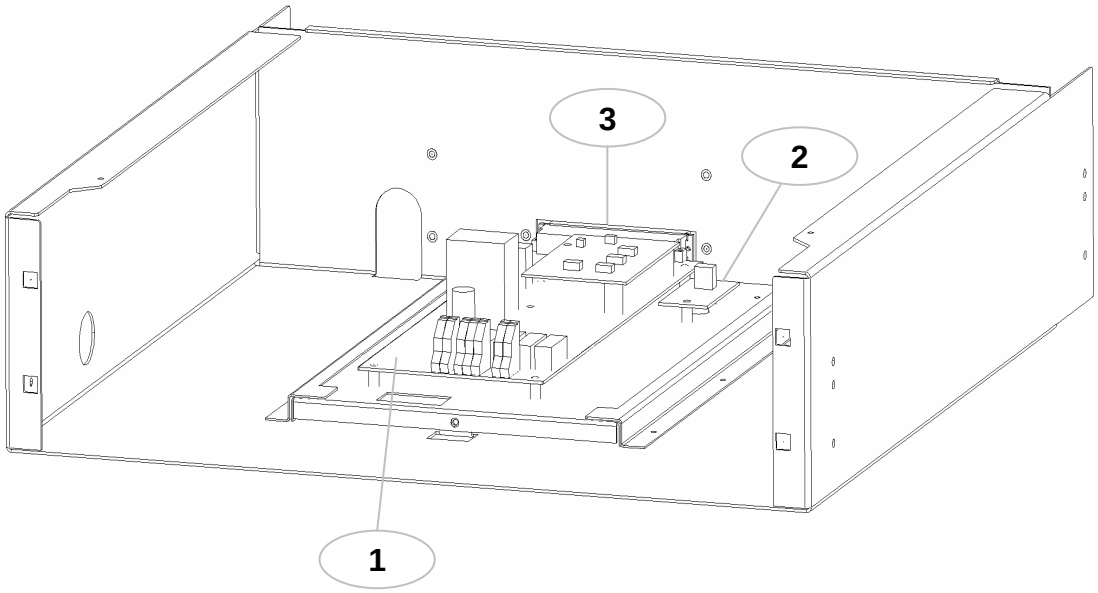
PHASYS STAR controller module

Front view



Internal view

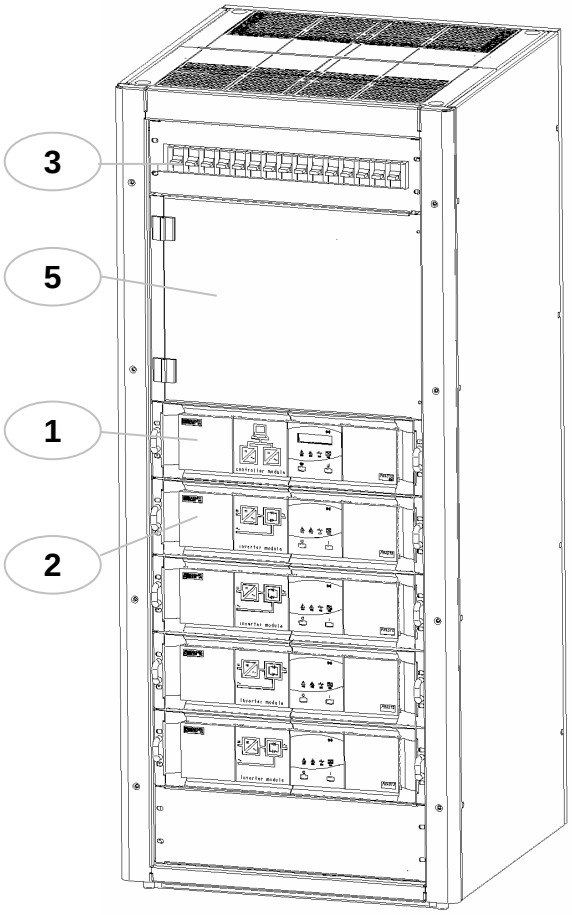


PHASYS star

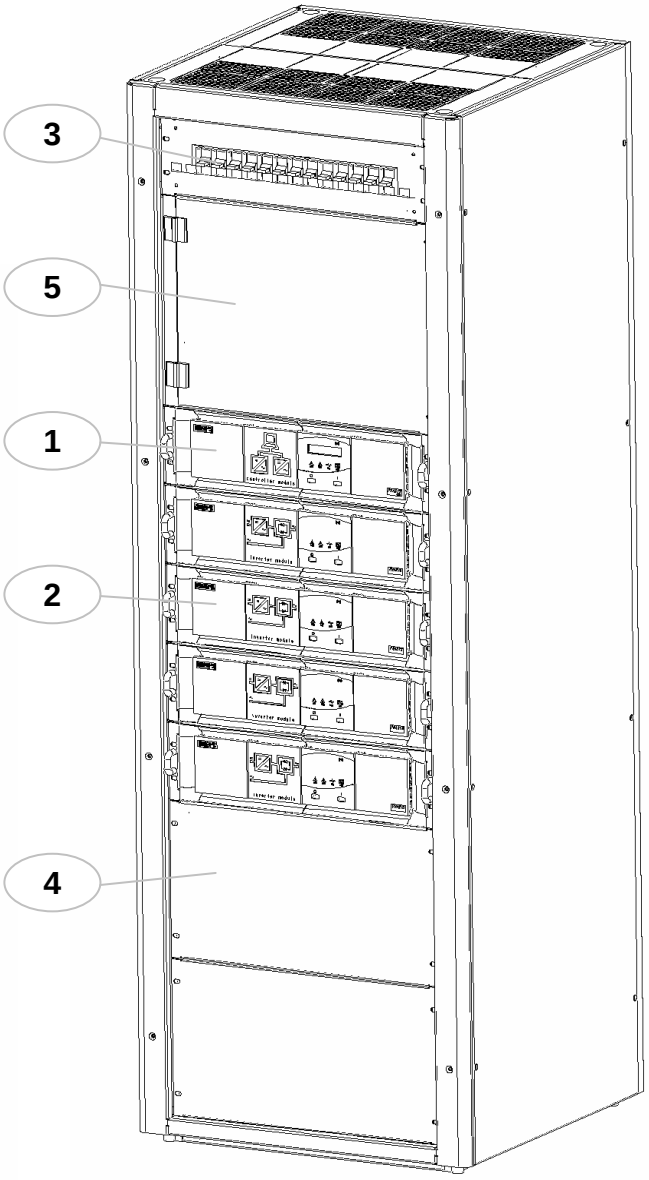
KEY:

1 Controller board (I.C.M.)
2 Temperature probe board
3 Plug-in connector

PHASYS ELITE Power System



View of Power System (1400mm)



View of Power System (1800mm)

PHASYS elite

KEY:

1 PHASYS STAR controller module (I.C.M.)
2 Phasys Inverter modules
3 Auxiliary AC distribution compartment
4 Options compartment
5 Access door to P.S. distribution

3. SAFETY STANDARDS

Respect for safety standards ensures that the operator works in a secure environment, with no risk of harming himself or others.
Before starting the *Power System* the operator must have full knowledge of its operation, the position of all the controls and the technical and functional characteristics of the equipment.
The **manufacturer**'s technicians are available at any time, should this be required, to give all the information necessary for the training of operators.

For the safety of personnel and of the equipment, it is strongly recommended that all users read this manual before starting up the equipment.

Description of the symbols on the unit labels:

	DANGER! HIGH VOLTAGE (RED/YELLOW)
	READ THE OPERATING INSTRUCTIONS (BLACK / YELLOW)
	EARTH TERMINAL (BLACK/SILVER)

All the precautions and the warnings on the labels and plates on the inside and outside of the equipment should be observed.

3.1. Reference standards

This section sets out all the information and standards of behaviour that must be followed by personnel during the various phases of installation, use and maintenance of the *"Power System"*.
Follow these instructions carefully before installation, during use, and later whenever it may be necessary to carry out maintenance operations on the System.

Read this "Operating Manual" carefully before using the Power System.

All operations of installation and/or maintenance must be carried out solely and exclusively by qualified and authorized personnel. High electrical voltages are generated inside the Power System, which could be dangerous for maintenance personnel not adequately prepared or trained for such work.

Before start-up, the Power System, must be provided with equipotential connection as established by the current safety standards in force. The Earth cable must be connected to the appropriate screw, labelled Earth (see the symbol in the table above), following the procedures described below, ensuring that the connection is firmly secured so that it cannot accidentally be pulled out.

The same applies for the Earth connection for the consumers: all loads connected to the PHASYS Power System must be connected to the Earth terminal (yellow/green).

If the Power System is not earthed, it will be without equipotential connection, as will all the equipment connected to it. In this case the manufacturers decline all responsibility for damage or incidents caused by the non-compliance with said standard.

Avoid wide ambient temperature ranges as these can cause condensation to form inside the equipment. Alternatively, wait at least two hours before starting the Power System.

Avoid the Inverter module and the entire Power System coming into contact with water or other liquids in general. Avoid the introduction of foreign bodies and ensure the front slots are not obstructed.

To avoid damage to the equipment, use only fuses of the specified type. On no account must repaired fuses be used, and/or short circuits must not be inserted in the fuse block.

This product conforms to standard EN50081-2 "Emissions" and EN61000-6-2 "Immunity" for industrial environments. It may cause interference in domestic environments, in which case the user may be required to take additional measures.

Do not attempt to service the equipment yourself, but follow the instructions illustrated in this manual in the section “Maintenance”.

In the event of a fault in the equipment, subsequent repairs must be effected **only by authorized personnel**, appropriately trained and specialized.

If the Power System needs to be scrapped it is essential to entrust the equipment solely and exclusively to firms specializing in the disposal of the materials making up the System. These are obliged to break up and dispose of the various components in accordance with the legal provisions in force in the country where the System is installed.

Keep this "Operating Manual" carefully. This manual must always be kept near the PHASYS Power System so that the operator can consult it at any time for any clarifications on the correct use of the equipment that may be required.

This equipment conforms to the European Community directives applicable to this product, therefore it is marked CE

The product you have chosen is designed for commercial and industrial use only.
In order to be used for particular “critical applications” such as life support systems, medical applications, commercial transportation, nuclear facilities or any other application or systems where product failure is likely to cause substantial harms to person or property, the products may have to be adapted.
For such uses we would advise you to contact SOCOMEC UPS beforehand to confirm the ability of these products to meet the requested level of safety, performance, reliability and compliance with applicable laws, regulations and specifications.

4. GENERAL DESCRIPTION

4.1. Operation

The function of the alternating current Power System is to convert the direct voltage (48Vdc) normally supplied by a rectifier or by a battery in operation in emergency situations, into a single-phase sinusoidal alternating voltage, stabilized in amplitude and in frequency.
The INVERTER System ensures that the direct voltage in input is transformed by means of DC/AC conversion into a stable single-phase sinusoidal alternating voltage, free from interference and with a low harmonics content, and which is completely isolated from the input direct voltage.
The various versions and sizes supplied can be adapted to suit any application from small power ratings of 1.5kVA to high power of 18kVA. The System makes use of the concept of **"modularity"** and, when appropriately prepared, can increase the power of the Power System with the addition of inverter modules in the 4 slots.
The parallel configuration is based on **"load sharing"** technology, which allows the load to be equally distributed between the various modules. This solution has two major advantages: the first is that inverter modules can be added in the future to increase the total power that can be generated, while the second is that, with the addition of one or more **redundant** modules, total continuity of operation can be guaranteed even in the event of the failure of an individual inverter module.
Moreover, in the event of module failure, the PHASYS ELITE Systems guarantee the selective disconnection of the module, without compromising the operation of the other modules and of the consumer.

4.2. Main features

The PHASYS ELITE Power System has a number of excellent features, high technology and an optimum design.

- Extremely compact (very high ratio of power to unit of volume)
- Easily interchanged inverter modules (rapid replacement and no connections)
- High efficiency, high MTBF (mean time between failure)
- Forced ventilation with control of fan efficiency
- Highest levels of expandability and modularity
- Availability of NET VISION remote control
- Electronic support service with e-service
- Dry contacts signalling
- Various optionals (auxiliary AC distribution, backfeed protection, manual By-pass, isolation transformer, etc…).

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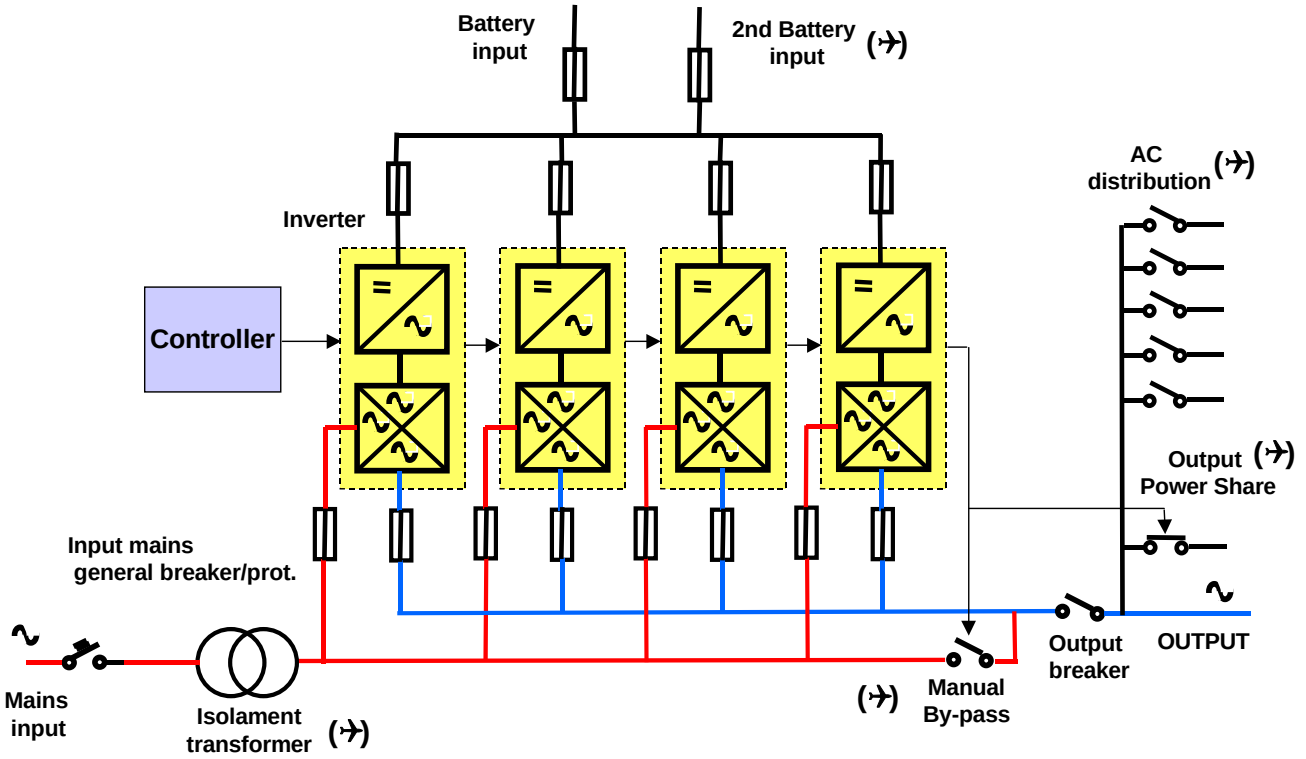
4.3. Block diagram



(ç): OPTIONAL

Battery input: this is the power supply for the PHASYS System and is in general supplied by a DC Rectifier (48V).
Controller module (I.C.M.): processes the information collected by the System and sends it to the mimic panel where it is displayed in the form of measurements, luminous report signals and messages.
Inverter module: the inverter module is the part of the System the function of which is to guarantee the presence of an AC voltage by taking energy from a DC source.
By-pass: this device is used to switch the consumer to the AC power supply source if the primary source (inverter) should fail or no longer be suitable for the consumer. The I.C.M. controller unit ensures this switching operation as soon as a distortion greater than the predefined threshold is detected.
By-pass input: the single-phase By-pass input is protected by a magneto-thermal switch and bipolar fuses. A backfeed protection device is also available on request.
Manual By-pass (optional): allows the consumer to be manually switched to the AC power supply source, without interrupting the power supply.
Power Share (optional): this is a low priority output, which can be automatically disconnected in certain operating conditions.
AC distribution (optional): auxiliary compartment comprising several breakers to distribute the output voltage to the various users.
Second battery input (optional): extra input fuse for the use of a second battery.
By-pass input transformer (optional): guarantees isolation between the By-pass mains and the output voltage.

For a fuller explanation of all the **OPTIONAL** parts, please see the chapter “Options available for the PHASYS ELITE”.

5. UNPACKING AND INSTALLATION

5.1. Environmental requirements for installation

The Power System must be placed in a suitably ventilated location, which is large enough to enable easy installation and maintenance of the equipment.
The Power System should therefore be installed taking the following points into consideration:

- The TLC Inverter was designed for use in closed environments.
- Place the Power System on a flat, stable surface, away from sources of heat or direct sunlight.
- Check that the floor is able to support the weight of the whole System complete with modules.
- Maintain ambient temperature between 0°C and 40°C and humidity at less than 90% (without condensation). The maximum operating temperature allowed is 50°C.
- Ensure that the environment where the Power System is to be installed is not dusty.
- A space of at least 50 cm must be left at the top for the installation phase.
- A space of at least 130 cm must be left at the front to enable the insertion and removal of the plug-in modules or of front access components.

5.2. Electrical requirements for installation

The PHASYS ELITE equipment requires a power supply generated by a direct current generator. This device (normally comprising a Rectifier with parallel batteries if necessary) must have sufficient power to support all the consumers that will be connected in output to the System.
The power supply sources (Rectifier and By-pass) must be able not only to support the nominal power required by the consumers, but also any inrush power.
With regard to safety devices, the PHASYS System is already provided internally with fuses in input and output and with a magneto-thermal switch for the By-pass line.
Before starting the equipment it is essential to check that the operating voltage and frequency settings **are correct for your electrical consumers** and compatible with the mains power supply. **It is recommended to check the data plate** of the equipment which is located inside the Power System distribution (door open).

5.3. Unpacking

Power System: the Power System is shipped on a pallet (secured with screws) to facilitate transport to the place of installation. The various components, such as the Inverter module and accessories, are shipped separately from the factory.

Inverter module: remove the module and take off all parts of the packaging. The module should not be lifted by the plastic front panel, as this is fragile. **In order to take the module out, remove the upper shock-absorbing packaging, lift the product using the protective bag and then remove completely by lifting the metal cabinet.**

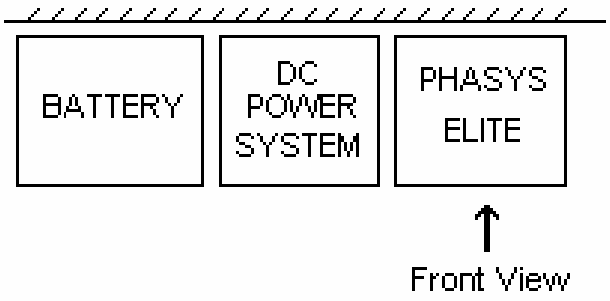
It is advisable to keep the packaging material; it has been designed for safe shipping in the event that the unit has to be sent away for maintenance operations.

!	**If the input voltage does not correspond to the voltage on the data plate, contact the Service centre without connecting the equipment.**

WARNING!: all Power System placing and assembly operations must be performed with the equipment switched off and disconnected from the power supply voltage and from the By-pass mains.

5.4. Positioning the PHASYS ELITE System

After removing the packaging, the PHASYS ELITE System must be placed on the ground, without the wooden pallet. To remove the equipment from the pallet, just undo the retaining screws and replace them with the feet provided. As well as providing a floor base for the Power System, these feet can also be screwed to regulate the stability of the whole System. It is important to decide on the definitive place of installation **before inserting the inverter modules** in the device.
Once it has been positioned vertically on the floor, the device can be placed with its back against a wall.
The top of the System has metal meshes to protect the equipment from metal objects accidentally falling into it, and which also allow the discharge of cooling air. After installation and the electrical connection phase, remember, therefore, to put the metal meshes back in place and not to obstruct the upper air vents.
The device must also have easy front access, therefore there should not be any obstacles in front of the equipment so as to allow maintenance of the inverter modules and sufficient space to open the upper door (at least 1.3 metres).
See the example shown below (installation with battery cabinet and System Rectifier).



The air inlets are located at the front of each inverter module; the air outlet slots are in the upper part of the System; the space around the front must therefore be left free.

Connection to the PHASYS cabinet can be done completely from the upper part.

5.5. Power System electrical connections

5.5.1. General wiring rules

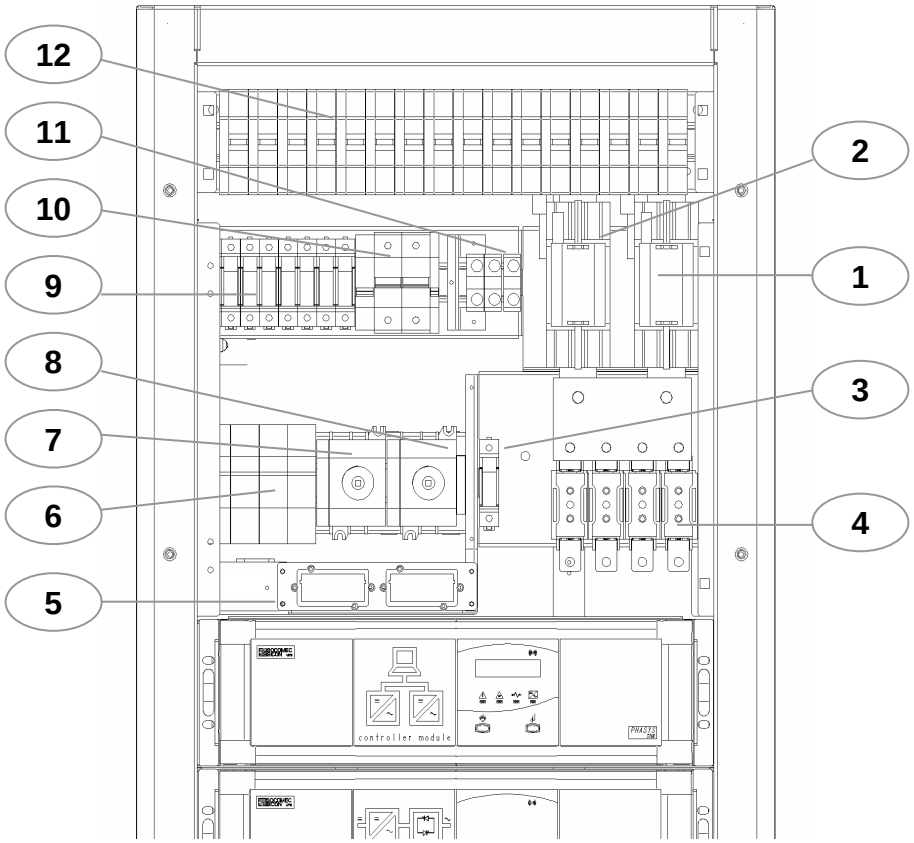
The plant must comply with the legislation in force in the country where the equipment is installed. The power cables should be divided into separate groups according to use for the following connections:
- Battery input
- By-pass mains input
- Output

The low-voltage control and connection cables should be kept separate from the power cables; there must therefore be two separate cable troughs.
This category comprises:
- Communication with the PC or remote mimic panel
- Alarm signalling (dry contacts)
- E.P.O. control, etc…

WARNING! the cables in and out of the System must be suitably secured.

5.5.2. Input and output connections set-up

The power supply voltage connection and connection of the consumers must be implemented using cables of appropriate section and complying to the standards currently in force. The first operation to be carried out is to **remove the upper closing panels**, as all the input and output connections can be done from above (access from below is also possible, however).
Adequate safety devices must be provided upstream of the Power System to protect the sections from the generator (Batteries and By-pass) to the Power System input.
The figure below shows all the parts in the PHASYS ELITE System distribution.



KEY:

1 Input fuse
2 Optional fuse for 2nd battery input
3 I.C.M. power supply
4 Inverter module input fuses
5 Slots for communication boards
6 Inverter module output fuses
7 Manual By-pass operation **(option)**
8 Output operation
9 Inverter module By-pass input fuses
10 By-pass input magneto-thermal switch
11 Output connector
12 Aux. AC distribution **(option)**

Refer to table 1 below when selecting the cable sections; it takes into account the nominal power of the Power System. Since the PHASYS ELITE is a device which, when suitably prepared, allows for future expansions and upgrades, it is recommended to size the connections for maximum power to ensure compatibility of the electrical plant with additional inverter modules in the future.
The PHASYS ELITE Power System requires a DC power supply of between 40V and 58V. The device is normally supplied with **earth input positive polarity** (possible different versions such as Non-Standard) and it is of course essential not to invert the polarities of the power supply voltage.

⚠	**Input polarities must be strictly observed!**

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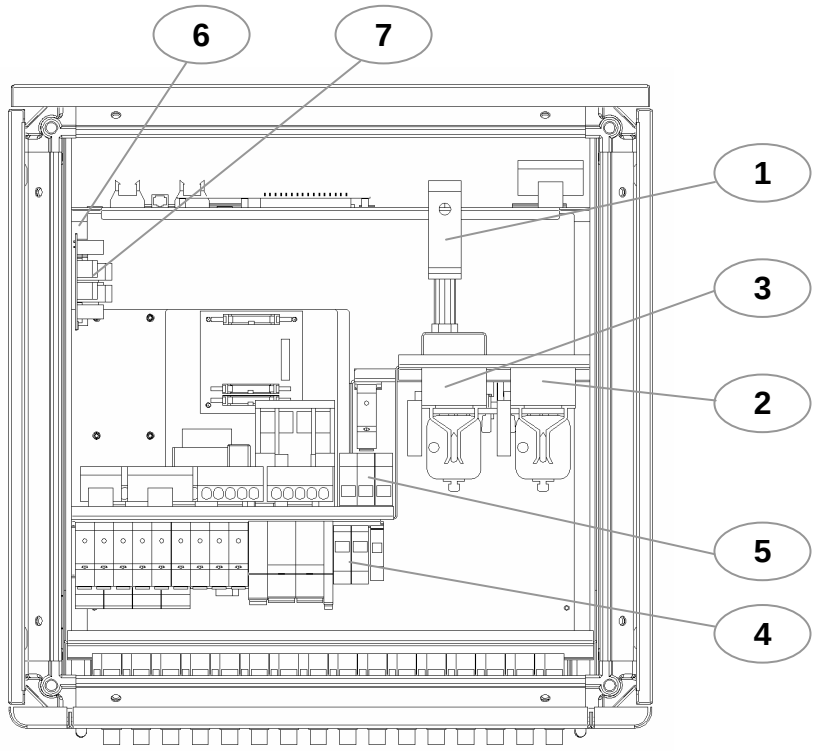
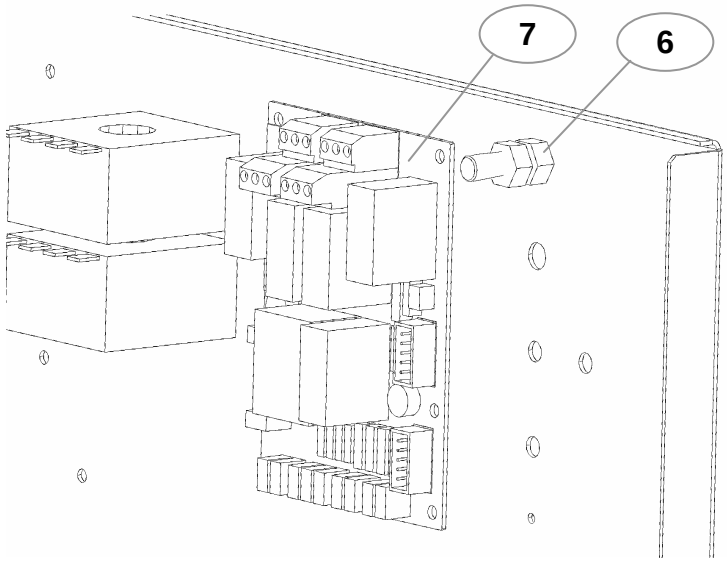
Refer to the figure and table below to ensure the correct System connection.



KEY:

1 Input positive bar
2 Input negative fuse
3 Optional fuse for 2nd battery input (negative polarity)
4 Consumer output connector (N/F/Earth)
5 By-pass input (N/F/ Earth)
6 EARTH connection (screwed)
7 Dry contacts board



The figure shows the **Earth connection**, which is located in the upper part of the Power System, near to the dry contacts board.

TABLE 1: reference to standard EN 60950 2001-2

BASIC Model	Maximum POWER	INPUT (●)		OUTPUT		EARTH
		Maximum input current (A)	Minimum input section (mm²)	Maximum output current (A)	Minimum output section (mm²)	Minimum Earth cable section (mm²)
PS	3000 VA	62	16	13	2.5	16
PS	4500 VA	93	25	20	2.5	25
PS	6000 VA	124	50	26	4	50
PS	9000 VA	186	70	39	10	70
PS	13500 VA	279	150	59	16	150
PS	18000 VA	372	185	78	25	185

(●): Calculations made on nominal output power and minimum input voltage (40V).

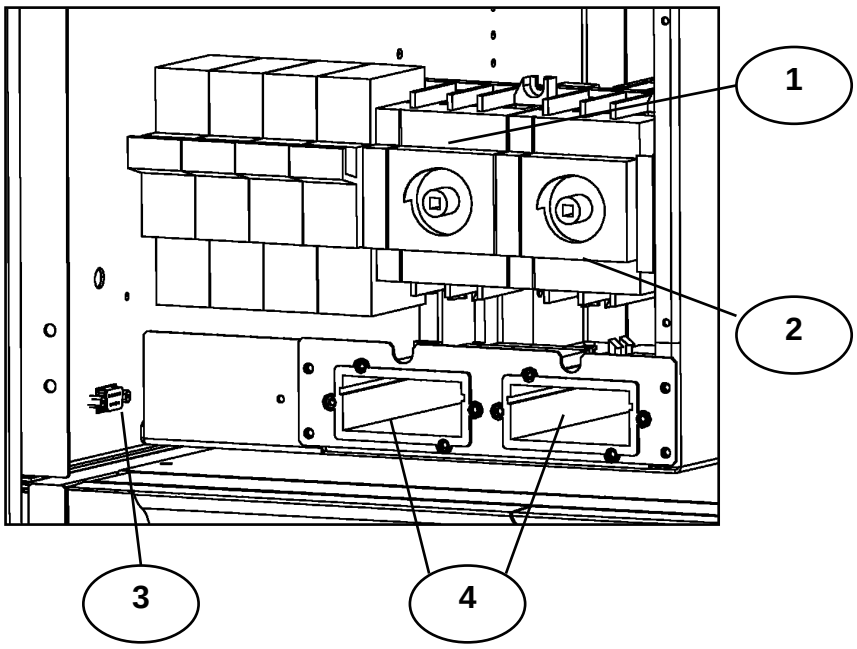
5.5.3. Connection of the single-phase backup mains

In an uninterruptible power System, the By-pass is fundamental in guaranteeing the continuity of the power supply to the load and enables the output voltage to be switched from the inverter to the mains. This device can be used manually or automatically: in the first case, it is the operator who manages the switching by means of a breaker located inside the distribution and this is generally in the event of equipment failure and while waiting for it to be repaired. In the case of automatic By-pass, the switching operation is managed by the controller to prevent a temporary overload or for a power supply which constantly goes out of the limits.
In both cases the By-pass powers the consumers directly from the single-phase mains voltage, completely excluding the control part of the equipment. In this operating mode the loads may receive a voltage that is not stabilized.

Warning!: When the backup mains is connected, the output is not isolated from the mains unless there is an isolation transformer (optional).

	**The two breakers (manual By-pass and output) are placed close to each other. The incorrect use of one of them can cause the undesired loss of voltage in output (read the labels before carrying out any operation).**

Manual switching from inverter to By-pass is effected in the event of ordinary maintenance of the equipment, without causing a loss of continuous power supplied to the load, or in the event of a major fault while waiting for the repair of the equipment.
It should however be remembered that with power supplied by the By-pass, the consumers are subject to electric mains variations and are no longer protected against “micro-interruptions”.



KEY:

1 Inverter - By-pass switch **(optional)**
2 Output breaker
3 RS232/485 serial connector
4 Slots for insertion of communication boards

Fig.1: Internal view of distribution compartment

In the event of backup mains connection, the differential safety devices should be sized so as to interrupt any currents caused by faults.

Remember that if there is no isolation transformer (optional), the equipment on the backup mains side has a high dispersion current:

Dispersion current on the backup mains side
20 mA max

⚠	**Warning! High dispersion current. The EARTH connection is essential before connecting to the power supply.**

Refer to table 2 for the sizing of the cables according to model:

TABLE 2: reference to standard EN 60950 2001-2

BASIC model	Maximum POWER	Maximum By-pass current (A)	Minimum By-pass section (mm²)	Minimum EARTH section (mm²)
PS	3000 VA	13	2.5	2.5
PS	4500 VA	20	2.5	2.5
PS	6000 VA	26	4	4
PS	9000 VA	39	10	10
PS	13500 VA	59	16	16
PS	18000 VA	78	25	25

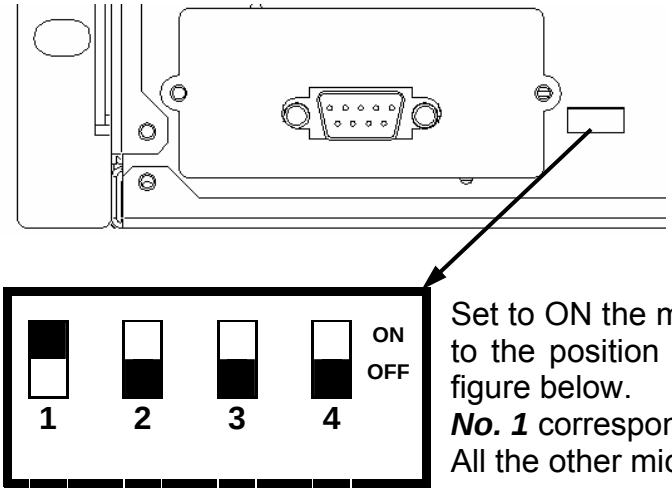
The backfeed protection device for backup mains protection is available on request (see section “Options available for the PHASYS ELITE”).

5.6. Insertion and configuration of the inverter modules

Before inserting the PHASYS modules (1500, 3000 or 4500VA) into the four slots of the Power System, the dip-switches located at the back must be set. In fact the CAN BUS communication between the modules and controller requires each PHASYS module to be assigned a “node number”; it is important that the devices inserted in the System all have a **different** configuration node.

⚠	**INSERT only inverter modules of the same size in the four slots.**

Each PHASYS module has a configuration dip-switch at the back.



Modules	*N° 1*	*N° 2*	*N° 3*	*N° 4*
DIP 1	**ON**	OFF	OFF	OFF
DIP 2	OFF	**ON**	OFF	OFF
DIP 3	OFF	OFF	**ON**	OFF
DIP 4	OFF	OFF	OFF	**ON**

Set to ON the microswitch on the dip-switch corresponding to the position in the System, according to the table and figure below.
No. 1 corresponds to the highest position.
All the other microswitches should remain OFF.

For a simplified configuration **it is recommended to associate the node number to the position of the module** in the System (from the top to the bottom). If a module needs to be replaced, this “conventional” numbering will ensure that it is assigned the exact node, without the risk of having double configurations. See figure 2 below:

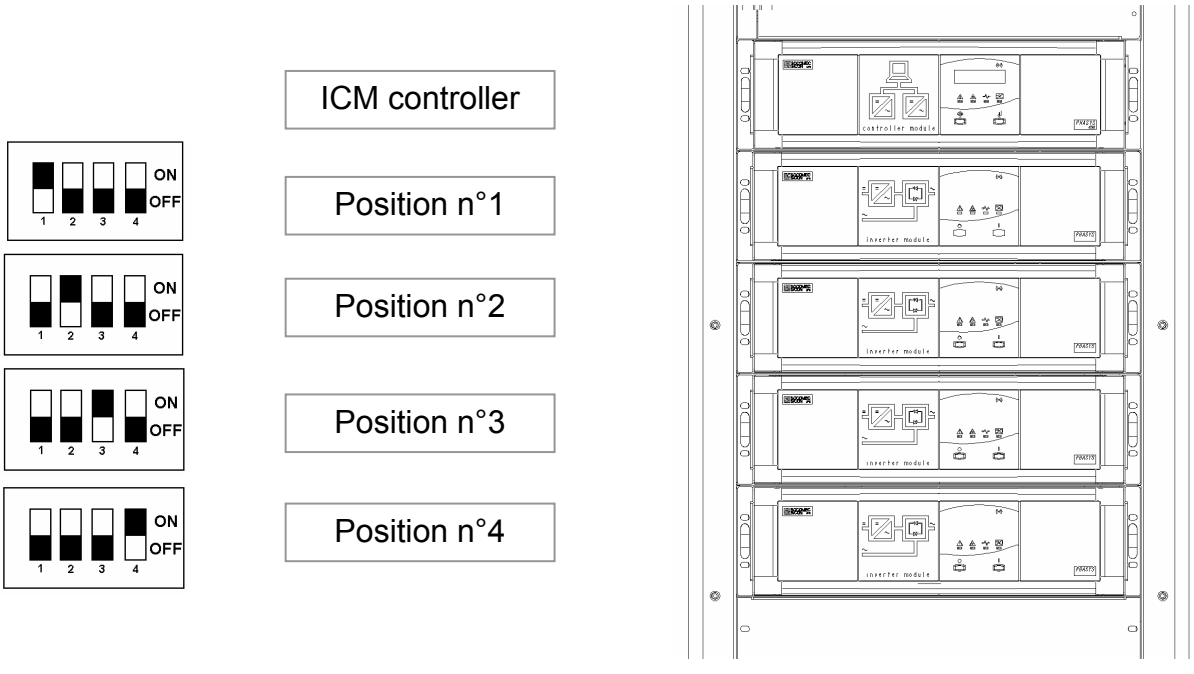


Fig.2: Positional numbering of the inverter modules

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6. I.C.M. INTELLIGENT COMMUNICATION MODULE (PHASYS STAR)

The function of the **"PHASYS STAR" Intelligent Communication Module** is to collect and process information from the individual inverter modules and to make it available to the outside by means of the System mimic panel or the optional remote mimic panel or Net-Vision. The **I.C.M.** also manages some global functions such as the **START** and **STOP** procedures, to facilitate the Startup and Shutdown operations of the whole System.

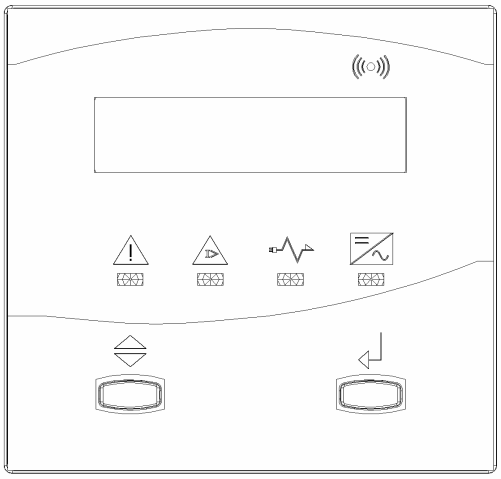
This module is the interface between the inverter modules and the outside world. It can:

- manage communication with supervision Systems via RS232,
- provide information on System operation (states and alarms) directly on the display,
- check all the electrical parameters and give commands,
- check the efficiency of the fuses and breakers, etc...

For the module to operate correctly, it requires some information to be input by the person installing the Power System.

6.1. Description of the Power System mimic panel

The mimic panel is a display panel that provides the user with useful information on the operation of the equipment and on the electrical values involved.

<table>
<tr><th>Description of LED</th><th>LED</th><th colspan="2">STATUS</th><th>Description</th></tr>
<tr><td rowspan="6"> 
PHASYS star</td><td rowspan="3">GREEN</td><td rowspan="3">L1</td><td>Constant</td><td>Indicates that the load is powered from the PHASYS inverter.</td></tr>
<tr><td>Slow flashing</td><td>Indicates stand-by state.</td></tr>
<tr><td>Fast flashing</td><td>Indicates that the AutoRestart function is active following a minimum or a maximum input voltage.
As soon as the input voltage returns above the pre-minimum threshold, the equipment will automatically restart.</td></tr>
<tr><td rowspan="2">YELLOW</td><td rowspan="2">L2</td><td>Constant</td><td>Indicates that the System load is powered from the auxiliary mains. Also indicates ECO-MODE active.</td></tr>
<tr><td>Flashing</td><td>Indicates that manual By-pass switching has been effected.</td></tr>
<tr><td>YELLOW</td><td>L3</td><td>Constant</td><td>Indicates that a load greater than 105% of the nominal power is present in output (more than 115% for By-pass).</td></tr>
<tr><td rowspan="2">RED</td><td rowspan="2">L4</td><td>Constant</td><td>Indicates the presence of a failure of the inverter modules or the ELITE System.
SEE ALARMS MENU.</td></tr>
<tr><td>Flashing</td><td>Indicates that the pre-minimum battery state is active. The input voltage is close to the minimum battery value.</td></tr>
</table>

P1		Change menu (Scroll)
P2		Confirm (ENT)

When the LCD display backlighting is off, the only function of the **ENT** or **Scroll** keys is to switch on the backlight and, if the buzzer has been activated (new alarm present) they also silence the buzzer. If these keys are subsequently pressed, the **Scroll** key changes the menu and the **ENT** key confirms this.

6.2. Description of the keys

The following keys are available on the PHASYS Star controller module:

P1: CHANGE MENU (SCROLL ⇳)

This key is used to go on to the next menu or to increase the value set.

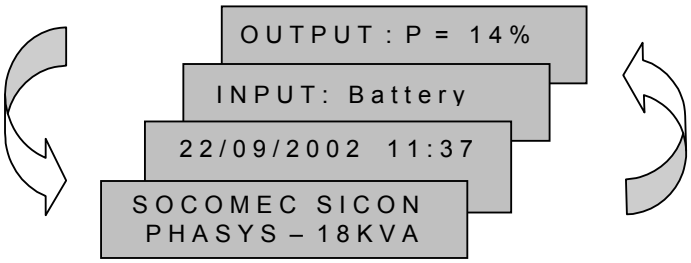
P2: CONFIRM (ENT ↵)

This key is used to enter the menu shown on the display or to confirm modified data.

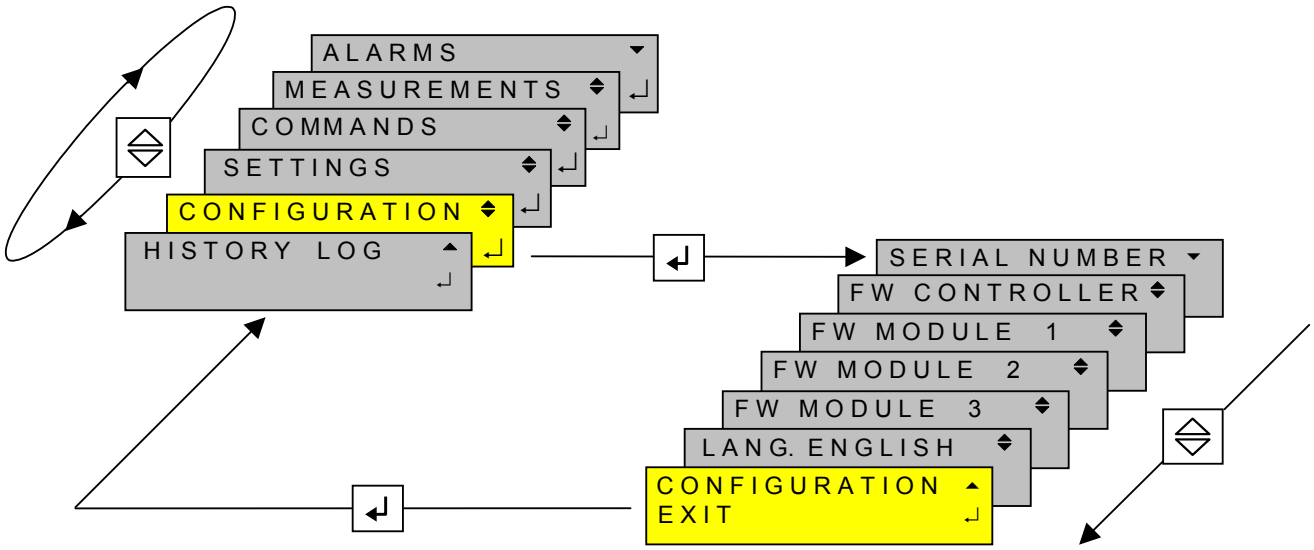
6.3. Description of the menus

There are two types of menu:

- Automatic rotating menu: this is activated autonomously when no key has been pressed for approx. 20 seconds.



- Scroll menu selectable from keyboard: this is activated via the selection (Scroll) and confirm (ENT) keys. It should be noted that the main menu is rotating, while the scroll function is inhibited within the individual menus when EXIT is selected.



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6.4. Menus available

The PHASYS STAR controller display presents a series of menus containing all the data, parameters and settings defined by the user for the Power System. An explanation will be given of all the messages that can be displayed, providing for each message:

- the meaning of the message.
- the possible user actions (change settings, next/previous menu, confirm command).
- a detailed description of the alarms.
- the maximum and minimum values accepted.

The various messages are grouped together according to the menu and submenu they belong to and are in the same order as they appear to the user, while the alarm messages appear in numerical order (if an alarm is not present, the message will obviously not be displayed and the next one will appear).

6.4.1. Automatic menu

With the **PHASYS ELITE** System in normal operating condition (no alarms), the mimic panel cyclically displays the start menu, which is made up of four windows providing the following information:

SOCOMEC SICON PHASYS 18KVA	for 5 seconds
22/09/2002 11:36 LOAD ON INVERTER	for 5 seconds
INPUT : b a t t e r y V=53.4V I= 47.6 A	for 5 seconds
OUTPUT : P = 14% V=231V F= 50.1Hz	for 5 seconds

The menus are displayed cyclically at the rate shown at the side.

Battery INPUT System input voltage
System input current

OUTPUT Percentage of power used with respect to the nominal
System output voltage
System output frequency

After 20 seconds of inactivity (no keys pressed) the mimic panel returns to the start menu and the backlighting is deactivated.

6.4.2. Main menu

The following menus are available on the I.C.M. (PHASYS STAR) display:

A L A R M S ▼ ↵	**ENT** = enter menu **SCROLL** = next menu

List of active alarms

M E A S U R E M E N T S ▲▼ ↵	**ENT** = enter menu **SCROLL** = next menu

List of available measurements

COMMANDS ↕ ↵	**ENT** = enter menu **SCROLL** = next menu

List of commands

SETTINGS ↕ ↵	**ENT** = enter menu **SCROLL** = next menu

List of parameters

CONFIGURATIONS ↕ ↵	**ENT** = enter menu **SCROLL** = next menu

Communication configurations

HISTORY LOG ↑ ↵	**ENT** = enter menu **SCROLL** = return to start of main menu

History log

6.4.3. Alarms

This menu provides a complete and detailed list of all the faults present when there are one or more alarm situations either on the inverter modules or on the System. The cause of the alarm can thus be verified immediately and, if possible, the problem can be sorted out straight away.

ALARMS ↓ ↵	**ENT** = enter menu **SCROLL** = next menu

NO ALARMS EXIT ↵	**ENT** = return to main menu **SCROLL** = no effect

No alarms: if this message is displayed on entering the alarms menu, it means that there are no active alarms.

If there is an alarm, the I.C.M. indicates the presence of the fault by sounding the buzzer and lighting the LEDs; more detailed information can be obtained by entering the alarms menu. The alarms that are seen may be single or multiple, that is a fault or alarm can trigger other alarms. It is recommended to scroll through all the active alarms before carrying out any action.
The list below shows all possible alarms and the solution to the problem, where applicable.

ALARM A00 ↓ GENERAL ALARM	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

General alarm: indicates that at least one of all the other alarms is active. Check the other alarms.

ALARM A01 ↕ BATTERY ALARM	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Battery alarm: indicates that the battery input fuse (F5) or the second optional fuse (F6) is open.

ALARM A02 ↕ OUTPUT OVERLOAD	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Inverter modules overload: the output load is too high for the Power System; check for possible problems with the consumers connected.

ALARM A03 Vout TOLERANCE	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Output voltage out of tolerance: appears when the value of the output voltage goes out of the accepted range (± 5 % of the nominal value).

ALARM A06 Vaux TOLERANCE	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

By-pass voltage out of tolerance or too high or too low: check the amplitude or frequency of the By-pass voltage; the problem is usually temporary unless there is a fault on the By-pass power supply line (triggering of safety device, opening of breaker).

ALARM A07 OVER TEMPERATURE	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

High ambient temperature: appears when the probe located in the controller (PHASYS STAR) drawer measures an ambient temperature greater than the value set. Check the correct reading of the temperature on the mimic panel, check the ambient temperature and if necessary start up the air-conditioning Systems.

ALARM A08 MANUAL BY-PASS	**LED** = red **LED** = flashing yellow	**ENT** = no effect **SCROLL** = next alarm

Manual By-pass: indicates that the manual By-pass switch has been disconnected.

ALARM A09 SH. CIRCUIT OUT	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Short circuit in output: check for any short circuits on the consumers connected.

ALARM A14 BOOST TOO LOW	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

DC/DC voltage too low: indicates that the voltage of the voltage boost stage inside an inverter module has gone below the minimum operating threshold. It is usually accompanied by alarm A24.

ALARM A15 BOOST TOO HIGH	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

DC/DC voltage too high: indicates that the voltage of the voltage boost stage inside an inverter module has exceeded the maximum operating threshold. It is usually accompanied by alarm A24.

ALARM A16 Vbatt. TOO HIGH	**LED** = red **LED** = flashing green	**ENT** = no effect **SCROLL** = next alarm

Input voltage too high: indicates that the power supply voltage has exceeded the maximum threshold set. When this alarm is activated, the System automatically switches the output onto the auxiliary mains (L3 on) if there are no alarms relating to the By-pass. If the setting AUTO-RESTART is active, the green led will blink quickly.

ALARM A17 IMPROPER USE	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Improper use of the equipment: this alarm (also known as environmental conditions) identifies fault situations caused by the customer which occur within a pre-set short space of time and which could compromise the correct operation of the inverter System. These faults may be the result of high ambient temperatures, frequent overloads, frequent inverter/By-pass switching, etc…

Output/load: indicates continual overloads (A02) or output voltages that are out of tolerance (A03).

Auxiliary mains: indicates continual By-pass voltages out of tolerance in both amplitude and frequency (A06 and S28).

Input voltage (battery): indicates the frequent occurrence of Power System operation with minimum battery (A67) or with maximum battery (A16).

Temperature: indicates the frequent occurrence of Power System operation with ambient overtemperature (A07 or S69).

ALARM A18 OVERLOAD OFF INV	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Inverter shutdown due to overload: indicates that the inverter module has shut down due to an overload on the PHASYS module inverter stage. Check the consumers connected.

ALARM A20 CONF. CORRUPTED	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Configuration data changed: check the parameters in the SETTINGS menu and confirm if correct (number of modules set).

ALARM A24 BOOST ALARM	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

DC/DC stage alarm: indicates a fault in the voltage boost stage in an inverter module. The module with the alarm is specified in the ALARMS menu.

ALARM A25 INVERTER ALARM	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Inverter stage alarm: indicates a fault in the inverter stage in a PHASYS module. The module with the alarm is specified in the ALARMS menu.

ALARM A29 BY-PASS ALARM	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Fault on By-pass: appears when there is a fault on the backup mains, for example magneto-thermal switch open, indication of energy inversion, By-pass out of tolerance.

ALARM A30 OVERLOAD STOP	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Shutdown due to overload: this alarm appears when an overload persists even after an inverter-mains switching operation.

ALARM A31 IMMINENT STOP	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Shutdown imminent: this alarm is activated if the STOP procedure is launched or when a shutdown due to minimum input voltage is imminent; it means that a countdown has started for the shutdown of all the inverter modules (stand-by operation).

ALARM A38 E.P.O. ACTIVE	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

E.P.O. active: this alarm is managed by optional boards, if present.

ALARM A39 EXTERNAL ALARM 2	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

External alarm 2: this alarm indicates the intervention of the input managed by the optional EASY relay board.

ALARM A40 EXTERNAL ALARM 3	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

External alarm 3: this alarm is managed by optional boards, if present.

ALARM A41 EXTERNAL ALARM 4	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

External alarm 4: this alarm is managed by optional boards, if present.

ALARM A42 E-SERVICE ALARM	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

E-service: this alarm generates an e-mail to the service centre if Net Vision is installed and the E-service support contract is activated.

ALARM A43 REDUNDANCY LOST	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Redundancy lost: the alarm indicates that there is no longer any module virtually without load.

ALARM A64 AUX DISTRIBUTION	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Auxiliary distribution: indicates the opening of at least one magneto-thermal switch of the optional auxiliary output distribution.

ALARM A65 FAN FAILURE	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Fan failure: indicates that one or more fans are faulty or inefficient.

ALARM A66 BACKFEED PROT.	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Backfeed protection: indicates that the magneto-thermal switch of the By-pass line has been triggered due to a fault on the line. Try to reset the switch.

ALARM A67 Vbatt TOO LOW	**LED** = red **LED** = flashing green	**ENT** = no effect **SCROLL** = next alarm

Minimum input voltage: indicates that the input voltage has gone below the threshold set. With this alarm, the PHASYS System automatically switches the output onto the backup mains (L3 on), if there are no alarms relating to the By-pass. If the setting AUTO-RESTART is active, the green led will blink quickly.

ALARM A68 OUTPUT BREAKER	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Output breaker open: indicates that the output breaker is open.

ALARM A69 OUT FUSE FAULT	**LED** = red	**ENT** = no effect **SCROLL** = next alarm

Output fuse opening: indicates the opening of the output fuse of at least one inverter module; in this case, the module in question is switched off.

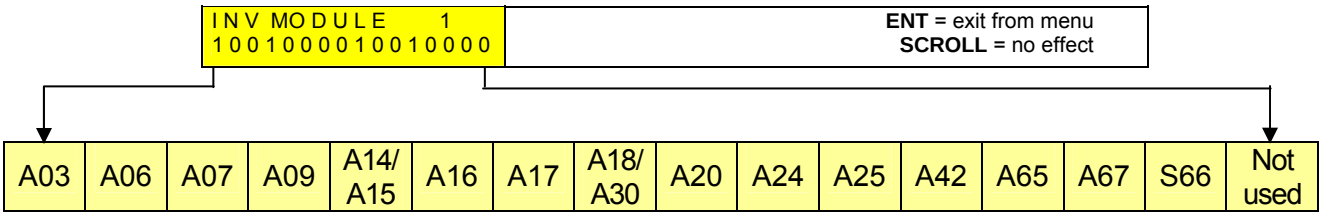
ALARMS EXIT ↵	**LED** = red	**ENT** = exit from alarms menu **SCROLL** = no effect

In this display, pressing ENT **exits from** the alarms menu.

A more detailed description can be requested for the **alarms of the individual inverter modules** that are configured. Pressing the ENT key with the following display provides a positional description of the alarms present.

ALARM A32 ▲▼ MODULE 1 ↵	**LED** = red	**ENT** = INV 1 information **SCROLL** = next alarm

Example: module 1alarm, pressing ENT gives access to an alarms submenu where the screen shown below is displayed, with all the module alarms.



The alarms are active if = 1 in the corresponding position from SX to DX

The code displayed above is positional, that is, the first number from the left corresponds to the first alarm code indicated above, the second to the second and so on; if the number is 0 it means that the alarm is not active, if 1 the alarm is active. The acronyms of the various alarms correspond to JBUS coding.

NO INFORMATION EXIT ↵	**ENT** = exit from menu **SCROLL** = no effect

This message is displayed if the configured module is not communicating with the controller (the module node number may have been configured wrongly).

6.4.4. Measurements

All the electrical parameters for the PHASYS ELITE are displayed in the measurements menu. Access to the list of measurements is from the following display.

MEASUREMENTS ▲▼ ↵	**ENT** = enter menu **SCROLL** = next menu

The list of measurements displayed is dependent on the actual measurements available; some measurements may therefore be missing from the list which may be only partial.

NO MEASUREMENTS EXIT ↵	**ENT** = exit from menu **SCROLL** = no effect

No measurements: if this message is displayed on entering the measurements menu, it means that no measurements are available (inverter modules switched off, no By-pass mains, etc..).

The following is a list of all the measurements that can be displayed.

SYSTEM INPUT ▼ Vbatt = 53.5 V	**ENT** = no effect **SCROLL** = next measurement

Battery voltage: indicates the measurement of the input voltage.

SYSTEM INPUT ▲▼ Ibatt = 4.8 A	**ENT** = no effect **SCROLL** = next measurement

Battery current: indicates the measurement of the input current.

AUXILIARY INPUT ▲▼ Vaux= 229 V	**ENT** = no effect **SCROLL** = next measurement

By-pass voltage: indicates the value of the backup mains voltage.

AUXILIARY INPUT ⇕ Faux= 49.9 Hz	**ENT** = no effect **SCROLL** = next measurement

By-pass frequency: indicates the value of the backup mains frequency.

AUXILIARY INPUT ⇕ Iaux= 1.3 A	**ENT** = no effect **SCROLL** = next measurement

By-pass current: indicates the value of the backup mains current.

SYSTEM OUTPUT ⇕ Vout = 231 V	**ENT** = no effect **SCROLL** = next measurement

Output voltage: displays the value of the output voltage on the load.

SYSTEM OUTPUT ⇕ Fout = 50.0 Hz	**ENT** = no effect **SCROLL** = next measurement

Output frequency: displays the value of the output voltage frequency.

SYSTEM OUTPUT ⇕ Iout = 15.5 A	**ENT** = no effect **SCROLL** = next measurement

Output current: displays the value of the output current. It is the sum of the currents of the inverter modules.

SYSTEM OUTPUT ⇕ Iinv =15.5 A	**ENT** = no effect **SCROLL** = next measurement

Output current: displays the value of the sum of the currents of the inverter modules.

SYSTEM OUTPUT ⇕ Power = 74 %	**ENT** = no effect **SCROLL** = next measurement

Output power percentage: indicates the percentage of output load with respect to the nominal value (in W).

SYSTEM OUTPUT ⇕ Pact. = 4.2KW	**ENT** = no effect **SCROLL** = next measurement

Active output power: indicates the measurement of active output power.

MEASUREMENTS ⇑ EXIT ↵	**ENT** = return to main menu **SCROLL** = no effect

6.4.5. Commands

This menu makes available to the user many of the functions required for the total management of the PHASYS ELITE System. Access to this menu is by entering a password which enables all the available commands to be displayed. If the password is entered incorrectly, only partial access to the menu is provided.

COMMANDS ⇕ ↵	**ENT** = enter menu **SCROLL** = next menu

PASSWORD - - - - ESC ↵	**ENT** = confirm digit **SCROLL** = change digit	**The correct password is STAR.**

The execution of the commands in this section is protected by a confirm menu. The list of all possible commands is shown below; this list is dependant on the operating status of the device.

COMMAND START PROCEDURE ↵	**ENT** = activate command **SCROLL** = go on to next command

Startup procedure: this command is used to start up the PHASYS modules present in the System; the modules have to be in stand-by condition (L4 flashing) for its correct execution.

COMMAND STOP PROCEDURE ↵	**ENT** = activate command **SCROLL** = go on to next command

Shutdown procedure: this command is used to shut down the PHASYS modules present in the System.

COMMAND ALARM RESET ↵	**ENT** = activate command **SCROLL** = go on to next command

Reset alarms: this command is used to reset all the alarms that are present/stored.

COMMAND ECO-MODE ON ↵	**ENT** = activate command **SCROLL** = go on to next command	**Password protected command**
COMMAND ECO-MODE OFF ↵	**ENT** = activate command **SCROLL** = go on to next command	**Password protected command**

Eco-Mode: activates/deactivates System operation in Eco-Mode. This operation provides for the output to be powered from the mains and the output is only switched from the mains to the inverter in the event of a mains failure. It should be noted that depending on the System operation that is active, only the executable command is displayed (e.g. with Eco-mode active, only the Eco-mode OFF command is shown).

COMMAND LOAD ON MAINS ↵	**ENT** = activate command **SCROLL** = go on to next command	**Password protected command**
COMMAND LOAD ON INV. ↵	**ENT** = activate command **SCROLL** = go on to next command	**Password protected command**

Mains/Inverter switching: enables the output voltage to be switched from By-pass mains/inverter and vice versa. It should be noted that depending on the System operation that is active, only the executable command is displayed (e.g. during operation from the inverter, only the command to switch onto the By-pass mains is shown).

COMMAND TEST LED ↵	**ENT** = activate command **SCROLL** = go on to next command

LEDs test: checks the indicator lights on the mimic panel and on the modules.

COMMAND TEST FAN ↵	**ENT** = activate command **SCROLL** = go on to next command

Fans test: checks the efficiency of the inverter module fans.

COMMAND NUMERATION VIEW ↵	**ENT** = activate command **SCROLL** = go on to next command

Module numbering: checks the numbering of the inverter module nodes and indicates “WRONG NUMBERING” in the event of numbering errors.

COMMANDS E X I T ↵	**ENT** = return to main menu **SCROLL** = no effect

All the commands are followed by a confirm menu as shown below:

– – E X E C U T I N G ! – – Confirm:YES ↵	**ENT** = execute command and go on to next menu **SCROLL** = confirm choice YES/NO

If a command cannot be executed, the following screen is displayed:

COMMAND NOT ALLOWED ESC ↵	**ENT** = exit from menu **SCROLL** = exit from menu

6.4.6. Settings

The SETTINGS menu is used to display and change (in Write "**W**" mode only) some PHASYS ELITE calibrations. Access to the menu is by entering a password, which provides the possibility of modifying some parameters of the menu which would otherwise be available as read-only. The items in the menu can only be changed according to use in Write mode, shown by a "W" in the top right-hand corner of the display: in these conditions the value of the parameter displayed can be changed by means of the SCROLL key and then stored by pressing the ENT key. The modification of a value must always be confirmed and if accepted has immediate effect.
See the example below.

SYSTEM TYPE **W** Size= ⬍<Power> ↵	**ENT** = go on to next parameter **Scroll** = change parameters

If one of the fields of the parameters menu has been changed, the following message of confirmation will be displayed once the change has been confirmed with the ENT key.

– – W R I T I N G ! – – Confirm:YES ↵	**ENT** = store new value **Scroll** = select YES/NO to change

All the parameters in the menu are described individually below.

S E T T I N G S ⬍ ↵	**ENT** = enter menu **SCROLL** = next menu

P A S S W O R D - - - - ESC ↵	**ENT** = confirm digit **SCROLL** = change digit	**The correct password is STAR.**

LANGUAGE SEL. **W** E n g l i s h ↵	**ENT** = go on to next parameter **SCROLL** = change language

Language: used to select the language of the display (English, Français, Italiano).

SYSTEM TYPE **W** S i z e= ⬍<Power> ↵	**ENT** = go on to next parameter **SCROLL** = change parameters

Size: size of the System; set LOW-POWER for power lower than or equal to 9KVA and HI-POWER for power ratings greater than 9KVA (check the size on the data plate).
Warning!: a wrong setting will cause errors in the measurement of the backup mains input current.

NUMBER MODULES **W** N= ⬍<NumMod> ↵	**ENT** = go on to next parameter **SCROLL** = change value

NumMod: To set the number of inverter modules in the System (1-4).
N.B.: if one module more is indicated, the System will be in a state of alarm because it will not be able to communicate with the module; if one module less is indicated, the System will function correctly but if the module fails the Power System will signal the presence of a fault.

REDUNDANCY **W** N + ⬍<RedLev> ↵	**ENT** = go on to next parameter **SCROLL** = change value

Redundancy: level of redundancy (can be set from 0 to (NumMod-1)).
Indicates the number of dedicated modules, should it be necessary to replace a faulty inverter.

OUTPUT W Vout= ⬍ <VoutNom> V ↵	**ENT** = go on to next parameter **SCROLL** = change value
OUTPUT W Fout= ⬍ <FoutNom> Hz ↵	**ENT** = go on to next parameter **SCROLL** = change value

Output: setting the output voltage (208-220-230-240V) and frequency (50-60Hz).
These parameters can only be changed with the inverter modules in stand-by or switched off.

DC INPUT W Vmax= ⬍ <Vbattmax> V ↵	**ENT** = go on to next parameter **SCROLL** = change value	**Vnom < Vmax < 58V**
DC INPUT W Voff= ⬍ <Vbattoff> V ↵	**ENT** = go on to next parameter **SCROLL** = change value	**35V < Voff < Vnom**
DC INPUT W Vmin= ⬍ <Vbattmin> V ↵	**ENT** = go on to next parameter **SCROLL** = change value	**Voff < Vmin < Vnom**
DC INPUT W Vpremin= ⬍ <Vbattpr> V ↵	**ENT** = go on to next parameter **SCROLL** = change value	**Vmin < Vpremin < Vnom**

Input: setting of the thresholds for the input voltage. These thresholds determine the signalling of alarms and the management of shutdown due to minimum battery.
These parameters can only be changed with the inverter modules in stand-by or switched off.

AUX INPUT W Present : <Vaux> ↵	**ENT** = go on to next parameter **Scroll** = select YES/NO to change

Aux. Input: configures the presence of the By-pass voltage.

AUX INPUT MASK W Vrms min= ⬍ <Vmin> V ↵	**ENT** = go on to next parameter **SCROLL** = change value
AUX INPUT MASK W Vrms max= ⬍ <Vmax> V ↵	**ENT** = go on to next parameter **SCROLL** = change value

Aux. input: setting of the range (maximum and minimum values) of the By-pass voltage beyond which a By-pass fault is indicated.

BACKFEED PROT. W Present: ⬍ <Riteneg> ↵	**ENT** = go on to next parameter **Scroll** = select YES/NO to change
BACKFEED PROT. W Imax: ⬍ <Iback> mA ↵	**ENT** = go on to next parameter **SCROLL** = change value

Backfeed protection: setting of the parameters for the management of the optional backfeed protection device.

MANUAL BY-PASS W Present: ⬍ <ManBP> ↵	**ENT** = go on to next parameter **Scroll** = select YES/NO to change

Manual By-pass: configures the presence or otherwise of the optional manual By-pass.

AUTO-RESTART W Status: ⬍ <AutoON> ↵	**ENT** = go on to next parameter **SCROLL** = change value
AUTO-RESTART W Vbatt: ⬍ <VbattR> V ↵	**ENT** = go on to next parameter **SCROLL** = change value
AUTO-RESTART W Delay: ⬍ <Delay> min ↵	**ENT** = go on to next parameter **SCROLL** = change value

Auto-restart: these three settings configure the restart procedure (from stand-by) of the inverter modules following a shutdown due to minimum input voltage battery. The first enables or otherwise the System restart after shutdown, the second and the third indicate the input voltage value and the delay before restart after it has been reached.

TEMP. PROBE W Present: ⬍ <Temp> ↵	**ENT** = go on to next parameter **Scroll** = select YES/NO to change

Temperature: setting of the presence of the probe of ambient temperature.

POWER SHARE **W** Mode: ▲▼<Power Share> ↵	**ENT** = go on to next parameter **SCROLL** = change value

Power Share: setting of Power Share mode (see the paragraph “Options available foe the PHASYS ELITE”).

The following parameters always have write mode active:

REMOTE COMMAND **W** Status: ▲▼<RemCmd> ↵	**ENT** = go on to next parameter **SCROLL** = change value

Remote commands: enables (ON, OFF) commands from a remote location (PC, Net Vision).

BUZZER SETTING **W** Status: ▲▼<BuzzerEn> ↵	**ENT** = go on to next parameter **SCROLL** = change value

Buzzer: enables the acoustic signal or buzzer (ON, OFF).

COM SETTING **W** N 8 1 ▲▼<ComSett> baud ↵	**ENT** = go on to next parameter **SCROLL** = change value

Remote commands: serial port baud-rate (1200, 2400, 4800, 9600 baud).

JBUS SETTING **W** Slave=▲▼<JbusSet> ↵	**ENT** = go on to next parameter **SCROLL** = change value

Slave: setting of the Jbus slave number (1 - 7).

TIME SETTING **W** ▲▼<hrs>h▲▼<min>m▲▼<00>s ↵	**ENT** = go on to next parameter **SCROLL** = change value

Time: clock setting (hours, minutes).

DATE SETTING **W** ▲▼<day>/ ▲▼<mth> / ▲▼<year> ↵	**ENT** = go on to next parameter **SCROLL** = change value

Date: date setting (year, month, day).

Changing any setting in this menu is followed by a request to confirm the change. If yes is selected, the value assigned becomes active and the menu goes on to the next setting; otherwise it returns to the current parameter.

– – – W R I T I N G ! – – – Confirm:YES ↵	**ENT** = store new value **SCROLL** = select YES/NO to change

At the end of the parameters menu, the output menu indicates that return to the main menu is by pressing the ENT key:

S E T T I N G S ▲▼ E X I T ↵	**ENT** = return to main menu **SCROLL** = no effect

The table below is a summary of the SETTINGS menu.

ACRONYM	DESCRIPTION OF SETTINGS	PASS WORD	LIVE SETTINGS
Language	Sets the language of the display (**English** Français Italiano)	√	√
Power	Identifies the size del System (**LOW-POWER** HI-POWER)	√	
NumMod	Indicates the number of modules in the System (**1**-2-3-4)	√	
RedLev	Identifies the setting of the redundancy level of the System (**0**…N-1)	√	
VoutNom	Identifies the setting of the System output voltage (208-220-**230**-240)		
FoutNom	Identifies the setting of the System output frequency (**50**-60)		
Vbattmax	Identifies the maximum setting of the System input voltage (Vbattnom **(48V)**…**58**)		
Vbattoff	Identifies the setting of the System input voltage at which the inverter modules shut down completely (**35**…Vbattnom)		
Vbattmin	Identifies the setting of the System input voltage at which the inverter modules go into stand-by mode (39…**40.8**…Vbattnom)		
Vbattpr	Identifies the setting of the System input voltage at which the countdown for imminent shutdown starts (Vbattmin…**44.4**…Vbattnom)		

Vaux	Sets the presence of the By-pass voltage (NO-**YES**)		
Vmin	Identifies the minimum setting of the By-pass voltage (**-20%**…VoutNom)		
Vmax	Identifies the maximum setting of the By-pass voltage (VoutNom…**+15%**)		
Ritenerg	Identifies the presence of the backfeed protection option (**NO**-YES)	√	
Iback	Identifies the current value at which the backfeed protection is triggered (200…**300**…400)	√	
ManBP	Identifies the presence of the Manual By-pass option (**NO**-YES)	√	
AutoON	Indicates the setting of System restart after the minimum input voltage has been reached (OFF-**ON**)		
VbattR	Identifies the setting of the System input voltage at which the inverter modules are restarted (Vbattpr…**Vbattnom**)		
Delay	Identifies the delay time for the inverter modules to be restarted after the pre-minimum input voltage has been reached (0…**60**)		
Temp	Identifies the presence of the probe for the measurement of the ambient temperature (**NO**-YES)	√	
PowerShare	Sets the Power Share mode (**NO**…STANDARD…DRY CONT...EM LIGHT…AUX INPUT)	√	
RemCmd	Indicates if the System executes remote commands (ON-**OFF**)		√
BuzzerEn	Identifies the buzzer status –enabled (**ON**) or disabled (OFF)		√
ComSett	Identifies the setting of the 232 and 485 serial port baud-rate (1200-2400-4800-**9600**)		√
JbusSet	Identifies the setting of the I.C.M. board JBUS-P address (**1**…7)		√
Hrs	Identifies the setting of the current hour (0…23)		√
Min	Identifies the setting of the current minutes (0…59)		√
Year	Identifies the setting of the current year (2000…2099)		√
Mth	Identifies the setting of the current month (1…12)		√
Day	Identifies the setting of the current day (1…29-30-31)		√

The values shown in bold print are the factory settings (default).
*The **PASSWORD** column shows whether or not it is necessary to enter the secret code to display these parameters.*
*The **LIVE SETTINGS** column shows the parameters that may change during normal operation (consumer powered). For all the other parameters the Inverter modules have to be in stand-by mode (green LED flashing) or off.*

6.4.7. Configurations

The configurations menu is used to display all the information linked to the PHASYS ELITE System firmware version and the serial number which **must always be quoted in the event of a request for technical support.**
The fields in this menu cannot be changed.

CONFIGURATIONS ↕ ↵	**ENT** = enter configurations menu **SCROLL** = next menu

SYSTEM SERIAL NUMB. : P161743001 ↓	**ENT** = no effect **SCROLL** = go on to next menu
FW. CONTROLLER 1.01 cks. AD54 ↕	**ENT** = no effect **SCROLL** = go on to next menu
FW. MODULE 1 1.01 cks. AD54 ↕	**ENT** = no effect **SCROLL** = go on to next menu
LANG. Francais 1.00 cks. AD54 ↕	**ENT** = no effect **SCROLL** = go on to next menu
LANG. Italiano 1.00 cks. E791 ↕	**ENT** = no effect **SCROLL** = go on to next menu
CONFIGURATIONS EXIT ↑ ↵	**ENT** = return to main menu **SCROLL** = no effect

The “LANGUAGE” displays show which languages are available and their version.

6.4.8. History log

This menu contains, in chronological order, a log of the states, alarms and commands that have taken place during System operation. An event is logged when a state is changed, following the presence or the disappearance of an alarm or when a command is executed.

It comprises the recording of the JBUS code of the event, the final logical value and the date and time that it took place. Access to the history log data is only via the controller display, from the main menu where the following page is available:

HISTORY LOG ▲ ↵	**ENT** = enter menu **SCROLL** = go back to start of main menu

NO INFORMATION EXIT ↵	**ENT** = exit from history log **SCROLL** = no effect

This display appears as long as the first alarm on the System is not verified. All the events that occur are stored and are available in the form of a list grouped according to data; the SCROLL key is used to select the data to check.

HISTORY LOG ▲▼ 16 / 05 / 2002 ↵	**ENT** = enter the log at the date indicated **SCROLL** (if present) = go on to the next date

This display contains the log of all the events that took place on the date indicated. Press ENT to access the list of faults as shown in the following screen.

17:04.43 A03 H ▲▼ Vout TOO LOW	**ENT** = no effect **SCROLL** = go on to the next event

The event is normally displayed in the following way: the time of the event, the event code (A=alarm, S=state C=command), a brief description and the status of the event (H=active event, L=event over).

14:31.07 A32 H ▲▼ MOD. 1 code:4000	**ENT** = no effect **SCROLL** = go on to the next event

Another type of event display describes the fault on the inverter modules: the time of the event and the alarm code are always shown, as is the hexadecimal alarm code of the indicated module.

Note: if the list of events is very long, to exit just press the SCROLL key down for 2-3 seconds and the display will go to the end of the submenu.

The following is displayed at the end of the events list:

16 / 05 / 2002 ▲ EXIT ↵	**ENT** = exit from the selected date **SCROLL** = no effect

6.5. First startup configuration

To start up the controller, close fuse F11 with battery input voltage present. With the modules inserted only and in stand-by condition (LED L4 flashing), the following will be shown on the PHASYS STAR controller display:

PASSWORD - - - - ESC ↵	**ENT** = confirm digit **Scroll** = change digit	**The correct password is STAR.**

This message is displayed for about 30 seconds, after which it is necessary to enter the SETTINGS menu to effect the first startup settings. Key in the correct password to enter the parameters (SETTINGS) menu, in which all the required values have to be set according to the desired System configuration. The electrical parameters of the System must be set before the START procedure is activated. Many of these (output voltage and frequency, battery thresholds) must in fact be input with the inverter modules switched off or in stand-by.

!	**The inverter modules must be in stand-by mode when setting the output voltage and frequency and the battery voltage thresholds.**

6.6. Changes to the System configuration

This section describes how to change the System configuration settings during normal operation. Follow the procedure set out below.

Select the **SETTINGS** menu from the start menu:

SETTINGS ↕ ↵	**ENT** = enter menu **SCROLL** = go on to next menu (configur.)

↓

P A S S W O R D - - - - ESC ↵	**ENT** = confirm digit **SCROLL** = change digit	**The correct password is STAR**

Entering the correct password gives access to the whole settings menu (the letter “W” will be seen on the right-hand side of the display, indicating that write mode is active). Select the parameter on the menu to be changed and confirm the operation.

DC INPUT **W** Vnom= 4 8 . 0 V ↵	**ENT** = go on to next parameter **SCROLL** = change value

– – – W R I T I N G ! – – – Confirm: YES ↵	**ENT** = change value **SCROLL** = select YES/NO to confirm

!	**To change the values of the battery voltage and output voltage and frequency thresholds, all the inverter modules must be switched off or in stand-by operation.**

6.7. Communication

All the PHASYS ELITE models are supplied as standard with RS232/RS485 serial communication interface with J-BUS protocol.

Optional communication and signalling accessories are also available, such as:

- the remote multi-language LCD panel to be connected via RS485 serial line.
- the NET-VISION network board for control via LAN with TCP/IP protocol and remote shutdown, which is installed on one of the communication slots.
- the advanced communication board which includes 4 inputs for environmental alarms and a second RS232 port which is installed on one of the communication slots.

All the communication boards are easy to install thanks to the preset slots inside the System distribution (fig.3). The example in the figure shows the use of the Net Vision board and the EASY relay board.

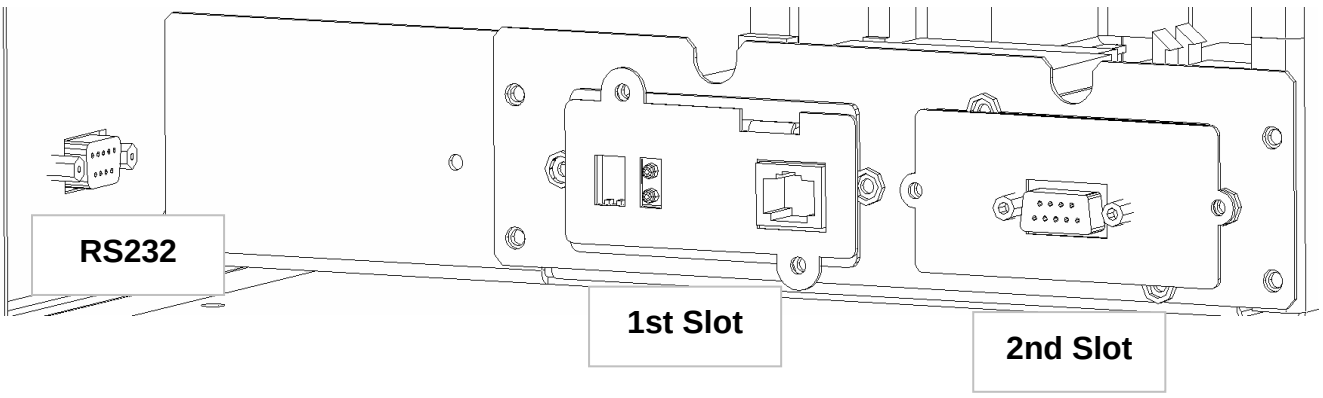
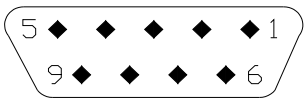


Fig.3: Communication interface - internal distribution view

6.7.1. RS232/485 interface

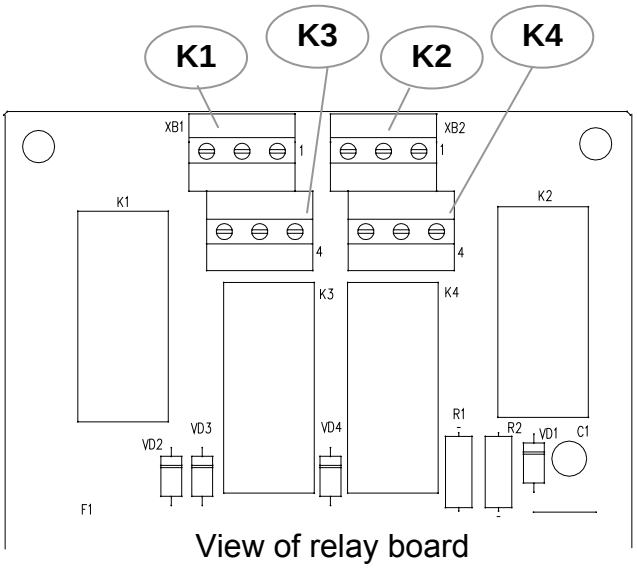
Communication with the server can be directly via the RS232 interface or by means of the direct connection of the System to the LAN network.
Monitoring in the LAN network makes use of TCP/IP protocol and a common WEB browser can therefore be used to "see" the equipment from any point in the LAN network. However, the appropriate cable normally provided with the software options must be used to connect the PHASYS ELITE via RS232 (pins 2, 3, 5).
For a full description of the software functions, refer to the Net-Vision documentation or that of other communication accessories.

Diagram of DB9 serial connector

	1 = Not connected 2 = RX for RS232 3 = TX for RS232 4 = Data + (RS485) 5 = GND for RS232	6 = Data - (RS485) 7 = Shutdown 8 = Not connected 9 = +12V

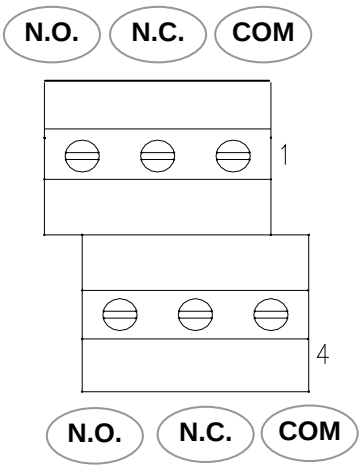
6.7.2. Dry contacts board

All the PHASYS ELITE Systems have a signalling board inside the distribution that is **only accessible from above.** This board consists of 4 relays which can manage unpowered contacts used for remote signalling.



View of relay board

Pin configuration XB1-XB2



The relay contacts are independent with common COM and can be connected NO or NC.

KEY:

Relay contact K1
Mains absent or out of limits

Relay contact K2
Consumer powered from the mains

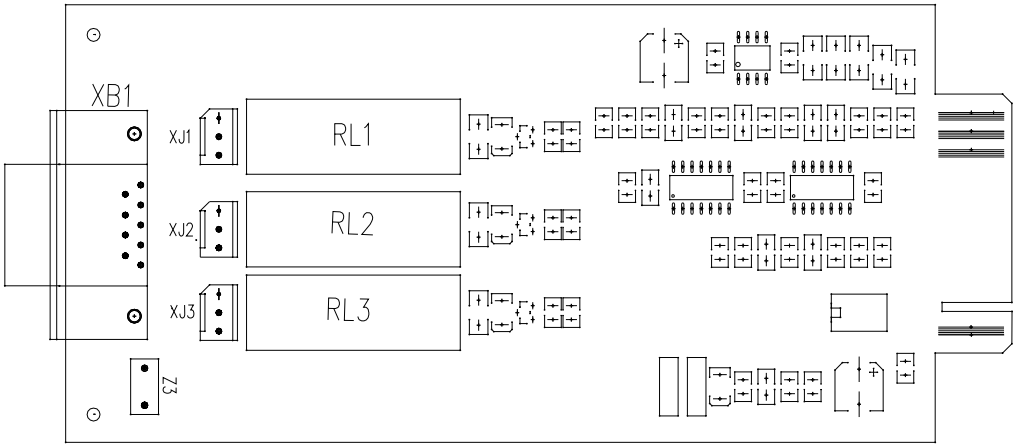
Relay contact K3
Pre-minimum battery alarm

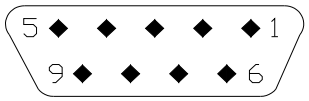
Relay contact K4
General alarm

THE MAXIMUM VOLTAGE THAT CAN BE APPLIED TO THESE CONTACTS IS 250Vac AND THE MAXIMUM CURRENT FOR EACH INDIVIDUAL CONTACT IS 5A.

6.7.3. EASY relay slot board

In addition to the 4 standard contacts described in the previous section, an optional board is available for insertion in a slot, which is able to manage 3 outputs and one input.
Two EASY relay boards cannot be used in the two preset slots.





Pin 4 Relay Contact RL1
pin 5 Common Relay RL1

pin 3 Relay Contact RL2
pin 7 Common Relay RL2

pin 2 Relay Contact RL3
pin 1 Common Relay RL3

pin 6 Isolated input
pin 8 Isolated +12V input
pin 9 Isolated GND input

The contacts of the relays can be configured NO (standard) or NC via the jumpers on the board (XJ1 - XJ2 - XJ3).

THE MAXIMUM VOLTAGE THAT CAN BE APPLIED TO THE CONTACTS IS 60Vdc AND THE MAXIMUM CURRENT IS 500mA.

This optional relay board activates alarm A39 “External alarm 2” on the display if there is a fault by means of the signalling connected to the preset isolated input.

Relay	Description of Signal	NC	NO	JUMPERS
RL1	General alarm	1-2	2-3	**XJ1**
RL2	Overload	1-2	2-3	**XJ2**
RL3	Redundancy lost	1-2	2-3	**XJ3**

NO: Default position of jumper.

ENGLISH

7. STARTUP

7.1. Sequence of operations for System startup

Once the System installation and connection phases have been completed, the System can be started up for the first time. Configure all the modules available one at a time and insert them into the System, in the correct position and corresponding to the assigned node number (see section “Insertion and configuration of the inverter modules”).
Once the equipment is powered, the PHASYS STAR controller will start up if fuse F11 is present. In these conditions, the display shows the SETTINGS menu so that all the System electrical parameters can be set before starting up (as described in the section “First startup configurations”). Once the setting phase is completed, put all the inverter modules in stand-by operation, by pressing key P2 on each of them; the green LED L4 on each module will start to flash.
Then enter the COMMANDS menu and launch the START procedure, as shown below.

Select the **COMMANDS** menu from the start menu:

COMMANDS ↕ ↵	**ENT** = enter menu **SCROLL** = go on to next menu (SETTINGS)

PASSWORD - - - - ESC ↵	**ENT** = confirm digit **SCROLL** = change digit	**The correct password is STAR**

It is not necessary to enter the correct password (the command to activate the START procedure is not protected), then press the ENT key.

COMMAND ↕ START PROCEDURE ↵	**ENT** = activate command **SCROLL** = go on to next

-- EXECUTING! -- Confirm: YES ↵	**ENT** = execute command and go on to next **SCROLL** = select YES/NO to confirm

If the inverter modules are not in stand-by (no LED flashing), the following message will be displayed:

press UPS ON key ENT to continue ↵	**ENT** = end procedure **SCROLL** = end procedure

Set the module to stand-by mode and press any key on the controller; this will activate the startup procedure. The following message will then be displayed:

START wait.. <NumSec>s Any key to ABORT	**ENT** = end operation **SCROLL** = end operation

indicating the time left until the end of the procedure and at the same time as this message, LEDs L2-L3-L4 on the mimic panels of the individual **PHASYS** modules and of the **I.C.M. (PHASYS STAR)** will light up in sequence. <u>The procedure can be interrupted at any time</u> (by pressing any controller key).
At the end of the START procedure, the PHASYS ELITE will be in a condition of correct operation depending on the battery voltage and backup mains conditions.
If in these conditions there are two or more modules with the four LEDs flashing, this means that the numbering operation of the PHASYS modules was not done correctly. In addition to this report signal, the red LED on the controller will be on (General alarm A00) and the following message will be displayed in the rotating menu:

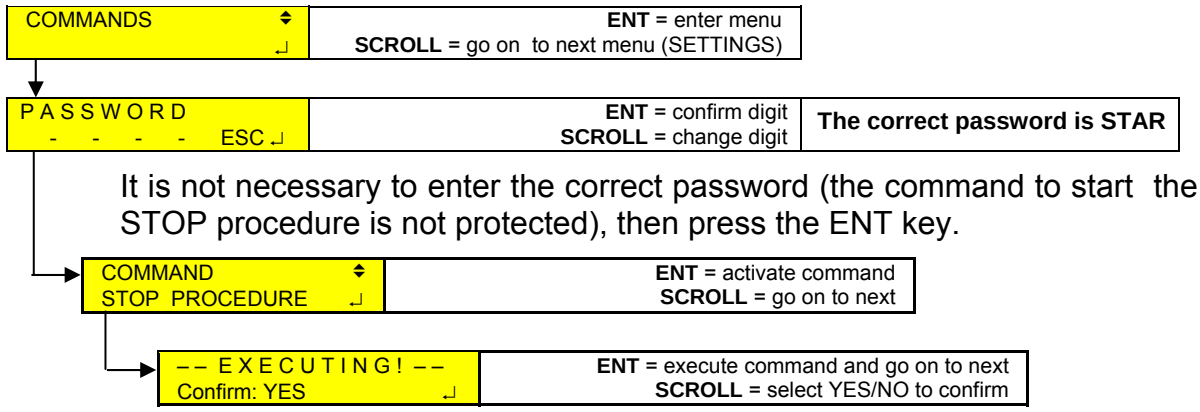
27/08/2002 11:36 WRONG NUMBERING

For more information see the section “Checking the numbering of the inverter modules”.

7.2. Sequence of operations for System shutdown

The specific design of the **I.C.M.** allows for the guided shutdown of the **PHASYS modules**, coordinating the information to the outside with the aim of protecting the connected consumer.

It is recommended always to follow the procedure described below and not to use the keys on the individual Modules.



Confirming the command activates the controlled shutdown phase:

STOP wait… <NumSec>s any key to ABORT	**ENT** = end operation **SCROLL** = end operation

This is displayed for the first 20 seconds, the procedure can be interrupted at any time simply by pressing any key.

STOP wait… <NumSec>s Imminent STOP !!	**ENT** = no effect **SCROLL** = no effect

After the first 20 seconds it will **NO LONGER** be possible to interrupt the procedure!.
From this time all the equipment connected to a shutdown client will start the ordered shutdown procedure.
The PHASYS STAR controller will communicate the execution of the shutdown by the intermittent sound of the buzzer and the red LED on.
At the end of the STOP procedure the PHASYS modules will be in the stand-by condition (green LED L4 flashing) and the consumer will not be powered. For the total shutdown of the individual inverter modules, press key P1 for approx. 10 seconds until L4 has switched off completely, while for the I.C.M. open fuse block F11 located inside the distribution.

7.3. Checking the numbering of the inverter modules

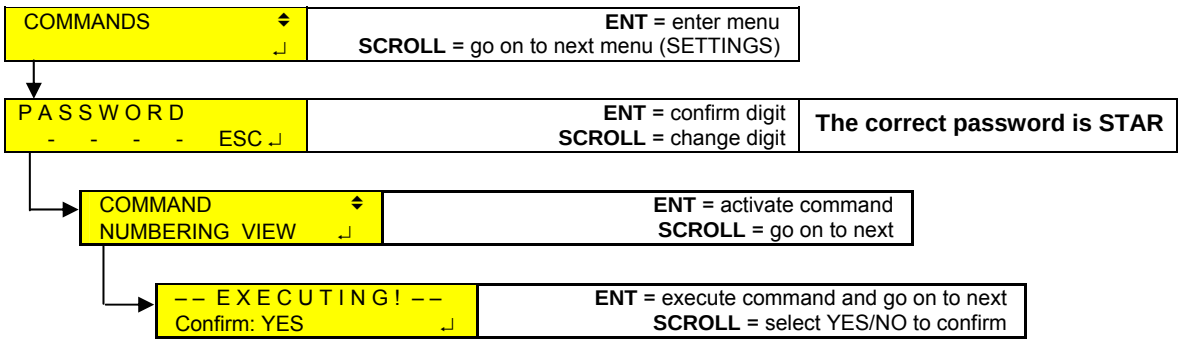
As described above in the section “Insertion and configuration of the inverter modules” the inverter modules inserted in a PHASYS ELITE System need configuration of the node number to be able to operate in parallel.
As has already been seen, the inverter module is by convention assigned the node corresponding to the position it occupies in the System (e.g. the highest position identifies node 1, etc…).
If on System startup the four LEDs are flashing on two or more modules and the following message appears on the display in the rotating menu:

27/08/2002 11:36 WRONG NUMBERING

this means that there are inverter modules with the same node and that they have not been numbered correctly.
In this case it is the LEDs flashing on the modules that indicate the double node configurations. Once the devices to renumber have been identified, execute a reset commands to stop the flashing and follow the procedure described below; the numbering of the inverters can be checked by means of the mimic panel.

NB: the module numbering check can be executed with the PHASYS inverters in operation or in stand-by condition (L4 flashing).

Select the COMMANDS menu from the start menu:



When this command is activated, the following message is displayed:

In addition to this display the LEDs of the corresponding module will flash. The controller will carry out this check in sequence for all four modules. In the event of double numbering, the LEDs on two separate inverters will flash, indicating that the same node number has been set on both of them.
This problem is solved by renumbering the double modules; see the section “Insertion and configuration of the inverter modules”. Remember however that the module must be completely switched off and removed from the System in order to set the node by means of a dip-switch. To do this it is advisable to use the STOP procedure or to manually switch off only the inverter to be reconfigured.

8. THE PHASYS 1500-3000-4500 VA INVERTER MODULE

8.1. General information

The inverter module ensures the presence of an AC voltage from a DC source. It can either be used within a PHASYS ELITE System in parallel with other inverter modules, as has been seen in the previous sections, or can operate alone in a “stand alone” configuration.
The inverter modules have high **efficiency, compact size and weight, forced ventilation**, direct current absorption (low ripple and reinjected psophometric noise), dialog capability and diagnostics with the outside by means of the microprocessor.
In order to guarantee **efficient diagnostics,** each inverter module is provided with a smart microprocessor unit which acquires and processes the electrical and functional parameters and displays the operating or alarm status by means of a mimic panel with LEDs and a backlit LCD display.

8.2. Block diagram

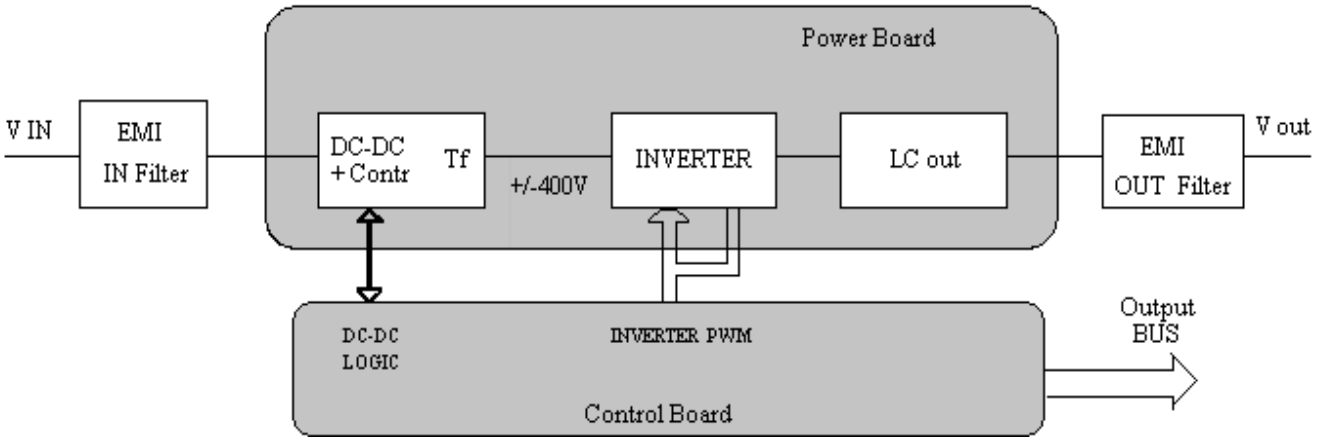


Fig.4: PHASYS inverter module block diagram

8.3. General description

The inverter module is made up of the following ”blocks”:

Input voltage (Vin): the input voltage is taken from a direct current source which may be a rectifier or a battery.
LC input filter: this first input filter of the “active” type allows a perfectly direct current to be absorbed from the DC generator (reduced RMS and psophometric ripple).
Isolated DC/DC boost stage: this converter is powered by the input voltage (48V) and together with the transformer and a rectifier bridge boosts this voltage to ±400Vdc. This stage operates at a frequency of 50KHz and is controlled by microprocessor regulation and by the independent hardware circuits.
DC/AC inverter stage: this converter operates at a frequency of approx. 25KHz in PWM technology; by means of the subsequent filter it supplies an alternating voltage that is perfectly sinusoidal and stable.
Regulator stage: controls the correct operation of the two power stages.
EMI output filter: used to filter the load voltage of unwanted harmonics (RF noise of the conducted and irradiated type).

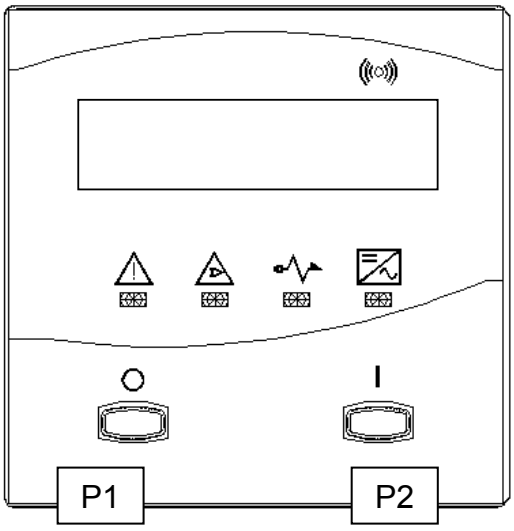
8.4. Main features

The main features of the PHASYS 1500÷4500 inverter module are described below:

Perfectly sinusoidal output: the sinusoidal output waveform ensures its compatibility with all IT and other loads.
Digital control on all functions: enhances reliability and ensures high stability and long-lasting electrical characteristics.
Protection against polarity inversion in input: a safety device is mounted to protect against the accidental inversion of the battery input connection.
Fan efficiency test: periodically tests the efficiency of the fans and notifies if they need to be replaced.
Automatic By-pass: in the event of an overload or an internal failure, the consumer is still powered via the By-pass circuit that is activated automatically and immediately.

8.5. Description of the module keys

The following keys are available on the PHASYS inverter module:



P1: OFF KEY
When the equipment is in operation, this key puts it in stand-by mode. From the stand-by condition, it is used to shut down the inverter module completely.

P2: ON KEY
With the module fully shut down, this key is used to switch on the internal logic (power supply unit) and to set the module to stand-by mode. From this condition, if the key is kept pressed down, the START procedure is activated.

Other functions:

SILENCE BUZZER

If the buzzer is on, press key P2 to silence it temporarily.

OUTPUT LOAD CODING

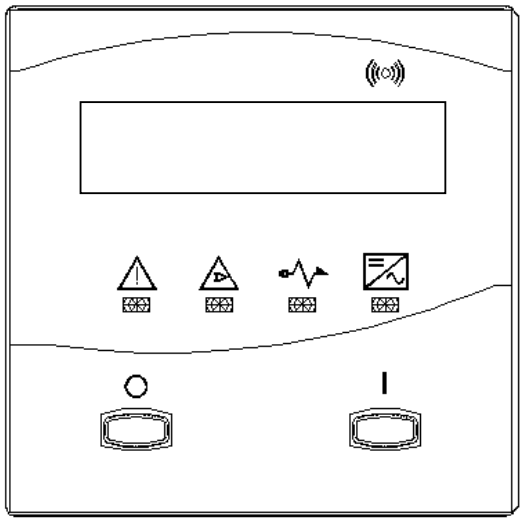
During normal PHASYS operation (GREEN LED ON), if keys P1 and P2 are pressed simultaneously for 1 second, the number of flashes of the LED shows the output load percentage expressed in tens (e.g. 4 flashes correspond to a load between 31% and 40%).

ALARM RESET

In the presence of an alarm (RED LED ON), pressing key P2 for 3 seconds resets the fault and the consumers are powered once more. If the equipment is operating from the By-pass, this action will also cause switching to the output inverter.

8.6. Luminous report signals on the mimic panel

In addition to a display, the mimic panel also has 4 LEDs of different colours and meanings.

Description of LED	LED	STATUS		Description
	**GREEN**	L1	Constant	Indicates that the load is powered from the PHASYS inverter stage.
			Slow flashing	Indicates stand-by state.
			Fast flashing	Indicates that the AutoRestart function is active following a minimum or a maximum input voltage. As soon as the input voltage returns within the set voltage range (between 44.4V and 57V), the equipment automatically restarts.
	YELLOW	L2	Constant	Indicates that the System output is powered from the auxiliary mains. Also indicates ECO-MODE active
			Flashing	Indicates that manual By-pass switching has been effected.
	YELLOW I>	L3	Constant	Indicates that a load greater than 105% of the nominal power is present in output (more than 115% for By-pass).
	RED	L4	Constant	Indicates the presence of any alarm (including A01 and A08).
			Flashing	Indicates that the pre-minimum battery state is active. The input voltage is close to the minimum battery value.

When the LCD display backlighting is off, the only function of key **P1** or **P2** is to switch on the backlight.

ENGLISH

9. OPTIONS AVAILABLE FOR THE PHASYS ELITE

This section sets out the main options available for the PHASYS ELITE Power System. Since the solutions are extremely versatile and multiple combinations are possible, these are described very generally, it being understood that at the time of the request the equipment and this manual will be customized.

9.1. ISOLATION TRANSFORMER FOR THE BACKUP MAINS

The optional isolation transformer for the backup mains is used in situations where isolation is required between the mains and the output voltage of the PHASYS ELITE System. Given the dimensions of the transformer, it is usually mounted inside in the lower part (options compartment) and only in Power Systems 1800mm high.
The single-phase/single-phase version can be used, with protection made up of a bipolar magneto-thermal switch placed between the mains and the transformer primary. Alternatively, a three-phase/single-phase isolation transformer is available, with three-phase magneto-thermal switch upstream of the transformer primary.

9.2. BACKFEED PROTECTION

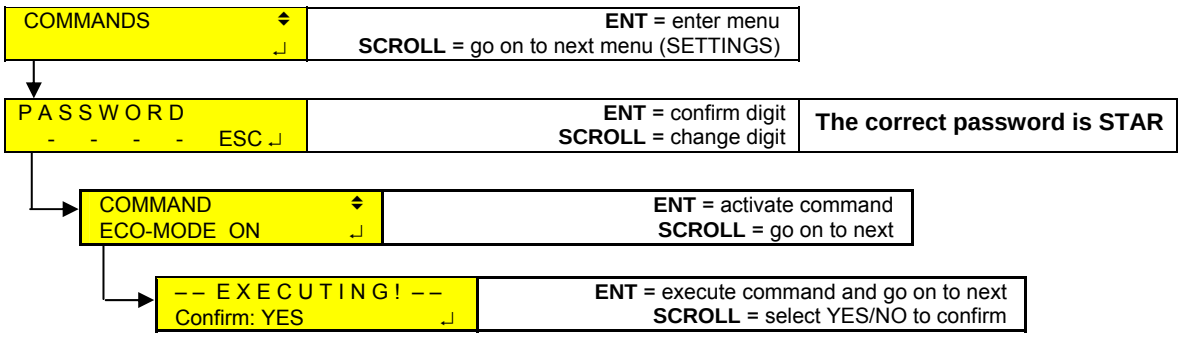
This safety device ensures that, in the event of a failure of the static By-pass, the inverter can generate on the mains power supply. The alarm is activated, triggering the input magneto-thermal switch in less than 300 milliseconds, when the faulty current exceeds a predefined value that can be set via the mimic panel (200÷400mA).

9.3. MANUAL BY-PASS

The optional manual By-pass allows the output voltage to be switched from the inverter to the mains. The main function of the manual By-pass breaker is to enable the customer to effect extraordinary maintenance operations on the PHASYS ELITE System or while waiting for repairs following a major fault of the inverter modules, while still ensuring an uninterrupted power supply to the consumers.

!	**The two breakers (By-pass and output) are placed close to each other. The incorrect use of one of them can cause the undesired loss of voltage in output (read the labels before carrying out any operation).**

By following the procedure described below, the Power System Inverter can in fact be switched off completely while still ensuring an uninterrupted power supply to the load. From the **COMMANDS** menu:



When the command is executed the consumer will be powered from the mains (L2 on); now close the manual By-pass switch located inside the distribution (LED L2 flashing).

To return from the **manual By-pass to inverter** open the By-pass switch and execute the ECOMODE OFF command (following the same procedure as described above); if everything has been executed correctly the green LED will go on.

9.4. ADDITIONAL BATTERY INPUT

A second battery input can be mounted on request, for an additional battery to be connected to the Power System input. This second input is protected by fuse NH and signalled in the event of a fault.

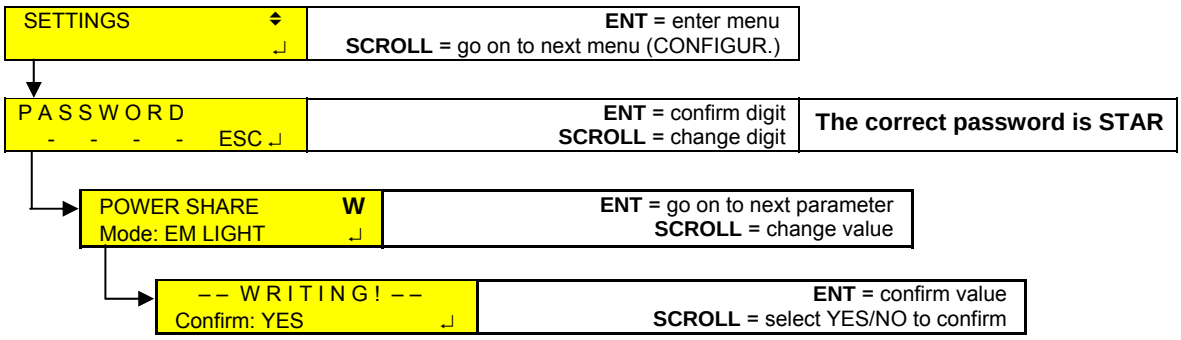
9.5. AC DISTRIBUTION (optional)

AC distribution to the consumers comprises magneto-thermal switches connected to the inverter output, with the aim of distributing the sinusoidal voltage to the various users, ensuring protection against overloads and/or short circuits upstream of the switches. Auxiliary contacts can also be mounted on request to show the triggering of a magneto-thermal switch. The I.C.M. indicates the triggering of one of the safety devices by means of a digital input controlled by the microprocessor.

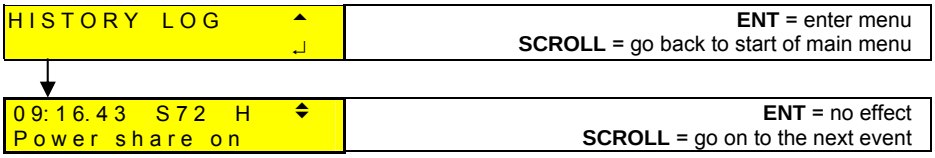
9.6. POWER SHARE (optional)

The purpose of this additional output is generally to power that part of the consumers (with the lowest priority) which in situations of mains failure, minimum battery or in the event of an overload, may be excluded to leave full availability of the power supply to the privileged consumers that are connected to the main outlets.
Depending on the several requirements, it's possible to choose among four different logics of Power Share:
Standard: the contactor of Power Share will be opened in condition of overload and/or pre-minimum battery voltage; the same one will be again closed if after a time the above-mentioned alarms will not be present and the load will be less than 85% of nominal power.
Mains absent (Aux. Input): the contactor of Power Share will be opened with standard logic above described with the added of the absence of the mains.
Emergency lights (EM Light): actives the "emergency lights" mode: the contactor will close only if mains will be absent and the load will be less than 85% of nominal power.
Ext. Relay Easy (Dry cont.): this logic is similar than standard logic with the added of the presence of digit input of Relay Easy board (optional).

Select the **SETTINGS** menu from the start menu:



When the contactor of Power Share opens, in the **HISTORY LOG** menu, you will see:



9.7. NET VISION

The Net Vision board is used to connect the System to the corporate PC network and to check the System from any point of this network.

Refer to the Net Vision manual for further information.

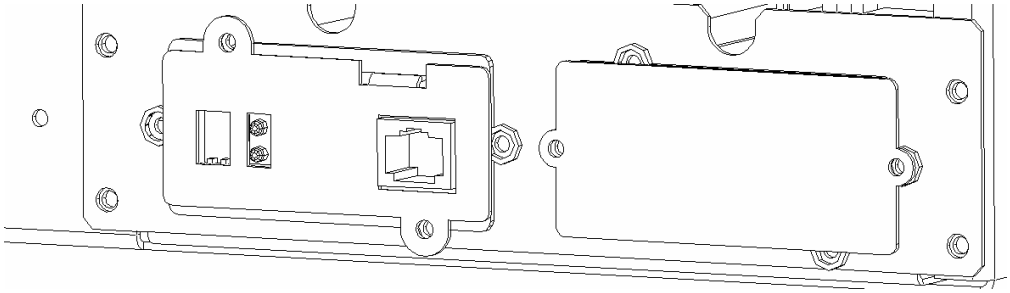


Fig.5: View of the Net Vision board installed

9.8. E-service

The **e-service** contract, by means of the optional Net Vision board, enables the remote control of System operation. In the event of a failure, the System manager and the authorized service centre will be informed via electronic mail, thus allowing immediate action to be taken.

Refer to the Net Vision manual for further information.

10. TECHNICAL DATA

Standards

Directive 89/336/CEE	Standard EN50081-2 (EMC) Standard EN 61000-6-2 (Immunity) Standard ETSI EN 300 386 V1.3.1
Directive 73/23/CEE	Standard EN60950 (Safety)
	ASTM D 999 (Vibration) ASTM D 5276 (Shock)

Environment

Operating temperature	0÷50°C **(¹)**
Recommended operating temperature	20÷30°C
Storage temperature	-25÷55°C
Relative humidity non condensing	10%÷90%
Maximum altitude (without derating)	1000mt above sea level
Acoustic noise (method EN 27779)	< 55dB @ 1mt

(¹): temperature range between 0°C and 50°C with output power derating above 40°C (approx. -2.9% Pnom/°C).

Isolation data

Isolation resistance	≥ 50 MΩ
Primary/earth isolation	500Vac 50Hz
Secondary/earth isolation	3kVac 50Hz
Primary/secondary isolation	3kVac 50Hz

Reliability

Mean Time between failures (MTBF)	≥ 35 years at 25°C

Technical data relating to the PHASYS Inverter modules

PRODUCT CODES:

PH-1500-48 PHASYS inverter module 1500VA
PH-3000-48 PHASYS inverter module 3000VA
PH-4500-48 PHASYS inverter module 4500VA

Mechanical data

	1500 VA	**3000 VA**	**4500 VA**
Weight	16.5 Kg	19.5 Kg	21.5 Kg
Dimensions in mm (L-D-H)	19″ - 460 - 133 (3HE)		
Input/output connections	Hot plug-in sul retro		
Colour	Grey RAL 7012		
Degree of protection	IP20		

Electrical input data

Nominal voltage	48Vdc		
Maximum tolerance on the DC input voltage	40 ÷ 58Vdc		
	1500 VA	**3000 VA**	**4500 VA**
Reinjected psophometric noise (CCITT curve A) (method ETSI 300 132-2)	< 1.5 mV	< 2 mV	< 4 mV
Reinjected RMS ripple (method ETSI 300 132-2)	< 20mV	< 100 mV	< 200 mV
Maximum current absorbed (Vbatt=40Vdc, Pout=Pnom.)	28 A	56 A	84 A
Polarity connected to earth	None (isolated input)		

BY-PASS Electrical input data

Nominal By-pass voltage (single-phase)	208/220/230/240Vac
Max tolerance on the By-pass input voltage	+15% -20%
By-pass nominal frequency	50/60Hz
Max tolerance on the By-pass frequency	±2% **(2)**

(2): can be set up to ±8% in By-pass configuration from the generator (GE).

Electrical output data

Nominal output voltage (single-phase)	208 **(3)** /220/230/240Vac		
Nominal output frequency	50/60Hz ±2%		
Max tolerance on the output frequency (inverter) (By-Pass)	±0.1% synchronous at the mains up to ±2%		
Waveform	Sinusoidal		
Peak factor (Ipk/Irms)	3 : 1		
Permanent overload	105% Iout nom.		
Minimum time in short circuit	50 msec.		
Commutation time inverter/By-pass	< 1 msec.		
Commutation time By-pass/inverter	< 3 msec < 15 msec (ECO-MODE)		
Ventilation	Forzed		
	1500 VA	**3000 VA**	**4500 VA**
Apparent power supplied (f.d.p. 0,7)	1500VA	3000VA	4500VA
Active power supplied	1050W	2100W	3150W
Nominal output current (Vout = 230V)	6.5 A	13 A	19.5 A
Short circuit current (from inverter)	13 A	26 A	39 A
Output voltage tolerance (variation from 0% to 100% Pnom.)	±3% Vnom	±3.5%Vnom	±4% Vnom
Harmonic distortion on linear load	< 4%	< 4%	< 4%
Harmonic distortion on distorting load (Ipk/Irms=3)	< 8%	< 8%	< 8%
Efficiency	0.85	0.85	0.84

(3): with 208V output configuration, output power derating is 80%.

Technical data relating to PHASYS ELITE Systems

PRODUCT CODES:

PH-LT..L-48	PHASYS ELITE System (height 1400mm)
PH-LT..H-48	PHASYS ELITE System (height 1800mm)

Mechanical data

	3000/48 3000-H/48	**4500/48 4500-H/48**	**6000/48 6000-H/48**	**9000/48 9000-H/48**	**13500/48 13500-H/48**	**18000/48 18000-H/48**
Dimensions in mm (L-D-H)	600 x 600 x 1400 **(version code L)** 600 x 600 x 1800 **(version code H)**					
Weight (without modules inserted)	125 Kg	125 Kg	125 Kg	135 Kg	135 Kg	135 Kg
Weight **(version H)** (without modules)	140 Kg	140 Kg	140 Kg	150 Kg	150 Kg	150 Kg
Input/output connections	Hot plug-in at the back Sockets and copper bars					
Panel colour	Grey RAL 7012					
Frame colour	Light grey RAL 9005 “glossy”					
Degree of protection	IP20					

Electrical input data

	3000/48 3000-H/48	**4500/48 4500-H/48**	**6000/48 6000-H/48**	**9000/48 9000-H/48**	**13500/48 13500-H/48**	**18000/48 18000-H/48**
Nominal voltage	48Vdc					
Maximum input voltage tolerance	40 ÷ 58Vdc					
Maximum input current (Vin=40V Pout=Pnom)	62A	93A	124A	186A	279A	372A
Reinjected psophometric noise - CCITT curve A (method EN 300 132-2)	< 2mV psof.				< 4mV psof.	
Reinjected RMS noise	< 100 mVrms				< 200 mVrms	
Polarity connected to earth	Positive (negative or isolated input are OPTIONALS)					

BY-PASS electrical input data

Nominal By-pass voltage	208/220/230/240Vac single-phase
Max tolerance on the By-pass input voltage	+15% -20%
By-pass nominal frequency	50/60Hz
Max tolerance on the By-pass frequency	±2% **([4])**

([4]): can be set up to ±8% in By-pass configuration from the generator (GE).

Electrical output data

Nominal output voltage (single-phase)			208 **([5])** /220/230/240Vac			
Nominal output frequency			50/60Hz ±2%			
Max tolerance on the output frequency (inverter) (By-Pass)			±0.1% synchronous at the mains up to ±2%			
Waveform			Sinusoidal			
Peak factor (Ipk/Irms)			3 : 1			
Permanent overload			105% Iout nom.			
Minimum time in short circuit			50 msec.			
Commutation time inverter/By-pass			< 1 msec.			
Commutation time By-pass/inverter			< 3 msec. < 15 msec (ECO-MODE)			
Ventilation			Forced			
	3000/48 3000-H/48	**4500/48 4500-H/48**	**6000/48 6000-H/48**	**9000/48 9000-H/48**	**13500/48 13500-H/48**	**18000/48 18000-H/48**
Apparent power supplied (f.d.p. 0,7)	3000VA	4500VA	6000VA	9000VA	13500VA	18000VA
Active power supplied	2100W	3150W	4200W	6300W	9450W	12600W
Nominal output current (Vout = 230V)	13 A	19.5 A	26 A	39 A	58.5 A	78 A
Short circuit current (from inverter)	26 A	39 A	52 A	78 A	117 A	156 A
Output voltage tolerance (variation from 0% to 100% Pnom.)	Max. ±4% Vnom					
Harmonic distortion on linear load	< 4%					
Harmonic distortion on distorting load (Ipk/Irms=3)	< 8%					
Efficiency	0.85	0.85	0.85	0.85	0.84	0.84

([5]): with 208V output configuration, output power derating is 80%.

11. MAINTENANCE

DANGEROUS electrical voltages are generated inside the Power System and the individual inverter modules. All maintenance operations must be effected EXCLUSIVELY by authorized personnel.

11.1. TROUBLESHOOTING FOR MINOR PROBLEMS

This section describes some of the most likely problems that may compromise the good operation of the System, together with an attempt to determine causes and possible solutions.
Some problems at **Inverter module** level are described below, together with their solutions, as well as some displays connected to malfunctions that may occur **in the I.C.M.**

IMPORTANT: If after following the instructions provided in this chapter the problems should persist or be repeated frequently, please call the technical service centre providing a full description of the problem.

The Inverter module DOES NOT SWITCH ON:	
PROBABLE CAUSE:	SOLUTIONS:
The ON button was not pressed for long enough. The power supply fuse is blown/open.	• Carefully follow the instructions for switching on. • Check that the fuse for the inverter module inserted is closed • The Inverter Module must be properly inserted in its compartment.
The input voltage is too low.	• Check that the battery input voltage is higher than the set threshold.

The Inverter modules BLOCK:	
PROBABLE CAUSE:	SOLUTIONS:
Overload.	• Check that the load applied is not greater than the allowed load. • Verify if there is a short circuit on the output connections; remove the faulty connection and check that the input and output fuses are good. • When first started, there may be a current rush due to the type of load. Wait and see if the alarm disappears, otherwise reduce the load.

Overtemperature.	• Check that the ambient temperature is not greater than 40° C. • Check that the front air vents are not obstructed and that there are no sources of heat near the System. • Presence of the Faulty fans alarm. **If the fault persists, contact the Service Centre.**
Boost stage failure.	• Reset the alarm by switching the module with the alarm off and then on again; if the fault persists, contact the Service Centre.
Inverter stage failure.	• Reset the alarm by switching the module with the alarm off and then on again; if the fault persists, contact the Service Centre.
Faulty fans alarm.	• The fans alarm switches the output onto the auxiliary mains (if the By-pass is present). The fans must be replaced as they are inefficient or faulty. Contact the Service Centre.

The Inverter module DOES NOT COMMUNICATE with the controller:	
PROBABLE CAUSE:	SOLUTIONS:
Inverter module not configured.	• The module has not been configured exactly with the dip-switches at the back. Follow the instructions provided in section “Insertion and configuration of the inverter modules”. • The exact number of modules present has not been configured in the SETTINGS menu.
The inverter module is a “stand alone” version (e.g. code PH-SA1500-48).	• The “stand alone” version does not operate in parallel in the System. It can be recognized by its code (e.g. PH-SA1500-48) or by the fact that it has an LCD display.

The Inverter modules have the 4 LEDs flashing:	
PROBABLE CAUSE:	SOLUTIONS:
Modules with the four LEDs flashing have the same node configured. “WRONG NUMBERING” on the display.	• Follow the instructions provided in the section “Insertion and configuration of the inverter modules”.

The Inverter module indicates IMPROPER USE (environmental conditions):	
PROBABLE CAUSE:	SOLUTIONS:
Output voltage.	• The module indicates the continual presence of overloads in output. Check the consumers connected to the output.
By-pass (auxiliary mains).	• The module indicates that the auxiliary mains is not very stable (in amplitude or in frequency). Check the By-pass voltage.
Input voltage (battery).	• The module indicates that the input voltage has gone below the minimum threshold set several times • The module indicates that the input voltage has gone over the maximum threshold set several times. • Check the equipment power supply.
Temperature.	• The module indicates that the maximum internal temperature alarm has been activated several times. • Check the ambient temperature (refer to the part of this section relating to “Module switched off due to overtemperature”.

Faults on the PHASYS STAR controller:	
DISPLAYS:	SOLUTIONS:
CONTROLLER FAULT Code:0000.00.XX ↵	If the message shown here is displayed during operation, press key P2 (ENT) to restore operation. Check that the settings in the SETTINGS menu are consistent with what is provided at installation. *If the display is shown again, contact the Service Centre.*
CONTROLLER FAULT Code:0000.XX.00 ↵	If the message shown here is displayed, the equipment cannot function correctly. *Contact the Service Centre.*
CONTROLLER FAULT Code:XXXX.00.00 ↵	If the message shown here is displayed during operation, open the single-pole fuse block **(F11)** located inside the **System** distribution at the top, and then close it again. *This should restore operation, if however it should be displayed again, contact the Service Centre.*

However, for the faults described above and for any other event not covered here, contact your nearest Service Centre and explain the problem. They will be pleased to give you all the instructions and explanations required.