USER MANUAL

UNINTERRUPTIBLE POWER SUPPLY

SLC CUBE 4

30 - 80 kVA

salicru

General index

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 30 and 80 kVA and consisting of cabinets measuring (depth x width x height) 909 x 377 x 1042 mm, for 30 and 40 kVA units measuring 919 x 560 x 1654 mm, and for 50 kVA, 60 kVA and 80 kVA units.

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

- "**SLC CUBE4, CUBE4, UPS system, equipment or unit**".- Uninterruptible power supply, SLC 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 *5* 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.

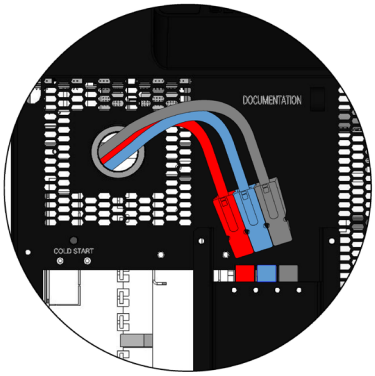
4. PRESENTATION.

4.1. VIEWS OF THE CABINETS

4.1.1. UPS cabinets

The power range between 30 and 80 kVA consists of two UPS cabinet sizes, one that is 1042 mm high for 30 and 40 kVA units and another that is 1654 mm high for 50 kVA, 60 kVA and 80 kVA units.

Fig. 1 to *Fig. 9* show front and rear views and their constituent parts.



Detail A

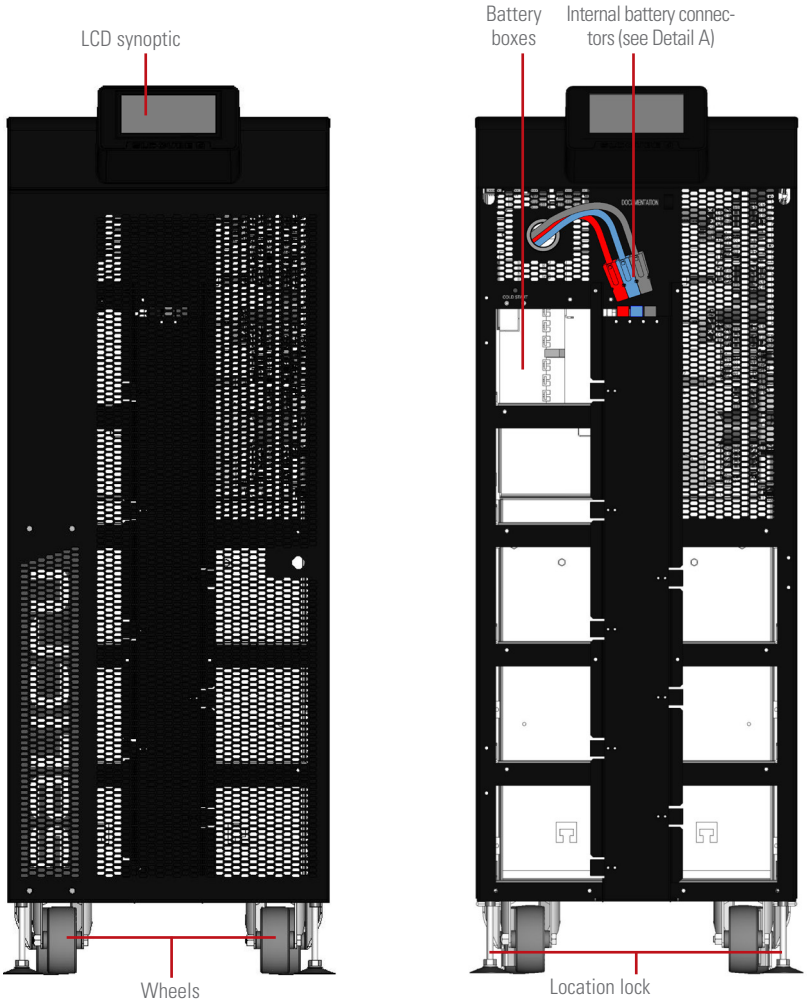
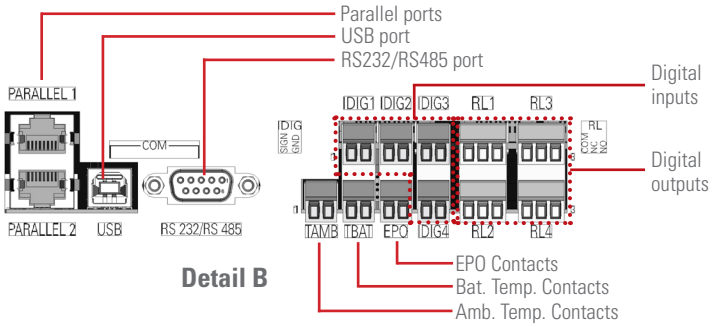
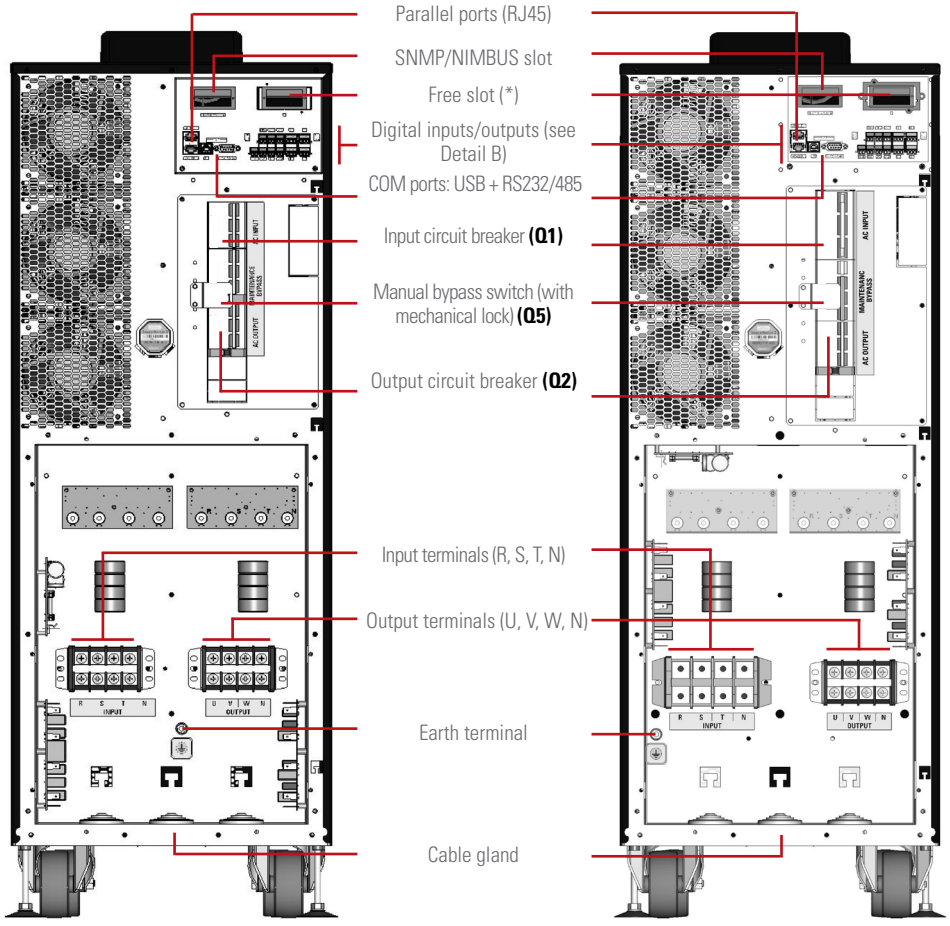


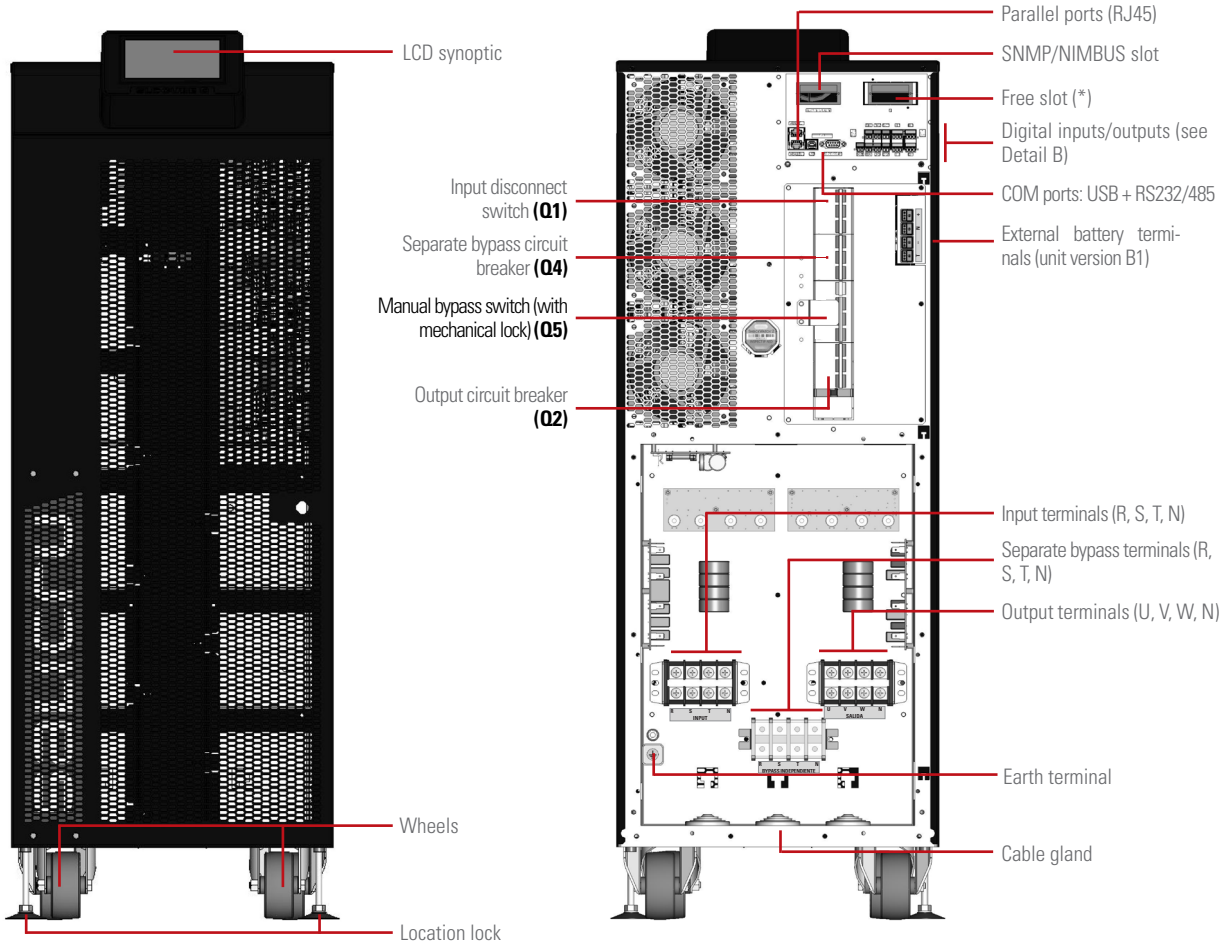
Fig. 1. Front views, with the door open and closed, of the 1042 mm cabinet for 30 kVA and 40 kVA standard units.





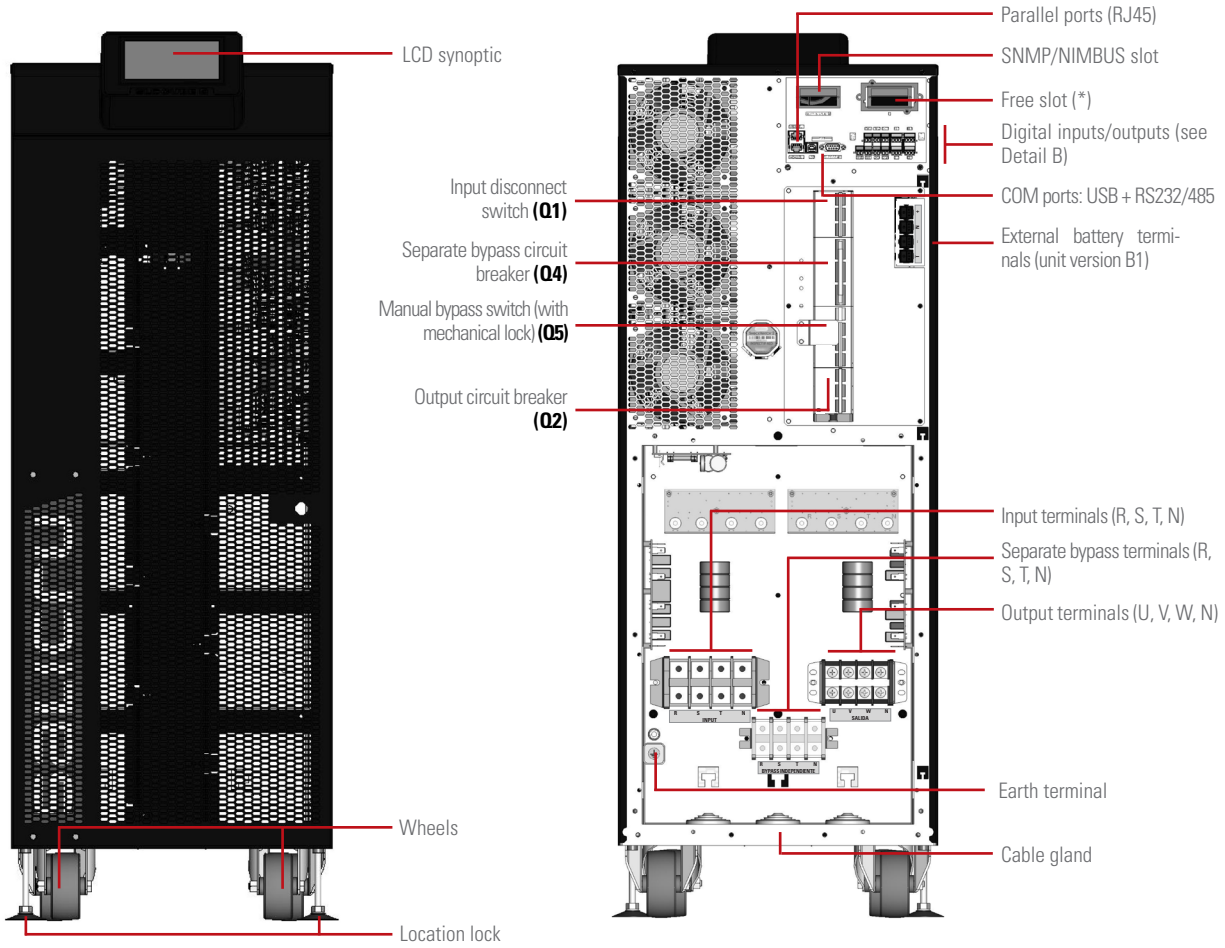
(*) Options:
- SNMP.
- RS232, RS485, USB.
- AS400 (relay extension).
- Remote battery temperature.

Fig. 2. Rear views of the 1042 mm cabinet for 30 kVA (left) and 40 kVA (right) standard units.



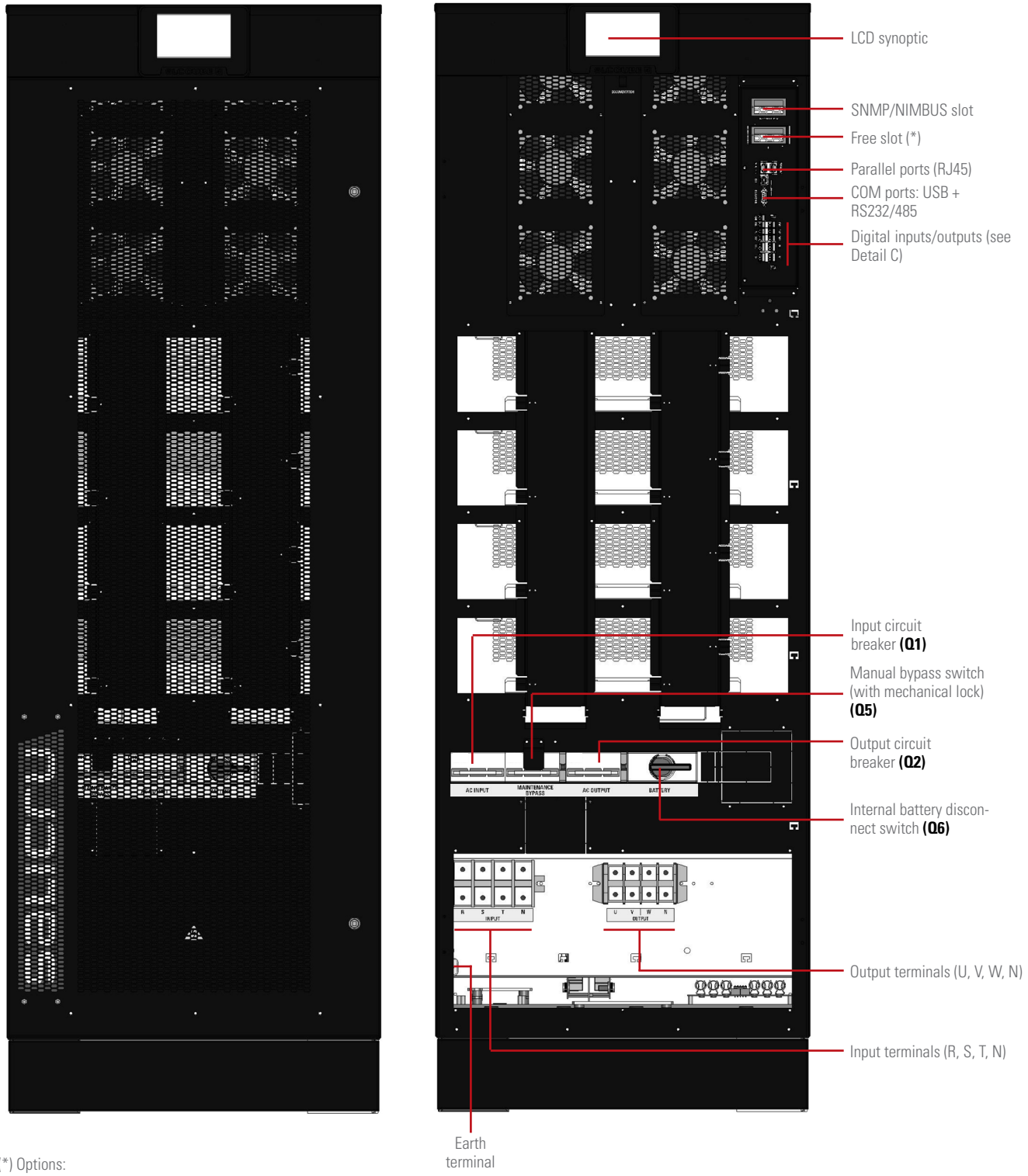
(*) Options:
- SNMP.
- RS232, RS485, USB.
- AS400 (relay extension).
- Remote battery temperature.

Fig. 3. Front and rear views of the 1042 mm cabinet for 30 kVA units with options.



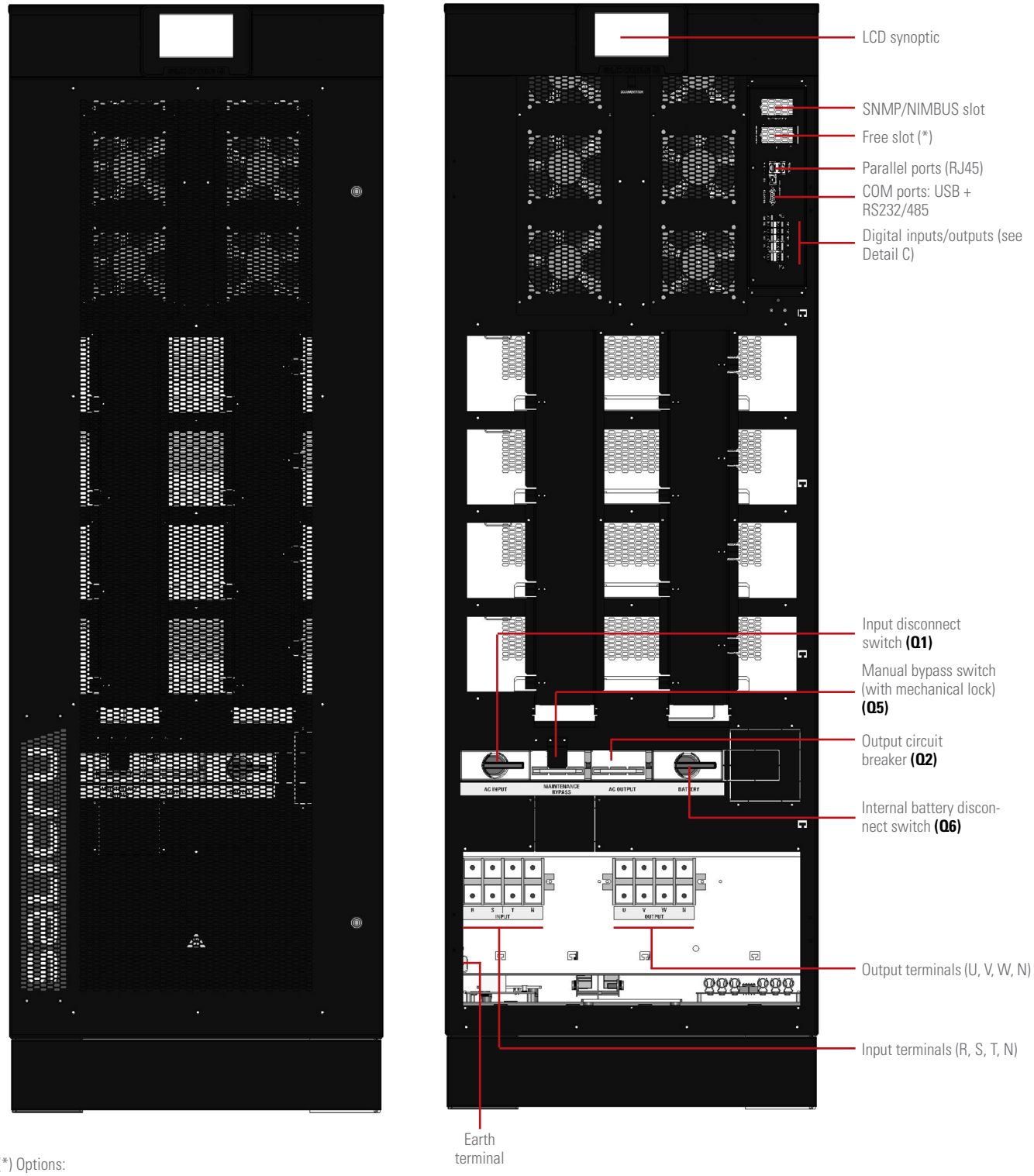
(*) Options:
- SNMP.
- RS232, RS485, USB.
- AS400 (relay extension).
- Remote battery temperature.

Fig. 4. Front and rear views of the 1042 mm cabinet for 40 kVA units with options.



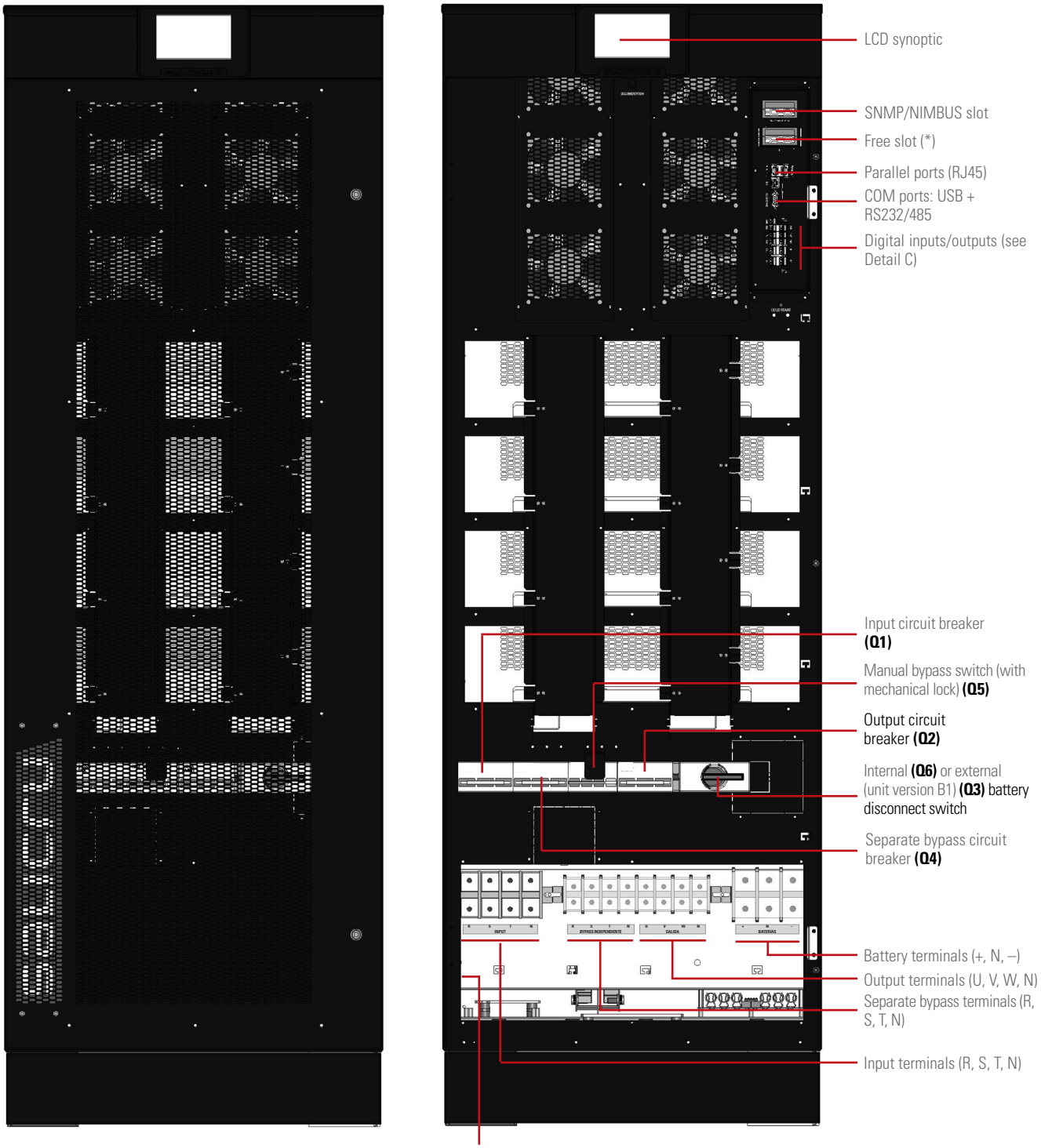
(*) Options:
- SNMP.
- RS232, RS485, USB.
- AS400 (relay extension).
- Remote battery temperature.

Fig. 5. Front view, with the door open and closed, of the 1654 mm cabinet for 50 kVA and 60 kVA standard units.



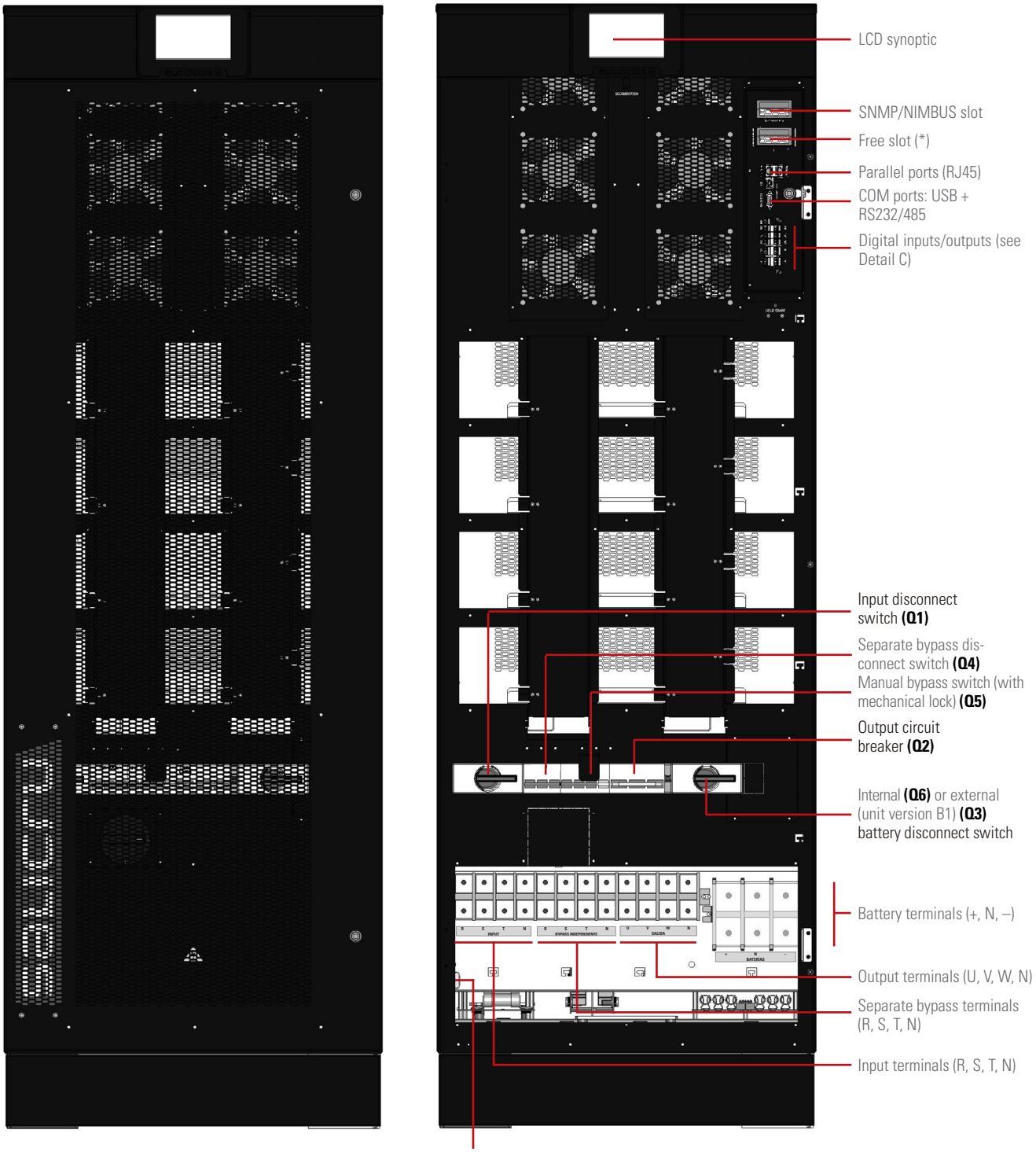
(*) Options:
- SNMP.
- RS232, RS485, USB.
- AS400 (relay extension).
- Remote battery temperature.

Fig. 6. Front view, with the door open and closed, of the 1654 mm cabinet for 80 kVA standard units.



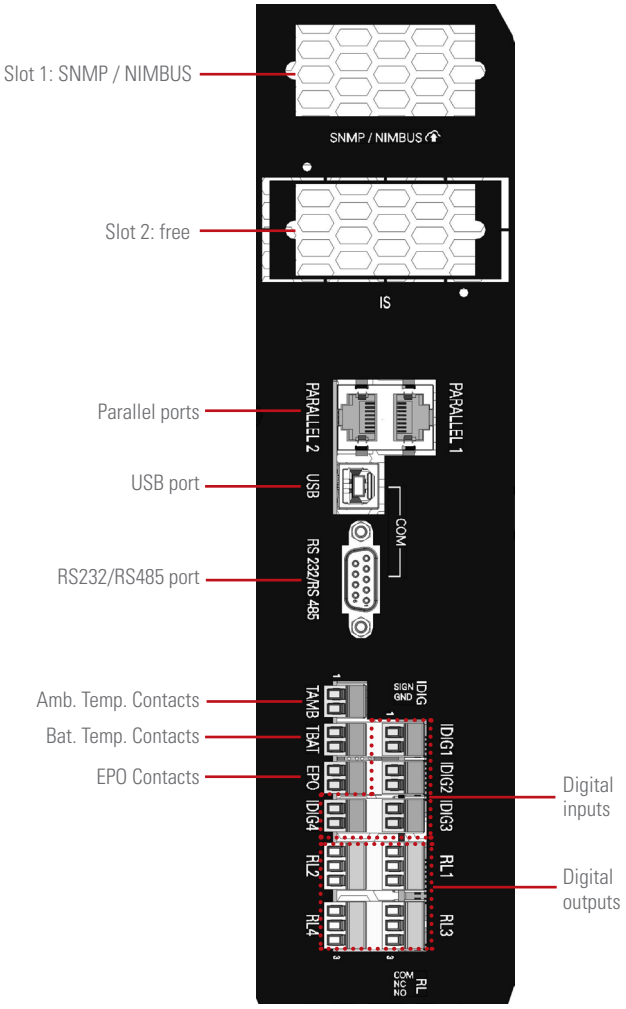
(*) Options:
- SNMP.
- RS232, RS485, USB.
- AS400 (relay extension).
- Remote battery temperature.

Fig. 7. Front view, with the door open and closed, of the 1654 mm cabinet for 50 kiVA and 60 kVA units with options.



*) Options:
- SNMP.
- RS232, RS485, USB.
- AS400 (relay extension).
- Remote battery temperature.

Fig. 8. Front view, with the door open and closed, of the 1654 mm cabinet for 80 kVA units with options.



Detail C

Fig. 9. Detailed view of the external interface and communications.

4.1.2. Battery cabinets

There are different battery cabinet sizes depending on the autonomy, being the most common for these power ratings (depth x width x height): 851 x 570 x 1008 mm for 30 kVA and 40 kVA units, and 851 x 678 x 1654 mm for 50 kVA, 60 kVA and 80 kVA units (see *Fig. 10* and *Fig. 11*).

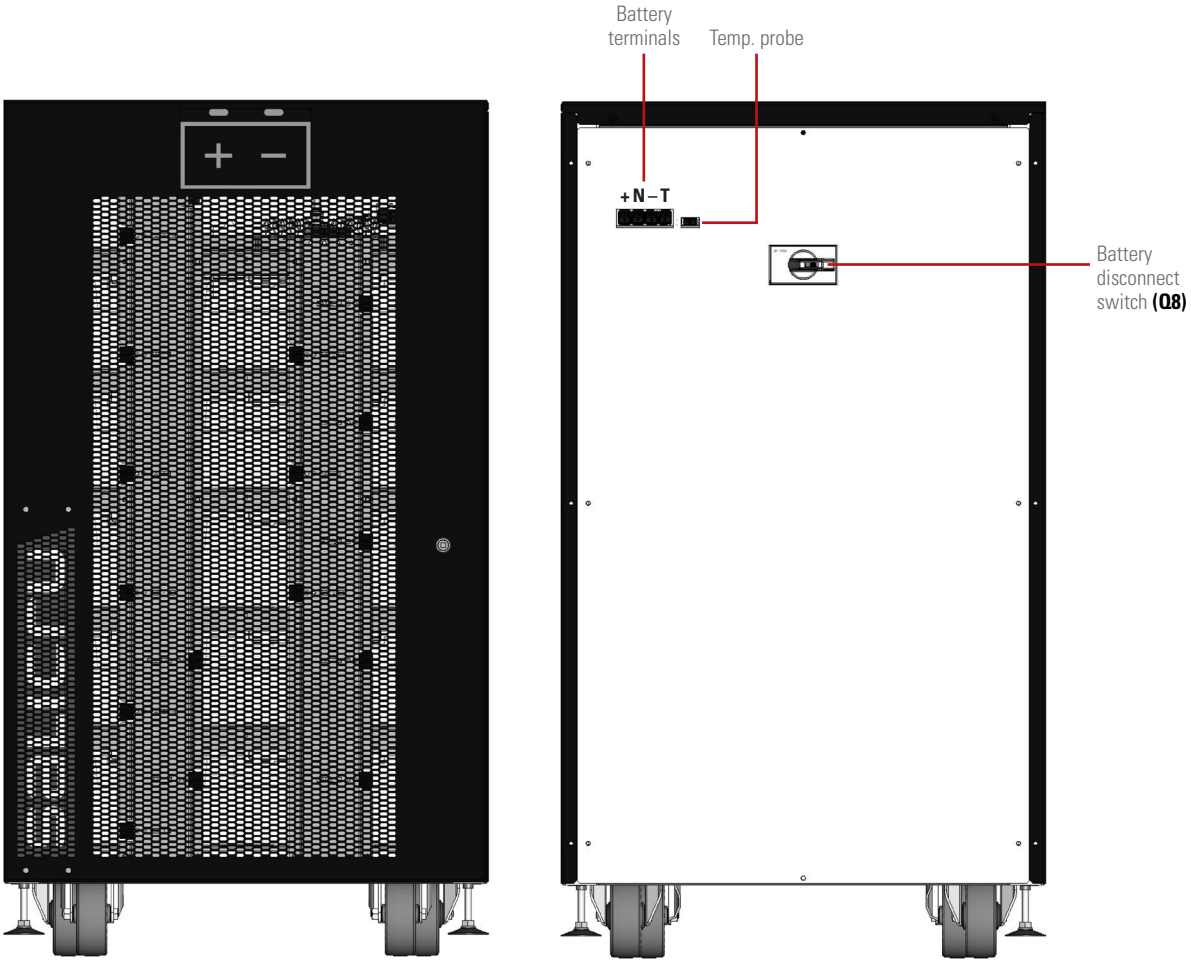


Fig. 10. Front and rear views of the 1004 mm battery cabinet for 30 and 40 kVA units.

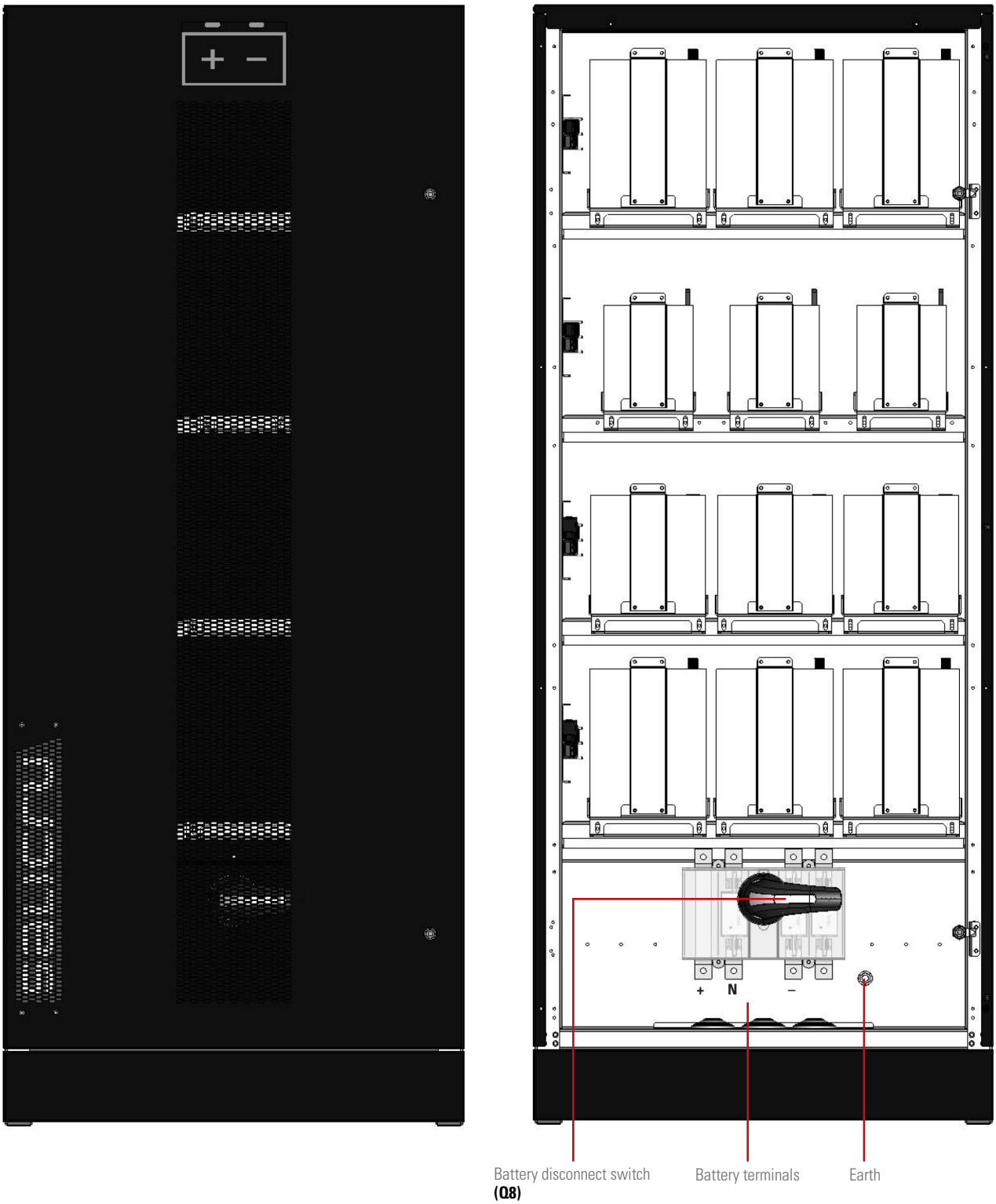
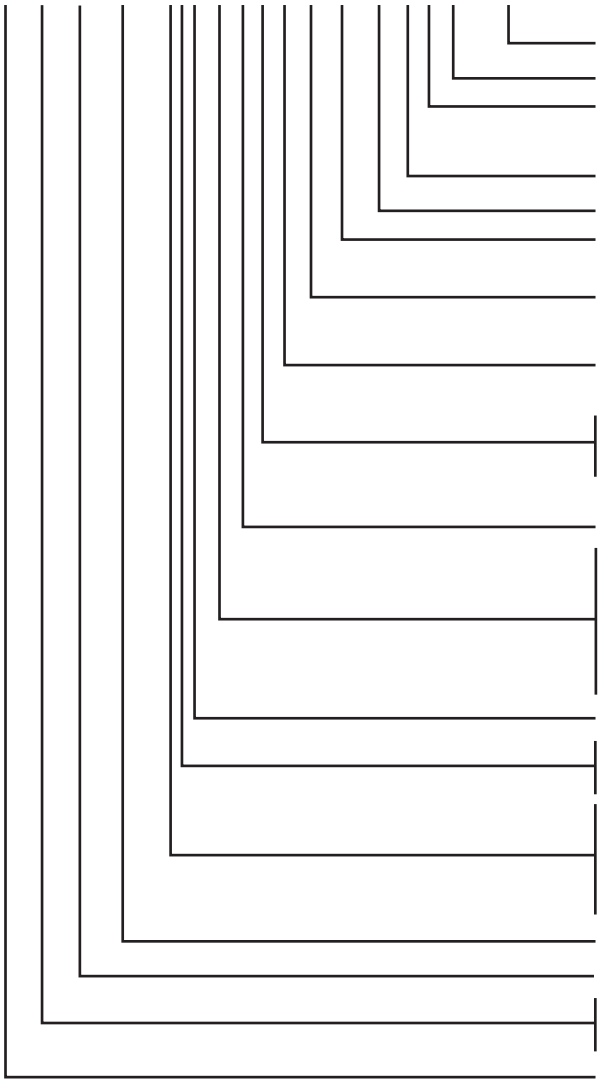


Fig. 11. Front view, with the door open and closed, of the 1654 mm battery cabinet for 50 kVA, 60 kVA and 80 kVA standard units.

4.2. PRODUCT DEFINITION

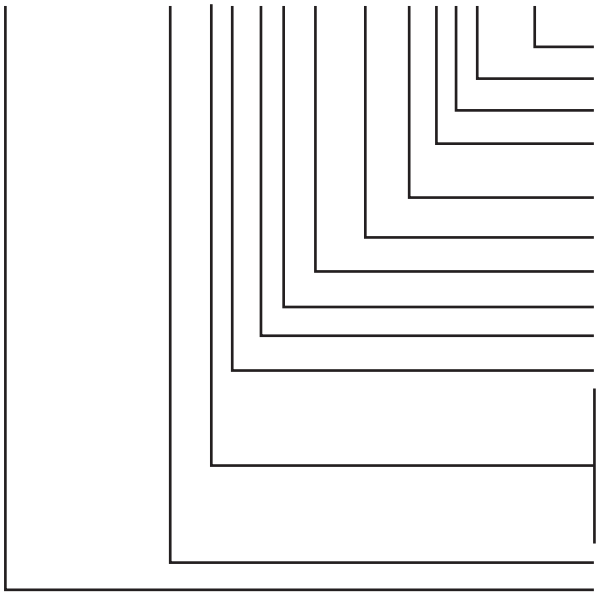
4.2.1. UPS and battery module nomenclature

KIT SLC-80-CUBE4-LBT B1 Q 0/44AB147 T/T AWC0 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.
T/T	Triangle/triangle unit.
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 2 languages (English, Spanish, Catalan and Portuguese).
B1	Unit with external batteries for non-standard autonomy.
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).
T	Top cable entry.
B	Separate bypass line (only for I/I, III/III units).
SB	UPS without bypass line.
L	Input/output, single-phase/single-phase configuration.
MB	Input/output, single-phase/three-phase configuration.
NB	Input/output, three-phase/single-phase configuration.
–	Input/output, three-phase/three-phase configuration.
CUBE4	UPS series.
80	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 AWC0 EE666502

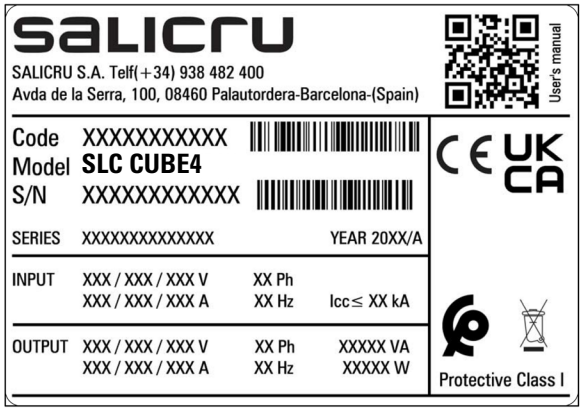


EE*	Special customer specifications.
CO	"Made in Spain" marking on the UPS and packaging (for customs).
W	Generic brand unit.
A	Battery module for three-phase network units from 2x200V to 3x220V.
BC	Last three digits of the battery code.
100A	Protection size.
999	Last three digits of the battery code.
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.

(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 4 floating-point DSP (Digital Signal Processor) cores.
- 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.
- "Unlimited" parallel system, non-critical communications.

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.

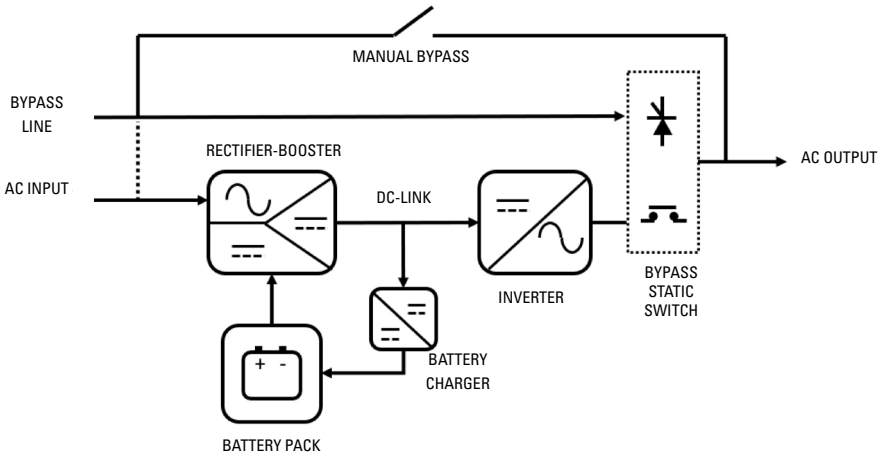


*Fig. 12. **SLC CUBE4 UPS block diagram.***

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 thy-

ristors) 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: if the set charge current is not exceeded, 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) line, and vice versa, without interruption. This bypass line may or may not be common to the rectifier AC input.

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.

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 to the rectifier AC input, or not) to be connected directly to the output, by simply activating this switch and without the intervention of a converter or controlled electronic device. Just 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.

External manual bypass

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

4.5. OPERATING MODES

The UPS "standby" or stopped status, is the one in which the UPS is powered but with the converters completely stopped, for various reasons:

- Before initial start-up.
- By command or manual request.
- Due to a block alarm that forces this situation.

In this "standby" status, depending on the previous situation from which we come, we may find that the UPS does not supply any voltage to the Output, or that the static Bypass is connected and supplying voltage to the Output:

1. In a first start-up, normally the UPS will not supply any voltage (see *Fig. 13*). This situation can also be reached after an emergency stop (EPO), total shutdown of the UPS, and then re-power the UPS with the emergency stop disabled.
2. ⚠ In UPS shutdown maneuvers, after it has been operating in normal mode, or after the initial start-up and forcing the transfer to static bypass on the display, **the UPS will supply the Bypass voltage to the Output (to the loads) even when completely stopped, if the input switch (or separate bypass switch if applicable) and the output switch are closed (to ON)**. In this situation, the Rectifier, Charger and Inverter will not be working. See *Fig. 14*.

From this "standby" status (either supplying voltage through the Bypass or not), the UPS can start working in different operating modes, which can be reached automatically, or forced by manual operator action. These operating modes, described in detail in successive sections, are:

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

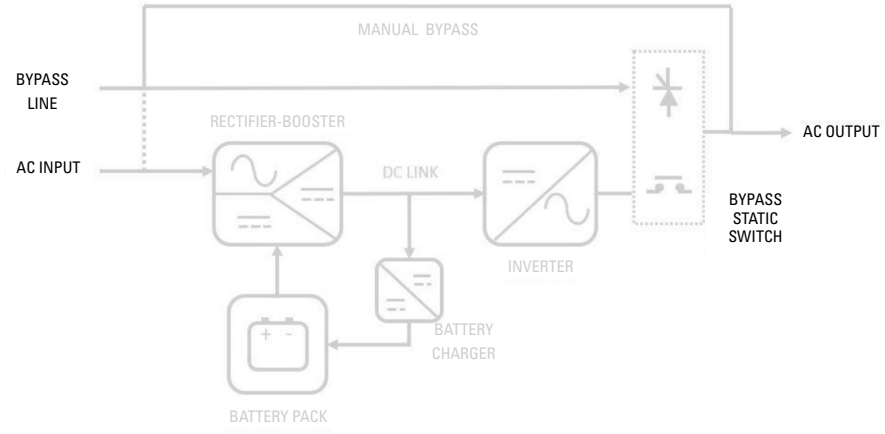


Fig. 13. Block diagram of UPS stopped, with no power flow, without powering the loads yet (typically in initial startup).

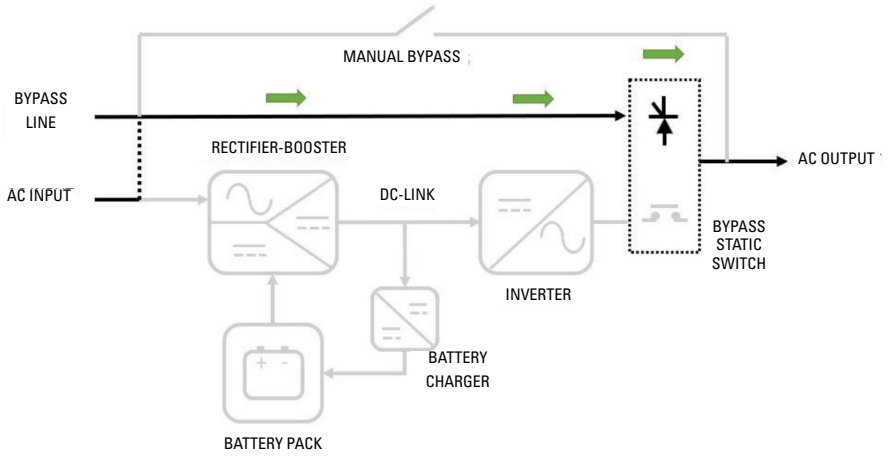


Fig. 14. UPS power flow stopped (but supplying the loads via the bypass).

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 is powered by the AC network, 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.

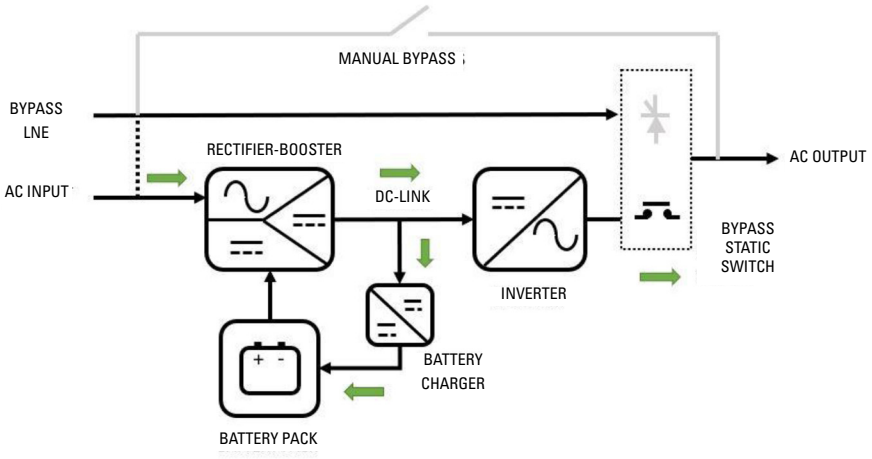


Fig. 15. UPS power flow in normal mode.

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. The battery voltage decreases according to the discharge current value, but 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, inverter continues operating.

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 that have 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 is transferred to this emergency line.

⚠ After a stop due to the end of autonomy, when the power supply is restored, the rectifier restarts the charging of the batteries. Likewise, if the power supply of the loads was interrupted (common bypass to rectifier input), **they are initially supplied via the static bypass switch. The inverter will then restart and will reconnect to the output.**

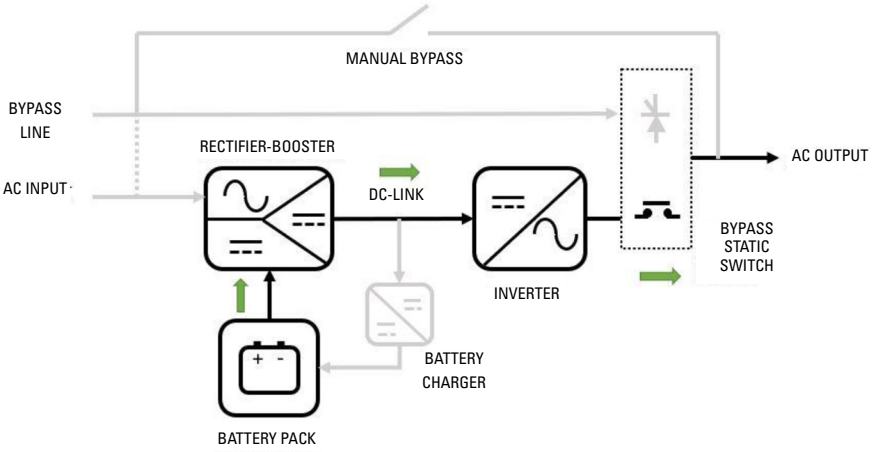


Fig. 16. UPS power flow in battery mode.

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. The rectifier-booster and the charger continue to operate, so the batteries will continue to maintain their optimum level of charge.

This is an operating mode where the loads are not "protected" against disturbances in the AC network or even power outages.

From normal operating mode, the output 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 (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.

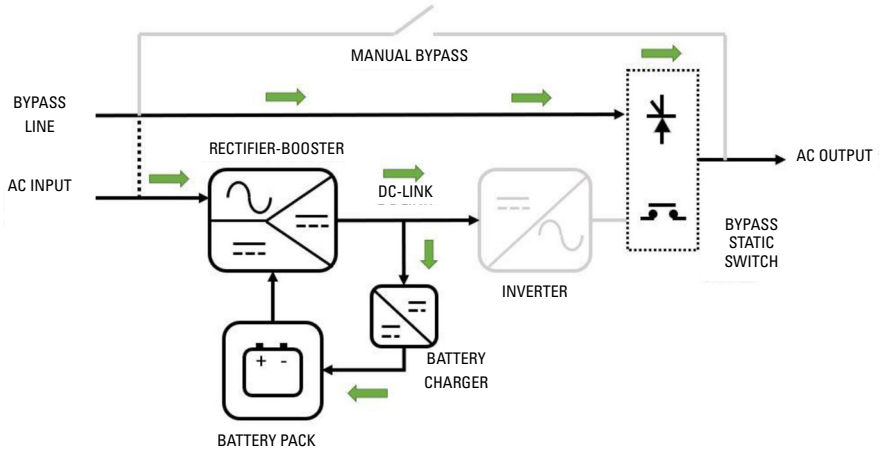


*Fig. 17. **UPS power flow in bypass mode.***

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.

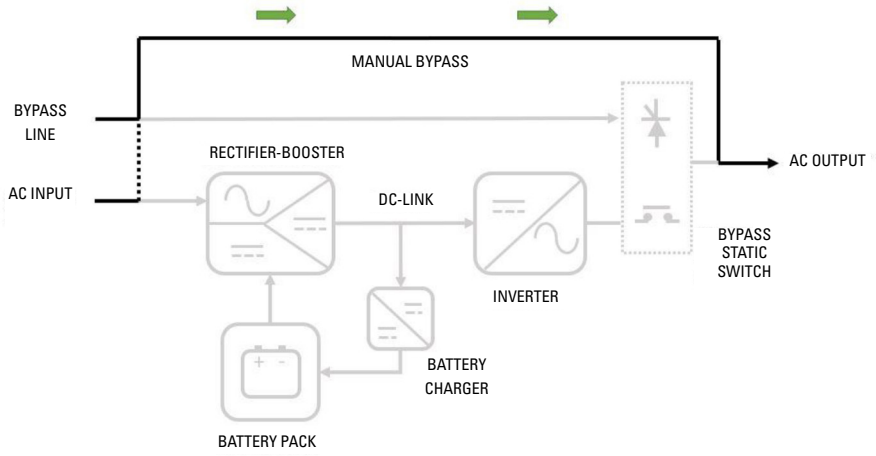


*Fig. 18. **UPS power flow in maintenance bypass mode.***

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, 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 (of between +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.

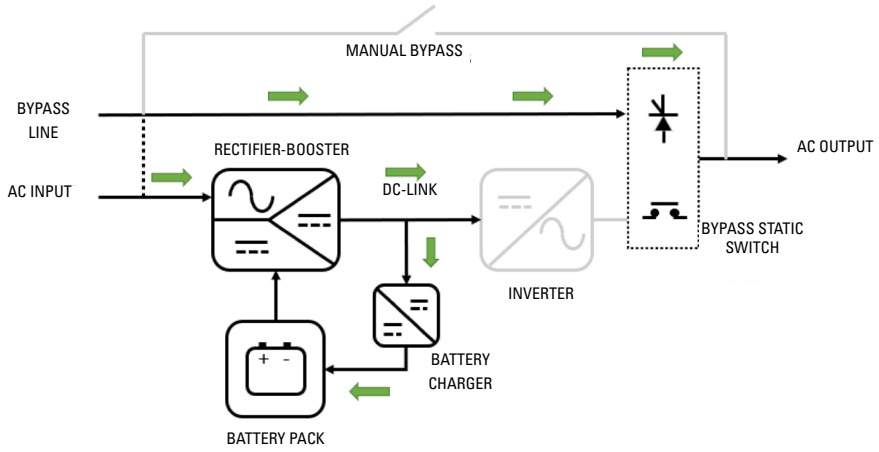


Fig. 19. UPS power flow in ECO mode.

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.

The presence of batteries (and charger) is optional for this type of unit.

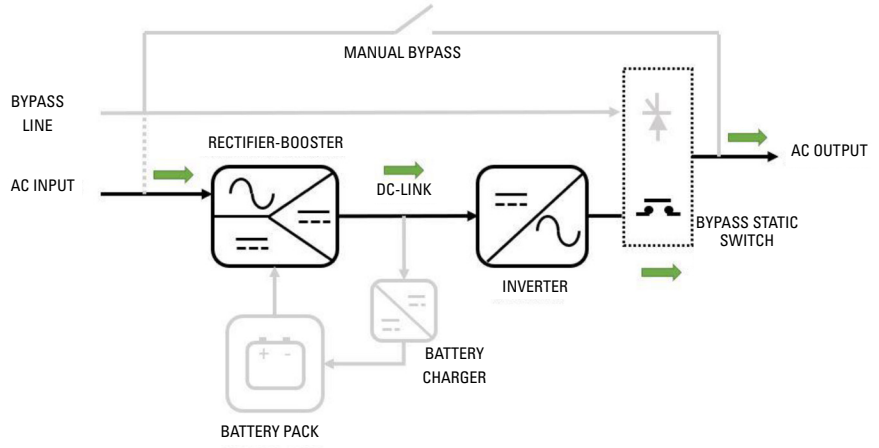


Fig. 20. UPS power flow in frequency converter mode.

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/RS485/USB communication ports.
  - ❒ Communication slots (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 (some are optional, as indicated):

- Rectifier AC input line switch (common to the bypass line, if it is not a unit with an optional separate bypass): this switch is a circuit breaker for models up to 50 kVA, and a disconnect switch for 80 kVA and higher.
- AC bypass line switch, optional for units with a circuit breaker-type separate bypass.
- Disconnect switch for maintenance bypass. This switch will remain mechanically locked (against activation) during operation in normal mode.
- Output circuit breaker switch. It allows the voltage supplied by the UPS to be connected to the loads, or for them to be isolated if necessary.
- Battery disconnect switch for 50 kVA models and higher. It allows the UPS to be isolated from the power supply provided by the batteries, whether they are internal or external. On models of up to 40 kVA, the UPS can be isolated from the batteries by disconnecting a connector that is easily accessible by the operator (whether they are internal batteries - *Fig. 1* ***Detail A*** -, or external - *Fig. 3 and Fig. 4*). In addition, in external battery cabinets, there will be a connection and disconnection method **(Q8)**.

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 unit's interface with the outside consists of various dedicated input and output signals, and different ports and communication slots.

1. Signalling (terminal strip):
   - ❒ Digital inputs (standard unit):
     - – Generator set supplying the UPS.
     - – Remote stop ("shutdown").
     - – External maintenance bypass auxiliary contact.
     - – External output switch auxiliary contact.
     - – Emergency stop (EPO).
   - ❒ Digital outputs, via potential free relay contacts (standard unit):
     - – Unit in bypass mode.
     - – Unit in battery mode.
     - – Battery end of autonomy alarm (early activation).
     - – Any alarm present in the unit.
2. External measurements (terminal strip):
   - ❒ Remote battery temperature (up to 10 m, for greater distances, dedicated communication slot).
   - ❒ External ambient temperature.
3. Direct communications of the unit:
   - ❒ USB (Type-B) port: Modbus protocol for user and service software for qualified staff.
   - ❒ RS232/RS485 port (DB9 connector): Modbus protocol for user, physically sharing the same connector (different pins).
   - ❒ Parallel ports (RJ45 connectors): to connect the units in parallel, it is necessary to interconnect them (output of one to the input of the next one) using 8-wire cables (4 Ethernet-type pairs).
4. Communications in slots:
   - ❒ Slot no. 1, "Nimbus Services" (standard unit): a "Nimbus" communications card is supplied by default, which allows connection to the "cloud" services owned by SALICRU.
   - ❒ Slot no. 2: A free slot for installing an SNMP card, or any other card for extending communications, signalling and/or other services.

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** 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 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 I. 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).

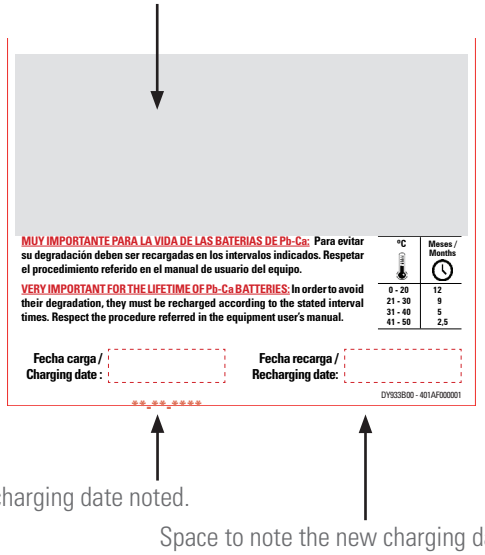
    Otherwise, follow the protocol indicated on the label attached to the impact indicator, located on the packaging.
- Unpacking
  - ❒ To check the contents, the packaging must be removed.

    Complete the unpacking according to the procedure in section *5.1.3*.
- Contents
  - ❒ The unit(s), consisting of a number of specific power modules.
  - ❒ Additional UPS cabinets, if any, for connection in parallel, connection bus cables.
  - ❒ Battery cabinets, if any, for their connection with the UPS cabinets.
- 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.
- Do not store units where the ambient temperature exceeds the thresholds indicated in *"Annex I. Technical specifications"*.
- When a battery pack is supplied with the UPS cabinet, either in the cabinet, separately to be installed in a cabinet belonging to the customer, to be installed in a battery rack or in any other way and it is not installed immediately in the unit, it will be stored in a cool, dry and well-ventilated area, at a controlled temperature of between 20 and 25ºC.
  - ❒ In general, and except for specific cases when batteries are supplied, they are of the sealed lead calcium type. To prevent degradation during storage, they should be recharged at the intervals indicated according to the temperature they are exposed to (see date of last charge noted on the label attached to the battery unit packaging *Fig. 21*).

Data label for the model.



Factory charging date noted.

Space to note the new charging date.

*Fig. 21. **Label on the packaging of the battery unit.***

- ❒ Once the period of time has elapsed, connect the batteries to the unit and the unit to the mains, following the safety and connection instructions.
- ❒ Proceed with the start-up. See chapter *6*.
- ❒ Leave it in this mode for at least 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. 21*).
- ❒ The units that form part of a parallel system will be treated as individual units for charging the batteries, and therefore no additional connection is necessary.

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.

5.1.3.1. 30-40 kVA equipments.

In *Fig. 22* to *Fig. 27* are shown, by way of example, the illustrations corresponding to the unpacking of the UPS cabinet from 30 kVA to 40 kVA.

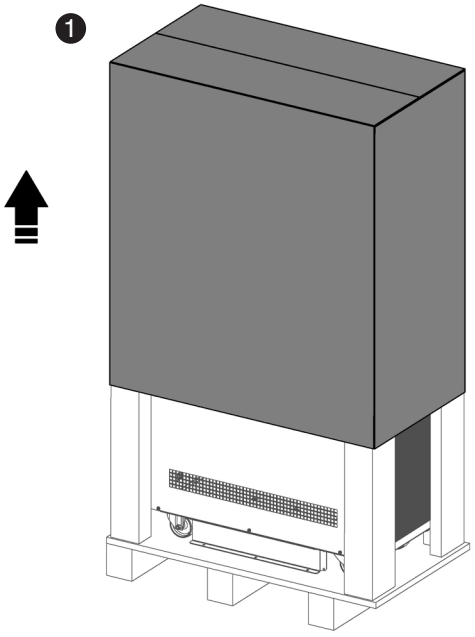


Fig. 22. Removing the cardboard packaging.

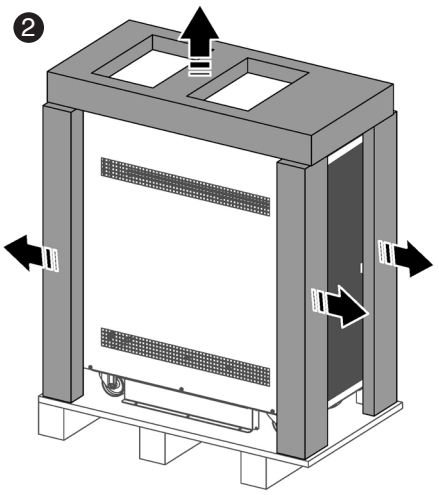


Fig. 23. Removal of the corner pieces and plastic cover.

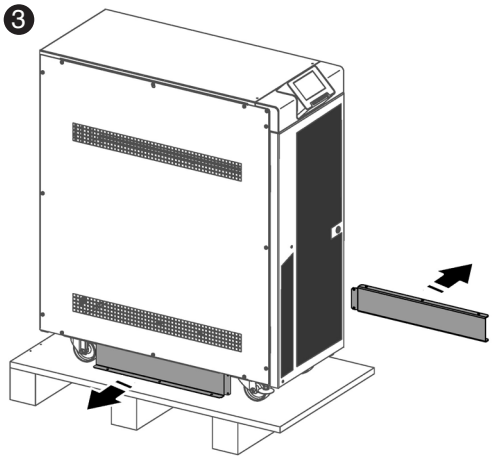


Fig. 24. Extraction of the guides to facilitate the descent of the equipment from its pallet.

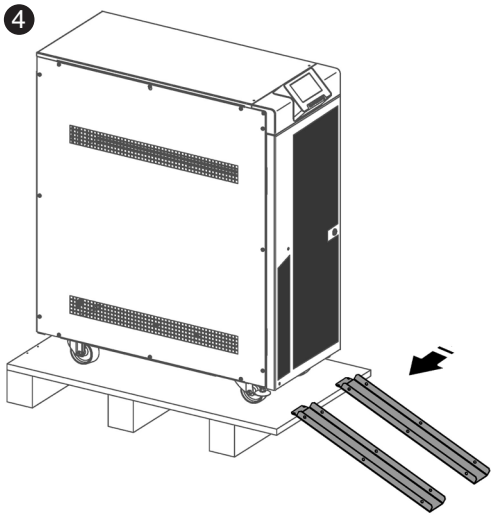


Fig. 25. Mounting the guides on the pallet.

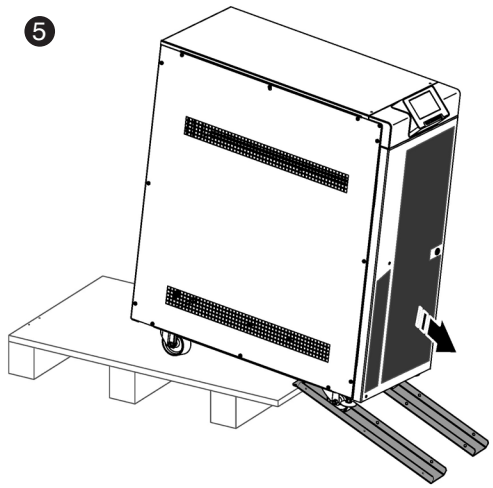


Fig. 26. Lowering the equipment from the pallet.

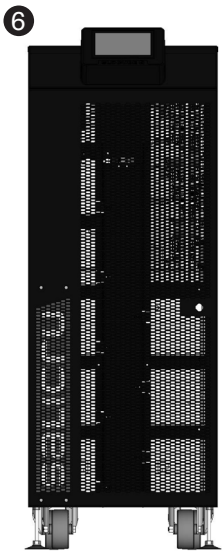


Fig. 27. Example of an unpacked unit.

The steps required for unpacking are:

1 To unpack the equipment, cut the strips of the cardboard enclosure and remove it from above as if it were a cover (*Fig. 22*) or disassemble it with the necessary tools if the enclosure is made of wood.

2 Remove the corner pieces and the plastic cover (*Fig. 23*).

3 Unscrew the guides on both sides of the base of the equipment provided in order to facilitate the descent of the equipment (*Fig. 24*).

4 Assemble the guides on the pallet as shown in *Fig. 25*.

5 Proceed to lower the equipment from the pallet (*Fig. 26*).

6 Equipment unpacked in its final location (*Fig. 27*).

5.1.3.2. 50-80 kVA equipments.

In *Fig. 28* to *Fig. 35* are shown, by way of example, the illustrations corresponding to the unpacking of the UPS cabinet from 50 kVA to 80 kVA.

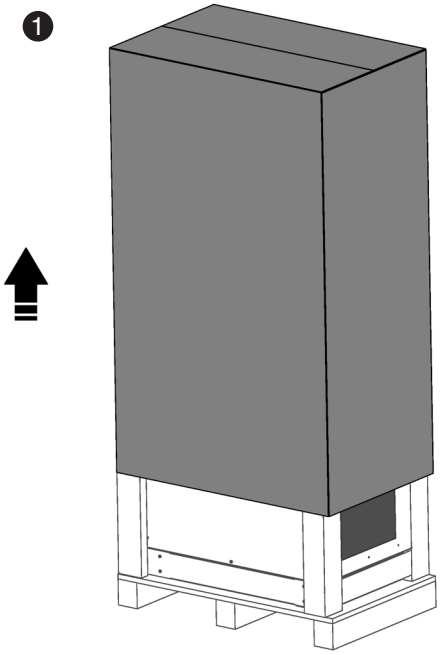


Fig. 28. Removing the cardboard packaging.

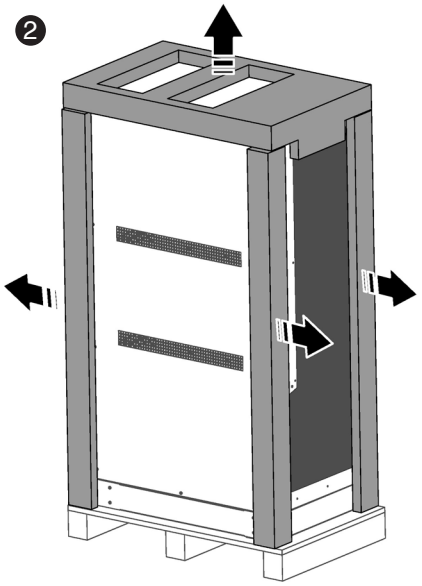


Fig. 29. Removal of the corner pieces and plastic cover.

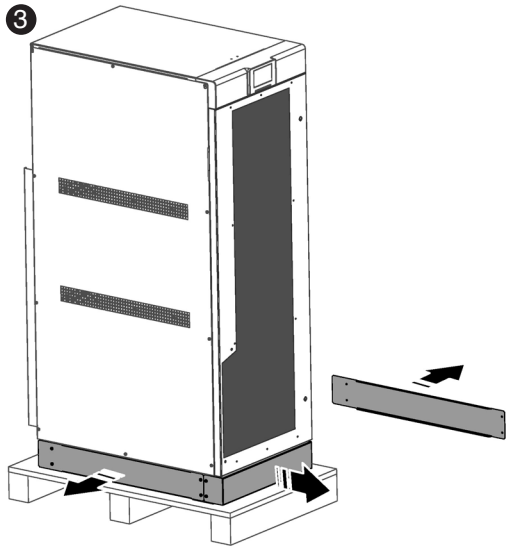


Fig. 30. ***Removing the base sockets.***

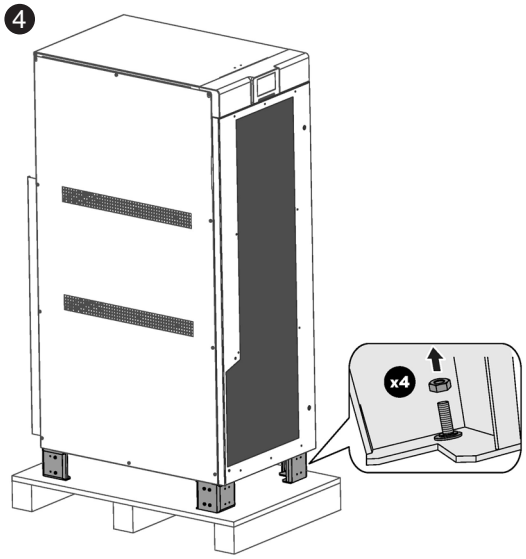


Fig. 31. ***Release of the equipment from the pallet.***

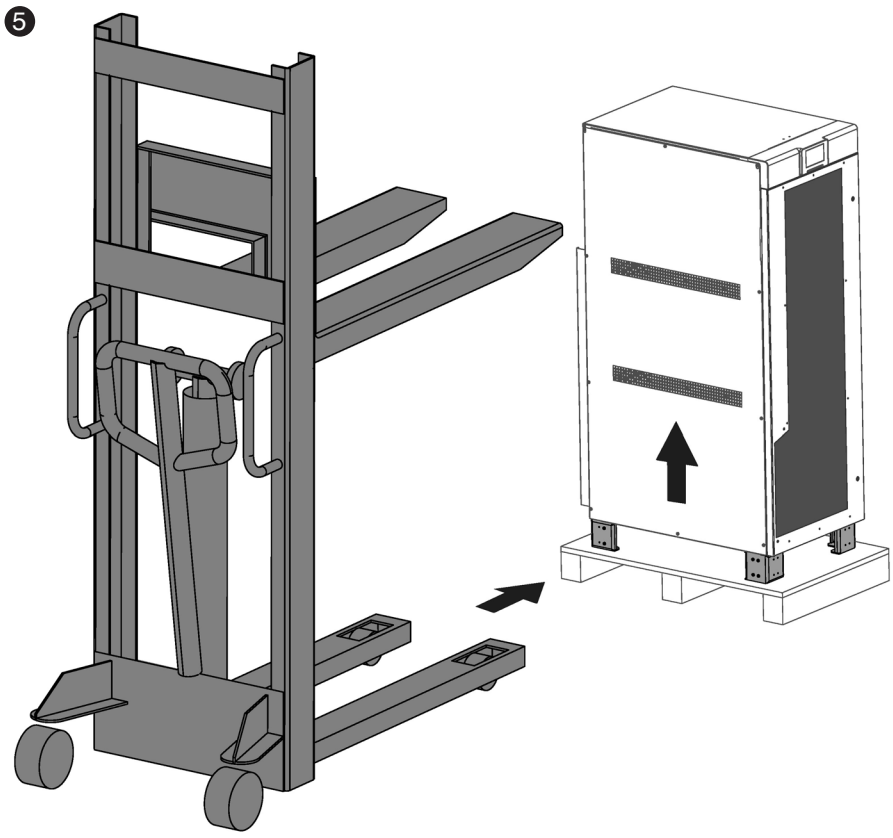


Fig. 32. ***Lifting of the equipment by means of a pallet truck.***

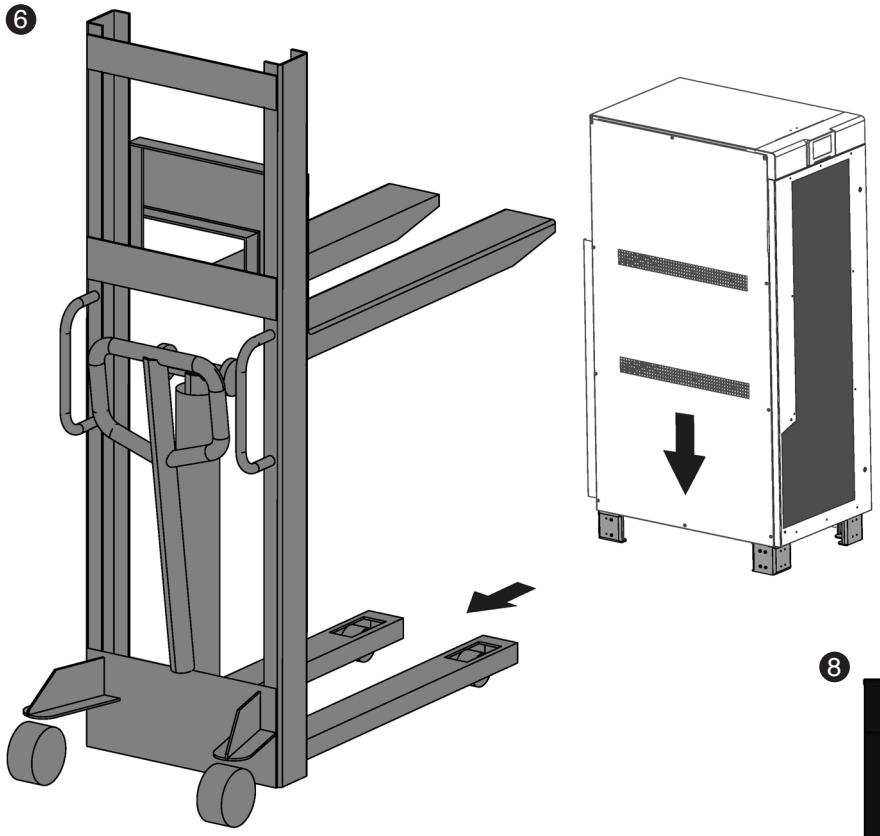


Fig. 33. Final location of the equipment and removal of the pallet truck.

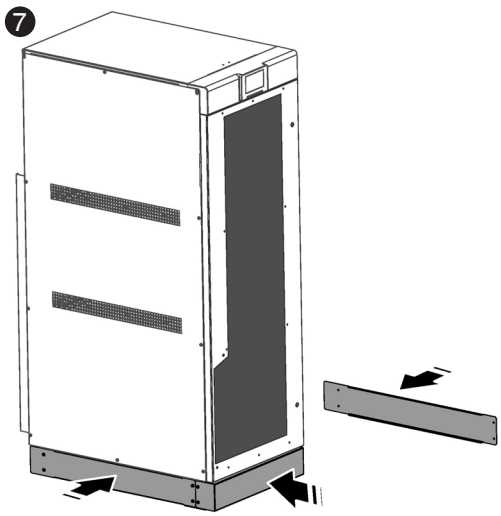


Fig. 34. Mounting the base sockets of the equipment in their final location.

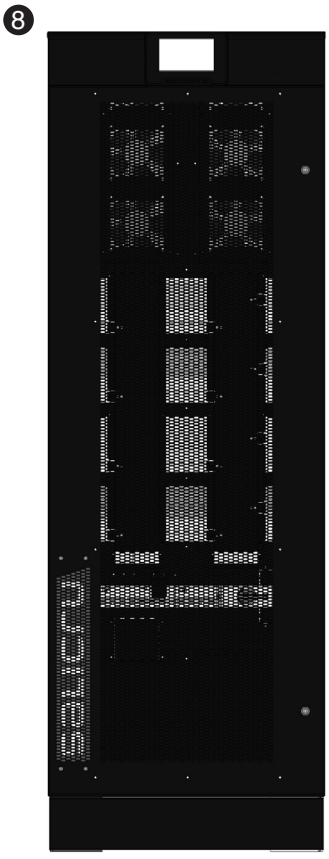


Fig. 35. Example of an unpacked unit.

The steps required for unpacking are:

❶ To unpack the equipment, cut the strips of the cardboard enclosure and remove it from above as if it were a cover (*Fig. 28*) or disassemble it with the necessary tools if the enclosure is made of wood.

❷ Remove the corner pieces and the plastic cover (*Fig. 29*).

❸ Remove the base sockets to expose the 4 legs in order to release the equipment from the pallet (*Fig. 30*).

❹ Unscrew the 4 screws located on the inside of each of the 4 legs. The equipment will be released from its pallet and ready for transfer (*Fig. 31*).

❺ Proceed to lower the equipment from the pallet using a forklift or pallet truck (*Fig. 32*).

❻ Move the equipment to its final location (*Fig. 33*).

❼ Refit the 4 sockets on the base of the equipment (*Fig. 34*).

❽ Equipment unpacked in its final location (*Fig. 35*).

5.1.4. Transport to the site

- If the reception area is far from the installation site, it is recommended to move the **SLC CUBE4** using a pallet truck or another more suitable means of transport, assessing 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/m^2).
- 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. 36* 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, C and D 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 for any service interventions (T.S.S.) or the required clearance for the connection cables to allow the unit to be moved forwards.

For extended autonomy with more than one cabinet, it is recommended to place one on each side of the unit, and in the case of a greater number of battery cabinets, to repeat the same sequence alternately.

5.1.5.2. Siting for parallel systems

- *Fig. 37* 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 (3.5 m) and the communication BUS (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. 1*, 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.

⚠ For service work it is recommended to leave a distance of 75 cm on the sides and to the rear (30 and 40 kVA) and only on the sides (50 kVA, 60 kVA and 80 kVA).

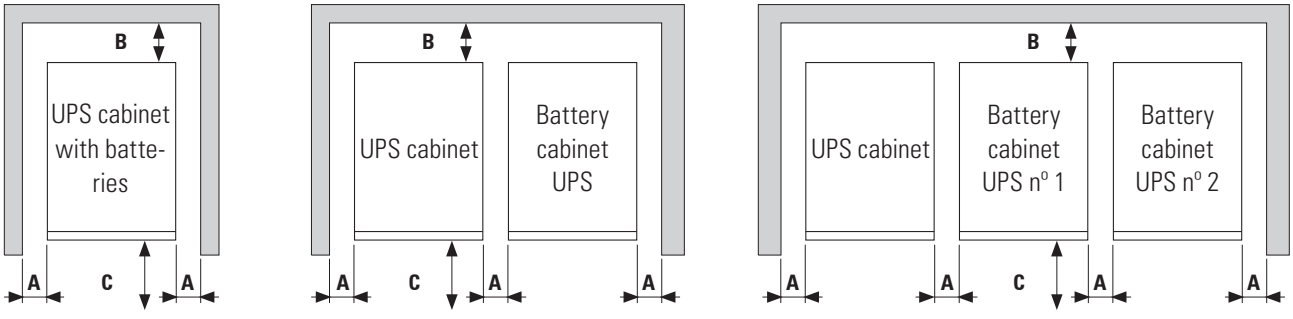


Fig. 36. Minimum peripheral dimensions for ventilating the UPS.

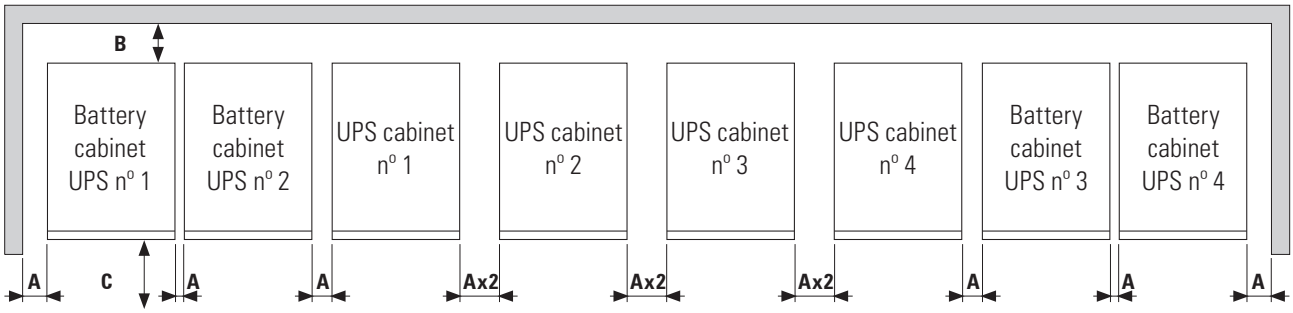


Fig. 37. Minimum dimensions for ventilating a system.

Power	A	B	C
30 - 40 kVA	10 cm	10 cm	40 cm
50 - 60 - 80 kVA	10 cm	0 cm (against the wall)	56 cm

Tab. 1. Minimum installation distances.

5.1.5.3. Immobilisation and levelling of the unit

- The 30 kVA and 40 kVA **SLC CUBE4** series UPS feature wheels and stabilising elements. These elements are also available for the smaller battery cabinet. However, due to their inherent weight, the 50 kVA, 60 kVA and 80 kVA **SLC CUBE4** series UPS have feet.
- The purpose of the stabilising elements is to immobilise and level the metal cabinet once it has been installed, as well as to increase safety during maintenance of the batteries in the case of cabinets with removable trays.

  Attention! Danger of tipping when removing the battery trays without first stabilising the unit. Do not remove more than one tray at a time, high risk of serious injuries to operators as a result of the impact due to the unit tipping over and/or the operator becoming trapped.
- 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. 38 shows how the stabilising elements must be in the end.

Original factory layout item.

Element pressed against the ground.

Fig. 38. 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 front on all units and/or battery modules. When the batteries are located inside the UPS cabinet, they can be removed in sets, grouped into 11 units in plastic enclosures. For the small external battery cabinet (1004 mm high, see), the batteries are also arranged in the same type of enclosure (see *Fig. 39).*

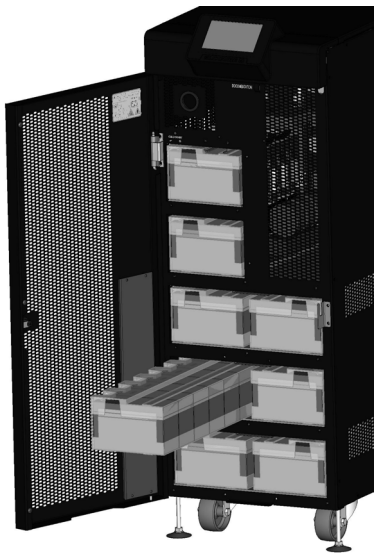


Fig. 39. Detail of front access to the batteries. Example of 30 kVA and 40 kVA units.

In the case of the large external battery cabinet (1654 mm high, see *Fig. 11*), the larger and heavier batteries are arranged in removable trays in sets of 3 units per tray. 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 board:
  - ❒ 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 more 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 install this external board, 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 protection 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:

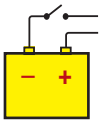
  a. In models with "standard" autonomy, the batteries are supplied integrated in the same cabinet as the unit. Likewise, for each power output, the "0/" and "/" versions, in their standard autonomy configuration, reserve the necessary space for locating the batteries in the same cabinet as the unit.

  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.
    - For 30 kVA and 40 kVA units, the internal battery protection consists of internal fuses located in the UPS and not accessible to the user.
    - For 50 kVA, 60 kVA and 80 kVA units, the internal battery protection consists of a disconnect switch + fuses **(Q6)** (see *Fig. 5 and Fig. 6*).
  - ❒ Units from group "**b.1**.".
    - For 30 kVA and 40 kVA units, the internal battery protection consists of internal fuses that are not accessible to the user and disconnect terminals for external batteries (see *Fig. 1* ***Detail B*** *- and Fig. 3 and Fig. 4*), all located in the UPS.
    - For 50, kVA, 60 kVA and 80 kVA units, the internal and external battery protection consists of both disconnect switches located on the front of the UPS **(Q6)** or **(Q3)**, respectively (see *Fig. 7 and Fig. 8*), and internal fuses.
  - ❒ Units from group "**b.2.**".
    - For 30 kVA and 40 kVA units, the external battery protection consists of disconnect terminals located in the UPS (see *Fig. 3 and Fig. 4*).
    - For 50 kVA, 60 kVA and 80 kVA units, the external battery protection consists of disconnect switch on the front of the UPS **(Q3)** (see *Fig. 7 and Fig. 8*), and internal fuses.
- The original factory battery circuit type is open.



- ⚠ 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 unit or parallel system's power supply fails beyond a simple intervention and it is expected to be out of service for a prolonged period, first shut it down completely and then disconnect the batteries. For 30 kVA and 40 kVA units, disconnect the internal batteries located on the front of the unit (see *Fig. 1* ***Detail A***). For 50 kVA, 60 kVA and 80 kVA units, and for external battery cabinets, open the corresponding disconnect switch (**Q3** and **Q8**, respectively).

5.2. CONNECTIONS

- ⚠ This unit is suitable for installation in networks with a TT, TN-S, TN-C or IT 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 Fig. 39 to Fig. 46 show the I / O and Bypass connection procedure independent of the equipment.

5.2.1. 30-40 kVA equipments.

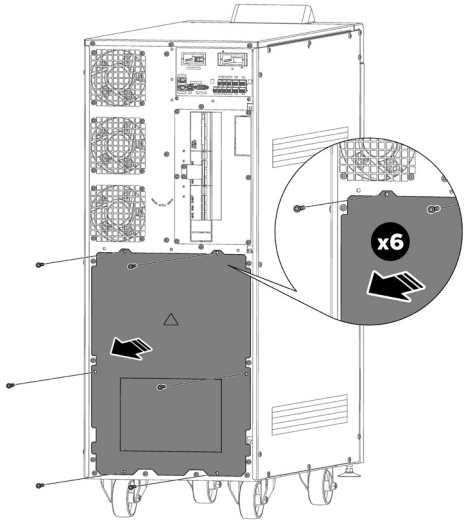


Fig. 40. Detail of the removal of the rear terminal cover.

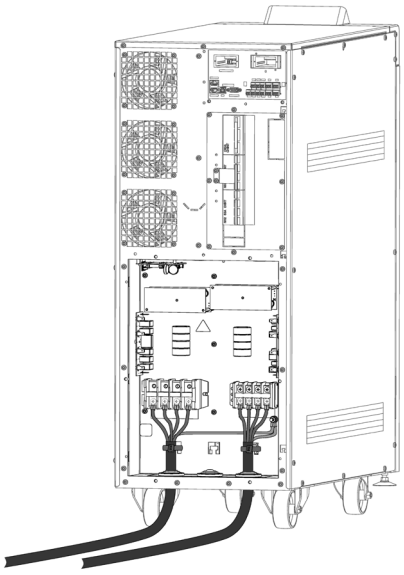


Fig. 41. Detail of the connection of the Input and Output terminals of the equipment.

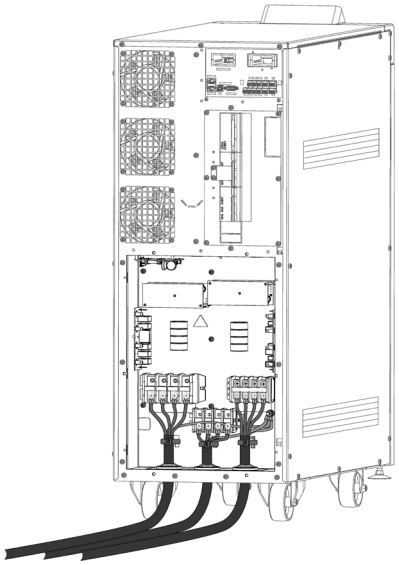


Fig. 42. Detail of the connection of the Input, Independent Bypass and Output terminals of the equipment.

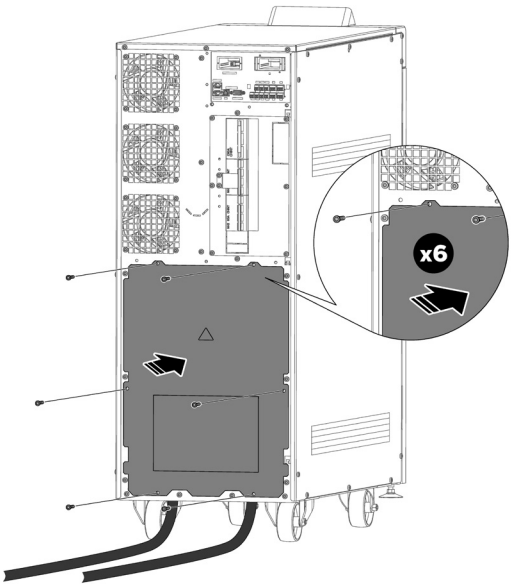


Fig. 43. Detail of the repositioning of the rear terminal cover.

5.2.2. 50-80 kVA equipments.

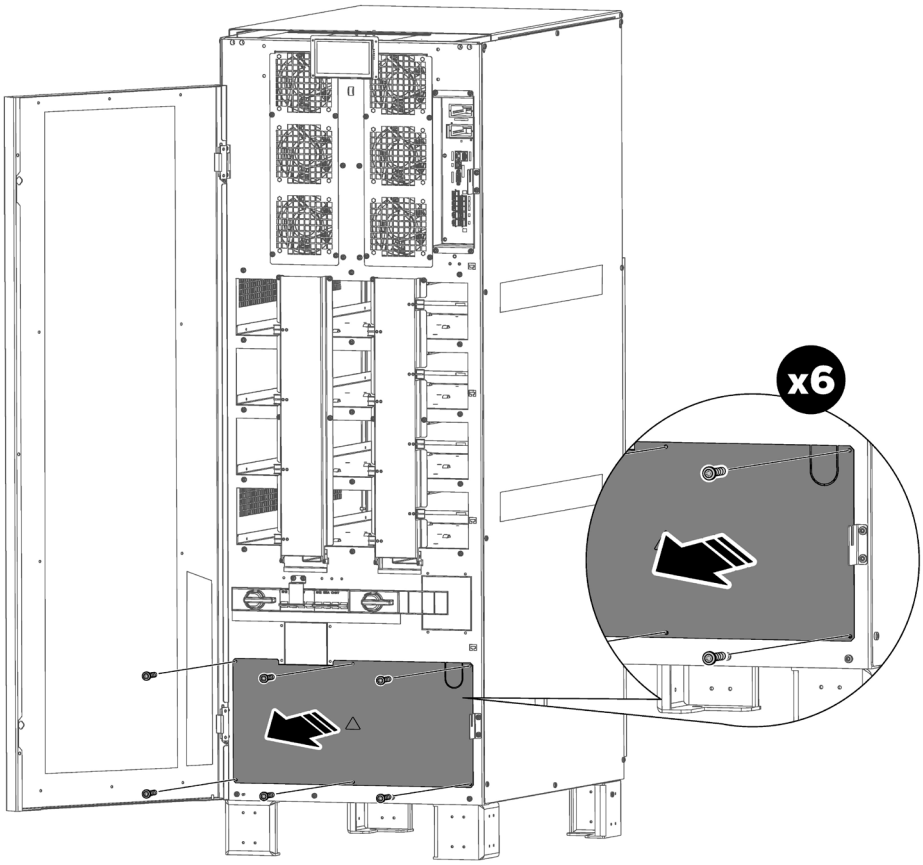


Fig. 44. Detail of the removal of the front terminal cover.

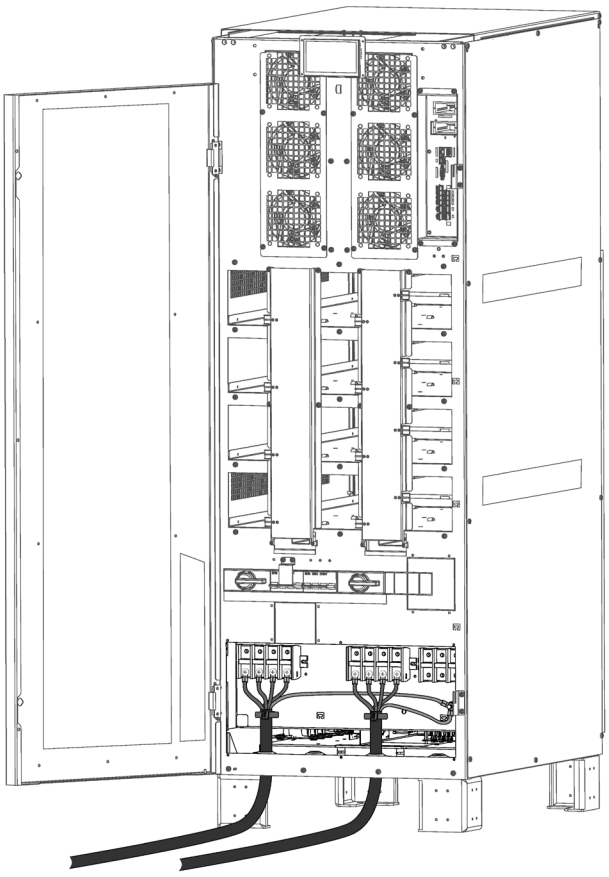


Fig. 45. Detail of the connection of the Input and Output terminals of the equipment.

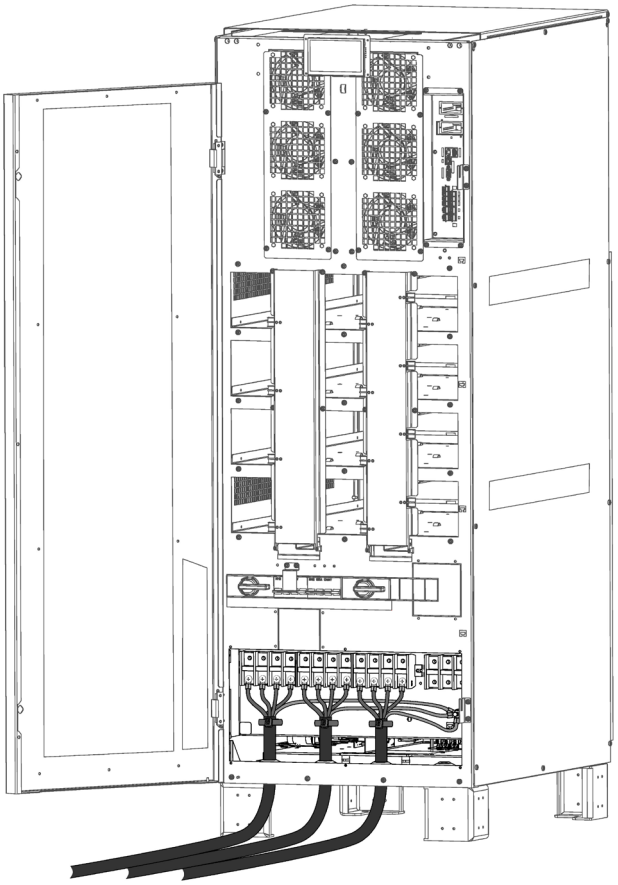


Fig. 46. Detail of the connection of the Input, Independent Bypass and Output terminals of the equipment.

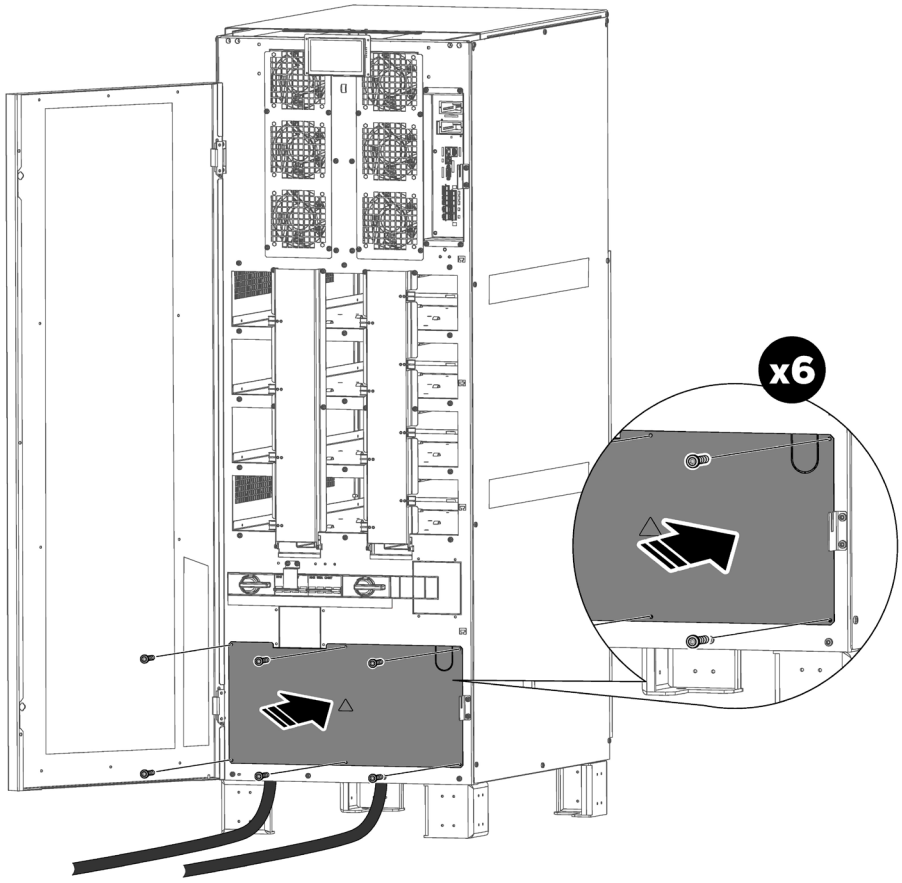


Fig. 47. Detail of the repositioning of the front terminal cover.

5.2.3. Connection to the mains, input terminals (see *Fig. 41 and Fig. 45*).

- 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.

  The standard is applicable regardless of whether the supply network is single-phase or three-phase and both for individual units and for each UPS of a parallel system.
- 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.

UPS return voltage risk.

- Connect the input cables to the respective terminals according to the configuration of the available unit.

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

  Connect the R-S-T-N power cables to the input terminals, 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.

5.2.4. Connection of the separate static bypass line. SLC CUBE4 B version (*Fig. 42 and Fig. 46)*.

- 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.
- Following the EN-IEC 62040-1 safety standard, in units with a static bypass line, the installation must be equipped with an automatic "Backfeed protection" system, such as a disconnector, which prevents voltage or hazardous energy from appearing in the UPS input line during a network failure.

  The standard is applicable regardless of whether the supply network is single-phase or three-phase and both for individual units and for each UPS of a parallel system.
- 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 "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.

UPS return voltage risk.

- Connect the bypass input cables to the respective terminals according to the configuration of the available unit.

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

  <u>Connection to a three-phase bypass network</u>:

  Connect the R-S-T-N power cables to the bypass terminals, 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.

5.2.5. Connection of the output, output terminals (see *Fig. 41, Fig. 42, Fig. 45 and Fig. 46*).

- 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 terminal (plate) before supplying voltage to the input terminals.
- 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.
- Connect the output cables to the respective terminals according to the configuration of the available unit.

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

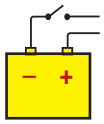
  Connection of the three-phase output:

  Connect the loads to the U-V-W-N output terminals, 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.
- 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. .

5.2.6. Connection of the unit's battery terminals to those of the battery module (*Fig. 10 and Fig. 11*).

- 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 is open.



- 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 a B1 model UPS using the cable bundle supplied, 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. 48 and Fig. 49*.

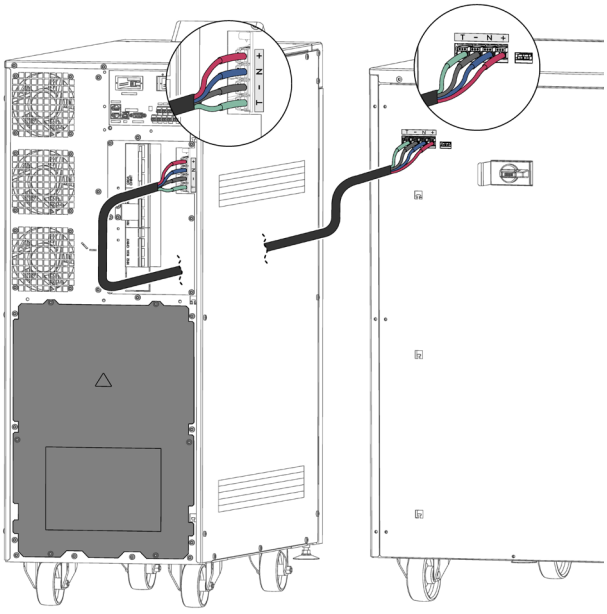


Fig. 48. Connection between the UPS and a battery cabinet for 30-40 kVA equipments.

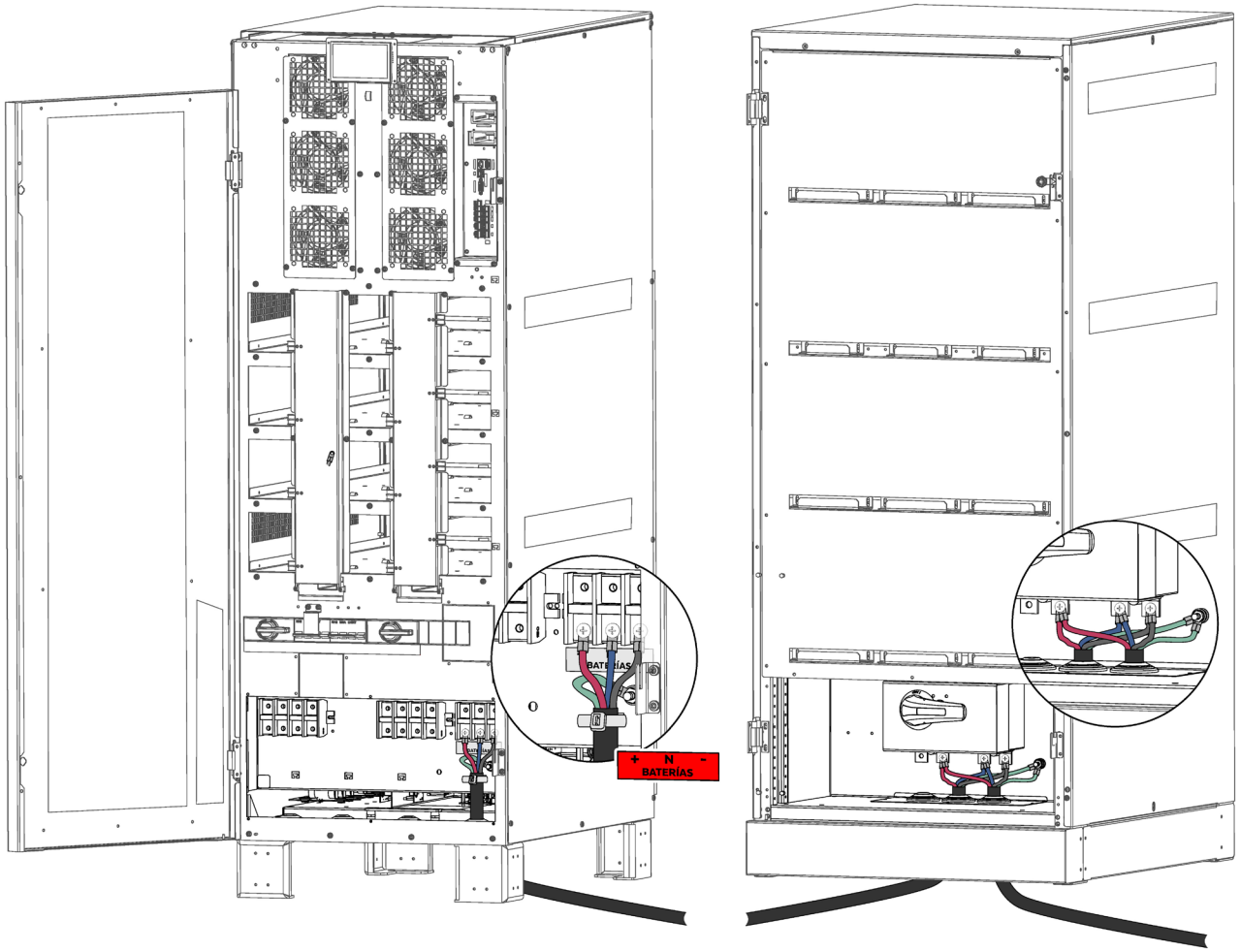


Fig. 49. Connection between the UPS and a battery cabinet for 50-80 kVA equipments.

- 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).

  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.

5.2.7. Connection of the parallel bus

- The communications line (COM) consists of a very low voltage safety circuit.

  To ensure the quality, it must be installed separately from other lines that carry dangerous voltages (power distribution line).

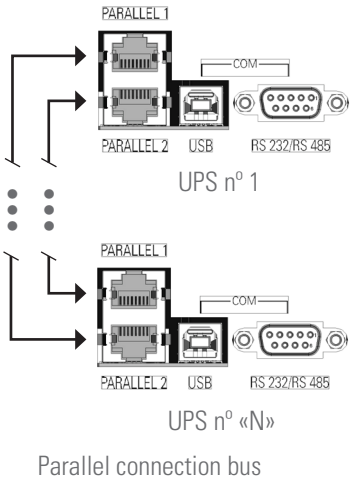


Fig. 50. RJ45 connectors of the parallel communication bus.

- **Parallel connection bus**. Use the Ethernet cable with RJ-45 connectors on both ends to connect up to 16 SLC CUBE4 units. The parallel bus loop must be closed.
- In addition to the communications bus, the parallel system installation must be equipped with a board that has individual input and output protection devices, as well as a manual bypass with mechanical lock.

5.2.8. 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).

5.2.8.1. Digital inputs, relay interface and communications

The SLC CUBE4 series UPS feature the following connections for communication with external peripherals of the unit or other identical units:

- Four digital inputs via terminal strip.
- Four relay interface outputs via terminal strip.
- Communication via RS232/RS485 (subD9) ports or USB.
- 2 ports for parallel communication.
- Two slots for integrating an SNMP card (slot1) or free slot (slot2), with the latter being suitable for housing the following, optionally:
  - ❒ SNMP.
  - ❒ RS232, RS485, USB.
  - ❒ AS400 (relay extension).
  - ❒ Remote battery temperature.

All connectors related to communications are located grouped on the interface panel and are accessible from the bypass module after removing the cover that conceals them entirely.

The communication interface has the following connections via the terminal strip:

- Temperature sensor input.
  - ❒ TBAT: sensor for compensating the battery floating voltage. Parameter shown on the control panel screen.
  - ❒ TAMB: sensor for measuring the ambient temperature. Parameter shown on the control panel screen.
- External EPO button signal input.
- 4 programmable digital inputs (see *Table 2*).
- 4 programmable relay outputs (see *Table 2*).

Digital inputs (potential free contact)		
IDIG1	Generator set	Other programmable functions (to be consulted).
IDIG2	Shutdown	
IDIG3	Maintenance bypass	
IDIG4	Output circuit breaker	
Relay outputs (potential free contact)		
RL1	Unit in bypass mode	Each relay can be programmed according to the status of an alarm/warning or a combination of them.
RL2	Mains failure, battery in discharge mode	
RL3	Low battery	
RL4	General alarm	

Table 2. Programming of digital inputs and relay output.

All connections referred to can be seen in **Detail B** and **Detail C** of *Fig. 2 and Fig. 9,* respectively.

5.2.8.2. Installation of SNMP cards

All **SLC CUBE4** units have two (2) slots as standard, located on the front of the unit, one is initially occupied by the NIMBUS Services card (see manual EL139*00), and the other is free to allow the inclusion of an SNMP electronic unit or another optional addition.

The aforementioned slots are located on the back of the unit at the top, in horizontal position, for 30 kVA and 40 kVA units, and on the front of the unit at the top (after opening the door), in vertical position, on 50 kVA, 60 kVA and 80 kVA units. See *Fig. 2 to Fig. 9.*

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

1. Remove the fixing screws from the access cover for the communication connections.
2. Remove the cover itself. The slot can now be seen.
3. Remove the fixing screws from the slot cover and the part as a cover.
4. Install the SNMP card or another option in the slot and secure it using the screws.
5. Make the relevant connections.
6. Fit the protective cover for the communication connections and the fixing screws.

6. OPERATION

This section describes the basic procedures for starting the UPS, with start-up being understood as reaching 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 (**IDIG3** see *Table 2*) of the unit's interface.
- Optionally, on units with a separate static bypass line, a 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.
- Check that the internal battery disconnect switch and/or the external cabinet are in the "Off" position.
- Make sure 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.
- 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.
- The earth cable is connected correctly.
- The battery polarity is correct and the voltage is within the operating values.
- 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, is not activated (a wire bridge is supplied in the unit, connected by default to the terminals of this connector, which allows normal operation).

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 to "On" (Q1). The "Initial Settings" screen appears**, see *Fig. 51*, if it is really the initial start-up of the UPS. Otherwise, the unit is already configured according to the installation and you can refer directly to section *6.1.3*.

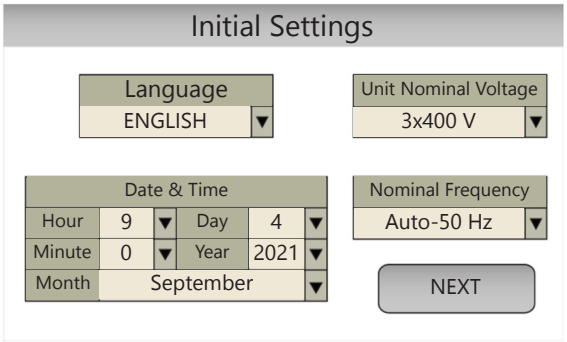


Fig. 51. First configuration screen for initial start-up.

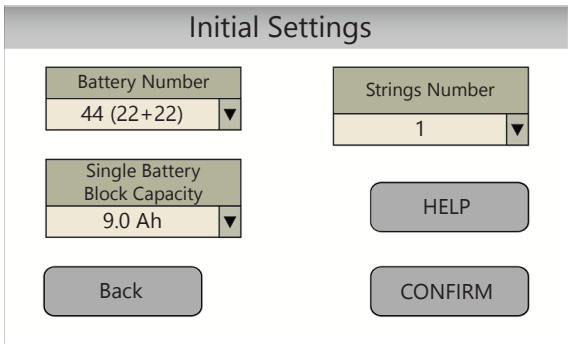


*Fig. 52. **Second configuration screen for initial start-up.***

By pressing the "HELP" button, the battery configuration label will appear (*Fig. 53*), which is attached to the equipment and which also indicates the number of battery strings.

5. Set the different parameters that are shown, pressing the "Drop-down" icon ▼ for each field and selecting the required and/or correct value for:

- ❒ "Language": you can select the display language of the control panel, from the following options:
  - "English"
  - "Spanish"
  - "Portuguese"
  - "French"
  - "German"
- ❒ "Date & Time": set the time (HH:MM) and date (DD:MM:YY) correctly via the corresponding pop-up windows by pressing "Drop-down".
- ❒ "Unit Nominal Voltage": the possible work voltages of the unit are preconfigured at the following standard values:
  - 3x380 V
  - 3x400 V
  - 3x415 V
- ❒ "Nominal Frequency": the input voltage frequency permitted by the UPS covers the entire range from 45 Hz to 65 Hz. Taking this into account, in theory all that is left to be defined is the required output frequency (in normal mode, generated by the inverter). This output frequency can be set to a value, or you can let the UPS detect the frequency it is being powered with, and then generate with that same frequency. This said, the possible output frequency configurations are:
  - 50 Hz: output (and inverter) frequency set to 50 Hz.
  - 60 Hz: output (and inverter) frequency set to 60 Hz.
  - Auto-50 Hz: at each start-up of the UPS (after a complete shutdown), the AC input frequency is detected and set as the output frequency. If this frequency cannot be detected, it is set to 50 Hz by default.
  - Auto-60 Hz: at each start-up of the UPS (after a complete shutdown), the AC input frequency is detected and set as the output frequency. If this frequency cannot be detected, it is set to 60 Hz by default.
- ❒ "Battery Number": the configuration of the number of batteries of the equipment is selected. Following the labelling of the equipment and / or external battery cabinet (s), select between the different battery configurations available:
  - 32 (16+16)
  - 36 (18+18)
  - 40 (20+20)
  - 44 (22+22)
- ❒ "Strings Number": according also to the labelling of the equipment and / or cabinet (s), select the number of branches of battery blocks of the equipment, or of the equipment system plus additional battery cabinet (s).
- ❒ "Single Battery Block Capacity" (*): obtain from the equipment labelling the capacity in Ah of each single battery block, and enter it in this field.

  (*) System total battery capacity available in Ah, can be obtained from:

  [Battery Number]*[Strings Number]*[Single Battery Block Capacity].

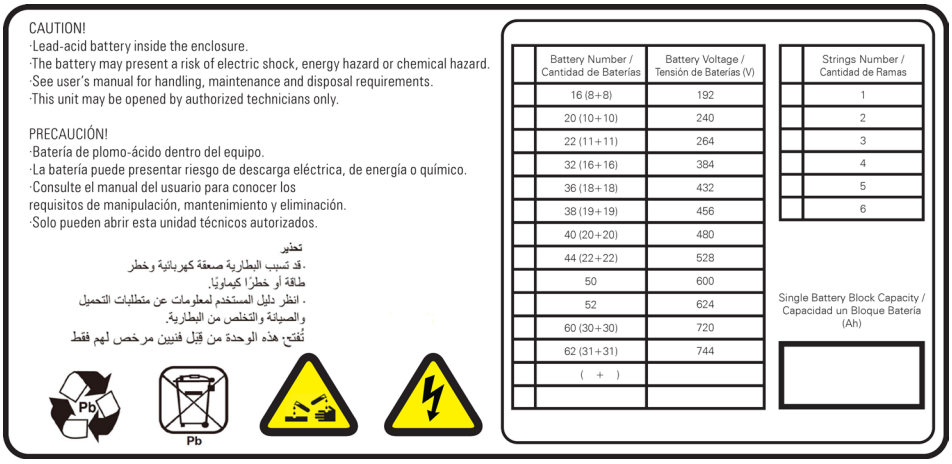


Fig. 53. Battery configuration label affixed to the equipment.

6. **Confirm the initial settings using the "CONFIRM" button.** The settings implemented in point *5* are confirmed. Even if no changes have been made, it is always necessary to press this confirmation button in order to move to the UPS start-up and access the main screen. In subsequent start-ups of the unit (after complete shutdown), it will no longer appear.
7. **Access the main or home screen automatically (see section** *7.1*).

   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 section *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 *6.1.4*), i.e. already supplying power to the loads but via the static bypass, you can follow the instructions in this section starting 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 for the UPS, also set this switch on the control panel to "On".
3. **Set the input switch of the UPS to "On" (Q1)**.

   If the main menu icon flashes red (and you hear an acoustic alarm), press it, check the existing alarms and verify if there is an alarm that prevents the UPS from starting, such as:

   "Rec Inp.V. ranges", and/or "Rec R Inp not present", and/or "Rec S Inp.V. not present", and/or "Rec T Inp.V. not present" (and possibly "Inv Bypass Ranges") → the rectifier input voltage is outside of the tolerance ranges (voltage and/or frequency), or not present in some input phases.

   ❒ Solution: check voltages and connections from the external control panel to connection to the UPS input.

   "Rec Phase rotation Inp" (and possibly "Inv Rotation phases Byp.") → the phase sequence of the rectifier input (and the bypass input) is not correct, it does not follow the R-S-T order.

   ❒ Solution: set the control panel switch corresponding to the UPS input and the UPS input switch to "Off" **(Q1)**, and swap the connections of two phases to the UPS input, or on the external control panel, as applicable.
4. **In units with a separate static bypass input, set the corresponding bypass switch to "On" (Q4).**

   If the main menu icon flashes red (and you hear an acoustic alarm), press it, check the existing alarms and verify if there is an alarm that prevents the UPS from starting, such as:

   "Inv Bypass Ranges" → the bypass input voltage is outside of the tolerance ranges (voltage and/or frequency), or not present in some input phases.

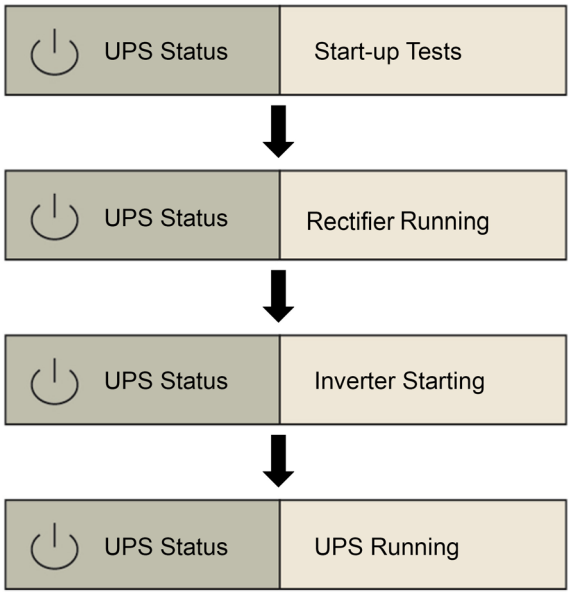
   ❒ Solution: check voltages and connections from the external control panel, up to connection to the UPS bypass line.

   "Inv Phase rotation Byp." → the bypass input phase sequence is not correct, it does not follow the R-S-T order.

   ❒ Solution: set the control panel switch corresponding to the UPS bypass and the UPS bypass switch to "Off" **(Q4)**, and swap the connections of two phases to the UPS bypass line, or on the external control panel, as applicable.
5. **Connect the batteries:**
   a. **Units with internal batteries, with 3-pole front connectors (30 kVA and 40 kVA)**: connect these connectors, which are accessed by opening the front door of the unit (see *Fig. 1* ***Detail A***).
   b. **Units with internal batteries, with battery switch Q6 (50 kVA, 60 kVA and 80 kVA)**: set this switch to "On", which is accessed by opening the front door of the unit (see *Fig. 5 and Fig. 6*).
   c. **Units with external batteries (or shared with internal ones), with 3-pole rear connectors (30 kVA and 40 kVA)**: connect these connectors, which can be accessed via the back of the unit (see *Fig. 3 and Fig. 4*). Also, set the external battery cabinet switch to "On" **(Q8)**, (see *Fig. 10* and *Fig. 11*).
   d. **Units with external batteries (or shared with internal ones), with an internal (Q6) or external battery switch (Q3) (50 kVA, 60 kVA, 80 kVA)**: set these switches to "On", which are accessed by opening the front door of the unit (see *Fig. 7 and Fig. 8)*. Also, set the external battery cabinet switch to "On" **(Q8),** (see *Fig. 10 and Fig. 11*).
6. **Press the "Status and Control" icon** You are on the screen described in *7.4*.
7. **If the UPS stopped due to a power loss** (disconnection of the 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**, and this can be checked in the "UPS Status" box: go to point 8 of this section.
8. **If the UPS does not start automatically ("UPS Status" remains as "UPS ON / Pending"), press the "Start/Stop UPS" icon** Start/Stop UPS
9. **The "UPS Control" pop-up box appears, with the "Start" and "Stop" options. Press "Start".**

Fig. 54. "UPS Control" pop-up window. Press "Start"

10. **Check the start-up phases in "UPS Status" ("Status and Control" submenu, see** *7.4*). **Check that the following phases are fulfilled.**



Otherwise (the final status "UPS Running" is not reached), or if the process is interrupted, check the Alarms menu, and inform the qualified Technical Service if necessary.

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 and output voltages, system load percentages).

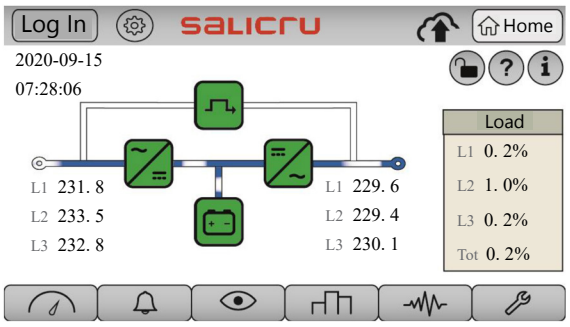


Fig. 55. Main screen in normal operation. The power flow should match the one shown: input supplies rectifier; this simultaneously supplies the inverter and the battery charger; the inverter supplies power to the output loads.

6.1.4. 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 *4.5.3*).

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

With the UPS operating in normal mode (synoptic shown in *Fig. 55*, and in the "Status and Control" submenu you can see that the "UPS Status" shows "UPS Running"), in order to switch to bypass mode, proceed as follows:

1. Press the "Status and Control" icon  You are on the screen described in *7.4*.
2. Press the "INV/BYP Output" icon 

3. The "UPS Control" pop-up box appears, with the "Inverter" and "Bypass" options. Press "Bypass".

Fig. 56. "Output Control" pop-up window. Press "Bypass".

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). A new "UPS Unit on Bypass" alarm appears, warning us of the current "risk" situation for critical loads.

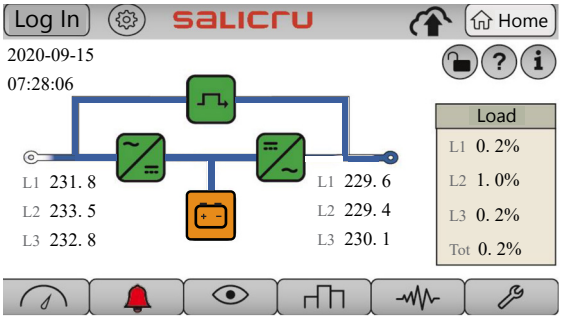


Fig. 57. Main screen in bypass mode. The power flow goes directly from the bypass input to the output, via the static bypass switch. The rectifier and charger continue operating.

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

6.1.5. Procedure for transferring to normal mode from bypass mode

Based on the situation described in *6.1.4* (manual forced bypass mode), you can recover the normal operating mode of the UPS via manual command.

By accessing the "Status and Control", you can see that the "UPS Status" shows "Rectif. Running". To switch to bypass mode, you need to:

1. Press the "Status and Control" icon  You are on the screen described in *7.4*.
2. Press the "INV/BYP Output" icon 

3. The "Output Control" pop-up box appears, with the "Inverter" and "Bypass" options. Press "Inverter".

4. The inverter should restart, and you will recover the normal operating mode of the UPS. "UPS Status" should show "UPS Running", and on the main screen, the power flow will correspond to the one shown in *Fig. 55*.

6.2. PROCEDURE FOR STOPPING THE UPS

This section describes the correct procedure for complete shut-down of the UPS, leaving the loads without power, and the UPS without any voltage at any of its input and output terminals (and batteries, if any).

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

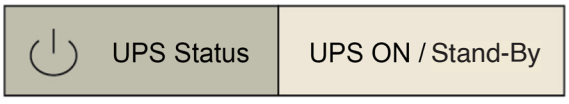
With the UPS operating in normal mode (synoptic shown in *Fig. 55*, and in the "Status and Control" submenu you can see that the "UPS Status" shows "UPS Running"), in order to shut it down completely, proceed as follows:

1. Stop the loads (or set their switches on the distribution board to "Off", if any) progressively.
2. Press the "Status and Control" icon  You are on the screen described in *7.4*.
3. Press the "Start/Stop UPS" icon 

4. The "UPS Control" pop-up box appears, with the "Start" and "Stop" options. Press "Stop".

Fig. 58. "UPS Control" pop-up window. Press "Stop".

5. You can check the status on "Stand-By" of the UPS. The "UPS Status" field (Status and Control" submenu, see *7.4*) shows:



On the main screen, you can also check that the power flow corresponds to that of the UPS when stopped, as shown in *Fig. 59*.

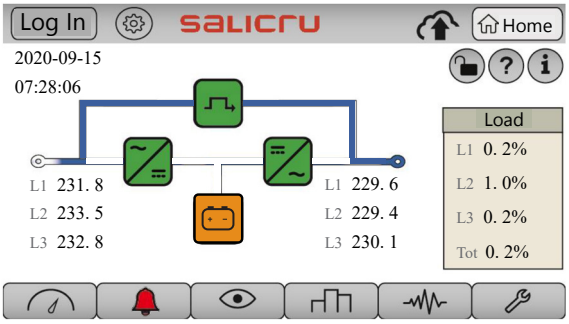


Fig. 59. Main screen with the UPS stopped. The power flow goes directly from the bypass input to the output, via the static bypass switch, and all converters are stopped.

6. Set the switch corresponding to the UPS output on the control panel (external) to "Off".
7. Set the output switch of the UPS to "Off" (**Q2**).
8. Disconnect the batteries:
   a. Units with internal batteries: disconnect the 3-pole battery connector (*Fig. 1* **Detail A**, on the front), or set the battery switch to "Off" (**Q6**, on the front), as applicable.
   b. Units with external batteries: disconnect the 3-pole battery connector (*Fig. 3 and Fig. 4 for 30 kVA and 40 kVA units,* on the back), or set the battery switch to "Off" (**Q3,** *Fig. 7 and Fig. 8 for 50 kVA, 60 kVA and 80 kVA units,* on the front), as applicable. Also, set the external battery cabinet switch to "Off" (**Q8**, *Fig. 10 and Fig. 11).*
   c. Units with shared internal and external batteries: carry out points **a.** and **b.** described above one after the other.
9. 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).
10. If possible, cut off the general power supply to the control panel.
11. Set the input switch of the UPS to "Off" (**Q1**).
12. In units with a separate static bypass input, set the corresponding bypass switch to "Off" (**Q4**).

The UPS is now completely de-energised, there is no voltage at its input, bypass, battery 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.

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).

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. Press the "Status and Control" icon  You are on the screen described in *7.4*.
2. Press the "Start/Stop UPS" icon 

3. The "UPS Control" pop-up box appears, with the "Start" and "Stop" options. Press "Stop".

Fig. 60. "UPS Control" pop-up window. Press "Stop".

4. The loads switch to being supplied directly from the static bypass line. A new "UPS Unit on Bypass" alarm appears, warning us of the current "risk" situation for critical loads. Also check that the unit's synoptic corresponds to the one in *Fig. 57* (UPS stopped).
5. Remove the mechanical lock of the UPS manual bypass switch: unscrew the screws provided and remove the metal cover (see *Fig. 61 and Fig. 62*).
6. Set the manual bypass switch of the UPS to "On" (**Q5**).
7. Remove the mechanical lock of the manual bypass switch on the external control panel.
8. Set the manual bypass switch of the external control panel to "On".
9. The unit reports the current status via the "Mainten. Byp Closed" alarm (maintenance bypass switch closed).

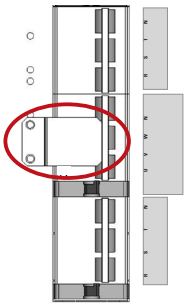


Fig. 61. Mechanical lock of the UPS maintenance bypass switch, 30 kVA and 40 kVA units.

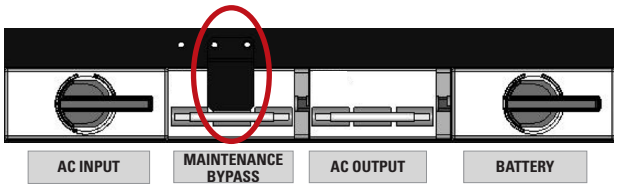


Fig. 62. Mechanical lock of the UPS maintenance bypass switch, 50 kVA, 60 kVA and 80 kVA units.

10. Set the switch corresponding to the UPS output on the control panel (external) to "Off".
11. Set the output switch of the UPS to "Off" (**Q2**).
12. Disconnect the batteries:
    a. Units with internal batteries: disconnect the 3-pole battery connector (*Fig. 1* ***Detail A***, on the front), or set the battery switch to "Off" (**Q6**, on the front), as applicable.
    b. Units with external batteries: disconnect the battery circuit breaker on 50 kVA, 60 kVA and 80 kVA units (**Q3**, on the front), or disconnect the external battery cables on the back of 30 kVA and 40 kVA units, as applicable. Also, set the external battery cabinet switch to "Off" **(Q8)**.
    c. Units with shared internal and external batteries: carry out points **a.** and **b.** described above one after the other.
13. 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).
14. Set the input switch of the UPS to "Off" (**Q1**).
15. In units with a separate static bypass input, set the corresponding bypass switch to "Off" (**Q4**).

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

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 bypass operating mode (see *6.3.1* above), 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. Set the input switch of the UPS to "On" (**Q1**).
3. In units with a separate static bypass input, set the corresponding bypass switch to "On" (**Q4**).
4. Connect the batteries:
   a. Units with internal batteries: connect the 3-pole battery connector (*Fig. 1* **Detail A**, on the front), or set the battery switch to "On" (**Q6**, on the front), as applicable.
   b. Units with external batteries: connect the battery circuit breaker on 50 kVA, 60 kVA and 80 kVA units (**Q3**, on the front), or connect the external battery cables on the back of 30 kVA and 40 kVA units, as applicable. Also, set the external battery cabinet switch to "On" **(Q8)**.
   c. Units with shared internal and external batteries: carry out points **a.** and **b.** described above one after the other.
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 the existing "UPS Unit on bypass" and "Mainten. Byp Closed" alarms, and the synoptic on the main control panel screen, as shown in *Fig. 59*.
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. 61 and Fig. 62*).
11. Press the "Status and Control" icon  You are on the screen described in *7.4*.
12. Press the "Start/Stop UPS" icon 

13. The "UPS Control" pop-up box appears, with the "Start" and "Stop" options. Press "Start".

Fig. 63. "UPS Control" pop-up window. Press "Start".

14. Check the start-up phases in "UPS Status" ("Status and Control" submenu, see *7.4*), and check that the final status "UPS Running" is reached.

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 all UPS converters (rectifier, charger and inverter).
- To ensure no voltage is supplied to the loads.

In the **SLC CUBE4** UPS, this circuit is included on the 2-pin strip of the unit interface (see **Detail B** *Fig. 2 and* **Detail C** *Fig. 9)*. 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 they will therefore switch off.

1. "Open" the circuit on the strip: remove the wire bridge or set the remote button that replaced this bridge to "ON".
2. A new "Emergency Stop" alarm appears on the control panel, and any power flow of the synoptic disappears from the main screen.

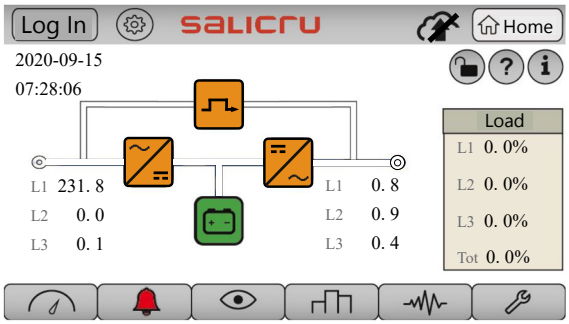


Fig. 64. Main screen with EPO emergency stop activated. No power flow represented, there is no output voltage.

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. Disconnect the batteries.
   d. 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".
   e. The unit will stop completely.
   f. If possible, cut off the general power supply to the control panel.
   g. Set the input switch of the UPS to "Off" **(Q1)**.
   h. In units with a separate static bypass input, set the corresponding bypass switch to "Off" **(Q4)**.

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 strip EPO: 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, the "Emergency Stop" alarm will be present, all converters will be stopped and no voltage will be supplied to the loads. To restore normal operation:
   a. "Close" the circuit on the strip EPO: replace the wire bridge, or set the remote button that replaced this bridge to "Off".
   b. Press the "Status and Control" icon  You are on the screen described in *7.4*.
   c. Verify that the UPS status still indicates that there is no voltage supplied at the Output.

   d. Press the "Start/Stop UPS" icon 

   e. The "UPS Control" pop-up box appears, with the "Start" and "Stop" options. Press "Stop".

Fig. 65. "UPS Control" pop-up window. Press "Stop".

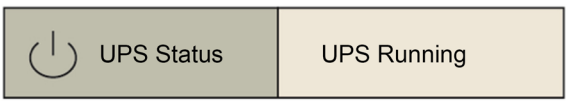
   f. Critical loads are still not supplied, but the UPS is already in stand-by or initial state, without critical alarms. Check that "Emergency Power Off" alarm has disappeared, and the UPS Status is "UPS ON / Stand-By". The unit synoptic still corresponds to *Fig. 64* (unit stopped, no active energy Flow).

   g. Press the "Status and Control" icon  You are on the screen described in *7.4*.
   h. Press the "Start/Stop UPS" icon 

   i. The "UPS Control" pop-up box appears, with the "Start" and "Stop" options. Press "Start".

Fig. 66. "UPS Control" pop-up window. Press "Start".

   j. Check the start-up phases in "UPS Status" ("Status and Control" submenu, see *7.4*), and check that the final status "UPS Running" is reached.



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.

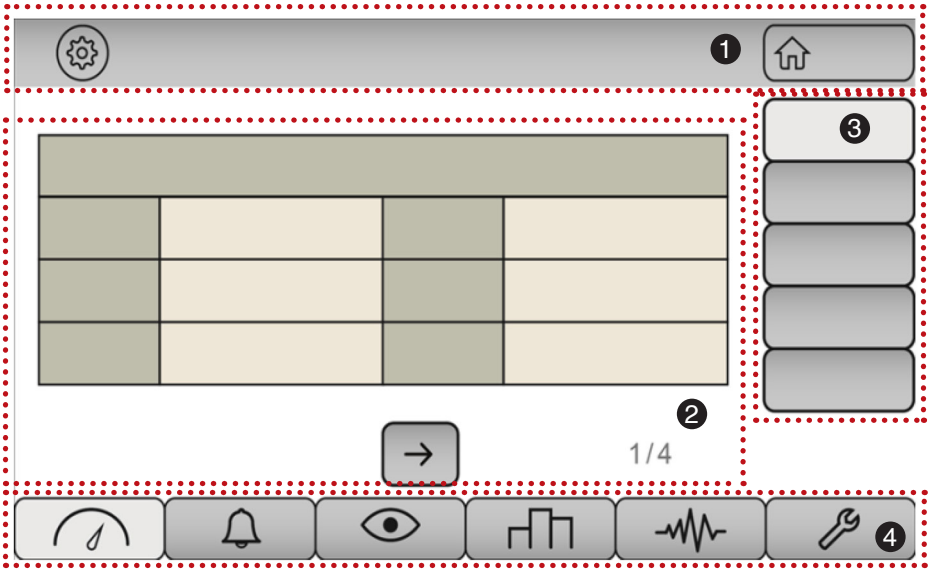


*Fig. 67. **Distribution of information on a generic screen.***

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.

7.1. MAIN OR HOME 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. 67*, the information on this screen also presents 4 areas, but with certain specificities (see *Fig. 68)*. In the display area, the UPS power flow is shown, and in the submenus area, the UPS output load is shown at all times:

1. System Information (with 3 additional buttons).
2. Power Flow or Synoptic, Voltages, Date and Time.
3. Output load.
4. Main menu.

Icon	Description
	Login button (*) The Login button gives qualified staff access to advanced functions, such as modification of the unit's operating parameters. A Username and corresponding Password are required.
	Settings button Access to system configuration and settings.
	Home button Press this button to return to the main menu from any other screen.
	Screen Lock button (*) By activating it, the main screen is locked, i.e. no button will be operative and no menu will be accessible. The same button will appear with a closed padlock. To unlock it, press the same button. A password is required.
	Help button (*) Quick help information indicated by screen.
	Information button (*) Internal system information
	ECO Mode active icon (*) This icon is displayed on the UPS power flow diagram, when the UPS is operating in ECO mode (this mode is activated and the unit is running).
	Maintenance bypass icon (*) This icon is displayed on the UPS power flow diagram when, due to a service intervention, the maintenance bypass switch (internal, or correctly wired external) has been activated (set to "ON").
	Test mode icon This icon may appear on the top bar of the screen ("System Information"), when qualified staff have configured the unit in test mode.
	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.
	Measurements menu The Measurements menu provides access to the various measurements of the UPS, organised in submenus, depending on the different parts of the unit.
	Alarms menu A table is accessed showing the alarms that are currently active. When a new alarm appears, pending viewing, the bell icon flashes red and the acoustic alarm sounds (intermittently). Once active alarms have been acknowledged, the red appears continuously and the acoustic alarm stops. If there are no alarms, the red disappears. This menu also provides access to the Alarms Log submenu and the button for muting the acoustic alarm.
	Status and Control menu The current status of the UPS is displayed, and the operating mode can also be changed.
	Nominal Values menu The main nominal values of the unit are displayed. Depending on the user role (password-protected access), some of them can be modified.
	Graphics menu Graphical representation of relevant UPS measurements, such as voltages and currents.
	Advanced menu Access restricted to qualified staff (password-protected). Advanced configuration parameters.

(*) Note: these buttons and their functions are only accessible from the main or home screen, and not from the other screens.

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

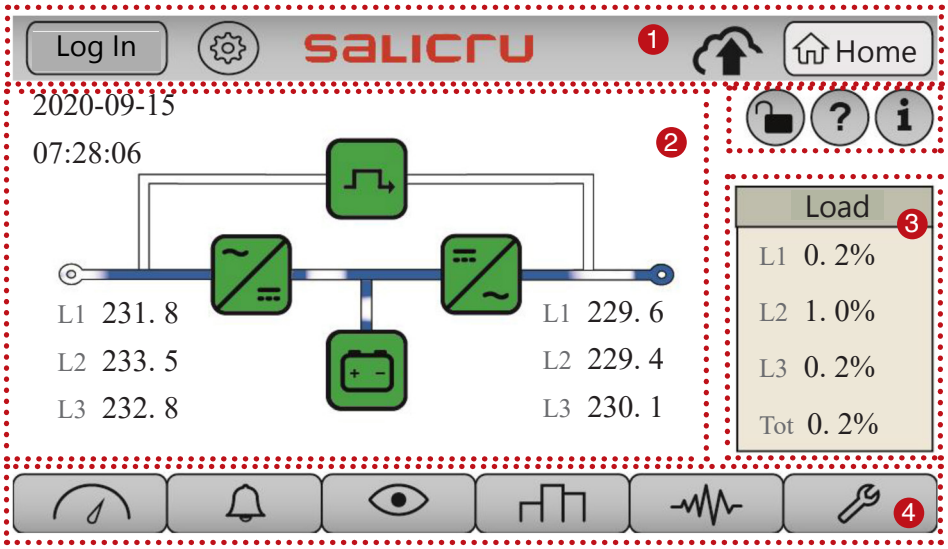


Fig. 68. ***Main screen.***

Going into detail in the main display area (area 2), the information consists of:

- Date (YY-MM-DD) and Time (HH:MM:SS).
- Input voltage measurements per phase (Phase-Neutral).
- Output voltage measurements per phase (Phase-Neutral).
- Output load percentage measurements per phase.
- Total output load percentage measurement.
- UPS synoptic diagram with the following power blocks represented:
  - **a.** Static bypass.
  - **b.** Rectifier.
  - **c.** Inverter.
  - **d.** Batteries.

Each power block can be represented with the following colour code:

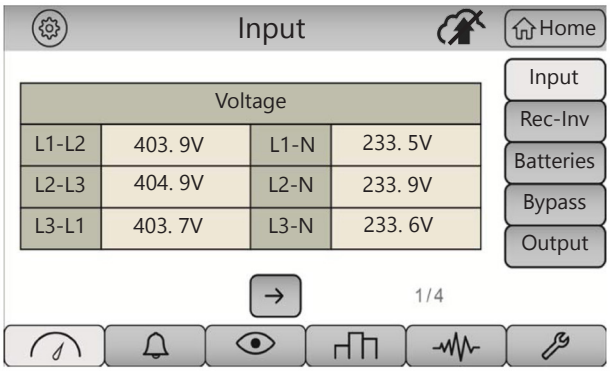
- ❒ GREEN: operating correctly.
- ❒ ORANGE: operating with an alarm.
- ❒ RED: critical alarm that prevents operation. Requires intervention.

A representation of a dynamic power flow (in blue), will detail the UPS operating mode (normal mode, bypass mode, battery mode, etc.).

7.2. MEASUREMENTS MENU

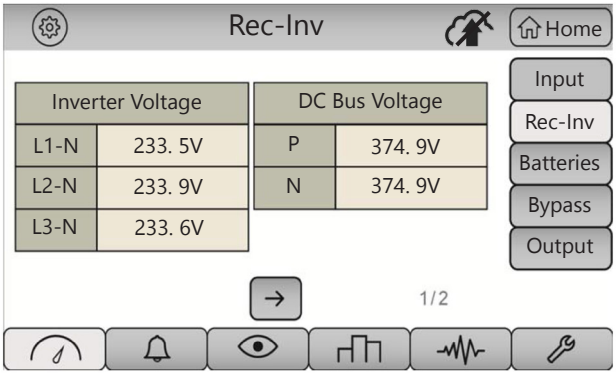
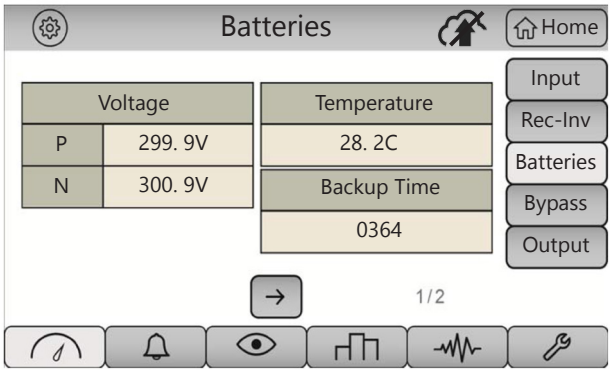
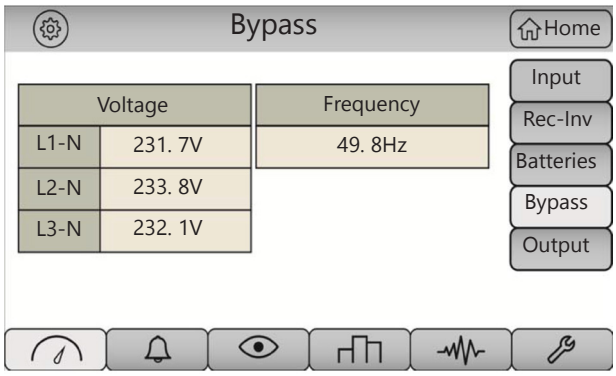
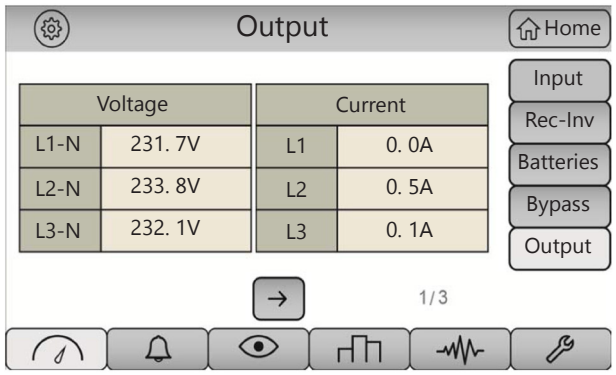
By pressing the Measurements menu icon  , you access the set of measurements taken by the unit itself, which are accessible via the control panel. The measurements are classified by submenus, which are accessed via the buttons on the right-hand side. Each submenu can contain more than one screen, which you can scroll horizontally using the arrows →, ←.

The following table lists all of the available measurements (including, as an example, just one screen per submenu).



"Input" submenu:

- Phase-phase and phase-neutral input voltages (1/4).
- Input currents and Power factors (2/4)
- Apparent and active input powers, per phase and totals (3/4)
- Input frequency and input load percentage (4/4).

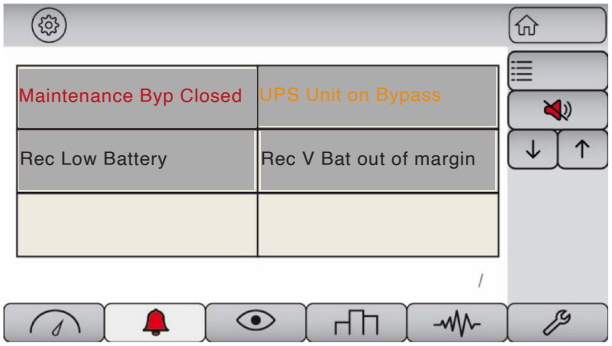
	"Rec-Inv" submenu (Rectifier and Inverter): • Phase-neutral inverter voltages, and positive and negative DC Bus voltages (1/2) • Internal heat sink temperatures, per phase (2/2).
	"Batteries" submenu: • Battery voltages (positive and negative bank), battery temperature and autonomy time estimate (1/2). • Battery currents, positive bank and negative bank (2/2)
	"Bypass" submenu: • Phase-neutral bypass voltages, and frequency.
	"Output" submenu: • Phase-neutral output voltages, and currents (1/3). • Apparent and active output powers, per phase and totals (2/3) • Output power factors and frequency (3/3)

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

7.3. ALARMS MENU

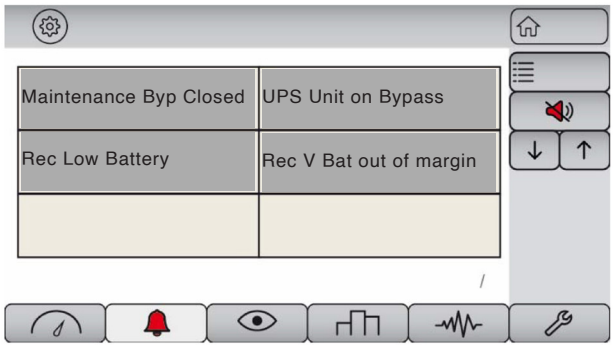
The Alarms menu, which can be accessed by pressing the  icon, consists of:

- An input submenu with active alarms represented in table format ("Alarms").
- A function button  , "Mute acoustic alarm"
- A "Log"  submenu, for accessing the event log.



An "Alarms" submenu (and "Mute acoustic alarm" button):

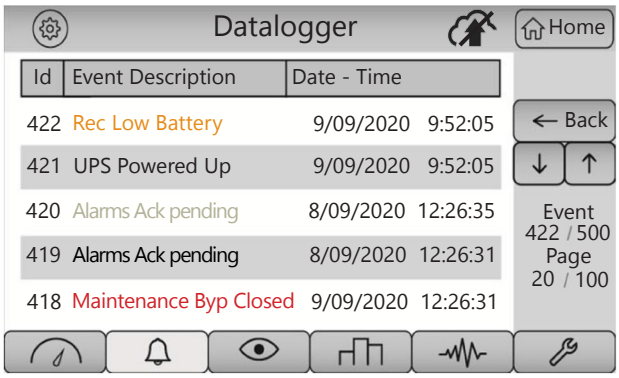
- The alarms are represented in table format, from left to right and top to bottom.
- If more than 6 alarms are active at the same time, you could have an (or various) additional page(s) of alarms, which you can browse with the arrows...



- When new alarms appear (pending acknowledgement), they are represented according to the following text colour code:
  - ❒ Orange text: warnings.
  - ❒ Red text: stop or lock, serious alarms.

  (see Section 7.11)
- In addition, when there are unacknowledged alarms, the acoustic buzzer will sound intermittently and the bell on the bottom menu will flash red.
- By pressing the "Mute acoustic alarm" button on the right-hand side...

... the acoustic buzzer stops, the bell symbol on the bottom menu stops flashing and all active alarms are acknowledged, i.e. they are displayed in black text.



"Log" submenu:

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.
- 5 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, the log no. shown above and the page are on the right-hand side of the screen.
- The information for each event consists of:
  - ❒ Event Number (ID, from 1 to 500).
  - ❒ Description of the Event.
  - ❒ Date and Time (DD:MM:YYYY, HH:MM).

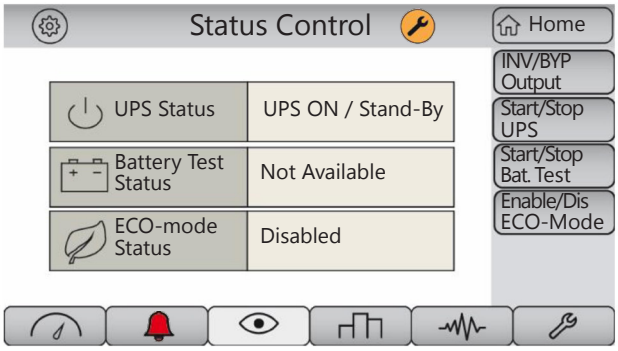
    (In monitoring software, measurements and statuses for each event are also captured).
- The events that are displayed are:
  - ❒ Unit alarms (see 7.11).
  - ❒ System events (see 7.12).
- Both the appearance of an alarm/event is shown, as well as its disappearance, with the following text colour code:
  - ❒ **Orange** text: warning alarm log.
  - ❒ **Red** text: serious alarm log (stop or lock).
  - ❒ **Black** text: system event log (not an alarm)
  - ❒ **Grey** text: any of the previous event types (alarm or event) disappears.

*Tab. 5. **Screens and contents of the Alarms menu on the control panel.***

See sections *"7.11. Alarm messages"* and *"7.12. System events"* for detailed information on all possible event messages and their descriptions.

7.4. STATUS AND CONTROL

The "Status and Control" menu  shows the essential operating statuses of the UPS and their respective Start/Stop controls.



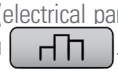
- "UPS Status" → two associated controls "INV/BYP Output", "Start/Stop UPS": you can find out the current operating status of the UPS and manage its operation.
  - ❒ The possible operating statuses of the UPS are:
    "UPS ON / Stand-By"
    "Start Tests"
    "Rectifier Running"
    "Inverter Starting"
    "UPS Running"
    "Cold starting"
    "UPS blocked"
    "UPS Output Off"
    "UPS Running ECO"
    "UPS Retrying"
  - ❒ The controls associated with generic operation of the UPS are:
    a. "INV/BYP Output": you can transfer the output to bypass (rectifier running, batteries charging, inverter stopped). To fully recover normal mode, press the same button and transfer to inverter.
    b. "Start/Stop UPS": start the UPS (normal or ECO mode) or stop it completely (rectifier, charger, inverter stopped, output in bypass).

For more details, see the procedures described in 6.1 and 6.2.

- "Battery Test Status" → "Start/Stop Bat Test": when the battery test status on the panel shows "Available" (UPS running in normal mode, batteries present), you can activate a battery test via the "Start/Stop Bat Test" control button.
  Optionally, a test can also be stopped before it ends.
  - ❒ Possible battery test statuses:
    "Not available"
    "Available"
    "Running"
    "Succes"
    "Failed"
- "ECO Mode Status" → "Enable/Dis ECO Mode": with the "Enable/Dis ECO" control, operation in ECO mode is enabled or disabled. If you press "Start/Stop UPS" with "ECO Mode Status" = "Enabled", the UPS will start to operate in ECO mode instead of normal mode (see 4.5.5).
  - ❒ Possible ECO mode statuses:
    "Disabled" / "Enabled"

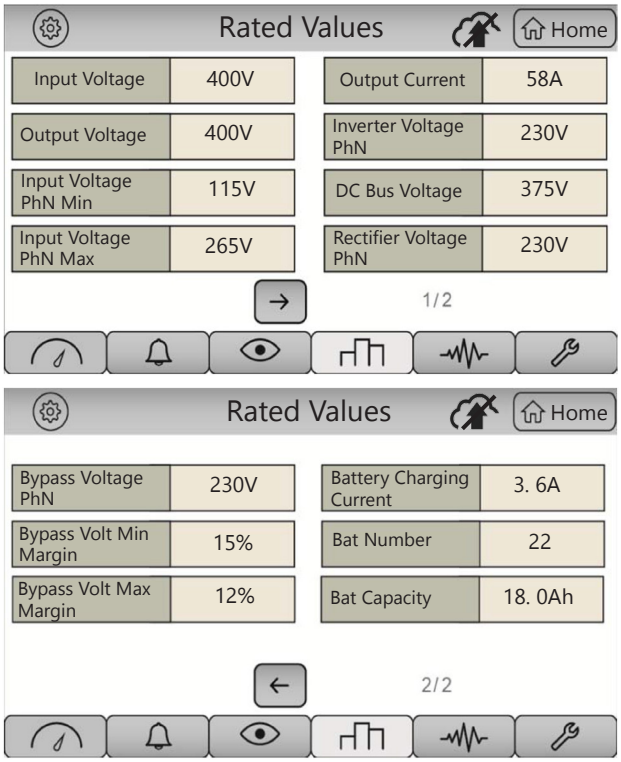
Tab. 6. Screens and contents of the Status and Control menu on the control panel.

7.5. NOMINAL VALUES MENU

The nominal values (electrical parameters) 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 "**Login**" button.

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



"Nominal Values" submenu.

Values displayed (on 2 screens, scroll horizontally using the arrows):

- Nominal input voltage in volts.
- Nominal output voltage in volts.
- Minimum phase-neutral input voltage in volts.
- Maximum phase-neutral input voltage in volts.
- Nominal output current in amperes.
- Nominal phase-neutral inverter voltage.
- Nominal DC bus voltage in volts.
- Nominal phase-neutral rectifier voltage..
- Nominal phase-neutral bypass voltage.
- Lower bypass voltage range in %.
- Upper bypass voltage range in %.
- Nominal battery charge current.
- Number of battery packs per half bank.
- Battery pack nominal capacity in ampere hours.

*Tab. 7. **Screens and contents of the Nominal Values menu on the control panel.***

7.6. GRAPHICS MENU

Access to the measurements graphical representation is via the  menu.

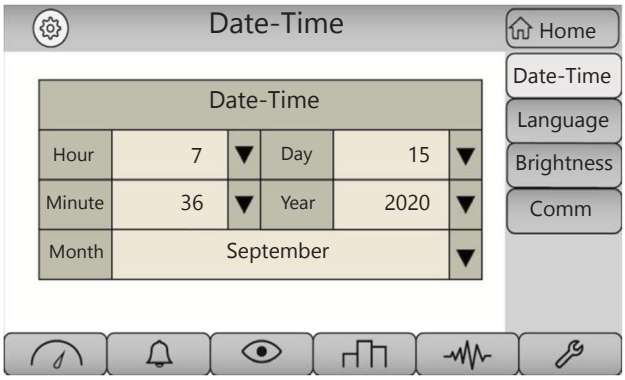
7.7. ADVANCED MENU

The "**Advanced**" menu  includes functions for qualified technical staff that are not available to basic users (the message "Not Available" is shown). To access these functions, it is necessary to first enter a username and password in the "**Login**" button.

Fig. 69. Screen shown when accessing the Advanced menu.

7.8. SETTINGS BUTTON

This button  , accessible from any screen, provides access to the system configuration and settings.



"Date-Time" submenu:

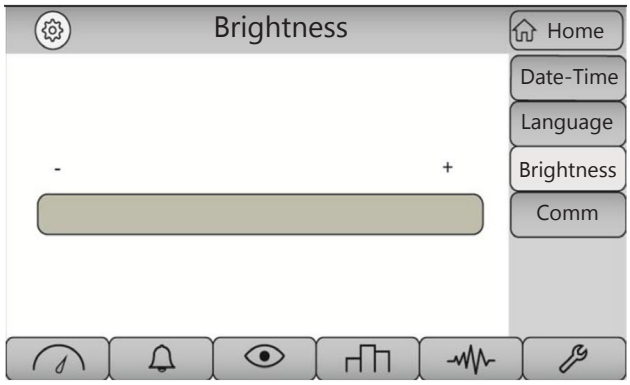
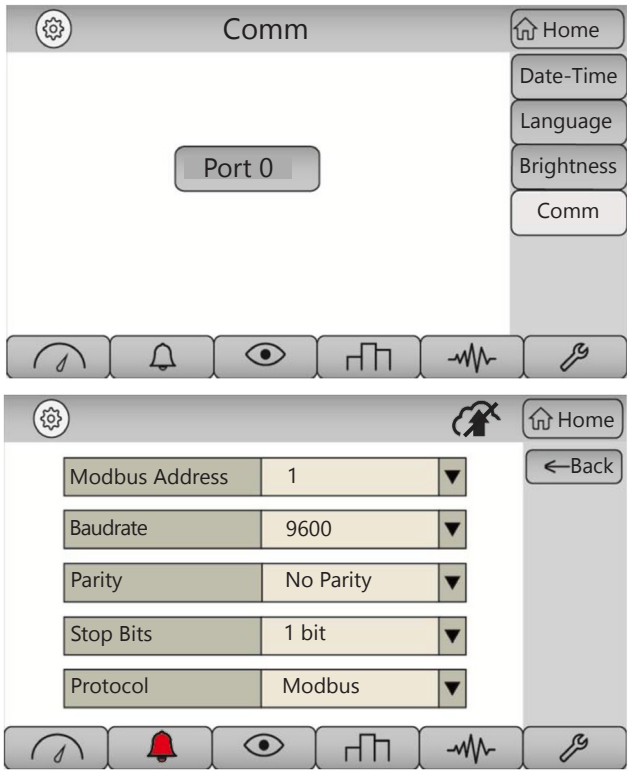
Any user can configure the following fields:

- Time (drop-down numeric keypad by pressing ▼)
- Minutes (drop-down numeric keypad)
- Day (drop-down numeric keypad)
- Year (drop-down numeric keypad)
- Month (pop-up menu with the 12 months)

"Language" submenu:

By pressing the country flag, the language of the text messages on the control panel changes to the corresponding language. Options:

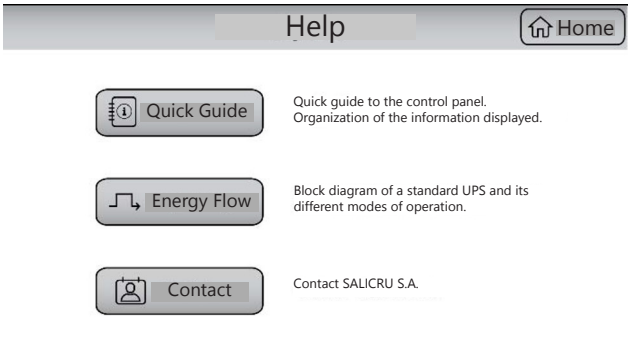
- English
- Spanish
- Portuguese
- French
- German

	"Brightness" submenu: by means of a graphic bar, sliding the cursor, you can adjust the brightness (luminosity) of the screen.
	"Com" submenu: when accessing it, the available ports are displayed. Press the port to be configured ("Port 0" by default). • "Port 0" configuration: ❒ Modbus address: drop-down numeric keypad, values between 1~255. ❒ Transmission speed: pop-up menu with options between 1200 bps ~ 115200 bps. ❒ Parity: pop-up menu with the options "Even", "Odd" and "No Parity". ❒ Stop bits: drop-down numeric keypad, values of 0~2 bits. ❒ Protocol: pop-up menu with the options "Modbus" and "Shell".

Tab. 8. Submenus and screens of the Settings menu.

7.9. HELP BUTTON

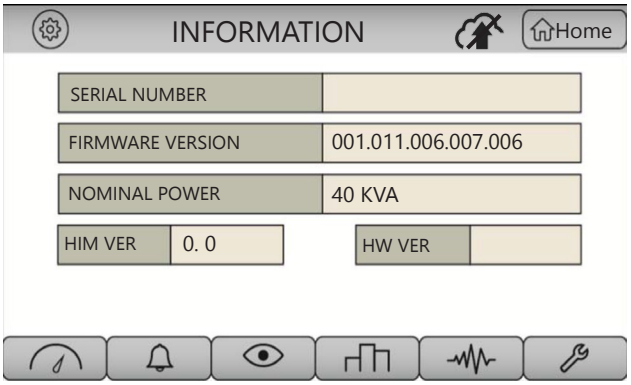
By pressing the ? button, some quick help information is displayed on the screen.

	• "Quick Guide" button: explanation by means of graphics of the control panel menus, and of the organisation of the information displayed. • "Power Flow" button: graphic indication of the power flow for the different operating modes of the UPS. • "Contact" button: all of SALICRU's corporate contact details.

Tab. 9. Screen and contents of the Help button.

7.10. INFORMATION BUTTON

The internal system information is obtained by pressing 
This information may be relevant for qualified technical staff, in case of anomalous behaviour or the need to update.



System information:

- Serial number of the unit.
- Firmware version.
- Nominal power
- "HIM" version (firmware screen).
- Hardware version control.

Tab. 10.Screen and contents of the Information button.

7.11. ALARM MESSAGES

Below is a table showing all of the possible alarm messages (see "7.3.- Alarms menu") that may appear on-screen and their descriptions.

Most of the UPS alarms (except for those indicated as "N/A", Not Applicable, in the table) can be classified according to the converter they affect, or also their level of severity.

- With regards to the converter they affect:
  - ❒ UPS: a generic alarm, no converter specified.
  - ❒ Rectifier: an alarm that affects the rectifier-PFC ("Rec" appears in the alarm message).
  - ❒ Charger: an alarm that affects the battery charger ("Charg." appears in the alarm message).
  - ❒ Inverter: an alarm that affects the inverter or the static bypass switch ("Inv" appears in the alarm message).
- With regards to the level of severity (from lowest to highest):
  - ❒ Warning: the unit can continue in the current status, but an action is recommended in order to eliminate the warning or to change the unit's status.
  - ❒ Stop: the alarm in question has caused an unwanted stop of the converter or the entire UPS. These alarms contain the text "Stop", followed by the affected converter or UPS. The converter or UPS may manage to recover normal operation automatically (retry, or the alarm condition disappears), or with an intervention external to the unit.
  - ❒ Block: this is the highest level of alarm severity, as a converter or the UPS is completely blocked (or faulty) due to the specified reason. These alarms will contain the text "Block". Normal operation will not be recovered, either automatically or via intervention external to the unit, and the intervention of a qualified technician in order to resolve the incident or even repair the unit is likely.

MESSAGE ON-SCREEN	CLASSIFICATION	DESCRIPTION
UPS Unit on bypass	UPS	Unit in bypass mode.
UPS Unit in Bat mode		Unit in battery mode.
UPS Parallel Sys Com Flt		Communication fault in parallel system.
UPS Bat replacement		Battery replacement alarm.
UPS Bat Test fail		Battery test failure.
UPS DC Caps replacement		DC capacitor replacement alarm.
UPS AC Caps replacement		AC capacitor replacement alarm.
UPS Fans replacement		Fan replacement alarm.
UPS Clock bat replace		Clock battery replacement alarm.
UPS Fans failure		Fan fault.
UPS Aux Pwr Supply Flt		Auxiliary power supply fault.
UPS Cold Start		Starting the unit from batteries (Cold Start).
UPS Diesel Generator		Unit powered by a generator set.
UPS Mant.Service Req.		Maintenance service required.
Rec Desaturation IGBT R	RECTIFIER	IGBT rectifier desaturation phase R.
Rec Desaturation IGBT S		IGBT rectifier desaturation phase S.
Rec Desaturation IGBT T		IGBT rectifier desaturation phase T.
Rec DC Bus High		DC bus overvoltage.
Rec Overload		Rectifier overload.
Rec Vin out of margins		Rectifier input out of range.
Rec Vin R not present		Rectifier input phase R not present.
Rec Vin S not present		Rectifier input phase S not present.
Rec Vin T not present		Rectifier input phase T not present.
Rec Phase Rotation		Rectifier input phase rotation.
Rec Vin Sync failure		Rectifier input network synchronisation fault.
Rec Low Battery		Low battery warning.
Rec V Bat out of margins		Rectifier, battery voltage out of range.
Rec T Amb out of margins		Rectifier, ambient temperature out of range.
Rec Temperature R high		Heat sink overtemperature phase R.
Rec Temperature S high		Heat sink overtemperature phase S.
Rec Temperature T high		Heat sink overtemperature phase T.
Chg Desaturation	CHARGER	Charger desaturation.
Chg Real Time Dead-line		Real-time dead-line charger control.
Chg DC Bus high		Charger, DC bus overvoltage.
Chg V Bat Overvoltage		Charger, battery overvoltage.
Chg Tem Bat margins		Charger, battery temperature ranges.
Inv Overload	INVERTER	Inverter overload.
Inv Volt out of margins		Inverter voltage out of range.
Inv DC Volt Out		DC voltage at the output warning.
Inv Byp out of margins		Bypass voltage out of range.
Inv Int Comm failure		Internal communication fault.
Inv Byp Rotation		Bypass input phase rotation.
Inv SSw Bypass R open		Static bypass switch possibly open phase R.
Inv SSw Bypass S open		Static bypass switch possibly open phase S.
Inv SSw Bypass T open		Static bypass switch possibly open phase T.
Inv Vout R Failure		Output Voltage Fault Phase R.
Inv Vout S Failure		Output Voltage Fault Phase S.
Inv Vout T Failure		Output Voltage Fault Phase T.
Maintenance Byp Closed		Maintenance Byp Closed.

MESSAGE ON-SCREEN	CLASSIFICATION	DESCRIPTION
UPS Stop by Temp High.	UPS STOP	UPS stop heat sink overtemperature.
UPS Stop No Rec Input V		No rectifier input voltage (neither AC nor DC).
UPS Stop Rec Dst IGBT R		IGBT rectifier maximum desaturation phase R.
UPS Stop Rec Dst IGBT S		IGBT rectifier maximum desaturation phase S.
UPS Stop Rec Dst IGBT T		IGBT rectifier maximum desaturation phase T.
UPS Stop by DC Bus high		UPS Stop high DC bus.
UPS Stop End Backup Time		UPS Stop end of autonomy.
UPS Stop Rec Ph Rotation		UPS Stop rectifier input phase rotation.
UPS Stop Rec C.Sharing		UPS incorrect rectifier current sharing among power blocks.
UPS Stop Ext Shut-Down		UPS Stop due to external shutdown signal.
UPS Stop Parall. Com Flt		UPS Stop parallel communication fault.
UPS Stop Rectifier OVL		UPS Stop due to rectifier overload.
UPS Stop Main SPS Flt		UPS Stop Main Supply Fault.
Rec Stop Desat IGBT R	RECTIFIER STOP	Rectifier stop IGBT desaturation phase R.
Rec Stop Desat IGBT S		Rectifier stop IGBT desaturation phase S.
Rec Stop Desat IGBT T		Rectifier stop IGBT desaturation phase T.
Rec Stop AC fail Start		Rectifier stop AC input fault at start-up.
Rec Stop Bat fail Start		Rectifier stop DC battery fault at start-up.
Rec Stop S.Strt T.Out		Rectifier stop due to soft start waiting time.
Rec Stop S.Strt in-rush		Rectifier stop due to input overcurrent during soft start.
Rec Stop by Sync fail		Rectifier stop due to input synchronisation fault.
Chg Stop by Desaturation	CHARGER STOP	Charger stop due to desaturations.
Chg Stop by Time-out		Charger stop due to waiting time.
Chg Stop No Battery		Charger stop due to lack of detection of batteries.
Inv Stop by Overload	INVERTER STOP	Inverter stop due to overload.
Inv Stop Desat IGBT R		Maximum inverter IGBT desaturations phase R.
Inv Stop Desat IGBT S		Maximum inverter IGBT desaturations phase S.
Inv Stop Desat IGBT T		Maximum inverter IGBT desaturations phase T.
Inv Stop Maintenance Byp		Inverter stop maintenance bypass.
Inv Stop by Byp Rotation		Inverter stop due to bypass input phase rotation.
Inv Stop C.Sharing		Inverter stop due to incorrect inverter or output current sharing among power blocks.
Inv Stop Out OFF Short		Inverter stop and bypass deactivated due to a short circuit at the output.
Inv Stop by V ramp error		Inverter stop due to voltage ramp fault.
Inv Stop Byp Tx Par Sys		Inverter stop and switch to bypass via the parallel system.
Inv Stop by Time-Out		Inverter stop, command waiting time exceeded.
Inv Stop Volt R margins		Inverter stop phase R due to voltage ranges.
Inv Stop Volt S margins		Inverter stop phase S due to voltage ranges.
Inv Stop Volt T margins		Inverter stop phase T due to voltage ranges.
UPS Block Rec Desat Rtrs	UPS BLOCK	UPS blocked due to exceeded stop retries because of rectifier desaturation.
UPS Block File Sys Fail		UPS blocked due to a fault in the file system.
UPS Block Intpro Loc Com		UPS blocked due to local communication fault between processors.
UPS Block Intpro Rem Com		UPS blocked due to remote communication fault between processors.
UPS Block Network Fail		UPS blocked due to an Odyssey network fault.
UPS Block DC Bus Hi Rtrs		UPS blocked high DC bus retries exceeded.
UPS Block Start		UPS block start-up summary (Waiting Time).
UPS Block Rectif Start		UPS block rectifier start-up summary (Overcurrent or Waiting Time).
UPS Block Rectifier Test		UPS blocked Rectifier Test.
UPS Block Inverter Test		UPS blocked Inverter Test.
UPS Block Set File Error		UPS blocked configuration file.
UPS Block License Expiry		UPS blocked Licence expired.

MESSAGE ON-SCREEN	CLASSIFICATION	DESCRIPTION
Rec Block by DC Bus Max	RECTIFIER BLOCK	Rectifier block maximum DC bus.
Rec Block by Dead-line R		Rectifier block Dead-line R.
Rec Block by Dead-line S		Rectifier block Dead-line S.
Rec Block by Dead-line T		Rectifier block Dead-line T.
Chg Block DC Bus Max	CHARGER BLOCK	Charger block maximum DC bus.
Chg Block by Dead-line		Charger block due to real-time Deadline.
Chg Block by Desat		Charger block stop retries due to desaturation exceeded.
Inv Block Desat retries	INVERTER BLOCK	Inverter block stop retries due to desaturation exceeded.
Inv Block DC V Out		Inverter block due to DC voltage at the output.
Inv Block Out OFF Short		Inverter blocked and bypass stopped due to maximum short circuit retries exceeded at the output.
Inv Block by DC Bus high		Inverter blocked due to high DC bus voltage.
Inv Block by Dead-line		Inverter blocked due to real-time Dead-line.
Inv Block Inverter Start		Inverter blocked Inverter start-up summary (Waiting Time).
Inv Block Vout Failure		Inverter blocked due to Output Voltage Fault.
Inv Block SSByp R short		Inverter blocked due to short-circuited static bypass switch phase R.
Inv Block SSByp S short		Inverter blocked due to short-circuited static bypass switch phase S.
Inv Block SSByp T short		Inverter blocked due to short-circuited static bypass switch phase T.
Inv Block SSInv R short		Inverter blocked due to short-circuited Phase R static inverter switch.
Inv Block SSInv S short		Inverter blocked due to short-circuited Phase S static inverter switch.
Inv Block SSInv T short		Inverter blocked due to short-circuited Phase T static inverter switch.
Inv Block SSInv R open		Inverter blocked due to open Phase T static inverter switch.
Inv Block SSInv S open		Inverter blocked due to open Phase S static inverter switch.
Inv Block SSInv T open		Inverter blocked due to open Phase T inverter static switch.
Inv Block Volt margins		Inverter blocked due to voltage ranges.
Sys Alm New Param added	N/A	System alarm, new parameters added.
Emergency Power Off		Emergency Stop. All converters stopped, there is no output voltage.

Tab. 11. ***Alarm messages by screen, classification and description.***

7.12. SYSTEM EVENTS

As a complement to the system alarms, the unit's "Log" (accessible via the control panel or via monitoring software) is capable of recording events that do not involve any type of alarm (see *7.3*). These events will therefore only be shown when accessing the "Log" submenu, and never in the "Alarms" submenu. They will also not trigger an acoustic or visual alarm, just a record of the log file, with a time capture (and a capture of other internal parameters, visible in monitoring software).

Tab. 12 shows the possible text messages of events (not alarms) in the Log, and their brief descriptions.

MESSAGE ON-SCREEN (Log)	DESCRIPTION
UPS Start	The UPS start-up control command has been sent.
UPS Stop	The UPS stop control command has been sent.
UPS on Inverter	The UPS is in normal mode, output on inverter.
UPS ECO-mode Activation	Activation of UPS ECO mode.
UPS ECO-mode in Bypass	The UPS is in ECO mode, output in bypass.
UPS ECO-mode in Inverter	The UPS is in ECO mode, output in inverter.
UPS in back-up mode	UPS in autonomy or battery mode.
UPS Charging Batteries	UPS charging batteries.
Inv Out Current Limit	Output current limit activated in inverter.
Batteries floating	Batteries at float voltage level.
Battery Boost Charge	The charger is on quick battery charging ("boost"), above float.
UPS on Battery Test	UPS carrying out a battery test.
Battery Test N.A.	It is not possible to have it carry out a battery test.
UPS with Any Alarm	UPS with an active alarm.
Alarms Ack pending	Alarms pending acknowledgement.
Parallel connect. at Out	UPS in parallel connected to the output.
UPS Powered Up	Capture of the moment when power is supplied to the UPS (from complete shutdown).
Chg on idle-mode	Charger operating with no load to increase efficiency.
No Input Voltage	There is no Input voltage.
Stop DC mode timeout	UPS Stop due to programmed timeout in battery mode.

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

8. MAINTENANCE, WARRANTY AND SERVICE

The UPS requires minimal preventive maintenance of its essential parts, as well as external cleaning with a soft, slightly damp cloth.

The key elements are all those moving parts such as fans, protection elements and batteries.

The periodicity required for external cleaning would be monthly, while checking the fans, to rule out blockages and verify their correct operation, once a year would be sufficient.

8.1. 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 20ºC. 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 (every 6 months) to extend their life expectancy, as well as a visual inspection to rule out bulging or deformation.**

  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 overcharging and deep battery discharge.

8.1.1. 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.

8.2. WARRANTY CONDITIONS

8.2.1. 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.

8.2.2. 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.

8.3. TECHNICAL SERVICES NETWORK

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

9. ANNEX I. TECHNICAL SPECIFICATIONS

9.1. 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 62477-1
Uninterruptible power systems (UPS). Electromagnetic compatibility (EMC) requirements	EN-IEC 62040-2
Uninterruptible power systems (UPS). Method of specifying the performance and test requirements	VFI-SS-11 (EN-IEC 62040-3)

Tab. 13. Standards applied.

9.2. ENVIRONMENTAL CHARACTERISTICS

Information	Environmental
Pollution degree	PD2
UV resistance	Yes, by epoxy-polyester paint
Mechanical conditions: vibration, shock, fall...	Class 3M1 (IEC 60721-3-3)
Overvoltage category	OVC II
Protection	Class I
IP protection degree	IP20
Acoustic noise at 1 metre distance	< 54.0 dB (A)
Operating altitude	2400 m a.s.l. [1]
Relative humidity	0.. 95%, no condensation
Operating temperature	0.. 40 ºC [2] (battery life is reduced by 50% for every 10ºC increase over 20ºC)
Storage and transport temperature	–15.. +60 (UPS) / 0.. +35 (Battery)

[1] Above 2400m. and up to 5000 m. there is a power derating of 1% per 100 m.
[2] Up to 55ºC with power derating.

Fig. 70. Environmental characteristics

9.3. MECHANICAL CHARACTERISTICS

Cabinet specifications		30 kVA	40 kVA	50 kVA	60 kVA	80 kVA
Dimensions (Depth × Width × Height)		909 x 377 x 1042 mm		919 x 560 x 1654 mm		
Weight	**without batteries**	70 kg		150 kg		
	with batteries (standard aut.)	290 kg		480 kg		
Colour		RAL 9005				
Degree of protection, IEC (60529)		IP20				

Tab. 14. Mechanical characteristics

Wiring Specification	30 kVA	40 kVA	50 kVA	60 kVA	80 kVA
Rectifier input general line section (mm²)	16		25	35	50
Bypass general line section (mm²)	10	16		25	35
General output line (mm²)					
Manual bypass general line (mm²)					
Auxiliary contacts (mm²)	1,5				
Terminal type	Rounds M6 Input/Output	Rounds M8 In/M6 Out.	Rounds M8 Input/Output		
Maximum number of conductors in a single terminal	2				
Wiring insulation temperature (º C)	90				
Torque (Nm)	5 Input/Output	6 Input/5 Output	6 Input/Output		

Tabla 15. Wiring specification and torque.

9.4. ELECTRICAL CHARACTERISTICS

9.4.1. Electrical characteristics (rectifier input)

Rectifier specifications	30 kVA	40 kVA	50 kVA	60 kVA	80 kVA
Active power (kW)	30	40	50	60	80
Technology	Double boosters per phase, 3 switching levels				
Three-phase nominal voltage (3P + N + E)	3 x 380 V / 3 x 400 V / 3 x 415 V				
Input voltage range (for 3 x 400 V)	+15 % ~ -15 %: 100% load / -15% ~ -50%: load degradation up to 65%				
Frequency	50 Hz / 60 Hz ± 5 Hz (45 to 65 Hz)				
Nominal input current (3 x 380 V / 3 x 400 V / 3 x 415 V) (A)	48 / 46 / 44	64 / 61 / 58	80 / 76 / 73	95 / 91 / 87	127 / 121 / 117
Maximum input current (A) at minimum voltage and maximum battery charge (3 x 380 V / 3 x 400 V / 3 x 415 V)	64 / 61 / 59	83 / 79 / 76	102 / 97 / 93	120 / 114 / 110	158 / 150 / 145
Icc (kA)	6		10		
Input power factor (load ≥ 10%)	1.0				
Input THDi	@100% load: THDi < 3.0% @50% load: THDi < 5.0% @25% load: THDi < 8.0%				

Tab. 16.Rectifier input characteristics

9.4.2. Electrical characteristics (bypass input)

Static bypass specifications	30 kVA	40 kVA	50 kVA	60 kVA	80 kVA
Nominal voltage (3P + N + E)	3 x 380 V / 3 x 400 V / 3 x 415 V				
Maximum allowed voltage (Phase-neutral / Phase-Phase)	265 V / 460 V				
Technology	Solid state + relays				
Activation criterion	Digital Control				
Transfer time	Zero				
Voltage range	-15 % ~ +12 %				
Overload	100% ~ 110% (permanently) 110% ~ 125% (for 60 min.) 125% ~ 150% (for 10 min.) 150% ~ 200% (for 10 s.) > 200% (immediate)				
Transfer time	0				
Manual bypass type	Without interruption				
Neutral line nominal current	1.7 × In				
Frequency	50 / 60 Hz ± 5 Hz (programmable between 0.5 Hz and 5 Hz)				
Nominal bypass current (3 x 380 V / 3 x 400 V / 3 x 415 V) (A)	46 / 43 / 42	61 / 58 / 56	76 / 73 / 70	91 / 87 / 83	122 / 115 / 111
Maximum permanent bypass current (3 x 380 V / 3 x 400 V / 3 x 415 V) (A)	50 / 48 / 46	67 / 64 / 61	84 / 79 / 77	100 / 95 / 92	134 / 127 / 122

Tab. 17.Static bypass characteristics

9.4.3. Electrical characteristics (battery charger)

Battery charger specifications	30 kVA	40 kVA	50 kVA	60 kVA	80 kVA
Nominal charge current (A.)	8		16		
Default charge current	0.2 x capacity				
Charging method	Constant current and voltage				
Number of batteries	22 + 22 (default) (16+16 ~ 22 + 22 available for PbCa and up to 220 batteries for NiCd)				
Battery charger bus voltage	Configurable between ± 180 ~ 330 V.				
Charge time	5 hours (90% capacity)				
Floating voltage (at 20ºC)	13.65 V / battery (programmable between 1.3 V ~ 14 V)				
Voltage compensation depending on the temperature	– 18 mV / ºC / Bat. (default for PbCa) (programmable 0.0 ~ 1000.0 mV / ºC)				
Voltage ripple	≤ 1%				
Current ripple	≤ 5%				
Quick charge voltage (equalisation)	13.65 V (default) (programmable between 1.35 V ~ 14.5 V)				
End of autonomy voltage	Variable between 9.6 V ~ 10.5 V (programmable)				
Remaining autonomy time estimate	Yes				

Tab. 18. Characteristics of parameters related to the batteries.

9.4.4. Electrical characteristics (inverter output)

Inverter specifications	30 kVA	40 kVA	50 kVA	60 kVA	80 kVA
Active power (kW)	30	40	50	60	80
Technology	3-level inverter per phase				
Three-phase nominal voltage (3P + N + E)	3 x 380 V / 3 x 400 V / 3 x 415 V				
Output voltage accuracy	Static regime (0% ~ 100% load/mains-battery): ± 0.5% Dynamic regime (0% ~ 100% ~ 0%): ± 10%, 20 ms.				
Dynamic recovery time	After 20 ms, nominal value ± 2 %				
Waveform	Pure sinusoidal				
Frequency	50 Hz / 60 Hz ± 0.05% (fixed value or autodetect can be selected)				
Nominal output current (3 x 380 V / 3 x 400 V / 3 x 415 V) (A)	46 / 43 / 42	61 / 58 / 56	76 / 72 / 70	91 / 87 / 83	122 / 115 / 111
Short circuit current (3 x 380 V / 3 x 400 V / 3 x 415 V) (A)	137 / 130 / 125	182 / 173 / 167	228 / 217 / 209	273 / 260 / 250	365 / 346 / 334
Short circuit protection	Yes				
Efficiency (%)	98,0				
Power factor	1				
Permitted crest factor	3:1				
Overload	110% ~ 125% (for 10 min.) 125% ~ 135% (for 5 min.) 135% ~ 150% (for 1 min.) > 150% (immediate transfer to bypass)				
Overcurrent limit	300 %				
Output THDv	≤ 1% (linear load) / < 4.0 (non-linear load)				
Maximum synchronism speed	10.0 Hz/s (default value)				
Inverter voltage range	± 5 %				

Tab. 19. Inverter characteristics

9.4.5. Electrical Characteristics (External protection elements).

Description	Characteristics
General Input Differential	Sensitivity from 300 to 500 mA; type B
Rectifier input disconnector	4P
Static bypass circuit breaker	4P - Curve C
Output disconnector	4P + advanced opening auxiliary contact (recommended)
Maintenance bypass circuit breaker	4P - Curve C + auxiliary contact
Backfeed protection disconnector	4 poles - 400V AC3 - 230 Va coil
Contactor coil control relay	1 contact - 400 Vac coil
Protection fuses	600 Vac

Tabla 20. Characteristics of the external protection elements.

9.4.6. Communications

Communication specifications	Parameters
Communication port 1	RS 232 / RS 485
Communication port 2	USB
Expansion slot 1	NIMBUS card
Expansion slot 2	Free slot (*)
Digital inputs	4 inputs
Relay interface	4 programmable relays
Protocol	MODBUS RTU
Display	5" touchscreen
EPO function	2-pole normally closed contact

(*) Options:
- SNMP.
- RS232, RS485, USB.
- AS400 (relay extension).
- Remote battery temperature.

Tab. 21. Communications available.

9.4.7. Efficiency

Efficiency specifications	30 kVA	40 kVA	50 kVA	60 kVA	80 kVA
General efficiency in battery mode (> 25% charge)	up to 96.5%				
General efficiency in normal mode	up to 96.2%				
Heat losses, normal mode, 100% charge (W)	1470	1920	2300	2700	3680
Air volume for cooling (m3/hour)	427		854		

Tab. 22. Efficiency characteristics

10. ANNEX II. 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. 71. 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.

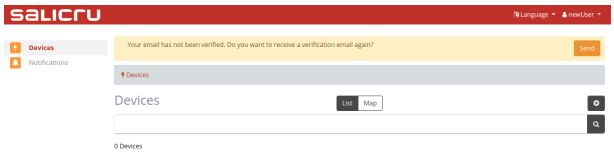
10.1. REGISTRATION OF THE UNIT IN THE CLOUD

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

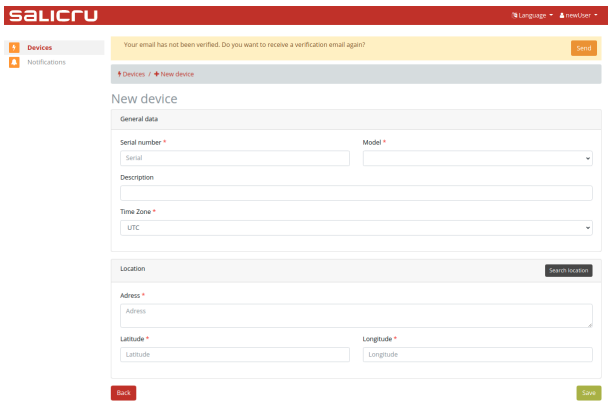
10.1.1. Nimbus portal

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.

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.



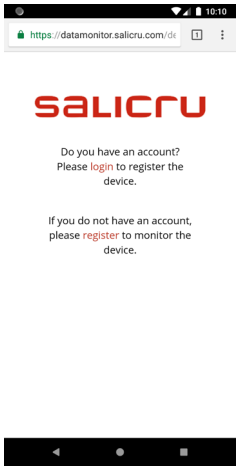
4. A page will appear where the fields that are displayed must be completed. Note: required fields are marked with an asterisk (*).



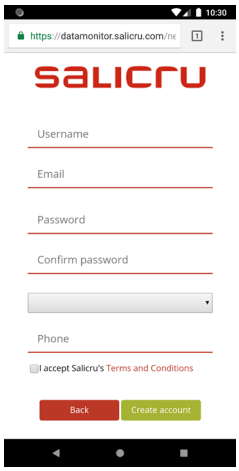
5. After registering the unit, a list of all units linked to that account will be shown, as well as the UPS status.

10.1.2. Reading the QR code

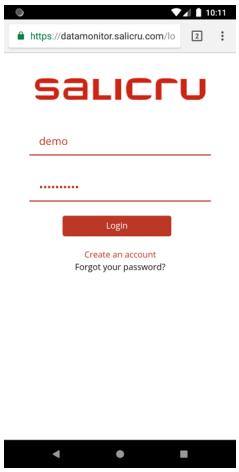
- Read the QR code that you will find on the central part of the unit.
- After reading the code, a new tab will open in the browser of your mobile device.



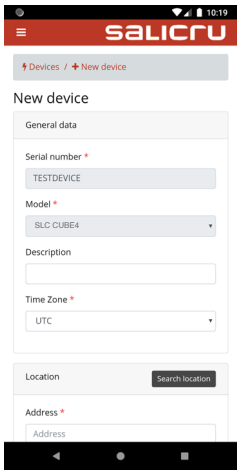
- If you do not have an account, you must register in order to access the unit.

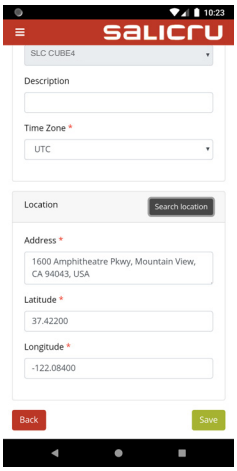


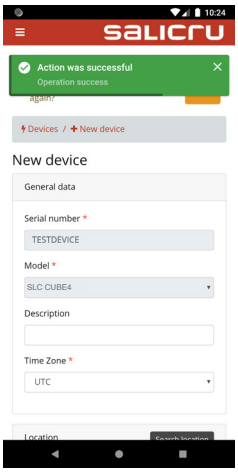
- Once registered, or if you already have a SALICRU account, you must log in.



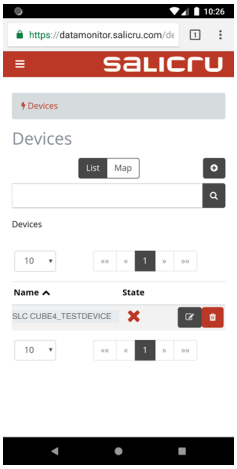
- Once you have accessed your account, the next step is to register the unit by filling in the fields that appear. Note: required fields are marked with an asterisk (*).







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



10.2. 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

11. ANNEX III. 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 f, where f 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.

Avda. de la Serra 100

08460 Palautordera

BARCELONA

Tel. +34 93 848 24 00

sst@salicru.com

SALICRU.COM

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