

USER MANUAL



UNINTERRUPTIBLE POWER SUPPLY (UPS)

SLC TWIN PRO2

0,7.. 3 kVA

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1. INTRODUCTION.

1.1. ACKNOWLEDGEMENT LETTER.

We would like to thank you in advance for the trust you have placed in us by purchasing this product. Read this instruction manual carefully in order to be familiarized with its contents, because, as much as you know and understand the equipment the highest will be your satisfaction and safety levels and their features will be optimized too. We remain at your entire disposal for any further information or any query you should wish to make.

Yours sincerely.

SALICRU


- The equipment here described **can cause important physical damages due to wrong handling**. This is why, the installation, maintenance and/or fixing of itself must be done by our staff or qualified **personnel exclusively**.
- Although we have made every effort to guarantee a complete and accurate information in this user's manual, we are not responsible for any errors or omissions that may exist. The images included in this document are mere illustrations and they could not represent the part of the equipment exactly, therefore they are not contractual. Nevertheless, differences that could exist will be alleviated or solved with the correct labelling of the equipment.
- According to our policy of constant evolution, **we reserve the right to modify the specifications, operating or described actions in this document without forewarning**.

Any reproduction, copy or third party concession, modification or partial or in whole translations of this manual or document, in any format or media, **is prohibited without the previous written authorization of our firm**, being reserved the full and exclusive ownership right over it.

2. INFORMATION FOR SAFETY.

2.1. USING THIS MANUAL.

The documentation of any standard equipment can be downloaded from our website by the client (www.salicru.com).

 The operation of the device described in this document is based on the original factory settings and configuration. Section 7.3 shows the screens tree, the variables and the original configuration. Take into consideration that any modification of them can lead to changes in the behaviour of the device.

- Those equipments «supplied by power cord with plug», this is the website to get the user's manual and the **«Safety instructions»** EK266*08.
- Those equipments «with permt connection», hardwired, can be supplied together with a CD-ROM or Pen Drive, which includes any information needed for its erection and commissioning, including the **«Safety instructions»** EK266*08.

Before doing any action over the equipment regarding installation or commissioning, change of location, setting or handling, read them carefully.

This user's manual is intended to provide information regarding the safety and to give explanations about the procedures for the installation and operating of the equipment. Read them carefully and follow the stated steps in the established order.



Compliance as regards to «Safety instructions» is mandatory, being the user the legal responsible regarding to its observance and application.

The equipments are delivered duly labelled for the correct identification of any their parts, which combined with the instructions described in this user's manual, allows the end-user to make any operating of both installation and commissioning, in an easy and ordered way without doubt.

Finally, once the equipment is commissioned and in operation, it is recommended to keep the downloaded documentation from the WebSite, or the CD-ROM or Pen Drive in a safe place and with easy access, for further questions that could arise.

The following terms are used in the document indistinctly to be referred to:

- **«SLC TWIN PRO2, TWIN PRO2, TWIN, PRO2, equipment, unit o UPS»**.- Uninterruptible Power Supply.
Depending on the context of the sentence, it can be referred either to the own equipment or to the equipment with batteries, although all is assembled in one cabinet or metallic enclosure.
- **«Batteries or accumulators»**.- Group or set of elements that store the electron flow through electrochemical means.
- **«T.S.S.»**.- Technical Service & Support.
- **«client, fitter, operator or end-user»**.- are used indistinctly and by extension, to be referred to the fitter and/or operator which will make the corresponding actions, being responsible the same person about the actions to take on behalf of himself.

2.1.1. Conventions and used symbols.

Some symbols can be used and shown in the equipment and/or in the description of this user's manual.

For more information, see section 1.1.1 of EK266*08 document as regards to **«Safety instructions»**.

3. QUALITY AND STANDARD GUARANTEE.

3.1. DECLARATION OF THE MANAGEMENT.

Our target is the client's satisfaction, therefore this Management has decided to establish a Quality and Environmental policy, by means of installation a Quality and Environmental Management System that becomes us capable to comply the requirements demanded by the standard **ISO 9001** and **ISO 14001** and by our Clients and concerned parts too.

Likewise, the enterprise Management is committed with the development and improvement of the Quality and Environmental Management System, through:

- The communication to all the company about the importance of satisfaction both in the client's requirements and in the legal and regulations.
- The Quality and Environmental Policy diffusion and the fixation of the Quality and Environment targets.
- To carry out revisions by the Management.
- To provide the needed resources.

3.2. STANDARD.

This product is designed, manufactured and commercialized in accordance with the standard **EN ISO 9001** of Quality Management Systems. The **CE** marking shows the conformity to the EEC Directive by means of the application of the following standards:

- **2014/35/EU**. - Low Voltage Directive [LVD].
- **2014/30/EU**. - Electromagnetic Compatibility [EMC].
- **2011/65/EU**. - Restriction of Hazardous Substances in electrical and electronic equipment [RoHS].

In accordance with the specifications of the harmonized standards. Standards as reference:

- **EN-IEC 62040-1**. Uninterruptible power supply [UPS]. Part 1-1: General and safety requirements for UPS's used in accessible areas by end users..
- **EN-IEC 60950-1**. IT equipments. Safety. Part 1: General requirements.
- **EN-IEC 62040-2**. Uninterruptible power supply [UPS]. Part 2: EMC requirements.



The manufacturers responsibility is excluded in the event of any modification or intervention in the product by the customer's side.



WARNING!:

SLC TWIN PRO2 0.7.. 3 kVA. This is a category C2 UPS product. In a residential environment, this product may cause radio interference, in which case the user may be required to take additional measures.

The use of this equipment is not suitable for life support applications, where the failure of it can leave out of service the life support device or could affect to its safety or effectiveness. Likewise, it is not recommended its use in those medical applications, commercial transport, nuclear power stations and other applications or loads, where the failure of this product can reverse in personal injuries and material damages.



Declaration of conformity CE of the product is at the client disposal under previous request to our headquarters offices.

3.3. ENVIRONMENT.

This product has been designed to respect the environment and has been manufactured in accordance with the standard **ISO 14001**.

Equipment recycling at the end of its useful life:

Our company commits to use the services of authorised societies and according to the regulations, in order to treat the recovered product at the end of its useful life (contact your distributor).

Packaging:

To recycle the packaging, follow the legal regulations in force, depending on the particular standard of the country where the equipment is installed.

Batteries:


The batteries mean a serious danger for health and environment. The disposal of them must be done in accordance with the standards in force.

4. PRESENTATION.

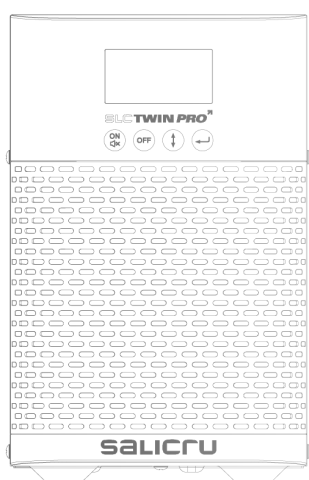
4.1. VIEWS.

4.1.1. Views of the equipment.

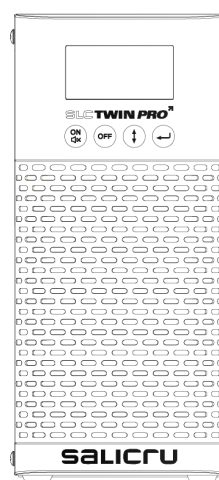
Fig. 1 to 10 show the illustrations of the equipment according to the case format and depending on the power of the model. Nevertheless and due to the constant evolution of the product, some discrepancies or small contradictions can arise. In front of any doubt, the labelling of the equipment will always prevail.

 All the values referring to the main features or specifications can be checked in the **nameplate of the equipment**. Keep them in mind for its installation.

4.1.2. Frontal UPS panel.

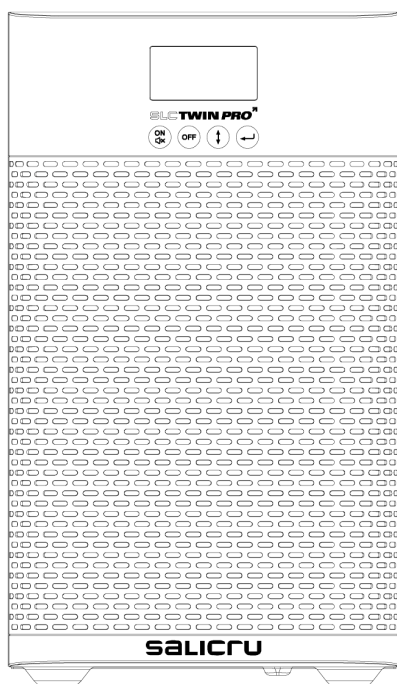


Models from 0.7 and 1 kVA -standard-

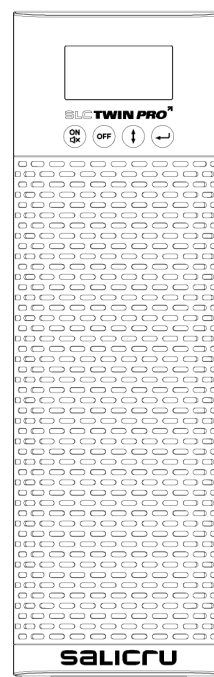


Models from 0.7 and 1 kVA -B1-

Fig. 1. Front view from 0.7 to 1 kVA models.



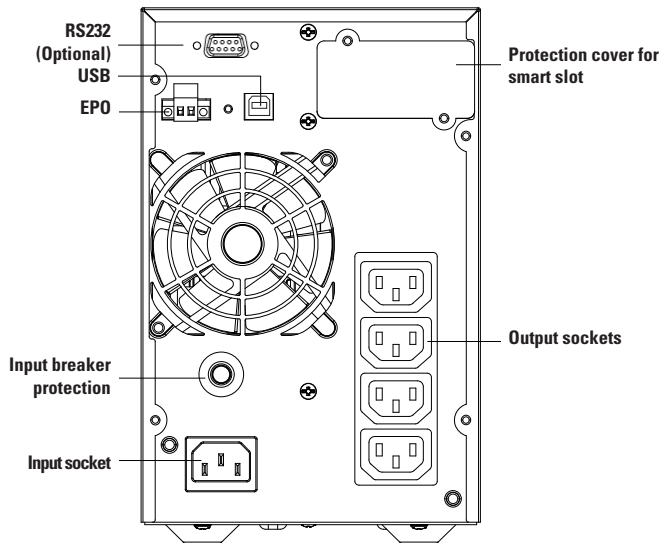
Models from 1.5 and 3 kVA -standard-



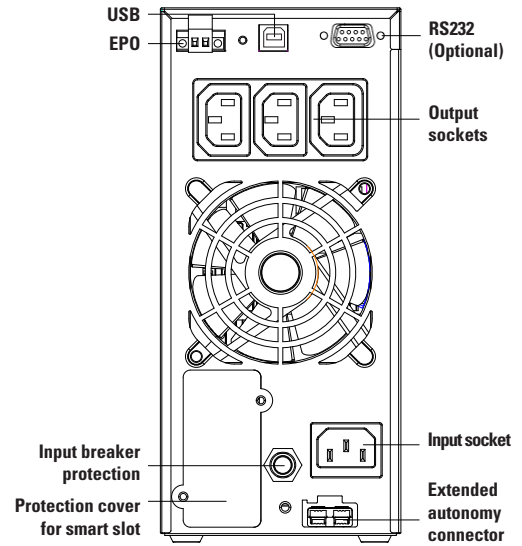
Models from 1.5 and 3 kVA -B1-

Fig. 2. Front view from 1.5 to 3 kVA models.

4.1.3. Rear panel IEC.

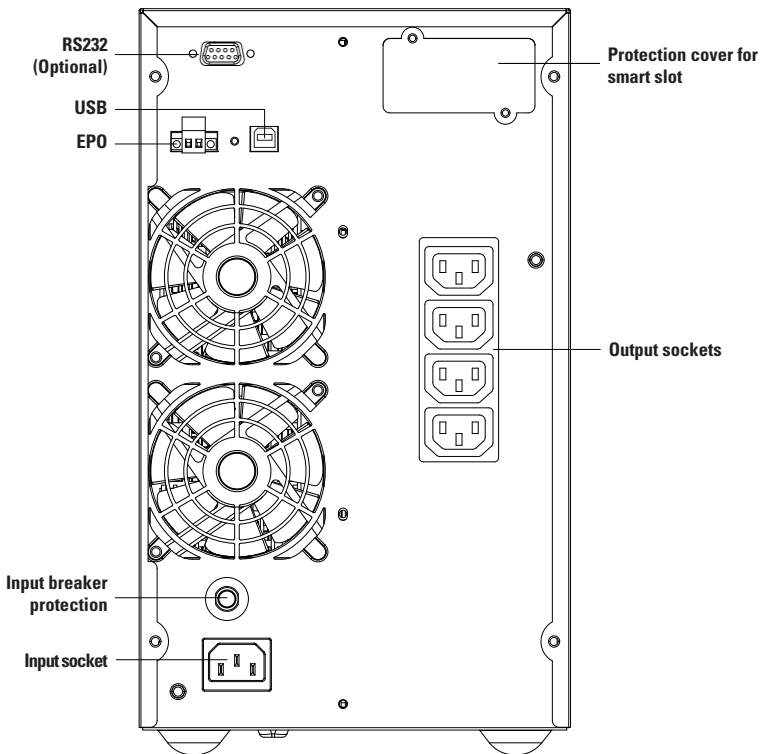


Models from 0.7 and 1 kVA -standard-

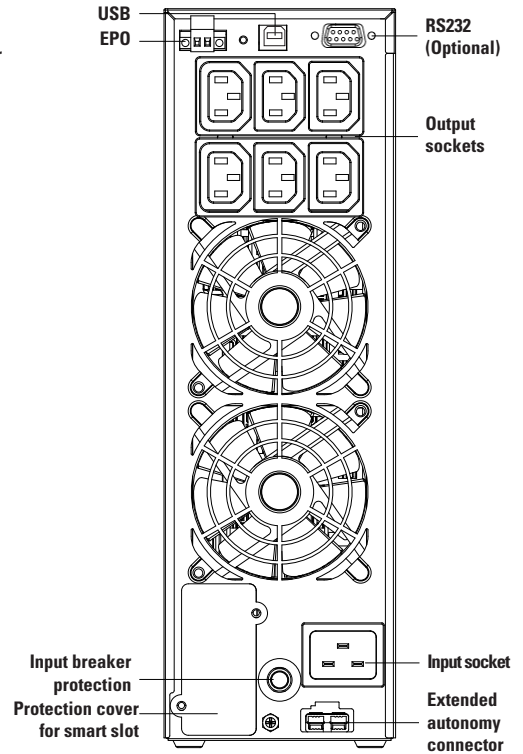


Models from 0.7 and 1 kVA -B1-

Fig. 3. Rear views from 0.7 to 1 kVA models with IEC output connectors.

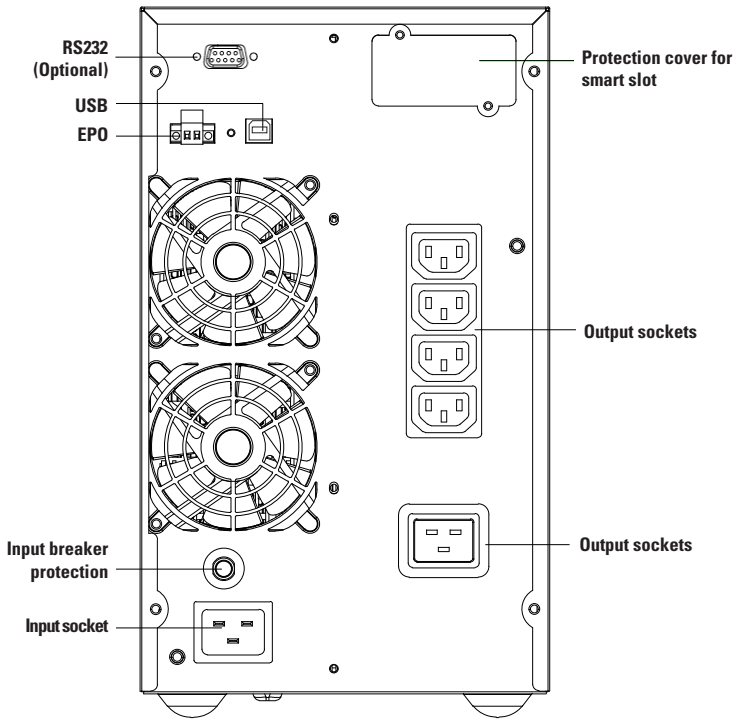


Models from 1.5 and 2 kVA -standard-

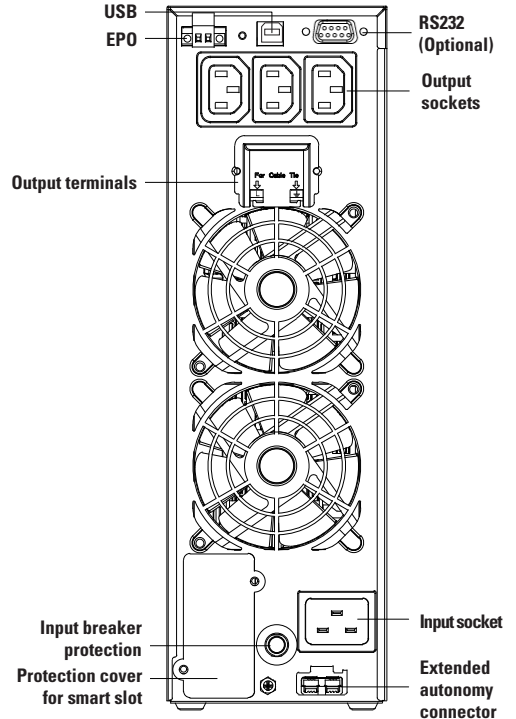


Models from 1.5 and 2 kVA -B1-

Fig. 4. Rear views from 1.5 to 2 kVA models with IEC output connectors.



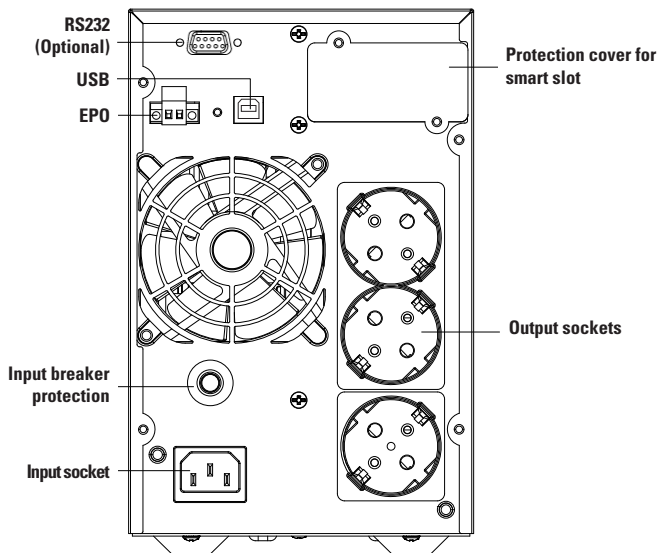
Models from 3 kVA -standard-



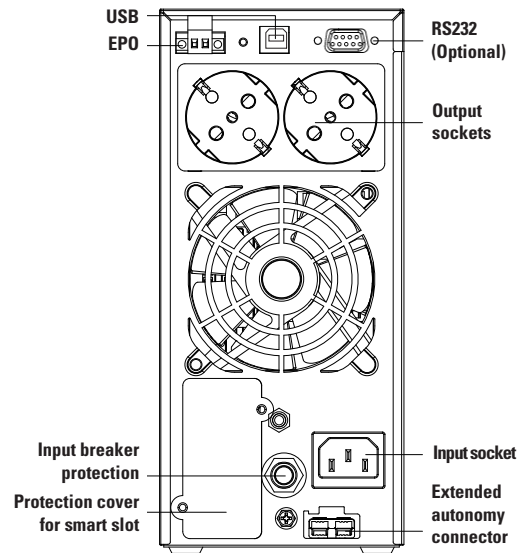
Models from 3 kVA -B1-

Fig. 5. Rear views from 3 kVA model with IEC output connectors

4.1.4. Rear panel schuko.

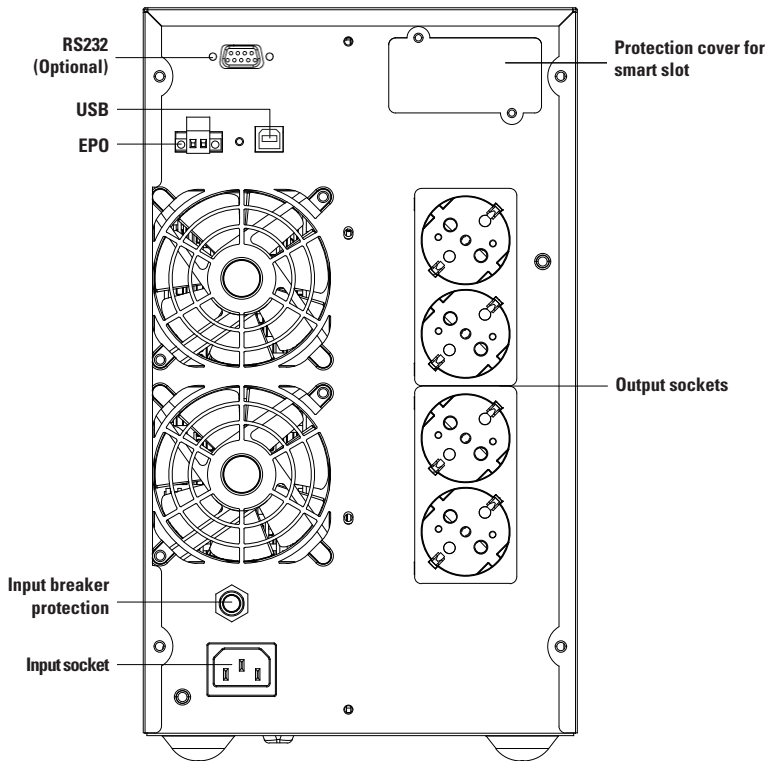


Models from 0.7 and 1 kVA -standard-

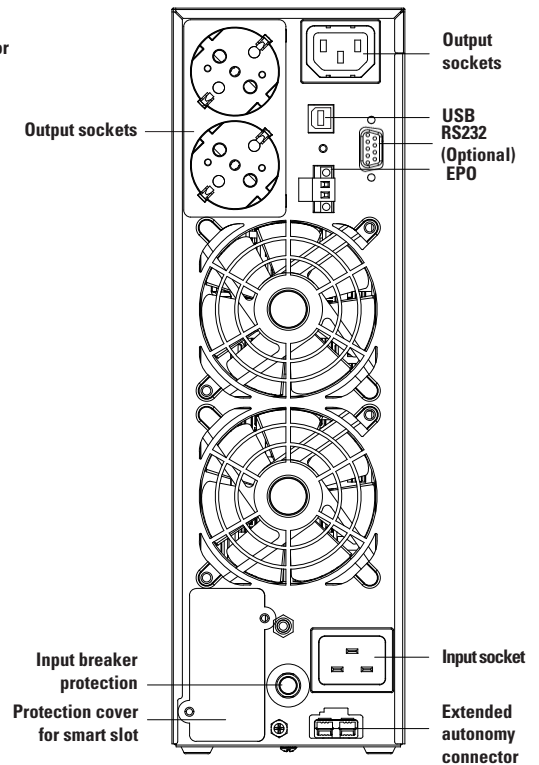


Models from 0.7 and 1 kVA -B1-

Fig. 6. Rear views from 0.7 to 1 kVA models with schuko output sockets.

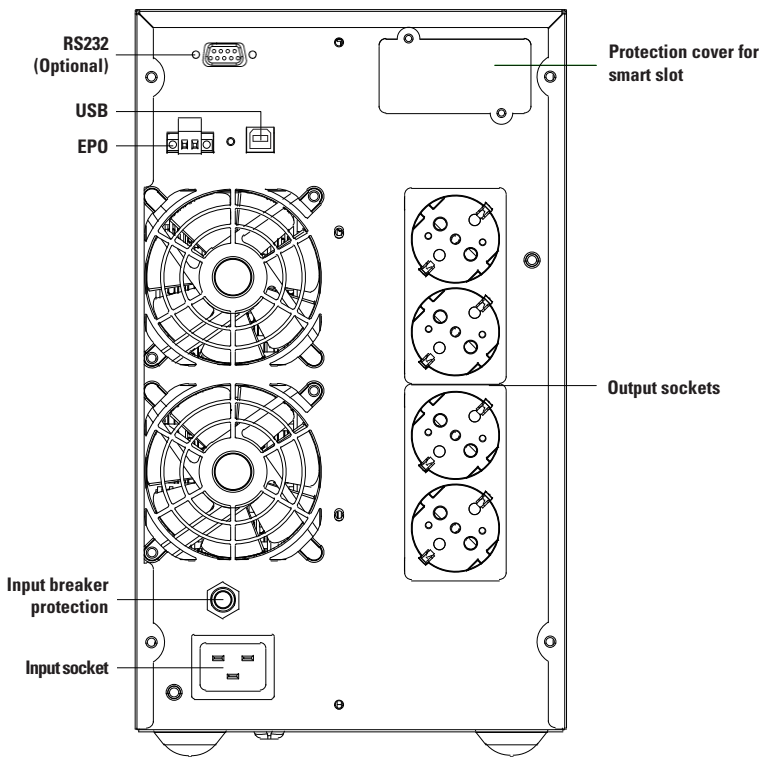


Models from 1.5 and 2 kVA -standard-

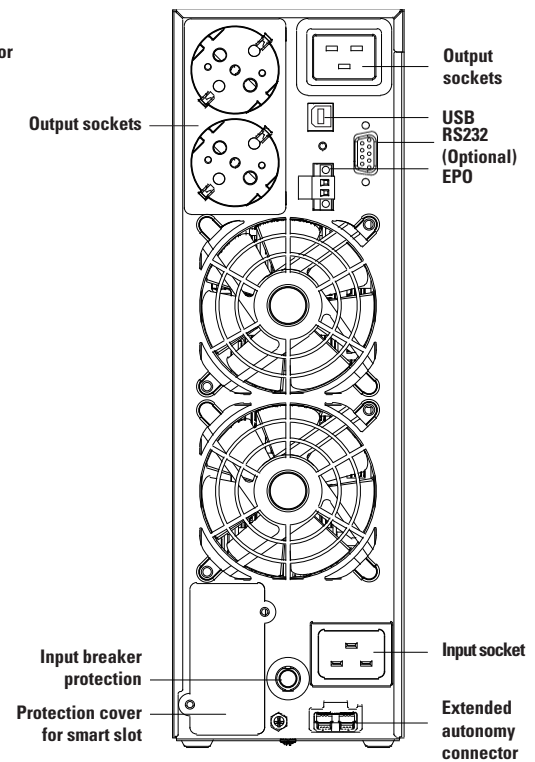


Models from 1.5 and 2 kVA -B1-

Fig. 7. Rear views from 1.5 to 2 kVA models with schuko output sockets.



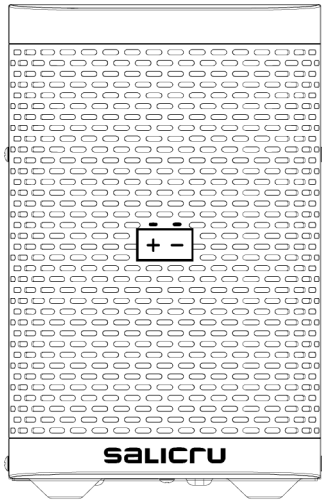
Models from 3 kVA -standard-



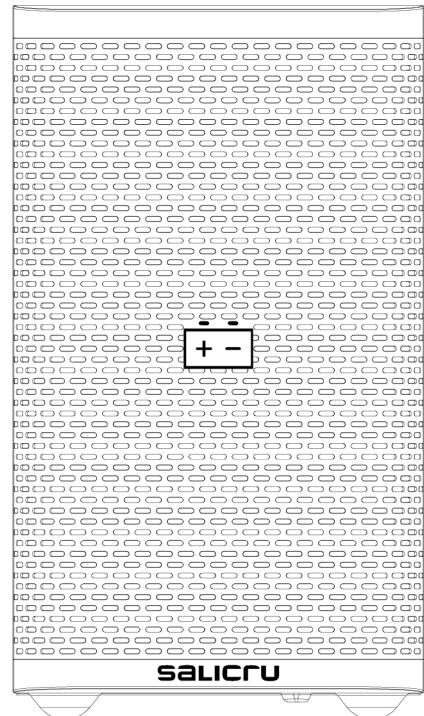
Models from 3 kVA -B1-

Fig. 8. Rear views from 3 kVA model with schuko output sockets.

4.1.5. Frontal battery panel.



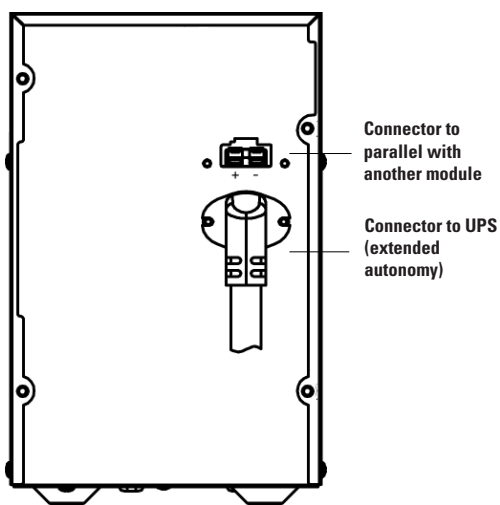
Battery module for models 0.7 and 1 kVA



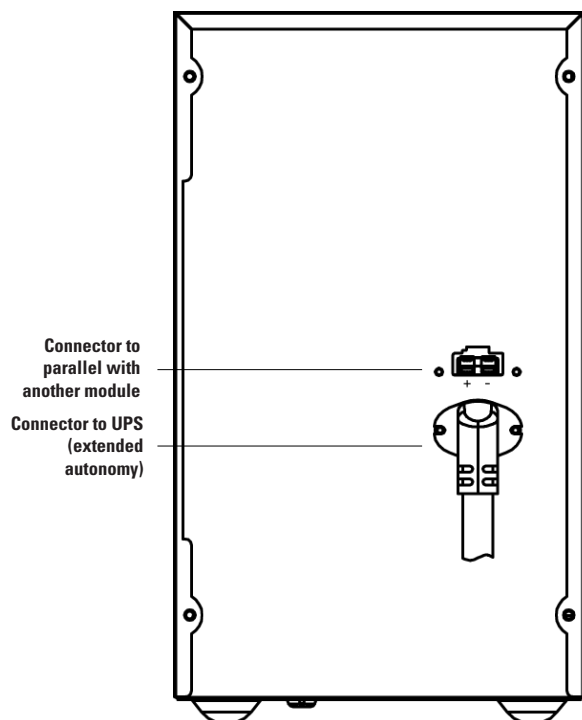
Battery module for models 1.5 and 3 kVA

Fig. 9. Front view from battery module.

4.1.6. Rear battery panel.



Battery module for models 0.7 and 1 kVA



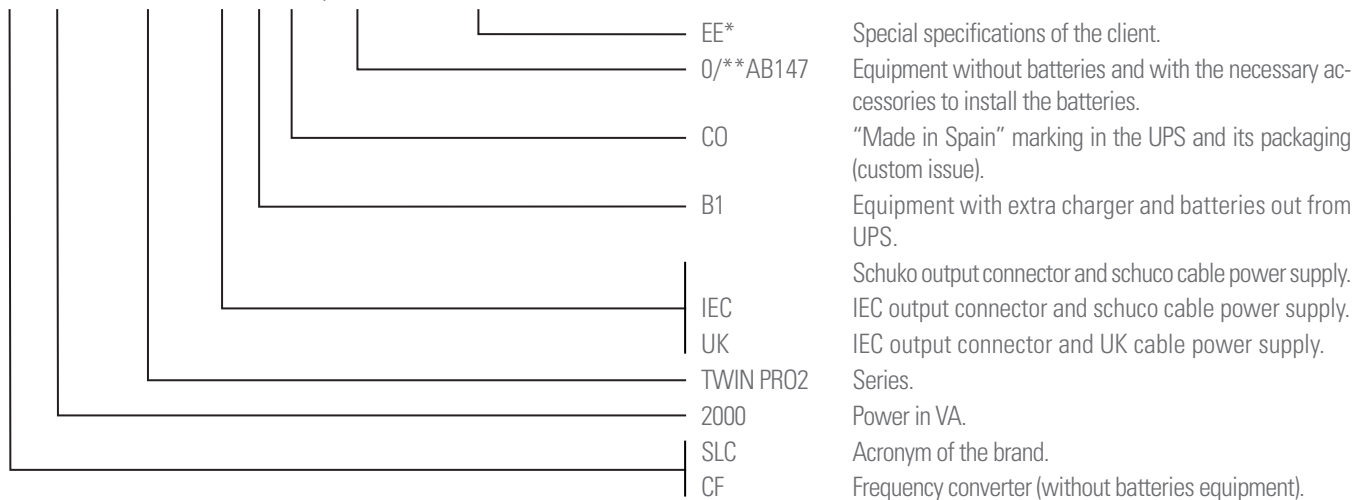
Battery module for models 1.5 and 3 kVA

Fig. 10. Rear view battery module for extended autonomy.

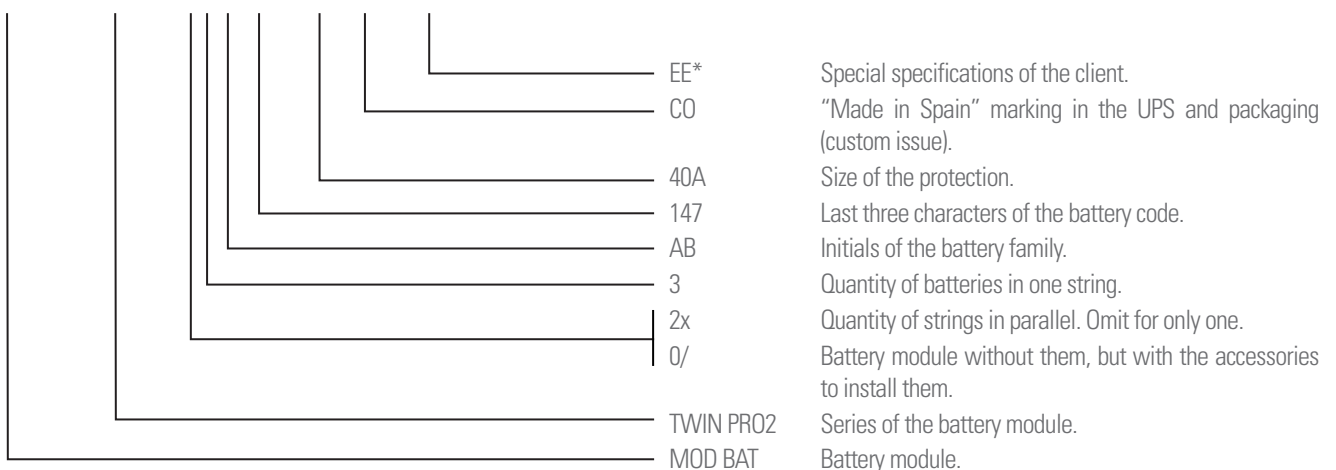
4.2. DEFINITION OF THE PRODUCT.

4.2.1. Nomenclature.

SLC-2000-TWIN PRO2 IEC B1 CO 0/**AB147 "EE29503"



MOD BAT TWIN PRO2 2x3AB147 3x40A CO EE521925



Note as regards to the batteries:

Acronyms B0 and B1 stated in the nomenclature is related to the batteries:

- B0 Equipment without batteries and with the necessary accessories to install the batteries.
Batteries owned by the client will be installed out from the case or cabinet of the UPS.
- B1 Equipment with extra battery charger. The equipment is supplied without batteries and no accessories (screws and electrical cables), corresponding to the specific batteries in the model.
Under request is possible to supply the accessories (screws and electrical cables), needed to install and connect the batteries.

For equipments requested with no batteries, the acquisition and connection of them will always be done by the customer and **under his responsibility**.

Data related to batteries about quantity, capacity and voltage are stated in the battery label stucked beside the nameplate of the equipment, **respect strictly** these data and connection polarity of the batteries.

4.3. OPERATING PRINCIPLE.

This manual describes the installation and operating of the Uninterruptible Power Supply [UPS] from SLC TWIN PRO2 series as equipments that can run as a complete separate and independent units. UPSs from SLC TWIN PRO2 series assures an optimal protection for any critical load, keeping the power supply of the loads between the stated parameters, with no break, during any blackout, or mains fluctuations or deteriorations with a wide range of available models (from 0.7 kVA to 3 kVA), it allows adapting the model to the end-user needs.

Thanks to the used technology, PWM (Pulse Width Modulation) and double conversion, the UPSs from SLC TWIN PRO2 series are compact, silent, and with high efficiency.

The double conversion principle cancels all the AC mains perturbations. A rectifier converts the alternating current from AC input mains into DC direct current, that keeps at the optimal level the batteries and supplies the inverter, which at the same time generates an AC voltage ready to feed the loads permanently. In case of fault of the input power supply of the UPS, the batteries supplies clean energy to the inverter.

The UPS design and construction from SLC TWIN PRO2 series have been done in accordance with the international norms.

So, this series has been designed to maximize the availability of the critical loads and make sure that your business is protected against fluctuations of voltage, frequency, electrical noises, blackouts and mains faults, which are present in the energy distribution lines. This is the main target of the UPSs from SLC TWIN PRO2 series.

This manual is applicable to the standardized models and stated in Tab. 1.

Model	Power (VA)	Type
SLC-700-TWIN PRO2	700	Standard
SLC-1000-TWIN PRO2	1000	
SLC-1500-TWIN PRO2	1500	
SLC-2000-TWIN PRO2	2000	
SLC-3000-TWIN PRO2	3000	
SLC-700-TWIN PRO2 B0	700	Without batteries
SLC-1000-TWIN PRO2 B0	1000	
SLC-1500-TWIN PRO2 B0	1500	
SLC-2000-TWIN PRO2 B0	2000	
SLC-3000-TWIN PRO2 B0	3000	
SLC-700-TWIN PRO2 B1	700	Standard with extended autonomy
SLC-1000-TWIN PRO2 B1	1000	
SLC-1500-TWIN PRO2 B1	1500	
SLC-2000-TWIN PRO2 B1	2000	
SLC-3000-TWIN PRO2 B1	3000	

Tab. 1. Standardized basic models.

4.3.1. Main features.

- True on-line double conversion and independent output frequency from mains.
- Output power factor of 0,9 and pure sinewave, suitable for almost any kind of loads.
- Input power factor > 0,99.
- Great adaptability to the worst conditions of the input mains. Wide margins of the input voltage, frequency range and wave shape, so it is avoided the excessive dependence on the limited energy of the battery.
- Availability of battery chargers up to 6 A in order to decrease the battery recharging time.
- High efficiency mode can be selected > 0,97 [ECO-MODE]. Energy saving, which reverts to the user in an economy way.
- It is possible to start up the equipment without mains or the battery discharged. Watch this last aspect, because the back up time will be decreased as much discharged the batteries are.
- The technology of the smart management of the battery is very useful for making longer the accumulator lifetime and to optimise the recharging time.
- Standard communications options by means of USB port.
- Control of the remote emergency power off [EPO].
- Control signal of the remote emergency power off [EPO].
- Interface between the user and the equipment through the control panel LCD, user friendly.
- Option cards are available to improve the communication capacity of connectivity.

4.4. OPTIONS.

Depending on the selected configuration, the equipment can include any of the following options:

4.4.1. Isolation transformer.

The isolation transformer, provides a galvanic isolation that allows isolating the output from the input completely.

The installation of an electrostatic shield between the primary and secondary windings of the transformer provides a high level of attenuation of the electrical noises.

The isolation transformer can be installed at the input or output of the UPS from SLC TWIN PRO2 series and it will always be located out from the equipment enclosure.

4.4.2. External maintenance manual bypass.

The purpose of this option is to isolate electrically the equipment from mains and critical loads, without breaking the power supply to the loads. Therefore, in this way the maintenance or fixing tasks can be done in the equipment with no interruption on the power supply energy to the protected system, at the same time that unnecessary risks are avoided to the technical staff, because it allows a complete disconnection of the UPS from the installation.

4.4.3. Integration in IT networks by means of the SNMP adaptor.

The big IT systems based on LANs and WANs that integrate servers with different platforms, they have to include an easy way of controlling and management at the manager system disposal. This facility is got through the SNMP adaptor, which is well-known by the main software and hardware manufacturers.

The available SNMP option for SLC TWIN PRO2 series is a card to be inserted into the slot that the UPS has in its rear side.







The connection of the UPS with the SNMP is internal meanwhile the connection between the SNMP and the IT network is done through a RJ45 connector 10 base.

4.4.4. MODBUS protocol.

The big IT systems based on LANs and WANs, many times they require that the communication with any device to be integrated in the IT network has to be done by means of an industrial standard protocol.

One of the most used industrial standard protocols in the market is the MODBUS protocol. SLC TWIN PRO2 series is also ready to be integrated in this type of environments through the external SNMP device with MODBUS protocol.


5. INSTALLATION.

-  Read and respect the Safety Information, described in section 2 of this document. The fact of ignoring any of the indications described in it, can cause serious accidents or very serious injuries to the persons in the vicinities in direct contact, as well as damages to the equipment and/or loads connected to itself.
-  All connections of the equipment including the control (interface, remote panel, ...), will be done with the switches at rest and no voltage present (UPS power supply switch to «Off»).
-  Never forget that the UPS is an electrical energy generator, so the user has to take the needed cautions against direct and indirect contacts.
-  Battery circuit is not isolated from input voltage. Hazardous voltages can be found out between the battery terminals and earth. Check that there is not input voltage before doing any intervention on them.
-  Any protection earth (⊕) contact or terminal of the plugs, outlets and/or connectors, at the input or output of the equipment are electrically joined among them, which is extended till the loads connected to the output of the UPS.
-  As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth ⊕).
It is compulsory that the power supply that feeds the equipment has this protection earth (⊕) cable duly connected.

5.1. RECEPTION OF THE EQUIPMENT.


- Any equipment handling will be done keeping in mind the weights and technical features of the model, stated in section «9. Annexes». Pay attention to section 1.2.1. from «**Safety intructions**» EK266*08 regarding handling, moving and location of the equipment.

5.1.1. Inspection.

- On receiving the device, make sure that it has not suffered any damage in transport (impact, drop, ...) and its features correspond with the ones in the order, so it is recommended to unpack the UPS and make a first visual inspection.
- In case of observing damages, make all pertinent claims to the transport agency or in their lack to our company.
 Never start up an equipment when external damages can be observed.
- Also check that the data in the nameplate sticked in the packaging and in the equipment, correspond to the ones stated in the order, so it is required to unpack it (see section 5.1.2). Otherwise, make a nonconformity as soon as possible, by quoting the serial number of the equipment and references in the delivery note.

5.1.2. Unpacking.


- The packaging of the equipment has a cardboard enclosure, expanded polystyrene [EPS] or polyethylene foam [EPE] corners, plastic bag and polyethylene strip, all materials are recyclable; so if you are going to dispose them, do it in accordance with the regulations in force. It is recommended to keep the packaging in case it were needed in future.

- Proceed as follows:
 - Cut the strips of the cardboard enclosure, in those models with strips.
 - Take out the accessories (cables, documentation, ...)
 - Take out the equipment or battery module from the packaging, considering the help of a second person depending on the weight of the model.
 - Remove the protection corners of the packaging and the plastic bag.
 Keep out of reach of children the plastic bag, due to the risks that it involves.
 - Inspect the equipment before continuing and in case damages are confirmed, contact with the supplier or in lack of him with our firm.

5.1.3. Content checking.

- Check the contents of the packaging. Depending on what we are checking, an equipment or battery module, the contents will vary.
 - UPS:
 - The own equipment.
 - Hardcopy quick guide.
 - Information for the registration of the guarantee.
 - 1 USB communication cable.
 - 1 connection cable for input - plug and IEC connector -.
 - 2 output cables (only on models with IEC connectors).
 - Battery module:
 - The own module.
 - Information for the registration of the guarantee.
 - 1 cable for connection between equipment and battery module or between modules.
- Once the reception is finished, it is advisable to pack the UPS again till its commissioning in order to protect it against mechanical shocks, dust, dirt, etc...


5.1.4. Storage.


- Storage of the equipment will be done in a dry place, safeguard from rain, protected from dust, water jets or chemical agents, never outdoors. It is advisable to keep the equipment and the battery pack/s, into their original packages, which have been designed to assure the maximum protection during the transport and storage.
-  In equipments that include Pb-Ca batteries, the figures, stated in Tab. 2 of the EK266*08 document, of charge period time depending on the temperature that they are exposed, must be respected, otherwise the warranty will be invalidated.
- After this time, connect the equipment to mains and together with battery unit, if any, start it up according to the instructions described in this manual and charge them for 12 hours.
- Finally, shutdown the equipment, disconnect it and fit the UPS and batteries in their original packaging, noting the new battery charge date on each respective label.
- Do not store the devices where the ambient temperature exceeds above 50°C or below -15°C, otherwise it may degrade the electrical characteristics of the batteries.

5.1.5. Transport to location.


- Although the weight of the equipments is not so high, it is recommended to move the UPS by the use of a forklift, pallet truck or by means of the most suitable means of transport by evaluating the remoteness of the location point.
If the distance is high, it is recommended to move the equipment still packaged till the installation place and unpack it later.

5.1.6. Preliminary considerations, before connecting the equipment.

- Check that the data in the nameplate are the required by the installation.
- A wrong connection or manoeuvring, can make faults in the UPS and/or loads connected to itself. Read carefully the instructions of this manual and follow the stated steps in the established order.
- All the equipments have power cord with plug to be connected to the AC mains.
In the same way, "N" output outlets or IEC connectors depending on the model are supplied, for its connection with the loads [output].
For the rest of connections is used an connector for the battery connection [B1 version] and ports for communications.
- Cross cable section of the input and output lines, will be calculated from the currents stated in the nameplate of each equipment, and respecting the Local and/or National Low Voltage Electrotechnical Regulations.
- Protections of the switchgear panel, will have the following features:
 - For input line, type B for RCD devices and C characteristic for circuit breakers.
 - For the output (load feeding), C characteristic for circuit breaker.
 Regarding the size, they will be as minimum to the currents stated in the nameplate of each UPS.
- In the nameplate of the equipment there are only printed the nominal currents as it is stated in the safety standard EN-IEC 62040-1. To calculate the input current, the power factor and the efficiency of the equipment have been considered.
Overload conditions are considered as nonpermanent and exceptional operating mode.
- If it is added peripherals to the input or output like transformers or autotransformers to the UPS, the currents stated in the own nameplates of those elements has to be considered in order to use the suitable cross sections, by respecting the Local and/or National Low Voltage Regulation.
-  When an equipment incorporates a galvanic isolation transformer, as standard, as an option or either installed by yourself, either at the UPS input line, output or in both, protections against indirect contact has to be fitted in (residual current device) at the output of each transformer, because due to its specification of isolation it will prevent the triggering of the protections fitted in the primary of the transformer in case of electrical shock in the secondary (output of the isolation transformer)
- Remind you that all external isolation transformers already installed or supplied from factory, has the neutral of the secondary connected to earth by means of a cable bridge between both terminals. If it were required an isolated output neutral, remove this cable bridge, keeping the precautions stated in the respective local and/or national low voltage regulations.

- All standard UPSs have batteries in the same enclosure of the equipment, less those ones as B1. In the first ones, the battery protection is by internal fuses and there is no access to the end-user.
Also the battery modules have internal protections by fuses and in the same way as it is done in the own equipments, they are not accessible by the end-user.
-  **IMPORTANT FOR SAFETY:** In case of installing the batteries by yourself, the accumulators have to be provided with a two pole circuit breaker protection sized to the features stated in Tab. 2.


5.2. CONNECTION.

-  Cross cable section used in the power supply of the equipment and loads to feed, will be sized according to the nominal current stated in the nameplate stucked on the equipment, by respecting the Low Voltage Electrotechnical Regulations or norms of the corresponding country.
- Installation will have the suitable input protections sized to the current of the equipment and stated in the nameplate of the equipment (residual current devices type B and circuit breaker with C characteristic or any other equivalent one).
Overload conditions are considered as a nonpermanent an exceptional operating mode, so these currents will not be kept in mind when sizing the protections.
- To insert the option cards, it is needed to remove the fixing screws of the smart slot and the own cover.

5.2.1. Connection of input.

- Take the input power cord with plug and IEC connector.
- Insert the IEC connector to the UPS inlet.
- Insert the plug in to the wall AC outlet.

5.2.2. Connection to output.

- All the equipments have «N» output outlets or IEC connectors depending on the model.
- Connect the loads to the outlets or IEC connectors.
- The 3 kVA B1 models with IEC output connectors also feature output terminals. To access them, it is necessary to remove the corresponding terminal protection cover, which will be replaced at the end of the connection tasks.
Connect the loads to the output terminals, **observing the order of the phase, the neutral and the earth cable** indicated on the labelling of the device, otherwise faults and/or defects may occur in the UPS and/or load or connected loads.
-  The sum of the loads connected to the different sockets, IEC connectors and/or terminals must not under any circumstances exceed the rated power of the device.
- If besides of the critical loads, it is required to connect lagging loads of high consumption, like laser printers or CRT monitors, the inrush currents of these peripherals will be kept in mind in order to avoid blocking the equipment under the worst conditions.
It is better to not connect the loads of this kind, due to the high quantity of energy resources that take from the UPS.

5.2.3. Connection of external batteries [extended back up times] -B1- or models without batteries -B0-.

- To not respect the stated indications in the safety instructions EK266*08 means a high risk of electrical discharge and even the death.**
- All the standard UPS's have batteries in the same enclosure, less the B0 and B1 models. Battery protection is done by internal fuses and not accessible for the end-user. Battery modules have internal protections for the batteries too and they are not accessible for the end-user.
- NECESSARY ADJUSTMENTS WHEN ADDING BATTERY MODULES TO SERIAL MODULES IN B1 MODELS.**

B0 and B1 models have factory default settings for connection to a single battery module. Whether battery modules are added to an already available device or if the acquired device has more than one module, it is necessary to change the parameter to the corresponding value.

Section 7.3 of this document indicates the steps to follow to adjust this setting and that of the load current.
- IMPORTANT FOR SAFETY:** In case of installing the batteries by yourself -B0-, the accumulators has to be provided with a two pole circuit breaker protection sized to the features stated in Tab. 2.

Model	Batteries ($U_{\text{element}} \times N^{\circ}$) = $U_{\text{nominal}} / U_{\text{floating}}$	Characteristics of the protection	
		Voltage DC (V)	Current (A)
SLC-700- TWIN PRO2 B1	(12 V x 2) = 24 V / 27,3 V	125	40
SLC-1000- TWIN PRO2 B1	(12 V x 4) = 48 V / 54,6 V		40
SLC-1500- TWIN PRO2 B1	(12 V x 6) = 72 V / 81,9 V		50
SLC-2000- TWIN PRO2 B1			
SLC-3000- TWIN PRO2 B1			

Tab. 2. Features of protection between the UPS and battery module.

- Before starting the connection between the battery module/s and the equipment, check that the equipment switch/es and the one in the battery cabinet are in "Off" position.** **Likewise when batteries are installed by own self, the fuse or switch has to be turned off.**
- Connection terminals of external batteries with the equipment are done with a polarised connector in B0 and B1 models. This connector is not available on standard models.
- To connect the equipment with the battery module, use the cable trunk supplied with the module and connect it between both units and through the connectors.

When more than one battery module is supplied for one equipment, the connection among the modules will be done through the cable trunk supplied in the second battery module.

Fig. 11 shows as an example, the connection of a **SLC-TWIN PRO2 B1** with «N» battery modules. Less the rear view of the model, it is applicable to all the range stated in this manual. Connect the available modules depending on each case.
- If for any reason the end-user manufactures the battery cable trunk, the colour code of the cables has to be respected, red for positive, black for negative and green-yellow for earth, as well as the correlation of the connection (+ with + and - with -).

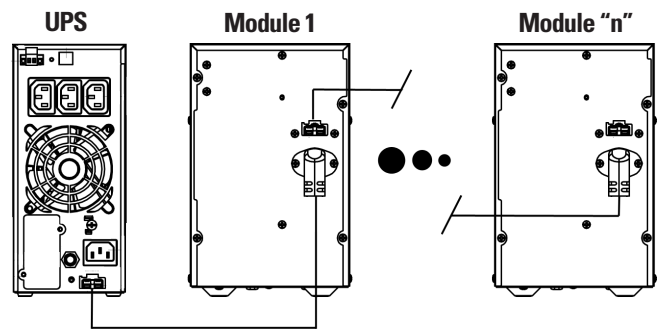


Fig. 11. Connection among the equipment and "n" battery modules.

- Each battery module is independent for each equipment. **It is strictly prohibited to connect two equipments to one battery module.**

5.2.4. Terminals for EPO (Emergency Power Off).

- All UPSs have a terminal strip to install an external button, for Emergency Power Off [EPO].
- The equipment is preset from factory with the EPO as normally closed contact [NC]. So, the UPS will break the output power supply when the circuit is open:
 - Either by removing the female connector inserted in the plinth. This connector has a cable bridge to close the circuit [Fig. A].

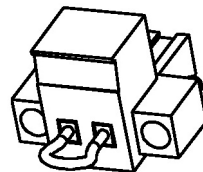


Fig. A

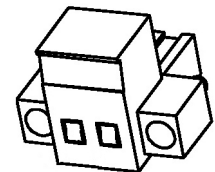


Fig. B


- Or by turning on the external button installed and belonging to the end-user. The connection in the button has to be in normally closed because it will open the circuit when turning it on.
- The reverse operating of the opened circuit [NO], can be set at factory or later on by our **T.S.S.** at site.

Less punctual cases, it is not recommended to use this type of connection due to the function of the EPO button, because it would not work in case of any of the two cables that goes from the button to the UPS were cut [damaged].

On the other hand this failure would be immediately detected in the normally closed EPO type, with the inconvenience of the sudden break in the power supply to the loads, but with a complete guarantee of the functioning of the emergency power off.
- To restore the normal operating mode of the UPS, the connector with the cable bridge has to be fitted back in the terminal strip or to deactivate the EPO button and later on to cancel the EPO status in the control panel. The equipment will be operative.

5.2.5. Communication ports.

5.2.5.1. USB interface.

- The USB interface provides the “smart battery” feature which supports the HID (Human Interface Device) Power Device Class, no software installation is required. Windows/Linux/Mac Operating Systems come with an embedded power management and monitoring function. When that computer is connected to the UPS via the USB interface, the UPS will be automatically acknowledged by the OS as a “HID UPS Battery”, and the user will be able to set action to make when the low battery alarm is triggered, like shutdown the computer automatically. Also, the UPS with this feature is the ideal back-up power for NAS (Network-Attached Storage).
-  Communication line (**COM**) is a very low voltage circuit of safety. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (energy distribution line).
- USB interface is used by the monitoring software and firmware updating.
USB communication port is compatible with the USB 1.1 protocol for communication software.

5.2.5.2. Smart slot.

- UPSs have a unique slot, hidden rear the cover stated in the views of the equipment as “Smart slot”, and allows inserting any of the following options cards:
 - Relay interface to terminals -dry contacts-.
 - SNMP adaptor.
- Each option card is supplied with its own particular documentation. Read it before installing them.

5.2.6. Software.

• Free software download - VinPower.

VinPower is a UPS monitoring software, which makes a user-friendly interface of monitoring and management. This software supplies an auto Shutdown for a system based on several PCs in case of an electrical blackout. With this software, the end-users can monitor and manage any UPS in the same IT network, through the RS232 or USB communication port, never mind the distance between them.

• Installation procedure:

- Go to website:
<http://support.salicru.com>
- Choose the operating platform that you need and follow the instructions described in the web site to download the software.
- When downloading the needed files from Internet, enter the following licence to install the software:
511C1-01220-0100-478DF2A .

When the computer is rebooted, VinPower software will be shown as an icon with plug shape and green colour in the system tray, near the clock.

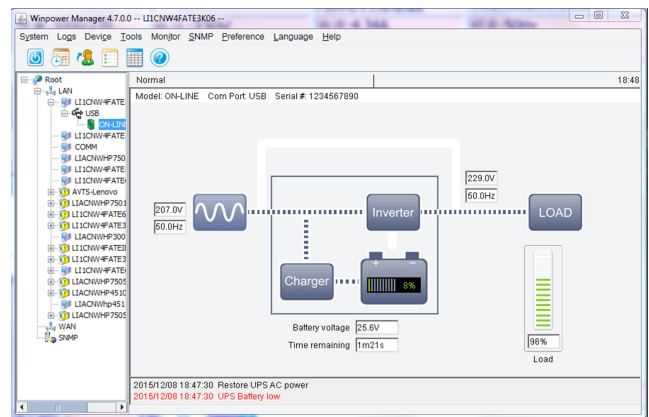





Fig. 12. Main screen of the monitoring software.

5.2.7. Considerations before starting up.


-  It is recommended to charge the batteries for 12 hours as minimum before using the UPS for first time. When supplying voltage to the equipment, the battery charger will automatically work.
-  [B1] equipments with extended back up time has a battery charger with higher quality performances. It is recommended to charge the batteries for 12 hours as minimum before using the UPS for first time.
-  Nevertheless, those equipments with extended back up time and with no additional battery charger, it is recommended to charge the batteries of each battery module for 12 hours.
- Although the equipment can work without charging the batteries during the stated time without any problem, the risk of a long blackout has to be valued during the first operating hours and the available autonomy time in the UPS.
- Do not start up the equipment and loads completely till chapter 6 states it.
Nevertheless, when it is done, it will be done gradually to avoid any problem, as minimum in the first commissioning.
- If inductive loads with big inrush current apart from sensitive ones are required to be connected like laser printers or CRT monitors, keep in mind the start inrush currents of these peripherals in order to avoid that the equipment becomes blocked under the worst conditions.
It is better to not connect the loads of this kind, due to the high quantity of energy resources that take from the UPS.

6. OPERATING.


6.1. UPS COMMISSIONING AND SHUTDOWN.

6.1.1. Preliminary controls.

- Make sure that all connections have been done properly, and respecting the labelling of the equipment and the instructions of chapter 5.
- Check that the power supply is correct.
- Check that the UPS is «OFF» [shutdown].
- Make sure that all loads are shutdown «OFF».
- Check that the thermal protection of the equipment is not tripped.
- It is very important to proceed in the established order.
- For UPS views, see Fig. 1 to 10.
- Turn «ON» the protection of the distribution panel.

 The operation of the device described in this document is based on the original factory settings and configuration. Section 7.3 shows the screens tree, the variables and the original configuration. Take into consideration that any modification of them can lead to changes in the behaviour of the device.


6.1.2. Start up the UPS, with AC mains.

-  When applying input voltage to the UPS, the sockets, connectors and/or output terminals supply power through the static bypass without the device running.
- The UPS can't supply voltage to the loads because the bypass mode is deactivated, code «STbY».
- To start up the UPS, press over the key «ON» of front panel for more than 1 second, the inverter will start up and at the same time the status of the UPS will be displayed in the LCD of the front panel.
- Start up the load/s.

6.1.3. Start up the UPS, with no AC mains (Battery mode)


- To start the device without mains voltage, i.e. cold start, press the «ON» key on the front panel for more than 1 second. The inverter will start up while the status of the UPS will be displayed on the front panel LCD display.
The time that the UPS will be working, will depend on the battery charge level and the consumption of the own loads connected to the output.
- Start up the load/s.

6.1.4. UPS shutdown with AC mains (on Inverter mode).

- To shutdown the inverter of UPS, press over the key «OFF» of front panel for more than 1 second.
-  Even if the inverter is «OFF», the device will supply output voltage through its static bypass.
- To carry out a complete shutdown, it is necessary to set the distribution board protection to «OFF».

6.1.5. UPS shutdown with no AC mains [on Battery mode].

- Shutdown the UPS inverter by a simple pulsation of more than 1 second over the key «OFF». The UPS will be shutdown.

-  With no mains power present, no output voltage will be available; however, take into consideration that, when it is restored, the device will immediately supply output voltage through its static bypass.
- To carry out a complete shutdown, it is necessary to set the distribution board protection to «OFF».


6.1.6. Battery test function.

- To make a battery test with the equipment started up and mains present, press over the button «ON» of the front panel for more than 1 second, the test will start automatically.
- With this test, it is able to detect if the batteries are low, open or not connected.

6.1.7. Alarm silencer.

- The acoustic alarm is activated when the equipment works on battery mode. If it disturbs, it can be silenced by pressing for more than 1 second the key «ON»/«MUTE».
The alarm will be automatically activated again due to low battery (end of back up time). When it happens, loads and UPS have to be shutdown, because the equipment will break the output voltage in short.
- If the alarm on bypass mode disturbs, press the key «OFF» for more than 1 second to deactivate it. This action will not affect to the warning and/or alarm fault.

6.1.8. EPO (Emergency Power Output).

- Also it is known as RPO (Remote Power Output).
 Check that the connector of Fig. A is inserted, before proceeding with the start up.
When it is activated, the output of the equipment doesn't supply voltage and the screen of the LCD panel shows the «EPO».
It is a special situation, where it is done an immediate break of the UPS output voltage, as a preventive or emergency measure. The EPO condition leaves the loads with no power supply, but the UPS is not shutdown. To do it, the EPO condition has to be released previously and then shutdown the equipment through the key «OFF», see Tab. 3. To start up the UPS press over the key «ON», see Tab. 3.

7. CONTROL PANEL WITH LCD.

7.1. CONTROL PANEL.

- The UPS has a control panel, which includes the following parts:
 - Four buttons or keys, see Tab. 3.
 - A LCD panel.

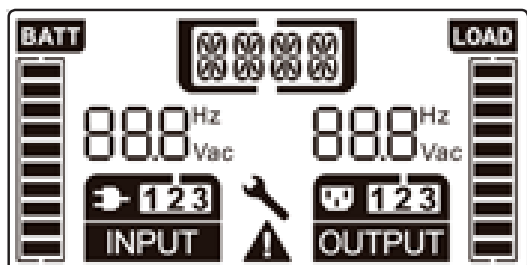


Fig. 13. Control panel view.

Key	Function	Description
←	ENTER key	The ENTER key has three utilities: entry to the main settings menu, entry to a submenu and validation of the new selected value.
	SELECT key	The SELECT key enables scrolling through the different menus and submenu variables.
OFF	UPS shutdown	When mains power is normal, the UPS system shifts to Bypass mode or No output by pressing the OFF-Button "⏻", the inverter is shutdown. The outlets are fed by the bypass, in case the Bypass mode option is enabled. Deactivating the acoustic alarm: With the UPS on Bypass mode, press this button and the acoustic alarm will be silenced. Re-start up the UPS from fault mode and EPO status.
ON MUTE	UPS start up	By pressing the ON-Button for more than 1 second the UPS system is turned on.
	Acoustic alarm silencer	By pressing this Button the acoustic alarm can be silenced when the UPS is on battery mode. By a short pressing on this Button, all the acoustic alarms can be silenced at any operating mode.
	Battery test	By pressing on this button, the device performs a battery test provided that the UPS is running. It is not possible to perform the test in Bypass, No Output or Battery modes.

Tab. 3. Functionality of the buttons or keypad from control panel.

Display	Function
Input information	
	It displays the input voltage/frequency figure alternately.
	It shows the input is connected to mains (input power is single phase).
Output information	
	It displays the output voltage/frequency figure alternately.
Load information	
	It displays the load level. Every two bars means 20% load level. Two bars will always be displayed in case the load is below 20%.
Battery information	
	It displays the battery capacity. Every two bars means 20% capacity. If the battery low alarm is triggered, the lowest bar will blink.
Information of Mode/Fault/Warning codes	
	It displays the operating mode, fault type, alarm or battery remaining time. In case of having several warning, they will be displayed alternately.
Else	
	It shows that the UPS is on setting mode.
	It shows that the UPS is on Fault mode or it has any alarm.

Tab. 4. LCD panel messages and their functions.

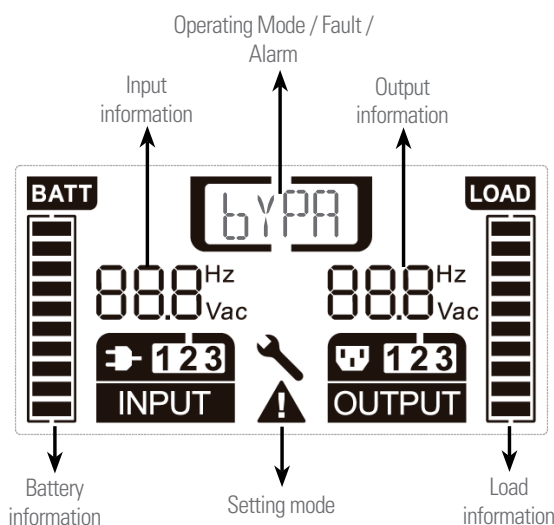


Fig. 14. Display LCD panel control description.

7.2. SETTING AND CONFIGURATION OF THE CONTROL PANEL.

Description	Code
Operating codes	
Bypass mode	bYPA
No output mode	STbY
Line mode	LINE
Battery mode	bATT
Battery test mode	TEST
ECO mode	ECO
Converter mode	CUF
Fault codes	
Inverter short	SHOR
Overload fault	OVLD
Inverter soft start failure	ISFT
DC Bus soft start failure	bSFT
Over temperature fault	OVTP
Inverter Volt Low	INVL
Inverter Volt High	INVH
DC Bus volt High	bUSH
DC Bus volt Low	bUSL
DC Bus short	bUSS
Inverter NTC open	NTCO
Emergency Power Off	EPO
Alarm codes	
Fan faulty	FANF
Battery over voltage (over charged)	HIGH
Battery low	bLOW
Charge failure	CHGF
Inverter temperature high	TEPH
Battery open	bOPN
Overload	OVLD
Extra-charger failure	dCHF
Internal temperature high	ITPH

Tab. 5. Code list and their meaning.

The codes displayed in the LCD panel as regards to operating, fault or alarm are listed in Tab. 5. Several codes can be activated or displayed at the same time, and they can correspond to operating, fault or alarm. Each one of these codes will be displayed cyclically in the LCD panel, less when one or several alarms are triggered. In case of several alarms are triggered, they will be displayed cyclically, but the operating mode or fault will not be shown.

7.2.1. Bypass mode -byPA-.

The LCD panel on bypass mode is shown in Fig. 16. And it displays the following information: mains, battery, UPS output and load. The UPS operating code is «byPA».

Fig. 15 shows the «byPA» stage is activated (frame with BYPA inscription inside), and it means that the bypass is supplying the energy to the load/s from mains directly, through the internal filter and at the same time the batteries are being charged.

The UPS acoustic alarm will beep every two minutes. On this operating mode, the UPS doesn't have back up time function, so in case of mains failure, the loads will be shutdown.

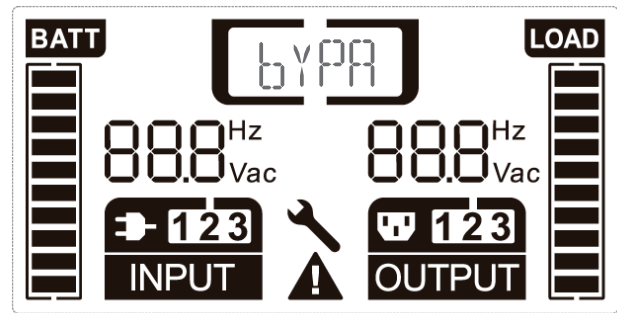


Fig. 15. Bypass mode screen.

7.2.2. No output mode -STby-.

The LCD panel on no output mode is shown in Fig. 16. And it displays the following information: mains, battery, UPS output and load. The UPS operating code is «STby».

On this mode, the UPS doesn't supply output voltage, but it is still charging the batteries.

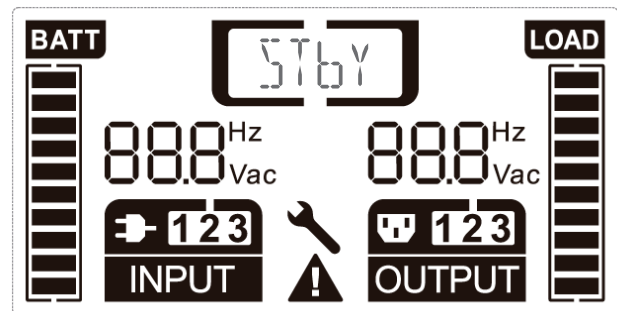


Fig. 16. No output mode screen.

7.2.3. Line mode -LINE-.

The LCD panel on line mode is shown in Fig. 17. And it displays the following information: mains, battery, UPS output and load. The UPS operating code is «LINE».

In the event of output overload, the fault code «OVLD» will be displayed and an audible alarm modulated at two beeps per second will be activated. It is necessary to stop the non-critical loads to reduce the load percentage to below 90% of the rated power of the UPS.

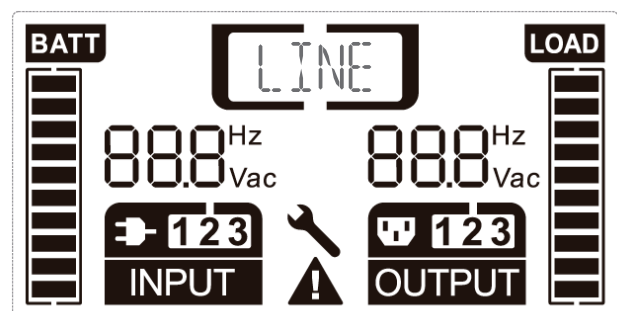


Fig. 17. Line mode screen.

7.2.4. Battery mode / Battery test mode -bATT / TEST-

The LCD display in battery mode is shown as Fig. 18. And it displays the following information: battery voltage, battery capacity, UPS output and the load level. The «bATT» bar indicates the UPS is working on the battery mode. If the remaining back up time function is enabled, the «bATT» bar and the remaining back up time (displayed in Min or Sec) will be displayed alternately every 2s. When the UPS is running on battery mode, the buzzer beeps once every 4 seconds. If the «ON» button of the front panel is pressed for more than 1 second, the buzzer will stop beeping (silence mode). Press the «ON» button once again for more than 1 second to resume the alarm function.

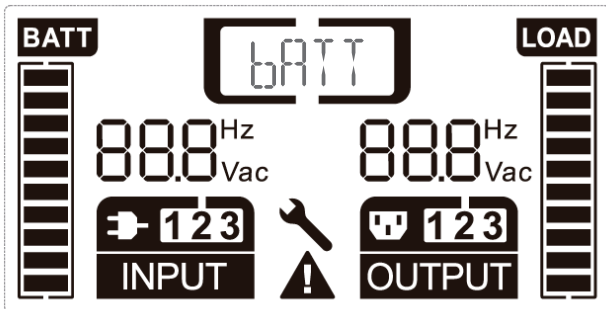


Fig. 18. Battery mode screen.

7.2.5. Economy mode -ECO-

It is also known as high efficiency mode [HE]. The UPS operating code of the ECO mode is «ECO». When the UPS is on ECO mode and meanwhile the voltage and frequency are inside the preset range, the load is supplied from mains directly through the internal filter. So, a high efficiency is achieved. When mains is out of the preset limits, the UPS shifts to battery mode and the load will be supplied from batteries, till the normal conditions of mains are restored. The ECO mode can be activated by means of the LCD panel, or software (VinPower, ...). Notice that when running on ECO mode, there is a transfer time of less than 10 ms when shifting to battery mode and some loads could not support it, act in consequence for those each particular cases.

7.2.6. Converter mode -CUF-

The UPS operating code on Converter mode is «CUF». On this operating mode, the UPS works as a frequency converter (50 Hz or 60 Hz). When mains is wrong or in case of blackout, the UPS will shift to battery mode and the load will be supplied from batteries, till the normal conditions of mains are restored. The Converter mode can be activated by means of the setting screen in the LCD panel, or software (VinPower, ...). It has to be considered that on this operating mode, the power rate of the equipment is derated up to 60 % of the nominal.

7.2.7. Fault code / Alarm code.

Fault and alarm codes are shown in Tab. 5. Fig. 19 shows the fault code «SHOR» as an example.

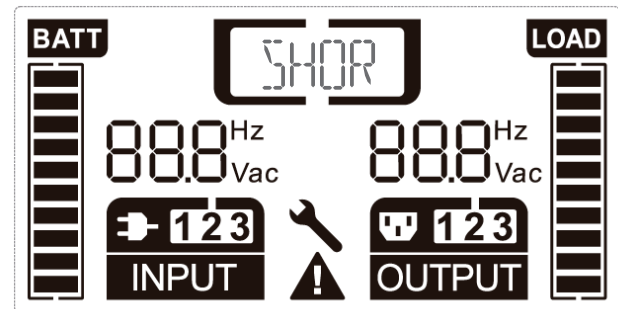
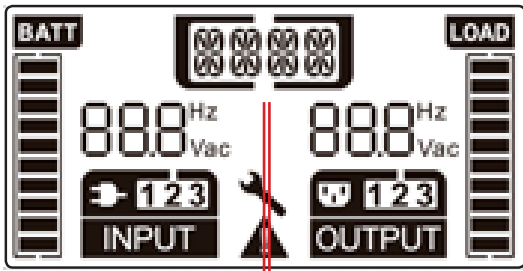


Fig. 19. «SHOR» fault code screen.

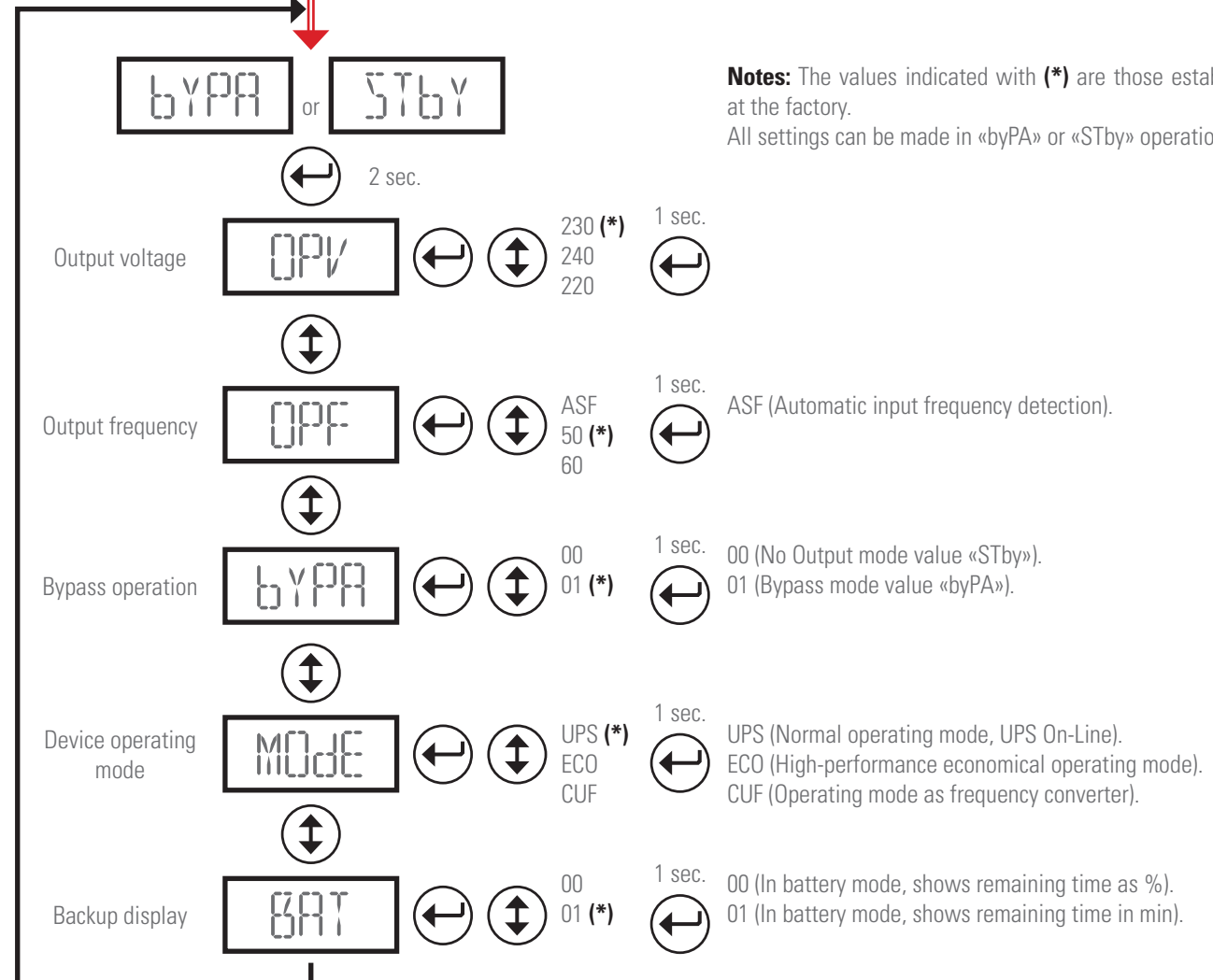
7.3. SETTINGS THROUGH THE LCD PANEL OF THE LCD PANEL.

The user can change some of the factory default settings very easily. It is however important to take into consideration that changes to the settings can affect the loads. The Fig. 20 screens map shows the chronological and cyclical order in which the parameters are displayed and their default value indicated with an asterisk in brackets (*), as well as the procedure for making the changes using the buttons of the control panel. Observe the sequence and minimum pulse times. To change the configuration of the device, it needs be connected to the mains in Bypass or No Output mode, i.e. with the inverter stopped. This operation will always be carried out with no load connected to its output. Fig. 20 just shows the fields that relate to the modifiable parameters and not a full view of the screen, except the first, which is used for reference.

STANDARD DEVICES



Notes: The values indicated with (*) are those established at the factory.
All settings can be made in «byPA» or «STby» operation.



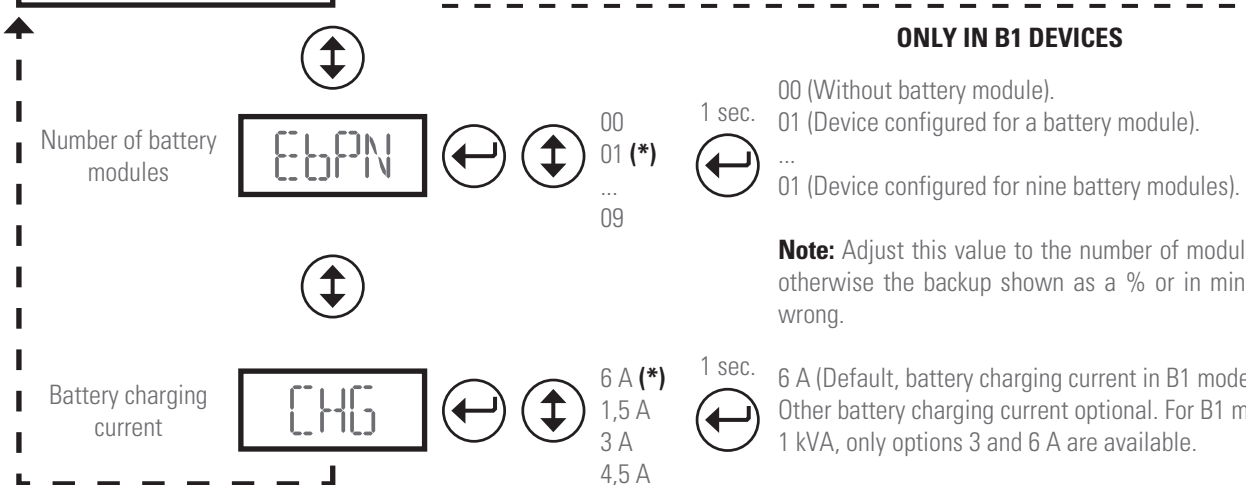
ASF (Automatic input frequency detection).

00 (No Output mode value «STby»)
01 (Bypass mode value «byPA»).

UPS (Normal operating mode, UPS On-Line).
ECO (High-performance economical operating mode).
CUF (Operating mode as frequency converter).

00 (In battery mode, shows remaining time as %).
01 (In battery mode, shows remaining time in min).

ONLY IN B1 DEVICES



00 (Without battery module).
01 (Device configured for a battery module).
...
01 (Device configured for nine battery modules).

Note: Adjust this value to the number of modules acquired, otherwise the backup shown as a % or in minutes will be wrong.

6 A (Default, battery charging current in B1 models).
Other battery charging current optional. For B1 models up to 1 kVA, only options 3 and 6 A are available.

Fig. 20. Settings screens map.

8. MAINTENANCE, WARRANTY AND SERVICE.

8.1. BATTERY MAINTENANCE.

- Pay attention to any safety instructions stated in EK266*08 manual section 1.2.3 referred to batteries.
- The useful lifetime of the batteries depends on the ambient temperature and other factors like the quantity of charging and discharging cycles and the deep discharges done. Its design lifetime is between 3 and 5 years if the ambient temperature is between 10 and 20 °C. Under request, other typology and/or design lifetime batteries can be supplied.
- The UPS from **SLC TWIN PRO2** series only needs a minimum maintenance. The used batteries in standard models are lead acid, sealed, VRLA and maintenance free. The only requirement is to charge them regularly in order to extend their lifetime. Meanwhile, the UPS is connected to mains, started up or not, it will keep the batteries charged and will guarantee a protection against overcharge and deep discharge.

8.1.1. Notes for installing and replacing the batteries.

- If it is needed to replace the connection of any wire, purchase original parts through authorised distributors or service centres in order to avoid overheating and sparks with fire risk because the size is not enough.
- Do not short the + and - poles of the batteries, there is risk of fire or electrocution.
- Be sure that there is no voltage before touching the batteries. Battery circuit is not isolated from the input. Hazardous voltages can be found between the battery and earth terminals

- Although the input circuit breaker the switchgear panel is turned off, the internal parts of the UPS are still connected to the batteries, so there are hazardous voltages inside. Therefore, before doing any reparation or maintenance task, the internal battery fuses have to be removed and/or the interlink connections between them and the UPS.
- Batteries have hazardous voltages. The battery maintenance and replacement have to be done by qualified personnel and familiarised with them. Nobody else can manipulate them.

8.2. UPS TROUBLE SHOOTING GUIDE.

If the UPS doesn't work properly, check the information given by the LCD of the control panel. Try to solve the problem by means of the established steps in the Tab. 6. In case the problem persists, consult with our Technical Service & Support **T.S.S.**

When it is needed to contact with our Technical Service & Support **T.S.S.**, provide the following information:

- UPS model and serial number.
- Date when the problem occurred.
- Complete description of the problem, including the information given by the LCD panel and the status of the alarms.
- Power supply condition, type of load and the level connected to the UPS, ambient temperature, cooling conditions.
- Information of the batteries (capacity and battery quantity), if the equipment is B0 or B1 -with external batteries-.
- Other informations that you may think that they are important.

8.2.1. Troubleshooting guide. Warning indications.

If the UPS doesn't work properly, before calling **S.S.T.** try to resolve the problem using the information in the following table:

Warning & fault code	Problem	Possible cause	Solution
/	No indication, no warning tone even though system is connected to mains power supply.	1) No input voltage. 2) Input switch is opened.	1) Check building wiring socket outlet and input cable. 2) Check the Breaker.
/	No Communication data.	1) RS232 wire is not matched. 2) USB wire is not matched.	1) check or change the RS232 wire. 2) check or change the USB wire.
/	Emergency supply period shorter than nominal value.	1) Batteries not fully charged 2) Batteries defect.	1) Charge the batteries until the Batteries are fully charged. 2) Change the batteries or consult your dealer.
FANF	Fan fail.	Fan abnormal.	Check if the fan is running.
HIGH	Battery over voltage.	Battery is over charged.	Switching to battery mode automatically, and after the battery voltage is normal and the mains is normal, the UPS would Switch to line mode automatically again.
bLOW	Battery low.	Battery voltage is low.	When acoustic alarm sounding every second, battery is almost empty.
bOPN	Battery open.	Battery pack is not connected correctly.	Do the battery test to confirm. Check the battery bank is connected to the UPS. Check the battery breaker is turn on.
CHGF	Charger is faulty.	The charge is broken.	Call the Technical Service and Support.
dCHF	Extra-charger is faulty.	The charge is broken.	Call the Technical Service and Support.
bUSH	DC Bus is too high.	UPS internal fault.	Call the Technical Service and Support.
bUSL	DC Bus is too low.	UPS internal fault.	Call the Technical Service and Support.
bSFT	DC Bus soft start fails.	UPS internal fault.	Call the Technical Service and Support.
bUSS	DC Bus short.	UPS internal fault.	Call the Technical Service and Support.
TEPH	Inverter temperature high.	Inside temperature of the UPS is too high.	Check the ventilation of the UPS, check the ambient temperature.
ITPH	Internal ambient temperature is too high.	The ambient temperature is too high.	Check the environment ventilation.
INVH	Inverter voltage is too high.	UPS internal fault.	Call the Technical Service and Support.
INVL	Inverter voltage is too low.	UPS internal fault.	Call the Technical Service and Support.

ISFT	Inverter soft start fail.	UPS internal fault	Call the Technical Service and Support.
NTCO	Inverter NTC open.	UPS internal fault.	Call the Technical Service and Support.
SHOR	Inverter short.	Output short circuit.	Remove all the loads. Turn off the UPS. Check whether the output of UPS and loads is short circuit. Make sure the short circuit is removed, and the UPS has no internal faults before turning on again.
OVTP	Over temperature fault.	Over temperature.	Check the ventilation of the UPS, check the ambient temperature and ventilation.
OVL	Overload.	Overload.	Check the loads and remove some non-critical loads. Check whether some loads are failed.
EPO	EPO active.	EPO function is enabled.	Plug into the EPO switch.

Tab. 6. Troubleshooting guide. Other circumstances or conditions.

8.3. WARRANTY CONDITIONS.

8.3.1. Warranty terms.

The warranty conditions for the acquired product can be found in our website and in that you will be able to register it. It is recommended to do it as soon as possible in order to include it in the Technical Service & Support **(T.S.S.)** database. Among other advantages, it will be easier to make any regulatory process to allow the **T.S.S.** action in case of any hypothetical fault.

8.3.2. Out of scope of supply.

Our company is not forced by the warranty if it appreciates that the defect in the product doesn't exist or it was caused by a wrong use, negligence, installation and/or inadequate testing, tentative of non-authorized repairing or modification, or any other cause beyond the foreseen use, or by accident, fire, lightnings or other dangers. Neither it will cover, in any case, compensations for damages or injuries.

8.4. TECHNICAL SERVICE NETWORK.

Coverage, both national and international, from our Technical Service & Support **(T.S.S.)**, can be found in our Website.

9. ANNEXES.

9.1. GENERAL TECHNICAL SPECIFICATIONS.

Available powers (kVA / kW) (**)	0,7 / 0,63	1 / 0,9	1,5/ 1,35	2 / 1,8	3 / 2,7
Technology	On-line double conversion, PFC, double DC bus				
Rectifier					
Tipology of the input	Single phase				
Quantity of wires	3 wires - Phase R (L) + Neutral (N) and earth				
Nominal voltage	220 / 230 / 240 V AC				
Input voltage range with 100 % load	176÷300 V AC				
Input voltage range with 40 % load	100÷300 V AC				
Voltage range of transference:	Depending on the load percentage between 100 and 50 %				
- Low mains voltage	176 V AC (±3 %)				
- Restore from low mains	186 V AC (±3 %)				
- High mains voltage	300 V AC (±3 %)				
- Restore from mains high	290 V AC (±3 %)				
Frequency	50 / 60 Hz (autosensing)				
Input frequency range	± 10 % (45-55 / 54-66 Hz)				
Power factor	> 0.99 (at full load)				
Inverter					
Technology	PWM				
Wave shape	Pure sinewave				
Nominal voltage	220 / 230 / 240 V AC				
Output voltage accuracy	± 1 %				
Voltage THD with linear load	< 2 %				
Frequency	With mains present, synchronised at nominal input (45-55 / 54-66 Hz) Free running, back up time mode 50 / 60 ±0.05 Hz				
Slew rate	1 Hz/sec.				
Power factor	0.9 (by default)				
Permissible load power factor	0.3 inductive to 1				
Transfer time, inverter to battery	0 ms				
Transfer time, inverter to bypass	< 4 ms				
Transfer time, inverter to ECO	< 4 ms				
Transfer time, ECO to inverter	< 10 ms				
Efficiency at full load, line mode with 100% charged battery	> 89%		> 91%		
Efficiency at full load, on ECO mode	> 97.2 %		> 98 %		
Overload, line mode	100-105 %, constant				
	> 105-130 %, 60 sec				
	> 130-150 %, 10 sec				
	> 150 %, 300 ms				
Overload, battery mode	100-105 %, constant				
	105-130 %, 10 sec				
	130-150 %, 1 sec				
	>150 %, 300 ms				
Crest factor	3:1				
Static bypass					
Type	Hybrid (thyristors in antiparallel + relay)				
Nominal voltage	220 / 230 / 240 V				
Nominal frequency	50 / 60 Hz ±4 Hz				
Overload	< 130 %, constant				
	> 130-180 %, 60 sec.				
	> 180 %, 300 ms.				
Batteries					
Voltage / capacity	12 V DC / 9 Ah				
Quantity of batteries in serial / set voltage	2 / 24 V DC		4 / 48 V DC		6 / 72 V DC

Available powers (kVA / kW) (**)	0,7 / 0,63	1 / 0,9	1,5/ 1,35	2 / 1,8	3 / 2,7
Internal battery charger					
Type of charge	I / U (Constant current / constant voltage)				
Constant current / constant voltage	1.5 A / 13.65 V DC batterie				
Floating voltage, block / set	13.65 V DC				
Maximum charging current	1.5 A				
Recharging time	4 hours at 90%				
Voltage / temperature compensation	-20 mV / °C per battery and above 25 °C (***)				
Internal battery charger option (B1)					
Maximum charging current	3 A or 6 A		1.5 / 3 / 4.5 / 6 A		
Generals					
Communication ports	USB				
Monitoring software	VinPower (free download)				
Noise level at 1 m,	< 49 dB (100 % load) / < 41 dB (60 % load)				
Operating temperature	0.. 40 °C				
Storage temperature	- 15.. + 50 °C				
Storage temperature without batteries	- 20.. + 70 °C				
Operating altitude	2,400 m a.s.l.				
Relative humidity	0-95 % non-condensing				
Protection degree	IP20				
Dimensions -Depth x Width x Height- (mm) - UPS	356 x 144 x 228		399 x 190 x 327		
Dimensions -Depth x Width x Height- (mm) - UPS - B1	346 x 102 x 228		390 x 102 x 327		
Weight (kg) -Standard UPS	9.2	10.2	17.4	18.4	22.7
Weight (kg) -B1 version UPS	3.9		6.4		
Safety	EN-IEC 62040-1; EN-IEC 60950-1				
Electromagnetic compatibility (EMC)	EN-IEC 62040-2				
Marking	CE				
Quality system	ISO 9001 e ISO 140001				

(**) As frequency converter mode, the supplied power is a 60 % of the nominal.

(***) Only on equipment with external batteries B1.

Tab. 7. General technical specifications.

9.2. GLOSSARY.

- **AC.-** It is nominated as alternating current (abbreviation in Spanish CA and in English AC) to the electrical current in which the magnitude and direction varies in a cyclic way. The most common wave shape of the alternating current is sine-wave, because the energy transmission is better. Nevertheless, some applications could need other period wave shapes, like triangular or square
- **Bypass.-** Manual or automatic, it is the physical junction between the input and the output electric device.
- **DC.-** The direct current (CC in Spanish, DC in English) is the continuous electron flow through a cable between two points with different potential. Unlike the alternating current, in direct current the electrical loads always flow in the same direction from the highest potential point to the lowest one. Although, usually the direct current is identified with the constant current (for example the one supplied by the battery), it is continuous any current that always maintain the polarity.
- **DSP.-** It is the acronym of Digital Signal Processor. A DSP is a system based on a processor or microprocessor that has instructions in it, a hardware and an optimised software to develop applications where numerical operations are needed with very fast speed. Due to this, it

is very useful to process analogical signals in real time: in a system that runs in this way [real time] samples are received, usually coming from an analogical/digital converter [ADC].

- **Power factor.-** It is defined as power factor, p.f., of an alternating current circuit, as the ratio between the active power, P, and the apparent power, S, or as the cosines of the angle that make the current and voltage vectors, designating as $\cos \phi$, being ϕ the value of that angle.
- **GND.-** The term ground, as its name states, refers to the potential of the earth surface.
- **EMI filter.-** Filter able to decrease the electromagnetic interferences, which is the perturbation that happens in a radio receptor or in any other electrical circuit caused by the electromagnetic radiation coming from an external source. Also it is known as EMI, ElectroMagnetic Interference, Radio Frequency Interference or RFI. This perturbation can derate or limit the efficiency of the circuit.
- **IGBT.-** The Insulated Gate Bipolar Transistor is a semiconductor device that is used as a controlled switch in power electronic circuits. This device has the feature of the gate signal of the effect field transistors with the capacity of high current and low voltage saturation of the bipolar transistor, combining an isolated FET gate for the input and a bipolar

transistor as switch in a single device. The triggering circuit of the IGBT is as the MOSFET one, while the driving features are like the BJT.

- **Interface.-** In electronic, telecommunications and hardware, an interface [electronic] is the port (physical circuit) through which are sent or received signals from a system or subsystems toward others.
- **kVA.-** The voltampere is the unit of the apparent power in electrical current. In direct current is almost equal to the real power but in alternating current can defer depending on the power factor.
- **LCD.-** LCD acronym of Liquid Crystal Display, device invented by Jack Janning, who was employee of NCR. It is an electric system of data presentation based on 2 transparent conductor layers and in the middle a special crystal liquid that have the capacity to orientate the light when trespassing.
- **LED.-** LED acronym of Light Emitting Diode, is a semiconductor device [diode] that emits light almost monochrome with a very narrow spectrum, it means, when it is direct polarized and it is crossed by an electric current. The colour, (wave longitude), depends on the semiconductor material used in its construction, being able to vary from the ultraviolet one, going through the visible spectrum light, to the infrared, receiving these last ones the denomination of IRED (Infra Red Emitting Diode).
- **Circuit breaker.-** A circuit breaker or switch, is a device ready to break the electrical current of a circuit when it overcomes the maximum set values.
- **On-Line mode.-** Regarding to an equipment, it is on line when it is connected to the system, and it is in operation, and usually has its power supply turned on.
- **Inverter.-** An inverter, is a circuit used to convert direct current into alternating current. The function of an inverter is to change an input voltage of direct current into a symmetrical output voltage of alternating current, with the required magnitude and frequency by the user or the designer.
- **Rectifier.-** In electronic, a rectifier is the element or circuit that allows to convert the alternating current into direct current. This is done by rectifier diodes, which can be solid state semiconductors, vacuum or gassy valves as the mercury vapour. Depending on the features of the alternating current power supply used, it is classified as single phase, when they are fed by a single phase electrical mains, or three phase when they are fed by the three phases. Depending on the rectification type, they can be half wave, when only one of the current semi-cycles is used, or full wave, where both semi-cycles are used.
- **Relay.-** The relay(in French relais, relief) is an electromechanical device that works as a switch controlled by an electric circuit where, through an electromagnet, a set of contacts are moved and it allows to open or to close other independent electric circuits.
- **SCR.-** Abbreviation of «Silicon Controlled Rectifier», called commonly as Thyristor: semiconductor device of 4 layer that works as almost an ideal switch.
- **THD.-** They are the acronyms of «Total Harmonic Distortion». The total harmonic distortion is done when the output signal of a system is not equivalent to the one that enter into it. This lack of linearity affects to the wave shape, because the equipment has introduced harmonics that they were not in the input signal. As they are harmonics, it means multiple of the input signal, this distortion is not so dissonant and it is more difficult to detect.

