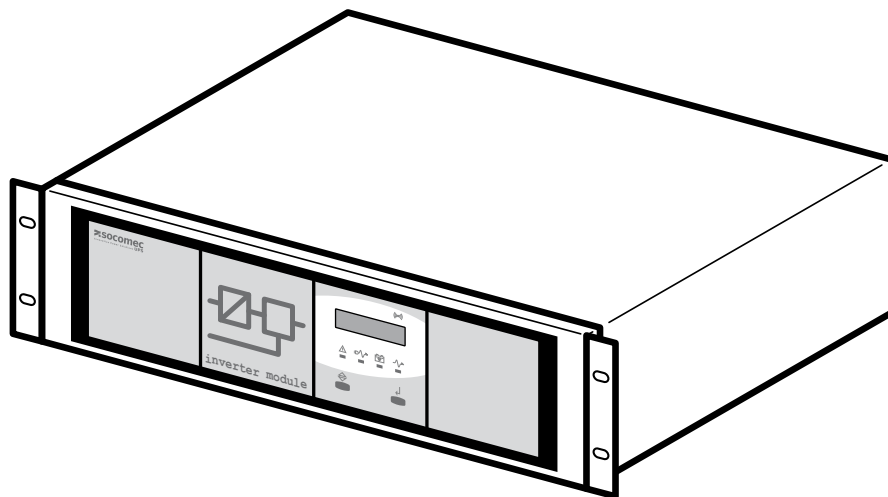


PHASYS

1.5-4.5 kVA



CONTENTS

| | |
|---|-----------|
| 1. OVERVIEW | 6 |
| 2. VERSIONS AVAILABLE | 7 |
| 3. SAFETY STANDARDS | 8 |
| 3.1. REFERENCE STANDARDS | 8 |
| 4. UNPACKING AND INSTALLATION | 10 |
| 4.1. ENVIRONMENTAL REQUIREMENTS FOR INSTALLATION..... | 10 |
| 4.2. ELECTRICAL REQUIREMENTS FOR INSTALLATION..... | 10 |
| 4.3. UNPACKING | 11 |
| 5. THE PHASYS INVERTER MODULE 1500-3000-4500 VA | 12 |
| 5.1. GENERAL INFORMATION..... | 12 |
| 5.2. BLOCK DIAGRAM | 12 |
| 5.3. GENERAL DESCRIPTION | 12 |
| 5.4. MAIN FEATURES | 13 |
| 5.5. DESCRIPTION OF PHASYS MODULE CONNECTIONS..... | 13 |
| 5.6. PHASYS MODULE ELECTRICAL CONNECTIONS..... | 15 |
| 5.6.1. <i>Inverter connection and protection procedures</i> | 15 |
| 5.6.2. <i>Description of inverter connections</i> | 16 |
| 5.7. DESCRIPTION OF THE MODULE KEYS..... | 19 |
| 5.8. PHASYS STAND ALONE CONFIGURATION | 20 |
| 5.8.1. <i>ECO-MODE configuration</i> | 20 |
| 5.9. STARTUP/SHUTDOWN OF THE INVERTER MODULE | 21 |
| 5.10. LCD DISPLAY | 21 |
| 5.11. LUMINOUS REPORT SIGNALS ON THE MIMIC PANEL | 24 |
| 5.12. DRY CONTACTS SIGNALLING..... | 24 |
| 6. TECHNICAL DATA | 26 |
| 7. MAINTENANCE | 28 |
| 7.1. TROUBLESHOOTING FOR SMALL PROBLEMS | 28 |

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.

SOCOMECS 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.

1. OVERVIEW

We would like to thank you for purchasing the Inverter Module of the **PHASYS** series, a product of advanced technological design from **SOCOMECS 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 inverter module 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 equipment, 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.

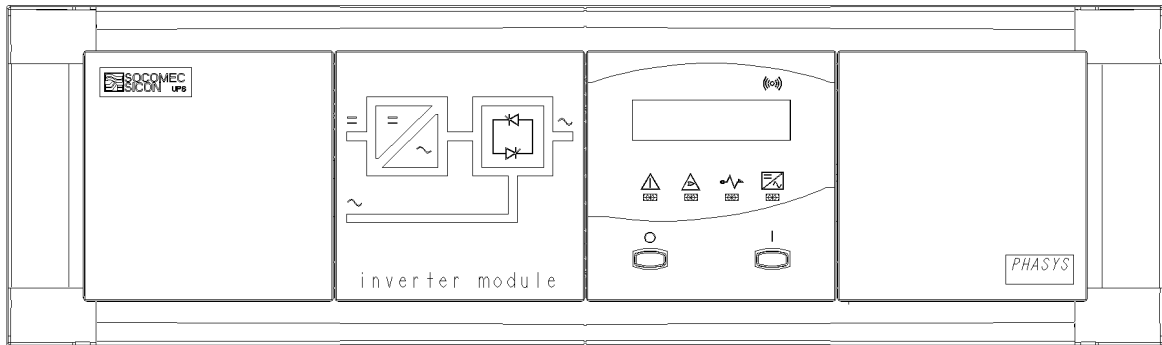
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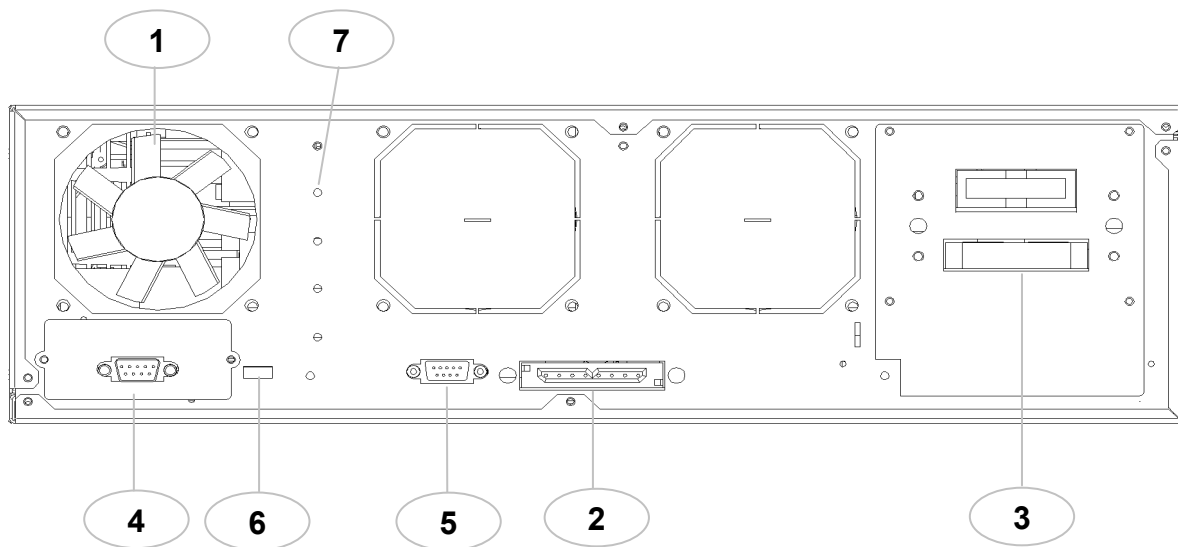
2. VERSIONS AVAILABLE

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

Front view



Rear view



PHASYS

1500

KEY:

- 1 Fan
- 2 DC input plug-in connector
- 3 AC By-pass input - AC output plug-in connector
- 4 Dry contacts interface
- 5 RS232 serial interface
- 6 Configuration Dip-switch
- 7 Earth connection

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 PHASYS inverter module 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~~ the various phases of installation, use ~~and~~ and maintenance of the PHASYS inverter.

Follow these instructions carefully before installation, during ~~use,~~ and later whenever it may be necessary to carry out maintenance operations on the ~~system~~ system.

Read this ~~the~~ "Operating Manual" carefully before using the inverter module.



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



Before start-up, the equipment must be provided with equipotential connection as established by the current safety standards. ~~The~~ The Earth cable must be connected to the bracket, located at the back and labelled (see the symbol in the table above), with the procedures described below, ensuring that ~~the~~ the connection is firmly secured so that it cannot be accidentally pulled out.

The same applies for the Earth connection for the consumers: all loads connected to the PHASYS inverter must be connected to the Earth terminal (yellow/green cable of the cable kit).



If the inverter module 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 Inverter Module.

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


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 without following 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 inverter 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 Module is installed.

Keep this “Operating Manual” carefully. This manual must always be kept near the PHASYS inverter 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 ed

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. UNPACKING AND INSTALLATION

4.1. Environmental requirements for installation

The PHASYS Inverter Module must be placed in a suitably ventilated location, which is large enough to enable easy installation and maintenance of the equipment.

The module should be installed taking the following points into consideration:

- The TLC Inverter was designed for use in closed environments.
- Place the equipment on a flat, stable surface; the equipment may not work properly if it is tilted.
- Avoid places subject to knocks or vibrations.
- Maintain ambient temperature between 0°C and 40°C and humidity less than 90% (without condensation). If possible, keep the equipment out of direct sunlight and away from other excessive heat or light sources.
- Avoid placing the equipment or any other heavy object on the cables.
- Ensure that the environment where the inverter is to be installed is not dusty.
- A space of at least 20 cm must be left at the back for adequate ventilation.
- A space of at least 100 cm must be left at the front for the air ventilation of the module and for access to the mimic panel.
- Ensure that the inverter module is close to the power supply source (Rectifier/Battery), so that the input cable reaches comfortably.
- Have a rear block so that the equipment cannot move backwards (if the keys are pressed too hard) during operation.

4.2. Electrical requirements for installation

The PHASYS inverter has been designed and must therefore be considered **as equipment for installation in a fixed position** or in any case as equipment to be incorporated permanently on Systems.

The cables provided for the electrical interconnection of the inverter **must not be considered** as sectioning devices for the power supply or for the output.

The PHASYS equipment requires a power supply equipped with 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 to the PHASYS inverter output.

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.

The PHASYS Module is internally prepared with the following overcurrent safety devices

- DC input: fuse on the negative polarity
- Inverter output: electronic circuitry.

It is however useful to provide output and battery input magneto-thermal switches (or fuses) of suitable capacity for easy sectioning.

It is also essential to have a safety and sectioning device on the By-pass input (see external safety devices below).

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 at the back of the equipment.**



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

4.3. Unpacking

Remove the module and take off all the packaging. The module should not be lifted by the plastic front panel, as this is fragile. **In order to take the equipment out, remove the upper shock-absorbing packaging, lift the product using the protective bag and then remove completely by holding 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 or repair.

WARNING!: all PHASYS module 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. The PHASYS Inverter Module 1500-3000-4500 VA

5.1. 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 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.

5.2. Block diagram

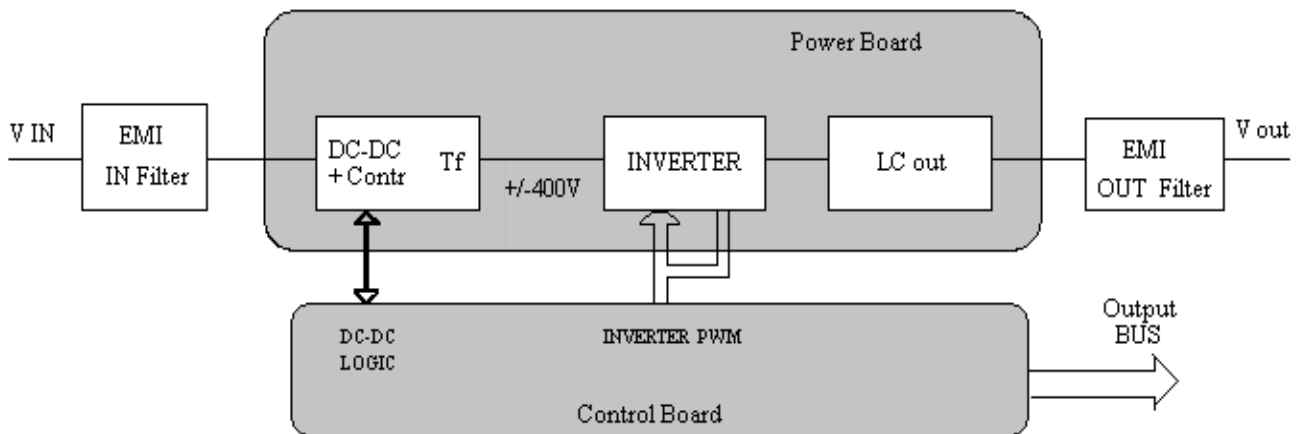


Fig. 1: PHASYS inverter module block diagram

5.3. 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 $\pm 400\text{Vdc}$. This stage operates at a frequency of 50KHz and is controlled by the 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).

5.4. Main features

The main features of the PHASYS 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 (on the “stand alone” version only).

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.

5.5. Description of PHASYS module connections

This section sets out the detailed instructions to install the PHASYS inverter module. Once the equipment has been installed, make sure it is blocked at the back (without obstructing the ventilation flow).

 **The connectors and the cable kit provided with the equipment must be used for connections.**

Refer to figure 2, and to the tables and boxes below.

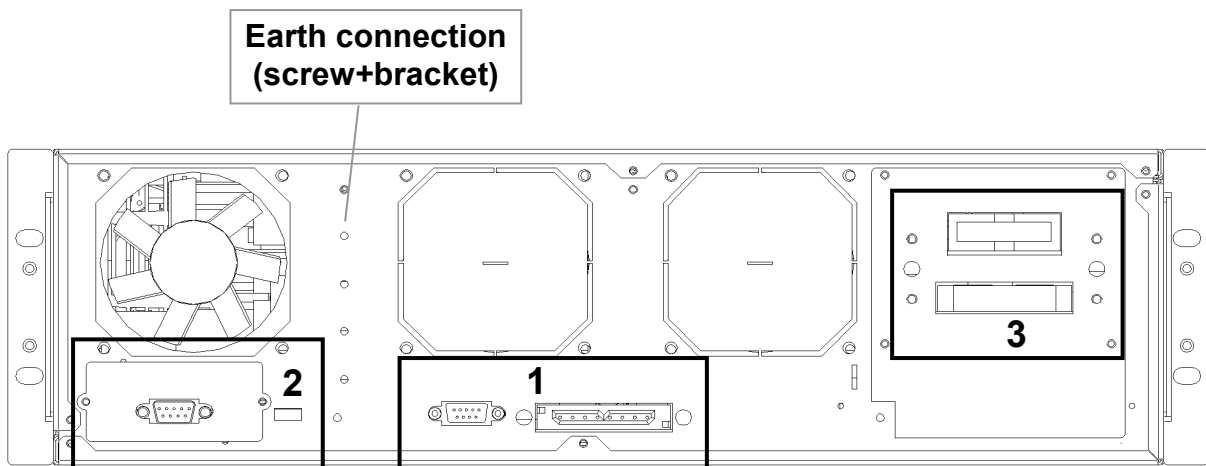
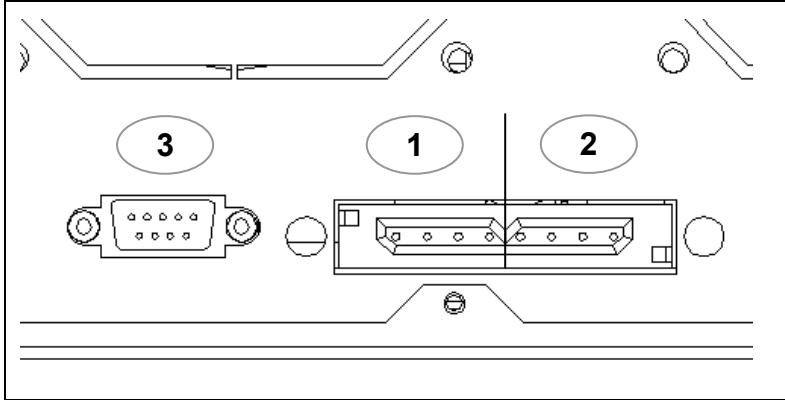


Fig. 2: rear view of the inverter module

WARNING!: all PHASYS module 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.

The details of the connectors at the back of the inverter module and a key to their meaning are given below.

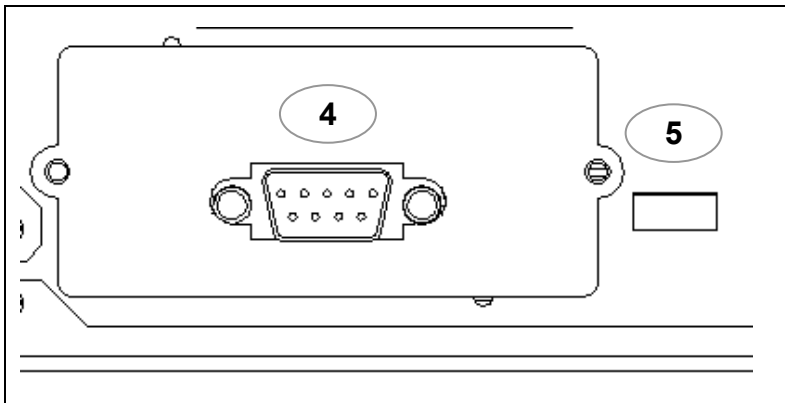
Box 1: Input and RS232 serial connector



KEY:

- 1 Input positive
- 2 Input negative
- 3 RS232 serial connector

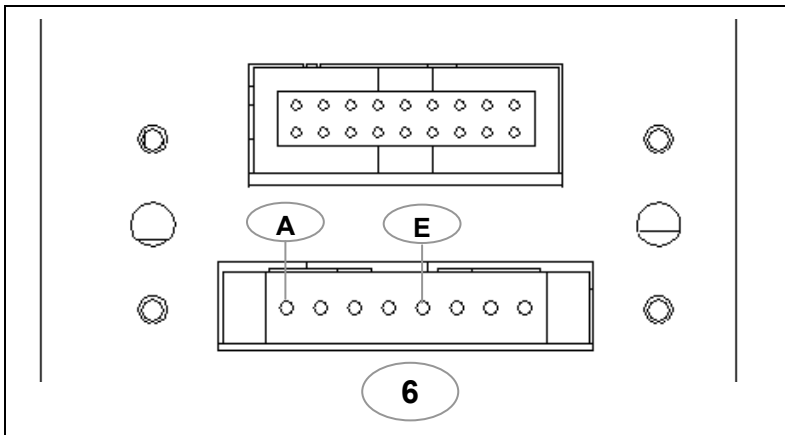
Box 2: Remote signalling and configuration DIP-switch connector



KEY:

- 4 Dry contacts connector
- 5 Configuration DIP-switch

Box 3: Output AC and Input By-pass connector



KEY:

- 6 Output AC and input By-pass connector
- A Earth connection
- B By-pass phase
- C Output neutral
- D Output phase
- E By-pass neutral



During the equipment installation phase, be careful not to press the start key before all the connection operations have been completed.

5.6. PHASYS module electrical connections

The input and output electrical connections must be effected using cables of appropriate section and conforming to the prevailing standards. All PHASYS inverter modules are easy to install and the power and signal connections are accessible from the back of the equipment. The inverter module packaging contains a “cable kit” consisting of polarized and labelled connectors (each connector has customized cable colours and labelling). There is also a descriptive label giving the electrical data at the back of the equipment, near each connector.

If not already available, a fuse-board must be prepared so as to be able to isolate the power supply upstream of the module. This fuse-board must have an automatic switch or fuses of sufficient capacity for the current absorbed at full load.

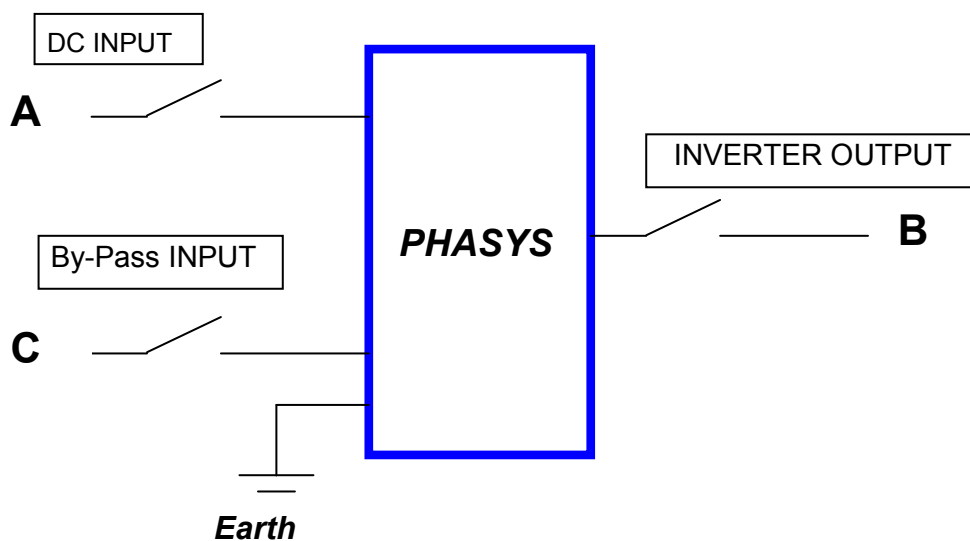
The battery input (fig. 3) and output/By-pass (fig. 4) connectors provided with the equipment are shown below.

5.6.1. Inverter connection and protection procedures

The various procedures for electrical input connection and protection and the minimum requirements and settings are shown below in diagram form.

TABLE 1

| Configuration | DC sectioning and protection A | Output sectioning and protection B | By-Pass sectioning and protection C |
|---------------------------------------|---|---|--|
| DC INPUT WITH POSITIVE EARTH POLARITY | Single-pole on negative polarity | Two-pole | Two-pole |
| DC INPUT WITH NEGATIVE EARTH POLARITY | Single-pole on positive polarity | Two-pole | Two-pole |
| ISOLATED DC INPUT | Two-pole | Two-pole | Two-pole |



5.6.2. Description of inverter connections

The following is a detailed description of the input, output and Earth connections, with their recommended safety devices. Follow the instructions given in TABLE 1 for the various ways of connecting the DC input.

The bracket must be securely fastened to avoid the cables being accidentally pulled out.

| | |
|---|--|
|  | WARNING!: The input and output connectors must NOT be inverted. |
|---|--|

INPUT CONNECTOR:

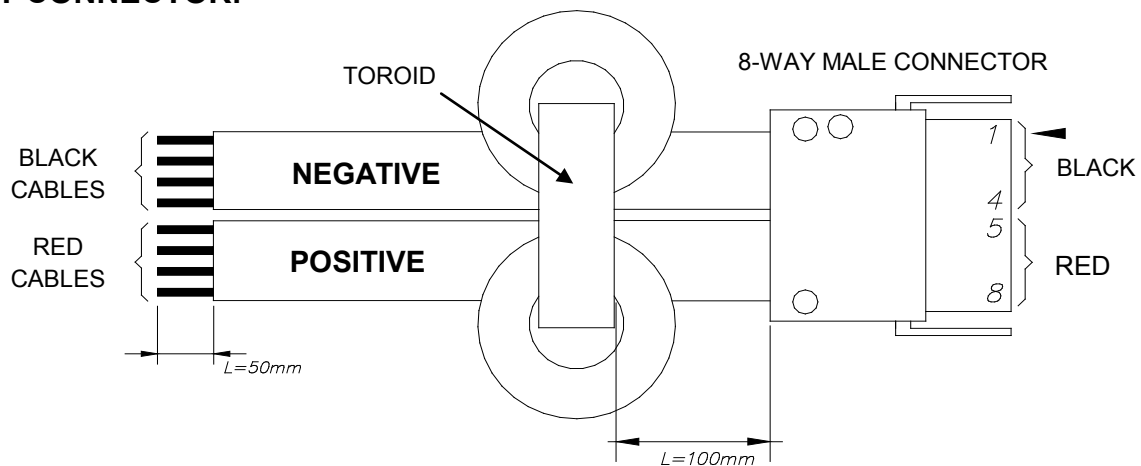


Fig. 3: Input connector

WARNING!: the input wires (positive and negative) for PHASYS 4500VA are all black; refer to the label around the cables.

| | |
|---|---|
|  | The positive and negative input polarity must be strictly observed |
|---|---|

NOTE:

- The safety devices are generally of the two-pole type, unless otherwise indicated in TABLE 1.
- The safety devices may be magneto-thermal switches or disconnectable fuses of the **minimum** indicated breaking capacity; **in any case** the safety device **must** have sufficient breaking capacity to **interrupt any short-circuit current supplied by the generators located upstream of the inverter** (Mains or DC source).
- The cable sections indicated are the minimum located upstream of the interconnection cable kit provided.

IMPORTANT!: For the correct operation of the PHASYS inverter module, the four red cables must be connected together and connected to the positive input polarity, while the four black cables must be connected to each other and connected to the negative input polarity.

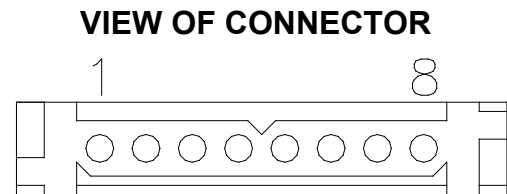
TABLE 2: reference to standard EN 60950 2001-2

| Model | DC INPUT (•) | | | | EARTH |
|----------------|---------------------------|--|------------------------------|---------------------------------------|--|
| | Maximum input current (A) | Minimum input section (mm ²) | Input safety device | Input safety device breaking capacity | Minimum EARTH section (mm ²) |
| PHASYS 1500 VA | 28 | 10 | AMT 32A "C" Fuse 32A GI | ≥ 10KA | ≥ 10 |
| PHASYS 3000 VA | 58 | 16 | AMT 63A "C" Fuse 63A GI | ≥ 10KA | ≥ 16 |
| PHASYS 4500 VA | 84 | 25 | AMT 100A "C" Fuse 100A GI | ≥ 10KA | ≥ 25 |

(•): values with reference to the nominal power and minimum input voltage (40V).

OUTPUT CONNECTOR:

| COLOUR | No. | CABLE |
|--------------|-----|-----------------------|
| Blue | 4 | By-Pass NEUTRAL (NBP) |
| Brown | 5 | Output PHASE (FINV) |
| Purple | 6 | Output NEUTRAL (NINV) |
| Grey | 7 | By-Pass PHASE (FBP) |
| Yellow/Green | 8 | EARTH |



8-WAY MALE CONNECTOR

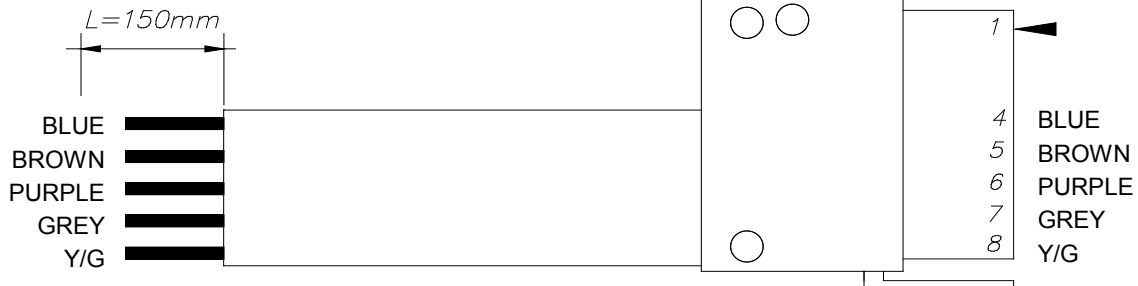


Fig. 4: Output connector

| | |
|--|--|
| | The phase and neutral connections must be strictly observed |
|--|--|

TABLE 3: reference to standard EN 60950 2001-2

| Model | INVERTER OUTPUT | | | | EARTH |
|----------------|----------------------------|--|----------------------------|---|--|
| | Maximum output current (A) | Min. output section (mm ²) | Output safety device | By-pass safety device breaking capacity | Minimum EARTH section (mm ²) |
| PHASYS 1500 VA | 7.2 | 1.5 | AMT 10A "C" Fuse 10A GI | ≥ 10kA | ≥ 1.5 |
| PHASYS 3000 VA | 14.4 | 2.5 | AMT 20A "C" Fuse 20A GI | ≥ 10kA | ≥ 2.5 |
| PHASYS 4500 VA | 21.6 | 2.5 | AMT 32A "C" Fuse 32A GI | ≥ 10kA | ≥ 2.5 |

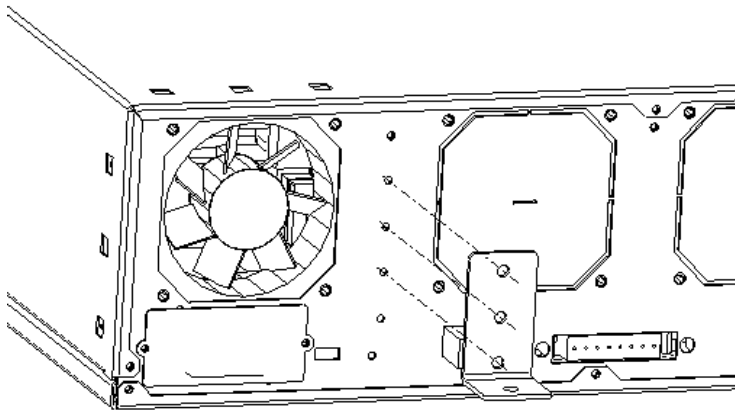
| Model | BY-PASS INPUT | | | | EARTH |
|----------------|-----------------------------|--|----------------------------|---|--|
| | Maximum By-pass current (A) | Minimum By-pass section (mm ²) | By-pass safety device | By-pass safety device breaking capacity | Minimum EARTH section (mm ²) |
| PHASYS 1500 VA | 7.2 | 1.5 | AMT 10A "C" Fuse 10A GI | ≥ 10kA | ≥ 1.5 |
| PHASYS 3000 VA | 14.4 | 2.5 | AMT 20A "C" Fuse 20A GI | ≥ 10kA | ≥ 2.5 |
| PHASYS 4500 VA | 21.6 | 2.5 | AMT 32A "C" Fuse 32A GI | ≥ 10kA | ≥ 2.5 |

WARNING!: the output and By-pass wires for PHASYS 4500VA are all black; refer to the label around the cables.

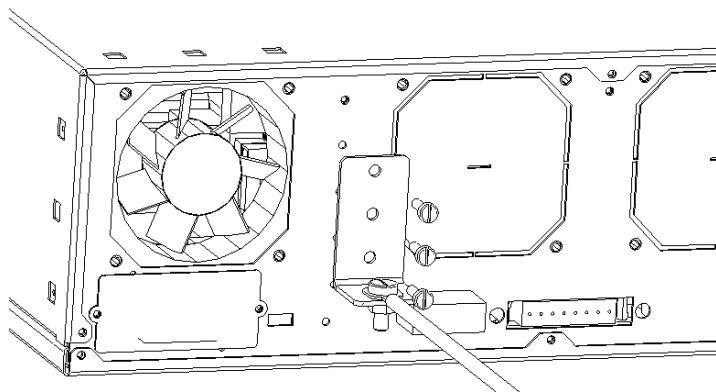
EARTH CONNECTION:

A bracket and the material needed to fasten it is provided for the Earth connection of the equipment. As can be seen in figure 5, the bracket is fastened at the back of the inverter module on the specifically prepared holes.

The bracket must be securely fastened to avoid the cable or the whole bracket being **accidentally pulled out**.



The bracket must be secured with the three screws (provided with the equipment) in the holes at the back of the equipment as shown in the figure.
Tightening torque 1N/m.

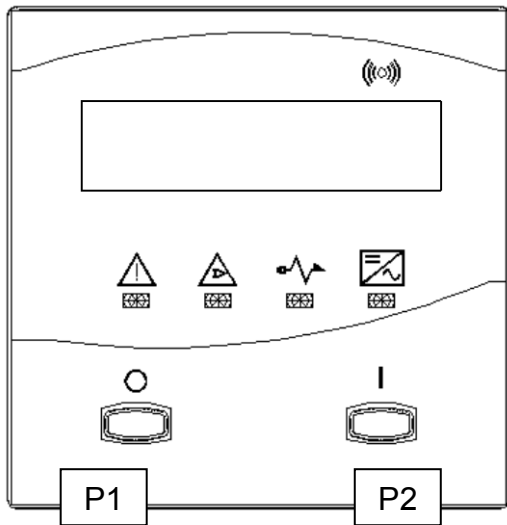


Secure the Earth cable (yellow-green) with a screw as shown here.
Tightening torque 3N/m.

Fig. 5: Earth connection

5.7. 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. From stand-by mode, 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. If the key is pressed down for a further 3-4 seconds, the startup procedure is activated.

Other functions:

SILENCE BUZZER

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

ALARM CODING

In the presence of an alarm (RED LED ON), simultaneously press keys P1 and P2 for 1 second to display the alarm by means of a code based on the flashing LED as described in TABLE 5.

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 corresponds to a load between 31% and 40%).

ALARM RESET

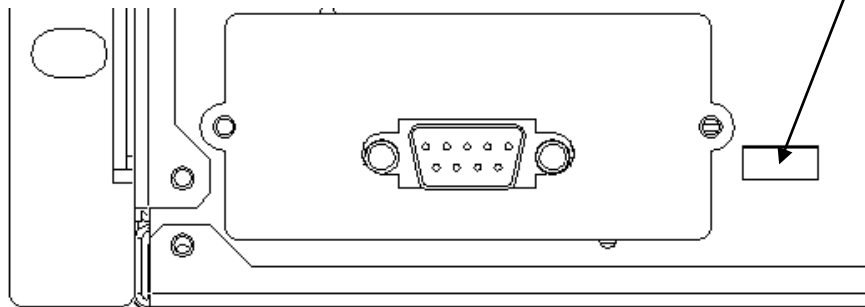
In the presence of an alarm (RED LED ON), pressing key P2 for 3 seconds resets the fault and the consumers are powered once more. If the equipment is operating from the By-pass, this action will also cause switching to the output inverter.

5.8. PHASYS stand alone configuration



WARNING! the factory setting is for operation with output at 230V / 50Hz. The configuration operations described below must be carried out with the inverter module switched off and disconnected from the power supply voltage.

4 auxiliary **DIP-switches** are accessible on the back panel, near connector DB9, for a different configuration of the voltage, the output frequency and the **BY-PASS** functions.



The 4 DIP-switches must therefore be set according to the table below to configure the module for a specific operation:

| DIP 1 | DIP 2 | DIP 3 | DIP 4 | Function |
|--------------|--------------|--------------|--------------|----------------------------|
| OFF | OFF | X | X | 230V output voltage |
| OFF | ON | X | X | 220V output voltage |
| ON | OFF | X | X | 240V output voltage |
| ON | ON | X | X | 208V output voltage |
| X | X | OFF | X | 50Hz output frequency |
| X | X | ON | X | 60Hz output frequency |
| X | X | X | OFF | BY-PASS enable |
| X | X | X | ON | BY-PASS disable (*) |

(*): this function excludes By-pass voltage management from the logic. The ECO-MODE function is also disabled with this configuration.

5.8.1. ECO-MODE configuration

With the inverter module in stand-by (GREEN LED flashing), hold keys P1 and P2 down simultaneously for approx. 10 seconds. The buzzer will sound (beep) when configuration for ECO-MODE operation has been effected. The following message will also be displayed:

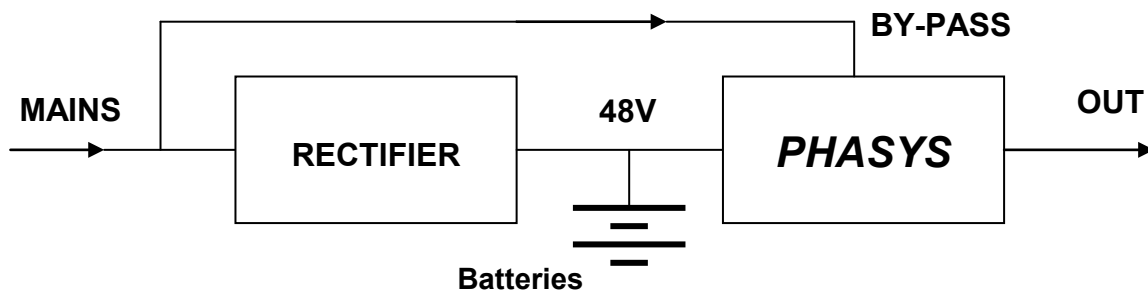
CONFIG: 230V 50Hz
ECO-MODE ACTIVE

This mode will be active after startup.

Note: Choosing this particular type of operation increases the efficiency of PHASYS (more than 98%) and therefore brings about lower energy consumption by the equipment. The **output voltage is filtered but not stabilized**: the inverter output voltage characteristics (such as distortion, tolerance, etc.) are in fact equivalent to those of the mains power supply.

Moreover, in this case the power of any rectifier present should be sufficient to allow battery charging within a reasonable time (see figure below).

Typical use of the ECO-MODE function



IMPORTANT: to disable the ECO-MODE function, the module must be put in stand-by mode and the operation described above has to be repeated.

 **ECO-MODE operation is recommended to power equipment that is not sensitive to spikes and micro-interruptions of the mains power supply.**

5.9. Startup/shutdown of the inverter module

Starting the module: once the input, output and By-pass electrical connections have been effected, follow the procedure described below to start the inverter module.

Press key P2 (ON): the module will go into stand-by mode. When the equipment is in stand-by, indicated by LED L1 flashing, the module's logic is activated and the fans are operational.

The start procedure is then activated by keeping key P2 pressed down for 3-4 seconds. LEDs L1-L2-L3 will switch on in succession.

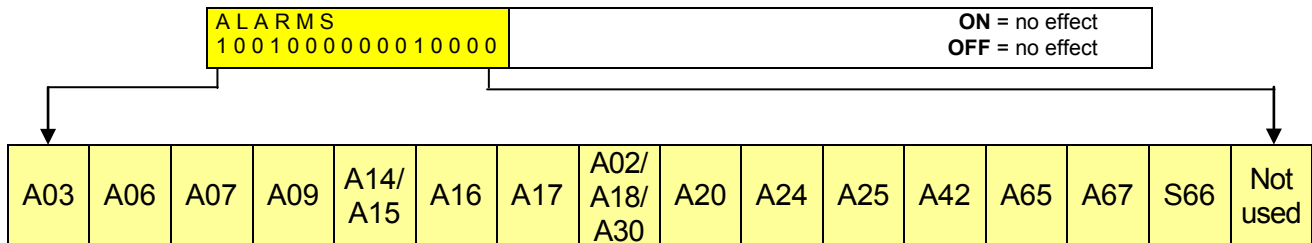
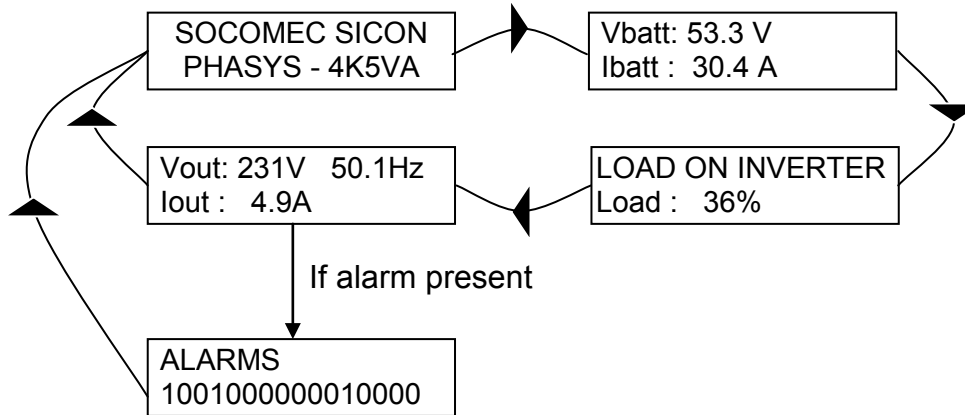
Shutting the module down: the module is switched off by pressing key P1 (OFF) for 3-4 seconds; the green LED L1 will flash. If P1 is held down for 6-7 seconds from this stand-by condition, the inverter will shut down completely (the buzzer will also emit a long beep).

5.10. LCD Display

The "stand alone" version of the inverter module has an LCD display which shows detailed information on the devices' operating status and on any faults that may be present; it is backlit to facilitate keying in operations. The backlighting is activated by pressing a key and automatically deactivates after a time.

On startup the start menu is displayed with a sequence of 4 messages as shown in the figure: the main information is displayed in rotation at 10 second intervals.

If there is an alarm, the message ALARMS will also be displayed, with the alarm code (refer to the table below for the interpretation of the type of alarm that is active).



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

The 16-digit code is positional, that is, a specific alarm corresponds to each digit. For the code of the alarm (or alarms) present, just count the position from SX to DX of the active alarm (1) and associate this to its position in the table shown above.

TABLE 4:

| Code | Description of alarm |
|-------------------|--|
| Alarm A03 | Output voltage out of tolerance |
| Alarm A06 | Auxiliary mains voltage out of tolerance |
| Alarm A07 | Ambient overtemperature |
| Alarm A09 | Short circuit in output |
| Alarm A14/A15 | Boost voltage under / over the limits |
| Alarm A16 | Battery voltage too high |
| Alarm A17 | Improper use of the equipment (environmental conditions) |
| Alarm A02/A18/A30 | Shutdown due to overload |
| Alarm A20 | Inconsistent settings |
| Alarm A24 | Boost failure |
| Alarm A25 | Inverter failure |
| Alarm A42 | e-service alarm |
| Alarm A65 | Faulty fans alarm |
| Alarm A67 | Battery voltage too low |
| State S66 | Indicates low fan efficiency |

The “stand alone” version of PHASYS normally has an LCD display, where the code of the active alarm can be displayed directly.

There is however a further code for the fault: when the red LED is ON, pressing keys P1 and P2 simultaneously for 3 seconds displays the active alarm, defined with the number of flashes of the LED. See table 5 for more information.

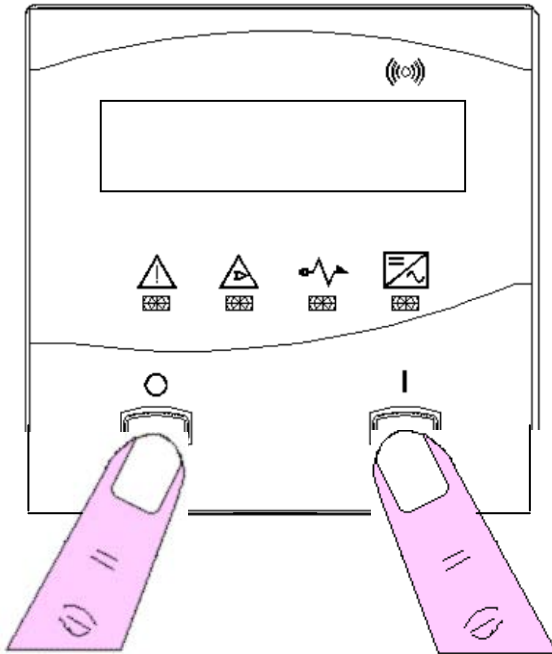


TABLE 5

| No. of flashes | Alarm present |
|----------------|---|
| 2 flashes | Battery voltage too low |
| 3 flashes | Battery voltage too high |
| 4 flashes | Block due to overtemperature |
| 5 flashes | Short circuit in output Shutdown due to overload |
| 6 flashes | Boost (or DC/DC) failure |
| 7 flashes | Inverter failure Output voltage out of tolerance |
| 8 flashes | By-pass voltage out of tolerance |
| 9 flashes | Improper use: output / load |
| 10 flashes | Improper use: By-pass |
| 11 flashes | Improper use: minimum battery |
| 12 flashes | Improper use: amb. temperature |

N.B.: if there are several alarms, only the flashes of the most significant one will be seen.

IMPROPER USE (A17) alarms: these are indicated by the following message on the display:

ALARMS
0000001000010000

these identify faulty conditions caused by the user which could compromise the correct operation of the inverter module.

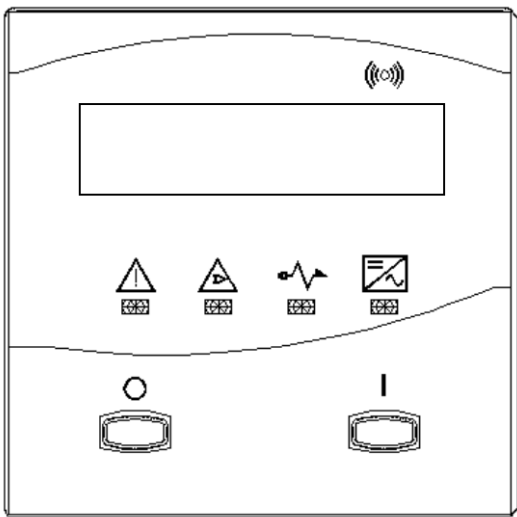




The alarm can be reset by pressing key P2 for 3-4 seconds; however, the presence of other active alarms (1) will be seen in the alarm message displayed, and these will indicate what generated the improper use of the equipment.

See the section on "Maintenance" for a more detailed explanation.

This alarm (also called environmental conditions) is always accompanied by A42 (e-service alarm); by means of the **Net Vision** option, an e-mail is sent to notify the presence of the alarm.

5.11. 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 by the PHASYS inverter stage. |
| | | L1 Slow flashing | Indicates stand-by state. |
| | | L1 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 output is powered by the auxiliary mains. Also indicates ECO-MODE active. |
| | | L2 Flashing | Indicates that manual By-pass switching has been effected. |
| | YELLOW  | L3 Constant | Indicates that a load greater than 105% of the nominal power is present in output (more than 115% with output on By-pass). |
| | RED  | L4 Constant | Indicates the presence of any alarm (A01 and A08 included). SEE TABLE 4 |
| | | L4 Flashing | Indicates that the pre-minimum battery state is active. The input voltage is close to the minimum battery value. |

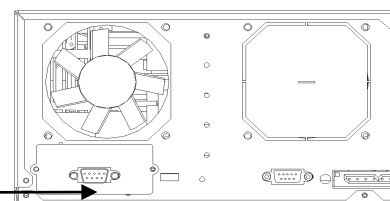
When the LCD display backlighting is off, the only function of key **P1** or **P2** is to switch on the backlight.

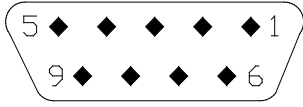
5.12. Dry contacts signalling

The PHASYS “Stand alone” version has a 9-way DB9 serial connector called XC3, located at the back at bottom left, for the management of a zero-potential contact for use in remote signalling.

An input for manual By-pass control is also available, on request.

The dry contacts are easy to access, by connecting to connector DB9, indicated in the figure with an arrow. Care must be taken to respect the pin configuration shown below.



| "Dry contact" connector | Pin configuration | Meaning |
|---|--|--|
|  | <p>pin 4 Contact NO Relay K1 pin 5 Contact NC Relay K1 pin 9 Common Relay K1</p> | <p>General alarm: (comprises all possible alarms)</p> |

| | |
|---|---|
|  | <p>THE MAXIMUM VOLTAGE THAT CAN BE APPLIED TO THESE CONTACTS IS 60Vdc, THE MAXIMUM CURRENT IS 500mA.</p> |
|---|---|

6. TECHNICAL DATA

PRODUCT CODES:

| | |
|---------------------|-------------------------------|
| PH-SA1500-48 | PHASYS inverter module 1500VA |
| PH-SA3000-48 | PHASYS inverter module 3000VA |
| PH-SA4500-48 | PHASYS inverter module 4500VA |

Standards

| | |
|----------------------|--|
| Directive 89/336/CEE | Standard EN50081-2 (EMC) Standard EN 61000-6-2 (Immunity) Standard ETSI EN 300 386 V1.3.1 ⁽¹⁾ |
| Directive 73/23/CEE | Standard EN60950 (Safety) |
| | ASTM D 999 (Vibrations) ASTM D 5276 (Shock) |

⁽¹⁾: positive connected to Earth, length of battery wires is less than 3 metres.

Environment

| | | | |
|-------------------------------------|-------------------------|----------------|----------------|
| Operating temperature | 0 ÷ 50°C ⁽²⁾ | | |
| 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 EN27779) | 1500VA | 3000 VA | 4500 VA |
| | < 48dB(A) 1mt | < 50dB(A) 1mt | < 52dB(A) 1mt |

⁽²⁾: temperature range between 0°C and 50°C with output power derating above 40°C (approx. 2.9% P_{nom}/°C).

Isolation

| | |
|-----------------------------------|-------------|
| Primary/earth isolation | 500Vac 50Hz |
| Secondary/earth isolation | 3kVac 50Hz |
| Primary/secondary isolation | 3kVac 50Hz |
| Isolation resistance (at 500 Vdc) | > 50 MΩ |

Reliability

| | |
|----------------------------------|--------------------|
| Mean Time between failure (MTBF) | ≥ 35 years at 25°C |
|----------------------------------|--------------------|

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 | | |
| 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% ⁽³⁾ |

⁽³⁾: can be set up to ±8% in By-pass configuration from the generator (GE).

Electrical output data

| | | | |
|---|---|----------------|----------------|
| Nominal output voltage (single-phase) | 208 ⁽⁴⁾ /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 | | |
| | 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 |

⁽⁴⁾: with 208V output configuration, output power derating is 80%.

7. MAINTENANCE



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

7.1. TROUBLESHOOTING FOR SMALL PROBLEMS

This section describes some of the most likely problems that may compromise the good operation of the PHASYS module, together with an attempt to determine causes and possible solutions.



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. | <ul style="list-style-type: none"> 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 power supply fuse is blown/open. | |
| The input voltage is too low. | <ul style="list-style-type: none"> Check that the battery input voltage is higher than the set threshold. |
| The inverter module is a plug-in version (e.g. code PH-1500-48). | <ul style="list-style-type: none"> The plug-in version only works when inserted on the System. It can be recognized by its code (e.g. PH-1500-48) or by the fact that it has no display. |

| The Inverter module STOPS: | |
|-----------------------------------|--|
| PROBABLE CAUSE: | SOLUTIONS: |
| Overload. | <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> • Check that the ambient temperature is not more than 40° C. • Check that the distance of the module from the rear wall is not less than 20 cm, that the front air vents are not obstructed and that there are no sources of heat near the equipment. • Presence of the Faulty fans alarm. If the fault persists, contact the Service Centre. |
| Boost stage failure. | <ul style="list-style-type: none"> • 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. | <ul style="list-style-type: none"> • 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. | <ul style="list-style-type: none"> • 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 indicates IMPROPER USE (environmental conditions): | |
|---|--|
| PROBABLE CAUSE: | SOLUTIONS: |
| Output voltage. | <ul style="list-style-type: none"> • The module indicates the constant presence of overloads in output. Check the consumers connected to the output. |
| By-pass. | <ul style="list-style-type: none"> • The module indicates that the auxiliary mains is not very stable (in amplitude or in frequency). Check the By-pass voltage. |
| Input voltage (battery). | <ul style="list-style-type: none"> • 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. | <ul style="list-style-type: none"> • 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”). |

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