

USER MANUAL



UNINTERRUPTIBLE POWER SUPPLY

SLC CUBE 4

7,5 - 20 kVA

SALICRU

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1. INTRODUCTION

1.1. THANK-YOU LETTER

We would like to thank you for purchasing this product. Read this instruction manual carefully in order to familiarise yourself with its contents. You will get the most out of the unit, achieve a higher the degree of satisfaction and guarantee high levels of safety the more you understand the unit.

Please do not hesitate to contact us for any further information or any questions you may have.

Yours sincerely,

SALICRU

- The unit described in this manual **can cause serious physical injury if handled incorrectly**. Therefore, the unit must only be installed, serviced and/or repaired by our staff or by **qualified personnel**.
- Although every effort has been made to guarantee that the information in this user manual is complete and accurate, we are not responsible for any errors or omissions that may be present.

The images included in this document are for illustrative purposes only and may not accurately represent the parts of the unit shown in this manual, therefore they are not contractual. However, any differences will be reduced or resolved through the correct labelling on the unit.

- In line with our policy of continuous development, **we reserve the right to modify the specifications, operating principle or actions described in this document without prior notice**.

Consequently, the contents of this manual may differ from the latest version available on our website. Check that you have the latest revision of the document (indicated on the back cover, on our brand logo) and if not, download it from the website.

- The **reproduction, copying, transfer to third parties, modification or translation in full or in part** of this manual or document, in any form or by any means, **without prior written consent** from our company, is prohibited, with us reserving the full and exclusive right of ownership to it.

2. SAFETY INFORMATION

2.1. USING THIS MANUAL

The latest version of the unit's user manual can be downloaded by customers from our website (www.salicru.com). It must be read carefully before carrying out any action, procedure or operation on the unit.

The purpose of the **SLC.CUBE4** documentation is to provide information relating to safety, as well as explanations about the unit's installation and operating procedures. The generic documentation for the unit is supplied in digital format on a CD-ROM/pen drive and includes, among other documents, the system user manual itself.



Document EK266*08 relating to the **"Safety instructions"** is supplied with the unit. Compliance **with these is mandatory, with the user being legally responsible** for their observance and application.

All units are supplied with the corresponding labels to guarantee the correct identification of each part. In addition, the user can refer to the user manual at any time during installation or start-up operation, which provides clear, well-organised and easy-to-understand information.



Nevertheless and as the product is continuously being developed, there may be slight discrepancies or inconsistencies. Therefore, in the case of any queries, the labels on the unit itself will always take precedence.

Once the unit is installed and in operation, we recommend that you keep all of the documentation in a safe place, in case of any future queries that may arise.

This user manual is intended for units from the **SLC CUBE4** series, of between 7.5 and 20 kVA and consisting of cabinets measuring (depth x width x height) 688.5 x 250 (370 ⁽¹⁾) x 826.5 mm.



⁽¹⁾ Dimensions corresponding to the unit with the stabilising supports installed. For safety purposes, it is recommended to install them to give the unit greater stability, largely avoiding the risk of tipping (see).

The following terms are used interchangeably in the document to refer to:

- **"SLC CUBE4, CUBE4, UPS, system, equipment or unit"**.- Uninterruptible power supply, CUBE4 series.

Depending on the context of the sentence, they may refer interchangeably to the UPS itself or to the UPS and the batteries, regardless of whether it is assembled in the same metal enclosure -box- or not.

- **"Batteries or capacitor banks"**.- A group or set of elements that stores the flow of electrons by electrochemical means.
- **"T.S.S."**.- Technical Service and Support.
- **"Customer, installer, operator or user"**.- They are used interchangeably and, by extension, to refer to the installer and/or the operator who will carry out the corresponding actions, whereby the responsibility for carrying out the respective actions may be held by the same person when they act on behalf or in representation of the installer or operator.

2.1.1. Conventions and symbols

Some symbols may be used and may appear on the unit, batteries and/or in the user manual.

For more information, see section 1.1.1 of document EK266*08 relating to the **"Safety Instructions"**.

When there are differences in relation to the safety instructions between document EK266*08 and the unit's user manual, those from the latter will always prevail.

2.1.2. Safety considerations

- Although chapter will cover safety-related considerations in more detail, the following will be taken into account:
 - ❑ Inside the battery cabinet there are accessible parts with DANGEROUS VOLTAGES and consequently with a risk of electric shock, which is why it is classified as a RESTRICTED ACCESS AREA. Therefore the key for the battery cabinet will not be available to the OPERATOR or USER, unless they have been properly instructed.

In the event of an intervention inside the battery cabinet, either during the connection, preventive maintenance or repair procedure, it must be taken into account that **the battery group voltage exceeds 200 V DC** and therefore the relevant safety measures must be taken.
 - ❑ Any connection and disconnection operation of the cables or handling inside the cabinet must not be carried out until 10 minutes have passed, in order to allow the internal discharge of the unit's capacitors. Even so, use a multimeter to check that the terminal voltage is less than 36 V.
 - ❑ In case of installing the equipment in IT neutral regime, the switches, circuit breakers and thermal-magnetic protection devices must break the NEUTRAL, as well as the three phases.

3. QUALITY ASSURANCE AND STANDARDS

3.1. MANAGEMENT STATEMENT

Our aim is to satisfy our customers. Management has established a Quality and Environmental Policy for such purposes. As a result, a Quality and Environmental Management System will be implemented, which will ensure that we are compliant with the requirements of the **ISO 9001** and **ISO 14001** standards and that we meet all customer and stakeholder requirements.

The company management is also committed to the development and improvement of the Quality and Environmental Management System, through:

- Communication to the entire company of the importance of satisfaction, both in terms of the customer's requirements, as well as legal and regulatory requirements.
- Dissemination of the Quality and Environmental Policy and setting of the Quality and Environment targets.
- Management reviews.
- Provision of the necessary resources.

3.2. STANDARDS

The **SLC CUBE4** product is designed, manufactured and marketed in accordance with the **EN ISO 9001** Quality Assurance standard. The **CE** mark indicates conformity with the EEC Directives through application of the following standards:

- **2014/35/EU**. - Low voltage directive.
- **2014/30/EU**. - Electromagnetic compatibility (EMC).
- **2011/65/EU**. - Restriction of hazardous substances in electrical and electronic equipment (RoHS).

According to the specifications of harmonised standards. Reference standards:

- **EN-IEC 62040-1**. Uninterruptible power systems (UPS). Part 1-1: General and safety requirements for UPS used in user access areas.
- **EN-IEC 62040-2**. Uninterruptible power systems (UPS). Part 2: Electromagnetic compatibility (EMC) requirements.



The manufacturer shall not be held responsible for any damage caused by the user after altering or tampering with the unit in any way.



WARNING!:

This is a C3 category UPS. This is a product for commercial and industrial application in the second environment; installation restrictions or additional measures may be necessary to avoid disturbances.

This unit is not suitable for use in basic life support (BLS) applications, whereby a fault in the unit could prevent the life support machine from working or could significantly affect its safety or effectiveness. Likewise, it is not recommended for medical applications, commercial transport, nuclear installations, or other applications or loads, whereby a fault in the product could lead to personal injury or material damage.



The EC declaration of conformity for the product is available for the customer and can be requested from our head office.

3.2.1. First and second environment

The following environment examples cover most UPS installations.

3.2.1.1. First environment

This environment includes residential, commercial and light industry installations, connected directly without intermediate transformers to a public low-voltage power supply network.

3.2.1.2. Second environment

This environment includes all commercial, light industry and industrial establishments that are not directly connected to a low-voltage power supply network supplying buildings used for residential purposes.

3.3. ENVIRONMENT

This product has been designed with the protection of the environment in mind and has been manufactured in accordance with the **ISO 14001** standard.

Recycling the unit at the end of its useful life:

Our company commits to using the services of approved companies that comply with the regulations in order to process the recovered product at the end of its useful life (please contact your distributor).

Packaging:

To recycle the packaging, follow the applicable legal regulations, depending on the particular standards of the country where the unit is installed.

Batteries:

The batteries represent a serious health and environmental risk. They must be disposed of in accordance with the applicable laws.

4. PRESENTATION

4.1. VIEWS OF THE CABINETS

4.1.1. UPS cabinets

The power range between 7.5 and 20 kVA consists of a UPS cabinet measuring 826.5 mm in height.

Fig. 1 and Fig. 2 show front and rear views and their constituent parts.

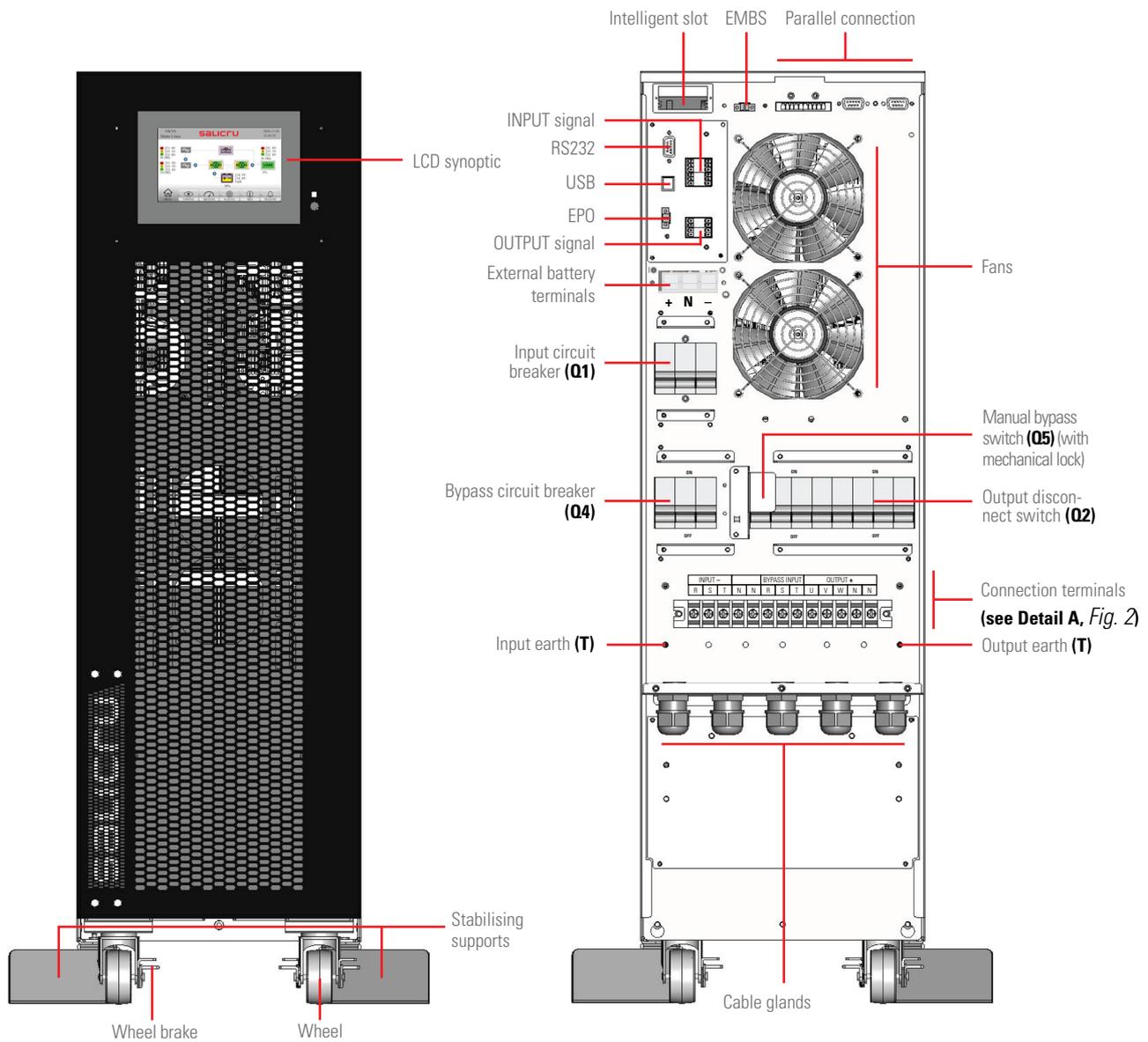
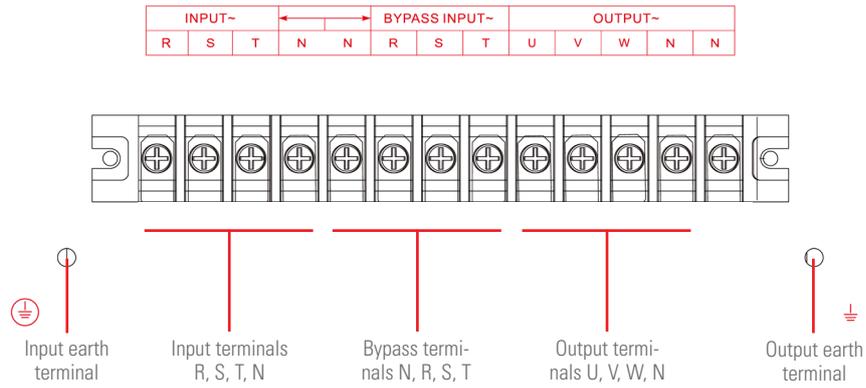


Fig. 1. Front and rear views (without the terminal cover) of the SLC CUBE4 series 7.5 to 20 kVA cabinet.



Detail A

Fig. 2. Detailed view of connection terminals.

! In the standard unit, the bypass line is connected internally to the rectifier, being common to the input line. In this case, there is a label that covers the silk-screen printing of the bypass input to indicate that the bypass terminals are not connected/available (see detail Fig. 2b). Annex II shows the other possible input/output configurations.

4.1.2. Battery cabinets

There are 2 battery cabinet sizes for all available UPS power outputs (depth x width x height): 577.2 x 250 x 576.5 mm and 800 x 250 (371.6 taking the stabilising elements into account) x 836.5 mm and (see Fig. 3 and Fig. 4).

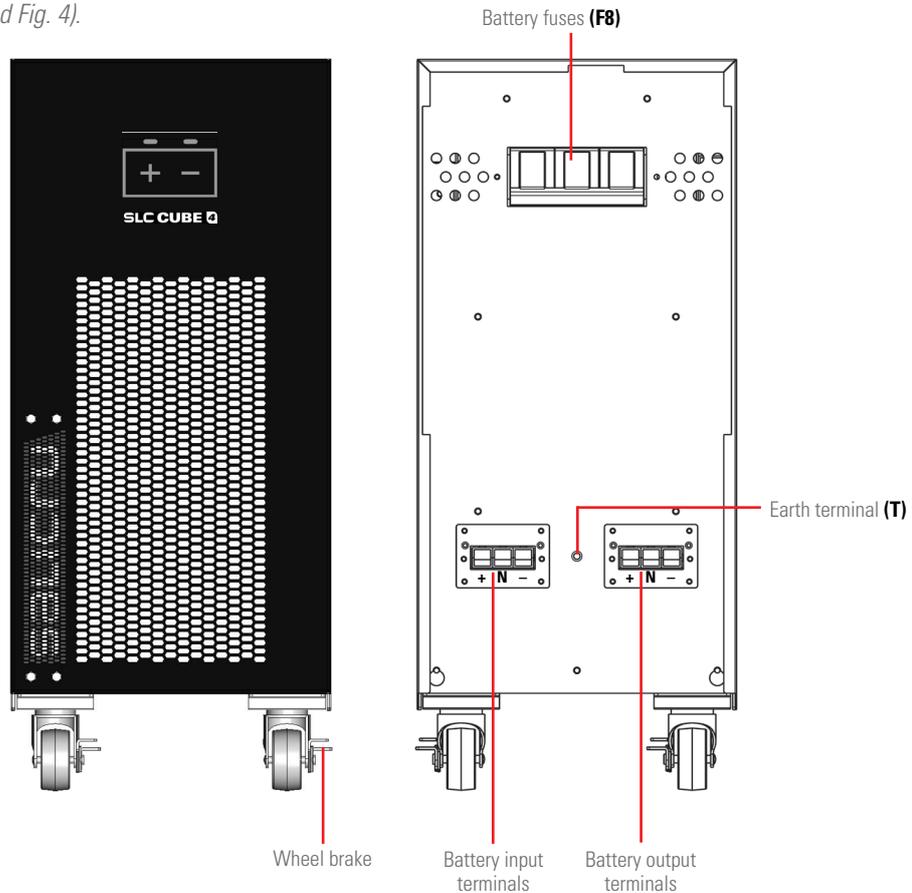


Fig. 3. Front and rear views of the battery cabinet measuring 576.5 mm in height.

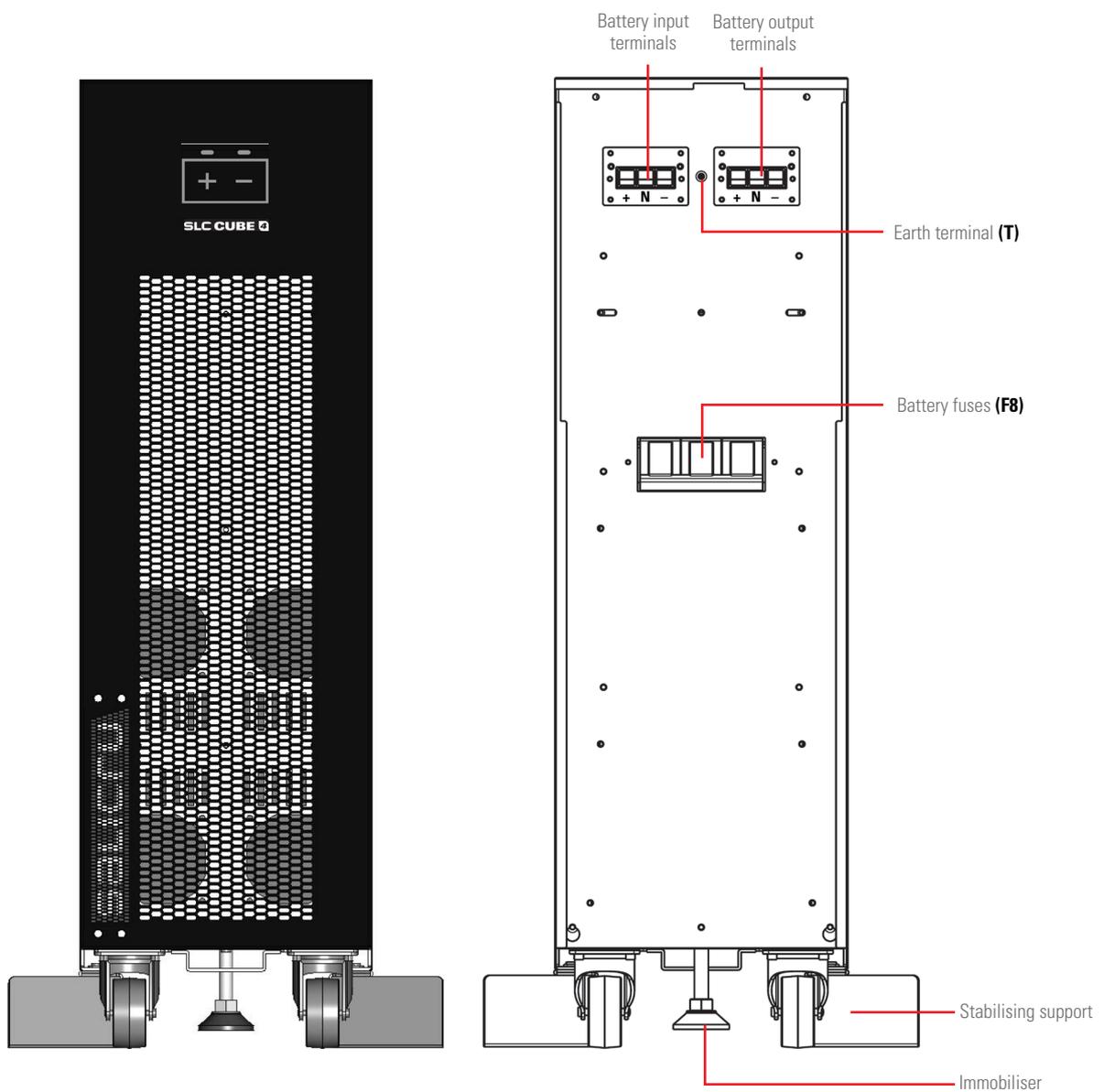
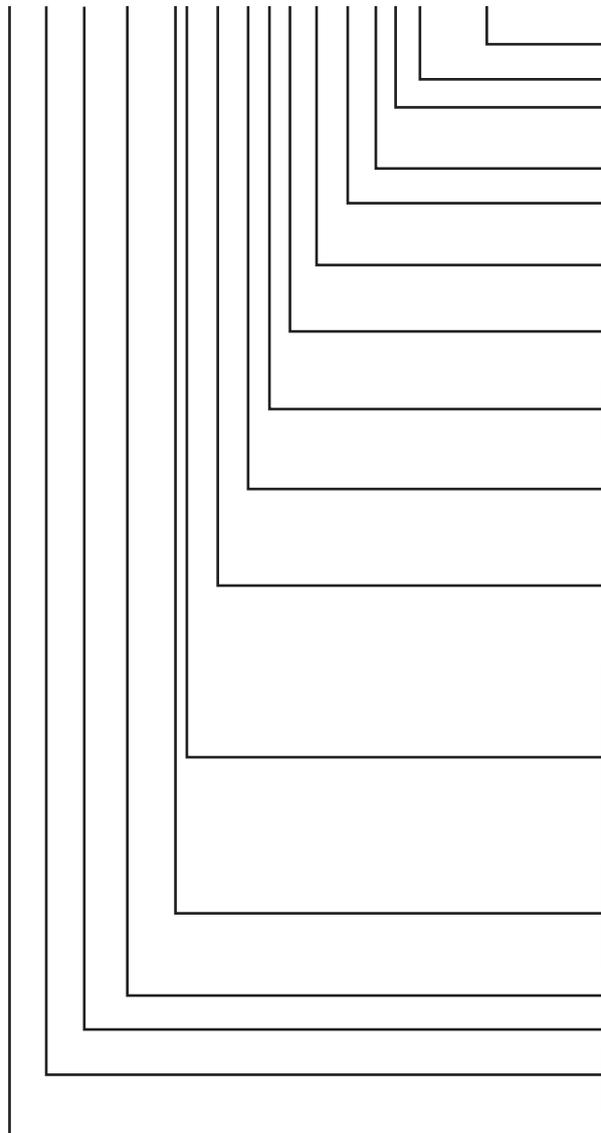


Fig. 4. Front and rear views of the battery cabinet measuring 836.5 mm in height.

4.2. PRODUCT DEFINITION

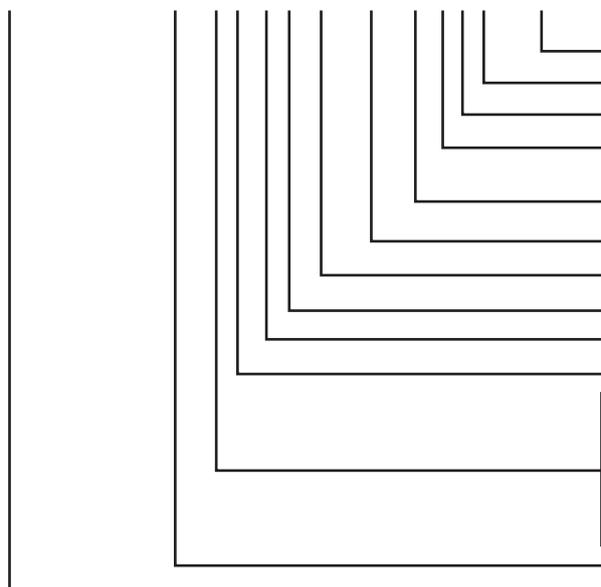
4.2.1. UPS and battery module nomenclature

KIT SLC-10-CUBE4-LB 8B1 Q 0/44AB147 AWCO EE666502



EE*	Special customer specifications.
CO	"Made in Spain" marking on the UPS and packaging (for customs).
W	Generic brand unit. The SALICRU brand does not appear on covers, manuals, packaging, etc.
A	Unit for three-phase networks from 3x200 to 3x220 V.
147	Last three digits of the battery code (units with non-standard autonomy batteries).
AB	Letters of the battery family (units with non-standard autonomy batteries).
44	Number of batteries in a single branch (units with non-standard autonomy batteries).
0/	Unit prepared for the autonomy or batteries requested.
/	No factory-installed batteries but with the necessary accessories for installing them. Batteries are supplied separately.
Q	Group of 4 languages (English, Spanish, Portuguese and French).
8B1	8: Charge current setting according to <i>Tab. 1</i> . Omit for standard equipment. B: Charger adjustment. Omit for standard equipment.
BC	Unit prepared for common battery bank (parallel systems of two units).
–	Omit for standard autonomy (only for internal batteries in the unit's cabinet).
B	Separate bypass line.
SB	UPS without bypass line.
L	Input/output, single-phase/single-phase configuration.
M	Input/output, single-phase/three-phase configuration.
N	Input/output, three-phase/single-phase configuration.
–	Input/output, three-phase/three-phase configuration.
CUBE4	UPS series.
10	Power in kVA.
SLC	UPS or frequency converter with batteries.
CF	Frequency converter.
KIT	Only for "/" units as the batteries are not installed in the units and it is treated as a KIT.

KIT MOD BAT CUBE4 0/2x44AB999 100A BC AWCO EE666502



EE*	Special customer specifications.
CO	"Made in Spain" marking on the UPS and packaging (for customs).
W	Generic brand unit.
A	Battery module for three-phase network units from 2x200V to 3x220V.
BC	Last three digits of the battery code.
100A	Protection size.
999	Last three digits of the battery code.
AB	Letters denoting the battery type.
44	Number of batteries of a single branch.
*x	Number of battery branches in parallel. Omit for one.
0/	Battery module without batteries but with cabinet and the necessary accessories for installing them.
/	Battery module without factory-installed batteries but with a cabinet and the necessary accessories for installing them. Batteries are supplied separately.
CUBE4	Battery module series.
KIT	Only for / units as the batteries are not installed in the units and it is treated as a KIT.

Battery configuration	
1	8+8
2	10+10
3	16+16
4	20+20

Charging current (A)	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Tab. 1. Battery configuration and charging current.



(B1) The unit is supplied without batteries and without accessories (screws and electric cables). The batteries are expected to be installed in an external cabinet or battery rack. Upon request, the cabinet or rack and the necessary accessories can be supplied.

For units ordered without batteries, their purchase, installation and connection will always be borne by the customer and **under their responsibility**. However, the intervention of our **T.S.S.** to carry out the necessary installation and connection work may be necessary. The data related to the batteries in terms of number, capacity and voltage are indicated on the battery label next to the unit's name plate. **Adhere strictly** to these data and the polarity of the battery connection.



On units with a separate static bypass line, a galvanic insulation isolation transformer must be inserted in either of the two UPS power lines (rectifier or static bypass input), to prevent the direct connection of the neutral of the two lines via the unit's internal connections. This only applies when the two power lines come from two different networks, such as:

- Two different electricity companies.
- An electricity company and a generator set...

4.3. UPS CHARACTERISTICS LABEL



4.4. UPS DESCRIPTION

4.4.1. General description and block diagram

The **SLC CUBE4** unit is a double conversion online Uninterruptible Power Supply (UPS). The classification in terms of its performance is in accordance with the UPS international standard (IEC 62040-3), corresponding to "VFI-SS-11" ⁽¹⁾.

The UPS achieves maximum performance in terms of efficiency, reliability, availability and adaptability to the needs of every installation, thanks to its advanced design:

- Control based on 2 DSP (Digital Signal Processor) cores for the PFC and the Inverter, and two microcontrollers for the display and communications.
- Rectifier and inverter with 3 switching levels.
- State-of-the-art electronic switching devices.
- Compact mechanical design optimised for maintenance.
- Advanced control techniques for achieving the best electrical performance.
- Parallel system of up to 4 units.

The main constituent parts of this unit are:

- Input and output EMI filters.
- Active rectifier with power factor correction (PFC) and low harmonic absorption (THD-i) for the input current. It also carries out the function of battery booster.
- 3-level inverter, and low harmonic voltage distortion.
- Batteries (they may be external to the unit), and battery charger.
- Static bypass
- Manual or maintenance bypass
- Control panel.
- Interface for external signals and communications.

⁽¹⁾**Note:**

"VFI" ("Voltage Frequency Independent"), indicates that the output voltage and frequency of the UPS are independent of the input voltage and frequency.

"SS" (sinusoidal-sinusoidal): sinusoidal output voltage both in normal and battery mode. (See chapter 4.5. of this manual)

"11" (dynamic response classification "1", see. IEC 62040-3): both in operating mode changes, as well as in linear load steps, the dynamic response is the best possible (response speed, voltage drop) within the classification specified by the standard in question.

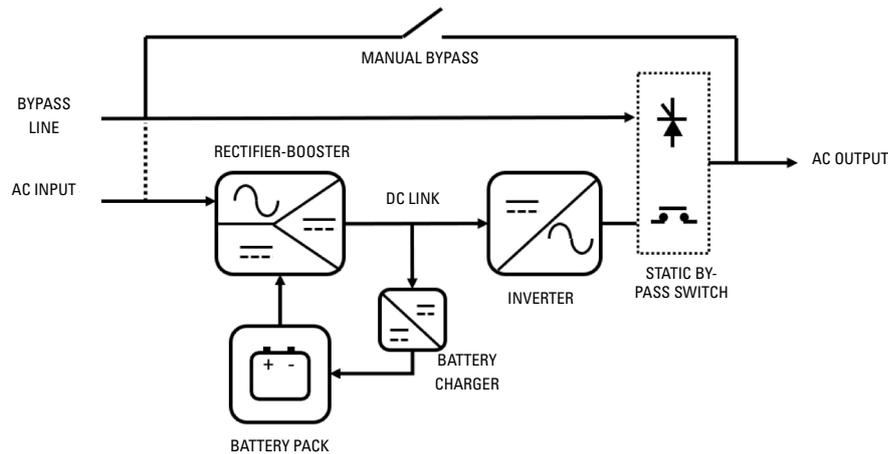


Fig. 5. SLC CUBE4 UPS block diagram.

4.4.2. Rectifier-booster

The rectifier-booster has the double function of:

- Converting (rectify) the alternating voltage (AC) into direct voltage (DC) in normal mode (input network voltage present), voltage required at the inverter input.
- Adapting (boost) the battery voltage (DC) to the required direct voltage (DC) at the inverter input.

This direct voltage generated by the rectifier-booster (supplied to the inverter) will be referred to as direct bus voltage.

The rectifier-booster has a static switch at the input, using thyristors, which allows the input source, alternate network or batteries, to be selected at all times, according to the UPS operating mode.

The rectification-boosting stage is carried out by the 3 sets of dual boost converters, one per phase, made up of a power inductor, IGBT transistors, diodes and electrolytic capacitors for filtering the bus voltage. The excitation of the IGBT transistors via PWM, controlled digitally, is carried out by one of the floating-point DSPs, with the aim of obtaining:

- Sinusoidal current absorption (low THDi) in normal or AC mode, so that no distortion is added to the input network, avoiding affecting the other loads.
- Power factor 1 from very low levels of output load.
- Balanced absorption of the three-phase input currents.
- Direct current absorption in battery or DC mode.

The sizing of the rectifier will allow the inverter to be permanently supplied with 100% load, plus the power required to charge the batteries.

4.4.3. Inverter

The inverter converts the DC voltage present at the DC bus into AC alternating voltage, stabilised in amplitude and frequency. Therefore, it completes the double conversion, so that this new "clean" AC voltage is independent of the input voltage (isolated from potential disturbances, peaks, dips, unstable frequency, etc.).

The architecture of this converter is based on 3 separate single-phase inverters with 3 switching levels (4 IGBT transistors per

phase), thus achieving the following:

- Minimal switching losses (half the PWM voltage compared to a conventional 2-level inverter).
- A reduction of the switching ripple on the power inductor, and an overall reduction of the L-C filtering effort.
- The switching frequency is raised to non-audible values.

The control of this inverter is also digital, and is carried out by another of the system's floating-point DSP cores. The generated voltage has:

- Low harmonic voltage distortion (THDv), even for highly distorting loads (non-linear load).
- Stable output voltage, with accuracies greater than 0.5% with regards to voltage and greater than 0.05% with regards to frequency.
- Current limit: in the event of output short circuits, starting loads with peak overcurrent ("in-rush"), or similar. The inverter limits the output current by reducing the output voltage (at the limit, to 0 V in the case of short circuits), in order to protect the unit in such situations, or it allows "starting" loads with this initial overcurrent.

The inverter is sized to operate permanently charged at 100%, and also for temporary overloads, depending on a Load-Time curve, with typical values of 125% for 10 minutes, 150% for 1 minute.

4.4.4. Batteries and battery charger

The batteries are the element that allows the UPS to work in the absence of an AC input network, i.e. in autonomy or battery mode. These elements can be integrated in the standard cabinet of the UPS or in an external cabinet or rack (a combination of internal and external batteries is also an option). The number of batteries (normally in 12 V blocks) must be enough to allow the rectifier-booster to work within its operating ranges, with a certain amount of flexibility to adjust to the required autonomy.

As already explained in the Rectifier-booster section, in battery mode, the battery voltage will be connected (via controlled thyristors) to the booster input, and this converter will be disconnected from the AC input (except for hybrid operating modes).

In terms of charging the batteries, this will occur when the UPS is working in normal mode (AC voltage network present, AC/DC rectifier operating). The UPS has a reducer converter ("buck"), which is supplied by the DC bus voltage, adjusting it to the required levels for charging the batteries. This battery charging includes 2 basic stages, or even 3 (depending on the type of battery):

- **Constant current:** the set charge current must not be exceeded, and the output voltage of the charger will be dynamically adjusted to achieve this allocation.
- **Constant voltage:** once the battery floating voltage is reached, the charge current will decrease. This floating voltage must be maintained in normal mode, a voltage that will be readjusted depending on the temperature.
- **Quick charge or "boost" voltage:** depending on the type of battery (chemistry), an intermediate stage can be configured, after charging at constant current and before allocating continuous float voltage, which consists of supplying the batteries with a voltage that is higher than the floating voltage for a limited time, in order to obtain a quicker and more efficient recharge.

The architecture of the charger is based on a double reducer converter: from positive and negative semi-buses, positive and negative battery charge voltages and currents are obtained. The switching of the charger's IGBTs also consists of a PWM controlled digitally by DSP.

The charger incorporated as standard in the units allows the batteries to be recharged for both standard autonomy and for extended autonomy (greater capacity in Ah installed).

4.4.5. Static bypass

The static bypass switch allows the load or loads to be switched between the inverter and the emergency (or bypass) network, and vice versa, without interruption. This bypass line may or may not be common to the rectifier AC input.

However, and unless otherwise requested - separate networks -, the phase terminals of both blocks are connected internally at the factory in order to have a single common input.

When separate power supplies are required, it will be necessary to remove the bridges between phases from both blocks before connecting the power cables.

The switching of the output load to the bypass line can be ordered manually, or it can be activated by the UPS automatic control in certain emergency situations, such as overload or over-temperature.

As power switching elements, it uses thyristors (SCR) and relays. Thyristors for connecting/disconnecting the voltage of the bypass line to the loads, relays for connecting/disconnecting the inverter voltage.

4.4.6. Manual or maintenance bypass

The manual bypass is used to isolate the UPS from the input voltage and loads, supplying the load directly from the input network in the event of maintenance or serious faults.

It consists of a switch, supplied as standard and integrated in

the unit, which allows the bypass or emergency line voltage (common or not to the rectifier AC input) to be connected directly to the output by simply activating this switch, and without the intervention of a converter or controlled electronic device. An auxiliary signal will notify the UPS control that this switch is activated.

The manual bypass switch supplied in the unit has a mechanical lock that makes it impossible for it to be activated accidentally by unqualified staff.

Before operating this switch, it is necessary to transfer the power supply of the load on the static bypass via the respective command from the touchscreen. The transfer of the power supply to the loads from the static bypass to the manual bypass is without interruption.

External manual bypass

In addition to the standard internal manual bypass, it is also possible to optionally install an external manual bypass.

4.4.7. Input-output configurations

The types available are:

- Three-phase/three-phase (with or without separate bypass).
- Three-phase/single-phase.
- Single-phase/single-phase (with or without separate bypass).



The user is not permitted or authorised to change the configuration, as this implies the modification of the plates between the power terminals by adding or removing them in order to obtain the required configuration, as well as changes to variables from menus accessed by "Password" via the control panel.

4.5. OPERATING MODES

The UPS can operate in various operating modes, which can be reached automatically or forced by a manual action of the operator. These basic operating modes are:

- Normal mode.
- Battery mode (autonomy mode).
- Bypass mode.
- Maintenance bypass mode.
- ECO mode.
- Frequency converter mode.
- Standby mode.

4.5.1. Normal mode.

For the UPS to work in normal mode, there must be an input network (input switch activated), output switch activated (supply for the loads), and there must be batteries in the unit or connected in an external cabinet.

In this double conversion mode, the rectifier works powered by the AC network and supplying direct voltage to the inverter (DC bus). The inverter converts the DC voltage into a stabilised sine wave, connecting to the loads via its static switch. The rectifier also supplies voltage to the battery charger, which keeps the batteries in an optimal state of charge.

It is the operating status with the highest protection for the loads, as it applies "clean" voltage to them independently of the input voltage, and with the battery power available in case an AC network fault occurs.

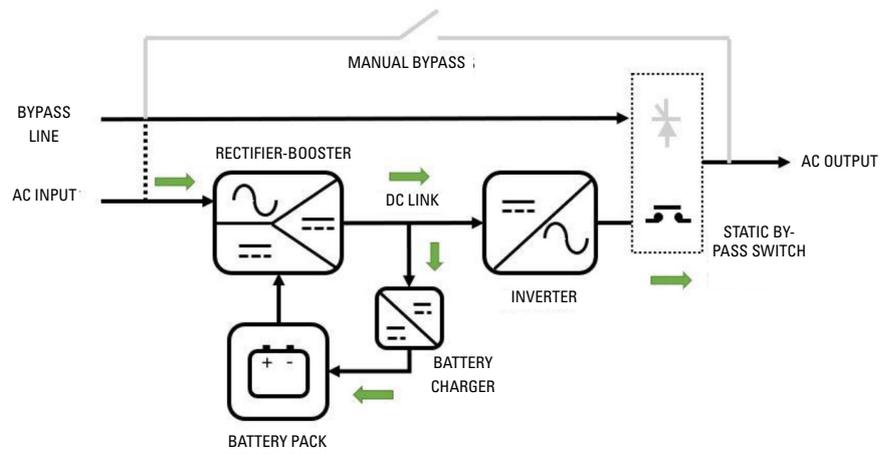


Fig. 6. UPS power flow in normal mode.

4.5.2. Battery mode

In the event of an AC power supply fault, the rectifier-booster switches its input power source from the AC network to the battery without interruption. Although the battery voltage decreases according to the discharge current value, the rectifier-booster is responsible for keeping the direct voltage to the inverter input within the nominal working values.

If the supply is restored before the batteries are completely discharged, the system will return to normal operation automatically: rectifier operating in AC/DC conversion, charger charging batteries and inverter operating normally.

Otherwise, as soon as the batteries reach the discharge limit (end of autonomy), the inverter switches off, and if the unit has a common

input for the rectifier and the bypass, the power supply of the load is interrupted ("black-out"). For units with a bypass line that is independent of the rectifier AC input, if, upon reaching the battery discharge limit, the voltage in the bypass line is within the tolerance limits, the power supply of the load will be transferred to this emergency line.

After a stop due to the end of autonomy, when the power supply is restored, the rectifier will restart the charging of the batteries. If the power supply of the loads was interrupted (common bypass at rectifier input), they will be powered initially via the static bypass switch, and once the inverter restarts and is reconnected to the output, they will be powered by it.

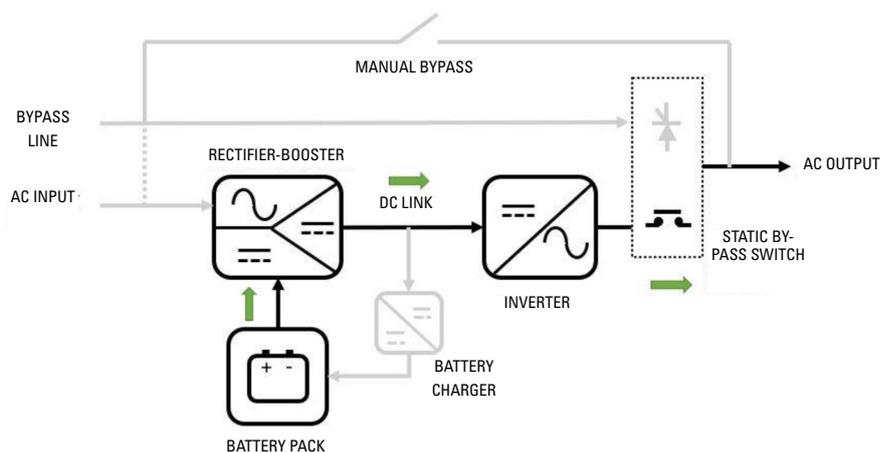


Fig. 7. UPS power flow in battery mode.

4.5.3. Bypass mode

In this operating mode, the voltage supplied to the loads corresponds directly to the emergency (or bypass) line, connected to the output by controlled thyristors. The inverter is disconnected from the output (open relays), and this converter can be completely stopped. This is a transient operating mode, or one that has been reached due to an emergency, where the loads are not "protected" against disturbances in the AC network or even power outages.

From normal operating mode, the load can be transferred to the bypass line, both via manual command by the operator or via communications, as well as automatically via the UPS (through its management logic), given specific circumstances (alarms), such as:

- Output overload.
- Overtemperature of UPS parts or elements.
- Failure or malfunctioning of an internal converter.
- Manual bypass activation.

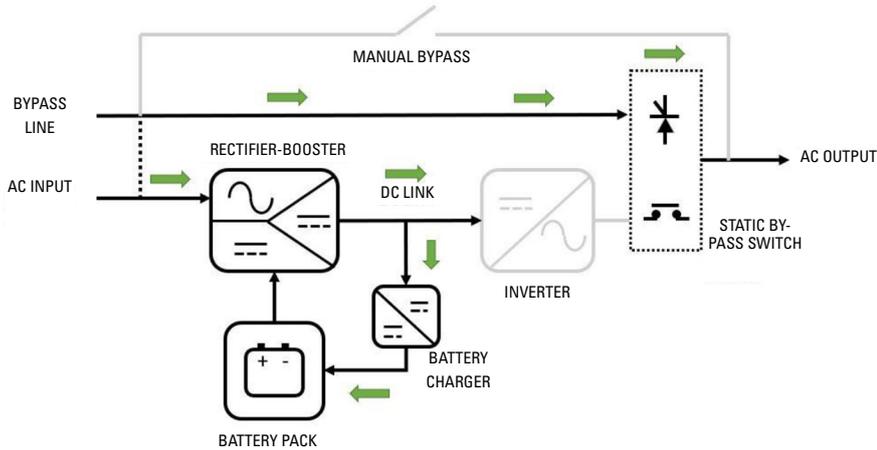


Fig. 8. UPS power flow in bypass mode.

4.5.4. Maintenance bypass mode

This operating mode allows the UPS to be maintained or repaired without interrupting the power supply to the loads.

! The operations for transferring to manual bypass and returning to normal operation will be carried out in accordance with the steps set out in the corresponding chapter of this document. The user will be solely responsible for any damage caused to the UPS, loads and/or installation due to improper actions.

After the controlled transfer process to the maintenance bypass, the loads will be supplied directly from the bypass line (common or not to the rectifier AC input), and initially all converters and internal power supplies of the UPS will be stopped. In this way, the qualified technical service staff will be able to:

- Check the inside of the UPS without the presence of dangerous voltages (except for battery voltage).
- Replace boards or electronic components that require maintenance or repair.
- Start parts of the UPS in test mode.

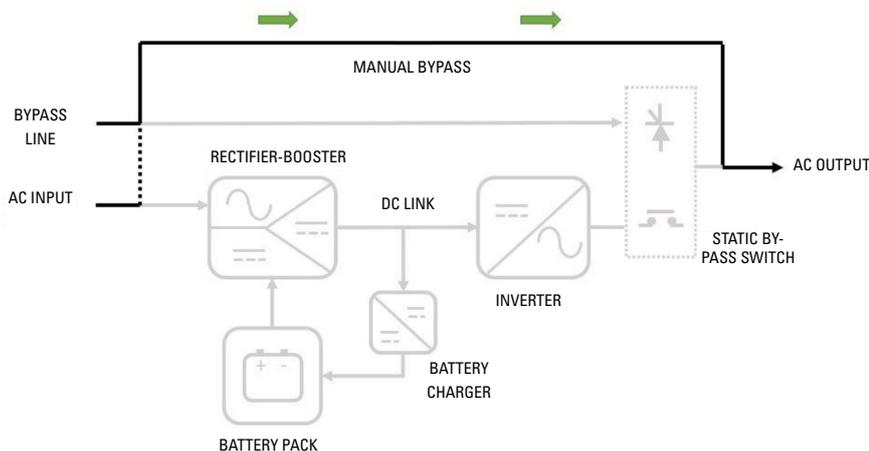


Fig. 9. UPS power flow in manual or maintenance bypass mode.

4.5.5. ECO mode

In addition to normal mode and bypass mode, it is possible to activate ECO mode in order to obtain greater overall system efficiency than normal mode. The downside is that the degree of protection for critical loads will be lower than normal mode (although greater than bypass mode).

In this operating mode, the output voltage is supplied by the static bypass via the emergency (or bypass) line, and the inverter converter will be stopped and ready to restart and connect to the output when a bypass voltage outside of the programmed ranges is detected.

 In the moments of transition (automatic transfer of the output: from the bypass to the voltage generated by the inverter), voltage dips can occur at the output of a few milliseconds (from 2 to 4 ms) that the critical loads must be capable of tolerating in order to make ECO mode viable. In addition, it must be taken into

account that some of the bypass line disturbances can reach critical loads in a "transparent" way, either because they cannot be detected or due to the delay in their detection and the connection of the inverter to the output.

The increase in efficiency (about +2%~3%) is due to the fact that while the bypass line is connected to the output, the inverter is stopped, therefore the conduction and switching losses of this converter are avoided.

Even when in bypass, the rectifier will remain in operation, with the aim of the DC bus being within the operating ranges of the inverter, allowing a quick intervention of the latter. In turn, the charger will carry out periodic start-stop cycles for greater efficiency of the system averaged over time, always monitoring the possible self-discharge of the batteries and recharging them when necessary.

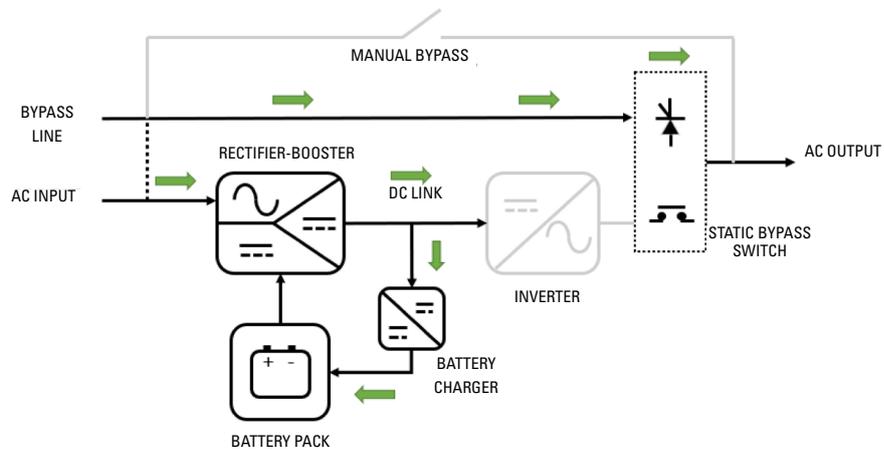


Fig. 10. UPS power flow in ECO mode.

4.5.6. Frequency converter mode

When operating in this mode, activated by configuration, the unit supplies a fixed output frequency of 50 or 60 Hz, which may be different to the input frequency. It consists of an operating mode derived from normal mode, as double conversion is performed, AC/DC rectifier and DC/AC inverter running.

When operating in this mode, the UPS static bypass is disabled, and may not even be physically present in the unit construction (if a frequency converter has been specifically ordered from the factory). The manual bypass switch (if present) should also not be actuated due to the possible impact on the loads connected at the output.

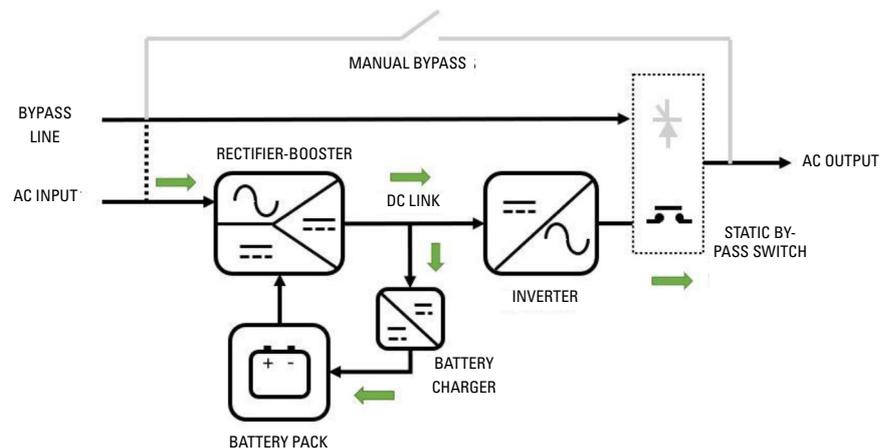


Fig. 11. UPS power flow in frequency converter mode.

4.5.7. Standby mode

By default, when the unit has bypass voltage, the unit powers the loads via the bypass. This function can be deactivated and the unit remains in standby mode without powering the loads via the bypass, and remains in standby mode until the order is given to start the UPS in online mode.

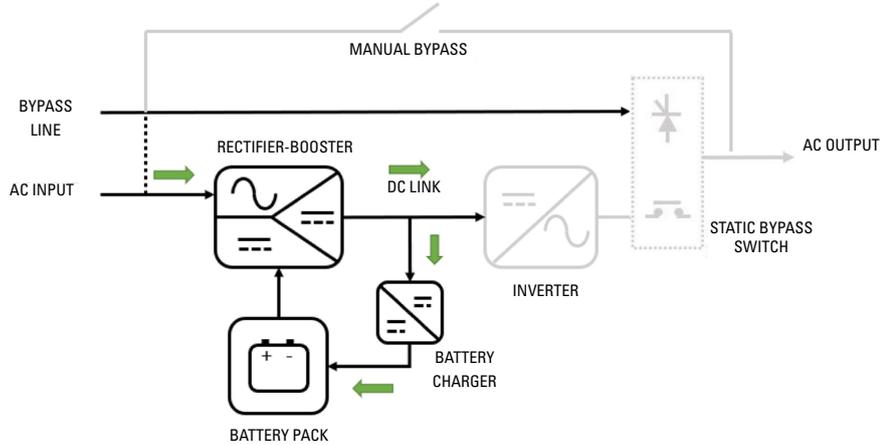


Fig. 12. UPS power flow in standby mode.

4.6. OPERATION AND CONTROL DEVICES

The operation and control devices allow the UPS user/operator to carry out the following actions, among others:

- Unit start-up.
- Special operations (such as switching to bypass mode).
- Maintenance and repair interventions (maintenance bypass mode).
- Monitoring of parameters and measurements "in-situ" via the unit screen (for example: consumption, load percentages, etc.).
- Remote monitoring and signalling (external to the UPS):
 - Digital inputs corresponding to external switchgear (e.g. external manual bypass).
 - Activation of UPS operating mode indication relays (e.g. UPS in battery mode indication relay).
 - RS232/USB communication ports.
 - Communication slot (SNMP, Nimbus, relay extension, extension of functions).

 The use of UPS operation and control devices is only intended for authorised staff. It is recommended to check the training of staff who are responsible for the use and maintenance of the system.

4.6.1. Switches

The switches arranged in the UPS are used to isolate the unit from the AC power supply, the storage batteries and the load.

 **Presence of voltage at unit terminals.** The disconnect switches do not fully isolate the UPS, as the AC voltage is still present at the UPS input terminals. Before carrying out any maintenance on the unit, it is necessary to:

- Fully isolate the UPS by opening (disconnecting) the external switches.
- Wait for at least 5 minutes to allow the capacitors to discharge.

The SLC CUBE4 UPS has the following switches:

- Rectifier AC input line switch, circuit breaker type **(Q1)**.
- AC bypass line switch, circuit breaker type **(Q4)**.
- Circuit breaker for maintenance bypass **(Q5)**. This switch will remain mechanically locked (against activation) during operation in normal mode.
- Output disconnect switch **(Q2)**. It allows the voltage supplied by the UPS to be connected to the loads, or for them to be isolated if necessary.
- For external battery cabinets, fuse holder disconnect switch **(F8)**.

 In the case of battery cabinets with a fuse holder disconnect switch, disconnection with load is not permitted.

4.6.2. Control panel with touchscreen

The control panel of the UPS is fully integrated into a graphic touchscreen ("touch panel"). Some of the characteristics of this screen are as follows:

- 5" diagonal screen size.
- 16:9 aspect ratio.
- Resolution of 800 x 480 pixels.
- 65 K colours.
- Capacitive touch sensor.

This control panel allows:

- Monitoring of measurements and operating parameters.
- Display and acknowledgement of alarms and statuses (active and passed).
- Modification of basic operating configurations and parameters.
- Change of UPS operating mode (normal, bypass, ECO mode, battery test).

4.6.3. External interface and communications



The communications line (COM) consists of a very low voltage circuit and it must be installed separately from other lines that carry dangerous voltages (power distribution line).

4.6.3.1. Digital inputs, relay interface and communications

The unit's interface with the outside consists of various dedicated input and output signals, and different ports and communication slots, as shown below in Fig. 13:

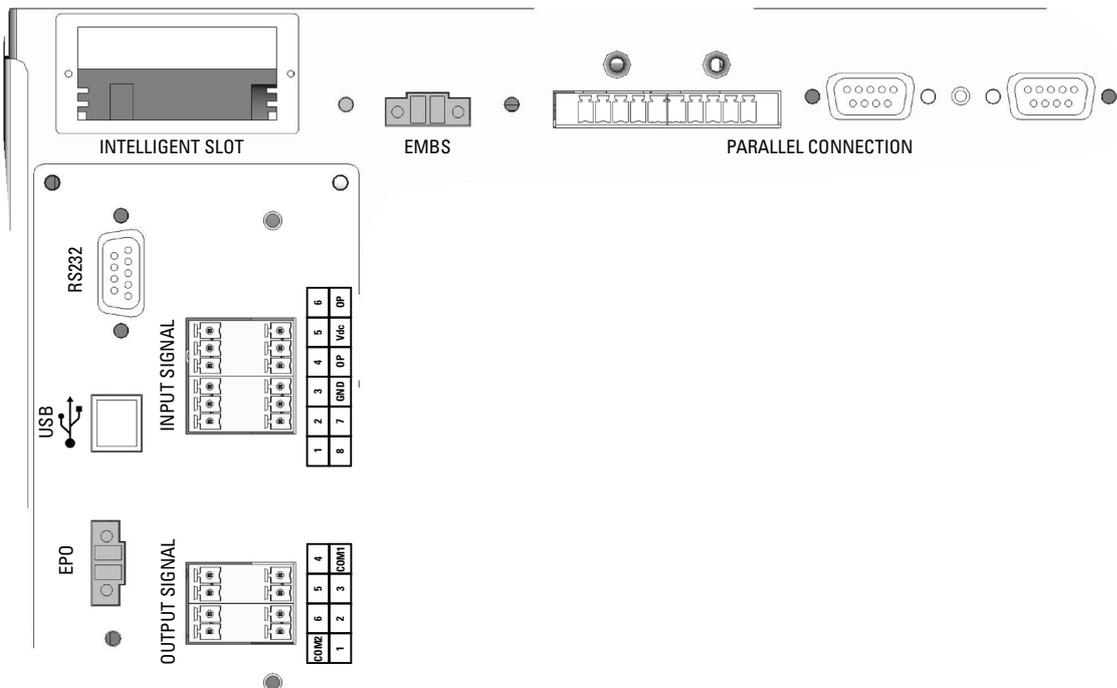


Fig. 13. Detailed view of the external interface and communications.

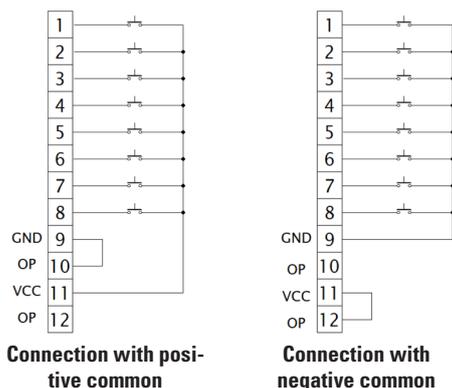


Fig. 14. Connection diagram of the digital input contacts.

1. Signalling (terminal strip):

□ Digital inputs (**INPUT SIGNAL**):

Pin	Description
1	Remote On UPS.
2	Remote Off UPS.
3	Shutdown-Restore: UPS stop, restart in 1 min.
4	Generator set supplying the UPS (activates generator function).
5	External output switch auxiliary contact. Opening the external control panel output switch activates warning <45> External output switch open and the unit is disconnected from the parallel system.
6	External battery switch auxiliary contact. Opening the external control panel battery switch activates warning <46> Battery switch open .
7	Signal provided for an external bypass line switch auxiliary contact. Opening the external control panel bypass switch activates warning <47> Bypass switch open .
8	External input line switch auxiliary contact. Opening the external control panel input line switch activates warning <48> Input breaker open .

□ Digital outputs (**OUTPUT SIGNAL**), via potential free relay contacts (standard unit):

Pin	Description
1	Unit in online or normal mode.
2	Unit in bypass mode.
3	Unit in battery mode.
4	Low battery. Battery end of autonomy alarm (early activation).
5	Any warning present in the unit. The UPS continues to operate in normal mode.
6	Summary Alarm (bypass mode / battery mode / bat open / bypass loss / fault / warning / line fault).

Application example:

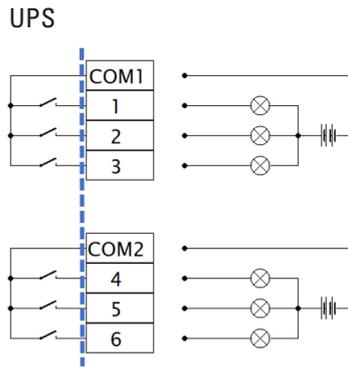


Fig. 15. Connection of digital outputs.

2. Direct communications of the unit:

- USB (Type-B) port.
- RS232 port (DB9 connector).
-  Both ports are mutually exclusive.
- Parallel ports (see Parallel Connection Fig. 13)
 - Two DB15 connectors: communication bus.
 - Two 6-pin strips: current signal bus.

To connect units in parallel, it is necessary to interconnect both ports (output of one to input of the next one using the cables supplied).

3. Communication slot:

A slot for installing a communication card, either SNMP or any other card for extending communications, signalling and/or other services. a "Nimbus" communication card is supplied by default, which allows connection to the "cloud" services owned by SALICRU.

4.6.3.2. Manual bypass auxiliary contact terminals (EMBS)

The unit's manual bypass switch (**Q5**) has a microswitch fitted behind its mechanical lock. This normally open contact is extended to a two-terminal strip (**EMBS**) located behind the unit (see Fig. 13 and Fig. 16) and internally connected to the UPS control.

On distribution boards with a manual bypass supplied on request, there is a two-terminal strip connected in parallel with the normally open auxiliary contact of the manual bypass switch or disconnect switch of the board itself. The manual bypass auxiliary contacts are of the advanced when closing type.

The connection between the board's auxiliary contact and the UPS or UPSs is in parallel with that of the board. As such, any of the auxiliary contacts that close the circuit will activate the inverter stop order, supplying output voltage via the static bypass, unless it is disabled via the control panel, which will cut the power to the loads.

 In parallel systems, the manual bypass switch or disconnect switch of the distribution board has an auxiliary contact block for each unit. Under no circumstances join the different contacts to each other, thus avoiding joining the different earths of the control of each UPS.

 If you acquire a manual bypass panel from another source, check that it has the indicated auxiliary contact and connect it to the terminal strip of the UPS or of each unit in parallel systems. The auxiliary contacts must be the advanced when closing type.

 As a safety measure for the system, including the loads, it is **ESSENTIAL** to connect the UPS strips to the strip with the same functionality on the manual bypass panel. As such, an incorrect action on any manual bypass switch or disconnect switch with the UPS running will be prevented from causing the total or partial failure of the installation, including loads.



Fig. 16. UPS manual bypass switch auxiliary contact connector.

4.6.3.3. EPO (Emergency Power Off) terminals

The UPS has two terminals for the installation of an external Emergency Power Off (EPO) button (Fig. 13).

By default, the unit is issued from the factory with the closed EPO circuit type **-NC-**: the UPS will cut the power supply, emergency stop, by opening the circuit:

- Either by removing the female connector of the socket where it is inserted. This connector has a cable connected as a bridge that closes the circuit (see Fig. 17-A).
- Or by activating the unit's external button, which belongs to the user and is installed between the connector terminals (see Fig. 17-B). The connection on the button must be in the normally closed (NC) contact, so the circuit will open when it is activated.

Via the communication software, it is possible to select the reverse functionality (**NO**).

However, and except for specific cases, we advise against this type of connection in view of the purpose of the EPO button, as it will not act upon an emergency request if either of the two cables that run from the button to the UPS is cut (this anomaly would immediately be detected in a closed EPO circuit **-NC-**, which, although there is a risk of an unexpected cut in the powering of the loads, ensures an effective emergency functionality).

To recover the normal operating status of the UPS, it is necessary to insert the connector with the bridge into its receptacle or deactivate the EPO button. The unit will be operational.

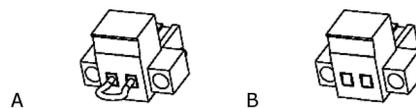


Fig. 17. Connector for the external EPO.

5. INSTALLATION



Read and follow the Safety Information set out in chapter 2 of this document. Failure to adhere to any of the indications set out in chapter 2 may cause a serious or very serious accident for those who are in direct contact with the unit or who are in the vicinity, as well as faults in the unit and/or in the loads connected to it.

In addition to the unit's user manual, other documents are supplied on the documentation pen drive. Consult them and strictly follow the indicated procedure.

The cross-sections of the cables used for the installation will be in line with the currents indicated on the name plate, in compliance with local Low Voltage Electrotechnical Regulations.

This chapter details the relevant requirements for locating and wiring the **SLC CUBE4** 7.5-20 kVA UPS series. As each site has its own location and installation particularities, the purpose of this chapter is not to provide precise step-by-step instructions, rather it should be used as a guide for the general procedures and practices to be observed by **qualified** staff (figure recognised and defined in the EK266*08 safety instructions).

Unless indicated otherwise, all actions, indications, premises, notes, etc. are applicable to the SLC CUBE4 units, whether or not they form part of a parallel system.

5.1. RECEPTION.

All cabinets are supplied on wooden pallets that are mechanically attached to them, with cardboard or wooden packaging according to the model. Although the risk of tipping is minimal, they must be handled with care, especially the taller cabinets and when there is a slope.

- It is dangerous to handle the unit on the pallet in a careless manner, as it could tip and cause serious or very serious injuries to the operators, resulting from impact due to it possibly tipping over and/or operators becoming trapped. Pay attention to section 1.2.1. of the safety instructions -EK266*08- in all matters relating to the handling, moving and positioning of the unit.

Use the most suitable means for moving the UPS when it is still packed, with a pallet truck or forklift.

Any handling of the unit must be done paying attention to the weights indicated in "Annex III. Technical specifications" according to the model.

5.1.1. Reception, unpacking and contents

- Reception. Check that:
 - The information on the label attached to the packaging corresponds to the information specified in the order. Once the UPS is unpacked, check the above information with the information on the unit's name plate.

If there are any discrepancies, deal with the non-conformity as soon as possible, citing the unit's manufacturing number and the references on the delivery note.
 - It has not suffered any mishap during transport (packaging and impact indicator in perfect condition).

Otherwise, follow the protocol indicated on the label attached to the impact indicator, located on the packaging.

- Unpacking
 - To check the contents, the packaging must be removed.
 - Complete the unpacking according to the procedure in section 5.1.3.
- Contents

UPS:

 - The unit itself.
 - The user manual in electronic format [Pen Drive].
 - 1 RJ45 cable for connection with the Nimbus communication card.
 - In the case of a parallel system, a set of parallel cables.

Battery cabinet:

 - Battery connection bundle.
 - Three battery fuses to be installed in the fuse holder disconnect switch.

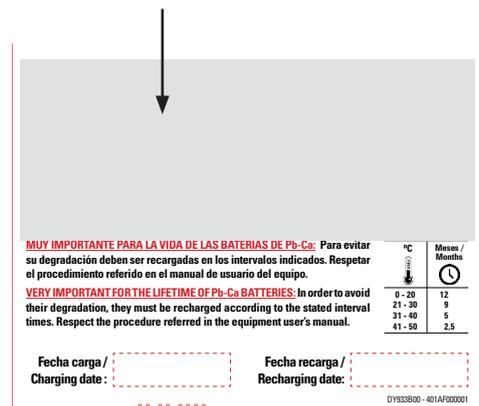
Once the reception process is complete, the UPS should be repacked until it is started up in order to protect it against mechanical shock, dust, dirt, etc.

5.1.2. Storage

The unit must be stored in a dry, well-ventilated area, protected from rain, dust, splashes of water or chemical agents. It is recommended to keep each unit in its original packaging, as it has been specifically designed to ensure maximum protection during transport and storage.

- For units that contain Pb-Ca batteries, the charging periods indicated in Tab. 2 of document EK266*08 must be observed, as well as the storage temperature to which they are exposed, otherwise the warranty may be invalidated.

Data label for the model.



- Factory charging date noted.
- Space to note the new charging date.

Fig. 18. Label on the packaging of the battery unit.

- After this period, connect the unit to the mains together with the battery unit, if applicable, start it according to the instructions described in this manual and charge for 12 hours.

- Once the batteries have been charged, stop the unit, disconnect it electrically and store the UPS and the batteries in their original packaging, noting the new date of recharge of the batteries in the box on the label (see Fig. 18).
- Do not store the devices where the ambient temperature exceeds 50°C or drops below -15°C, as this may cause degradation of the electrical characteristics of the batteries.

5.1.3. Unpacking

- The unit's packaging consists of a wooden pallet, cardboard or wooden packaging, as applicable, expanded polystyrene (EPS) or polyethylene foam (EPE) corner protectors, polyethylene cover and strips, all recyclable materials, so if you do dispose of them, you should do so in accordance with current laws. We recommend that you keep the packaging in case you need to use it in the future.
- The following figures show, by way of example, the necessary steps for moving and unpacking a UPS. The same can be applied to the battery cabinets that use the same packaging system.

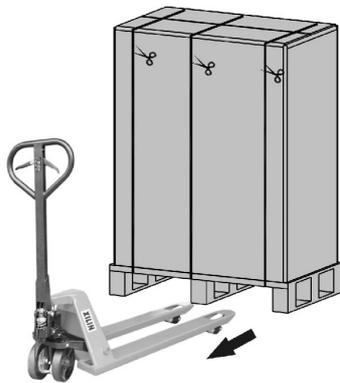
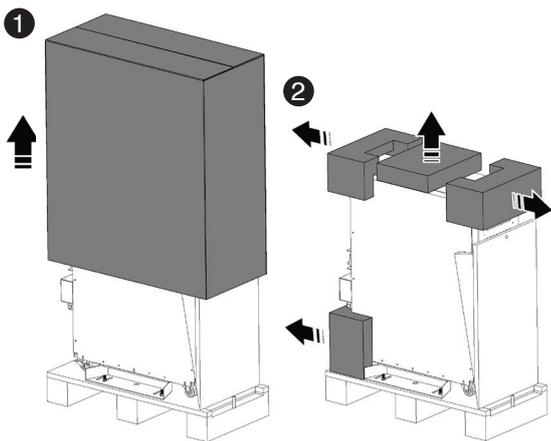
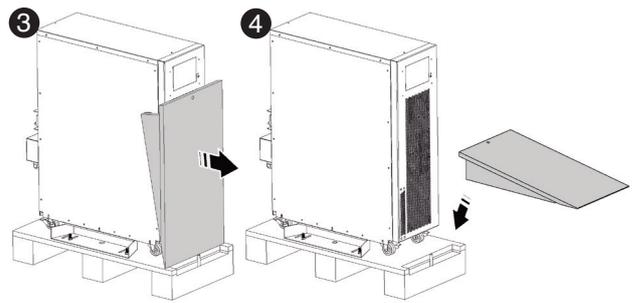


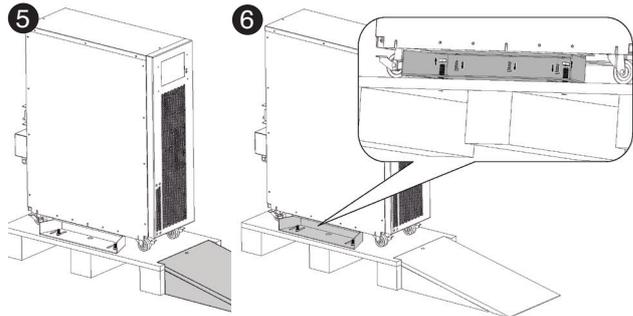
Fig. 19. Moving a packaged unit using a pallet truck.



To unpack the unit, cut the strips around the cardboard packaging and remove the packaging upwards as if it were a cover ①; remove the corner protectors and the plastic cover ②.

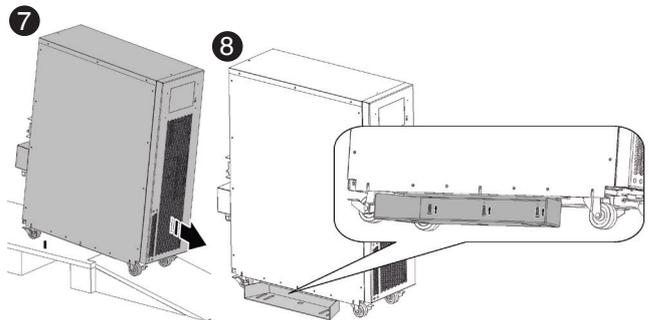


Remove ③ and mount ④ ⑤ the wooden ramp supplied for lowering the unit from the pallet.



The unit is joined to the wooden pallet via a metal part in the shape of an "L" (stabilising supports), located on each side.

Remove the screws connecting the pallet and the unit ⑥.



! Before proceeding to lower the unit, it is necessary to remove the stabilising supports in order to prevent them from hindering the process and bending on impact with the wooden ramp, which could damage the UPS structure.

Lower the UPS from the pallet ⑦ and fix the stabilising supports to the UPS ⑧.

Fig. 20. Example of cardboard packaging being removed and the unit being lowered from the pallet.

! As mentioned in chapter 2, **Safety information**, it is highly recommended to install the stabilising supports to give the unit greater stability once it has been installed in its final location.

5.1.4. Transport to the site

- If the reception area is far from the installation site, it is recommended to move the **CUBE4** using a pallet truck (see Fig. 19) or another more suitable means of transport, as-

sessing the distance between the two points, the unit's weight, the characteristics of the area to be crossed and the site (floor type, floor resistance kg/m²).

- However, when the distance is considerable, it is recommended to move the unit in its packaging to the vicinity of the installation site and then unpack it.

5.1.5. Siting, immobilisation and considerations

5.1.5.1. Siting for single units

- By way of example, *Fig. 21* shows configurations composed of a single UPS cabinet: a UPS with batteries inside, a UPS with an external battery cabinet and a UPS with extended autonomy with two external battery cabinets.

- To correctly ventilate the unit, it is necessary to ensure its surrounding area is free of obstacles. Observe the minimum distances indicated in the table in section 1.2.1 of document EK266*08 (Safety instructions), which indicates the values for dimensions A, B and C according to the power of each unit.

For battery cabinets, keep the same distances as for the UPS, which are configured by the system.

- It is recommended to leave an additional 75 cm free on the sides and to the rear for any service interventions (T.S.S.) or the required clearance for the connection cables to allow the unit to be moved forwards.

5.1.5.2. Siting for parallel systems

- *Fig. 22* shows an example of 4 parallel units with their respective battery cabinets. For systems with fewer units, act accordingly on a case-by-case basis.
- It is recommended to place them in order according to the number indicated on the door of each unit. The number corresponds to the original factory-assigned address.

This is not random, as due to the length of the battery cables (1.5 m) and the communication BUS (1.5 m), this is the optimal arrangement. For a greater number of battery cabinets in systems with extended autonomy, follow the same criteria, maintaining the symmetry.

- When the system is structured by models with the batteries and unit mounted in the same cabinet, the illustrations of the battery modules should be disregarded.

- To correctly ventilate the unit, it is necessary to ensure its surrounding area is free of obstacles. Observe the minimum distances indicated in *Tab. 2*, which indicates the values for dimensions A, B and C according to the power of each unit.

For battery cabinets, keep the same distances as for the UPS, which are configured by the system.

- Minimum dimensions for ventilating a system.

Power	A	B	C
7.5 - 20 kVA	10 cm	10 cm	40 cm

Tab. 2. Minimum installation distances.

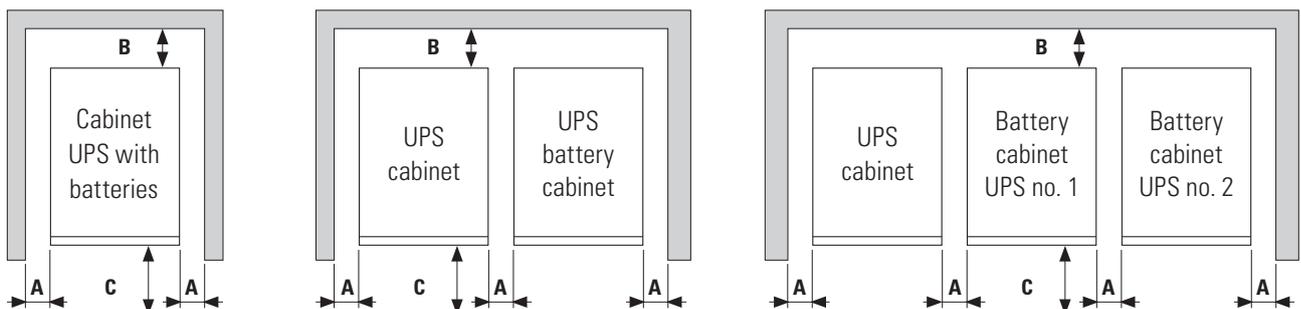


Fig. 21. Minimum peripheral dimensions for ventilating the UPS.

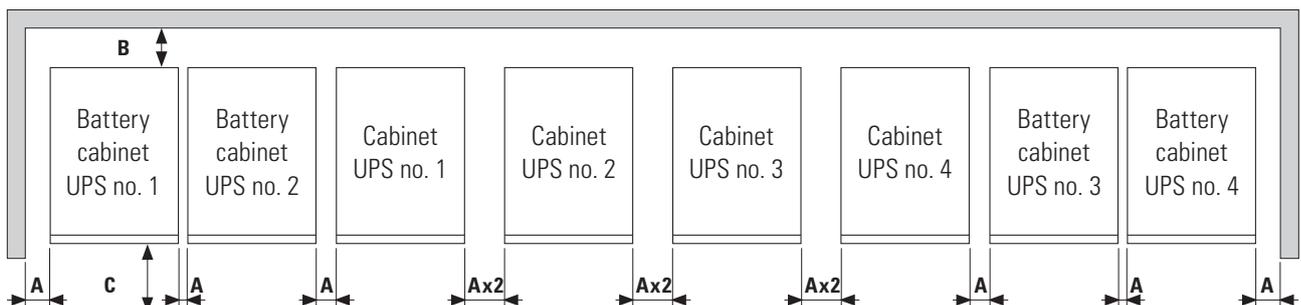


Fig. 22. Minimum dimensions for ventilating a UPS system in parallel.

5.1.5.3. Immobilisation and levelling of the unit

- The SLC CUBE4 7.5 kVA to 20 kVA **UPS** series feature wheels with brakes and stabilising supports and elements. The UPS cabinet has wheels with brakes and stabilising supports (see Fig. 1), the tall battery cabinet has wheels with brakes, stabilising elements and supports (Fig. 4), while the small battery cabinet has just wheels with brakes (Fig. 3).
- The purpose of the stabilising elements mentioned in the unpacking section is to immobilise, level and stabilise the metal cabinet once it has been put in place.
- To immobilise the tallest battery cabinets using the stabilising elements, it is necessary to loosen the elements by hand, turning them in anticlockwise direction until they touch the floor, and using a spanner, loosen them by another half turn to immobilise the metal cabinet, ensuring the correct levelling.

Fig. 23 shows how the stabilising elements must be in the end.



Original position from factory.



Pressed against the floor.

Fig. 23. Stabilising elements for the unit/battery module.

- Unit and battery maintenance is the responsibility of the T.S.S. or authorised staff.

The batteries are always accessed from the side on all units and/or battery modules. Before any handling, observe the indications on the label attached to each one.

5.1.5.4. Preliminary considerations before connection

- The description of this manual refers to the connection of terminals and switch operations that are only available in certain versions or units with extended autonomy. Ignore the related operations if your unit does not have them.
- Follow and observe the instructions described in this section relating to the installation of a single unit or a parallel system.
- Protection or external manual bypass panel:
 - It is recommended to have an external manual bypass panel provided with input, output, static bypass (the latter only in the **SLC CUBE4 B** version) and manual bypass protection devices in single installations.
 - For parallel systems of up to two units, it is highly recommended to have a protection board and it is essential for systems of 3 or 4 units. The switches on the board must allow a UPS to be isolated from the system in the event of an anomaly and the loads to be supplied via the remaining ones, either during the period of preventive maintenance or during the fault and its repair.
- On request, it is possible to supply an external manual bypass panel for a single unit or a parallel system.

You can also choose to have the installer provide and in-

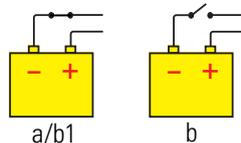
stall this external panel, paying attention to the version and configuration of the unit or system available and to the documentation on the pen drive relating to the "Recommended installation".

-  In the documentation supplied with this user manual and/or on your pen drive, there is information relating to the "Recommended installation" for each input and output configuration. It shows the wiring diagrams, as well as the protection size and the minimum cross-sections of the cables connected to the unit, according to its nominal working voltage. All values are calculated for total maximum cable length of 30 m between the distribution board, unit and loads.
 - For longer lengths, correct the cross-sections to prevent voltage drops, observing the regulations or standards of the country.
 - In the same documentation and for each configuration, the information for "N" parallel units is available, as well as the characteristics of the "Back-feed protection".
- In parallel systems, the length and cross-section of the cables that run from the protection board to each UPS and from these to the board will be the same for all of them without exception.
- The cross-section of the cables must always be considered in relation to the size of the switch terminals, so that their entire cross-section is correctly embraced for optimal contact between the two elements.
- Only the nominal currents are printed on the unit's name plate, as indicated in the EN-IEC 62040-1 safety standard. For the input current calculation, the power factor and the unit's performance have been considered.
- If peripheral input, output or bypass elements such as transformers or autotransformers are added to the UPS or parallel system, the currents indicated on the name plates of these elements must be considered in order to use the appropriate cross-sections, observing the local and/or national Low Voltage Electrotechnical Regulations.
- When an isolation transformer is incorporated into a UPS or parallel system, as standard, as an option or installed by you, either at the input, bypass or output line or at all of them, protection devices against indirect contact (differential switch) must be fitted at the output of each transformer, as due to its isolation characteristics, it will prevent the tripping of the protection devices fitted in the primary of the disconnect switch in the event of electric shock in the secondary (isolation transformer output).
- Please note that all factory-installed or factory-supplied isolation transformers have the output neutral connected to earth via a connection bridge between the neutral and earth terminals. If the output neutral must be isolated, this bridge must be removed, taking the precautions indicated in the respective local and/or national low voltage regulations.
- To pass the cables into the cabinet, there are cable glands mounted on the metal structure or a single opening as a bushing.
- In case of installing the equipment in IT neutral regime, the switches, circuit breakers and thermal-magnetic protec-

tion devices must break the NEUTRAL, as well as the three phases.

5.1.5.5. Preliminary considerations before connection, regarding the batteries and their protection devices

- Inside the battery cabinet there are accessible parts with **DANGEROUS VOLTAGES** and consequently with a risk of electric shock, which is why it is classified as a **RESTRICTED ACCESS AREA**. Therefore the key for the external battery cabinet (if present) will not be available to the **OPERATOR** or **USER**, unless they have been properly instructed.
- As a minimum, the batteries are protected by fuses and their physical arrangement is conditioned by the tangible location of the batteries themselves. The different groups resulting from this are detailed below:
 - a. In models with "standard" autonomy, the batteries are supplied integrated in the same cabinet as the unit. Likewise, for each power output, the "0/" and "/" versions, in their standard autonomy configuration, reserve the necessary space for locating the batteries in the same cabinet as the unit.
 - b. The extended autonomy models are a variant of group "a", which in turn are divided into two subgroups:
 1. Batteries installed or intended to be installed partly in the UPS cabinet and the rest in another cabinet or other cabinets or in a battery rack.
 2. Batteries installed or intended to be installed entirely in another cabinet or other cabinets or in a battery rack.
- As a result of the battery layout, the respective protection will be arranged as follows:
 - Units from group "a" indicated in the previous point.
 - The protection of internal batteries consists of **internal fuses located in the UPS that are not accessible to the user**.
 - Units from group "b.1.".
 - As mentioned in the previous point, the protection of internal batteries consists of **internal fuses located in the UPS that are not accessible to the user**. The protection of external batteries lies in the battery cabinet itself (**F8**), see *Fig. 3 and Fig. 4*.
 - Units from group "b.2.".
 - The protection of external batteries consists of fuses in the battery cabinet itself (**F8**), (see *Fig. 3 and Fig. 4*).
- The original factory battery circuit is of the closed type (a/ b1) for units with internal batteries, and of the open type (b) for external battery modules.



i External battery cabinets are supplied with the fuses in a bag. Insert them into the fuse holder disconnect switch during start-up.

- Do not handle the battery connectors and/or the disconnect switch when the unit is running. These mechanisms cannot be disconnected under load.
- When the power supply of the unit or parallel system cuts out and requires more than a simple intervention, and it is expected to remain out of service for a prolonged period of time, first proceed to complete shutdown and disconnect the batteries by accessing the fuses (**F8**) shown in *Fig. 3 and Fig. 4*.

5.2. CONNECTIONS

- As this unit has protection against class I electric shocks, it is essential to install a protective earth conductor (connect earth (⊕)). Connect this conductor to the earth terminal before supplying voltage to the input terminals.
- In accordance with the EN-IEC 62040-1 safety standard, in units without a static bypass line, the installation must be equipped with an automatic "Backfeed protection" system, such as a contactor, which prevents voltage or hazardous energy from appearing in the UPS input line during a network failure.
- In the documentation supplied with this user manual and/or on your pen drive, the information relating to the "Recommended installation" is provided. It shows the wiring diagrams, as well as the protection size and the minimum cross-sections of the cables connected to the unit, according to its nominal working voltage. All values are calculated for total maximum cable length of 30 m between the distribution board, unit and loads.
 - For longer lengths, correct the cross-sections to prevent voltage drops, observing the regulations or standards of the country.
 - In the same documentation and for each configuration, the information for "N" parallel units is available, as well as the characteristics of the "Backfeed protection".
- There can be no bypass of the line that runs from the "Backfeed protection" to the UPS, as this would not comply with the safety standard.
- Warning labels must be placed on all primary power switches, installed in areas away from the unit, to alert electrical maintenance staff to the presence of a UPS in the circuit.

The label will contain the following or an equivalent text:

Before working on the circuit:

- Isolate the uninterruptible power supply (UPS).
- Check the voltage between all terminals, including the protective earth terminal.

Risk of UPS return voltage.

-  This unit is suitable for installation in networks with a TN (TN-C, TN-S and TN-C-S) or TT power distribution system, taking into account the specificities of the system used and the national electrical regulations of the destination country at the time of installation.
-  The following figures show the configuration of the terminals and their connections for standard **three-phase input and three-phase output configuration, with and without a separate bypass line.**
 For other configurations, see **Annex II. Input-output configurations.**
- Before proceeding with the connection, it is necessary to remove the protective cover from the terminal block, as shown below in *Fig. 24*:

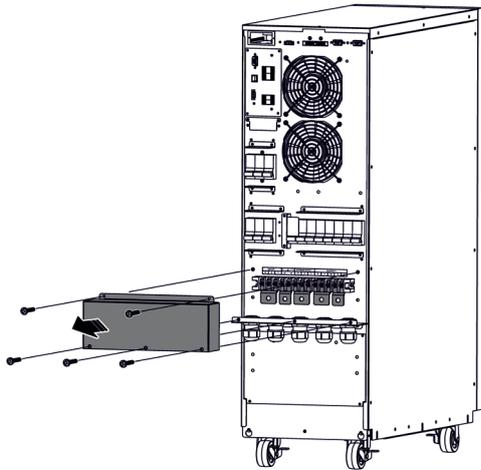


Fig. 24. Removal of the protective cover from the connection terminals.

5.2.1. Connection to the mains, input terminals

- Connect the input cables to the respective terminals according to the **three-phase/three-phase with common bypass line** configuration.

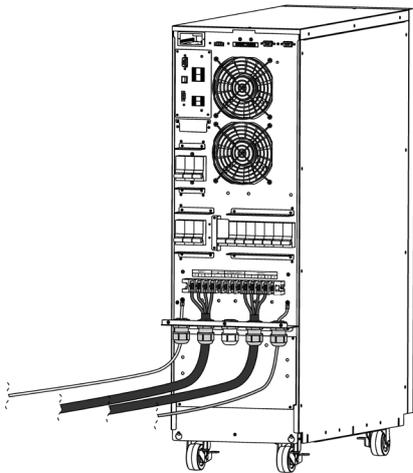


Fig. 25. Connection with input-output configuration: three-phase/three-phase with common bypass line.

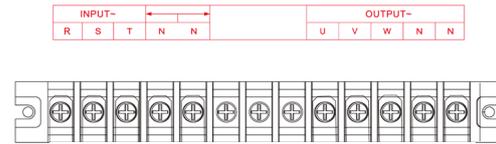


Fig. 26. Detailed view of the connection terminals with input-output configuration: three-phase/three-phase with common bypass line.

For parallel systems, the connections that go from the panel to each unit must be repeated.

Connect the R-S-T-N or R-N power cables to the input terminals according to the unit's configuration (Annex II), observing the order of the phases and neutral indicated on the unit's labelling and in this manual. If the order of the phases is not observed, the unit will not work.

When there are discrepancies between the labelling and the instructions in this manual, the labelling will always prevail.

5.2.2. Connection of the separate static bypass line. CUBE4 B version.

-  Connect the bypass input cables to the respective terminals according to the **three-phase/three-phase with separate bypass line** configuration.

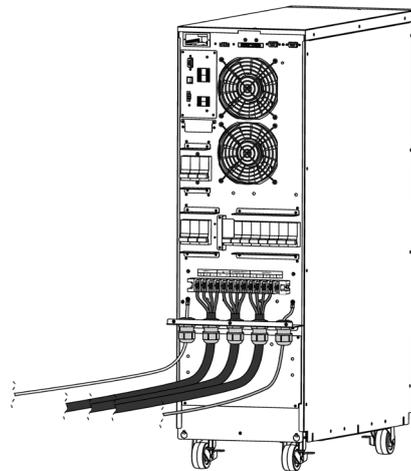


Fig. 27. Connection with input-output configuration: three-phase/three-phase with separate bypass line.



Fig. 28. Detailed view of the connection terminals with input-output configuration: three-phase/three-phase with separate bypass line.

For parallel systems, the connections that go from the panel to each unit must be repeated.

Connect the N-R-S-T or N-R power cables to the separate bypass terminals according to the unit's configuration (Annex II), observing the order of the phases and neutral indicated on the unit's labelling and in this manual. If the order of the phases is not observed, the unit will not work.

When there are discrepancies between the labelling and the instructions in this manual, the labelling will always prevail.

5.2.3. Connection of the output, output terminals

Connect the output cables to the respective U-V-W-N or U-N terminals, Fig. 25 to Fig. 28, and Annex II for other configurations, observing the order of the phases and neutral indicated on the unit's labelling and in this manual.

With regards to the protection that must be fitted on the protection board or manual bypass output, we recommend dividing the output power between at least four lines. Each one will have a protection circuit breaker of a suitable value. This type of output power distribution will ensure that a fault in any of the machines connected to the unit that causes a short circuit only affects the line that is faulty. The other connected loads will have guaranteed continuity due to the protection only being tripped on the line affected by the short circuit.

For parallel systems, the connections that go from each unit to the board must be repeated.

Finally, once the input and output connections have been made, replace the protective cover of the terminals as shown in Fig. 29 and Fig. 30.

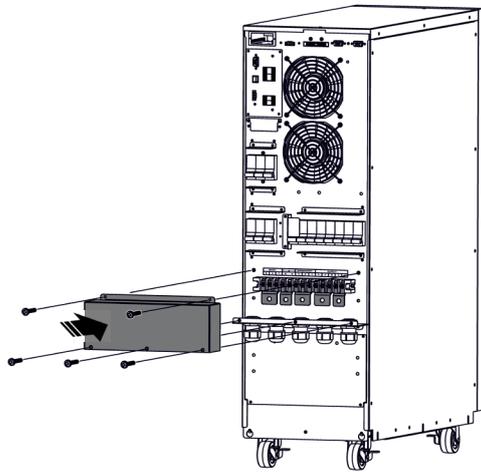


Fig. 29. Repositioning of the protective cover of the connection terminals.

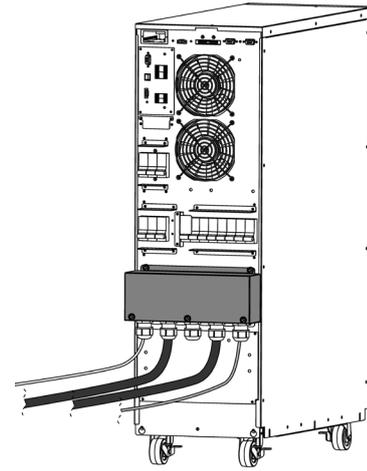
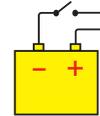


Fig. 30. UPS with the protection cover of the connection terminals in position.

5.2.4. Connection of the unit's battery terminals to those of the battery module (Fig. 31).

-  As this unit has protection against class I electric shocks, it is essential to install a protective earth conductor (connect earth ). Connect this conductor to the earth terminal before supplying voltage to the input terminals.
- The original factory battery circuit type for external battery modules is open.



 External battery cabinets are supplied with the fuses in a bag. Insert them into the fuse holder disconnect switch during start-up.

-  Do not handle the battery connectors and/or the disconnect switch when the unit is running. **Do not disconnect under load.**
- The battery cabinet is connected to the UPS using the cable bundle supplied with each battery cabinet, connecting one end to the UPS terminals and the other to the battery module terminals, observing the polarity indicated on the labelling of each element and in this manual. Observe the connections according to cable colour: a UPS positive colour to a battery cabinet positive; another UPS negative colour to a battery negative; another UPS neutral colour to the battery middle tap (N). Use the green-yellow cable to interconnect the earth connections, see Fig. 31. Fig. 1, Fig. 3 and Fig. 4 show the battery connectors and their respective earths in more detail.

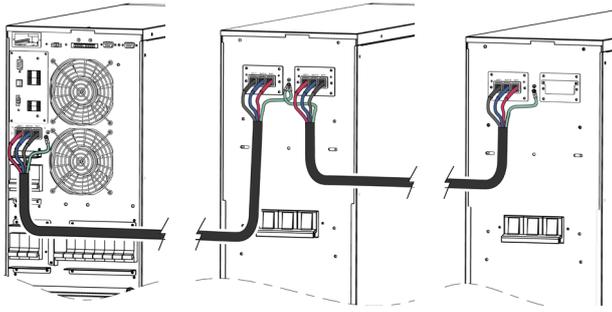


Fig. 31. Connection between the UPS and one or several battery cabinets.

- For extended autonomy where **more than one module or battery cabinet** is supplied, the connection will always be in parallel between them and the unit (see Fig. 31).

That is, a cable of the same colour, from the UPS negative to the negative of the first battery cabinet and from this to the negative of the second battery cabinet, and so on. Proceed in the same way for the connection of the positive cable, for the middle tap cable (N) and for the green-yellow earth connection.

The connection of the batteries to the UPS is the same as if it were a single unit, due to the fact that it belongs or is connected to a parallel system, as each set of batteries is connected directly to its UPS by default, irrespective of the number of battery cabinets.

⚠ Danger of electric shock. If, after start-up of the UPS, the battery cabinet must be disconnected, a complete shutdown of the unit must be performed. Open the battery disconnect switch in the battery cabinet and/or switch located in the UPS. Wait at least 5 min. until the filter capacitors have discharged.

5.2.5. Installation of SNMP cards

All **SLC CUBE4** units have one (1) slot on the back of the unit (identified as INTELLIGENT SLOT, Fig. 13) as standard, suitable for installing a communication card, SNMP or any other card for extending communications, signalling and/or other services. the NIMBUS (*) communication card is supplied by default, which allows connection to the "cloud" services owned by SALICRU.

i (*) See the specific manual for the NIMBUS card, EL139*00, for a detailed description of the services offered and its configuration.

To install the SNMP card or another optional addition in the intelligent slot, proceed as follows:

1. Remove the fixing screws from the slot cover and the part as a cover.
2. Install the NIMBUS, SNMP card or another option in the slot and secure it using the screws.
3. Make the relevant connections.
4. Fit the protective cover for the communication connections and the fixing screws.

6. OPERATION

This section describes the basic procedures for starting the UPS, understanding how to start it up in order to reach the normal operating mode described in section 4.5, specifically in "4.5.1. Normal mode.". That is, "online" or double conversion mode, to achieve maximum protection for critical loads.

Additional procedures are also described, understanding that these should only be carried out exceptionally due to a unit shutdown, maintenance, changes in the installation, faults, etc.

All procedures will consider an installation whereby there is a control panel that is external to the UPS, highly recommended for facilitating interventions and maintenance, equipped with the following:

- Switch for UPS input voltage.
- Switch from the UPS output to the loads.
- Switch corresponding to the UPS maintenance bypass, with its auxiliary contact wired to the corresponding terminal (**EMBS**) of the unit's interface.
- If there is a separate bypass line, the switch for this line is also present on the panel.

6.1. UPS START-UP

6.1.1. Checks before start-up



Read the technical documentation

Before isolating and starting the unit, all instructions contained in this manual and in the technical support documentation must be read and understood.

Before starting the unit:

- Make sure that all connections have been made correctly and with sufficient torque, observing the unit's labelling and the instructions in chapter 5.
- Check that the unit's input, bypass and output disconnect switches/switches and the control panel external to the UPS are in the "Off" position.
- For units with external batteries, check that the external battery cabinet disconnect switch is in the "Off" position.
- Check that all loads are switched off (set to "Off").
- It is very important to proceed according to the order established in the following procedures of this section.
- Before starting the unit, check that: All installation and electrical connection tasks have been carried out by duly qualified technicians.
- Check that all power and control cables have been connected correctly and firmly to the corresponding terminals.
- With regards to external boards or panels, it is very important to wire the auxiliary contact of the maintenance bypass switch, and the auxiliary contact of the output switch for parallel systems, to the corresponding connector of the unit.
- Check that the earth cable is connected correctly.
- Check that the battery polarity is correct and the voltage is within the operating values.
- Check that the phase rotation (phase sequence) of the AC

input line is correct and the voltage is within the tolerance of the operating values. The same applies for the separate bypass line, if any.

- The emergency stop circuit (EPO), if installed, must not be activated (a wire bridge is supplied in the unit, connected by default to the terminals of this connector, which allows normal operation).

For queries regarding unit parts, see Fig. 1 to Fig. 4.

6.1.2. Initial start-up

The initial start-up of the UPS after reception and installation has certain specificities. For normal or periodic start and stop operations, refer to sections 6.1 and 6.2, respectively.



The initial start-up must be carried out by authorised staff (**T.S.S.** or the distributor). This operation activates the start of the product's warranty, and as well as the start-up, the qualified technician will also carry out additional checks and calibrations "in-situ" that are not described in this manual.

Once all checks described in 6.1.1 have been carried out, proceed to:

1. Check, once again, the correct connection of the phases and neutral to the unit's input, as well as that of the separate static bypass line, if any. In the event of incorrect connection or phase rotation, correct it.
2. Supply general voltage to the control panel external to the UPS.
3. Set the switch corresponding to the UPS input on the control panel to "On".
4. Set the input switch of the UPS (Q1) and the bypass switch (Q4) to "On". You will access the main or home screen automatically (see 7.1).
5. If the selected language (Spanish by default) and the time are correct, you can refer directly to section 6.1.3. Otherwise, go to the  SETTINGS menu, select the GENERAL submenu and set the language and time.



Fig. 32. Configuration screen for initial start-up.

- "Language": you can select the display language of the control panel, from the following options:
 - "English"
 - "Spanish"
 - "Portuguese"
 - "French"
- "Date & Time": correctly configure the time (HH:MM:SS) with the drop-down numeric menu corresponding to each field.

6. Once set, return to the main screen by pressing this icon:



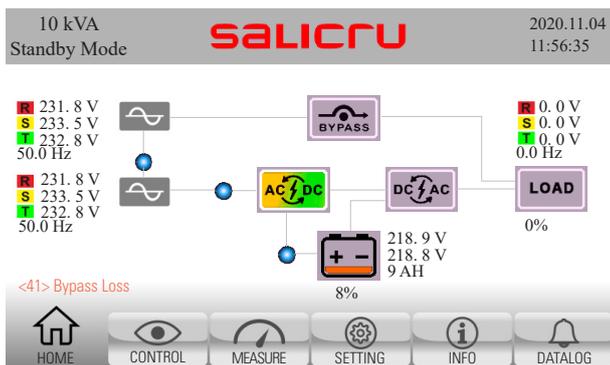
CONTINUE THE START-UP ACCORDING TO THE INDICATIONS DESCRIBED IN SECTION 6.1.3.

6.1.3. Generic start-up procedure (normal mode)

If you find the UPS completely shut down (see 6.2), but it had been operating previously in the installation where it is located, to restart it, proceed as indicated in this section.

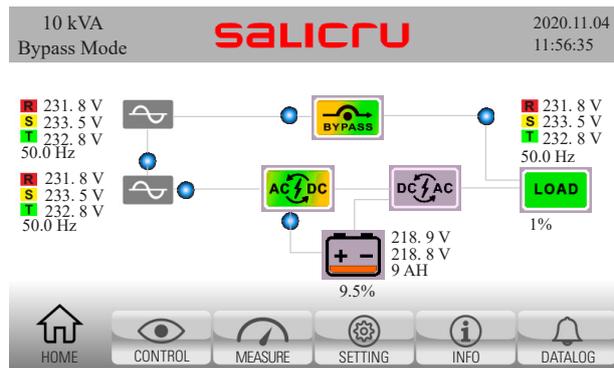
If the UPS is simply in bypass mode (see 6.1.5), i.e. already supplying power to the loads but via the static bypass, you can follow the instructions in this section from point 6.

1. Supply general power to the control panel (external to the UPS).
2. Set the switch corresponding to the UPS input on the panel to "On". If there is a separate bypass line, also set this switch on the control panel to "On".
3. Connect the external batteries if the unit has them, in the case of B1 models (long autonomy).
4. Set the input switch of the UPS to "On" (Q1). The screen boots, the fans start to run and the main screen appears. The unit starts up in standby mode, the "<41> Bypass Loss" warning appears on the screen and the acoustic alarm sounds every second.



5. Set the corresponding bypass switch to "On" (Q4). In standard units, the static bypass input is connected internally to the rectifier.

By activating the bypass switch, the warning and the acoustic alarm disappear and the unit switches to bypass mode, supplying power to the loads via the bypass:

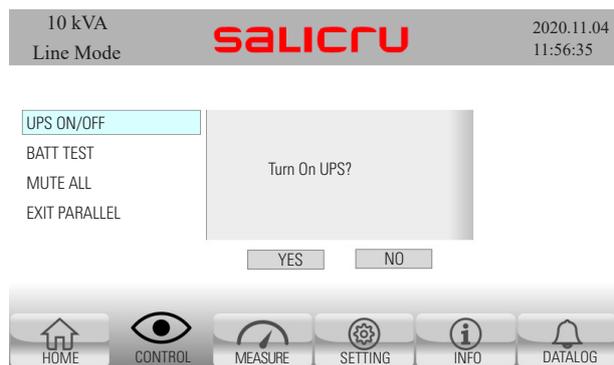


6. Press the "Control" icon. You are on the screen described in 7.2.

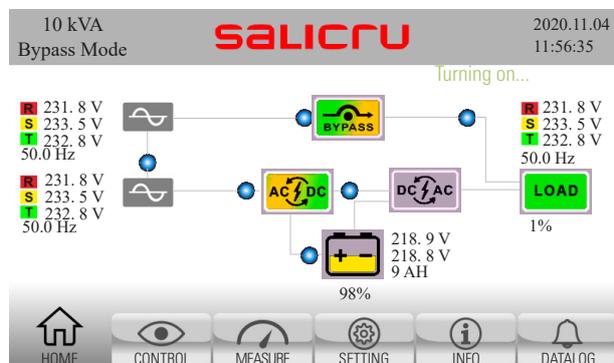
7. If the UPS stopped due to a power loss (disconnection of AC input and batteries, or end of autonomy), having been operating in normal mode just before this, the UPS will restart automatically at this point in online mode.

8. If the UPS does not start automatically ("Bypass Mode"), press the UPS ON/OFF icon.

9. The "Turn on UPS" pop-up box appears with the options "YES" and "NO". Press "YES".



10. Once validated, the main screen appears again with the on-screen message "Turning on",



and after a few seconds the unit will switch to online mode.

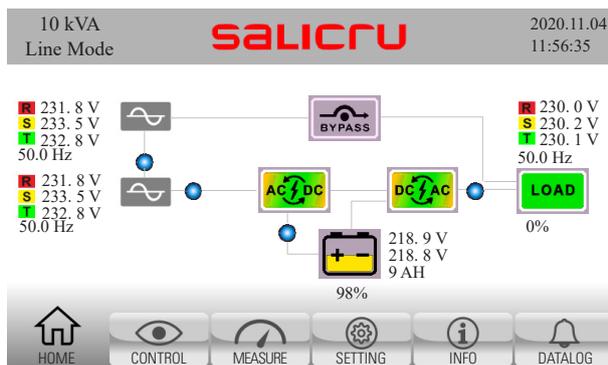


Fig. 33. Main screen in normal operation. The power flow should match the one shown: input supplies rectifier; this simultaneously supplies the inverter and the battery charger; the inverter supplies power to the output loads.

11. Set the switch corresponding to the UPS output on the control panel (external) to "On".
12. Set the output switch of the UPS to "On" (Q2). The unit supplies voltage at the output terminals of the control panel.
13. Start the loads (or set their switches on the distribution board to "On", if any) progressively.
14. The system is operating fully, and the loads are protected by the UPS. You can obtain basic information on the main screen of the control panel (synoptic, input, output and battery voltages, battery and output load percentages). See Fig. 33.

6.1.4. UPS start-up without mains power – Cold Start (battery mode)

- If necessary, the unit can be started up without an input line and directly in battery mode.
- Press the **POWER** key to start the power supply. The screen then boots and after a few seconds, the home screen appears. The unit starts in standby mode.
- Press the "Control" icon. You are on the screen described in 7.2.
- Press the UPS ON/OFF icon and validate; after a few seconds, the UPS starts and switches directly to battery mode.
- Start the load or loads, without exceeding the unit's nominal power.

⚠ With this type of start-up, the level of charge must be considered and therefore the remaining autonomy available and the risk posed by operating in this mode.

6.1.5. Procedure for transferring to bypass mode

On specific occasions, for example temporarily while awaiting an intervention on the UPS due to a fault, or as indicated by the Service Technician, it may be useful to manually transfer the UPS to bypass mode (see section 4.5.3).

⚠ In this operating mode, the loads will not be protected against power outages and line disturbances.

With the UPS operating in online mode (synoptic shown in Fig. 33), proceed as follows to switch to bypass mode:

1. Press the "CONTROL" icon  You are on the screen described in 7.2.
2. Press "UPS ON/OFF".
3. The "Turn off UPS" pop-up box appears with the options "YES" and "NO". Press "YES".

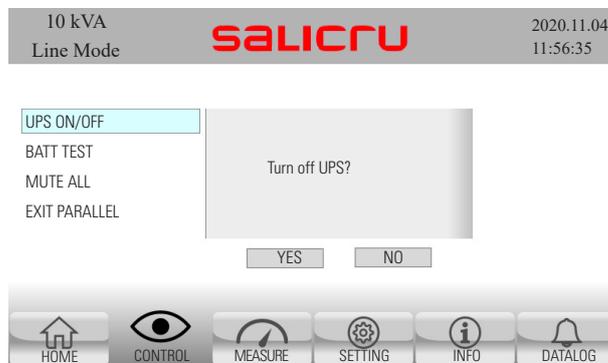


Fig. 34. "Turn off UPS" pop-up window. Press "YES".

4. The loads switch to being supplied directly from the static bypass line.

The unit's inverter is shutdown (waiting), but the rectifier and charger are operating (the battery charge is maintained). The operating mode indicated in the upper left corner of the main screen switches to "Bypass Mode".

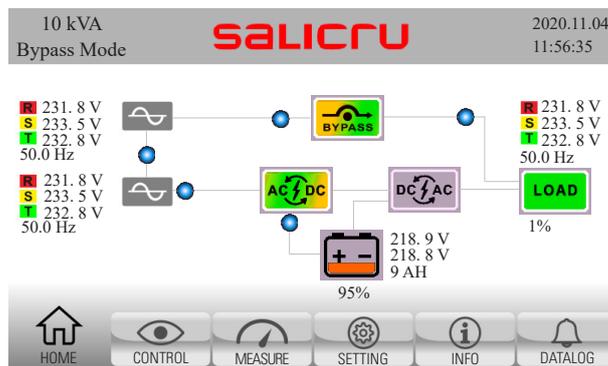


Fig. 35. Main screen in bypass mode. The power flow goes directly from the bypass input to the output, via the static bypass switch.

5. The unit is now in bypass operating mode, described in 4.5.3.

6.2. PROCEDURE FOR STOPPING THE UPS

This section describes the correct procedure for complete shutdown of the UPS, leaving the loads without power, and the UPS without any voltage at any of its input and output terminals.

This procedure may be necessary in interventions to change the installation, remove the UPS, replace it, etc.

With the UPS operating in online mode (synoptic shown in Fig. 33), proceed as follows to shut it down completely:

1. Stop the loads (or set their switches on the distribution board to "Off", if any) progressively.
2. Switch the unit to bypass as described in the previous section 6.1.5.
3. Set the switch corresponding to the UPS output on the control panel (external) to "Off".
4. Set the output switch of the UPS to "Off" (Q2).
5. Units with external batteries: Disconnect the battery cable between the unit and the battery cabinet. Set the external battery cabinet switch or disconnect switch to "OFF" (F8).
6. Set the switch corresponding to the UPS input on the control panel (external) to "Off". If there is a separate bypass line for the UPS, also set this switch on the control panel to "Off".
At this point, the unit will stop completely (the control panel screen switches off).
7. If possible, cut off the general power supply to the control panel.
8. Set the input switch of the UPS to "Off" (Q1).
9. Set the bypass switch to "Off" (Q4).

The UPS is now completely stopped and there is no voltage at its input, bypass and output terminals.

! However, perform the relevant checks using external measuring instruments before carrying out any work to disconnect the cables.

! DANGER OF ELECTRIC SHOCK: before any repair or maintenance operation inside the unit, to be carried out solely and exclusively by the qualified Technical Service, wait for approximately 5 minutes from this moment, the required time for the electrolytic capacitors to discharge.

For units with internal batteries, disconnect and isolate the positive, neutral and negative battery terminals.

6.3. MANUAL OR MAINTENANCE BYPASS

When a repair or maintenance intervention on the UPS is necessary, to be carried out by the qualified Technical Service, and the continuity of supply to the loads must be maintained, the output must be transferred to the bypass line via the maintenance bypass switch (Q5), integrated in the unit or optionally in the external control panel (with the auxiliary contact correctly wired to the UPS interface terminals, (EMBS)).

6.3.1. Transferring to maintenance bypass mode

To detail this procedure, we will start from the initial point of the UPS operating in normal mode (rectifier converters, charger and inverter running; output in inverter). If it is necessary to transfer to maintenance bypass from another status (from bypass mode, for example, either by manual transfer or by unit alarm), carry out the same steps, for greater safety.

! Do not actuate the manual bypass switch (of the unit or on the external control panel) directly in normal mode, or in general, without strictly following the procedure described here. The "uncontrolled" operation of this mechanism may cause faults on the unit and/or damage to the installation.

To switch to maintenance bypass mode:

1. Switch the unit to bypass as described in the previous section 6.1.5.
2. The loads switch to being supplied directly from the static bypass line. Check that the unit's synoptic corresponds to the one in Fig. 35 (unit in bypass mode).
3. Remove the mechanical lock of the UPS manual bypass switch (Q5): unscrew the screws provided and remove the metal cover (see Fig. 37).
4. The unit reports the current status via the main screen with the warning <3A>"maintain is open". See Fig. 36.

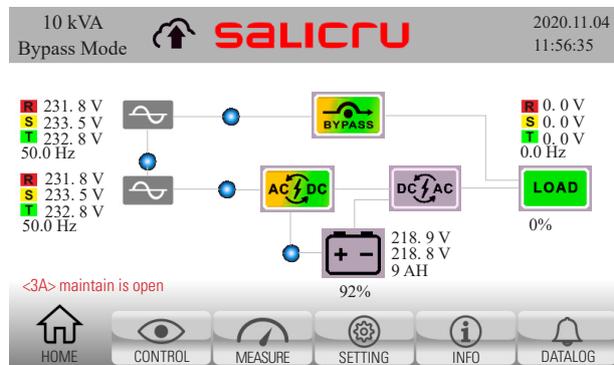


Fig. 36. Main screen of the control panel with manual bypass contact open warning.

5. Set the manual bypass switch of the UPS to "On" (Q5).
6. Remove the mechanical lock of the manual bypass switch on the external control panel.
7. Set the manual bypass switch of the external control panel to "On".

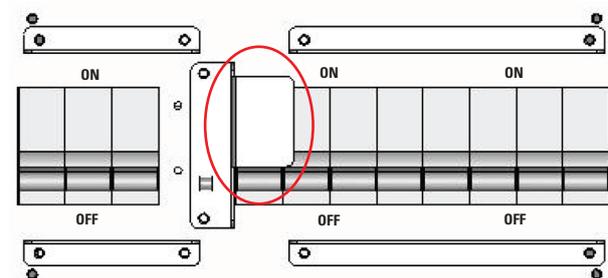


Fig. 37. Mechanical lock of the UPS maintenance bypass switch.

8. Set the switch corresponding to the UPS output on the control panel (external) to "Off".
9. Set the output switch of the UPS to "Off" (Q2).
10. Units with external batteries: Disconnect the battery cable between the unit and the battery cabinet. Set the external battery cabinet switch or disconnect switch to "OFF" (F8).
11. Set the switch corresponding to the UPS input on the control panel (external) to "Off". If there is a separate bypass line for the UPS, also set this switch on the control panel to "Off".
At this point, the unit will stop completely (the control panel screen switches off).
12. Set the input switch of the UPS to "Off" (Q1).
13. Set the separate static bypass switch of the UPS to "Off" (Q4).

The unit is now in maintenance bypass operating mode, described in section 4.5.4.



DANGER OF ELECTRIC SHOCK: before any repair or maintenance operation inside the unit, to be carried out solely and exclusively by the qualified Technical Service, wait for approximately 5 minutes from this moment, the required time for the electrolytic capacitors to discharge.



For units with internal batteries, disconnect and isolate the positive and negative battery terminals.



In addition, any repair work on the UPS will require the neutral disconnect mechanism inside the unit to be activated by the technician, in order to prevent the installation's differential circuits from tripping, causing the supply to the load(s) to be disrupted.

6.3.2. Transferring back to normal mode (from maintenance bypass mode)

To recover the normal operating mode of the UPS, while the unit is in the maintenance bypass operating mode (see section 4.5.4), strictly follow the procedure described in this section.



If repair work has been carried out inside the UPS, before continuing, make sure that all elements, internal connections, fixing screws, etc., are correctly assembled. The neutral disconnect mechanism must also be in its normal position, ensuring the continuity of this conductor to the interior of the UPS. With regards to the external cables of the UPS, if they have been handled, make sure they have been returned to their normal position and with the correct tightening torque.

1. Set the switch corresponding to the UPS input on the panel to "On". If there is a separate bypass line for the UPS, also set this switch on the control panel to "On".
2. Connect the external batteries if the unit has them.
3. Set the input switch of the UPS to "On" (Q1).
4. Set the separate static bypass switch to "On" (Q4).
5. Set the switch corresponding to the UPS output on the control panel (external) to "On".
6. Set the output switch of the UPS to "On" (Q2).

7. Check that the UPS supplies voltage simultaneously to the output via the maintenance bypass switch and the static bypass: check that the UPS is in bypass mode and the alarm <3A> shows "maintain is open", and the synoptic on the main screen of the control panel is as shown in Fig. 36.
8. Only at this point proceed to set the maintenance bypass switch on the control panel to "Off". If applicable, replace its mechanical lock.
9. Set the maintenance bypass switch of the UPS to "Off" (Q5).
10. Replace the mechanical lock of the UPS manual bypass switch: screw the metal cover in using the screws provided (see Fig. 37).
11. The <3A> alarm "maintain is open" disappears. Check that the unit's synoptic corresponds to the one in Fig. 35 (unit in bypass mode).
12. Press the "CONTROL" icon  You are on the screen described in 7.2.
13. Press the "UPS ON/OFF" icon.
14. The "Turn on UPS" pop-up box appears with the options "YES" and "NO". Press "YES".
15. Check that the UPS switches to online mode and the synoptic on the main screen of the control panel is as shown in Fig. 33.

The system goes back to operating in normal mode, and the loads are protected by the UPS against disturbances and potential supply interruptions.

6.4. EMERGENCY STOP (EPO)

The unit is equipped with an emergency stop circuit (EPO - "Emergency Power Off"). This shutdown may be necessary to prevent dangerous situations for the unit itself or for the loads (fire, flooding, electric shock, etc.).

The functionality of this circuit, when activated, is to switch off the inverter and bypass (the unit continues charging the batteries) and no voltage is supplied to the loads.

In the CUBE4 UPS, this circuit is present on the 2-pin strip (Fig. 13) of the unit interface. On this strip there is a wire bridge, supplied from the factory, "closing" the EPO circuit. In the final installation, this bridge can be replaced by a remote button or switch, which closes the circuit in standby (normal operation of the UPS), and opens the circuit when activated (activation of the emergency stop).

6.4.1. Activation of the emergency stop (EPO)



Take into account that the activation of this circuit will cause a supply cut for the loads, and therefore, they will switch off.

1. "Open" the circuit on the EPO strip: remove the wire bridge or set the remote button that replaced this bridge to "ON".
2. A new alarm, <OB> "EPO active", appears on the control panel, and the unit switches automatically to standby mode (Fig. 38).

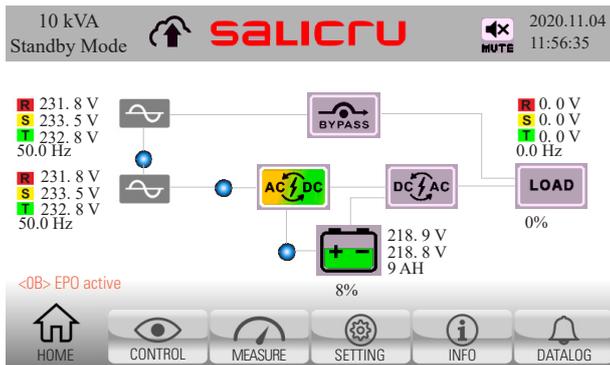


Fig. 38. Main screen with EPO emergency stop activated. There is no output voltage.

3. If it is necessary to completely stop the UPS at this point, proceed in the same way as 6.2. In short:
 - a. Set the switch corresponding to the UPS output on the control panel (external) to "Off".
 - b. Set the output switch of the UPS to "Off" (Q2).
 - c. Set the UPS input switch on the control panel to "Off". If there is a separate bypass line for the UPS, also set that switch to "Off".
 - d. The unit will stop completely.
 - e. If possible, cut off the general power supply to the control panel.
 - f. Set the input switch of the UPS to "Off" (Q1).
 - g. Set the corresponding separate static bypass switch to "Off" (Q4).
 - h. Units with external batteries: Disconnect the battery cable between the unit and the battery cabinet. Set the external battery cabinet switch or disconnect switch to "OFF" (F8).

6.4.2. System restoration after an emergency stop (EPO)

1. If the system is completely stopped (all UPS and external control panel switches set to "Off", open EPO circuit or remote button activated):
 - a. "Close" the circuit on the EPO strip: replace the wire bridge, or set the remote button that replaced this bridge to "Off".
 - b. From here, proceed as described in "6.1.3. Generic start-up procedure (normal mode)", and ignore the following steps described in this section.

2. If the UPS is powered (the UPS and external control panel switches required for normal operation are set to "On", the batteries are connected), but the EPO circuit is open or the remote button is activated: the UPS will be powered, alarm <OB> "EPO active" will be present and no voltage will be supplied to the loads. To restore normal operation:
 - a. "Close" the circuit on the EPO strip: replace the wire bridge, or set the remote button that replaced this bridge to "Off".
 - b. The UPS switches automatically from standby mode to bypass mode, the loads switch to being supplied directly from the static bypass line. Check that the alarm <OB> "EPO active" disappears. Also check that the unit's synoptic corresponds to the one in Fig. 35 (unit in bypass mode).
 - c. Press the "CONTROL" icon  You are on the screen described in 7.2.
 - d. Press the "UPS ON/OFF" icon.
 - e. The "Turn on UPS" pop-up box appears with the options "YES" and "NO". Press "YES".
 - f. Check that the UPS switches to online mode and that the synoptic on the main screen of the control panel is as shown in Fig. 33.

The system goes back to operating in normal mode, and the loads are protected by the UPS against disturbances and potential supply interruptions.

7. CONTROL PANEL

The unit's control panel, totally integrated in a 5" touchscreen, includes monitoring, indication, control and adjustment functions, etc.

The organisation of the information and functions on this screen, as you will see in detail in this section, is divided into 4 basic display areas:

- ① System information.
- ② Main display area.
- ③ Submenus or related functions.
- ④ Main menu.

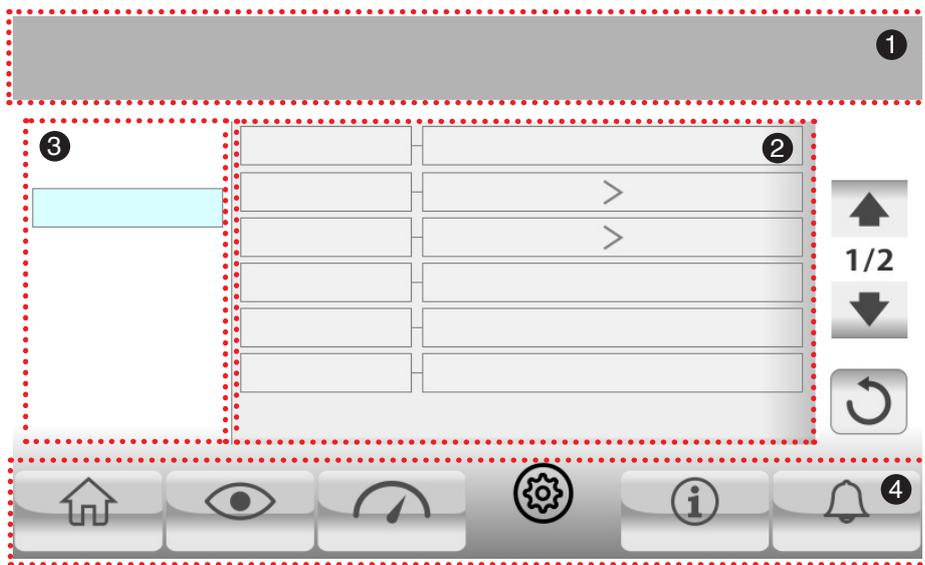


Fig. 39. Distribution of information on a generic screen.

The information and contents in areas ② and ③ will be distinct and particular to each screen. However, access to the main menu (area ④) in its entirety, and the system information (in area ①), with certain specificities, will always be accessible from any screen.

The buttons and icons in areas ① and ④, which are always visible, are described in the table below:

Icon	Description
 Home	Home button Press this button to return to the main menu from any other screen.
 Control	Control menu It lets you operate some of the unit's functions (start/stop UPS, battery test, etc.).
 Measure	Measure menu The Measurements menu provides access to the various measurements of the UPS, organised in submenus, depending on the different parts of the unit.

Icon	Description
 Setting	Setting button Access to system configuration and settings.
 Info	Information button System information
 DataLog	Datalog menu Provides access to the Alarm, warning and event log.
	Nimbus Services communication This icon indicates that the Nimbus card is correctly inserted into its slot and is connected to the Internet. If this icon appears crossed out, it may indicate that the Nimbus card is not present, or there is no Internet access, or that there is another card that is not compatible with NIMBUS Services.

Tab. 3. Icons and buttons that are accessible from any control panel screen.

7.1. HOME MENU OR MAIN SCREEN

The main screen will appear by default after the UPS starts up. It is the starting point from where you can access all submenus, functions and settings. With regards to the generic screen described in Fig. 39, the UPS power flow is shown in the display and submenu area. The information on this screen is divided into 3 basic display areas.

- 1 System information (power, operating mode, NIMBUS communication status, acoustic alarm, date and time).
- 2 Power flow or synoptic, voltages, frequency, battery status, output load, presence of alarms/warnings.
- 3 Main menu.

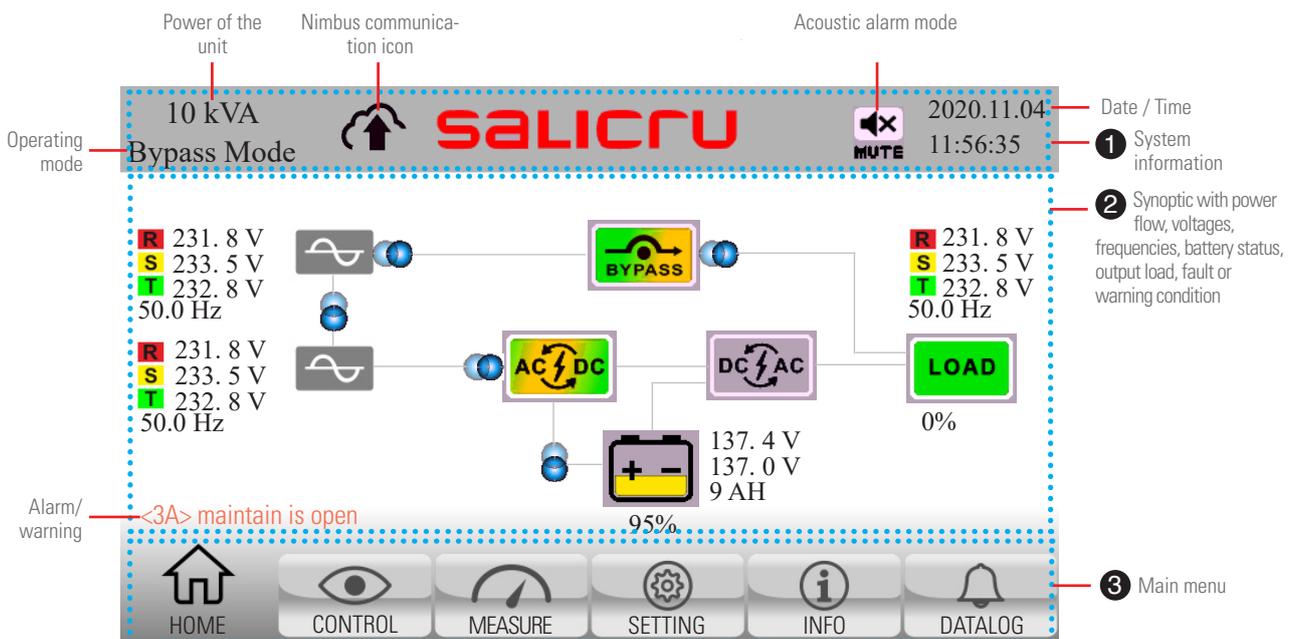


Fig. 40. Main screen.

7.1.1. Contents of the main screen information

The information on the main screen consists of:

1. Power of the unit.
2. Operating mode.

The different operating modes are as follows:

- PowerOn Mode.
- Standby Mode.
- Bypass Mode.
- Line Mode.
- Battery Mode
- Battery Test.
- Fault Mode.
- CVCF Mode.
- ECO Mode.
- Shutdown Mode.
- SelfTest Mode.

3. Nimbus Services communication
4. Acoustic alarm status



Silent mode (Mute Mode).



Total mute mode (Mute All).

5. Date and time
6. Phase-neutral bypass voltage measurement.
7. Bypass frequency measurement.
8. Phase-neutral input voltage measurement.
9. Input frequency measurement.

10. Battery charge capacity.
11. Battery + and - voltage.
12. Battery capacity Ah.
13. Phase-neutral output voltage measurement.
14. Output frequency measurement.
15. Total output load percentage measurement.
16. UPS synoptic diagram with the following power blocks represented:
 - a. Static bypass.
 - b. Rectifier.
 - c. Inverter.
 - a. Batteries.

All power blocks can be represented with two statuses:

- GREY: Not operating
- Flashing YELLOW/GREEN: Operating.
- Load:



Grey: There is no output

Green-red: different level of charge from 0% to 100%. 25% per colour.

17. Power flow between the different power blocks of the UPS.

A representation of the dynamic power flow (via moving blue areas), will detail the UPS operating mode: normal mode, bypass mode, battery mode, etc.

7.1.2. Map of screens from the main screen

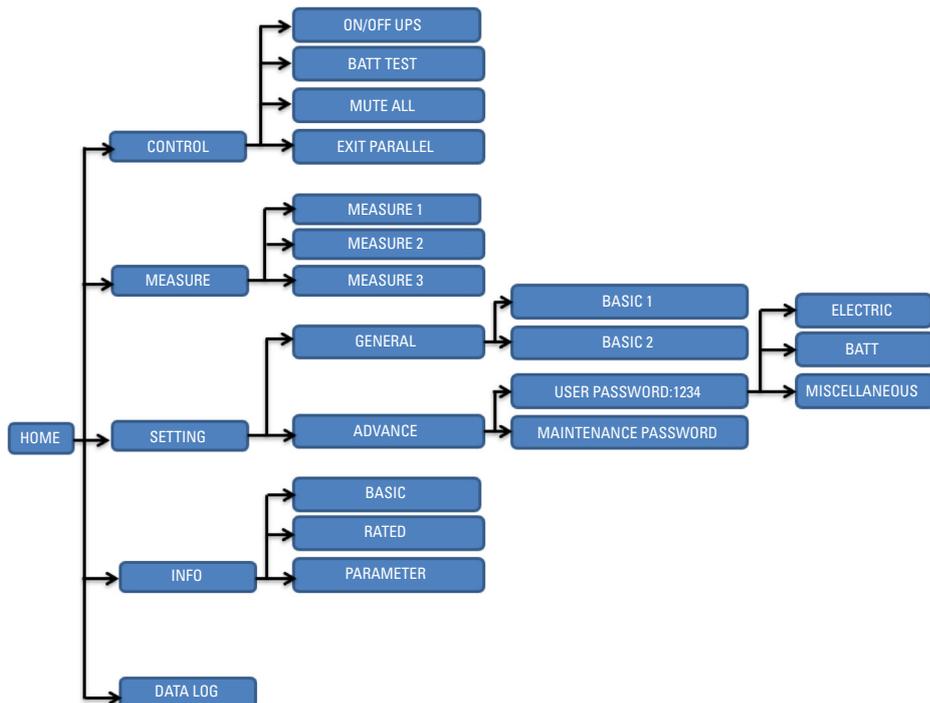
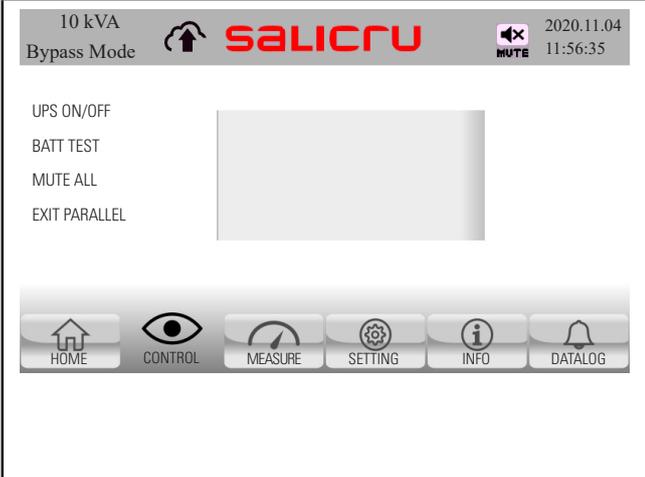


Fig. 41. Screen menu tree

7.2. CONTROL MENU

Press the  icon to enter the "CONTROL" menu. The following operations can be carried out from this menu:

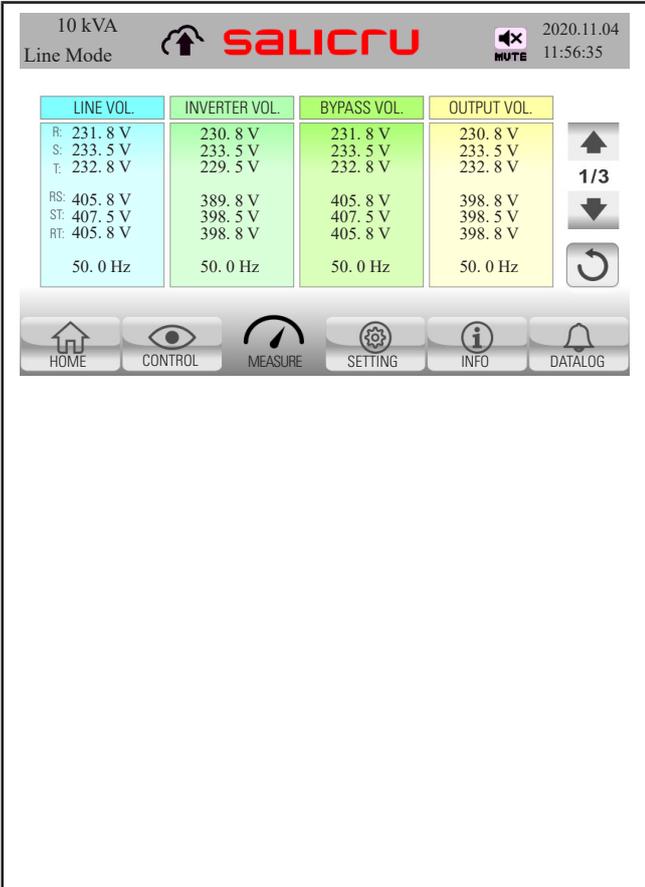
	<ul style="list-style-type: none"> • UPS ON/OFF. It lets you turn the inverter on and off, switch to bypass or standby mode, according to the configuration, to online mode, or vice versa. • BATT TEST. It lets you carry out a battery test. • MUTE ALL. It lets you activate/deactivate the acoustic alarm. When it is activated, the  icon appears in the upper right of the display, next to the date/time. • EXIT PARALLEL. It lets you remove the unit in question from the parallel system. By pressing on each function, a confirmation message for the action to be taken appears.
---	---

Tab. 4. Screens and contents of the Measurements menu on the control panel.

7.3. MEASUREMENTS MENU

By pressing the  icon in the Measurements menu, you access the set of measurements taken by the unit itself, which are accessible via the control panel. Using the arrows  you can scroll through the different measurements available.

The following table lists all available measurements.

	<p>Screen 1 measurements:</p> <ul style="list-style-type: none"> • Input: voltages between phases and neutral, between phases and frequency. • Inverter: voltages between phases and neutral, between phases and frequency. • Bypass: voltages between phases and neutral, between phases and frequency. • Output: voltages between phases and neutral, between phases and frequency. <p>Screen 2 measurements:</p> <ul style="list-style-type: none"> • Output power per phase in W and VA. • Output power per phase in W (%) and VA (%). • Total output power in W (%) and VA (%). • Autonomy. • Positive and negative battery voltage. • Positive and negative bus voltage. • Battery charge current. • Battery discharge current. • PFC, inverter and bypass temperatures. <p>Screen 3 measurements:</p> <ul style="list-style-type: none"> • Input power per phase in W and VA. • Input power per phase in W (%) and VA (%). • Total input power in W (%) and VA (%). • Input current per phase. • Input power factor per phase. • Output current per phase. • Output power factor per phase.
---	---

Tab. 5. Screens and contents of the Measurements menu.

7.4. SETTINGS MENU

This menu provides access to the system configuration and settings. Press the  icon to enter the configuration menu page.

There are 2 options: General and Advanced.



- **GENERAL:** it is to configure the basic information of the UPS. It is not related to any function parameter.
- **ADVANCE:** the password must be entered in order to access the "ADVANCED" configuration. There are two types of authority here, User and Maintainer.

The default password at the advanced user level is 1234.

 Not all settings are available in all operating modes (see "9. Annex I. SETTINGS AND OPERATING MODES"). If the setting is not available in the present mode, the LCD screen informs that in the current operating mode it cannot be activated.

7.4.1. GENERAL configuration



- **Date/Time:** time setting (HH:MM:SS). Drop-down numeric keypad when pressing each field.
- **Language:** set the language of the LCD screen. There are four languages: English, Spanish*, Portuguese and French.
- **Input source:** it lets you choose between two sources: Line* and Generator. When "Generator" is selected, the acceptable input frequency will be set in the range of 40 to 75 Hz. It can only be adjusted in the "Bypass" and "Standby" operating modes.
- **Service Contact:** it lets you establish the name of the maintenance person. The maximum length is 18 characters.
- **Service Phone:** it lets you enter the telephone number of the maintenance person. The maximum length is 14 characters.
- **Service Mail:** it lets you enter the email address of the maintenance person. The maximum length is 18 characters.
- **Audio Alarm:** there are two mute modes available: to mute the acoustic alarm:
 - All Mute: when enabled, the alarm, including warnings and alarms, is muted. The  icon is shown in the upper right corner of the main screen.
 - Mode Mute: it only deactivates the bypass mode and battery mode acoustic alarm. If activated, the  icon will be shown in the upper right corner of the main screen.

*values set by default.

7.4.2. ADVANCED configuration - Password



The password (4 digits) must be entered to access the "ADVANCED" settings menu.

There are two types of restriction, one at the advanced user level and the other at the maintenance user level.

- Advanced user

To access the "Advanced user" configuration menu, the default password is "1234".

If the password entered is correct, the page will jump to the configuration screen. If the password is incorrect, you will be asked to enter it again.

- Maintenance user

There is a second password for qualified technical staff to access certain maintenance functions that are not available for basic users.

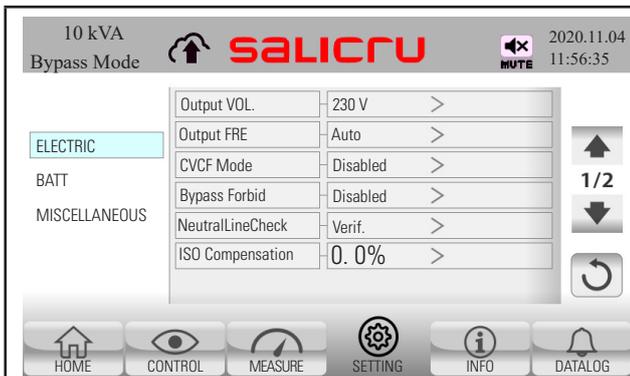
7.4.2.1. Advanced user configuration menu



Advanced user configuration menu:

There are three submenus under user password "1234":
ELECTRIC, BATT and MISCELLANEOUS.

7.4.2.1.1. ELECTRIC submenu



- **Output VOL:** select the nominal output voltage.

- There are four options, 208 V, 220 V, 230 V* and 240 V.

- **Output FRE:** select the nominal output frequency.

- AUTO*:** the output frequency is auto-detected according to the normal input when the unit is connected to the mains. If it is between 46 and 54 Hz, it will be set to 50 Hz, and if it is between 56 and 64 Hz, it will be set to 60 Hz.

- 50 Hz:** the output frequency is set to 50 Hz.

- 60 Hz:** the output frequency is set to 60 Hz.

- **CVCF Mode:** Frequency converter function (see description of CVCF mode in section 4.5.6).

- Enabled:** the CVCF function is enabled. The output frequency will be set to 50 Hz or 60 Hz according to the output frequency setting. The input frequency can be between 40 Hz and 70 Hz.

- Disabled*:** the CVCF function is deactivated. The output frequency will be synchronised with the bypass frequency within the 45 - 55 Hz ranges for the 50 Hz system or within 55 - 65 Hz for the 60 Hz system.

- **Bypass Forbid:**

- Enabled:** When selected, the static bypass is disabled, not allowing the switch to bypass mode in the event of an anomaly, such as overload/fault.

- Disabled***: the bypass is active.
 - **NeutralLineCheck**: loss of neutral detection function.
 - Disabled**: it deactivates the check function for the neutral line. The UPS will not detect if the neutral line has been disconnected.
 - Auto**: the UPS will automatically detect if the neutral line has been disconnected or not. If a loss of neutral is detected, the corresponding alarm will be generated. If the UPS is on, it will switch to battery mode. When the neutral line is restored and detected, the alarm will be muted automatically and the UPS will return to normal mode automatically.
 - Verif.***: in contrast to the Auto setting, the alarm will NOT be muted automatically and the UPS will NOT return to normal mode automatically until it is acknowledged manually by pressing the Verif. function in order to validate it.
 - **ISO compensation**:
It serves to compensate the voltage drop in the event that an isolating transformer is connected to the UPS output.
 - **Bypass UPS Off**: it lets you select the static bypass status when the UPS is stopped. The bypass will be activated provided the "Prohibited bypass" function is disabled. "
 - Enabled***: bypass enabled. When selected, the stopped unit supplies voltage to the output via the bypass.
 - Disabled**: bypass disabled. When selected, there is no output via bypass when turning the UPS off manually (Standby mode).
 - **Bypass VOL range**: bypass voltage range setting.
 - Bypass VOL Range Low**: the setting range is from 176 V to 209 V.
 - Bypass VOL Range High**: the setting range is from 231 V to 264 V. Default setting: 196-264 V
 - **Bypass FRE Range**: bypass frequency range setting.
The acceptable frequency range is from 46 Hz to 54 Hz when the system frequency is 50 Hz, and from 56 Hz to 64 Hz when it is 60 Hz.
Default setting: 46-54 (50 Hz) / 56-64 (60 Hz).
 - **ECO mode**: a function that allows the ECO mode to be enabled/disabled*. The default configuration is "Disabled". (see ECO mode description in section 4.5.5).
 - **ECO VOL Range**: it adjusts the ECO mode voltage range.
 - ECO VOL Range Low**: the setting range is from (nominal output voltage – 11 V) to (nominal output voltage - 24 V). Default setting: "Nominal output voltage – 23 V".
 - ECO VOL Range High**: the setting range is from (nominal output voltage + 11 V) to (nominal output voltage + 24 V). Default setting: "Nominal output voltage + 23 V".
 - **ECO FRE Range**: it establishes the ECO frequency range.
The frequency range is from 46 Hz to 54 Hz when the frequency is 50 Hz, and from 56 Hz to 64 Hz when it is 60 Hz.
Default setting: 46-54 (50 Hz) / 56-64 (60 Hz)
- *Default settings.

7.4.2.1.2. BATTERY submenu

	<ul style="list-style-type: none"> • BATT Warning VOL: <ul style="list-style-type: none"> <input type="checkbox"/> High: high battery voltage warning level. The setting range is from 14.0 V to 15.0 V*. 15 V is the default configuration. <input type="checkbox"/> Low: low battery voltage warning level. the setting range is from 10.1 V to 14.0 V. 11 V is the default value. This setting value must be greater than the "Shutdown voltage" setting due to low battery voltage. • Shutdown VOL: when the battery voltage is less than this in battery mode, the UPS will shut down automatically. the setting range is from 10.5 V to 12 V. 10.5 V is the default configuration. (This configuration is only available for the B1 long autonomy model). For standard units, the shutdown voltage level due to low battery depends on the output load (see the electrical characteristics in). • BATT Parameters: <ul style="list-style-type: none"> <input type="checkbox"/> BATT AH: battery capacity configuration. <input type="checkbox"/> BATT Groups: configuration of the no. of groups of batteries in parallel. <input type="checkbox"/> BATT Mode Work Time: It lets you limit the autonomy time.
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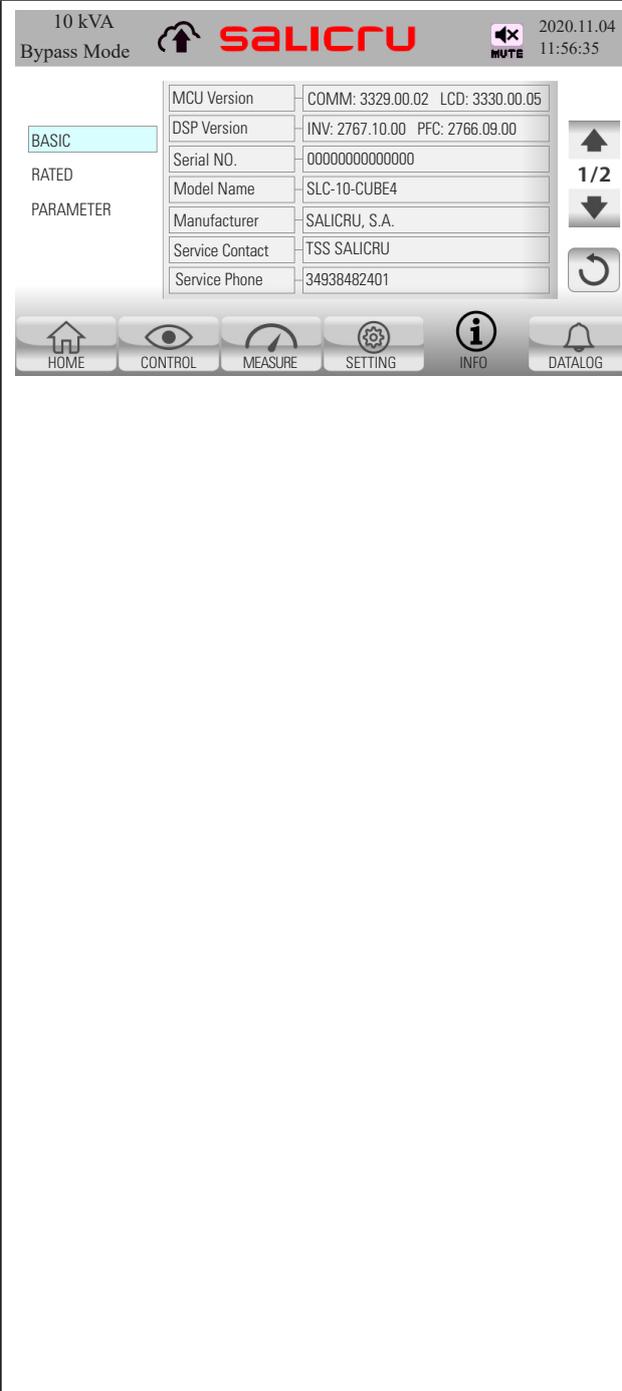
7.4.2.1.3. MISCELLANEOUS submenu

	<ul style="list-style-type: none"> • Automatic Restart (Hot Standby): <ul style="list-style-type: none"> <input type="checkbox"/> Enabled: if this function is activated, the UPS will start automatically in online mode. <input type="checkbox"/> Disabled*: the UPS does not start automatically in online mode. It remains in bypass mode or standby mode depending on the configuration until the order is given to switch to online mode. • Shutdown Delay: the UPS will shut down after the configured minutes. The countdown will start after confirming the value. • Restore Delay: the UPS will restart automatically in the selected configuration minutes after the UPS has shut down. • New Password: it lets you change the advanced user password. <p>*Default settings.</p>
--	--

Tab. 6. Screens and contents of the Settings menu on the control panel.

7.5. INFO MENU

Touch the  icon to consult basic information on the system and settings. This is divided into 3 ranges: Basic, Nominal and Parameters.



MCU Version	COMM: 3329.00.02 LCD: 3330.00.05
DSP Version	INV: 2767.10.00 PFC: 2766.09.00
Serial NO.	00000000000000
Model Name	SLC-10-CUBE4
Manufacturer	SALICRU, S.A.
Service Contact	TSS SALICRU
Service Phone	34938482401

BASIC:

This information may be relevant for qualified technical staff in case of anomalous behaviour or the need to update.

- **MCU Version:** communications and LCD firmware version.
- **DSP Version:** inverter and PFC firmware version.
- **Serial NO:** UPS serial number.
- **Model Name:** UPS model name.
- **Manufacturer:** SALICRU S.A.
- **Service Contact:** Technical Service contact name.
- **Service Phone:** Technical Service telephone number.
- **Service Mail:** Technical Service email.
- **PAR Status:** parallel or single UPS configuration.
- **PAR ID:** number that identifies the unit within the parallel system.
- **Customer Code:** it lets you view the customer code in case the dynamic password is enabled. If it is disabled (default value), the code is 0000000.
- **Dynamic Password:** enabled/disabled. It lets you see whether the dynamic password is enabled or disabled.

RATED:

The nominal values the UPS is configured with are in this menu. Depending on the user role on the control panel, some of these parameters can be modified, accessing with a username and password via the ADVANCED submenu in the Settings menu.

In any case, the read-only display will always be available to any user.

- **Output VOL:** it shows the nominal output voltage.
- **Output FRE:** it shows the nominal output frequency.
- **CVCF Mode:** it shows whether the CVCF mode is enabled/disabled.
- **Bypass Forbid:** it shows whether the bypass function is enabled/disabled.
- **Bypass UPS Off:** it shows whether the unit has the unit in bypass function enabled/disabled when the UPS is off.
- **Auto Restart:** it shows whether the automatic restart function is enabled/disabled.
- **ECO Mode:** ECO mode enabled/disabled.

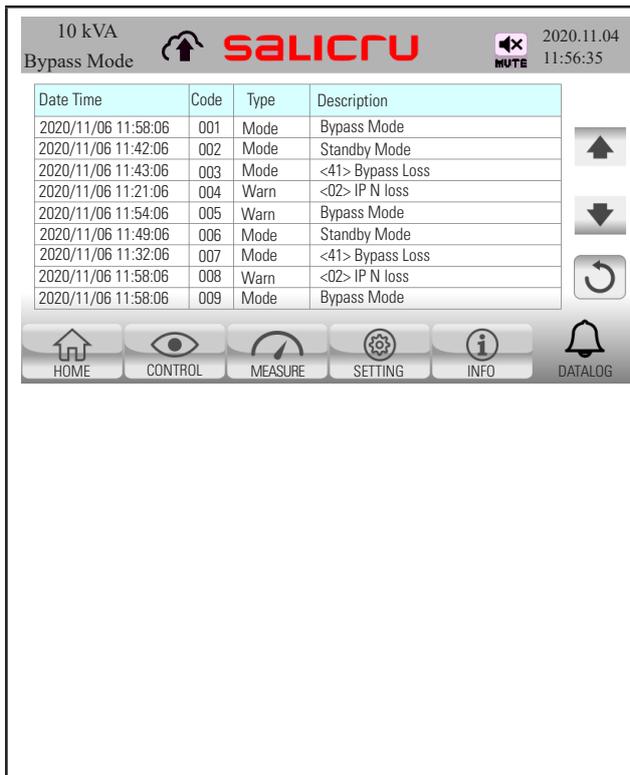
	<p>PARAMETER:</p> <ul style="list-style-type: none"> • Line VOL Range: acceptable line input voltage range. • Line FRE Range: acceptable line input frequency range. • Bypass VOL Range: acceptable input voltage range for bypass mode. • Bypass FRE Range: acceptable input frequency range for bypass mode. • ECO VOL Range: acceptable input voltage range for ECO mode. • ECO FRE Range: acceptable input frequency range for ECO mode. • BATT Mode Work Time: maximum discharge time in battery mode. • BATT Warning VOL: <ul style="list-style-type: none"> <input type="checkbox"/> HIGH: level of battery voltage that activates the high battery warning. <input type="checkbox"/> LOW: level of battery voltage that activates the low battery warning. • Shutdown VOL: level of battery voltage that shuts the UPS down due to low voltage. • Shutdown Delay: the UPS will shut down in the configuration minutes. The countdown will start after confirming via the pop-up screen. • Restore Delay: the UPS will restart automatically in the configuration minutes after the UPS has shut down. • BATT Number : shows the number of batteries.
--	--

Tab. 7. Screens and contents of the Info menu on the control panel.

7.6. DATA LOG MENU

Press the  icon to access the event log. The data log is used to record information on warnings, alarms and other events, such as a change of operating mode, control, settings and calibrations. The log contains the date and time, code (list within the log, the most recent event appears as 1), type and description. See sections 7.8.1, 7.8.2 and 7.8.3 for the list of warning, fault and event codes and their descriptions.

7.6.1. Log submenu



Date Time	Code	Type	Description
2020/11/06 11:58:06	001	Mode	Bypass Mode
2020/11/06 11:42:06	002	Mode	Standby Mode
2020/11/06 11:43:06	003	Mode	<41> Bypass Loss
2020/11/06 11:21:06	004	Warn	<02> IP N loss
2020/11/06 11:54:06	005	Warn	Bypass Mode
2020/11/06 11:49:06	006	Mode	Standby Mode
2020/11/06 11:32:06	007	Mode	<41> Bypass Loss
2020/11/06 11:58:06	008	Warn	<02> IP N loss
2020/11/06 11:58:06	009	Mode	Bypass Mode

The log events are shown in reverse chronological order (from top to bottom). So, when accessing this submenu, the most recent alarm will always appear first.

- The recorder has a storage capacity of 500 logs.
- 9 logs are displayed per page, and you will have to scroll (up and/or down) through a maximum of 100 pages of logs. The navigation arrows are on the right-hand side of the screen.
- The information for each event consists of:
 - Date Time (YYYY:MM:DD, HH:MM:SS).
 - Event Number (ID, from 1 to 500).
 - Event type* (warning, fault, operating mode, control, setting and calibration).
 - Description of the event
- The events that are displayed are:
 - Unit alarms (see 7.8.1)
 - Unit warnings (7.8.2)
 - Operating mode change (7.8.3)
 - Control events (7.8.3)
 - Settings log (7.8.3)
 - Calibrations (7.8.3)

Tab. 8. Screen and contents of the Log menu on the control panel.

7.7. ACOUSTIC ALARM

The following table shows the function and muting of the acoustic alarm.

Description	Alarm status	Muted	
		Mode Mute	All Mode Mode
UPS status			
Bypass mode	Beeping sound every 2 minutes	Yes	Yes
Battery mode	Beeping sound every 4 seconds	Yes	Yes
Fault mode	Continuous beeping	No	Yes
Warning			
Overload	2 beeping sounds every second	No	Yes
Other	Beeping sound every second	No	Yes
Fault			
All	Continuous beeping	No	Yes

Tab. 9. Mutable events

7.8. ALARM, ALERT AND EVENT TABLES

7.8.1. UPS alarm table

When a fault occurs, the UPS will switch to fault mode, the acoustic alarm will sound continuously and the alarm will appear on the main screen.

Below is a table with all of the possible alarm messages that can appear on the screen and their descriptions.

FAULT CODE	MESSAGE ON-SCREEN	DESCRIPTION
0x01	<01> Bus start fail	BUS start failure. When the bus voltage can't reach the setting value in 30s, the fault signal will be displayed.
0x02	<02> Bus over	When one of the following conditions occurs, the fault signal will be displayed. +Bus voltage keeps higher or the -BUS voltage keeps lower than normal.
0x03	<03> Bus under	When +Bus voltage keeps lower or the -BUS voltage keeps higher than normal, the fault signal will be displayed.
0x04	<04> Bus unbalance	When the difference between the \pm Bus voltage absolute value, the fault signal will be sent.
0x06	<06> Conv over cur	PFC over current. When the current of PFC/Boost is over current, the fault signal will be display.
0x11	<11> INV start fail	Inverter soft start failure. Inverter voltage can't reach the setting value.
0x12	<12> High INV VOL	High inverter voltage. When INV voltage keeps higher than normal, the fault signal will be displayed.
0x13	<13> Low INV VOL	Low Inverter Voltage. When INV voltage keeps lower than normal, the fault signal will be displayed.
0x14	<14> INV R out SC	Inverter R output (line to neutral) short circuited. When INV phase R output voltage keeps lower and output current keeps higher than normal, the fault signal will be displayed.
0x15	<15> INV S out SC	Inverter S output (line to neutral) short circuited. When INV phase S output voltage keeps lower and output current keeps higher than normal, the fault signal will be displayed.
0x16	<16> INV T out SC	Inverter T output (line to neutral) short circuited. When INV phase T output voltage keeps lower and output current keeps higher than normal, the fault signal will be displayed.
0x17	<17>INV RS out SC	Inverter R-S output (line to line) short circuited. When INV phase R-phaseS (Line to line) voltage keeps lower and output current keeps higher than normal, the fault signal will be displayed.
0x18	<18>INV ST out SC	Inverter S-T output (line to line) short circuited. When INV phase S phase T (Line to line) voltage keeps lower and output current keeps higher than normal, the fault signal will be displayed.
0x19	<19>INV RT out SC	Inverter R-T output (line to line) short circuited. When INV phase T phase R (Line to line) voltage keeps lower and output current keeps higher than normal, the fault signal will be displayed.
0x1a	<1A> INV R N-fault	Inverter R negative power fault. When the output power on the INV phase R terminal is over-power, the fault signal will be displayed.
0x1b	<1B> INV S N-fault	Inverter S negative power fault. When the output power on the INV phase S terminal is over power, the fault signal will be displayed.
0x1c	<1C> INV T N-fault	Inverter T negative power fault. When the output power on the INV phase T terminal is over power, the fault signal will be displayed.
0x23	<23> INV relay open	Inverter relay open. The inverter voltage detection is normal, but the output voltage difference form the inverter voltage.
0x25	<25> In&out swop	Line wiring fault. INV relay and bypass SCR open, but output voltage is higher than normal.
0x31	<31>Par commu fail	Parallel communication failure. When the parallel communication between the UPSs is interrupted, the fault signal will be displayed.
0x41	<41> Over temp	Over temperature. The temperature of sink is over the protection setting.
0x42	<42> DSP commu fail	DSP communication Failure. When the communication between the INV control board and the PFC control board is interrupted, the fault signal will be displayed.
0x43	<43> Overload	The load is over the settings for certain time.
0x45	<45> Charger error	Charger fault. The UPS detect the charger current more than 1.5A when power on the UPS.
0x46	<46> Incorrect UPS set	Model fault. The UPS can not identify the right model.
0x47	<47> DSP&MCU commu fail	DSP and MCU communication Failure. When the communication between the INV control board and the COMM board is interrupted, the fault signal will be displayed.

FAULT CODE	MESSAGE ON-SCREEN	DESCRIPTION
0x49	<49> In&out phase incomp	Input and output phase sequence is not compatible. Input and output phase sequence different.
0x61	<61> BYP SCR SC	Bypass SCR short. There isn't signal drive the bypass SCR close, but bypass output voltage higher.
0x62	<62> BYP SCR open	Bypass SCR open. There is signal drive the bypass SCR close, but bypass output voltage is lower than normal.
0x63	<63> INV R wave abnormal	Inverter R waveform abnormal. The voltage difference between the inverter reference and inverter sample is greater than normal.
0x64	<64> INV S wave abnormal	Inverter S waveform abnormal. The voltage difference between the inverter reference and inverter sample is greater than normal.
0x65	<65> INV T wave abnormal	Inverter T waveform abnormal. The voltage difference between the inverter reference and inverter sample is greater than normal.
0x67	<67> BYP out SC	Bypass output short (L-N). Bypass O/P voltage drop too fast and O/P current more than normal.
0x68	<68> BYP out line SC	Bypass output line short (L-L). Each of line current more than normal, but line plus line current lower than normal.
0x69	<69> INV SCR SC	Inverter Relay short circuited. There isn't signal drive the Inverter Relay close, but inverter output voltage over normal.
0x6c	<6C> Bus-VOL dec fast	BUS voltage vary fast. BUS voltage drop too fast in Inverter mode.
0x6d	<6D> CUR detect err	Current detect error. Inverter current and share current and output current sample deviation more than normal.
0x6e	<6E> SPS Power fault	SPS Power fault. SPS 12V power lower than normal.
0x6f	<6F> BATT reversal	Battery polarity reverse.
0x71	<71> R PFC IGBT fault	R PFC IGBT over current fault . The unit have detected IGBT fault signal from the drive board.
0x72	<72> S PFC IGBT fault	S PFC IGBT over current fault. The unit has detected an IGBT fault signal from the drive board.
0x73	<73> T PFC IGBT fault	T PFC IGBT over current fault. The unit has detected an IGBT fault signal from the drive board.
0x74	<74> R INV IGBT fault	R INV IGBT over current fault . The unit have detected IGBT fault signal from the drive board.
0x75	<75> S INV IGBT fault	S INV IGBT over current fault. The unit has detected an IGBT fault signal from the drive board.
0x76	<76> T INV IGBT fault	T INV IGBT over current fault. The unit has detected an IGBT fault signal from the drive board.
0x77	<77> ISO Over temp	ISO transformer over temperature. Output ISO transformer or Auto transformer over temperature.
0x78	<78> LCD&MCU commu fail	LCD and MCU communication failure. Touch panel and MCU communication failure.

Tab. 10. Alarm messages by screen, classification and description.

7.8.2. UPS warning table

Any warning implies that there is an anomaly in the UPS, which indicates that a situation has occurred that could put the reliability of the UPS at risk, but these situations do not immediately lead to the interruption of the power supply.

WARNING CODE	MESSAGE ON-SCREEN	DESCRIPTION
01	<01>BATT open	Battery Open.
02	<02>IP N loss	Input Neutral loss.
04	<04> Line phase error	Line phase error.
05	<05> Bypass phase error	Bypass phase error.
07	<07> BATT over charge	Battery Over Charge.
08	<08> BATT low	Battery low.
09	<09> Overload warning	Over load warning.
0A	<0A>Fan lock warning	Fan lock warning.
0B	<0B> EPO active	EPO active.
0D	<0D> Over temperature	Over temperature.
0E	<0E> Charge Fail	Charger Fail.
21	<21> Line connect dif	The input(line) voltage of UPS is different in parallel system.
22	<22> Bypass connect dif	The input(bypass) voltage of UPS is different in parallel system.
24	<24> Par INV vol dif	Unbalanced load in parallel system. Parallel load different.
33	<33> Lock BYP OL 3 times	Locked in bypass after overload 3 times in 30 min.
34	<34> AC input CURR unb	AC Input current unbalance.
36	<36> INV CURR unb	Unbalanced inverter current.
3A	<3A> maintain is open	Cover of the maintain switch is open.
3C	<3C> Utility ext unb	Utility extremely unbalanced.
3D	<3D> Bypass unstable	Bypass unstable.
3E	<3E> BATT VOL High	Battery Voltage High.
3F	<3F>BATT VOL Unbalance	Battery Voltage Unbalance.
38	<38> BATT replace	Battery replace warning.
41	<41> Bypass Loss	Bypass Loss.
42	<42> ISO Over temp	ISO over temperature.
45	<45> External output switch open	When the external output switch is opened.
46	<46> Battery switch open	When external battery switch is disconnected.
47	<47> Bypass switch open	When external bypass switch is disconnected.
48	<48> Input breaker open	When external line switch is disconnected.

Tab. 11. Warning messages by screen, classification and description.

7.8.3. UPS event table

As a complement to the system alarms, the unit's "Log" is capable of recording events that do not involve any type of alarm.

Tab. 12 shows the possible (non-alarm) event messages in the log and their brief descriptions.

EVENT TYPE	MESSAGE ON-SCREEN (Log)	DESCRIPTION
Operating Mode	PowerOn Mode	UPS starting up.
	Standby Mode	UPS in standby mode (there is no output).
	Bypass Mode	UPS in bypass mode.
	Line Mode	UPS in normal mode, output in inverter.
	BATT Test Mode	UPS in autonomy or battery mode.
	Battery Test	UPS in battery test mode.
	Fault Mode	UPS in fault mode.
	Converter Mode	UPS in frequency converter mode.
	ECO Mode	UPS in ECO mode.
	Shutdown Mode	UPS shutting down.
	SelfTest Mode	UPS in auto-test mode.
Control	Turn On UPS	The inverter has been turned on.
	Turn Off UPS	The inverter has been turned off.
	BATT Test On	The battery test has been activated.
	BATT Test Off	The battery test has been cancelled.
	Mute All	The acoustic alarm has been muted in total mode.
	Cancel Mute All	The acoustic alarm has been enabled.
	Turn On Charger	The charger has been turned on.
	Turn Off Charger	The charger has been turned off.
Setting	Language	Language setting
	Input Source	Input source setting
	All Mute	Mute all mode setting
	Mute Mode	Mute mode setting
	Output VOL	Output voltage setting
	Output Rated FRE	Output frequency setting
	CVCF Mode	Frequency converter mode has been enabled/disabled
	Bypass Forbid	Prohibited bypass function has been enabled/disabled
	Bypass UPS Off	Bypass has been enabled/disabled when the UPS is off
	Bypass VOL Range Low	Bypass voltage lower range setting
	Bypass VOL Range High	Bypass voltage upper range setting
	Bypass FRE Range Low	Bypass frequency voltage lower range setting
	Bypass FRE Range High	Bypass frequency voltage upper range setting
	ECO Mode	ECO mode has been enabled/disabled
	ECO VOL Range Low	ECO voltage lower range setting
	ECO VOL Range High	ECO voltage upper range setting
	ECO FRE Range Low	ECO mode frequency lower range setting
	ECO FRE Range High	ECO mode frequency upper range setting
	BATT Warning VOL High	High battery voltage level warning setting
	BATT Warning VOL Low	Low battery voltage level warning setting
	Shutdown VOL	End of autonomy cut-off level due to low battery voltage setting
	Shutdown Delay Min	Off time setting
Restore Delay Min	On time setting	

EVENT TYPE	MESSAGE ON-SCREEN (Log)	DESCRIPTION
	New Password	Password has been changed
	Model Name	Model name setting
	Serial Number	Serial number setting
	Manufacturer	Manufacturer setting
	Max Charging CURR	Charger current setting
	BATT Number	No. of batteries setting
	Charging VOL	Charger voltage setting
	Charger Number	No. of chargers setting
	System Install Date	UPS installation date setting
	BATT Install Date	Battery installation date setting
Calibration	Calibration: BUS VOL	BUS voltage calibration
	Calibration: BATT VOL	Battery voltage calibration
	Calibration: LINE VOL	Input line voltage calibration
	Calibration: Output VOL	Output voltage calibration
	Calibration: Inverter VOL	Inverter voltage calibration
	Calibration: Bypass VOL	Bypass voltage calibration
	Calibration: Touch Calibration	Touchscreen calibration

Tab. 12. Log event messages on-screen, and their descriptions.

8. PARALLEL SYSTEM

8.1. INTRODUCTION

The **SLC CUBE4** series of uninterruptible power supply (UPS) systems are designed to be connected in parallel, up to a maximum of four units and provided they are of the same model (configuration, voltage, power, frequency, backup, etc.), without the need for any additional hardware.

In conceptual terms, and notwithstanding their potential configurations, parallel systems are divided into two structures that are very similar to each other yet also very different, from the perspective of their application.

Systems connected in parallel or active parallel share the burden of supplying power to the loads equally, unless the facility only has one UPS. The system may or may not be redundant, depending on the needs and requirements of the application.

- **Simple (non-redundant) parallel system:** a non-redundant system is one in which all of the UPSs supply the power required by the loads. The total power of a system comprised of n devices with a power rating P_n is $n \times P_n$.

If the system is working with a load that is near to or at the maximum, and one of the UPSs fails, the load will be automatically transferred to the bypass without a zero crossing; as a result, the power demand cannot be met, owing to the overload that will inevitably occur in the rest of the UPSs.

- **Redundant system:** a redundant system is one that has one or more UPSs meeting the minimum total power requirements for the system (depending on the level of redundancy), with the load shared equally between them.

Thus, if one of the UPSs fails, it will be isolated from the system and the rest will continue to supply the load with all due guarantees. Once the faulty UPS has been repaired, it can be reconnected to the system and provide redundancy once again.

A system with this configuration provides increased reliability and ensures a high-quality AC supply for more critical loads.

The number of redundant devices that should be connected to the system must be calculated in accordance with the needs of the application. $N+X$ is usually the most reliable power structure. N represents the minimum number of devices that the total load needs; X represents the number of redundant devices, i.e. the number of faulty UPSs that the system can allow simultaneously. The higher X is, the greater the reliability of the system. For occasions where reliability is essential, $N+X$ will be the optimum mode.

8.2. INSTALLATION AND CONNECTION.

To install a parallel system correctly you must follow the recommended installation diagram for **SLC-CUBE4** series devices.

When installing the parallel system, it is necessary to incorporate a board equipped with individual protections for input, output and static bypass (the latter for the version with independent bypass input), as well as a manual bypass with mechanical locking. See *Fig. 42* and *Fig. 43*.

In the event of an anomaly of any kind, this protection board will enable a single device in the system to be isolated in the event of a fault and the loads to be powered by the rest while the device is being repaired, or during preventive maintenance. It will also make it possible to remove a device from the parallel system and replace it or reconnect it once fixed, while ensuring the loads remain constantly supplied.

Upon request, we can supply a manual bypass board for a parallel system where it is needed.

By way of example, *Fig. 44* provides an illustration of the diagram to follow in order to install a parallel system without an independent bypass line:

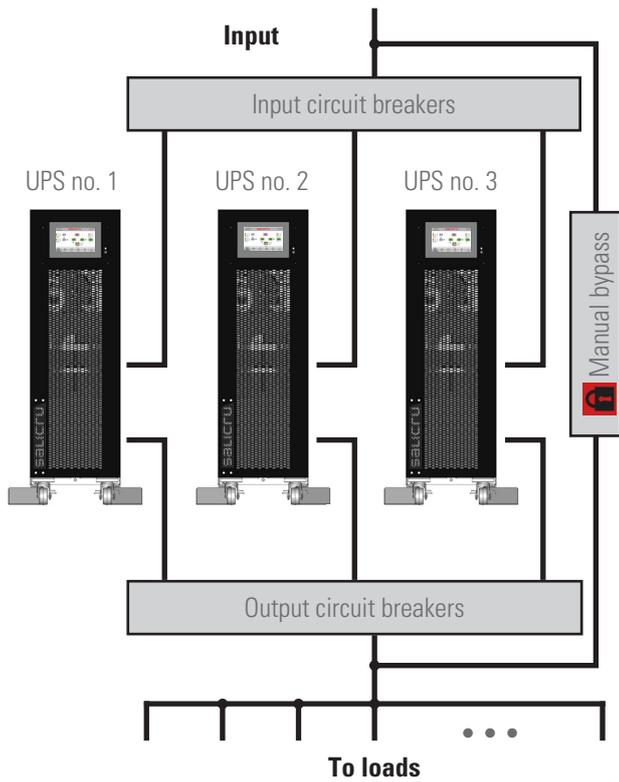


Fig. 42. Parallel installation of UPSs without independent static bypass line and with manual bypass board.

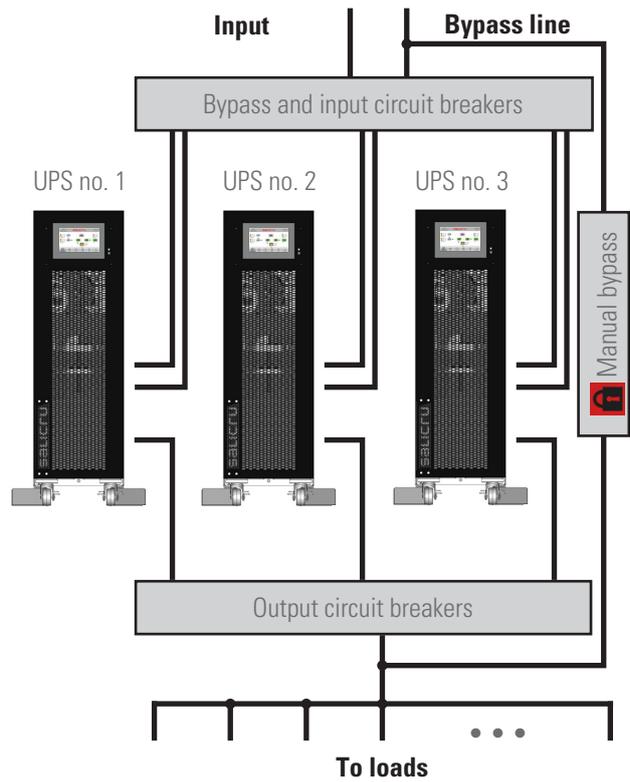


Fig. 43. Parallel installation of UPSs with independent static bypass line and manual bypass board.

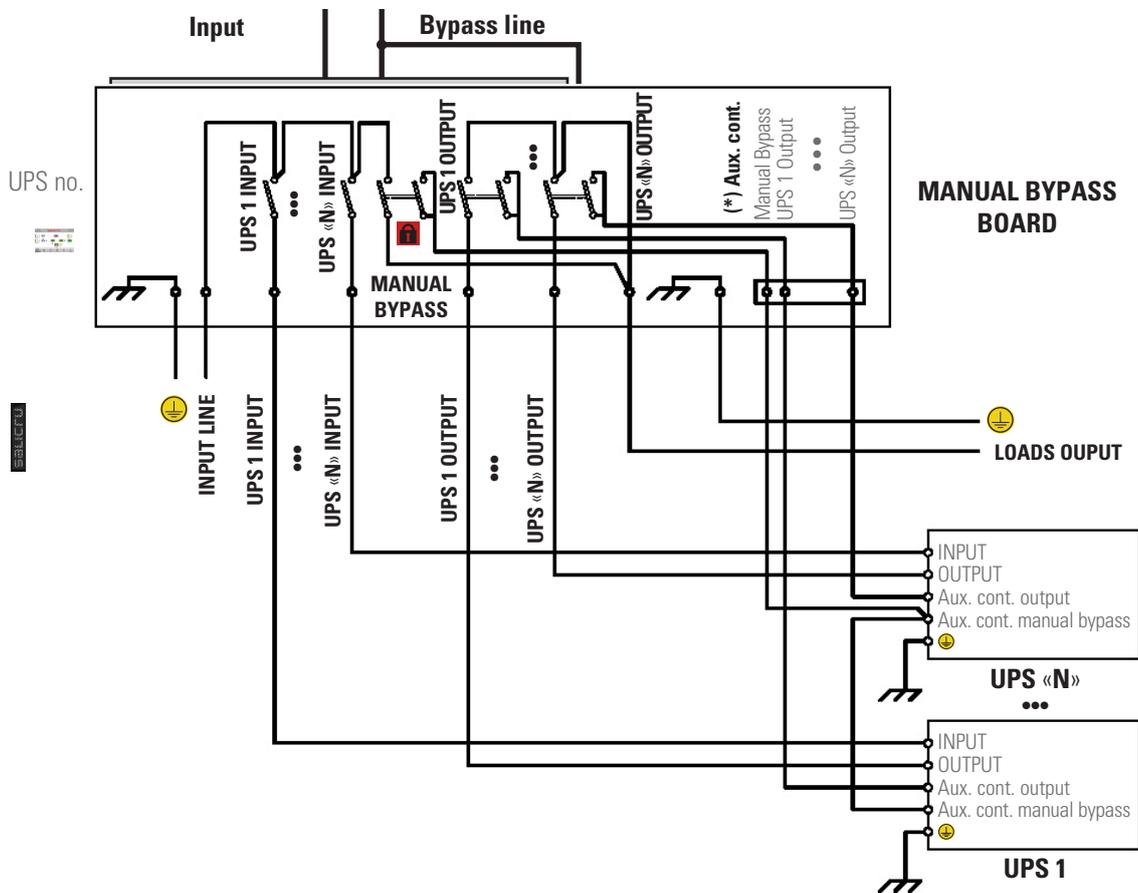


Fig. 44. Manual bypass board for "n" standard UPSs arranged in parallel with redundancy.

Make sure you follow the connection procedure described in section 5.2 Connection for the input, bypass, output (loads) and the battery module(s) for those devices that have backup extension.

! In parallel systems, the length and cross section of the cables that run from the manual bypass board to each UPS and from the UPSs to the board will be the same for all of them, without exception.

In the worst case, the following deviations must be strictly observed:

- When the distance between the UPSs in parallel and the board is less than 20 metres, the difference in length between the devices' input and output cables must be less than 20%.
- When the distance between the UPSs in parallel and the board is more than 20 metres, the difference in length between the devices' input and output cables must be less than 10%.

i Placement of the parallel system: see section 5.1.5.2.

8.2.1. Connecting signals in parallel.

8.2.1.1. Current signal and communication bus.

- **Communication signal bus.** Use the DB15 cable to connect the communication signal bus between the devices in the system. Each cable has a male and a female connector at the end and must be used to connect two consecutive devices. It is vital that you close the loop between the last and first devices. The length of the parallel cable is about 1.5 meters. It should not be extended under any circumstances, as this would present a risk of interference and communication failure.
- **Current signal bus.** Use the cable with connectors at the ends to connect the current signal between consecutive devices, as shown in Fig. 45. Lastly, close the bus loop between the last and first devices.

! The length of the parallel cable supplied should not be extended under any circumstances, as this would present a risk of interference and communication failure.

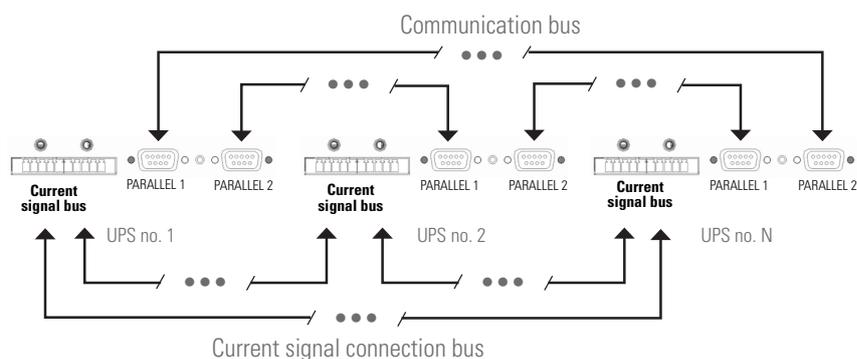


Fig. 45. Current signal and communication bus connection.

8.2.1.2. Terminal block, auxiliary contact switch or manual bypass disconnecter (EMBS).

The UPS's two-terminal block (**EMBS**) is connected in parallel to the normally closed (**NC**) auxiliary contact of the device's manual bypass disconnecter or switch.

The protection boards with manual bypass (optional) have a two-terminal block connected in parallel to the normally open (**NO**) auxiliary contact of the protection board's manual bypass disconnecter or switch. All of the manual bypass auxiliary contacts are of the early-make type.

- **!** If you acquire a protection board with manual bypass from another source, make sure it has the auxiliary contact indicated and connect it to the terminal block (**EMBS**) for each device. The auxiliary contact must be the early-make type.
- **!** It is **VITAL**, as a measure to ensure the safety of the system - including the loads - to connect the UPS's terminal blocks (**EMBS**) to the terminal block that provides the same function on the protection board. This will prevent any erroneous actions involving any manual bypass disconnecter or switch from causing total or partial failure of the installation, including loads, while the UPSs are running.

8.2.1.3. INPUT SIGNAL connection block, auxiliary contact switch or output disconnecter.

This normally open (**NO**) auxiliary contact signal is useful in systems that are connected in parallel, as it is used to tell the UPS that the output disconnecter switch on the distribution board has dropped or opened.

Between pins 5 and Vcc on the **INPUT SIGNAL** block, connect the terminals for the block corresponding to the auxiliary contact of the output switch for each device, located on the protection board.

Bear in mind that in order to enable the input signal of the auxiliary contact of the external output switch, first it is necessary to make a bridge between the GND and OP pins on the same **INPUT SIGNAL** connection block (see and).

! If you acquire a protection board from another source, make sure it has an output auxiliary contact and connect it as described above for each device. The auxiliary contact must be of the early-break type.

8.3. PARALLEL SYSTEM OPERATING PROCEDURES.

The operating procedures established in this section apply to systems incorporating devices connected in parallel, on the condition that all of the devices in the system have the same configuration and technical characteristics.

8.3.1. Startup procedure for a parallel system.

- Make sure the load(s) and/or the input circuit breakers on the distribution board are in the "Off" position.
- Supply input voltage to the protection board.
- Set the input switches on the board for each device in the parallel system to the "On" position.
- Set the input switch **(Q1)** of each UPS to "On".
- The touchscreen for each device will be activated automatically. The devices will start up in standby mode with the following warnings activated: **<41> loss of bypass** and **<45> external output switch open**.
- Via the INFO → BASIC menu (screen 2/2), make sure that for all devices, the "PAR status" is set to "Parallel" and that, in each of them, the ID PAR 1, 2, 3 etc. is shown (this identifies the device within the parallel system).

Example for a parallel system with two devices:

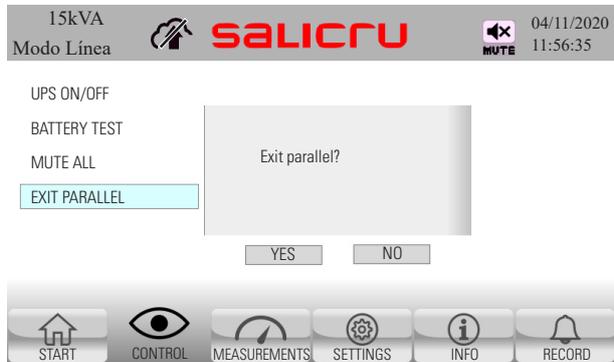


- Set the bypass switches on the board to "On", for a system with independent static bypass line.
- Set the bypass input switch **(Q4)** of each UPS to "On". The warning message **<41>** will disappear and the devices will go into bypass mode.

- Activate the inverter for each device, as follows:
 - ❑ Press the **CONTROL** menu.
 - ❑ Press the **UPS ON/OFF** sub-menu.
 - ❑ The pop-up message **Turn on UPS** will appear. Confirm the action by pressing the **"YES"** option.
 - ❑ The word **"On"** will appear on the screen of the first device, and will remain there until the same procedure is completed for all of the UPSs in the system. Once the order to switch on has been given to the final UPS in the system, the entire parallel system will move from bypass mode to line mode.
- Until now, voltage has not been supplied to the output, as the respective output disconnectors **(Q2)** for each device, as well as those of the board, have not yet been activated.
- Set the board's output switches to "On". Check to make sure the **<45> external output switch open** warnings have disappeared from each device in the parallel system.
- Set the output switch **(Q2)** for each UPS to "On".
- The parallel system supplies voltage to the output terminals of the protection board.
- If the parallel system has an output distribution, activate it by setting the switches to "On".
- Gradually turn on the loads that are to be supplied with power. The system as a whole is now fully activated and the loads are protected by the parallel UPS system.
- Check the screen to make sure the load is divided between all of the UPSs in the system.

8.3.2. Stopping a device in the parallel system.

- Go to the device's **CONTROL** menu, press **EXIT PARALLEL** and confirm by pressing **YES**.



- The UPS will go into standby mode and its load will be transferred in full to the rest of the devices in the parallel system.
- Set the UPS's bypass and input circuit breakers to "Off".
- After a few seconds, the UPS will stop.
- If you have stopped the device in order to disconnect it from the parallel system entirely, you must then set the input, output and bypass switches on the UPS's external board to "Off", in order to isolate it completely.

8.3.3. Starting the UPS up again.

- Turn off the input switch on the external board.
- Turn off the device's bypass and input circuit breaker.
- The device will power up in Standby mode and display the following warning: <45> **external output switch open**.
- Set the board's output switch to "On". Make sure the <45> warning has disappeared.
- Set the UPS's output disconnecter (**Q2**) to the "On" position.
- Activate the inverter:
 - Press the **CONTROL** menu.
 - Press the **UPS ON/OFF** sub-menu.
 - The pop-up message **Turn on UPS** will appear. Confirm the action by pressing the "YES" option.
- The word "On" will appear on the screen, and after a few seconds the device will synchronise with the rest of the system's UPSs and change to line mode. The load will once again be shared between all of the UPSs.

8.3.4. Moving the parallel system from line mode to bypass mode.

To move the entire system from Line mode to Bypass mode, you need to stop all of the inverters for each UPS, as follows:

- Press the **CONTROL** menu for each UPS.
- Press the **UPS ON/OFF** sub-menu.
- The pop-up message **Turn off UPS** will appear. Confirm the action by pressing the "YES" option on each of the UPSs in the parallel system. Once you have done this for the final UPS, all of the inverters will stop and the system will move to bypass mode.

8.3.5. Moving the parallel system from bypass mode to line mode.

To move the entire system from Bypass mode to Line mode, you need to activate all of the inverters for each UPS, as follows:

- Press the **CONTROL** menu for each UPS.
- Press the **UPS ON/OFF** sub-menu.
- The pop-up message **Turn on UPS** will appear. Confirm the action by pressing the "YES" option on each of the UPSs in the parallel system. All of the inverters will turn on and the system will move to Line mode (after undergoing full synchronisation) once you have performed this procedure for the last UPS in the system.

8.3.6. Moving the parallel system to maintenance bypass.

The procedure to go from normal operation to maintenance bypass is the same for single devices and parallel systems alike. The only difference is that the parallel system will require a greater number of individual actions:

- Move the entire system to static bypass mode, as described in section 8.3.4.
- Once you have verified that the entire system is in static bypass mode, unlock the manual bypass switch on the protection board and set the switch to the "On" position. This will activate an audible alarm, which will go off intermittently, and the display will show the following warning: <3A> **Cont. Maint. bypass open**.

- If the protection board does not have a manual bypass switch, remove the protective cover that acts as a mechanical lock on the manual bypass switch (**Q5**), located at the back of each device, and set it to the "On" position.



CAUTION! Do not set any manual bypass switches to the "On" position while the UPS's inverter(s) is/are running.

- The loads are supplied via the manual bypass and vulnerable to any incidents in the supply network.



Set the following circuit breakers to the "Off" position, in the following order:

- In devices with independent static bypass line, the bypass circuit breakers on the manual bypass board.
- The input circuit breakers (**Q1**) and bypass circuit breakers (**Q4**) on each UPS.
- All of the input circuit breakers on the manual bypass board.
- The output switches on the external control board.
- The output switches on each UPS (**Q2**).

The UPS or parallel system is now completely switched off and inactive, and the loads will be supplied via the manual bypass on the protection board or the manual bypass of the device(s).

8.3.7. Moving the parallel system from maintenance bypass to normal mode.

The procedure to go from manual maintenance bypass to normal operation is the same for single devices and parallel systems alike. The only difference is that the parallel system will require a greater number of individual actions:

- Set the following circuit breakers to the "On" position, in the following order:
 - All of the input circuit breakers on the manual bypass board.
 - The input circuit breakers (**Q1**) on each UPS.
 - In devices with independent static bypass line, the bypass circuit breakers on the manual bypass board.
 - The bypass circuit breakers (**Q4**) on each UPS.
 - The output switches on the external control board.
 - The output switches on each UPS (**Q2**).
- Set the protection board's manual bypass switch to "Off" and put the mechanical lock back in place.

In the absence of the above, set the manual bypass switches (**Q5**) located at the back of the device to the "Off" position, and attach the protective covers so that they act as a mechanical lock.



CAUTION! Do not activate the UPS inverters by setting any of the manual bypass switches to the "On" position.

- Activate the inverter of each UPS by following the procedure described in section 8.3.5.
- The load(s) is/are once again protected by the UPS or parallel system.

8.3.8. Stopping the parallel system completely.

- Stop the loads.
- If the system has an output distribution, set the corresponding switches to the "Off" position.
- Stop the inverters of each of the UPSs in the parallel system:
 - Press the **CONTROL** menu.
 - Press the **UPS ON/OFF** sub-menu.
 - The pop-up message **Turn off UPS** will appear. Confirm the action by pressing the "**YES**" option on each of the UPSs in the parallel system. Once you have done this for the final UPS, all of the inverters will stop and the system will move to Bypass mode.



Remember that the UPS or system is still supplying output voltage via the static bypass.

- Set the board's output switches to "Off".
- Set the output switch (**Q2**) for each device in the system to the "Off" position.
- For devices with an external battery cabinet, set the cabinet's fuse holder switch (**F8**) for each UPS to the "Off" position.
- Set the board's bypass switches to the "Off" position.
- Set the bypass switch (**Q4**) for each UPS in the system to the "Off" position.
- Set the board's input switches to the "Off" position.
- Set the input switch (**Q1**) for each device in the system to the "Off" position.
- Cut the protection board input voltage supply. The system will then be completely deactivated.



Danger of electric shock. If the battery cabinets or racks need to be disconnected from the UPSs, you must wait for several minutes (approx. 5 minutes) until the electrolytic capacitors have been discharged.

9. MAINTENANCE, WARRANTY AND SERVICE

9.1. BATTERY MAINTENANCE

- Pay attention to all of the safety instructions relating to the batteries and indicated in chapter 1.2.3 of the EK266*08 manual.
- The useful life of the batteries depends directly on the ambient temperature and other factors, such as the number of charges and discharges, as well as the depth of these. Their design lifetime is between 3 and 5 years if the ambient temperature to which they are subjected is between 10 and 20°C. On request, batteries of a different type and/or design lifetime can be supplied.

- The **SLC CUBE4** series UPS requires a minimum level of maintenance. The batteries used in standard models are sealed lead-acid, valve-regulated and maintenance-free. The only requirement is to charge the batteries regularly to extend their life expectancy.

As long as the UPS is connected to the supply network, whether or not it is in operation, it will keep the batteries charged and will also provide protection against over-charging and deep battery discharge.

9.1.1. Notes for installing and replacing the batteries

- If a connection cable must be replaced, purchase original materials through our **T.S.S.** or authorised distributors. The use of unsuitable cables can lead to overheating in the connections that could pose a fire risk.
-  There are permanent dangerous voltages inside the unit, even without mains supply present, due to its connection with the batteries, and especially in UPS units where the electronics and batteries share the same box.

Also take into consideration that the battery circuit is not isolated from the input voltage, so there is a risk of discharge with dangerous voltages between the battery terminals and the earth terminal, which in turn is connected to the earth (any metal part of the unit).

Repair and/or maintenance work must be carried out by the **T.S.S.**, except for the replacement of batteries, which can also be carried out by qualified staff who are familiar with them. No other person should handle them.

- Depending on the UPS configuration, certain actions will be carried out before handling the batteries:
 - Units with batteries and electronics in the same box.
 - To stop the loads and the unit completely.
 - Disconnect the **SLC CUBE4** from the mains.
 - Open the unit in order to access the inside.
 - Remove the internal battery fuse or fuses.
 - Proceed to replace the batteries, after releasing their holders.
 - Proceed in the reverse order to leave the unit as it was at the beginning, including start-up.
 - UPS with batteries and electronics in separate boxes.
 - To stop the loads and the unit completely.
 - Disconnect the **SLC CUBE4** from the mains.

- Disconnect the UPS battery module.
- Open the battery module to access the inside.
- Remove the internal battery fuse or fuses.
- Proceed to replace the batteries, after releasing their holders.
- Proceed in the reverse order to leave the unit as it was at the beginning, including start-up.

9.2. WARRANTY CONDITIONS

9.2.1. Warranty terms

On our website, you will find the warranty conditions for the product you have purchased and you can register it there. It is recommended to do so as soon as possible in order to include it in the database of our Technical Service and Support (**T.S.S.**). Among other advantages, it will streamline any regulatory procedures for the intervention of the **T.S.S.** in the event of a fault.

9.2.2. Exclusions

Our company will not be bound by the warranty if it notices that the defect in the product does not exist or was caused by improper use, negligence, improper installation and/or verification, attempts at unauthorised repair or modification, or any other cause beyond the intended use, or by accident, fire, lightning or other hazards. Nor shall it cover any compensation for damages.

9.3. TECHNICAL SERVICES NETWORK

Information about our national and international Technical Service and Support (**T.S.S.**) centres can be found on our website.

10. ANNEX I. SETTINGS AND OPERATING MODES

Setting		UPS operation mode								Authorisation			
		Standby Mode	Bypass Mode	Line Mode	Battery Mode	Battery Test Mode	Fault Mode	Converter Mode	ECO Mode	No. Password	User		
GENERAL	Date Time	Y	Y	Y	Y	Y	Y	Y	Y	Y			
	Language	Y	Y	Y	Y	Y	Y	Y	Y	Y			
	Input source	Y	Y							Y			
	Contact	Y	Y	Y	Y	Y	Y	Y	Y	Y			
	Phone	Y	Y	Y	Y	Y	Y	Y	Y	Y			
	Mail	Y	Y	Y	Y	Y	Y	Y	Y	Y			
	Audio Alarm	Y	Y	Y	Y	Y	Y	Y	Y	Y			
ADVANCE	ELECTRIC	Output voltage	Y	Y								Y	
		Output frequency	Y	Y								Y	
		CVCF mode	Y	Y								Y	
		Bypass Forbid	Y	Y	Y	Y	Y	Y	Y	Y		Y	
		NeutralLineCheck	Y	Y	Y	Y	Y	Y	Y	Y		Y	
		ISO Compensation	Y	Y	Y	Y	Y	Y	Y	Y		Y	
		Bypass UPS Off	Y	Y	Y	Y	Y	Y	Y	Y		Y	
		Bypass Voltage Range	Y	Y									Y
		Bypass Frequency Range	Y	Y	Y	Y	Y	Y	Y	Y			Y
		ECO mode	Y	Y									Y
	ECO Voltage Range	Y	Y									Y	
	ECO Frequency Range	Y	Y									Y	
	BATT	Warning Voltage	Y	Y	Y	Y	Y	Y	Y	Y			
		Shutdown Voltage	Y	Y	Y	Y	Y	Y	Y	Y			
		Age Alert	Y	Y	Y	Y	Y	Y	Y	Y			
		Capacity in Ah	Y	Y									
		BATT Groups	Y	Y	Y	Y	Y	Y	Y	Y			
		BATTMode Work Time	Y	Y	Y	Y	Y	Y	Y	Y			
	MISCELLANEOUS	Auto Restart	Y	Y	Y	Y	Y	Y	Y	Y		Y	
		System Shutdown Time	Y	Y	Y	Y	Y	Y	Y	Y		Y	
System Restore Time		Y	Y	Y	Y	Y	Y	Y	Y		Y		
Password setting		Y	Y	Y	Y	Y	Y	Y	Y		Y		

Tab. 13. Settings vs Operating modes



"Y" means that the setting is permitted in this operating mode.

11. ANNEX II. DETAILS OF CONNECTION TERMINALS AND CONNECTIONS FOR ALL INPUT-OUTPUT CONFIGURATIONS AVAILABLE

The following figures show the configuration of the connection terminals and their connections for the different input-output configurations available^(*), with a bypass with common supply to the rectifier (standard model) or with a separate bypass input.

(*)Except for the standard three-phase/three-phase configuration, with or without a separate bypass line, which has already been considered in sections 5.2.1 and 5.2.2.

! Although CUBE4 series 7.5-20 kVA units are configurable as the input and output type, any modification by the customer or user is restricted, as in addition to modifications to the connection strip, it is necessary to make changes via the password-restricted screen that is exclusively reserved for the **T.S.S.** or authorised distributors.

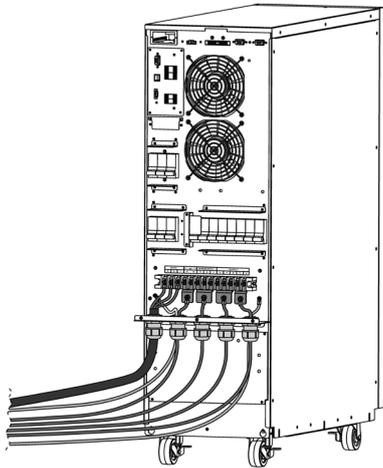


Fig. 46. Connection with input-output configuration: three-phase/single-phase with separate bypass line.

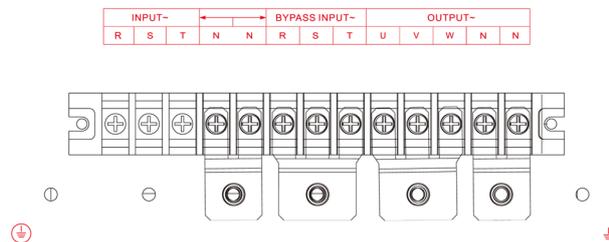


Fig. 47. Detailed view of the connection terminals with input-output configuration: three-phase/single-phase with separate bypass line.

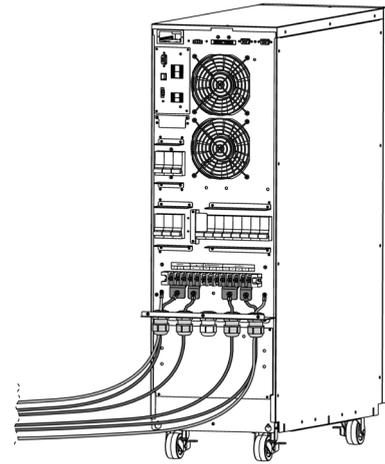


Fig. 48. Connection with input-output configuration: single-phase/single-phase with common bypass line.

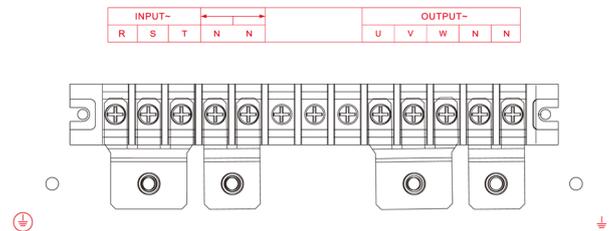


Fig. 49. Detailed view of the connection terminals with input-output configuration: single-phase/single-phase with common bypass line.

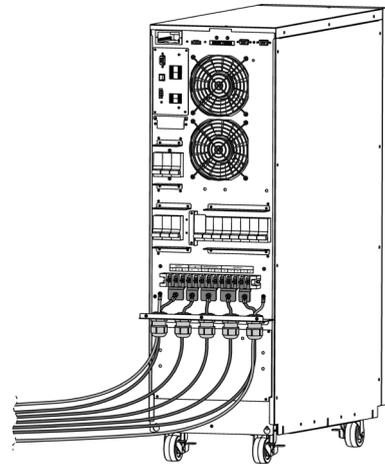


Fig. 50. Connection with input-output configuration: single-phase/single-phase with separate bypass line.

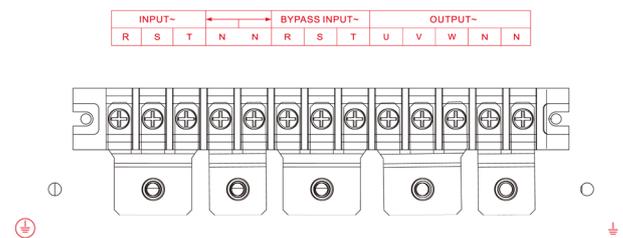


Fig. 51. Detailed view of the connection terminals with input-output configuration: single-phase/single-phase with separate bypass line.

12. ANNEX III. TECHNICAL SPECIFICATIONS

12.1. INTERNATIONAL STANDARDS

Information	Standards
Quality and Environmental Management	ISO 9001 & ISO 14001
Uninterruptible power systems (UPS). Safety requirements	IEC/EN 62040-1
Safety requirements for power electronic converter systems and equipment. Part 1: General	IEC/EN 620477-1
Uninterruptible power systems (UPS). Electromagnetic compatibility (EMC) requirements	EN-IEC 62040-2, Cat. C3
Uninterruptible power systems (UPS). Method of specifying the performance and test requirements	VFI-IEC-11 (EN-IEC 62040-3)

Tab. 14. Standards applied.

12.2. ENVIRONMENTAL CHARACTERISTICS

Information	7.5 kVA	10 kVA	15 kVA	20 kVA
Acoustic noise at 1 metre distance	< 55 dB (A)		< 57 dB (A)	
Operating altitude	2400 m at nominal power. Above 2400 m there is a power de-rating of 1% every 100 m.			
Relative humidity	0.. 95%, no condensation			
Operating temperature	0.. 40 (battery life is reduced by 50% for every 10°C increase over 20°C)			
Storage and transport temperature	-15.. +60 (UPS) / 0.. +35 (Battery)			

Tab. 15. Environmental characteristics

12.3. MECHANICAL CHARACTERISTICS

Cabinet specifications		7.5 kVA	10 kVA	15 kVA	20 kVA
Dimensions (Depth × Width × Height)		688.5 x 370 x 826.5 mm			
Weight	without internal batteries (mod. B1)	43 kg		47 kg	
	with batteries (standard aut.)	88 kg	98 kg	118 kg	132 kg
Colour		RAL 9005			
Degree of protection, IEC (60529)		IP20			

Tab. 16. Mechanical characteristics

12.4. ELECTRICAL CHARACTERISTICS

12.4.1. Electrical characteristics (rectifier input)

Rectifier specifications	7.5 kVA	10 kVA	15 kVA	20 kVA
Active power (kW)	7.5	10	15	20
Technology	Double boosters per phase, 3 switching levels			
Three-phase nominal voltage (3P + N + E)	3 x 360 V / 3 x 380 V / 3 x 400 V / 3 x 415 V			
Input voltage range	176 V ... 276 V (-23.5% / +20% @ 3x400 V)			
Frequency	50 Hz / 60 Hz ± 4 Hz (46 to 64 Hz)			
Nominal input current (A)	12	16	24	32
Maximum input current (A)	15.8	21	31.6	42
Input power factor (load ≥ 10%)	1.0			
Input THDi	@100% load: THDi < 4.0% @50% load: THDi < 6.0% @25% load: THDi < 15.0%			

Tab. 17. Rectifier input characteristics

12.4.2. Electrical characteristics (bypass input)

Static bypass specifications	7.5 kVA	10 kVA	15 kVA	20 kVA
Nominal voltage (3P + N + E)	3 x 360 V / 3 x 380 V / 3 x 400 V / 3 x 415 V			
Technology	Solid state STS (SCR)			
Activation criterion	Digital Control			
Transfer time	Zero			
Voltage range	176...264 V (-23% +15% @ 230 V)			
Overload	< 130% (permanently) > 130% (for 1 min.)			
Transfer time	0			
Manual bypass type	Without interruption			
Neutral line nominal current	1.7 × I _n			
Frequency	50 / 60 Hz. ± 4 Hz (programmable)			
Nominal bypass current (A)	11	14.5	22	29
Maximum permanent input current (A)	18.4	24.6	36.9	49.2

Tab. 18. Static bypass characteristics

12.4.3. Electrical characteristics (battery charger)

Battery charger specifications	7.5 kVA	10 kVA	15 kVA	20 kVA
Nominal charge current (A)	Can be set between 1 and 12			
Default charge current (A)	Standard: 1 B1 model: 3			
Charging method	Constant current and voltage			
Number of batteries	Standard	8+8	10+10	16+16
	B1	8+8, 10+10, 16+16, 20+20		16+16, 20+20
Battery charger bus voltage	± 106.5 V ~ ± 141 V for configuration 8+8/10+10 ± 208 V ~ ± 282 V for configuration 16+16/20+20		Configurable between ± 208 V ~ ± 282 V	
Charge time	5 hours (90% capacity)			
Float voltage	13.6 V / battery (programmable between 13.4 V ~ 14 V)			
Voltage compensation depending on the temperature	- 3 mV / °C*Cell. (default for PbCa) (Programmable 0.0 ~ 9.9 mV / °C*Cell.)			
Voltage ripple	≤ 1			
Current ripple	≤ 5			
Quick charge voltage (equalisation)	14 V			
End of autonomy voltage	Standard	10.7 V/pcs (0 ~ 30% charge) 10.2 V/pcs (30 ~ 70% charge) 9.6 V/pcs (> 70% charge)		
	B1	10.5 V (default) (programmable between 10.5 V ~ 12.0 V)		
Remaining autonomy time estimate	Yes			

Tab. 19. Characteristics of parameters related to the batteries.

12.4.4. Electrical characteristics (inverter output)

Inverter specifications	7.5 kVA	10 kVA	15 kVA	20 kVA
Active power (kW) (*)	7.5	10	15	20
Technology	3-level inverter per phase			
Three-phase nominal voltage (3P + N + E)	3 x 360 V (**) / 3 x 380 V / 3 x 400 V / 3 x 415 V			
Output voltage accuracy	Static regime (0% ~ 100% load/mains-battery): ± 1% regime (0% ~ 100% ~ 0%): ± 10%, 20 ms.			Dynamic
Dynamic recovery time	After 20 ms, nominal value ± 10%			
Waveform	Pure sinusoidal			
Frequency	50 Hz / 60 Hz ± 0.1 Hz (fixed value or autodetect can be selected)			
Nominal output current (A.)	11	14.5	22	29

Inverter specifications	7.5 kVA	10 kVA	15 kVA	20 kVA
Short circuit current (A.)	32.6	43.5	65	87
Short circuit protection	Yes			
Power factor	1			
Permitted crest factor	3:1			
Overload	100% ~ 110% (for 60 min.) 110% ~ 125% (for 10 min.) 126% ~ 150% (for 1 min.) > 150% (immediate transfer to bypass)			
Overcurrent limit	300 %			
Output THDv	≤ 2% (linear load) / < 4.0 (non-linear load)			
Maximum synchronism speed	1.0 Hz/s (default value)			
Inverter voltage range	± 10 %			

(*) Power reduction to 60% of nominal as I/I configuration frequency converter.

(**) Power reduction to 90% of the nominal.

Tab. 20. Inverter characteristics.

12.4.5. Electrical Characteristics (Parallel System).

Parallel Specification	7.5 kVA	10 kVA	15 kVA	20 kVA
Maximum Nr. units in parallel	Up to 4			
Current distribution unbalance	< 5% @ 100% load			
Output Power	Power reduction to 90% of nominal $\sum_{n=1}^N P_n \cdot 90\%$			

Tabla 21. Parallel System Features.

12.4.6. Communications

Communication specifications	Parameters
Communication port 1	RS 232
Communication port 2	USB
Expansion slot	NIMBUS card (*)
Digital inputs	8 inputs
Relay interface	6 programmable relays
Protocol	RS 232 + USB
Display	5" touchscreen
EPO function	
EMBS signal: external maintenance bypass auxiliary contact	2-pole normally closed contact

(*) Options:

- SNMP.

- RS485.

- AS400 (relay extension).

Tab. 22. Communications available.

12.4.7. Efficiency

Efficiency specifications		7.5 kVA	10 kVA	15 kVA	20 kVA
Normal mode and linear load efficiency	25% load		91.86		95.21
	50% load		94.33		95.77
	75% load		94.30		95.30
	100% load		94.15		94.93
Battery mode and linear load efficiency	25% load		94.95		94.18
	50% load		93.05		95.16
	75% load		94.23		95.06
	100% load		93.98		93.6
Heat losses, normal mode, 100% charge (W)		438	585	760	1014
Air volume for cooling (m³/hour)		266			

Tab. 23. Efficiency characteristics

13. ANNEX IV. CONNECTIVITY

Nimbus Service in the cloud.

The UPS of the **SLC CUBE4** series incorporate, as standard, the **NIMBUS** communication card. This allows, by connecting this card via Ethernet, a multitude of IoT ("Internet of Things") communication possibilities, ranging from remote diagnosis, remote maintenance, integration into SNMP platforms, MODBUS/TCP protocol, orderly shutdown of servers and/or remote firmware updates of the **NIMBUS** card.



Remote diagnostics

The equipment data can be displayed on the website embedded in the card itself, and can also be uploaded to the SALICRU web platform. In this platform, the user has the possibility to view the status of the equipment without having to be on the same network, as well as remotely update the cards, view the location of the equipment and personalize notifications via SMS and email in the event of an alarm.



Fig. 52. Remote monitoring system and direct notifications to the Technical Service, response time is minimized to the maximum.

To know if the unit is connected and sending data to the cloud, the following icon should appear on the right at the top of the screen:



Otherwise, the following icon will appear:



The reasons why a unit may not be connected are as follows:

- The card is not correctly connected to the network.
- The network to which the card is connected does not have Internet access.

13.1. REGISTRATION OF THE UNIT IN THE CLOUD

There are two ways of registering the unit in the cloud, via the portal or by reading a QR code.

13.1.1. Nimbus portal

1. Access the following link: <https://nimbus.salicru.com/>
2. If you are not yet registered, click on "Create an account" and follow the process to create it.

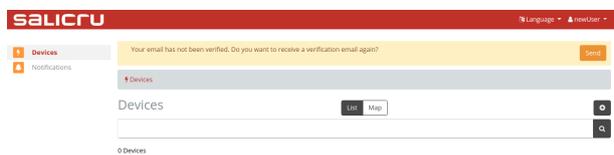
SALICRU

Username

Password

[Create an account](#)
[Forgot your password?](#)

3. Once the account has been created and accessed, the unit must be added by pressing the "+" button in the top right-hand corner of the "Device" tab.



4. A page will appear where the fields that are displayed must be completed. Note: required fields are marked with an asterisk (*).

SALICRU

Your email has not been verified. Do you want to receive a verification email again?

Devices / + New device

New device

General data

Serial number * Model *

Description

Time Zone *

Location

Address *

Latitude * Longitude *

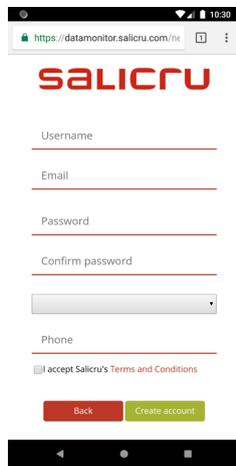
5. After registering the unit, a list of all units linked to that account will be shown, as well as the UPS status.

13.1.2. Reading the QR code

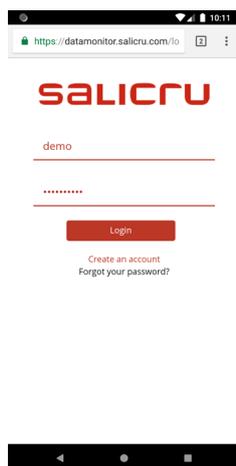
- Read the QR code that you will find on the central part of the unit.
- After reading the code, a new tab will open in the browser of your mobile device.



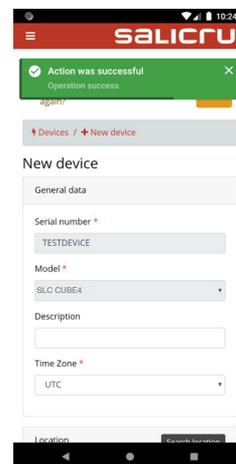
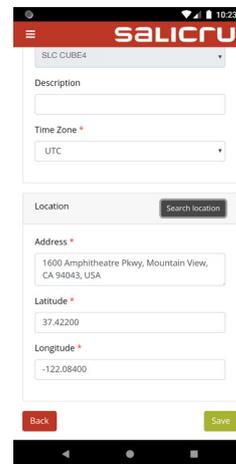
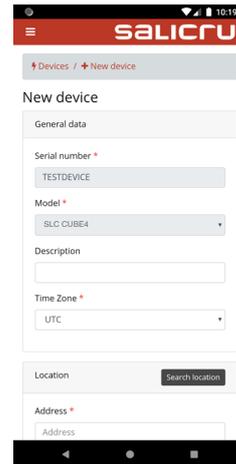
- If you do not have an account, you must register in order to access the unit.



- Once registered, or if you already have a SALICRU account, you must log in.



- Once you have accessed your account, the next step is to register the unit by filling in the fields that appear. Note: required fields are marked with an asterisk (*).



- After registering the unit, a list of all units linked to that account will be shown, as well as the UPS status.



13.2. GENERAL TECHNICAL SPECIFICATIONS

The technical characteristics of the NIMBUS card are shown below.

	Characteristic
Processor	Sitara AM3358BZCZ100 1 GHz, 2000 MIPS
Graphics card	SGX530 3D, 20M Polygons/S
SDRAM memory	512 MB DDR3L 800 MHZ
Flash memory	4 GB, 8-bit integrated MMC
PMIC	TPS65217C PMIC regulator and an additional LDO.
Debug support	Optional onboard 20-pin CTI JTAG
SD/MMC connector	microSD, 3.3 V
Audio	HDMI interface, stereo

ANNEX V. GLOSSARY

- **AC.**- Alternating current is electric current in which the magnitude and direction vary cyclically. The waveform of the most commonly used alternating current is that of a sine wave, since this achieves a more efficient transmission of energy. In certain applications, however, other periodic waveforms are used, such as triangular or square.
- **Bypass.**- Manual or automatic, this is the physical connection between the input of an electrical device and its output.
- **DC.**- Direct current is the continuous flow of electrons through a conductor between two points with different potential. Unlike AC, in DC, electrical loads always circulate in the same direction from the point of greatest potential to the lowest. Although DC is commonly identified as a continuous current (for example, that supplied by a battery), any current that always maintains the same polarity is continuous.
- **DSP.**- Digital signal processor. A DSP is a processor or microprocessor-based system that has a set of instructions, hardware and optimised software for applications that require numerical operations at very high speed. Because of this, it is especially useful for the processing and representation of analogue signals in real time: in a system that works in this way (real time) samples are usually received from an analogue/digital converter (ADC).
- **Power factor.**- The power factor, PF, of an AC circuit is defined as the ratio between active power, P, and apparent power, S, or as the cosine of the angle formed by the current and voltage factors, designated in this case as $\cos \phi$, where ϕ is the value of the angle.
- **GND.**- This stands for GROUND or EARTH and, as the name indicates, refers to the potential of the earth surface.
- **IGBT.**- An insulated gate bipolar transistor (IGBT) is a semiconductor device that is generally used as a controlled switch in power electronics circuits. This device possesses the characteristics of the gate signals of field effect transistors with the capacity for high current and low saturation voltage of the bipolar transistor, combining an isolated FET gate for input and control and a bipolar transistor as a single switch in a single device. The IGBT's excitation circuit is similar to that of the MOSFET, while the conducting characteristics are similar to those of the BJT.
- **Interface.**- In electronics, telecommunications and hardware, an interface (electronics) is the port (physical circuit) through which signals are sent or received from one system or subsystem to another.
- **kVA.**- A volt-ampere is the unit used for apparent power in electrical current. In DC, it is practically equal to real power but, in AC, it can differ from this depending on the power factor.
- **LCD.**- Liquid crystal display, a device invented by Jack Janning, who was an employee of NCR. It is an electrical system for data presentation formed by 2 transparent conductive layers and a special crystalline material in the middle (liquid crystal) which have the ability to orientate light as it passes through.
- **LED.**- Light-emitting diode, a semiconductor device (diode) that emits light that is almost monochromatic, that is to say, it has a very narrow spectrum when it is polarised directly and is penetrated by an electric current. The colour (wavelength) depends on the semiconductor material used in the construction of the diode, and can vary from ultraviolet, passing through the visible light spectrum, to infrared, the latter called IRED (infra-red emitting diode).
- **Circuit breaker.**- A circuit breaker is a device capable of interrupting the electrical current of a circuit when it exceeds certain maximum values.
- **Disconnect switch.**- Mechanical disconnecting device with two alternative positions with a separation between contacts that satisfies the minimum physical spacing between the two parts of the mains where it is located. In case of failure of the circuit in which it is located, it opens its contacts automatically, thus isolating the failure. They can open or close circuits only when they are without loads.
- **Online mode.**- A device is said to be online when it is connected to a system, is operative, and normally has its power supply connected.
- **Inverter.**- An inverter is a circuit used to convert DC into AC. The function of an inverter is to change a DC input voltage to a symmetrical AC output voltage, with the magnitude and frequency desired by the user or designer.
- **Rectifier.**- In electronics, a rectifier is the element or circuit that converts AC into DC. This is done by using rectifier diodes, whether solid state semiconductors, vacuum valves or gaseous valves, such as those containing mercury vapour. Depending on the characteristics of the AC power that they use, they are classified as single-phase when they are powered by a mains phase or three-phase when they are powered by three phases. Depending on the type of rectification, they can be half wave when only one of the half cycles of the current is used or full wave when both half cycles are used.
- **Relay.**- A relay is an electromechanical device that functions as a switch controlled by an electrical circuit in which, by means of an electromagnet, a set of one or several contacts is activated to enable other independent electrical circuits to be opened or closed.
- **SCR.**- Silicon controlled rectifier, commonly known as a thyristor, a 4-layer semiconductor device that works as an almost ideal switch.
- **THD.**- Total harmonic distortion. Harmonic distortion occurs when the output signal of a system does not equal the signal that entered it. This lack of linearity affects the waveform because the device has introduced harmonics that were not in the input signal. Since they are harmonic, that is to say, multiples of the input signal, this distortion is not so dissonant and is less easy to detect.

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Information about the technical support and service network (TSS), the sales network and the warranty is available at our website:

www.salicru.com

Product Range

Uninterruptible Power Supplies (UPS)

Lighting Flow Dimmers - Stabilisers

Power Systems

Static Inverters

Photovoltaic Inverters

Voltage Stabilisers



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