USER MANUAL

UNINTERRUPTIBLE POWER SUPPLY

SLC ADAPT2

salicru

General index

1. INTRODUCTION.

1.1. THANK YOU LETTER.

We thank you in advance for the trust placed in us in the purchasing of this product. Read this instruction manual carefully in order to familiarise yourself with its content, since the more you know and understand the device the greater your satisfaction, level of safety and optimisation of its functionalities will be.
Do not hesitate to contact us for any additional information or queries that you may wish to make.

Yours sincerely.

SALICRU

- The device described here **is capable of causing significant physical injury if improperly handled**. For this reason, its installation, maintenance and/or repair must be carried out exclusively by our staff or by **qualified personnel**.
- Although no effort has been spared to ensure that the information in this user manual is complete and accurate, we accept no liability for any errors or omissions that may exist. The images included in this document are for illustrative purposes and may not exactly represent the parts of the device shown; therefore they are not contractual. However, any divergence that may arise will be remedied or solved with the correct labelling on the unit.
- Following our policy of constant evolution, **we reserve the right to modify the characteristics, operations 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 version of the document (listed on the back cover, on the logo of our brand) and download it from the website.
- Any **reproduction, copying, assignment to third parties, amendment or total or partial translation** of this manual or document, in any form or by any means, **without the prior written permission of Salicru is prohibited**, with the company fully and exclusively reserving its ownership rights over it.

2. SAFETY INFORMATION.

2.1. USING THIS MANUAL.

The latest version of the device's user manual is available to the customer for download on our website **(www.salicru.com)**. It is necessary to read it carefully before performing any actions, procedures or operations on it.

The purpose of the user manual is to provide information about safety and the procedures for device installation and operation. Read them carefully and follow the steps indicated in the order established.

The **"Safety Instructions"** document EK266*08 is supplied with this device. Compliance **with these instructions is obligatory, with the user being legally responsible** for observing and applying them, as well as a Pen Drive that adds all the necessary information for its connection and start-up.

The device is delivered properly labelled for correct identification of each of its parts, which, together with the instructions described in this user manual, allows installation and start-up operations to be performed in a simple and organised manner without any doubts whatsoever.

Finally, once the equipment is installed and operational, it is recommended to keep the documentation downloaded from the website, the CD-ROM or the Pen Drive in a safe and easily accessible place, for future queries or doubts that may arise.

However, because the product is constantly evolving, discrepancies or slight contradictions may arise. If in any doubt, the labelling on the device itself will always prevail.

This user manual applies to the **SLC ADAPT 2,** series consisting of cabinets with 24, 33 and 42U of height and with 10 and 15 kVA modules, with the following configurations:

- **24U cabinets**: with 2 or 4 slots that allow them to hold up to 4 x 10 kVA modules or 3 x 15 kVA modules (*).
- **33U cabinets**: with 2, 4 or 6 slots that allow them to hold up to 6 x 10 kVA modules or 6 x 15 kVA modules (*).
- **42U cabinets**: with 2, 4 or 6 slots that allow them to hold up to 6 x 10 kVA modules or 6 x 15 kVA modules (*).

(*) 10 kVA modules: degrade to 6 kVA/FPout = 1.
(*) 15 kVA modules: degrade to 9 kVA/FPout = 1 when operating with a three-phase input of 3x220 V or 3x208 V.

The housings are 19" rack cabinets, which may or may not share the space with the batteries.

While the customer can perform these adaptations on their own or otherwise, we can also manufacture any configuration on demand.

When a system differs from that shown in the figures in Chapter *4*, except when it differs in the number of modules connected in parallel and/or the technical specifications are modified, additional explanatory annexes will be published if deemed appropriate or necessary. These will be supplied in printed format with the device.

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

- **'SLC ADAPT 2, ADAPT 2, UPS, system, device or unit'**.- ADAPT2 series of Uninterruptible Power Supplies. Depending on the context of the phrase, it can refer either to the actual UPS itself or to the UPS and the batteries, regardless of whether or not it is all assembled in the same metal enclosure.
- **'Batteries' or 'accumulators'**.- Bank or set of elements for storing the flow of electrons by electrochemical means.
- **'T.S.S.'**.- Technical Service and Support.
- **'Customer', 'installer,' 'operator' or 'user'**.- These are used interchangeably, and by extension can refer to the installer and/or operator who will carry out the corresponding actions, while this same person may be responsible for carrying out the respective actions when acting on behalf or in representation of the first.

2.1.1. Conventions and symbols used.

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

For more information, see Section 1.1.1 of the **'Safety Instructions'** document EK266*08.

In the event that there are differences in relation to the safety instructions between document EK266*08 and the user's manual of the device, the latter will always prevail.

2.1.2. Safety considerations.

- While safety-related considerations will be dealt with in more detail in Chapter *5*, the following must be taken into account:
  - ❒ Inside the battery cabinet there are accessible parts with HAZARDOUS VOLTAGE and consequently risk of electric shock, so they are classified as RESTRICTED ACCESS ZONES. Therefore, the key of the battery cabinet will not be available to the OPERATOR or USER, unless such person has been properly instructed.
    In case of intervention inside the battery cabinet either during the connection, preventive maintenance or repair procedures, it must be taken into account that **the voltage of the battery set exceeds 200 V DC**, so appropriate safety measures must be taken.
  - ❒ Any operation of connecting and disconnecting the cables or handling inside a cabinet will not take place for around 10 minutes in order to allow the internal discharge of the capacitors of the device. Even so, check with a multimeter that the voltage at terminals is less than 36 V.
  - ❒ In case of installation in neutral IT mode, the switches, circuit breakers and thermal magnetic protection must cut the NEUTRAL in addition to the three phases.

3. QUALITY ASSURANCE AND STANDARDS.

3.1. STATEMENT BY THE MANAGEMENT.

Our goal is customer satisfaction, therefore this Management has decided to establish a Quality and Environment Policy, through the implementation of a Quality and Environmental Management System that will enable us to comply with the requirements demanded in the **ISO 9001** and **ISO 14001** standards and by our Customers and Stakeholders.
Likewise, the management of the company is committed to the development and improvement of the Quality and Environmental Management System, through:

- Communication to the entire company of the importance of satisfying both the customer's requirements as well as legal and regulatory requirements.
- The dissemination of the Quality and Environment Policy and the setting of the Quality and Environment objectives.
- Conducting reviews by the Management.
- Providing the necessary resources.

3.2. STANDARDS.

The **SLC ADAPT 2** is designed, manufactured and sold in accordance with Quality Assurance Standard **EN ISO 9001**. The CE marking indicates conformity with EC Directives through the application of the following standards:

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

In accordance with the specifications of the harmonised standards. Reference standards:

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

The manufacturer is not liable in the event of modification or intervention on the device by the user.

WARNING:
This is a category C3 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.
It is not appropriate to use this device in basic life support applications (BLS), where a failure of the former can render vital equipment out of service or significantly affect its safety or effectiveness. It is also not recommended in medical applications, commercial transport, nuclear installations, or other applications or loads, where a failure of the product can lead to personal or material damage.

The EC declaration of conformity of the product is available to the customer upon express request to our offices.

3.2.1. First and second environment.

The environment examples that follow cover most UPS installations.

3.2.1.1. First environment.

Environment including residential, commercial and light industry installations, directly connected, without intermediate transformers, to a low voltage public power grid.

3.2.1.2. Second environment.

An environment that includes all commercial, light industrial and industrial establishments that are not directly connected to a low voltage power grid supplying buildings used for residential purposes.

3.3. ENVIRONMENT.

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

Recycling of the device at the end of its useful life:

Our company undertakes to use the services of authorised and regulatory companies to treat the set of products recovered at the end of their useful life (contact your distributor).

Packaging:

For the recycling of the packaging there must be compliance with the legal requirements in force, in accordance with the specific regulations of the country where the device is installed.

Batteries:

Batteries pose a serious danger to health and the environment. The disposal of them shall be carried out in accordance with the laws in force.

4. PRESENTATION.

4.1. VIEWS OF THE CABINETS.

4.1.1. UPS cabinet

The models described above can be integrated into 3 different cabinets that differ in height and the number of slots available: up to 4 in the 24U cabinet and up to 6 in the 33 and 42U cabinets, as can be seen in *Fig. 1* to *Fig. 10*:

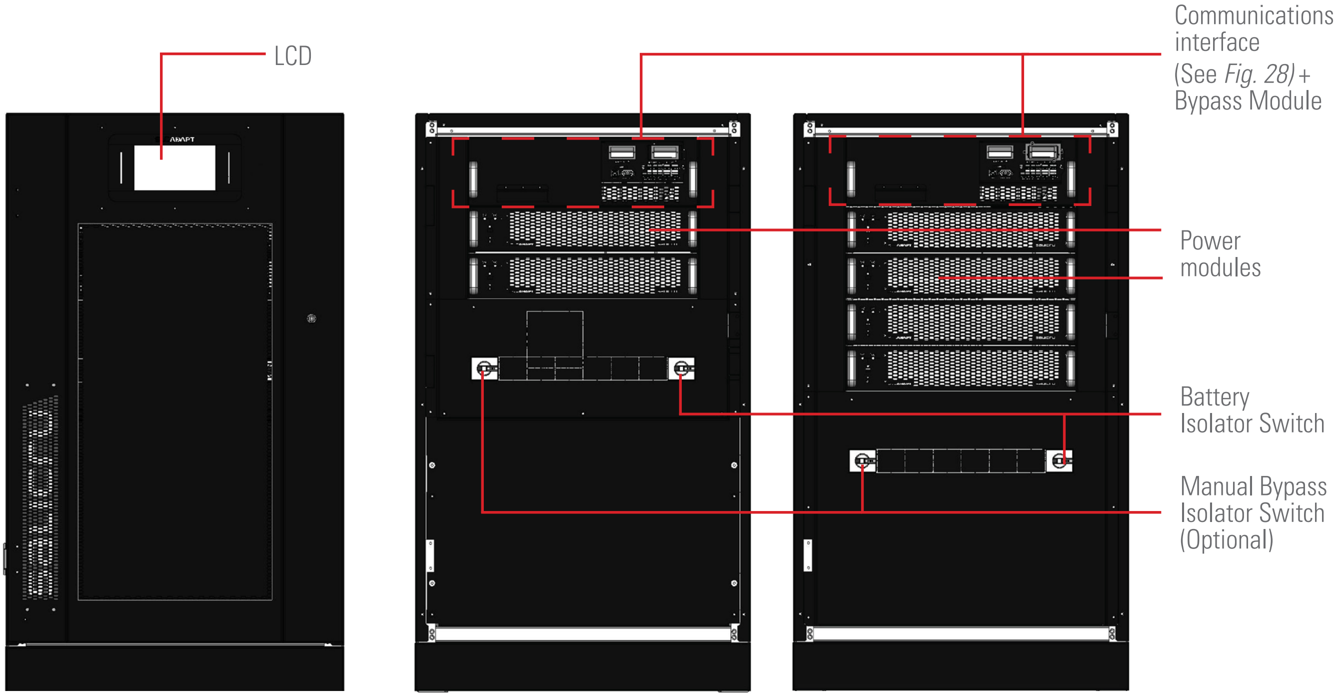


Fig. 1. Front views of the 24U cabinet, with the door closed (left) and the door open with 2 and 4 modules installed (centre and right, respectively).

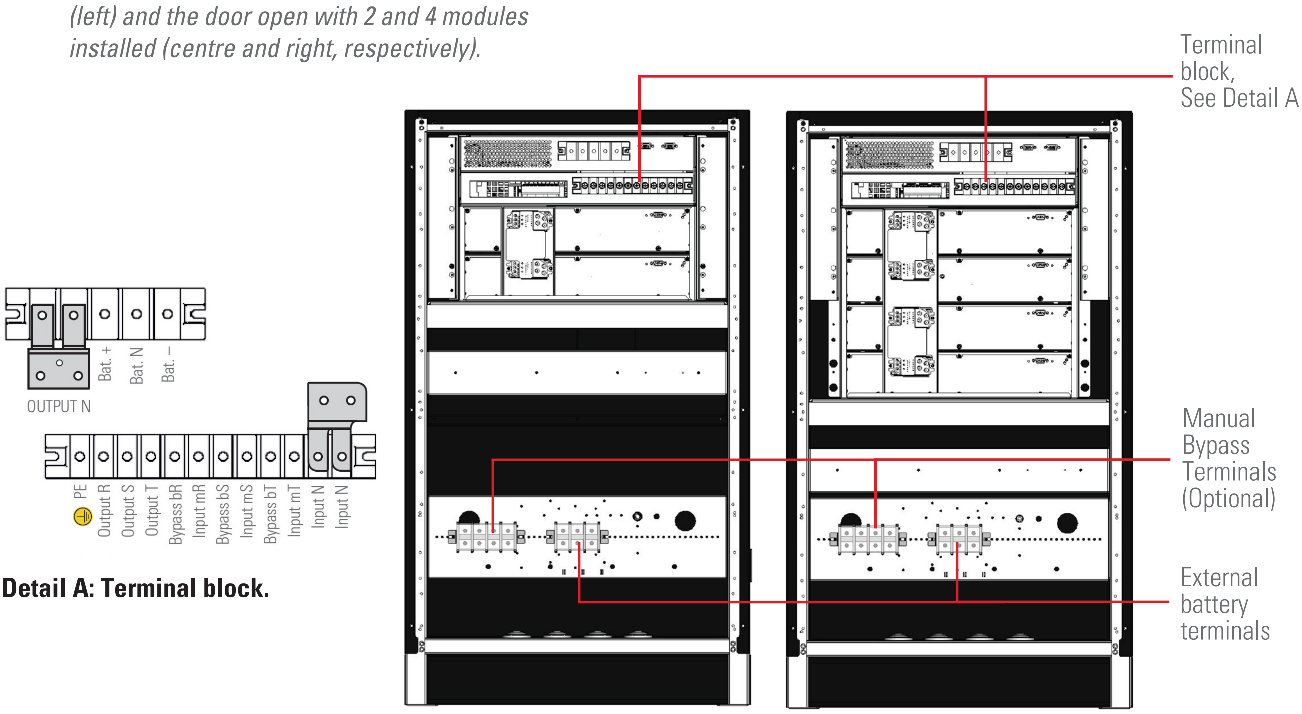


Fig. 2. Rear views of the 24U cabinet with 2 and 4 modules installed and detail A of the terminal block.

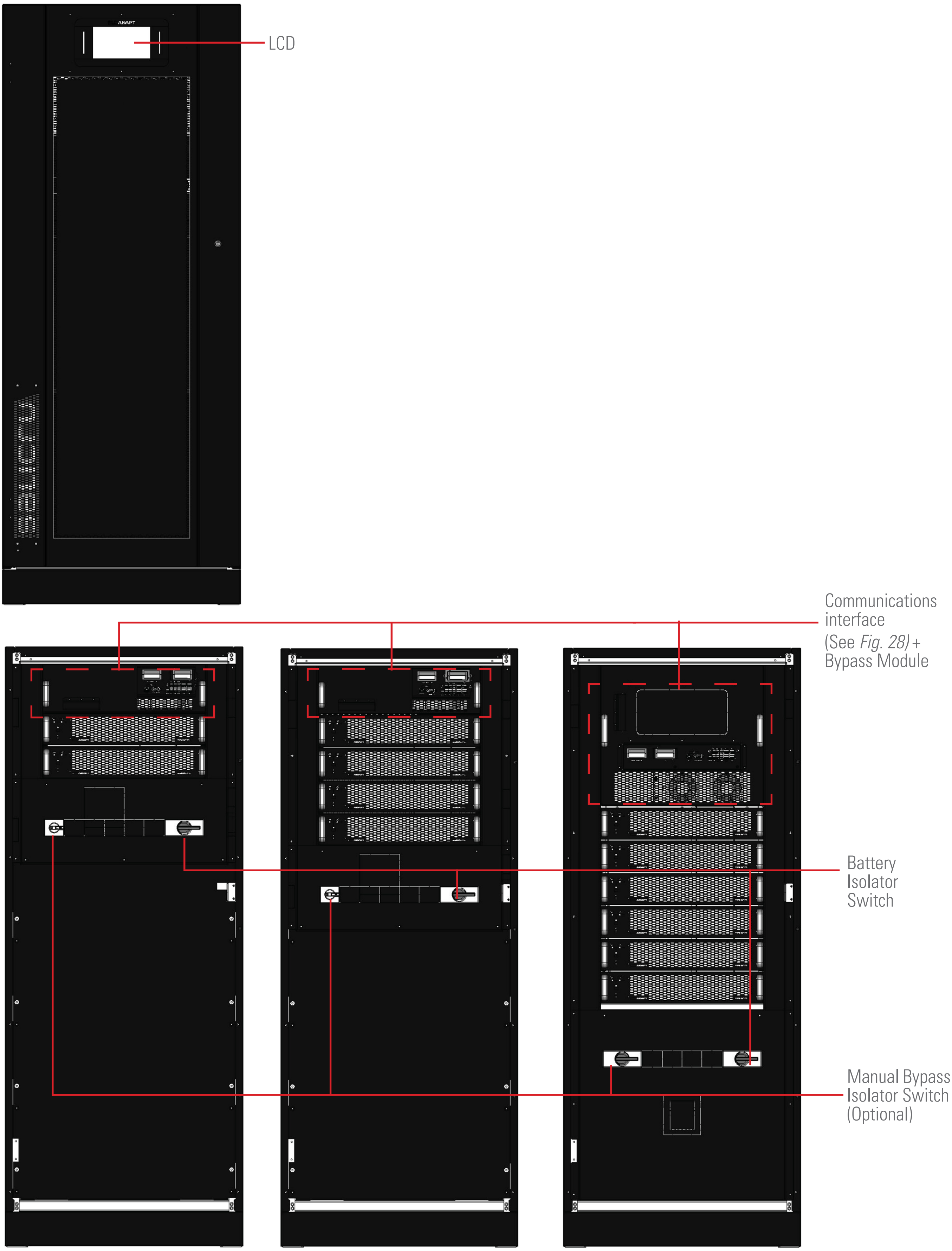
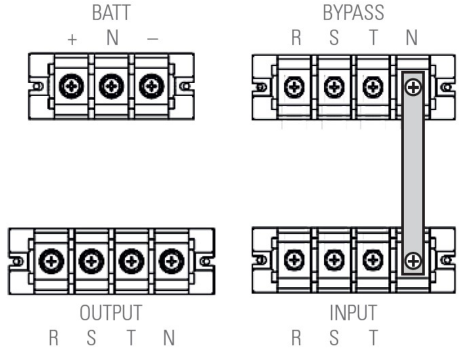


Fig. 3. Front views of the 33U cabinet, with the door closed (above left) and the door open with 2, 4 and 6 modules installed (below).



Detail B: Terminal block.

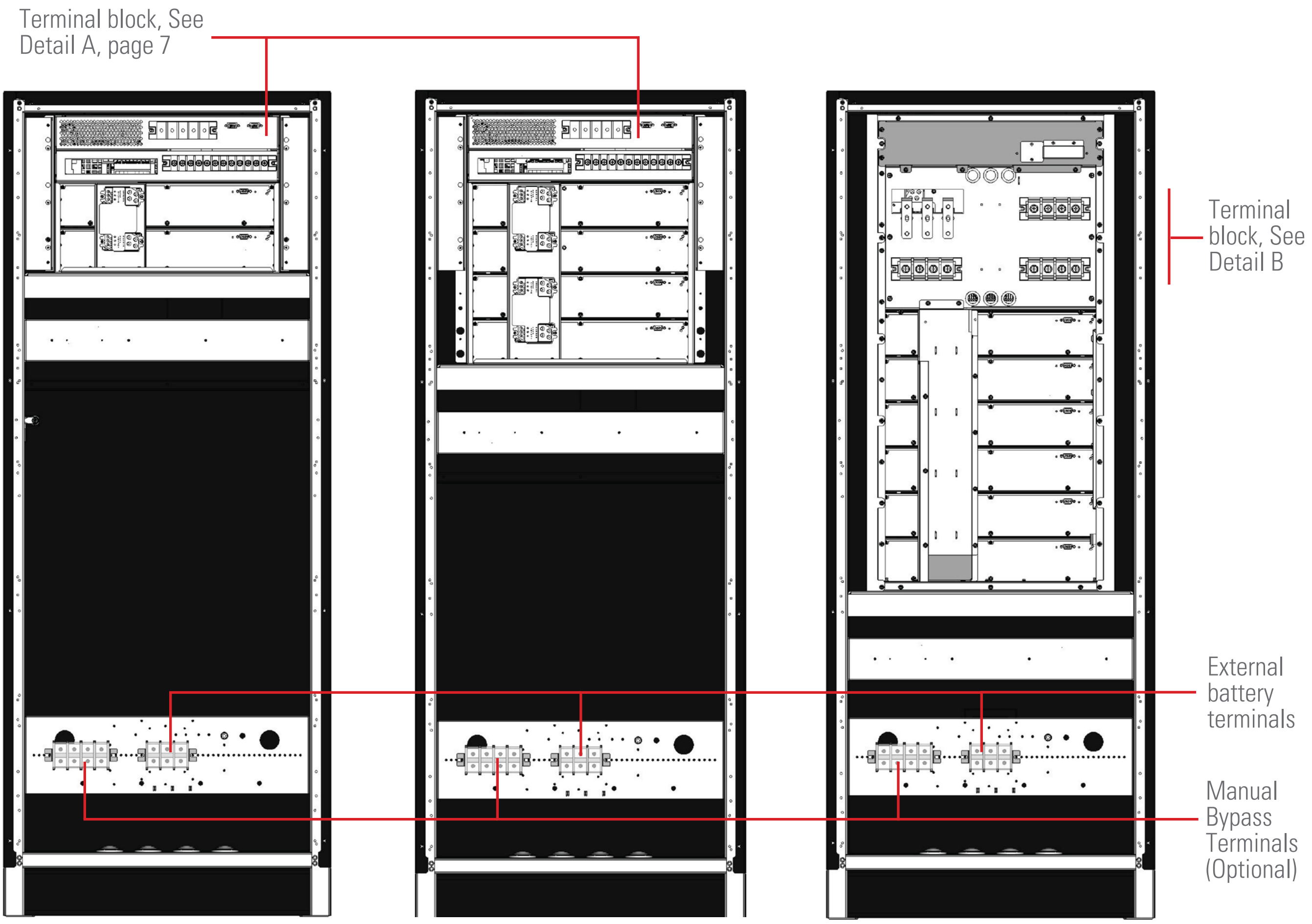


Fig. 4. Rear views of the 33U cabinet with protective cover removed for 2 ,4 and 6 modules installed.

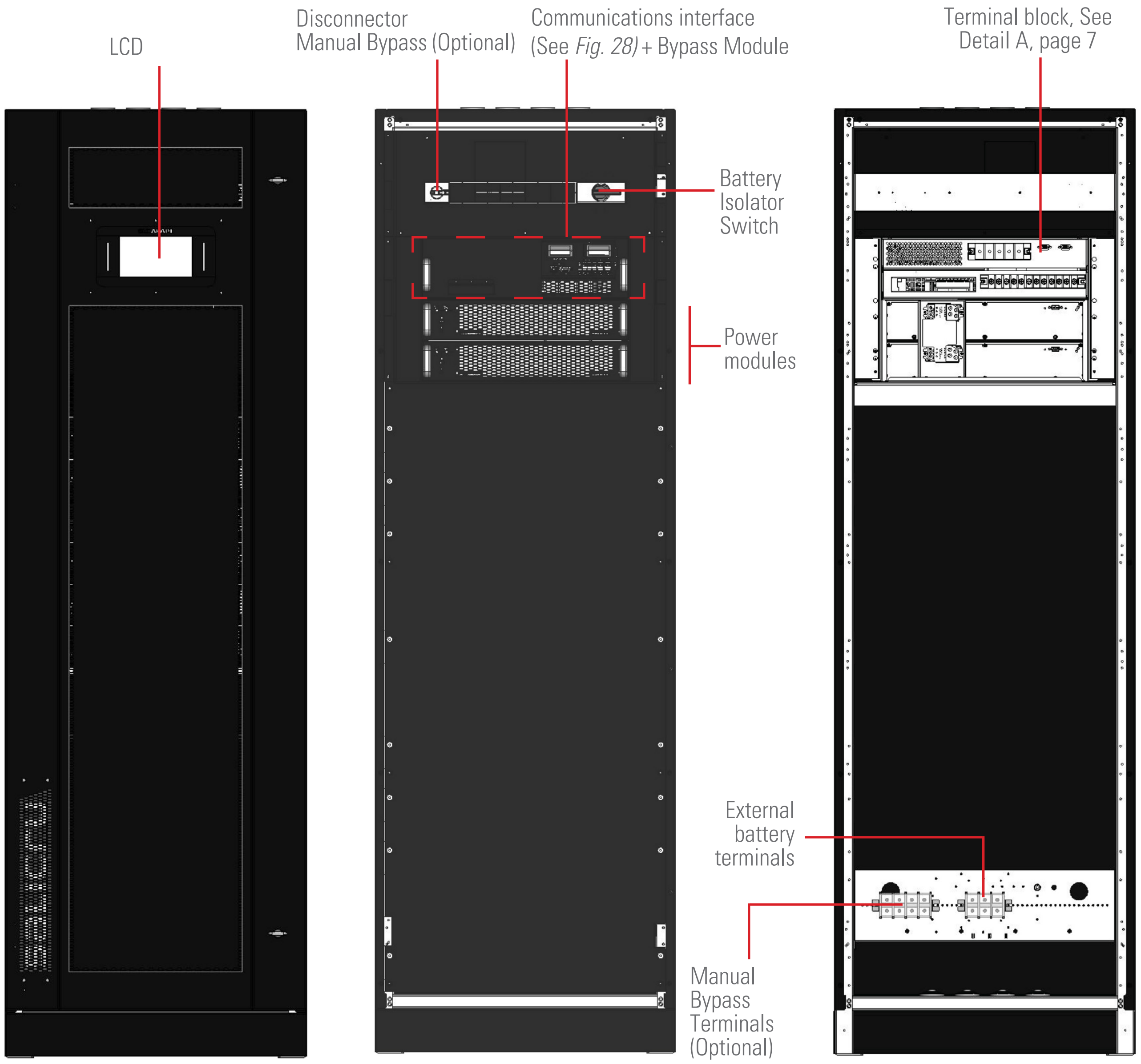


Fig. 5. Front views of the 42U cabinet, with the door closed (left), with the door open and 2 modules installed (centre) and rear view with protective cover removed (right).

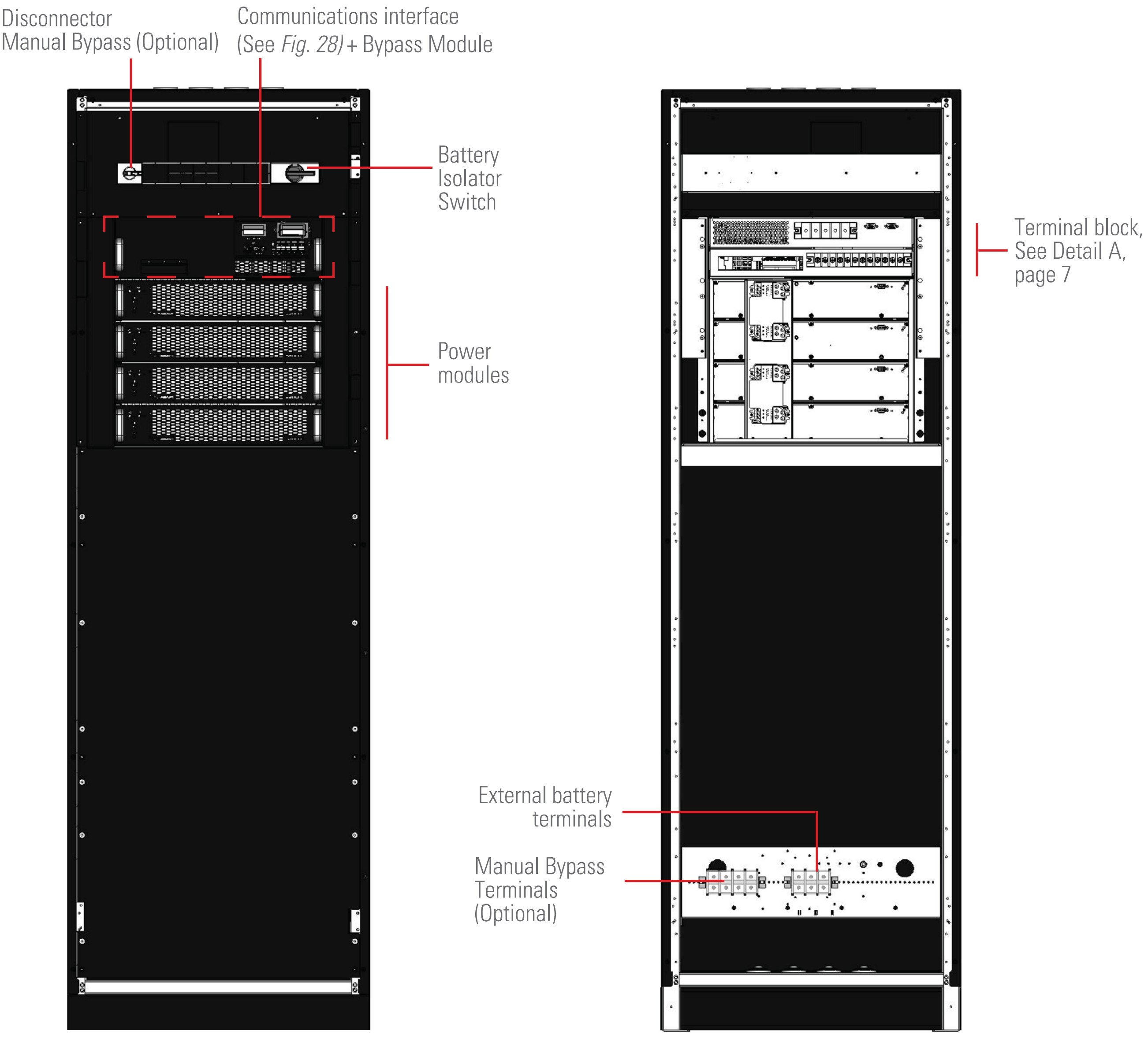


Fig. 6. Front view (left) and rear view (right) of the 42U cabinet with 4 modules installed.

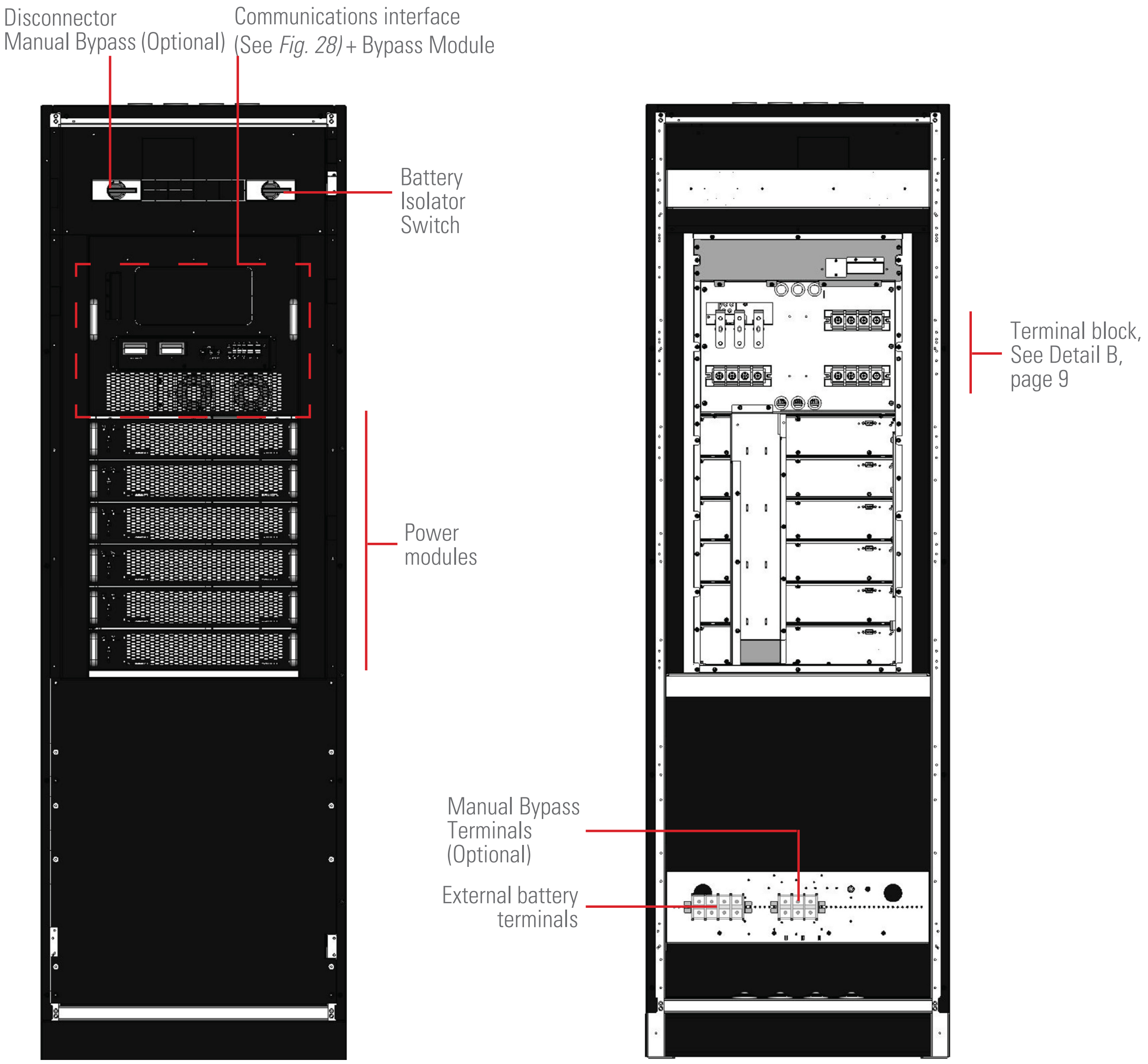


Fig. 7. Front view (left) and rear view (right) of the 42U cabinet with 6 modules installed.

	24U cabinet		33U cabinet		42U cabinet	
	No. and power of modules	Internal batteries	No. and power of modules	Internal batteries	No. and power of modules	Internal batteries
20 kVA (12 kVA*)	2 x 10 kVA	Yes	2 x 10 kVA	Yes	2 x 10 kVA	Yes
30 kVA (18 kVA*)	2 x 15 kVA	No	2 x 15 kVA	Yes	2 x 15 kVA	Yes
40 kVA (24 kVA*)	4 x 10 kVA	No	4 x 10 kVA	Yes	4 x 10 kVA	Yes
45 kVA (27 kVA*)	3 x 15 kVA	No	3 x 15 kVA	Yes	3 x 15 kVA	Yes
60 kVA (36 kVA*)	-	-	6 x 10 kVA	No	6 x 10 kVA	Yes
90 kVA (54 kVA*)	-	-	6 x 15 kVA	No	6 x 15 kVA	Yes

Table 1. Total available power depending on the height of the cabinet and the number of modules.

(*) Power when using a three-phase input of 3x208 V o 3x220 V.
10 kVA module = 6 kVA (FP=1).
15 kVA module = 9 kVA (FP=1).

4.1.2. Battery cabinets

Views of the three available battery cabinets, one for each height of UPS (24, 33 and 42U).

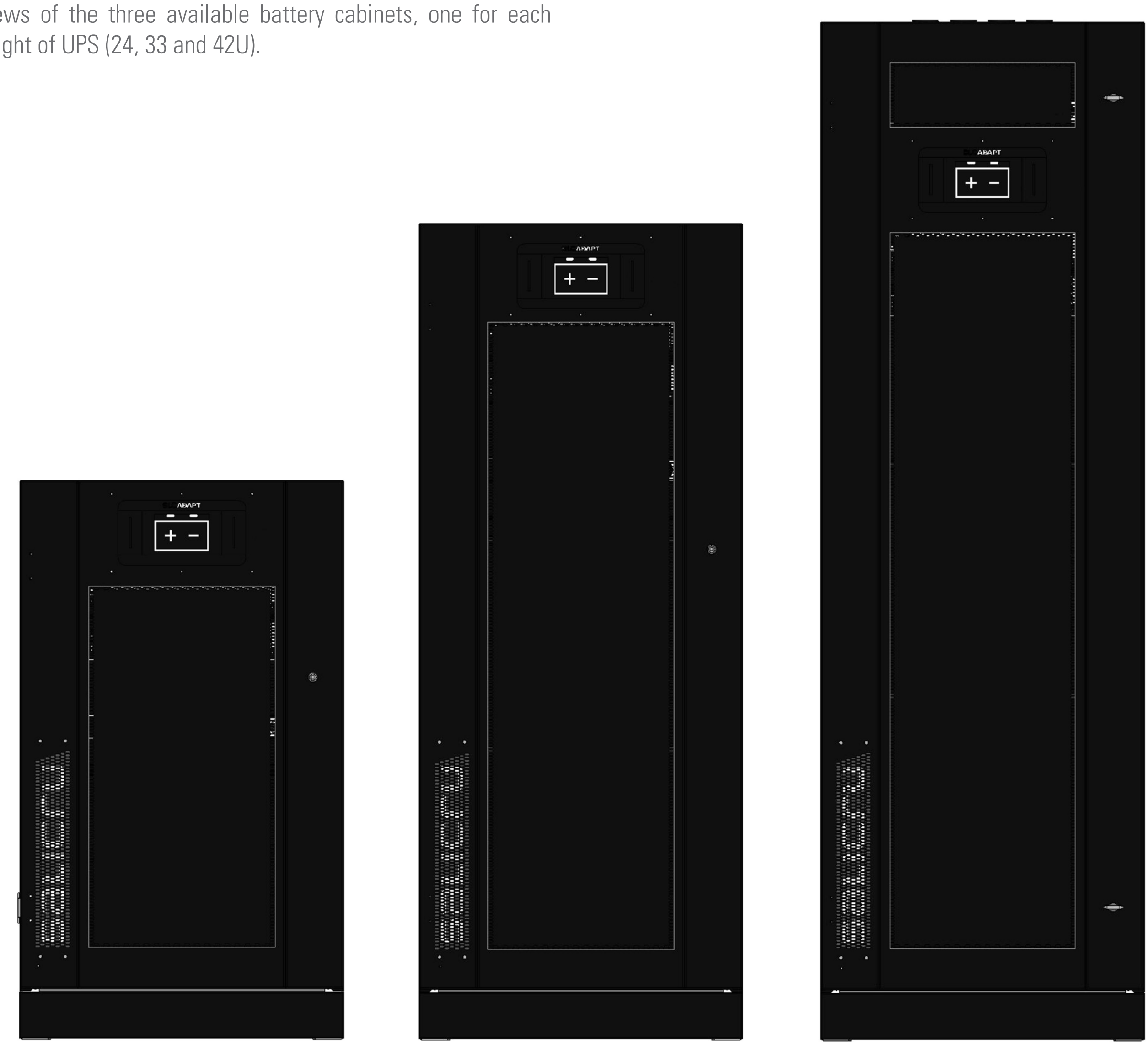


Fig. 8. Front views of the 24, 33 and 42U battery cabinets.

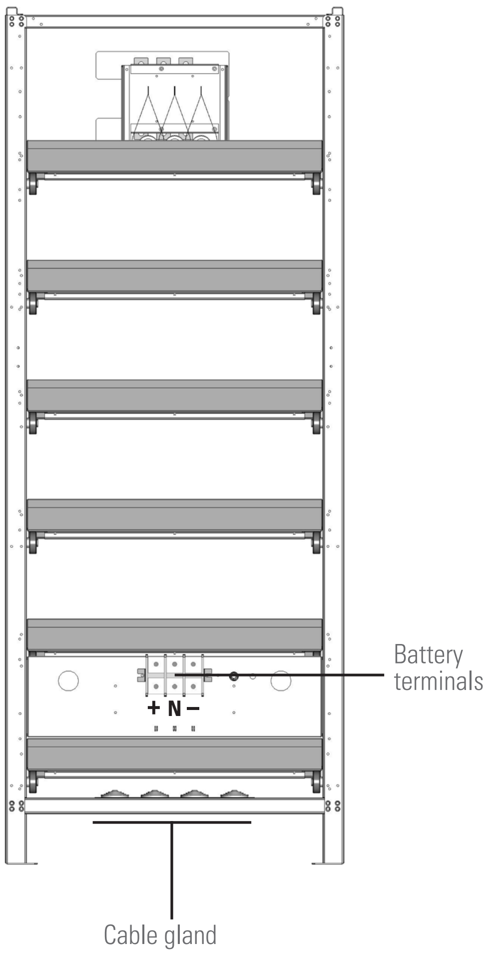


Fig. 9. Rear view of battery cabinets.

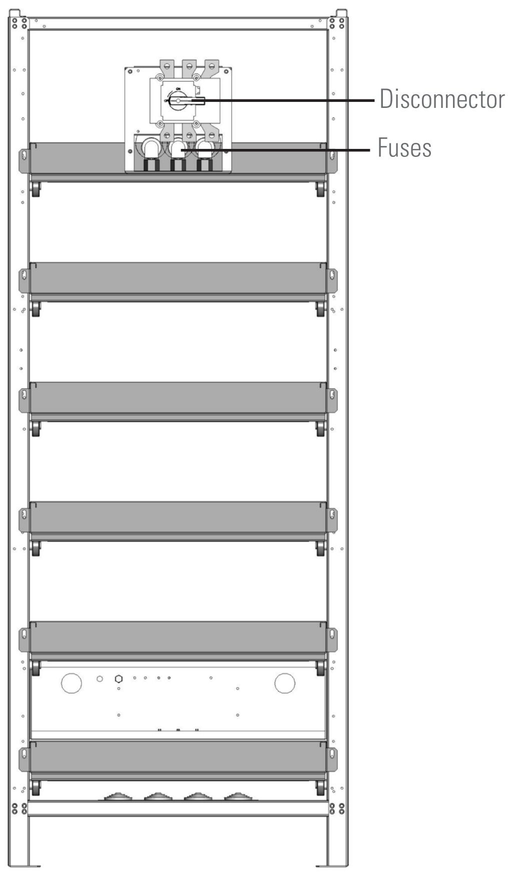


Fig. 10. Front view of battery cabinets.

4.2. DEFINITION OF THE PRODUCT.

4.2.1. UPS and battery module nomenclature.

SLC-4+1/6-ADAPT2 60X R P2LBDS B1 0/36AB165 COW EE666502

EE*	Special customer specifications.
W	Private-label device.
CO	Marking "Made in Spain" in UPS and packaging (for customs).
165	Last three digits of the battery code.
AB	Letters of the battery family.
36	Number of batteries in a single branch. For common battery set, all of them will be indicated in the system.
0/	Device ready for backup or batteries requested.
B1	UPS or cabinet with external batteries.
S	Ambient temperature sensor.
D	Transient protection filter.
B	Independent bypass line.
	Input-output configuration, three-phase-three-phase.
L	Input-output configuration, single-phase-single-phase.
M	Input-output configuration, single-phase-three-phase.
N	Input-output configuration, three-phase-single-phase.
2	Number of UPSs in parallel.
P	Parallel kit (material for paralleling UPSs or cabinets).
R	In sub-rack format (not integrated inside cabinet).
Y	IP20 protection rating with open door and keyless lock.
X	Sub-family of the ADAPT series (2U modules)
60	Maximum power installable in UPS or in cabinet, in kVA.
ADAPT2	UPS Series.
6	Maximum number of modules installable in UPS or in cabinet.
+1/	Redundant modules. Disregard if none.
4	Number of factory modules installed, except redundant ones.
SLC	Acronym abbreviation brand.
CF	Frequency converter 50/60 or 60/50 Hz.

MB ADAPT2 3A-0/2x36AB165 100A COW EE666502

EE*	Special customer specifications.
W	Private-label device.
CO	Marking "Made in Spain" in UPS and packaging (for customs).
100A	Protection size.
165	Last three digits of the battery code.
AB	Letters of the battery family.
36	Number of batteries in a single branch
*x	Number of parallel battery branches. Disregard for one.
0/	Device ready for backup or batteries requested.
A	Cabinet type (A: AM262; B: AM261; C: AM263; D: AM264)
3	Number of cabinets in the battery configuration.
ADAPT2	UPS Series.
MB	Battery module.

(B1) The device is supplied without batteries and without the accessories (screws and electric cables). Predictably the batteries will be installed in an external cabinet or rack. On request, the cabinet or rack and the necessary accessories can be supplied. For equipment ordered without batteries, their acquisition, installation and connection will always be borne by the customer and **under their responsibility**. **However, our T.S.S.** may be required to intervene in order to carry out the necessary installation and connection work. The data concerning the batteries in terms of number, capacity and voltage are indicated on the battery label attached alongside the device rating plate; **strictly observe** these data and the connection polarity of the batteries.

For devices with an independent static bypass line, a galvanic isolation transformer must be inserted between any two power lines of the UPS (rectifier input or static bypass) to prevent direct connection of the neutral of the two lines through the internal connection of the device. This applies only when the two power lines come from two different networks, such as:

- Two different electricity companies.
- An electricity company and a power generator, etc.

4.3. GENERAL DESCRIPTION.

The SLC ADAPT2 series is classified as an on-line double-conversion uninterruptible power supply with DSP control and three-level IGBT inverter technology, with a flexible modular topology.

Reliability: The DSP ("Digital Signal Processor") control applied to the three-level PWM technology increases the system performance without requiring the switching frequency to be reduced. This provides advantages associated with the absence of switching noise and, together with the redundancy of the modules, manages to notably increase the availability of the system and of power to the critical loads, a parameter that contributes to achieving a good TIER classification for the entire system.

Availability: Its "hot-swap" modules can be added or replaced during operation, thereby improving mean time to repair (MTTR) and reducing maintenance costs. Moreover, both the touch-sensitive control display ("Touch Panel") and the bypass module can be hot-swapped without affecting the operation of the device. Finally, remote system management, which can be integrated into any platform, facilitates system management, and the extensive back-up options available, along with intelligent battery charging, ensure continuous operation of the protected critical loads.

Modularity: This allows simple configurable solutions from 10 to 90 kVA by installing 10 or 15 kVA modules in the 3 subracks of 2, 4 or 6 slots available for all cabinets. As composite solutions, a certain number of modules can be paralleled, depending on the model, to obtain higher power systems or "N+n" redundant configurations. Either way, it is only possible to install identical modules in the same cabinet and/or parallel cabinets of identical characteristics.
Table 2 shows a summary of the possible system configurations, enabling gradual and scaled growth for future expansions depending on the need for "pay as you grow" protection, improving the total cost of ownership (TCO), while obtaining a high level of flexibility.

At operational level, a system consisting of 'N' modules or different systems connected in parallel is considered a single UPS. Any expansion or structural change to the number of modules is possible even during normal operation and without needing to shut down the hot-swappable system, all with the simple use of a screwdriver to remove or tighten the fixing screws of the module(s).
Although all of the UPS modules incorporate a battery charger that can allocate up to 20% of its rated power to maintain them at an optimum charge level depending on the type and number of elements, 15 A battery charger modules are available to be installed with the 10 or 15 kVA ADAPT2 modules.
As many charging modules as considered appropriate can be installed, but this will be to the detriment of the total number of UPS modules and, consequently, to the maximum power of the system, which will be reduced.

Input-output configurations: A system made up of 10 kVA or 15 kVA modules can be implemented with different input-output types, or it can be modified in-situ by our **T.S.S.** and/or distributors. The types available are as follows:

- Three-phase/three-phase.
- Single-phase/single-phase.
- Single phase/three phase.
- Three-phase/single-phase.

The user is not allowed or authorised to change the configuration, since this involves the modification of strips between the power terminals by the addition or removal of same to obtain the required configuration, plus changes in the variables of the password-protected access menus via the control panel.

Autonomy: The capacity of the batteries determines the backup time of the system when replacing the usual source of energy during mains failures. The accumulator bank is always common to any modular system.
Batteries owned by the customer or supplied with the UPS, and depending on different factors in addition to the power and/or backup time requested, can be installed in a rack or one or more cabinets, or in the module cabinet itself.

Power per module (kVA)	Slots per UPS	Power range (kVA) / No. of modules installed in the slots (min. - max.)				Max no. of UPSs in parallel	Power range (kVA) for type III / III / Min. - max. no. of UPSs in parallel (**)
10 / 6 (*)	2	10.. 20 / 1.. 2				9	40.. 180 / 2.. 9
	4	10.. 40 / 1.. 4				7	80.. 280 / 2.. 7
	6	10.. 60 / 1.. 6				5	120.. 300 / 2.. 5
15 / 9 (*)	2	15.. 30 / 1.. 2	-	-	-	9	60.. 270 / 2.. 9
	4	15.. 45 (**) / 1.. 3	-	-	-	7	90.. 315 / 2.. 7
	6	15.. 90 / 1.. 6	-	-	-	5	180.. 450 / 2.. 5
Type		III / III	I / I	I / III	III / I		
Input/output voltage		Input/output voltage (V): 3x380.. 3x415 (three phases + N) or 220.. 240 (phase and N)					

(*) Modules power at 3x220 V, see *Table 3*

(**) Although 4 modules can be installed, due to the limits of the static bypass, only 3 of them can operate, so the system can at most be configured as 3+1 (45 + 15 kVA).

Table 2. Configurations and power ranges.

Module	3x400 V			3x208 / 3x220 V		
	Power rating	FP out	No. of batteries	Power rating	FP out	No. of batteries
MP10X	10 kVA / 10 kW	1	2x16/../2x22	6 kVA / 5.4 kW	1	2x11
MP15X	15 kVA / 15 kW	1	2x16/../2x22	9 kVA / 8.1 kW	1	2x11

Table 3. Module power vs input voltage.

4.3.1. Introduction.

The SLC ADAPT2 series of UPS basically consists of:

- Cabinets with 2, 4 or 6 slots to install the power modules.
- Power modules, consisting of the following blocks:
  - ❒ AC/DC PFC rectifier.
  - ❒ Battery charger.
  - ❒ DC/AC inverter.
  - ❒ Digital control.
- Centralised bypass module: control of UPS and parallel parameters.
- Maintenance bypass (optional).
- Control panel with touch screen (see section 7 for more information).
- Batteries (Number, type and location depending on the back-up time).
- Self-supporting 24, 33 and 42U cabinets to hold the different power modules.

4.3.2. Architecture.

4.3.2.1. Structural diagram.

Fig. 11, by way of example, shows a single-line diagram of the device with three-phase input and output.

All UPS units are structured according to the same criteria, with separate terminals for the PFC-rectifier power supply and the static bypass. However, unless otherwise requested, the terminals of the phases of both blocks are connected in the factory by means of bridging strips to provide a single common input.

When separate power supplies are required, it is obligatory to remove the bridging strips between the phases of the two blocks before connecting the power cables, leaving only the connection strip joining the neutral terminals.

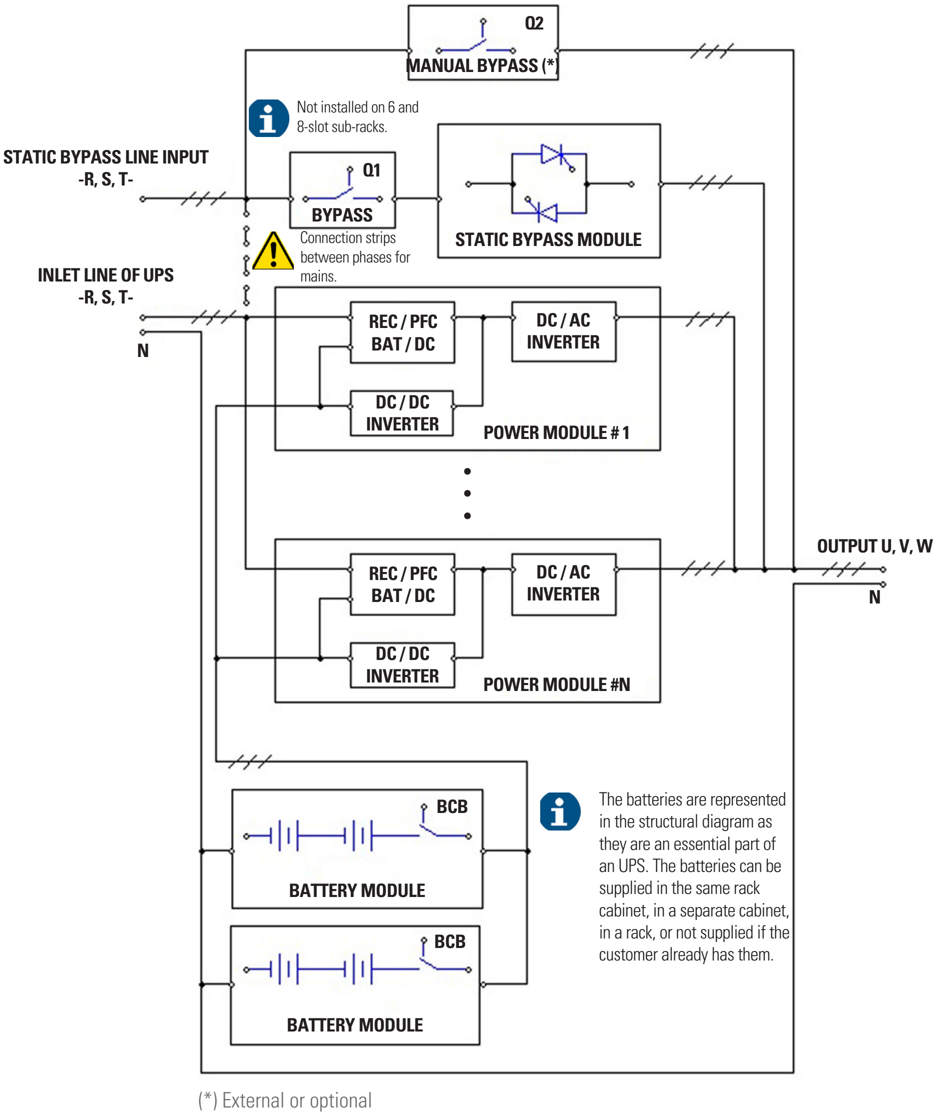


Fig. 11. Single-line structural diagram by way of example.

4.3.2.1.1. Power modules (PM).

Power modules are the basic core of all SLC ADAPT2 systems. Apart from the static bypass block and LCD touch screen, each power module contains all of the converters and functionalities of a traditional UPS. Since this equipment is designed to use a variable number of modules, depending on the cabinet used, a multi-parallel system is obtained with behaviour equivalent to that of a single mono-bloc UPS plus the advantages of a modular UPS. The system supplies power to the critical loads (such as communication and data processing equipment) with uninterrupted high quality AC power. The power supplied by the unit is stable, without voltage and/or frequency variations and free from other disturbances such as cuts or micro-cuts, sine wave alterations or electrical noise, anomalies commonly present in the commercial AC network.
This is achieved through the double-conversion and high frequency Pulse Width Modulation (PWM), in combination with a digital control based on a Digital Signal Processor (DSP), which provides high reliability and availability.
As can be seen in *Fig. 11*, the AC power supplied to the UPS input is converted into DC voltage. This voltage supplies a converter that transforms the voltage type from DC to AC, clean of disturbances and variations of the AC input mains. If this fails, the PFC rectifier changes the input source of the AC mains to that of the batteries, powering in the same way through the output of the UPS to the load for a limited time, that of the backup determined by the battery pack.

4.3.2.1.2. Static bypass.

Static transfer switch.
In the event of inverter failure, overload or over-temperature, the voltage connected to the static bypass line can supply power to the load connected to the UPS output.
The static bypass module identified in *Fig. 11* contains the power management and control circuits that allow the most optimum decision in each scenario to be made, in order to select the most favourable power to the critical load connected to the output of the UPS, either from the inverter or from the static bypass itself.
During normal system operation, the load is connected to the inverter and in case of overload or failure, it will automatically transfer to the static bypass line. In order to provide a clean transfer (without interruption) between the inverter output and the bypass line, they must be fully synchronised during normal operation. This is achieved through real-time digital control of the inverter, so that the frequency of the inverter follows the frequency of the bypass line if the bypass is within the range of acceptable frequencies.
In addition, a Manual Bypass, which is very useful during periods of maintenance or failure, can be included (internal or external), allowing continuous powering of the critical load while the UPS is out of service.

⚠ When the UPS is operating in bypass mode (over static bypass), connected devices are not protected against power cuts or micro-cuts, overvoltages, voltage and/or frequency variations as they are powered directly from the AC mains.

4.3.2.1.3. Battery charger modules.

The range of UPSs for 10 and 15 kVA modules has 15 A chargers in the same format as the conventional modules. These charger modules can be inserted in any slot in a UPS without having to turn it off.
As many chargers as there are slots available in the UPS can be installed.

4.3.2.1.4. Manual bypass switch for maintenance (optional).

The device has an optional manual bypass switch with a mechanical lock, *Fig. 11,* useful for periods of preventive maintenance or repair. This switch transfers the load power directly onto the AC input mains, allowing the intervention on the UPS without this preventing further feeding of the loads.

⚠ When the UPS is operating in manual bypass mode (maintenance or repair period), the connected devices are not protected against power cuts or micro-cuts, over- voltage, or voltage and/or frequency variations, as they are powered directly from the commercial AC mains.
Before operating this switch it is necessary to transfer the load power over the static bypass through the respective command from the touch screen. The switching of the power mode onto the static bypass and from that to the manual bypass is done without any interruption in the supply to the loads.

The cabinet has a front door that prevents access to unauthorised personnel, especially when safety measures so require (protection against direct contact). As an alternative, these mechanisms can be installed in a wall-mounted “manual bypass board”, which for safety has a door with access restricted to authorised personnel.

⚠ When installing protection devices, their ratings must be appropriate to the currents indicated on the nameplate and to the specifications indicated in Chapter of this document.

4.3.2.2. Parallel system.

4.3.2.2.1. Parallel system considerations.

- All UPS modules have hardware and software that is suitable for and compatible with the requirements of parallel systems.
- Although all modules installed in a cabinet are internally connected in parallel, parallel connection between UPSs is also possible because a communications board is supplied as standard equipment for this function. The resulting power range, according to the input/output type, and the individual power of each module, is shown in *Table 2*.
- The hardware adjustments referring to the change of input and output configuration are reserved exclusively to the manufacturing process itself or subsequent in-situ configuration performed by the **T.S.S.**
- The UPSs are supplied with terminal strips for connecting the power cables and a number of connectors for the control bus and interface signals.
  Using the DB15 signal connectors, the parallel control bus is connected in the form of a closed ring, linking the different UPSs that configure the system in parallel.

Smart parallel logic provides maximum flexibility to the user. For example, stopping the inverter (switching to bypass mode) or starting it up (transfer to inverter mode) can be done from any UPS in a parallel system. In both parallel systems and in a single UPS, transfers from Normal to Bypass modes and vice versa are synchronised. For example, when an overload is detected in a UPS, it is automatically transferred to Bypass. If the overload disappears, the parallel system automatically recovers normal operation, transferring the load from Bypass to the Inverter.

- Standard UPSs are supplied without output protections, so it is necessary to remove the jumper from the **IDG1** terminals (*Fig. 28* for equipment with 2 and 4 slots, and *Fig. 29* for equipment with 6 slots) and connect it to its place the auxiliary contact of the output protection of the subrack. However, if the UPSs already have the output protections (non-standard equipment), the aforementioned auxiliary contact will be already connected from origin.

4.3.2.2.2. Features of the parallel system.

The performance of an SLC ADAPT2 parallel system is similar to a large UPS with the advantage of greater reliability and adaptability. For a system to operate correctly with the load, the following requirements must be met:

1. All of the UPSs must be identical, even though they do not contain the same number of modules.
2. All of the UPSs must be powered by the same AC line.
3. In case of devices with an independent bypass line, the power supply network will be the same for all of them.
4. Both feeds, points 2 and 3, must be referenced to the same neutral potential.

   Isolation transformers are optionally available for installations where the sources do not share the same neutral reference or where it is not available.

4.3.2.3. Sleep operating mode.

- Usually the dimensioning of a modular UPS is based on the power required for the loads, plus the redundant modules estimated with the expression N+n; where "N" is the number of modules permanently in parallel in order to obtain the required rated power and "n" is the number of redundant modules. Beyond this planned over-dimensioning, all the modules operate by load sharing, delivering the same unit power to obtain the total amount required, which implies a lower performance than desired. In order to solve this problem and increase the efficiency of the system, one of the two sleep modes can be activated at the factory or subsequently by the **T.S.S.**:
  - ❒ **"Smart Sleep"**. This advanced technology applied to the ADAPT2 UPS series allows you to seek the maximum performance point even when working with low loads. This is achieved by activating one of two possible modes, although each has a different purpose:
    – Normal Sleep mode. The inverter of the modules is activated but in standby, with its output disconnected from the load. In this way, the "sleeping" modules can be connected to the load in seconds, with no transfer time at all if the Bypass can supply the load during this time.
    – Deep Sleep mode. All the power converters of the modules are completely off with their outputs disconnected from the load. Activation takes several minutes, with no transfer time at all if the Bypass can supply the load during this time.
  - ❒ **"Cycling"**. In addition, the cycling function is available, to allow all of the modules to age at the same rate, by alternating which are active and which are idle. The minimum programmable cycling period is three months.

Distribution of the load in normal operation.

Distribution of loads and cycling of the UPSs.

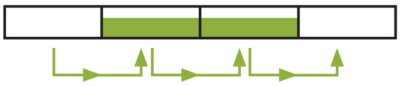


*Fig. 12. **Graphic example of normal operation or cycling.***

4.3.3. Operating statuses.

The modular system described is part of the on-line double-conversion UPS family, with static bypass line and manual maintenance bypass (optional). The available operating statuses are:

- Normal status.
- Battery status.
- Bypass status.
- Manual Bypass status (optional).
- Status - ECO mode.
- Status - Frequency converter (CF) mode.

In the description of the operating statuses, the operation description refers to the PFC-rectifier and inverter parts as functional parts of one module, although there will be as many of them as there are modules connected in parallel.

In the following diagrams, when the manual bypass switch is mentioned, it must be remembered that this, when it exists, will always be external or optional.

4.3.3.1. Normal status.

The inverters of the power modules installed in the UPS feed the critical load. The PFC-rectifier, which is supplied by the AC mains, simultaneously supplies direct current to the inverter and the battery charger, which maintains them in an optimal state of charge.

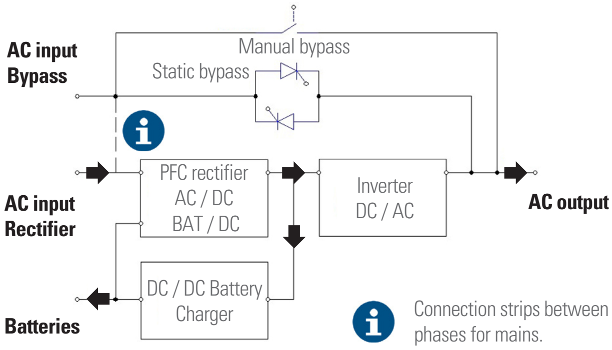


*Fig. 13. **Flowchart in Normal status.***

4.3.3.2. Battery status.

This mode is activated in the event of any fault in the AC mains, in which the PFC-rectifier switches its AC mains input power to the battery. The inverter, powered from the batteries, supplies power to the critical load. This automatic transition from "Normal Mode" to "Battery Mode" is performed without any interruption of the output voltage.

When the AC mains voltage returns, "Normal Mode" is automatically reset without any intervention.

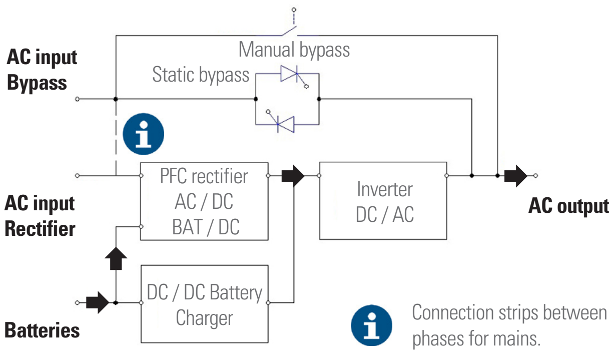


Fig. 14. Flowchart in Battery status.

If there is a failure of the AC input power for an extended period of time, the battery may reach the end of backup -EOD- and the inverter will switch off, leaving the critical loads without power. If the "Auto Recovery after EOD" (factory default) UPS setting is set, the device will restart after the set time after the AC power is restored.

4.3.3.3. Bypass state.

If the inverter overload capacity is exceeded in "Normal Mode", or in cases where the inverter-PFC-rectifier set can not supply power to the load for any reason, including manual switch-over, the "Bypass Mode" will be activated automatically without interruption of service at the output.

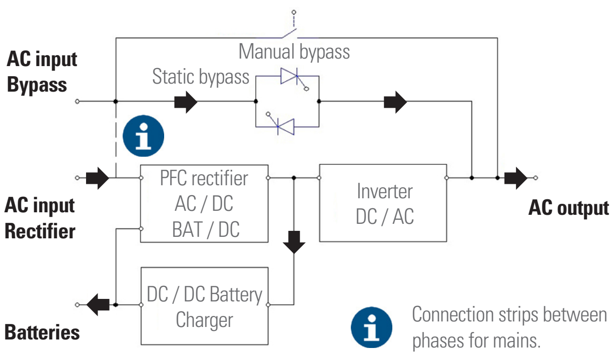


Fig. 15. Flowchart in Bypass status.

If the inverter is not synchronised with the bypass, this transition will be made with a short interruption at the output of a few milliseconds to avoid the occurrence of high current peaks due to the paralleling of non-synchronised alternating voltage sources. The time of this interruption is variable, the typical value being less than ¾ parts of the input signal cycle (less than 15 ms for 50 Hz and 12.5 ms for 60 Hz).

4.3.3.4. Manual Bypass status (external or optional).

If the UPS requires intervention due to breakdown or for maintenance (for example, because an anomaly has been detected in a power module, the bypass or the LCD screen), there is the possibility of continuing to supply the loads through the internal manual bypass (maintenance bypass).

When the UPS is operating in "Manual Bypass Mode" (maintenance or repair period), the connected equipment is not protected against power cuts or micro-cuts, overvoltages, voltage and/or frequency variations, etc., since it is being supplied directly from the commercial AC mains.

DANGER: During manual bypass mode, the input, output and bypass terminals (version B) are live even if all modules are switched off.

It is recommended in this operating mode:

- Remove the fastening screws of all power, control and bypass modules.
- Slightly pull the handles on each one until they are protruding by about 4-5 cm from their housing in order to enable them to be unplugged from their connector located on the backplane of the device.

Before any change of operating mode and after carrying out the possible corrective actions, it is necessary to correctly insert the modules to their original position and fix them with their screws.

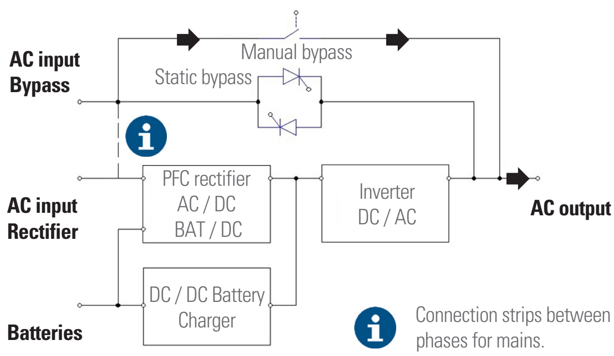


Fig. 16. Flowchart in manual bypass status (external or optional maintenance bypass).

4.3.3.5. Status - ECO mode.

This is a special operating mode, activated in the configuration, to improve the efficiency of the system. The load will be fed directly from the AC mains through the bypass line, provided the voltage and/or the input frequency are acceptable. The inverter that is in Standby mode will start up and power the load whenever the voltage and/or frequency of the commercial AC mains goes outside the established nominal margins. The performance in the ECO Mode can reach up to 98%.

During the transfer of the load on the inverter from ECO mode, a small interruption (less than 10ms) occurs. It is very important to ensure that the critical load fed into this UPS mode, tolerates that interruption time.

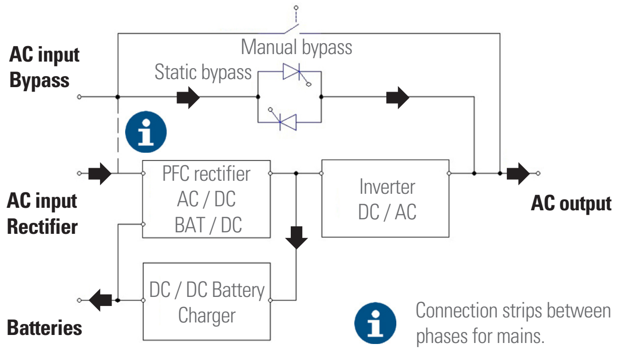


*Fig. 17. **Flowchart in ECO status.***

4.3.3.6. Status - Frequency converter (CF) mode.

When operating in this mode, activated in the configuration, the device supplies a fixed output frequency of 50 or 60 Hz, which may be different from the input power frequency. When operating in this mode, the UPS's static bypass is inhibited and the manual bypass switch should not be operated, due to the consequences this could have on the loads connected to the output.

4.3.4. Battery management (factory default settings).

4.3.4.1. Basic functions.

- **Charging at constant current**.
  The battery charge current corresponds to the formula $\underline{I_{ch} = Kc \times C}$, where Kc is a configuration parameter with a value between 0.01 and 0.3.

  The UPS is designed to provide 100% of its rated power to the load and additionally has a unique reserve power to charge the batteries that can be set between 0 and 20% of the rated power of the UPS, depending on the capacity of the batteries and the charging current.
- **Fast charging at constant current**.
  This voltage can be adjusted according to the requirements of the battery type. For example, for valve-regulated lead-acid batteries (VRLA), the maximum fast charge voltage should not exceed 2.4 V / cell.
- **Float charging**.
  The float voltage can be adjusted for the type of batteries. For -VRLA- batteries, the float voltage must be between 2.2 V and 2.3 V. By default it is set to 2.25 V.
- **Compensation of the floating voltage according to temperature**.
  The compensation value of this voltage can be adjusted according to the temperature and type of batteries. To do so, it is necessary to install the supplied temperature sensor in the battery cabinet. The compensation range per cell is 0 to 5 mV / ºC and the default value is 3 mV / ºC.

4.3.4.2. Advanced functions.

- **Low battery alarm**.
  The low battery alarm is activated prior to the end of discharge -EOD- alarm. When activated, it has a few minutes of backup at full load.
- **End of discharge protection -EOD-**.
  When the battery voltage reaches this minimum value, the accumulator block is disconnected to avoid the deep discharge that could irreversibly damage them. There are two voltage levels of end of discharge and the actual is calculated by interpolating the following two values:
  - ❒ -EOD- Voltage / Cell @ 0.6 C Discharge current. By default 1.65 V / cell.
  - ❒ -EOD- Voltage / Cell @ 0.15 C Discharge current. By default, 1.75 V / cell.

  The end of backup voltage values are factory configurable from 1.6 to 1.75 V / cell.
- **Battery protection disconnection alarm -MCB-**.
  This alarm will be available when using the mechanism provided for the external batteries, a circuit breaker -MCB- with an auxiliary contact. The alarm will be activated if the battery protection -MCB- is switched off.

5. INSTALLATION.

- Read and respect the Safety Information described in Chapter *2* of this document. Failure to obey some of the instructions described in this manual can result in a serious or very serious accident to persons in direct contact or in the vicinity, as well as failures in the device and/or loads connected to it.
- The cross sections of the cables used for installation must be in accordance with the currents indicated on the nameplate, in compliance with local and/or national low-voltage electrotechnical regulations.
  These currents will also determine the minimum sizes of the equipment's protection devices, which will be in accordance with to the selectivity indicated in Chapter of this document.
- This chapter presents the relevant requirements to place and wire the SLC ADAPT2 modular series of UPSs. As each site has its own placement and installation characteristics, it is not the purpose of this chapter to provide precise step-by-step instructions, but rather to be used as a guide for general procedures and practices to be observed by **qualified** personnel (as defined in safety instructions EK266*08).

5.1. RECEPTION.

- All cabinets are supplied mechanically attached to wooden pallets, with a cardboard or wooden casing, according to model. While the risk of tipping over is minimised, these must be handled with caution, especially those with 6 slots, because of their greater height, and especially when there is a slope.
  - ❒ It is dangerous to handle the equipment carelessly when it is on the pallet, as it could overturn and cause serious or very serious impact injuries to operators, falling onto them and/or trapping them. Pay attention to section 1.2.1. of the safety instructions -EK266*08- in all matters relating to the handling, movement and siting of the unit.
- Use the most suitable means to move the UPS while it is packed, with a pallet jack or forklift.
- Whenever the manipulation is manipulated, the weights indicated in Chapter in the technical characteristics, according to model, must be taken into account.

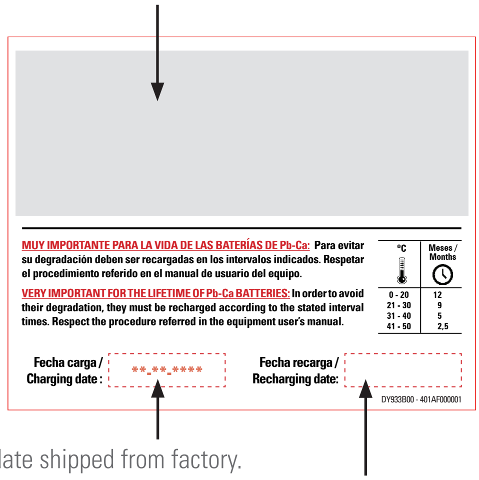
5.1.1. Reception, unpacking and contents.

- Reception. Check that:
  - ❒ The data on the label affixed to the packaging corresponds to that specified on the order. Once the UPS is unpacked, check the previous data with those of the device nameplate.
    If there are discrepancies, report the issue as soon as possible, citing the device's manufacturing number and delivery note references.
  - ❒ It has not suffered any mishaps during transportation (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 verify the contents it is necessary to remove the packaging.
    Complete the unpacking according to the procedure in section *5.1.3.*
- Contents.
  - ❒ The equipment itself, consisting of a certain number of power modules.
  - ❒ Additional UPS cabinets, if any, for parallel connection, and the connection bus cables.
  - ❒ The battery cabinets, if any, to be connected to the UPS cabinets.
- Once the reception is completed, it is advisable to re-pack the UPS until it is put into service in order to protect it against mechanical shock, dust, dirt, etc.

5.1.2. Storage.

- The device storage shall be done in a dry, ventilated place and protected from rain, dust, water splashes or chemical agents. It is advisable to keep each device in its original packaging as it has been specifically designed to ensure maximum protection during transport and storage.
- Do not store the equipment where the ambient temperature exceeds the thresholds given in chapter .
- When a battery pack is supplied with the UPS cabinet, either in a cabinet, loose to be installed in your own cabinet, on a rack or in any other way and not immediately installed together, it should be stored in a cool, dry and ventilated place at a controlled temperature of between 20 and 25°C.
  - ❒ In general and except in particular cases when batteries are supplied they are hermetically sealed lead-calcium batteries. To avoid degradation during storage, they must be recharged at the indicated intervals according to the temperature to which they are exposed (see date of last charge noted on the label affixed to the packaging of the battery unit *Fig. 18*).

Model information label.



Charge date shipped from factory.

Space to write down the date of the new recharge.

*Fig. 18. **Label on the packaging of the battery pack.***

- ❐ After the indicated time period has elapsed, connect the batteries to the device and this to the mains, following the safety and connection instructions.
- ❐ Proceed to commissioning. See chapter *6*.
- ❐ Leave it in this mode for at least 12 hours.
- ❐ Once the battery recharging is complete, turn off the equipment, disconnect it electrically and store the UPS and batteries in their original packaging, noting the new date of recharge of the batteries in the box on the label (see *Fig. 18*).
- ❐ Units that are part of a parallel system will be treated as individual device for battery recharging and therefore no additional connection is required.

5.1.3. Unpacking.

- The packaging of the equipment consists of wooden pallet, a carton or wood box, as appropriate to the case, polystyrene foam (EPS) or polyethylene foam (EPE) corner protectors, and polyethylene sheath and strap, all of these being recyclable materials; so if you are going to dispose of them, you must do so according to applicable regulations. We recommend storing the packaging in case it should be used in the future.
- As an example, *Fig. 19* to *Fig. 21* show the illustrations corresponding to a 6-slot cabinet.

Fig. 19. Example of transfer of packed ADAPT 2 with pallet jack.

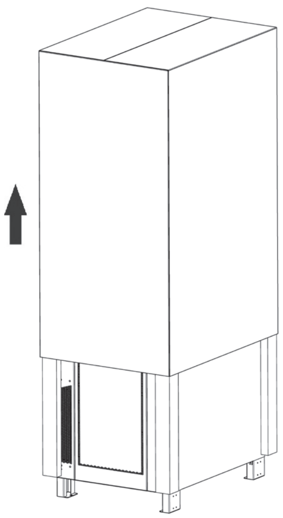


Fig. 20. Example of removal of cardboard box.

- To unpack the device, cut the straps of the cardboard box and remove it as if it were a cover (see *Fig. 19* and *Fig. 20*) or disassemble it with the necessary tools if the casing is made of wood; remove the corner protectors and the plastic sheath.
- Only equipment in sub-rack format is packed onto pallets.

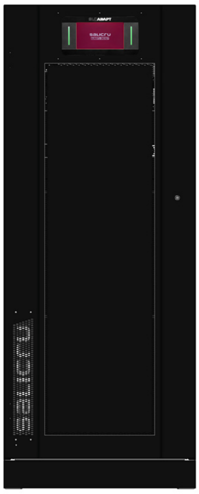


Fig. 21. Device unpacked by way of example.

5.1.4. Transport to the site.

- If the receiving area is remote from the installation site, it is recommended to move the ADAPT2 using a pallet truck or other suitable means of transport, assessing the distance between the two points, the weight of the unit, the characteristics of the passageway and site (soil type, soil resistance kg/m^2, etc.).
- However, when the distance is considerable, it is recommended to move the packaged device to the immediate vicinity of the installation site and its subsequent unpacking.

5.2. LOCATION.

5.2.1. Location of the ADAPT2.

- The following premises will be taken into account when locating an ADAPT2 modular UPS, as this is a safety device for electrical power supplies and its mission must not be prevented or invalidated:
  - ❐ Not suitable for outdoor installation. Degree of protection by default IP20.
  - ❐ The location will be in a ventilated room, controlled temperature and humidity to maintain the device in the environmental parameters within the specified operating range. The cooling capacity of the air conditioner shall be selected according to the heat losses of the UPS and other devices in the same room.
  - ❐ The room will have adequate filters to prevent environments with dust or lint from contaminating the device and adversely affecting its proper operation or generating, as a result, direct or indirect fire, and have strict preventative maintenance control.

This control will be more rigorous, exhaustive and appropriate to the circumstances, when there may be a dusty environment with conductive materials in suspension.

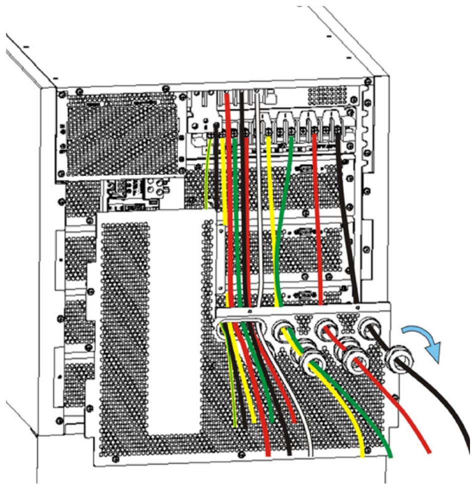
- ❒ The modules are equipped with three internal speed-regulated fans. The air flow is channelled from the front to the rear. Do not block the ventilation holes or obstruct the air circulation.
  The modules can be fully integrated into a rack cabinet since they have no ventilation grilles on their sides.
- ❒ To allow comfortable operation of personnel, it is recommended to leave a free space on the front of 1 m that allows loosely open the door of a rack cabinet and facilitate the operations of removal or installation of additional modules.
  It is necessary to leave a minimum of 50 cm in the back for free circulation of ventilation air pushed by the fans.
- ❒ When the conditions of the room are extreme, it will be necessary to install an external ventilation system to force the cooling air flow.
- ❒ The acoustic level of the ventilation system is high and invalidates the device to install it in the same room where office personnel work.
- ❒ Only intended for mounting on cement or other non-combustible surface.
- ❒ For the battery cabinets supplied by our brand, the battery trays are extracted frontally. Leave a free space on the front of 1 m for the installation of accumulators and preventive maintenance.
- ❒ In general comply with all the conditions indicated in the safety instructions (document EK266*08).

5.2.2. Room for the batteries.

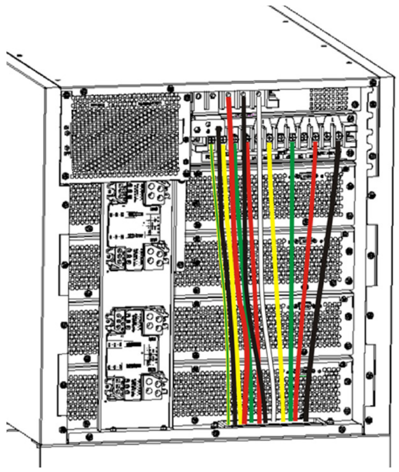
- The batteries generate quantity of hydrogen and oxygen during the charging process, reason why it is indispensable condition to have a good air circulation of the room.
- The stability and ambient temperature of the room where the battery is located is an important factor that determines the capacity to store the energy during the chemical process that occurs during charging. In the same way, these factors influence the reverse chemical process that occurs in the discharge in the event of an energy demand and that they have a significant effect on shortening the useful life of the same.
  The nominal operating temperature of a battery is 20°C. Operating above this temperature will reduce its duration or life and operating below it will reduce its storage capacity. If the average operating temperature of the battery increases from 20°C to 30°C, the service life will be reduced by 50%. If the operating temperature exceeds 40°C, the service life will be reduced exponentially.
  In a normal installation, the battery temperature is maintained between 15 and 25°C. Keep batteries away from heat sources or air intakes.
- When external batteries are used, the protections (fuses or circuit breakers) should be fitted as close as possible to the accumulators, and their connecting cables, between them and the UPS, should be as short as possible.

5.3. ENTRY FOR THE CONNECTION CABLES.

- The 2 and 4-slot cabinets have a cable gland in the terminal protection cover and an elliptical hole behind a metal part that serves as a cover. Either of these is valid for the routing of connection cables as they prevent the entry of foreign materials and insects into the enclosure, although the cable glands are more suitable since they perform the additional function of retaining the cables to protect them against fortuitous or accidental pulling (see *Fig. 22*).



Cable entry through the back cover.



Cable entry through the base.

Fig. 22. ***Cable entry on 2 and/or 4-slot cabinets.***

- The 6-slot cabinets have two elliptical panel-entry holes in the base of the cabinet (see *Fig. 23*). Make the necessary cuts that allow the passage of cables.

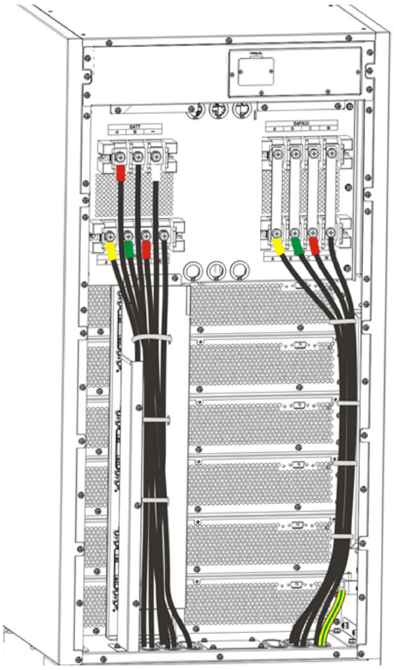


*Fig. 23. **Cable entry on 6-slot cabinet.***

On the base itself and between the two elliptical panel-entry holes there is a metal plate that can be extracted and machined for the installation of cable glands or conical panel-entry glands.

It is essential to fix the cables to the points provided, as shown in *Fig. 23*, so as not to obstruct the ventilation air outlet.

5.4. PROTECTIVE DEVICES AND CROSS-SECTIONS OF THE CONNECTION CABLES.

5.4.1. Input, bypass and output.

- The cabinets only include an external battery disconnector that can be operated by the user, and a manual bypass switch (optional) that is useful during preventative maintenance or in case of device failure.
  These are located at the front of the cabinet.
- Protection or external manual bypass board:
  - ❒ It is necessary to have an external protection board provided with the mechanisms of input, output, and static bypass (the latter only on models with independent static bypass line).
    In addition it is highly recommended to include a manual bypass mechanism to facilitate preventive maintenance or repair operations, so we will refer to it as a manual bypass board instead of a protection board.
  - ❒ For cabinets in parallel, it is essential to have a manual bypass board. The panel mechanisms must allow a cabinet to be isolated from the set of systems in parallel in the event of any anomaly and to feed the loads with the rest, either during preventive maintenance or during the failure and repair of some of them.
- On request we can supply an external protection board or manual bypass board for a single unit or a manual bypass board for a parallel system.
  You can also choose to manufacture one, taking into account the version and configuration of the available device or system and the "Recommended installation" documentation that can be downloaded from the website.
- On the nameplate of the cabinet you can check all the values referring to the main characteristics related to the equipment.
  The cabinet has two nameplates. One that defines the configuration of the unit supplied and one that identifies the configuration of the highest power model that can be installed, that is, supposing that it incorporates all of the modules for which it has capacity. In all cases, the cross sections of the cables and protections must be in accordance with the data on the first one.
- In the documentation downloaded from the website or supplied with the CD-ROM or Pen Drive, the user manual, the EK266*08 safety instructions and the information on the "Recommended installation", technical data and single-line diagrams on the connection of the system to the installation, are also available.
  These data are useful for determining the minimum protections and sections to be installed at the input and output of the ADAPT2, taking into account their rated working voltage, input-output configuration and the number of modules installed in parallel.
  It is possible to opt for any of the two solutions regarding the size of the panel protections:
  a. Protections sizes according to the power installed in the cabinet. Future expansions will require the ratings to be updated to adjust the protection to the installation.
  b. Protections size considering maximum expandable power or up to where future scaling extension is envisaged. This option is the most economically beneficial if future expansions are envisaged.
  It is recommended that the cable cross section of the switchboard be suitable for option "**b.**".
- In order to determine the particular technical characteristics of the system in the respective table of specifications, only the number of modules working in parallel will be taken into account, but not those that function in redundant.
  Pay attention to the notes indicated in the tables and that are conditioning to determine the respective data provided, although the installer will be responsible for defining the particularities of the installation (cables cross sections, protections size, ...), since it is the person who has all the information regarding the system's location environment.
  All values given in the tables are calculated for a **maximum total cable length of 30 m** between the distribution board, the equipment and the loads.
  - ❒ For longer lengths correct the cross sections to avoid voltage drops, respecting the regulations or standards corresponding to the country.
  - ❒ The same documentation contains, for each configuration, the information for N units in parallel (in 6-slot cabinets), as well as the characteristics of "Backfeed protection".

- In parallel systems, the length and cross section of the cables from the protection switchboard to each UPS and from these to the switchboard shall 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 terminals of the terminals terminal block and/or switches, so that they are correctly fastened in their entire section for optimum contact between the two elements.
- Only rated currents are printed on the nameplate of the device as indicated by the EN-IEC 62040-1 safety standard. For the calculation of the input current, the power factor and the device's own 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 data plates of these elements must be considered in order to select the appropriate cross-sections, in compliance with the local and/or national Low Voltage Electrotechnical Regulations.
- When a galvanic isolation transformer is added to an UPS or parallel system as an option, as standard or installed on its own account, either on the input line, on the bypass line, on the output or in all of them, they must be fitted with protection against indirect contacts (earth leakage breaker) at the output of each transformer, since due to its own insulation characteristic it will prevent the tripping of the protections placed in the primary winding of the transformer in case of electric shock in the secondary winding (output of the isolation transformer).
- We remind you that all the isolation transformers installed or factory supplied, have the output neutral earthed through a jumper between the neutral terminal and earth. If the isolated output neutral is required, this jumper must be removed, taking the precautions indicated in the respective local and/or national low voltage regulations.
- For the passage of cables to the interior of the cabinet, there are cable entry cones and/or cable glands mounted on the metal structure, in addition to a blind plate machinable at the user's discretion.
- In case of installation in neutral IT mode, the switches, circuit breakers and thermal magnetic protection must cut the NEUTRAL in addition to the three phases.

In the case of UPSs with unbalanced input and output frequency or frequency converters, the static bypass is disabled and the manual bypass switch of the device must not be operated, due to the disparity of the input frequency and the frequency required by the load. Do not operate the manual bypass switch on the frequency converters and/or in equipment where the input and output voltages are unequal because of the effects that this may have on the loads connected to its output, according to their type and/or tolerance to variations.

5.4.2. Battery installation and maintenance.

- Batteries are a source of energy, so take into account all recommendations, guidelines and indications in this section and specially when they are owned by the user in which they must be manipulated, installed, connected between them and with the device.

5.4.2.1. General recommendations.

- Precautions for installation, use and maintenance of batteries should be provided by the manufacturers.
- The safety warnings regarding the batteries indicated in section 1.2.3 of the safety instructions (document EK266*08) include issues that must be taken into account when handling or dealing with devices that incorporates them.
- Additionally consider the following premises:
  - ❒ Before accepting and using the batteries, check their apparent good condition. If the housing is damaged, broken, deformed or leaking, if the battery terminals are dirty, corroded or rusted, act accordingly or replace with a new one according to each case. Otherwise, there is a risk of reduced battery capacity, electric leakage or even a potential fire hazard.
  - ❒ The battery contains sulfuric acid that is confined in its housing. However, when the battery case cracks or breaks due to ill-treatment, there is an acid leak with its fateful consequences. Therefore, when handling batteries, use the appropriate safety PPE.
  - ❒ At the end of its useful life, there may be increased internal resistance and/or erosions of positive/negative plaques. If this condition continues without replacement, it can overheat resulting in deformations or leaks of the electrolyte. Be sure to replace the battery before this happens.
  - ❒ If a battery leaks, or if it is physically damaged, it must be replaced, stored in a sulfuric acid resistant container and disposed of in accordance with applicable laws.

5.4.2.2. Installing the batteries. Preliminary considerations before connecting them and their protections.

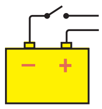
- The equipment covered in this user manual does not include batteries as elements installed in the same cabinet because there is no physical space available. However, the installer can carry out an adaptation to integrate both blocks into a rack cabinet, under his responsibility and if he/she is a **qualified** person (defined in section 1.2 of document EK266*08).
- The most standard assemblies in rack cabinets made by our firm are represented in document EL096*00.
- For all cases, section 5.5.4. describes the connections between the battery pack and the UPS, treating both as separate entities, although they may cohabit in the same cabinet or not, or even a part of the battery pack may share the cabinet space with the UPS.
- In general in this section there are some minimum traces to consider and respect in relation to batteries and their installation, especially when adaptations and/or modifications are made on their own:

- **In your installation.**
  - For greater safety, install the external batteries in a closed cabinet or in a battery room accessible only by **qualified** personnel.
    Inside the battery cabinet there are accessible parts with HAZARDOUS VOLTAGE and consequently risk of electric shock, so they are classified as RESTRICTED ACCESS ZONES. Therefore, the key of the battery cabinet shall not be available to the OPERATOR or USER, unless he/she has been properly instructed or is a **qualified** person. This cataloging is applicable to battery rooms, regardless of whether they can be installed in cabinets or on a rack.
  - The cabinet is only for sealed maintenance-free valve-regulated lead-acid batteries. For refillable lead-acid batteries, they are expected to be installed on an enabled rack in a specific room.
  - Lead acid battery carries chemical hazards.
  - Reserve a minimum of 1.5 cm between the batteries and the tray immediately above, allowing free circulation of air around the accumulators. Trays will be pull-out type to simplify maintenance tasks.
  - When placing batteries in the trays or shelves of the cabinet or rack, always start at the bottom, in order to keep the centre of gravity as low as possible.
  - Avoid sudden impacts and/or vibrations.
  - Avoid cable bending less than 10 cm.
  - Do not cross the battery cables with each other, they are a risk that can lead to connection errors with the consequent consequences.
  - The battery connection must be firm and comply with the tightening torque required by the battery manufacturer's specifications.
  - Each battery terminal must be isolated after its connection.
  - Do not subject the cables connected to the terminals of the battery to external mechanical stresses of tension or twisting, as they can damage their internal connection and in very serious cases ignite.
  - The connection diagram of the batteries is shown in *Fig. 24*.

- **Precautions in connection.**
  - The operations referred to the connection between accumulators that configure the battery block are reserved to our **T.S.S.** or in its defect to the distributor, reason why they are not treated in the user documentation.
    For cabinets where user-owned batteries are installed, the operations must be carried out and/or supervised by **qualified** personnel under their responsibility.
  - Check that the battery **is not** connected or grounded, as it may cause an electric shock. Otherwise disconnect the electrical connection.
  - The battery pack can be configured for 32, 36, 40 and 44 12V elements and is calibrated at the factory with the number of cells according to the battery set supplied or the number of items requested when the batteries are owned by the user. If not, 32 elements **[16 + 16]** will be calibrated, with an information label for the user.
  - The connection of the battery pack to the UPS will be done before connecting the device to the AC mains or with the load.
  - **DANGER, POTENTIAL OF LETHAL BATTERIES.** Pay attention when handling the battery connection cables and all parts associated with them. Terminal block battery voltage greater than 400 V DC.
  - Inside the battery cabinet there are accessible parts with HAZARDOUS VOLTAGE and consequently risk of electric shock, so they are classified as RESTRICTED ACCESS ZONES. Therefore, the key of the battery cabinet shall not be available to the OPERATOR or USER, unless he/she has been properly instructed or is a **qualified** person. This cataloging is applicable to battery rooms, regardless of whether they can be installed or not on a rack.
  - Do not operate the battery mechanisms until indicated.
  - The protection of batteries will always be carried out at least with fuses and their physical arrangement will be conditioned to the tangible location of the batteries themselves.
    The following are the different assemblies made by our firm and the location of the battery protection for each case, which is necessary for the operations of running and stopping the assembly:
    a. Batteries integrated in the same cabinet as the device or in its homologous version of "0/" and "/" in which space is reserved to include them.
    b. Batteries installed or planned to be installed partly in the own cabinet of the UPS and the rest in another cabinet or other cabinets or rack.
    c. Batteries installed in one or more independent cabinets, depending on the requested support time or "0/" and "/" versions, in which their backup configuration reserves the necessary space for the location of the batteries.
  - As a result of the arrangement of the batteries, the switch and/or the respective protection shall be arranged as follows and identified in the illustrations in document EL096*00 according to each case as:
    Assemblies type "**a.**".
    1. Battery disconnect switch, identified as (Q3).
    Assemblies type "**b.**" and "**c.**".
    1. In UPS cabinet. Battery disconnect switch, identified as (Q3).
    2. In every battery cabinet. Depending on protection size:
    Battery fuse-holder switch with 3 fuses, referenced as (F3).
    Or battery disconnect switch, identified as (Q8) and three internal fuses not accessible to the user.

- ❒ The fuses will be supplied in a plastic bag inside the battery cabinet or inside the rack cabinet in case of adaptations, except the fixed ones, since they form a mechanical part of the cabinet.
- ❒ The size of the protection fuses and switches are dimensioned according to the initial start-up power.

  Any modification (addition or reduction of installed modules) will necessarily involve the **revision and/or adaptation** of the installation (cable sections, protection sizes, etc.).
- ❒ In the same way, it is recommended to enlarge the battery pack in case of power amplification to maintain the back-up time as much as possible.
- ❒ The original factory battery circuit is open.



  Activate the disconnector and/or place the fuses in the corresponding fused isolator switch and **set to** "On" once the UPS has been started. The front panel indicates that the batteries are not connected and that that the number of batteries in series in each branch has been verified to be equal and to match the number of batteries in series configured in the UPS.

- Do not operate the battery fuse holder switch and/or the disconnect switch when the device is running. In units manufactured by us, these mechanisms **are not load-disconnect types**.
- When a unit or a parallel system is expected to be out of service for an extended period of time, a complete stop must be carried out beforehand and the 3 fuses of the fused isolator switch of the device or the battery module shall be removed for safety and stored in a safe place.

5.4.3. Access to the interior of the cabinet for its connection.

- All devices in the SLC ADAPT2 series have the following connection elements:
  - ❒ Terminal block for power. Depending on the type of input and output, they are supplied with some connection strips between terminals to obtain the required configuration (see *Fig. 39 to Fig. 48 in Annex I*).
  - ❒ Separate terminal block connectors for digital inputs and dry contacts signals.
  - ❒ Terminal block connector for RS485.
  - ❒ DB9 connector for RS232.
  - ❒ Slot prepared to integrate the SNMP card.
  - ❒ The 6-slot cabinets also have HDB15 / DB15 connectors for the parallel bus.
- All power connection terminals (input, output and batteries) are located on the back of the devices, behind a protective cover. Only **T.S.S.** personnel or **qualified** personnel are authorised to remove these covers for connection.

  Do not remove more covers than indicated. Access to other internal parts is reserved exclusively for **T.S.S.**
- The dry-contact connectors are located on the front of the UPS.
- Consider the cross section of the cables and crimped terminals at their ends, in relation to the surface and size of the terminals, to obtain optimum contact between them.
- At the end of the wiring tasks, the device must be fitted with the corresponding lids firmly attached.

5.5. CONNECTIONS.

- WARNING The connection of the device can only be carried out by **qualified** personnel with the help of the supplied documentation, however the first start-up of the system is reserved exclusively to our **T.S.S.** or distributor, as an implicit action that activates the start of the guarantee of the product .

  Do not apply power to the device before the first start-up.
- This device is suitable for installation in networks with power distribution system TT, TN-S, TN-C or IT, taking into account at the time of installation the particularities of the system used and the national electrical regulation of the destination country.
- In devices with three-phase input will feed the system with 4 wires (3 phases and Neutral), being essential the neutral in the power of all three-phase system. Optionally we can supply an isolation transformer to generate the neutral, in those mains supply that do not have it. Only in single-phase devices and in compliance with the rated supply voltage of the device, it is possible to dispense with the neutral and to replace it with another phase in its absence. In this case and in devices with independent bypass line, as in any equipment, respect the order of the phases when connecting the input and bypass, using the same pair of phases in both networks.
- In devices with three-phase input connected to an IT-type power distribution system, breakers, differentials and magnetothermal protections must cut the NEUTRAL in addition to the three phases.
- All the connections of the device including the control ones will be done with all the switches at rest position and with no power supply (power supply line switch of the device in «Off» position).
- Do not connect ADAPT2 devices in parallel with different firmware versions, settings and/or back-up times. Follow all instructions related to parallel connections to connect up to 5 cabinets in parallel (6-slot cabinets only).
- The tightening torques of the screw terminals are as follows:
  - ❒ For screw with M6 thread, tightening torque of 5 Nm.
  - ❒ For screw with M8 thread, tightening torque of 13 Nm.
  - ❒ For screw with M10 thread, tightening torque of 25 Nm.
- The parallel connection of 6-slot cabinets shall be carried out as described in sections 5.5.1 to 5.5.5 individually for each cabinet, and is subject to having its manual bypass board for the installation procedure as well as for start-up and future maintenance.

5.5.1. Connecting the device to the mains.

- As it is a device with protection against class I electrical shock, it is essential to install the protective earth conductor to the terminal identified as ⏚. Connect this conductor before supplying voltage to the input terminals.
- In accordance with the safety standard EN-IEC 62040-1, in devices without independent bypass line, the installation must be equipped with an automatic backfeed protection system, such as a contactor, which prevents the occurrence voltage or hazardous energy on the UPS input line during a mains failure.
  The standard is applicable regardless of whether the power supply is single-phase or three-phase, and for individual units of sub-racks as well as for each of the UPS sub-racks of a parallel system.
  All values are calculated for a **maximum total cable length of 30 m** between the distribution board, the device and the loads.
- There can be no derivation of the line from the Backfeed protection to the UPS, since the safety standard will not be complied with.
- Warning labels shall be affixed to all primary power switches installed in areas remote from the device to alert electrical maintenance personnel of the presence of a UPS in the circuit.
  The label shall bear the following text or an equivalent:

> **Before working on the circuit.**
> - Isolate the uninterruptible power supply system (UPS).
> - Check the voltage between all terminals, including the protective earth.
>
> **Risk of UPS return voltage.**

- Connect the input cables to the respective terminals according to the configuration of the available equipment, taking into account the illustrations in *Fig. 39 to Fig. 48* of ANNEX I in terms of the connection points of the cables.
  - ❒ **Connection to a three-phase input mains:**
    Connect the R-S-T-N power supply cables to the input terminals, **respecting the order of the phases and the neutral** indicated on the labelling of the equipment and in this manual. If the phase order is not respected the device will not work.
    It is essential to connect the input neutral
  - ❒ **Connection to a single-phase input mains:**
    Connect the R-N power cables to the input terminals, respecting the order of the phases and the neutral indicated on the labelling of the device and in this manual. Failure to observe the phase and neutral order will cause serious damage to the device.

  Where there are discrepancies between the labelling and the instructions in this manual, labelling shall always prevail.
  For systems in parallel, it will be necessary to repeat the connections that go from the panel to each device.
- In general, the devices are supplied ready for powering through a single terminal block (common power supply for the rectifier and the static bypass line).
  However, when both functional blocks are powered through two independent lines, **it is essential** to remove the bars or strips that connect the terminals of the respective phases and **leave the bar or connection strip installed** between the **two Neutral terminals**.
- The input Neutral for the rectifier power supply and the input Neutral for the bypass line power supply must be the same. In any case, **remember** that within the equipment, both neutrals will be connected through the bar or strip that joins the two terminals**.**
- **Frequency converter mode.** You can use the device with the frequency converter configuration, activating this function through the control panel menus. For connection purposes, the order of connection of the phase or phase and neutral cables must be respected.
  When a device operates as a frequency converter, **it is essential** to remove the connection strips between the input terminals of the UPS and those of the independent bypass line. This will prevent inappropriate transfers of the input on the output in case of operating the manual bypass switch (optional).

5.5.2. Independent static bypass line connection. In version B only.

- As it is a device with protection against class I electrical shock, it is essential to install the protective earth conductor to the terminal identified as ⏚. Connect this conductor before supplying voltage to the input terminals.
- In accordance with safety standard EN-IEC 62040-1, in devices with a static bypass line, the installation must be equipped with an automatic backfeed protection system, such as a contactor, to prevent the presence of voltage or hazardous power on the UPS input line during a mains failure and another for the bypass line.
  The standard is applicable regardless of whether the power supply is single-phase or three-phase, and for individual units as well as for each of the UPSs in a parallel system.
- There can be no derivation of the line from the Backfeed protection to the UPS, since the safety standard will not be complied with.
- Warning labels shall be affixed to all primary power switches installed in areas remote from the device to alert electrical maintenance personnel of the presence of a UPS in the circuit.
  The label shall bear the following text or an equivalent:

> **Before working on the circuit.**
> - Isolate the uninterruptible power supply system (UPS).
> - Check the voltage between all terminals, including the protective earth.
>
> **Risk of UPS return voltage.**

- Connect the bypass input cables to the respective terminals according to the configuration of the available equipment, taking into account the illustrations in *Fig. 39 to Fig. 48* in terms of the connection points of the cables.

- **Connection to a three-phase bypass network:** Connect the R-S-T-N power supply cables to the bypass terminals, respecting the order of the phases and the neutral indicated in the labelling of the device and in this manual. If the phase order is not respected the device will not work.
  It is essential to connect the input neutral.
- **Connection to a single-phase bypass network:** Connect the R-N power supply cables to the bypass terminals, respecting the order of the phases and the neutral indicated in the labelling of the device and in this manual. Failure to observe the phase and neutral order will cause serious damage to the device.

Where there are discrepancies between the labelling and the instructions in this manual, labelling shall always prevail.
For systems in parallel, it will be necessary to repeat the connections that go from the panel to each device.

- **Frequency converter mode.** With the frequency converter configuration activated, the cables of the static bypass line must not be connected. With this operation mode, all the functionalists of the static bypass are inhibited.

5.5.3. Output connection, terminals.

- As it is a device with protection against class I electrical shock, it is essential to install the protective earth conductor to the terminal identified as ⏚. Connect this conductor before supplying voltage to the input terminals.
- Connect the output cables to the respective terminals according to the configuration of the available equipment, taking into account the illustrations in *Fig. 39 to Fig. 48* in terms of the connection points of the cables.
  - **Three-phase output connection:** Connect the loads to the U-V-W-N output terminals, **respecting the order of the phases and the neutral** indicated in the labelling of the equipment and in this manual. If the phase order is not respected the device will not work.
    Where there are discrepancies between the labelling and the instructions in this manual, labelling shall always prevail.
  - **Single-phase output connection:** Connect the loads to the U-N output terminals, respecting the order of the phase and the neutral indicated in the labelling of the device and in this manual. Failure to observe the phase and neutral order will cause serious damage to the device.

  Where there are discrepancies between the labelling and the instructions in this manual, labelling shall always prevail.
  For systems in parallel, it will be necessary to repeat the connections that go from the panel to each device.
- **Frequency converter mode.** You can use the device with the frequency converter configuration, activating this function through the control panel menus. For connection purposes, the order of connection of the phase or phase and neutral cables to the load or loads shall be respected.

- With regard to the protection to be placed at the output of the protection board or manual bypass (optional), we recommend the distribution of the output power via at least four lines. Each of them will have a magneto thermal protection switch of adequate value. This type of output power distribution will ensure that a fault in any of the machines connected to the device that causes a short circuit does not affect more than the line that is faulty. The remaining connected loads will have continuity assured due to the tripping of the protection only in the line affected by the short circuit.

5.5.4. Connection of the battery terminals of the device with those of the battery module.

The battery set can consist of 32, 36, 40 or 44 elements connected in series, but always in even numbers since it is necessary for the internal architecture of the device to have a central point or N neutral medium intake. At the same time, the back-up time together with the power required to feed the loads determines the Ah capacity of the accumulators.

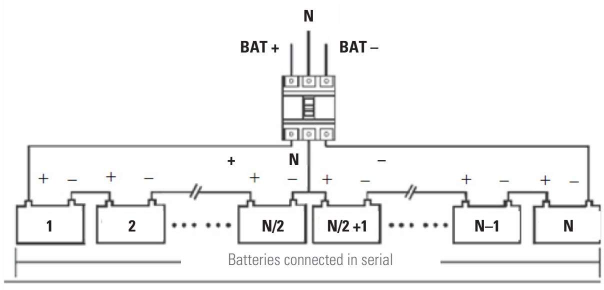


Fig. 24. Typical connection of battery set.

- As it is a device with protection against class I electrical shock, it is essential to install the protective earth conductor to the terminal identified as ⏚. Connect this conductor before supplying voltage to the input terminals.
- The connection between the terminals of the cabinet or battery pack and the UPS will always be made through the supplied cable hose, respecting the polarity indicated in the labelling of each unit and the colour of the cables or their identification at the ends through heat shrink sleeve (red for positive "+", blue for common "N" and black for negative "-").
  It is imperative to respect this rule and not to extend the hose supplied.
- For extended back-up time in which more than one module or battery cabinets are supplied, the connection will always be in parallel between them and in turn with the device. Respect the rule indicated in the previous point for the connection.
- For 6-slot cabinets in parallel the connection of the batteries with the UPS will not change, since each group of accumulators is connected directly with its UPS.
  However, there is also another possibility, a set of batteries inside a cabinet or installed in a rack, and common to a UPS system with 6 slots in parallel.

- **Danger of electric shock**. If after starting up the UPS, it is necessary to disconnect the battery cabinet, it must carry out a complete stop of the device.
  Open the battery fused isolator switch or the battery disconnect switch located on the accumulator cabinet and/or the fused isolator switch or disconnect switch on the UPS.
  Wait at least 5 minutes until the filter capacitors have been discharged.

5.5.5. Earth terminal connection.

- As it is a device with protection against class I electrical shock, it is essential to install the protective earth conductor to the terminal identified as ⏚. Connect this conductor before supplying voltage to the input terminals.
- Make sure that all loads connected to the UPS are only connected to this ground terminal. Failure to limit the grounding of the load or loads and the cabinet or battery cabinets to this single point will create loops back to ground that will degrade the quality of the power supplied.

5.5.6. Parallel connection.

When we talk about paralleling in this section we refer to UPS, since the paralleling of modules is a characteristic of the entire SLC ADAPT2 series.
The following table specifies the number of UPS cabinets in parallel according to their configuration.

	UPS configuration	Maximum cabinets in parallel	Maximum modules in parallel
3x400 V	2 slots with 10 kVA modules (20 kVA)	9	18
	2 slots with 15 kVA modules (30 kVA)	8	16
	4 slots with 10 kVA modules (40 kVA)	6	24
	3 slots with 15 kVA modules (45 kVA)	5	15
	6 slots with 10 kVA modules (60 kVA)	4	24
	6 slots with 15 kVA modules (90 kVA)	2	12
3x208 V / 3x220 V	2 slots with 6 kVA modules (12 kVA)	9	18
	2 slots with 9 kVA modules (18 kVA)	8	16
	4 slots with 6 kVA modules (24 kVA)	6	24
	3 slots with 9 kVA modules (27 kVA)	5	15
	6 slots with 6 kVA modules (36 kVA)	4	24
	6 slots with 9 kVA modules (54 kVA)	2	12

Table 4. Number of UPS cabinets in parallel according to their configuration.

5.5.6.1. Parallel bus connection.

- The COM communications line constitutes a very low voltage safety circuit.
  To preserve the quality, it must be installed separately from other lines carrying dangerous voltages (power distribution line).

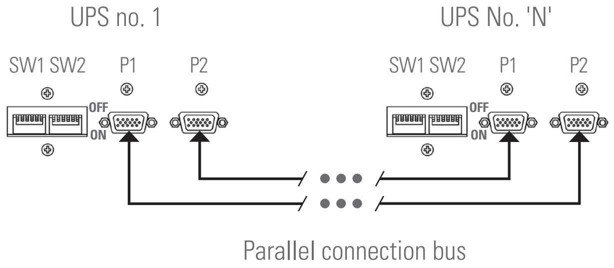


Fig. 25. DB15 connectors on the communication bus.

- **Parallel connection bus**. Use the 15-wire signal hose with mesh and DB15 connectors at the ends to attach a maximum of 5 sub-racks with the sequence shown in *Fig. 25*. Each hose has a male and a female connector at the ends, which must be connected between two correlative devices. It is imperative to close the bus loop in parallel.
  The length of the parallel cable is about 1.5 meters and should not be prolonged under any circumstances due to the risk of interferences and failures in the communication that this would entail.
  Fig. 25 shows an installation with two devices in parallel. For five units, proceed similarly to close the communications bus.
- **Parallel bus settings** . Although up to nine devices can be connected in parallel, it is necessary to change the position of the Mini DIP Switches SW1 and SW2 located on the back of the device, depending on the number of UPSs in parallel.
  The device is shipped from the factory adjusted to the requested requirements. When it is necessary to modify the initial configuration of the number of units, the position of SW1 and/or SW2 must be changed according to *Table 5* and each device must be configured using the software application. These actions are exclusively reserved for the **T.S.S.** or the distributor.

UPSs in parallel	SW1	SW2
1	ON	ON
2	ON	OFF
3	OFF	OFF
4	OFF	OFF
5	OFF	OFF
6	OFF	OFF
7	OFF	OFF
8	OFF	OFF
9	OFF	OFF

Table 5. SW1 and SW2 settings for paralleled units.

To access them it is necessary to remove the corresponding cover that keeps them from tampering and then reinsert it.

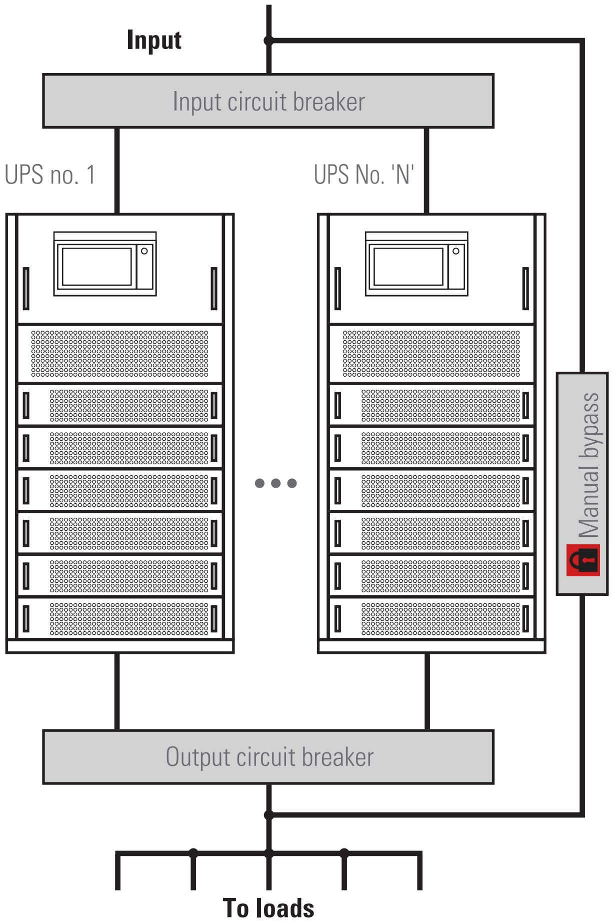


Fig. 26. Example of a parallel system, with a single AC network and manual bypass board.

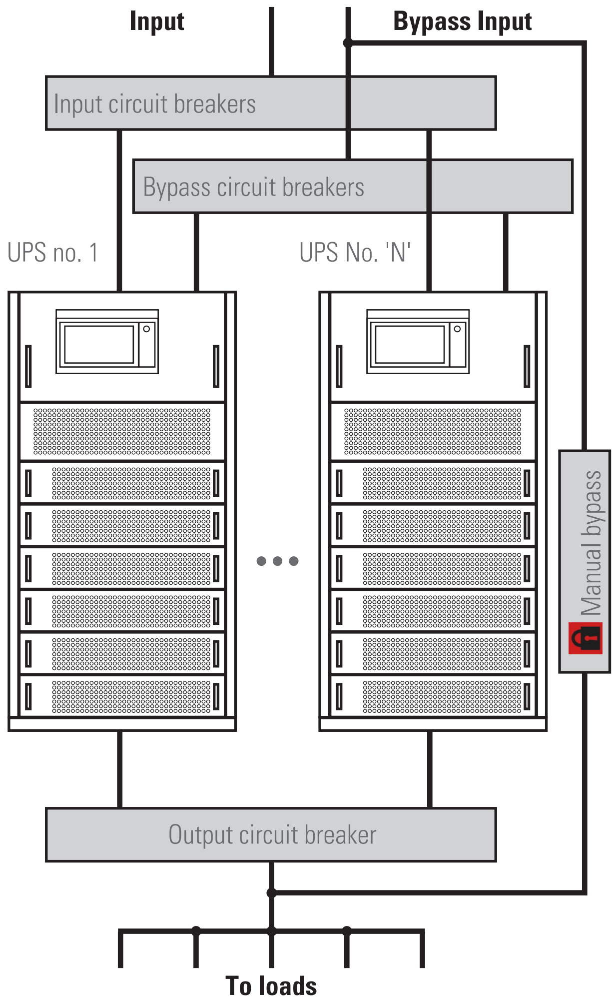


Fig. 27. Example of a parallel system, with independent static bypass line and manual bypass board.

- Beyond the communication bus, it is necessary to provide the installation with parallel systems, a board provided with the individual input and output protections and a manual bypass with mechanical locking. See *Fig. 26 or Fig. 27*, depending on whether or not there is an independent static bypass line.
  For more information see the documentation for the "Recommended installation".

5.5.7. Interface and communications.

- The communications line (COM) constitutes a very low voltage safety circuit and must be installed separately from other lines carrying dangerous voltages (power distribution line).

5.5.7.1. Digital inputs, dry contacts and communications.

The ADAPT2 UPS series incorporates the following connections as standard for communication with external peripherals or with other identical equipment:

- Four digital inputs through terminal block.
- Four relay interface outputs via terminal block.
- Communication via RS232/RS485 ports (subD9) or USB.
- Two slots for installing an SNMP card or relay expansion board (IS).

All connectors related with communications are grouped together on the interface panel and can be accessed from the Bypass module after removing the cover, which covers them completely.

The communication interface has the following connections via terminal block:

- Temperature sensors input.
  - ❐ TBAT: Sensor for the compensation of the floating voltage of batteries. Parameter shown on the control panel display.
  - ❐ TAMB: Sensor for measuring ambient temperature. Parameter shown on the control panel display.
- Signal input for the external EPO button.
- 4 programmable digital inputs (see *Table 6*).
- 4 programmable relay outputs (see *Table 6*).

Digital Inputs (Voltage-free contacts)		
IDIG1	Power generator.	Programming options: • Shut-down (stop Inverter and switch to Bypass). • Power generator input. • Auxiliary contact input for Maintenance Bypass switch. • Auxiliary contact input for output switch. • Auxiliary contact input for battery BCB switch (allows common battery).
IDIG2	Shutdown	
IDIG3	Maint. bypass.	
IDIG4	Battery circuit breaker.	
Relay outputs (Voltage-free contacts)		
RL1	Maint. bypass.	*Each relay can be programmed to respond to the status of an alarm/warning or a combination of these.*
RL2	Mains failure, battery discharging	
RL3	Battery low	
RL4	UPS bypassed	

Table 6. Programming the digital inputs and relay outputs.

All of the connections mentioned can be seen in *Fig. 28 and Fig. 29,* shown below:

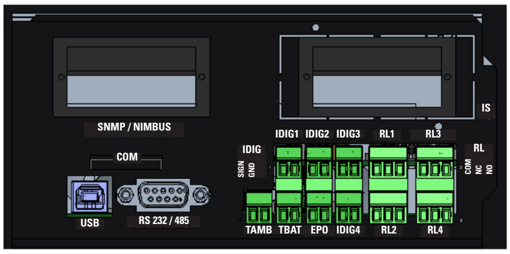


Fig. 28. Distribution of the available communications interface connections in 2- and 4-slot UPSs.

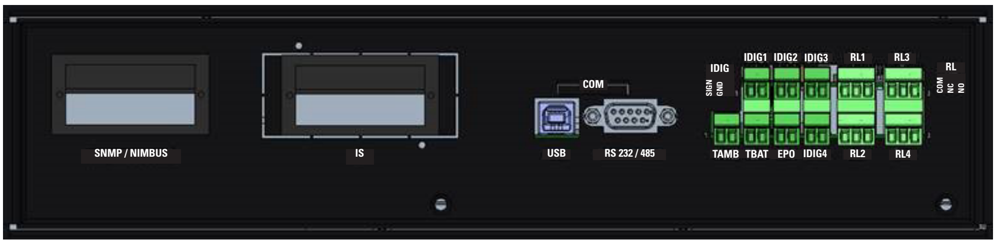


Fig. 29. Distribution of the available communications interface connections in 6-slot UPSs.

5.5.7.2. Installation of the SNMP card (Nimbus Services).

All SLC ADAPT2 devices have a slot for the inclusion of the SNMP adapter unit, located physically on the front of the unit, and a Nimbus Services card.

See the specific manual EL139*00 for a detailed description of the available services and their configuration.

- In the 2- and 4-slot UPSs, it is located behind the cover giving access to the communication connections, located next to the monitoring panel with touch screen. see *Fig. 28.*
  - ❒ To install the SNMP card:
    1. Remove the screws securing the access cover to the communication connections.
    2. Remove the cover. The slot is visible.
    3. Remove the fixing screws of the slot cover and the part as a cover.
    4. Install the SNMP card in the slot and fix it with the screws.
    5. Make the relevant connections.
    6. Fit the protective cover of the communication connections and fit the fixing screws.

- In 6-slot UPSs, the slot is located on the back of the device, see *Fig. 29.*
  - ❒ To install the SNMP card:
    1. Remove the fixing screws of the slot cover and the part as a cover.
    2. Install the SNMP card in the slot and fix it with the screws.
    3. Make the relevant connections.

6. OPERATION.

6.1. INTRODUCTION.

The operating modes of the SLC ADAPT2, with respect to the nature of the output voltage, are defined in the *Tab. 7*. This chapter describes the different procedures in each operation mode, including transfers between them, the UPS settings and procedures to enable the inverter to "On/Off".

Operating modes	Description
Normal mode	The load is fed from the UPS inverter.
Bypass Mode (Static bypass)	The load is fed from the static bypass. This mode can be considered a temporary transition between normal mode and the manual bypass or a temporary abnormal operating condition. **Note:** In this mode the load is not protected, since it is powered directly from the AC network and therefore is subject to the variations thereof.
Maintenance Bypass mode (manual Bypass switch)	The load is powered directly from the AC network through the manual bypass switch, scheduled for periods of maintenance or repair. **Note:** In this mode the load is not protected, since it is powered directly from the AC network and therefore is subject to the variations thereof.

Tab. 7. Operating modes.

- Throughout the description in the user manual, the terms Control and Bypass Module, Bypass and Monitoring Module or MBS are used to refer to the UPS Bypass module. The same applies to the term Power Module or MP.
- See chapter 7 for a description of the functions of the keypad and the touch screen.
- There are some parameters that can modify the UPS operations described in this section. These parameters are pre-set in the factory and are password-protected, and so they can only be modified by our **T.S.S.** personnel or by the distributor.

6.2. STARTING UP THE UPS.

6.2.1. Checks before start-up.

Before starting the device:

- Check that all the connections have been made correctly and with sufficient tightening torque, respecting the labelling of the device and the instructions of chapter 5.
- Check that the internal and/or external isolation switch on the battery cabinet and those in the protection switchboard are in the "Off" position.
- Make sure that all loads are "Off".
- It is very important to proceed in the established order.
- Refer to *Fig. 1 to Fig. 10* to identify parts of the device.
- *Fig. 32* shows a manual bypass board for a parallel system of N units, with a common AC line and with independent networks for the rectifier and bypass. In both, the installation must match the number of protections to the number of available UPSs in parallel.
  Although the internal and external manual bypass switches have the same functionality, the latter is superior in performance because it allows complete isolation of the device during periods of preventive maintenance, repair or replacement.
  The following sections describe all the steps to be performed when a manual bypass board is used, although for a single UPS cabinet, a switchboard may be used [the same switchboard, but without the manual bypass device].

6.2.2. Start Menu.

At the first start-up of the equipment, the Start Menu will appear, consisting of two screens (see *Fig. 30).*

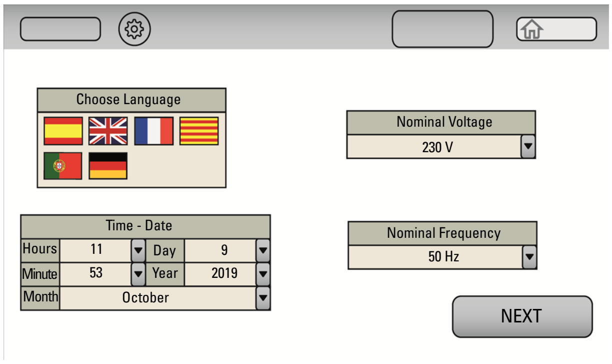
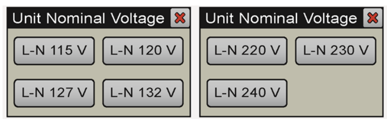


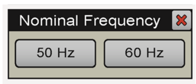
Fig. 30. Home screen during the first start-up of the equipment.

In the **first screen** of the Start Menu you can configure 3 parameters:

1. **Nominal voltages of the equipment.**
   You can choose between the following values:



2. **Nominal frequences of the equipment.**
   You can choose between the following values:



3. **Time-Date.**

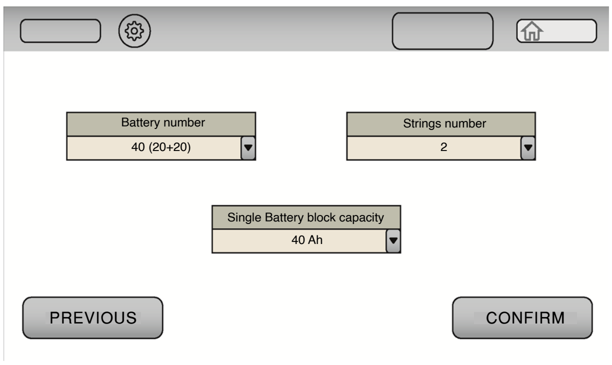


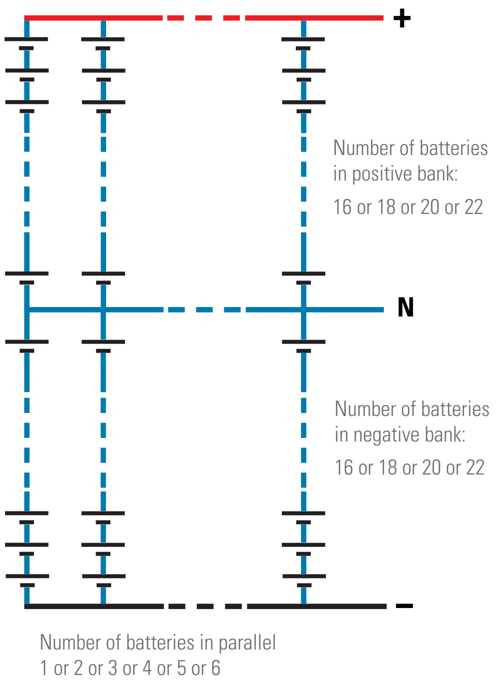
Fig. 31. Second Home Screen: set number of batteries, branches and capacity.

In the **second screen** of the Start Menu (*Fig. 31)* you can configure 3 parameters too:

1. **Number of Batteries in series:** it is the number of batteries connected in each of the branches in parallel. See the diagram below:

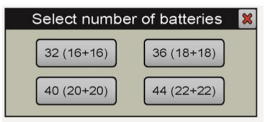
   Number of batteries in series:

   32* (16+16)
   36 (18+18)
   40 (20+20)
   44 (22+22)

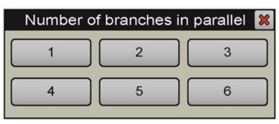


* Depending on the model.

   You can choose between the following values:



2. **Strings number in parallel.**
   You can choose between the following values:



   Where this number indicates the installed parallel strings. The total capacity of the battery bank in Ah will be the capacity of the battery model used programmed in the next section multiplied by the number of strings in parallel.

3. **Single battery block capacity of 12V.**
   In this section, the value of the battery model capacity used in Ah will be programmed. Said value multiplied by the number of parallel strings programmed in the previous point (2.) will give rise to the global capacity of the system that can be displayed in the Nominal / Batteries / Global Capacity menu.

   Global Capacity (Ah) = Battery Capacity of 12V (Ah) x Strings number in parallel.

⚠ **CORRECTION OF THE NUMBER OF BATTERIES. Since the number of batteries is a critical parameter, this correction should be carried out by qualified personnel**. In the event that the customer has made a mistake in the configuration of the number of batteries, the following cases may occur:

1. The setting of the number of batteries is higher than the actual number of batteries.

   In this case, if the battery floating voltage should be 13.5V / battery, we could apply 15V / battery or more. If the battery were to work under these charging conditions for a long time, they would begin to deteriorate producing sulfation, inflate and finally they could get burned and could cause a fire.

2. The setting of the number of batteries is less than the actual number of batteries.

   In this case, the battery bank would not be charged correctly, so when the UPS operation was required from batteries, the autonomy time would be very short or practically null.

To modify the number of batteries there are two solutions:

A) Parameter change with UPS disconnection.

- **a.** Modify the number of batteries in Nominals / Batteries / Number_Batteries indicating the number of batteries installed in series.
- **b.** Once this is done, the rectifier input network, the bypass and the battery disconnector should be disconnected.
- **c.** Wait a minute.
- **d.** Re-energize the rectifier, bypass and batteries and the system will apply the load according to the new parameter for the number of batteries entered.

B) Parameter change without UPS disconnection.

- **a.** Modify the number of batteries in Nominals / Batteries / Number_Batteries.
- **b.** Open Adapt2 Explorer, go to the option ADVANCED / SERVICE / Battery_adjustments and modify the number of batteries by writing the correct number of batteries in series.
- **c.** Press the button "APPLY CHANGES".
- **d.** Then go to the menu "MODULES / Commands".
- **e.** Press the "SEND CONFIGURATION" button. From this moment on, the system will change the battery charging regime according to the new parameter entered.

6.2.3. First Start-up.

- The first start-up of the device or parallel system is exclusively reserved for authorised personnel, either from our **T.S.S.** or the distributor. This operation activates the start of the product warranty and among other jobs a verification test and calibration "in situ" of the device is also started, but which is not described in this document.
- Follow this procedure to start the UPS from a total stopped position.

  Proceed as follows:

  1. **Check the correct connection of the phases and neutral to the input of the device, as well as the static bypass line when it is available. Correct in the case of wrong connection or phase rotation.**

During the next manoeuvres described in this section, the output terminals of the UPS will be under potential at some point. If any loads are connected to them, check that it is reliable to apply voltage, otherwise disconnect it securely from the output terminals of the UPS.

2. **Supply voltage to the external manual bypass board**
   Observe the wiring diagrams of the external manual bypass boards as shown in *Fig. 32*. It shows the two possible options, with a single AC input network or with separate networks for the rectifier and the independent bypass.
3. **Activate the circuit breakers of the manual bypass board in the following order: Output, Input and Bypass [devices version B, with independent bypass line].**
   The LCD touch screen will light up and the rectifier pilot light will initially light in red. The rectifier enters the normal operating status (amber icon) and, after around 20 seconds, the rectifier indicator stops flashing and remains green. After initialisation, the static bypass is activated, supplying voltage to the output terminals from the AC mains with the bypass indicator lit in green.
   Tab. 8 shows the display status with the inverter turned off.

Icon	Flow	Colour	Conditions
Rectifier	Input and output flow	Green	If rectifier OK, otherwise red
Batteries	No flow	Red	Battery disconnected
Bypass	Input and output flow	Green	If Bypass module OK, otherwise red
Inverter	No output flow	Amber	If inverter OK, otherwise red

Tab. 8. Status indications with inverter off.

4. **The inverter starts automatically.** The inverter pilot indicator turns amber during start-up. After approximately 1 minute, the inverter becomes operative and the output will be transferred from the bypass to the inverter. The bypass flow disappears and the inverter pilot light turns green to indicate input and output flow. The UPS is now operating in Normal mode. *Tab. 9* shows the display status with the inverter running.

Icon	Flow	Colour	Conditions
Rectifier	Input and output flow	Green	If rectifier OK, otherwise red
Batteries	No flow	Red	Battery disconnected
Bypass	No input or output flow	Green	If Bypass module OK, otherwise red
Inverter	Input and output flow	Green	If inverter OK, otherwise red

Tab. 9. Status indications with inverter running.

5. **Turn on the protection or circuit breaker of batteries.** The red led of the batteries shuts off a few minutes later and then turns green. These will be charged by the device charger. *Tab. 10* shows the state of the LEDs.

Icon	Flow	Colour	Conditions
Rectifier	Input and output flow	Green	If rectifier OK, otherwise red
Batteries	Rectifier input flow	Green	Battery disconnected and voltage OK, otherwise red
Bypass	No input or output flow	Green	If Bypass module OK, otherwise red
Inverter	Input and output flow	Green	If inverter OK, otherwise red

Tab. 10. Status indications in normal mode while charging batteries.

- The touch screen has RGB LEDs indicating the UPS STATUS. You can quickly see if the UPS status is NORMAL, LOW-LEVEL ALERT (WARNING) or ALARM. They change in colour and flashing frequency. Although both the colours and the flashing frequencies of the RGB LEDs can be programmed, by default they are as shown in *Table 12*.

6.3. OPERATIONS OF THE MANUAL BYPASS SWITCH (MAINTENANCE).

6.3.1. Procedure to switch from normal mode to maintenance bypass mode.

This procedure is applicable to transfer the load power from the inverter output [Normal Mode] to the manual bypass switch [Maintenance Bypass Mode].

Before performing this operation, read the display messages to ensure that the bypass power is stable [device input voltage] and that the inverter is synchronised with the bypass voltage. This is important to avoid the risk of interrupting the power supply to the load.

1. Click on the icon **BYP Transf.** in the "Status & Ops" menu. The "Inverter" indicator on the diagram will flash green and the "Status" indicator will turn red. In addition, the acoustic alarm will be activated. The load will be transferred to the static bypass and the inverter will be set to standby.
   To silence the acoustic alarm, click on the icon in the "Status & Ops" menu. This action cancels the audible alarm, but does not delete the warning message on the screen, which disappears when the alarm condition ends.
2. Remove the mechanical lock of the manual bypass switch from the external panel and switch it to "On". The load will be fed directly from the mains via the manual bypass.
   When a protection board is provided instead of a manual bypass, the mechanical bypass lock must be removed, at the back of the cabinet, and the bypass switch set to "On", as this switch will not be located in the switchboard. It is recommended in this operating mode [Bypass mode] and condition [manual bypass board defect] to perform the following actions:
   - ❒ Remove the fixing screws of the lateral trim strips.
   - ❒ Remove the fixing screws of all MPs and MBS.
   - ❒ Slightly pull the handles on each one until they are protruding by about 4-5 cm from their housing in order to unplug them from their connector on the backplane of the device.

Before any change of operating mode and after carrying out the possible corrective actions, it is necessary to correctly insert the modules to their original position and fix them with their screws.

3. Switch the protection or the battery circuit breaker of the battery cabinet to the "Off" position.
4. Switch the circuit breakers of the manual bypass board to the "Off" position in the following order: Output, Input and Bypass [devices version B, with independent bypass line].
5. Initiate the necessary maintenance tasks.

Removing a faulty module.

- It is not necessary to switch the device to "Bypass Mode", since power modules can be removed while the system is in operation. We recommend that you check that the load power does not exceed the power of the remaining functional modules.
- Stopping a module: To stop a power module, the operation must first be enabled via the display in the "Status&Op" menu, and then the module can be stopped by pressing the Extraer Mod button and the "On/Off" button next to the LED indicators on the display simultaneously during 1 minute. To do this, use an object of diameter ≤ 3 mm, such as a small screwdriver, inserted into the hole indicated as " " and press the button located on the inside for around 5-6 seconds.
- Wait about 10 minutes for the condenser group on the module's internal DC bus to discharge completely before removing the module.

Maintenance operations are restricted to **T.S.S.** personnel or the distributor. Under no circumstances can there be any access to the inside of the equipment, apart from the connection operations, which are also reserved exclusively for **qualified** personnel.

Do not open the sub rack or modules, there is a high risk of an electric shock that could be fatal.

When the UPS is operating in "Manual Bypass Mode" (maintenance or repair period), the connected equipment is not protected against power cuts or micro-cuts, overvoltages, voltage and/or frequency variations, etc., since it is being supplied directly from the commercial AC mains.

6.3.2. Procedure to switch from maintenance bypass mode to normal mode.

1. Reset all the modules of the system when they have been extracted as indicated in point 2 of the section 6.3.1, above. Insert and secure them.
2. Activate the circuit breakers of the manual bypass board in the following order: Bypass [device version B, with independent bypass line], Input and Output.
   The LCD touch screen starts up. The rectifier indicator flashes during start-up. The rectifier enters the normal operating state and after around 20 seconds the rectifier indicator stops flashing red to remain permanently active in green. After initialisation, the static bypass remains active, supplying voltage to the output terminals from the AC main; the bypass indicator turns green. Check this last point on the display and/or the LCD screen before proceeding.
3. Turn the manual bypass switch on the external panel to "Off" and set the mechanical lock.
   In installations with protection boards [without manual bypass switch], turn the manual bypass switch on the subrack to "Off" and place its mechanical lock.
   For safety, it is necessary to block the switch mechanically, otherwise there is a risk of unexpected operation of the switch at any time, with the consequent destruction of the UPS and the load.
4. After around 60 seconds, the UPS transfers the load to the inverter. Switch the protection or the battery circuit breaker of the battery cabinet to the "On" position.

6.4. EPO PUSH BUTTON (EMERGENCY STOP). PROCEDURE.

Conceptually the EPO push button is designed to disconnect the UPS in emergency conditions (e.g. fire, flood, etc.).
The device has an EPO push button and the user can install an external one, connected to the device via communications terminal J4.
When the EPO button is pressed, the system immediately stops the rectifier, the inverter and the bypass, leaving the load without power. Batteries are no longer charged or discharged.
If the AC input network is present, the UPS control circuit will remain active, but without voltage at the output.
To completely isolate the UPS, follow the steps in the next section.

6.4.1. Complete stop of the UPS, with EPO.

1. If stopping is planned or scheduled, stop the loads beforehand. In case of emergency, go directly to step 2.
2. Press the EPO button on the bypass and monitoring module.
3. Switch the protection or the battery circuit breaker of the battery cabinet to the "Off" position.
4. Switch the circuit breakers of the manual bypass board to the "Off" position in the following order: Bypass [device version B, with independent bypass line], Input and Output.
   The EPO condition will be clear when the input panel switch to "Off" is pressed.
   The UPS is completely out of service.

6.4.2. UPS restart after full stop with EPO.

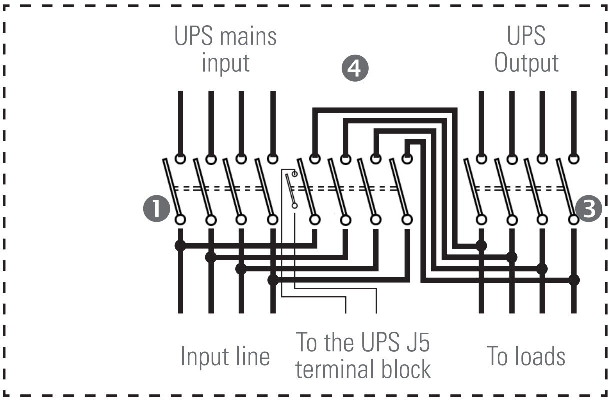
The procedure is used to restore the system after the EPO has been activated and its complete stop:

1. Once you press the EPO button, you need to end the procedure before attempting to restart the system.
2. Restart the UPS as described in section 6.2.2.
   The alarm will be cancelled, so the EPO status will be deleted when the input off operation described in the preceding paragraph is executed.

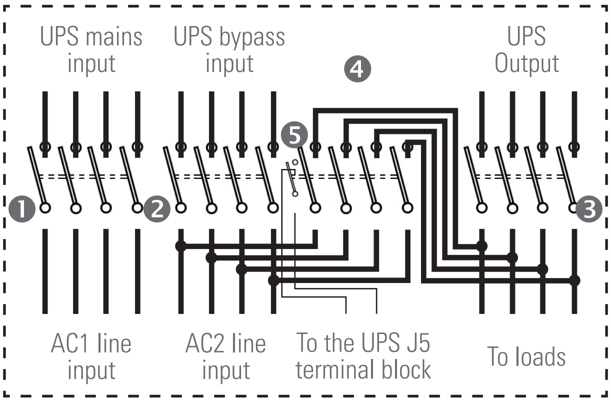
6.5. AUTOMATIC RESTART.

When the UPS is operating in Normal Mode and the input mains fails, it will automatically switch to Batteries Mode, where the loads are fed from the inverter from the energy stored in the accumulators. If the mains failure goes on beyond the possible power that the battery pack can supply, the end of discharge is reached and the UPS will stop.
The UPS will restart automatically by supplying output voltage:

1. After returning the commercial AC network.
2. If the parameter "Automatic reset" after EOD is enabled.



External manual bypass board, with common input network for rectifier and static bypass.



External manual bypass board with separate networks for rectifier and static bypass.

Fig. 32. Internal wiring diagram of an external manual bypass board for a device.

Functionality of the switches:

❶ Input circuit breaker.
❷ Static bypass circuit breaker - line 2.
❸ Output circuit breaker.
❹ Manual bypass circuit breaker -maintenance Bypass-.
❺ It is necessary to connect the auxiliary contact of the manual bypass switch on the external panel, with the J5 terminal block of the communication block of the UPS as a preventive action. In case of improper or untimely switching of the manual bypass switch to "On" with the UPS in "Normal Mode", this auxiliary contact will force the transfer of the device to "Bypass Mode", so avoiding a short-circuit and its destructive consequences.
If you are purchasing a manual bypass board, you must ensure that you have the auxiliary contact normally open -NO- which should be advanced to the closed position.
In parallel systems, the manual bypass mechanism shall have as many auxiliary contacts as there are units in parallel, allowing separate connection.

6.6. OPERATING INSTRUCTIONS FOR MAINTENANCE OF POWER MODULES.

These actions are reserved exclusively for the **T.S.S.** staff or the distributor.

6.6.1. Maintenance guide for power modules.

6.6.1.1. With the system operating in normal mode and the normal bypass voltage and frequency, with at least 1 power module as redundant:

1. Click on the Extraer Mod icon in the "Status & Ops" menu to enable the power module shut-down function.
2. Using the "On/Off" button next to the LED indications on the front panel, manually stop the power module. Use an object of diameter ≤ 3 mm, such as a small screwdriver, to insert it into the hole indicated as "⏻" and press for around 5-6 seconds on the button located on the inside.
3. Remove the fixing screws of the lateral trim profiles and the power module fixing screws.
   Slightly pull the handle on each end of the module and remove it 4-5 cm from the socket to remove it from the connector on the backplane of the device.
   Wait around 10 minutes and remove it from its slot.
   ⚠ To ensure safety, check with an instrument the voltage of the DC bus, which should be below 60 V DC.

6.6.1.2. No power modules operating as redundant:

1. Click on the icon BYP Transf. in the "Operation" menu. to switch to "Bypass mode."
2. Click on the icon Extraer Mod in the "Operation" menu to enable the power module shutdown function.
3. Manually stop the power module by pressing the button "⏻" for around 5-6 sec.
4. Remove the fixing screws of the lateral trim profiles and the power module fixing screws.
   Slightly pull the handle on each end of the module and remove it 4-5 cm from the socket to remove it from the connector on the backplane of the device.
   Wait around 10 minutes and remove it from its slot.
   ⚠ To ensure safety, check with an instrument the voltage of the DC bus, which should be below 60 V DC.
5. After the end of the maintenance operations, insert the power module until it is at the end of its slot to connect to the "backplane" of the device. After around 2 min the power module will activate automatically adding to the parallel of the rest of the modules.
6. Insert and tighten the fixing screws of the module.
7. Fit the side profiles, their screws, and fix them in place.

6.7. OPERATING INSTRUCTIONS FOR MAINTENANCE OF THE BYPASS AND MONITORING MODULE.

⚠ The bypass and monitoring module cannot be operated in Battery Mode.

These actions are reserved exclusively for the **T.S.S.** staff or the distributor.

6.7.1.1. With the system operating in Normal Mode and normal bypass voltage and frequency, transfer the load over the manual bypass.

1. Manually stop the inverter. The UPS will transfer to Bypass Mode.
2. Remove the mechanical lock of the manual bypass switch from the external panel and switch it to "On". The load will be fed directly from the mains via the manual bypass.
   When a protection board is provided instead of a manual bypass, the mechanical bypass lock must be removed, at the back of the cabinet, and the bypass switch set to "On", as this switch will not be located in the switchboard.
3. Switch the protection or the battery circuit breaker of the battery cabinet to the "Off" position.
4. Switch the circuit breakers of the manual bypass board to the "Off" position in the following order: Output, Input and Bypass [devices version B, with independent bypass line].
5. Remove the fixing screws of the lateral trim profiles and the MBS fixing screws.
   Slightly pull the handle on each end of the module and remove it 4-5 cm from the socket to remove it from the connector on the backplane of the device.
   Wait around 10 minutes and remove it from its slot.
   Carry out appropriate maintenance.
6. After the end of the maintenance operations, insert the bypass and monitoring module until it is at the end of its slot to connect to the "backplane" of the device.
   All UPS configuration parameters are stored in the bypass and monitoring module. Any substitution entails the necessary programming of the same parameters as the original module. This task must only be carried out by our **T.S.S.** staff or the distributor.
   Replacing one MBS with another without carrying out the corresponding configuration can lead to serious or very serious faults.
7. Insert and tighten the fixing screws of the module.
8. Fit the side profiles, their screws, and fix them in place.
9. Proceed as described in section 6.4.2. to switch back to Normal Mode.

6.8. LANGUAGE SELECTION.

The menus displayed on the LCD touch screen and the display of parameters and data are available in 6 languages:

- Spanish.
- English.
- French.
- Catalan.
- Portuguese.
- German.

To select a language, perform the following:

1. Click on the icon within the main menu to enter the set-up menu on the LCD.
2. Select the "Language" menu.
3. Select the required language, see *Fig. 33*. From this moment all the menus, parameters and data will be displayed in the selected language.

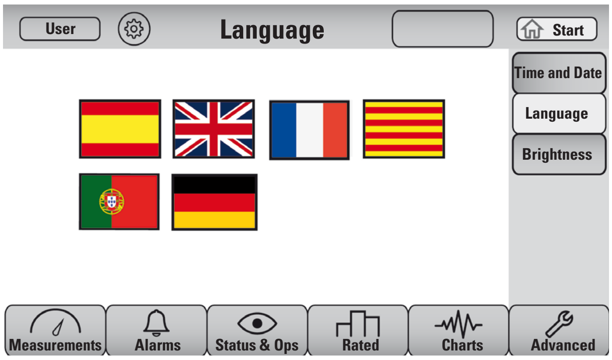


Fig. 33. Language Screen

6.9. CHANGING THE CURRENT DATE AND TIME

To change the system date and time, perform the following:

1. Click on the icon in the "Main" menu to access the Time and Date menu.
2. Select the "Time and Date" menu.
3. Enter the Time, Date in Month, Month, Day of the Week and Date Format.

6.10. LEVEL CONTROL PASSWORD.

The system is password protected to control unauthorised operations. The following table specifies the types of user and the corresponding permissions:

Menu Options	User level	Password
Status and Control Orders	Advanced User level	PWS#1
Rated values (Input-Output and Batteries)	Advanced User level	PWS#1
Tools (Date and Time, UPS flags, Module flags)	Advanced User level	PWS#1
Advanced (Initial config, Power, UPS flags, Module flags)	Technical User level	PWS#2

Table 11. Permissions corresponding to types of user.

7. MONITORING PANEL WITH LCD TOUCH SCREEN.

This chapter describes the functions and instructions for operation of the monitoring panel with LCD touch screen, including detailed information on the menus, notice screens and list of alarms from the UPS.

7.1. INTRODUCTION.

Physically, the monitoring panel with LCD touch screen and static bypass are part of the same unit as a module, although they are individual entities with their own functionalities.
Through the LCD panel you can operate and control the UPS, verify all measurements and parameters, device status and batteries, and historical and event logs. The following figure shows the monitoring panel:

Fig. 34. Touch screen with two RGB LEDs to show the status of the UPS.

The control panel consists of two parts:

1. The touch-sensitive data and parameter configuration display.
2. Two RGB status LEDs.

7.2. FUNCTIONS OF THE RGB LEDS.

The RGB LEDs indicate the STATUS of the UPS You can see at a glance if the UPS status is NORMAL, LOW-LEVEL ALERT (WARNING) or ALARM. They change in colour and flashing frequency. Although both the colours and the flashing frequencies of the indicators can be programmed, by default they are as shown in the following table:

UPS Status	LED colour	Flashing frequency
Normal	Green	Very slow
Warning	Amber	Slow
Alarm	Red	Quick

Table 12. Functions and colour coding of the LEDs.

7.3. ACOUSTIC ALARM.

The acoustic alarm in the UPS has two tones that define the presence of Alarms (rapid beeps) or Warnings (slow beeps).

7.4. DESCRIPTION OF THE SCREENS SHOWN ON THE LCD TOUCH SCREEN.

7.4.1. Start menu or main screen.

Fig. 35, by way of example, shows the main screen that the LCD monitoring panel can display. It is basically divided into four areas: System information, Power flow, Current warnings or Alarm window, and Main menu.

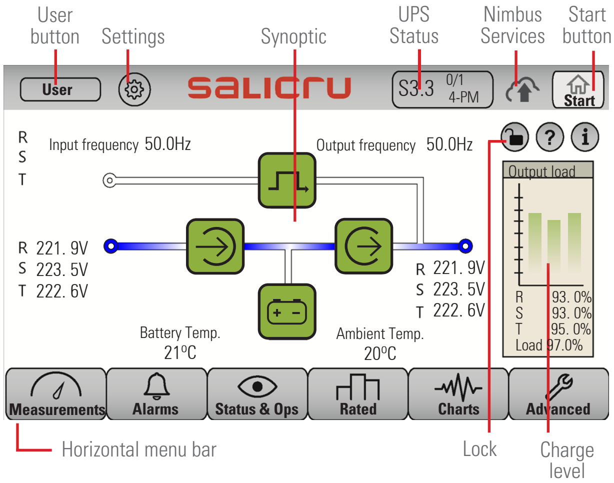


Fig. 35. Main start-up screen.

7.4.1.1. Access to menus and sub-menus from the Main screen.

The Main menu includes the following icons:

Icon	Description
Measurements	UPS parameters menu. This menu contains sub-menus to obtain information on the different parts of the UPS.
Alarms	Alarms menu. Opens a table showing the active Alarms and Warnings at any moment.
Status & Ops	Status and Control menu. This screen displays the different states of the UPS and allows a series of UPS operations to be controlled manually.
Ratings	Rated Values menu. Certain ratings parameters of the UPS can be configured in this menu.
Charts	Graphics display menu for some relevant parameters of the UPS, such as voltages, currents, powers, etc.
Advanced	UPS Advanced Configuration menu.
User	Allows users to initiate session as an Advanced user or a Specialised user.
	Tools sub-menu for date and time setting, language selection, screen brightness, etc.
Start	Returns the user to the Main Screen.
	Screen Lock button
?	Help text button.
i	Button to contact the UPS manufacturer

	UPS's operating mode information - S(Single), P(Parallel), E(ECO Single), EP(ECO Parallel), - L(LBS Single), LP(LBS Parallel), A(Reinjection) - UPS ID / Nº of UPSs in Parallel (e.g.: 0/3) - Number of Modules connected in the UPS (e.g.:N=5) Type of UPS: - 3:3 3Ph/3Ph - 3:1 3Ph/1Ph - 1:3 1Ph/3Ph - 1:1 1Ph/1Ph
	Nimbus Services communications enabled: SNMP card correctly inserted into its slot.
	Nimbus Services communications disabled: No SNMP card or card installed in non-Internet proprietary networks or communications errors.

Tab. 13. Description of the start or main menu icons.

7.4.1.2. Information content of the Main Screen.

The following information can be viewed on the Main Screen.

1. Measured input frequency.
2. Measured input voltages per phase.
3. Measured output frequency.
4. Measured output voltages per phase.
5. Battery temperature.
6. Ambient temperature.
7. Graphic of percentage output load level per phase.
8. Measured percentage of output load level per phase.
9. Measured percentage of total output load.
10. Synoptic diagram of the UPS showing the states of the following Power Blocks:
    a. Bypass status.
    b. Rectifier status.
    c. Inverter status.
    d. Battery status.
       All of the power blocks can be represented in three colours:
       – GREEN: Normal Operation
       – ORANGE: Operating with a non-critical warning.
       – RED: Operating with a Critical Alarm.
    e. Energy flows in the different power blocks of the UPS.

7.4.1.3. Map of screens accessible from the Main Screen.

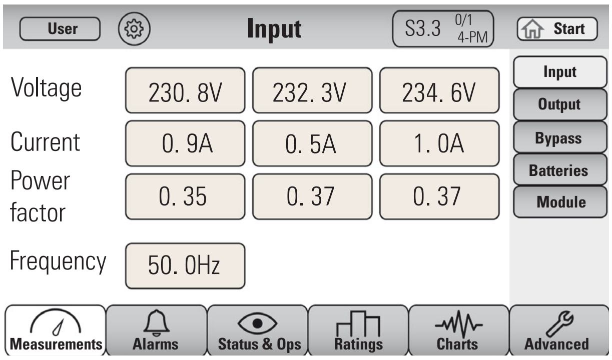
												Main scr
Measurements							Alarms		Status and Control			Rat
	UPS			Module				Historical record		States		
		Input			Rectifier			Mute alarm			UPS	
			Voltage			Voltage					Battery	
			Current			Current					Modules	
			Power factor			Frequency				Commands		
			Frequency			Power factor					Transfer to bypass	
		Output				Bus voltage					Transfer to inverter	
			Voltage		Inverter						Extract Module	
			Current			Voltage					UPS unlock	
			Power factor			Current					Boost/Float	
			Frequency			Frequency					Battery Test	
			Load R			Power factor					Discharge Test	
			Load S		Output Power						Stop test	
			Load T			Active power						
			Total load			Apparent power						
		Bypass				Reactive power						
			Voltage			Load R						
			Current			Load S						
			Power factor			Load T						
			Frequency		Module alarms							
		Batteries			Information							
			Voltage			Rectifier IGBT Temperature						
			Current			Inverter IGBT Temperature						
			Capacity			Fan Usage Time						
			Temperature			Capacitors Usage Time						
			Usage Time									
			Backup Estimation time									
			No. Discharges									

Fig. 36. Screen menu tree

n screen														
Rated					Charts		Advanced					Other		
	Input-Output							Setting Menu					Tools	
		Rated Input voltage						Power Configuration						Time and Date
		Rated Input frequency							UPS Power					Language
		Rated Output voltage							UPS Power use					Brightness
		Rated output frequency							Module power				Lock	
	Batteries								Module Power use				Guide	
		No. Batteries							UPS setting flags					
		Battery capacity							Module setting flags					
		Charging current												
		Float voltage/cell												
		Quick charging voltage/cell												
		EOD Voltage@0.15xC/Cell												
		EOD Voltage@0.6xC/Cell												

7.4.2. Measurements menu.

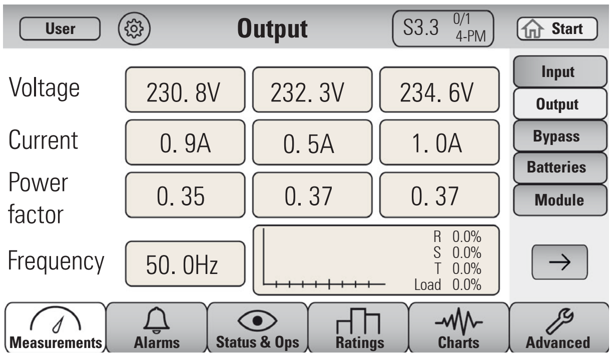
All of the measurements screens that can be accessed from the Measurements screen are described below.



UPS Input measurements:

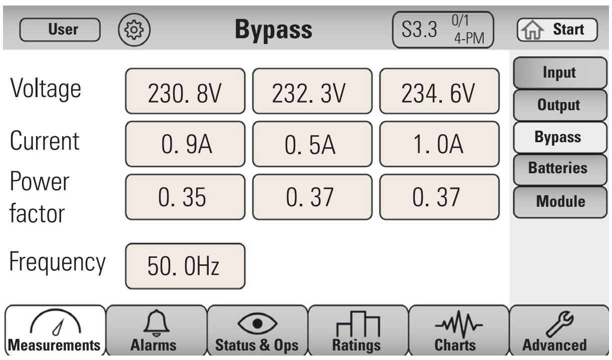
- Three voltages at the rectifier input, measured phase to neutral in volts.
- Three currents at the rectifier input, measured per phase in Amperes.
- Three power factors at the rectifier input, per phase.
- Measured rectifier input frequency in Hz.

Note: in this and the subsequent screens, all readings are expressed to one decimal place except the power factor, expressed to two decimal places.



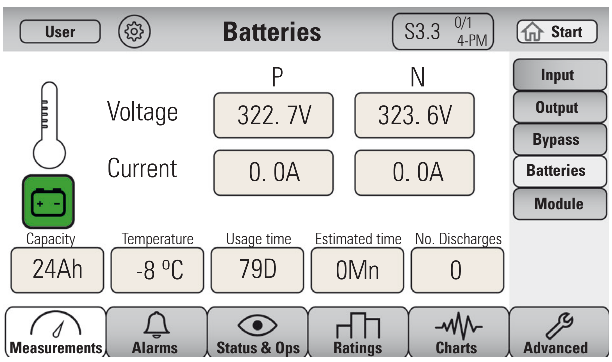
UPS Output measurements:

- Three voltages at the UPS Output, measured phase to neutral in volts.
- Three currents at the UPS Output, measured per phase in Amperes.
- Three power factors at the UPS Output, per phase.
- Measured UPS Output frequency in Hz.
- Three UPS output load percentages, one per phase, and the total percentage of load at the UPS output,with a graphic display.



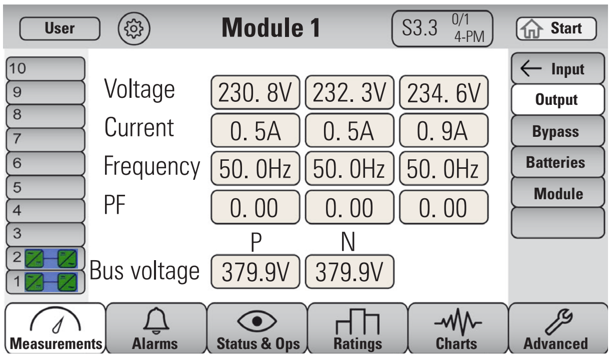
Bypass Input measurements:

- Three voltages at the Bypass input, measured phase to neutral in volts.
- Three currents at the Bypass input, measured per phase in Amperes.
- Three power factors at the Bypass Input, per phase.
- Measured Bypass input frequency in Hz.



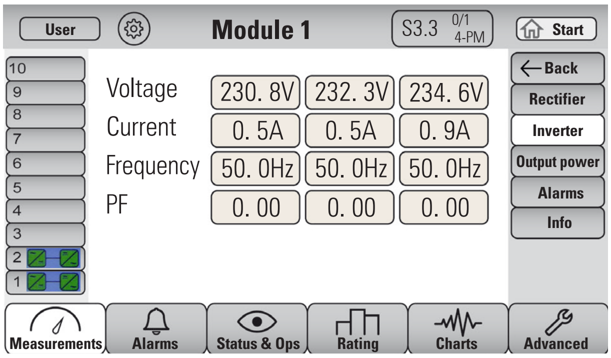
Battery Bank Measurements:

- Two battery voltages, Positive and Negative, in volts.
- Two battery currents, Positive and Negative, in Amperes.
- Battery capacity in Ah.
- Battery temperature in ºC.
- Operating time of the battery, in days.
- Estimated backup time, in minutes.
- Number of times battery discharged.



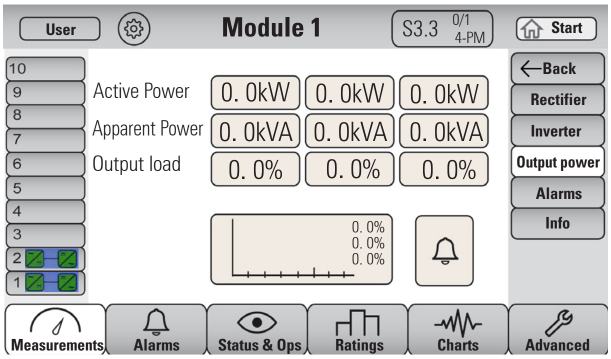
Rectifier measurements of selected module:

- Three voltages at the rectifier input, measured phase to neutral in volts.
- Three currents at the rectifier input, measured per phase in Amperes.
- Measured rectifier input frequency, per phase in Hz.
- Three power factors at the rectifier input, per phase.
- Two DC bus voltages, Positive and Negative, in volts.



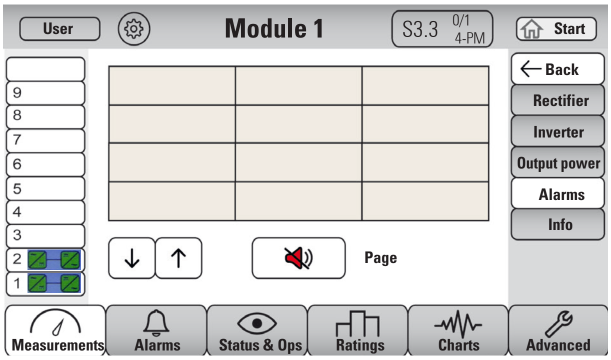
Inverter measurements of selected module:

- Three voltages at the Inverter Output, measured phase to neutral in volts.
- Three currents at the Inverter Output, measured per phase in Amperes.
- Measured Inverter Output frequency in Hz.
- Three power factors at the Inverter Output, per phase.

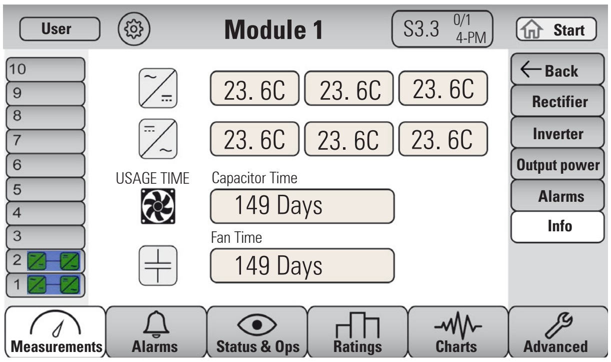


Power measurements at the module output:

- Three module active power outputs, measured per phase in kW.
- Three module apparent power outputs, measured per phase in kVA.
- Three percentages of output load, per phase in %.
- Three percentages of output load for the module, per phase, and with graphic and overload alarm.



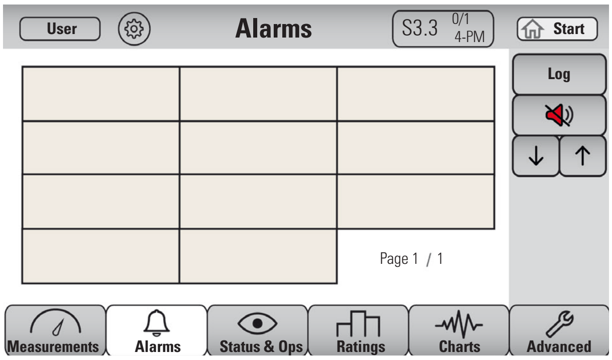
- Screen with a table listing the Active Alarms for the module (red text) and Active Warnings (yellow text).
- Button to silence the acoustic alarm and vertical scroll controls in case there are many alarms.



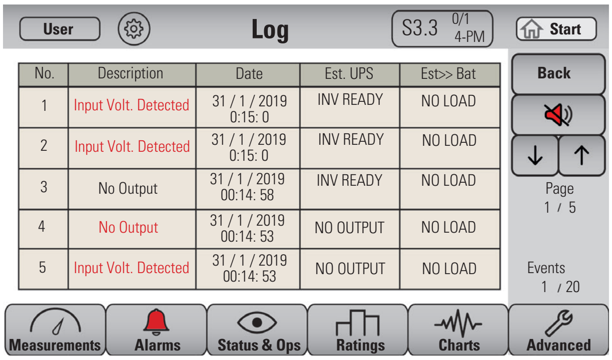
Other information of interest for this module:

- Rectifier semiconductor temperatures in the module, per phase in °C.
- Inverter semiconductor temperatures in the module, per phase in °C.
- Operating time of the fans in the module, in days.
- Operating time of the DC condensers in the module, in days.

7.4.3. UPS alarms menu.



Screen with a table listing the Active Alarms for the UPS (red text) and Active Warnings for the UPS (yellow text).
Button to silence the acoustic alarm and vertical scroll controls in case there are many alarms.
See the tables of Alarms and Warnings for the Alarms and Warnings that may appear in this menu.

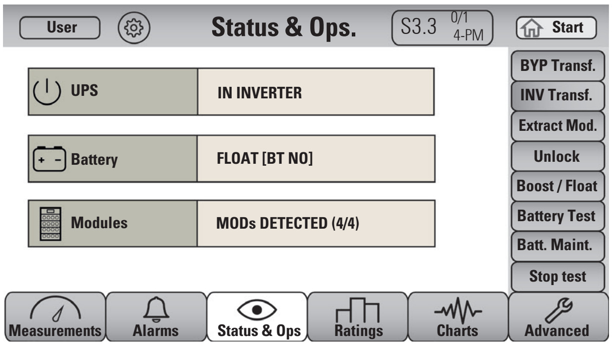


Screen showing the Events log with the following information in columns:

- Event number
- Description
- Date and time of event
- State of the UPS
- Battery status

The events log store information on Alarms, Warnings and Events. See the tables of Alarms, Warnings and Events.

7.4.4. Status & Ops menu.



Manual operations buttons, password-protected for Advanced users.

- Switch BYP: Switch to Bypass mode.
- Switch INV: Switch to Inverter mode.
- Extract Module: Button to allow extraction of modules.
- Unlock: UPS Unlock button.
- Boost / Float: Button to switch manually from Float Charging to Fast Charge, or vice versa.
- Battery test: Button to manually initiate a battery test.
- Batt. Maint.: Button for maintenance discharge test.
- Stop test: Button to manually stop any of the above tests.

UPS:

- NO OUTPUT: Message that is displayed when the UPS is started-up.
- IN BYPASS: Displayed when the UPS is in Bypass mode.
- INV.RUNNING: The Inverter is running.
- IN INVERTER: The UPS is operating in Inverter mode.
- BYP.LOCKED: The UPS is locked in Bypass mode. This requires manual unlocking.
- OUT.LOCKED: The UPS is locked with no output. This requires manual unlocking.

Battery status message:

- NO BATTERY: No batteries are connected to the UPS.
- FLOATING: Batteries are float-charging.
- FAST: Batteries are fast-charging.
- DISCHARGE: Batteries are Discharging.
- STOP CHARGE: Temporary pause in battery charging.
- END BCKUP: End of backup.
- TEST: Battery test.
- MAINT.: Maintenance discharge test.

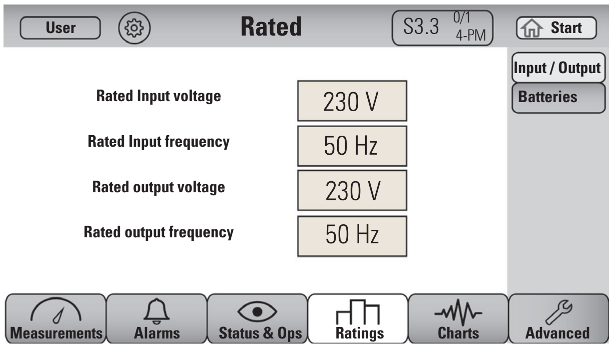
Battery test results message:

- [BT NO]: No battery test has been performed since the last time the UPS was started-up.
- [BT ..]: Test running.
- [BT OK]: Result of the latest test: OK.
- [BT KO]: Result of the latest test: fault.

Modules:

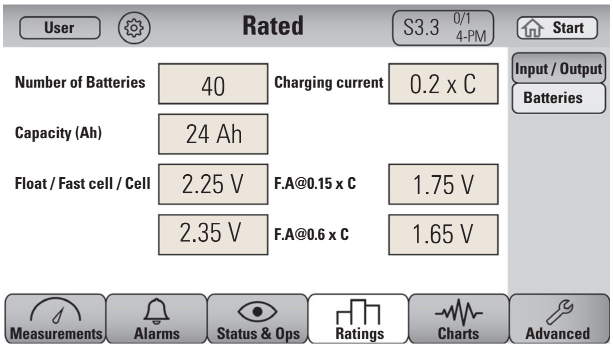
- MOD START: No modules detected.
- MOD DETECTED (n): Normal message: number of modules feeding the UPS output.
- MODULE OFF: Appears when the module disconnection button is pressed.
- MOD EXTRACTED: Appears when a module is correctly extracted.
- MOD INSERTED: Appears when a new module is correctly inserted.
- MOD EXTRACT INC: Appears when a module is incorrectly extracted.

7.4.5. Rated values menu.



Configuration menu for the Rated Voltage and Frequency parameters.

- Rated input voltage in volts.
- Rated input frequency in Hz.
- Rated output voltage in volts
- Rated output frequency in Hz.

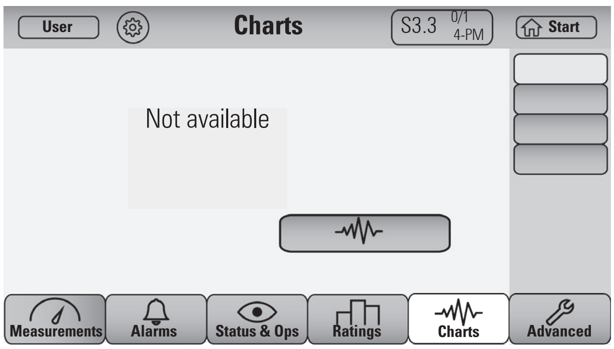


Configuration menu for the Rated Battery parameters:

- Number of batteries in each half-bus, positive and negative (40 = 20 + 20)
- Battery charge current with respect to battery capacity (If C = 24 Ah, Charge Current = 0.2 x 24 = 4.8 A)

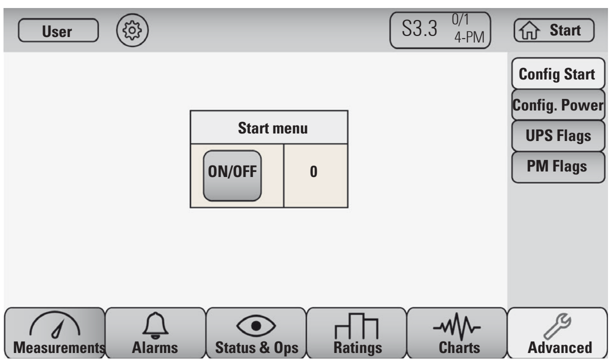
- Battery capacity in Ah.
- Float Voltage per cell in Volts [Half-bus Float Voltage = 40 (batteries) / 2 (half-buses) x 6 (cells/battery) x 2.25 (V/cell) = 270 Volts].
- End of Backup Voltage at a discharge current of 0.15 x C per cell in Volts [Half-bus EOD Voltage @ 0.15 x C = 40 (batteries) / 2 (half-buses) x 6 (cells/battery) x 1.75 (V/cell) = 210 Volts].
- End of Backup Voltage at a discharge current of 0.6 x C per cell in Volts [Half-bus EOD Voltage @ 0.6 x C = 40 (batteries) / 2 (half-buses) x 6 (cells/battery) x 1.65 (V/cell) = 198 Volts].
- Fast Charge Voltage per cell in Volts [Half-bus Fast Charge Voltage = 40 (batteries) / 2 (half-buses) x 6 (cells/battery) x 2.35 (V/cell) = 282 Volts].

7.4.6. Charts menu.



Charts screen.

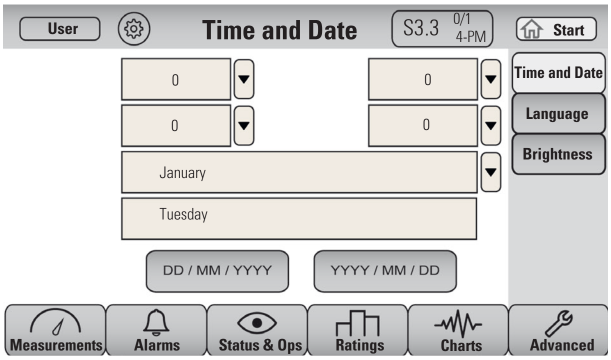
7.4.7. Advanced menu



Configuration menu for the Start Screen.

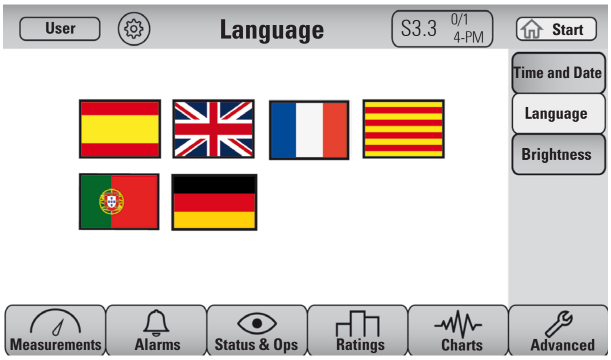
When the Config on Start button is pressed, a 1 appears in the cell to the right. If the UPS is turned off under these conditions, the next time it is turned on, the user will have to enter the Rated Voltage and Frequency, Date and Time, and Language. Once these parameters have been set, the value Config on Start will be reset to zero.

7.4.8. Other screens



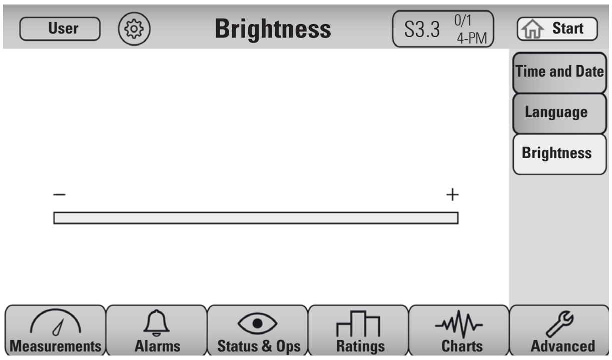
Time and Date settings screen:
Program:

- Hour
- Minutes
- Date in Month
- Year
- Month
- Day of Week
- Date Format

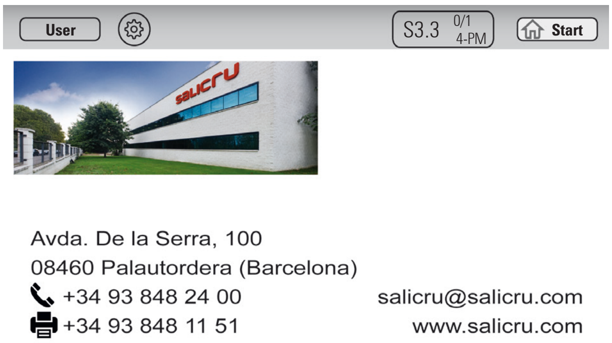


Language selection screen:
Select between:

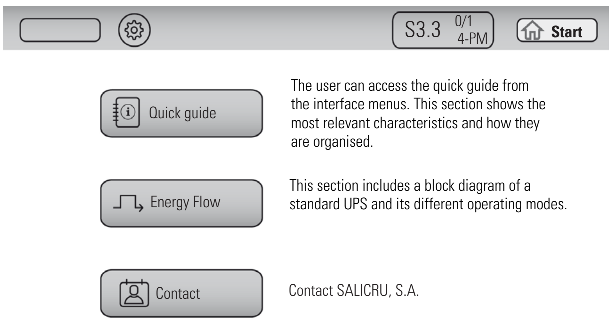
- Spanish
- English
- French
- Catalan
- Portuguese
- German



Screen brightness adjustment screen:
Slide the control with a finger or press + or - to increase or decrease the brightness of the touch-sensitive LCD screen.



Screen to contact the UPS manufacturer.



User Guide to resolve doubts:

- General Guide to operation of the UPS device.
- Descriptive Block Diagrams of the different operating modes available in the UPS.
- Contact the Manufacturer.

7.5. TABLES OF ALARMS, WARNINGS AND EVENTS.

7.5.1. Table of UPS Alarms.

No.	NAME OF ALARM	DESCRIPTION	TYPE OF ALARM
1	ALM_EPO	Emergency Power Off	UPS
2	ALM_BYPASS_SEQUENCE_ERROR	Phase sequence failure in Bypass	UPS
3	ALM_BYPASS_SCR_FAIL_OPEN	Semiconductor fault in Bypass, Open-circuit SCR.	UPS
4	ALM_BYPASS_SCR_FAIL_SHORTED	Semiconductor fault in Bypass, Short-circuit SCR.	UPS
5	ALM_BYPASS_OVER_LOAD_TOUT	Bypass Overload Timed-out	UPS
6	ALM_OUTPUT_SHORT_CIRCUIT	Short-circuit in Output	MODULE
7	ALM_BATTERY_EOD	The battery has reached End of Backup	UPS
8	ALM_RECTIFIER_FAIL	Rectifier fault	MODULE
9	ALM_INVERTER_FAIL	Inverter fault	MODULE
10	ALM_RECTIFIER_OVER_TEMP	Rectifier over-temperature	MODULE
11	ALM_FAN_FAIL	Fan fault	MODULE
12	ALM_OUTPUT_OVER_LOAD	Overload at Output	MODULE
13	ALM_INVERTER_OVERLOAD_TOUT	Inverter Overload Timed-out	MODULE
14	ALM_INVERTER_OVER_TEMP	Inverter over-temperature	MODULE
15	ALM_ON_UPS_INHIBITED	The UPS is disabled, cannot switch to Inverter	UPS
16	ALM_BATTERY_REVERSE	Battery polarity fault	MODULE
17	ALM_INVERTER_PROTECT	Over-current protection tripped in Inverter	MODULE
18	ALM_INPUT_NEUTRAL_LOST	Neutral connection fault	MODULE
19	ALM_BYPASS_FAN_FAIL	Fan fault in Bypass	UPS
20	ALM_PARALLEL_CABLE_ERROR	Connection fault in parallel communications cable	UPS
21	ALM_REC_CAN_FAIL	CAN bus connection fault in Rectifier	UPS
22	ALM_INV_IO_CAN_FAIL	CAN bus connection fault in Current Sharing between Modules	MODULE
23	ALM_INV_DATA_CAN_FAIL	CAN bus connection fault in Inverter	UPS
24	ALM_SYNC_PULSE_FAIL	Fault in the low-frequency synchronisation signal	MODULE
25	ALM_BATTERY_VOLT_DETECT_FAIL	Low battery	UPS
26	ALM_OUTPUT_VOLT_FAIL_R	Inverter output voltage fault in Phase R	UPS
27	ALM_OUTPUT_VOLT_FAIL_S	Inverter output voltage fault in Phase S	UPS
28	ALM_OUTPUT_VOLT_FAIL_T	Inverter output voltage fault in Phase T	UPS
29	ALM_INV_BRIDGE_FAIL	Fault in an IGBT half-bridge branch in Inverter	MODULE
30	ALM_INPUT_CURR_UNBALANCE	Rectifier input current unbalanced	MODULE
31	ALM_REC_SOFT_START_FAIL	Rectifier soft-start circuit fault	MODULE
32	ALM_RELAY_CONNECT_FAIL	Fault in Inverter Connection Relay output	MODULE
33	ALM_RELAY_SHORT_CIRCUIT	Inverter Connection Relay Short-circuit	MODULE
34	ALM_PWM_SYNC_FAIL	Fault in the PWM Synchronisation signal	MODULE
35	ALM_INPUT_OVER_CURR_TOUT	Rectifier Overload Timed-out	MODULE
36	ALM_NO_INLET_TEMP_SENSOR	No temperature sensor in external air inlet	MODULE
37	ALM_NO_OUTLET_TEMP_SENSOR	No temperature sensor in external air outlet	MODULE
38	ALM_BYPASS_CAN_FAIL	Fault alarm in Bypass CAN bus	UPS
39	ALM_FIRMWARE_ERROR	A module contains unrecognised firmware	UPS
40	ALM_SYSTEM_SETTING_ERROR	System file corrupt or erroneous. The module configuration does not correspond to the type of module.	MODULE
41	ALM_MODULE_ID_DUPLICATE	Duplicate Module Address	MODULE
42	ALM_INV_IGBT_OVERCURRENT	Over-current in the IGBTs in one of the Modules	MODULE
43	ALM_REDUNDANT_OVL_TOUT	Non-redundant Modules Overload Timed-out	UPS
44	ALM_NO_OUTPUT	Output voltage fault	UPS
45	ALM_MAINT_BYPASS	Maintenance Bypass Switch Connected	UPS
46	ALM_BATTERY_LOW	Low Battery Alarm	USP
47	ALM_FILE_SYSTEM_ERROR	File System Error	UPS

7.5.2. Table of UPS Warnings

No.	NAME OF ALARM	DESCRIPTION	TYPE OF ALARM
1	WRN_BATTERY_NOT_CONNECTED	Battery disconnected	UPS
2	WRN_MODULE_ON_LESS	There are not enough Modules to supply the Inverter load	UPS
3	WRN_UTILITY_ABNORMAL	Rectifier Input voltage out of range	MODULE
4	WRN_BYPASS_VOLT_ABNORMAL_R	Bypass voltage out of range in Phase R	UPS
5	WRN_BYPASS_VOLT_ABNORMAL_S	Bypass voltage out of range in Phase S	UPS
6	WRN_BYPASS_VOLT_ABNORMAL_T	Bypass voltage out of range in Phase T	UPS
7	WRN_BYPASS_MODULE_OVER_LOAD_R	Bypass overload in Phase R	UPS
8	WRN_BYPASS_MODULE_OVER_LOAD_S	Bypass overload in Phase S	UPS
9	WRN_BYPASS_MODULE_OVER_LOAD_T	Bypass overload in Phase T	UPS
10	WRN_BYP_FREQ_OVER_TRACK	Modules and Bypass Synchronisation fault	UPS
11	WRN_EXCEED_TX_TIMES_LMT	Bypass transfer attempts exceeded	MODULE
12	WRN_BATTERY_VOLT_LOW	Battery voltage low	MODULE
13	WRN_LOST_N_X_REDUNDANT	Loss of Redundancy	UPS
14	WRN_BATTERY_TEST_FAIL	Battery Test results in Fail	MODULE
15	WRN_BATTERY_MAINTENANCE_FAIL	Discharge Test results in Fail	MODULE
16	WRN_AMBIENT_OVER_TEMP	Ambient overtemperature	UPS
17	WRN_INPUT_VOLT_DETECT_FAIL	Rectifier input voltage fault	MODULE
18	WRN_OUTLET_TEMP_ERROR	Error in outlet air temperature measurement	UPS
19	WRN_DC_BUS_OVER_VOLT	DC bus overvoltage	MODULE
20	WRN_INLET_OVER_TEMP	Module inlet air over-temperature	MODULE
21	WRN_BATTERY_OVER_TEMP	Battery over-temperature	UPS
22	WRN_BYPASS_FAN_EXPIRED	Excess Operating Time of the fans in the Bypass	UPS
23	WRN_CAPACITOR_EXPIRED	Excess Operating Time of the capacitors in the Modules	MODULE
24	WRN_FAN_EXPIRED	Excess Operating Time of the fans in the Modules	MODULE
25	WRN_OUTLET_DELTA_TEMP	Internal over-temperature	MODULE
26	WRN_BATTERY_EXPIRED	Excess Battery Operating Time	UPS
27	WRN_DUST_FILTER_EXPIRED	Excess Dust Filter Operating Time	UPS
28	WRN_BYPASS_OVER_TEMP	Bypass over-temperature	UPS
29	WRN_RTC_BATT_LOW	Low voltage in Lithium battery of the clock and Non-volatile Memory	UPS
30	WRN_GENSET_INPUT	Generator input	UPS
31	WRN_SHUTDOWN_INPUT	Shutdown input	UPS
32	WRN_BCB_OPEN	Battery circuit breaker input open	UPS
33	WRN_EXTERNAL_DIG1	External digital input 1	UPS
34	WRN_EXTERNAL_DIG2	External digital input 2	UPS
35	WRN_EXTERNAL_DIG3	External digital input 3	UPS
36	WRN_EXTERNAL_DIG4	External digital input 4	UPS

7.5.3. UPS Events list

No.	NAME OF ALARM	DESCRIPTION
1	EVN_UPS_POWER_ON	The UPS has started up
2	EVN_FAULT_CLEAR	Device unblocked
3	EVN_LOG_CLEAR	Log File deleted
4	EVN_LOAD_ON_UPS	Load connected to INVERTER
5	EVN_LOAD_ON_BYPASS	Load connected to BYPASS
6	EVN_NO_LOAD	No supply to Load
7	EVN_BATTERY_BOOST	Quick battery charging initiated
8	EVN_BATTERY_FLOAT	Battery Float Charging initiated
9	EVN_BATTERY_DISCHARGE	Batteries discharged
10	EVN_BATTERY_CONNECTED	Battery connected
11	EVN_MAINTENANCE_CB_CLOSED	Maintenance switch Closed
12	EVN_MAINTENANCE_CB_OPEN	Maintenance switch Open
13	EVN_GENERATOR_INPUT	Generator input
14	EVN_BATTERY_TEST	Battery Test initiated
15	EVN_BATTERY_TEST_OK	Battery Test results in OK
16	EVN_BATTERY_MAINTENANCE	Discharge Test initiated
17	EVN_BATTERY_MAINTENANCE_OK	Discharge Test OK
18	EVN_MODULE_INSERTED	Module inserted
19	EVN_MODULE_EXIT	Module Extracted
20	EVN_MANUAL_TRANSFER_BYP	Manual Transfer from Inverter to Bypass
21	EVN_ESC_MANUAL_BYPASS	Manual Transfer from Bypass to Inverter
22	EVN_MANUAL_SHUTDOWN	UPS Shut-down Order
23	EVN_MANUAL_BOOST_CHARGE	Fast-Charge Order
24	EVN_MANUAL_FLOAT_CHARGE	Float-Charge Order
25	EVN_UPS_LOCKED	UPS locked
26	EVN_EOD_SYS_INHIBITED	Battery End of Backup disabled
27	EVN_INTELLIGENT_SLEEP	UPS in Sleep Mode
28	EVN_MANUAL_TRANSFER_TO_INV	Force Transfer from Bypass to Inverter
29	EVN_CAPACITOR_TIME_RESET	Module Capacitor Operating Time reset
30	EVN_FAN_TIME_RESET	Module Fan Operating Time reset
31	EVN_BATTERY_HISTORY_RESET	Battery log reset
32	EVN_BYP_FAN_TIME_RESET	Bypass Fan Time reset
33	EVN_STOP_TEST	Stop Order for Battery or Discharge Test
34	EVN_WAVE_TRIGGER	Trigger signal
35	EVN_SHUTDOWN_INPUT	UPS Shut-down Input

8. OPTIONS

8.1. INTERNAL MANUAL BYPASS.

The manual bypass is an option that allows the load to be powered from the UPS or directly from the commercial mains supply.

If the UPS has an isolation transformer connected in its output or in the static bypass line, the manual bypass board must also have a transformer, in order to maintain a common neutral connection. The optional isolation transformer provides galvanic isolation between the primary and secondary windings, and this greatly attenuates electrical noise and transients from the mains, and also reduces their transfer to the secondary.

The manual bypass board is a make-before-break type, and so does not cause any interruption in the supply to the load when it is switched, unless it is operated in a different order to that specified.

⚠ If the contactor includes "backfeed protection" inside the switch board, it must be remembered that its operation is automatic and requires no attention except in the exceptional circumstance of one of its protection fuses tripping. Do not manipulate disconnector with backfeed protection fuses, except when replacing one of these protection elements.

As can be seen in *Fig. 1 to Fig. 7*, SLC ADAPT2 devices can optionally be equipped with an Internal Manual Bypass for maintenance operations, with an independent Bypass line.

Externally, the devices are equipped with additional connection terminals at the back, for the independent Bypass line, and have a manual bypass disconnector on the front, as shown in *Fig. 37,* below:

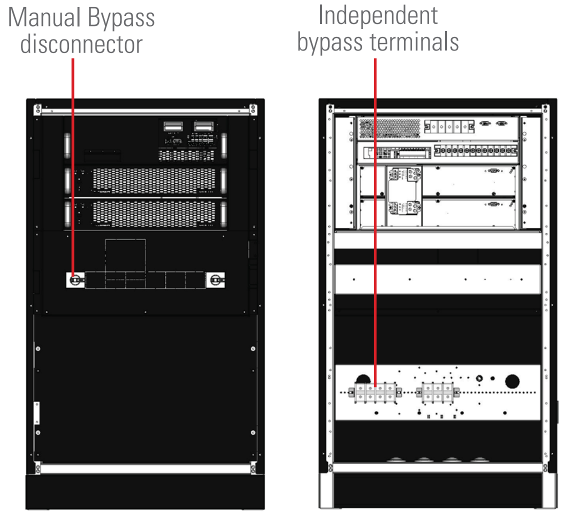


Fig. 37. Manual Bypass disconnector and terminals.

8.2. AMBIENT TEMPERATURE SENSOR.

This is a sensor that incorporates a resistance of R = 5k with B25 / 50 = 3275 K ± 1% to display the ambient temperature on the screen.

Fig. 38 shows the connection pin out of the terminal block located on the connector block of the digital inputs and dry relay contacts for the temperature sensors.

The room sensor connects to J3.

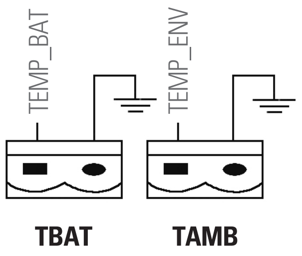


Fig. 38. Terminal block connections for sensors.

9. WARRANTY.

9.1. WARRANTY CONDITIONS.

9.1.1. Terms of the warranty.

On our website, you will find the warranty conditions for the product you have purchased where you can also register it. We recommend that this be done as soon as possible, to include it in the database of our Technical Service and Support **(T.S.S.)**. Among other advantages, it will streamline any regulatory procedures for the intervention of the **T.S.S.** in the event of a fault.

9.1.2. Exclusions.

The company will not be bound by the warranty if the defect in the product is considered to not exist or to have been caused by improper use, negligence, inadequate installation and/or verification, unauthorised attempts at repair or modification, or any other actions beyond its intended use, or by an accident, fire, lightning or other hazards. Nor shall it cover any compensation for loss or damage.

9.2. TECHNICAL SERVICES NETWORK.

Information on both national and international coverage of the Technical Service and Support **(T.S.S.)** points can be found on our website.

10. GENERAL TECHNICAL FEATURES.

10.1. INTERNATIONAL STANDARDS.

Information	Standards
Quality and Environmental Management	ISO 9001 & ISO 14001
General and safety requirements for UPS used in user access areas.	IEC/EN62040-1
Electromagnetic compatibility (EMC) requirements for UPS	EN-IEC 62040-2
Railway standards	EN 50121-4 / EN 50121-5
Method of specifying the performance and test requirements of UPS	VFI-IEC-111 (EN-IEC 62040-3)

Table 14. Standards applied.

10.2. GENERAL SAFETY CHARACTERISTICS.

Information	Standards
Pollution Degree	PD2
Overvoltage Category	OVCII

Table 15. Safety characteristics.

10.3. ENVIRONMENTAL CHARACTERISTICS.

Information	Units	Environmental
Acoustic noise at 1 metre distance	dB(A)	56.0
Operating altitude	masl	2400
Relative humidity	%	0.. 95%, non-condensing
Operating temperature	ºC	0.. 40 (battery life is reduced by 50% for every 10ºC increase over 20ºC)
Storage and transport temperature	ºC	-20.. +70 (UPS)
Recommended battery storage temperature	ºC	0.. 25 (20ºC for optimum storage)

Table 16. Environmental characteristics.

10.4. MECHANICAL CHARACTERISTICS.

Specifications of the cabinets	Units	24 U	33 U	42 U	UPS	Bat.
Dimensions (Depth × Width × Height)	mm	888 × 639 × 1103	888 x 639 x 1613	888 x 639 x 2013	Yes	Yes
Colour	-	RAL 9005				
Degree of protection, IEC60529	-	IP20				

Sub-rack specifications	Units	20/10 and 30/15	40/10 and 45/15	60/10 and 90/15
Dimensions (Depth × Width × Height)	mm	671 × 485 × 308	671 × 485 × 485	792 × 485 × 1033
Weight	Kg.	58 ÷ 73	66 ÷ 112	100 ÷ 178
Colour	-	RAL 9005		
Degree of protection, IEC60529	-	IP20		

Power module specifications (PM)	Units	10 kVA	15 kVA
Dimensions (Depth × Width × Height)	mm	590 × 485 × 85	
Weight	Kg.	15.3	15.5
Colour	-	RAL 9005	

Specifications of Bypass and Monitoring Module (MBS)	Units	2-slot and 4-slot sub-racks	6-slot sub-rack
Dimensions (Depth × Width × Height)	mm	395 × 485 × 130	380 × 485 × 380
Weight	Kg.	4.5	13.5
Colour	-	RAL 9005	

Table 17. Mechanical characteristics.

10.5. ELECTRICAL CHARACTERISTICS.

10.5.1. Electrical characteristics (rectifier input).

Information	Units	Parameters
Input ratings	V AC	200/208/380/400/415 (3-phase, sharing the neutral with the bypass input)
Input voltage range	%	-20% of 380 V (304 V) 100% load -40% of 380 V (228 V) ≤ 70% load from -40% to -20% of 380 V linearly from 70% to 100% load +25% of 380 V (475 V)
Rated frequency	Hz	50/60 (margin: 40..70)
Input power factor	KW / KVA, full load	0.99
THD	THDi %	≤ 4

Table 18. Rectifier input characteristics.

10.5.2. Electrical characteristics (DC Bus).

Information	Units	Parameters
Battery type		Pb-Ca, lead acid, gel, Ni-Cd
Charging voltage regulation		Constant current / constant voltage curve
Charger maximum power		20% of total system power
Battery charger bus voltage	V DC	Configurable between ± 192 and ÷ 264
Floating voltage	V / cell (VRL)	2.25 (selectable between 2.2.. 2.35) Mode of charging to current and constant voltage
Voltage compensation according to temperature	mV / ºC / cl	-3.0 (Selectable: 0.. 5.0 / 25 or 30ºC, or disabled)
Voltage ripple	% V floating	≤1
Power ripple	% C10	≤5
Quick charge voltage (equalisation)	V/cell (VRLA)	2.4 (selectable between: 2.30.. 2.45) Mode of charging to current and constant voltage
End of discharge voltage	V/cell (VRLA)	1.65 (selectable between: 1.60.. 1.750) @ 0.6C discharge current 1.75 (selectable between: 1.65.. 1.8) @ 0.15C discharge current (The end of discharge voltage changes linearly within the range set according to the discharge current)
Battery charging power	KW	20% * UPS capacity (selectable from: 1.. 20% * UPS capacity)

Table 19. Characteristics of parameters related to batteries.

10.5.3. Electrical characteristics (Inverter output).

Information	Units	Parameters
Rated voltage (1)	V AC	200/208/380/400/415 (3-phase and sharing the neutral with the bypass input and with the rectifier input).
Frequency (2)	Hz	50 / 60
Power factor		1

Information		Units	Parameters
Overload		%	110 (for 1 h) 125 (for 10 min.) 150 (for 1 min.) > 150 (for 200 ms)
Overcurrent		%	300 (overcurrent limitation for 200 ms)
Inverter short circuit current (PM)	**Peak**	A	53 (10 kVA); 65 (15 kVA)
	RMS	A	41 (10 kVA); 50 (15 kVA)
Inverter short circuit time (PM)		mS	240
Non-linear load capacity (3)		%	100
Neutral current capacity		%	170
Static voltage stability		%	± 1 (balanced load) ± 1.5 (100% unbalanced load)
Dynamic voltage response (4)		%	± 5
THD		THDv %	≤ 1 (linear load) / < 5.5 (non-linear load)
Sync Window		-	Rated frequency ± 2 Hz (selectable from: ±1.. ±5 Hz)
Max. setting of the synchronisation of the rated frequency		Hz/s	1: selectable: 0.1.. 5
Inverter voltage range		% V AC	± 5

Notes:
1. The factory setting is 400 V for input voltages of 3x380/400/415 V. Authorised personnel can set it to 380 or 415 V.
   the factory setting is 220 V for input voltages of 3x208/220 V. Authorised personnel can set it to 208 V.
2. Factory setting is 50 Hz. Authorised personnel can set it to 60 Hz
3. IEC62040-3 [1.4.58] 3:1 crest ratio
4. IEC62040-3 including 0.. 100.. 0% transient load, the recovery time is half-cycle in order to have 5% of the stable output voltage.

Table 20. Inverter characteristics.

10.5.4. Electrical characteristics (Bypass input).

Information	Units	Parameters
Rated voltage	V AC	3x208/220/380/3x400/3x415
Voltage range	%	- 40 ÷ + 25
Type		Static thyristor
Overload	%	< 110 permanently / < 150 during 1 min.
Transfer time	ms.	0
Manual bypass type		Uninterrupted
Rated current of neutral line	A	1.7 × In
Frequency	Hz	50/60
Sync Window	Hz	Rated frequency ±2 (selectable from ±0.5.. ±5 Hz)

Notes:
The factory setting is 400 V for input voltages of 3x380/400/415 V. Authorised personnel can set it to 380 or 415 V.
the factory setting is 220 V for input voltages of 3x208/220 V. Authorised personnel can set it to 208 V.
Authorised personnel can select 50 or 60 Hz. If the UPS is selected as a frequency inverter, then the bypass status will not be available.

Table 21. Bypass input characteristics.

10.5.5. Communications.

Information	Parameters
Ports	RS 232 / RS 485 / Relays
Protocol	MODBUS RTU
Smart slot	1 x SNMP / 1 x IS
Display	7” touch screen, LEDs and keypad

Table 22. Available communications.

10.6. EFFICIENCY.

		Details
Normal double-conversion mode	%	95
Eco-mode	%	98
Battery discharge mode		(Rated voltage of batteries 480 V and full linear load)
Battery module	%	94.5
Maximum air exchange	m^3/min	4.5 / power module, 3.02 / bypass module

Table 23. Efficiency characteristics.

10.7. PROTECTION DEVICES POWER MODULES (PM).

Information	Rated Voltage	Rated Current	Type	Dimensions	Nº fuses in parallel
Input Fuses R, S, T	250 V	30 A	F	Ø6.985 mm., 32.72 mm.	1 [1]
Output Fuses R, S, T					1
Battery Fuses +, –	500 V				2

[1] 2 for 15 kVA module.

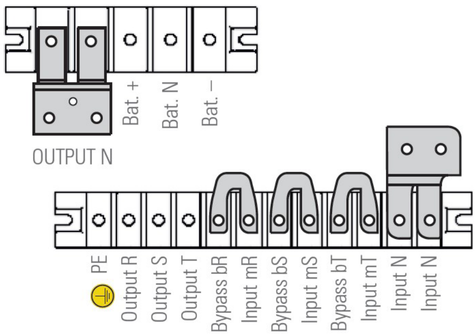
11. Characteristics of power modules protection fuses (PM).

12. ANNEXES.

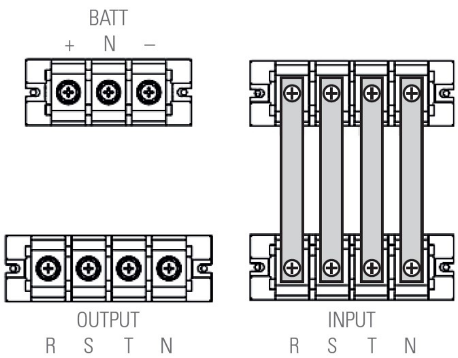
12.1. ANNEX I: CONNECTION CONFIGURATION FOR SINGLE MAINS SUPPLY TO RECTIFIER-PFC - STATIC BYPASS.

These illustrations show the connection plates between the terminals of both supplies (PFC-rectifier input and static by-pass) for a single mains supply, generally the most common case. When separate AC mains are available to separately feed the PFC-rectifier and the static bypass inputs, the connection strips between the phases must be removed, depending on the UPS model. In this configuration, the static bypass and main-tenance bypass share the same AC source independent of the PFC-rectifier source.

⚠ Although the input and output types of SLC ADAPT2 se-ries with 10 kVA modules are configurable, any modifi-cation by the customer or user is restricted, since, in addition to modifications to the connection strip, it is necessary to make changes through the password-restricted screen exclusively reserved for our **T.S.S.** or distributors. The bridging strips for the different configurations described are only included when the client requests them.

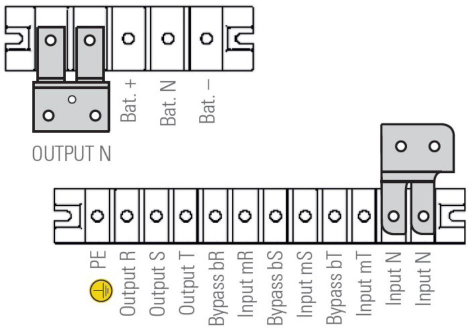


Terminal block in 2-slot and 5-slot UPSs

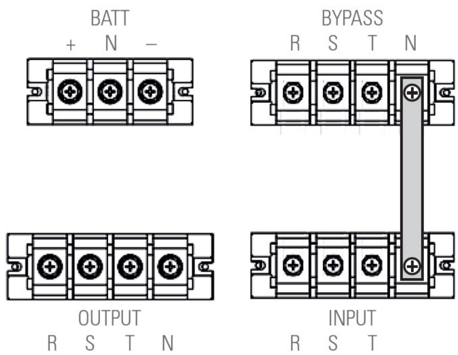


Terminal block in 6-slot UPS

Fig. 39. Terminal blocks for three-phase/three-phase configuration and single mains supply (PFC-recti-fier and static bypass)

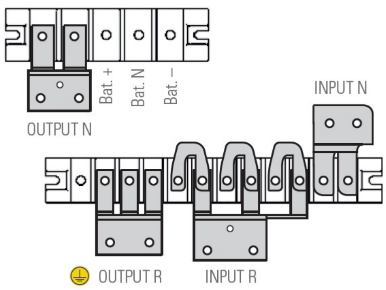


Terminal block in 2-slot and 4-slot UPSs



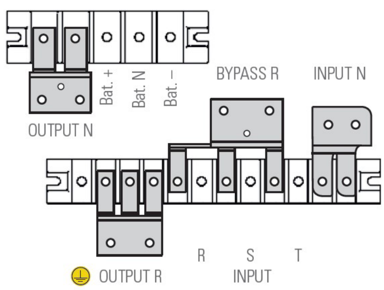
Terminal block in 6-slot UPS

Fig. 40. Terminal blocks for three-phase/three-phase configuration and separate mains supplies (PFC-rectifier and static bypass)



Terminal block in 2-slot and 4-slot UPSs

Fig. 41. Single-phase input - Single-phase output, single supply to Rectifier and Bypass (2 and 4-slots)



Terminal block in 2-slot and 4-slot UPSs

Fig. 42. Three-phase input - Single-phase output, separate supplies to Rectifier and Bypass (2 and 4-slots)

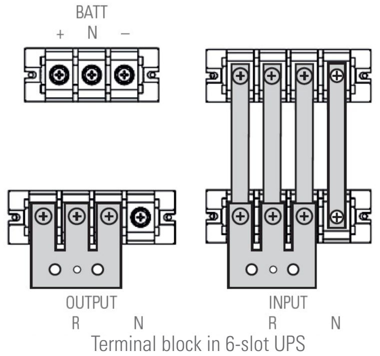


Fig. 43. Single-phase input - Single-phase output, single supply to Rectifier and Bypass (6-slots)

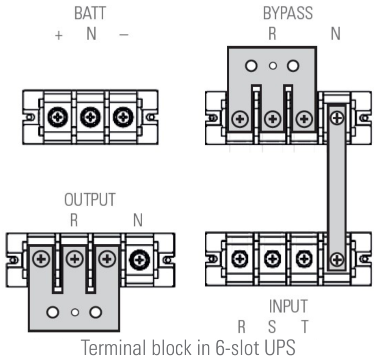


Fig. 44. Three-phase input - Single-phase output, separate supplies to Rectifier and Bypass (6-slots)

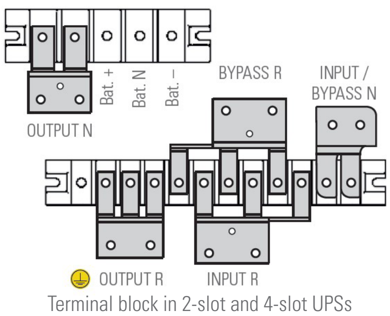


Fig. 45. Single-phase input - Single-phase output, separate supplies to Rectifier and Bypass (2 and 4-slots)

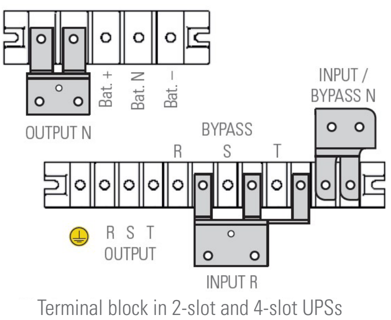


Fig. 46. Single-phase input - Three-phase output, separate supplies to Rectifier and Bypass (2 and 4-slots)

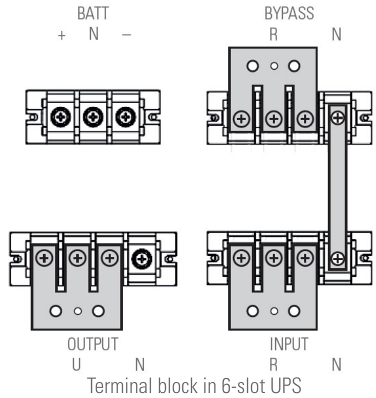


Fig. 47. Single-phase input - Single-phase output, separate supplies to Rectifier and Bypass (6-slots)

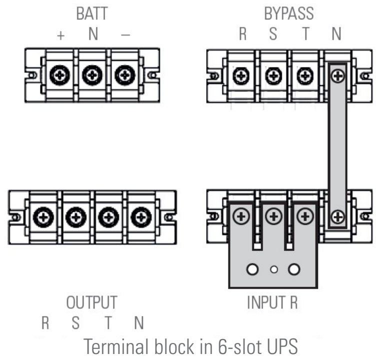


Fig. 48. Single-phase input - Three-phase output, separate supplies to Rectifier and Bypass (6-slots)

12.2. ANNEX II. CONNECTIVITY.

For all SALICRU devices compatible with the NIMBUS card, the data displayed on the onboard panel can also be uploaded to SALICRU's online platform. This platform allows users to view the status of the device without needing to be on the same network. It also makes it possible to update the cards remotely, view the device's location and customise the SMS and email notifications that are received in the event of an alarm.

In the SLC ADAPT2 and SLC CUBE4 series, you can find out if the device is connected and sending data to the cloud through the following icon at the top right of the screen:

If the device is not connected, the following icon will appear:

The device may not be able to connect for the following reasons:

- The card is not correctly connected to the network.
- The card is connected to a network that does not provide access to the Internet.

12.2.1. Network firewall requirements.

12.2.1.1. Option 1 (recommended): full opening of ports 443 and 8883.

In order to successfully connect and send data towards the remote maintenance portal, the card must **have ports 443 (https) and 8883 (MQTT)** open to allow data output and connection to the server from any IP address. This will enable you to establish a correct and stable connection between your device and the portal.

12.2.1.2. Option 2 (not recommended): list of google hostnames and ports.

In cases where the first option is excessive, the connection can also be established by the more restrictive rules detailed below. It is important to set the hostname by FQDN rules and not by IPs, as the latter are variable.

It is important to note that with this method the connection is correct, but not stable. Connection failures may occur if the firewall does not figure out the set hostname correctly.

Hostname	Port
mqtt.googleapis.com	443 and 8883
accounts.google.com	443
oauth2.googleapis.com	443
cloudiout.googleapis.com	443
www.googleapis.com	443

Tab. 24. List of IPs / ports for correct connection to the remote maintenance panel.

12.2.1.3. Creating an account.

In order to make use of this optional system, follow the steps below:

1. Go to https://nimbus.salicru.com/.
2. Create an account (if you do not already have one), using the "Create an account" link shown in the image.

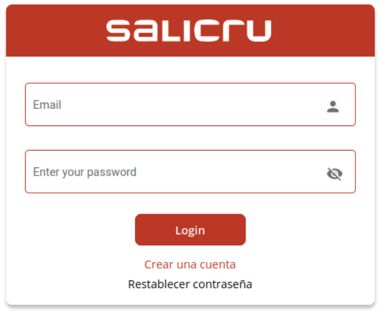


Fig. 49. Main login screen on the remote maintenance panel.

3. Complete the form with the correct data. You must accept the "Terms and conditions".

Fig. 50. User registration screen.

The password must be at least 8 characters long and contain at least one lower-case letter, one upper-case letter, one number and one symbol e.g. #MiContraseñaParaNimbus2020

To continue, you must read and agree to the terms and conditions set out by clicking on the box.

4. Once you have created your account, go to the inbox of the email address you entered during registration. Within a few minutes you will receive an email confirming your account.

Remember that this message has an expiry date. To be used within 15 minutes of receipt.

5. Click on the link sent in the email for user activation and you will have access to the remote maintenance portal.

12.2.1.4. Registering the device in the cloud.

There are two ways of registering the device in the cloud:

- Directly from the remote maintenance portal (not recommended for users)

- Scanning the QR code located on the front of the device.

12.2.1.4.1. Manual registration through the remote maintenance portal.

1. Start the session on the portal with a previously validated account.

2. On the main screen of the "Devices" application, click on the "+ add new device" button in the top right corner.

3. Complete the form to create the device with the relevant information.

Obligatory fields are marked with an asterisk (*).

The SERIAL NUMBER, UUID and MODEL fields contain basic data identifying the product. You can find this information on your device's identification label.

We recommend that you provide a clear and concise description to identify the product. That way, if you have registered other SALICRU devices, you can use this field to easily differentiate between them.

The device's location and the corresponding time zone are both obligatory fields. To add the device's location you can search for it using the option Search location, which will open an interactive map, or you can manually enter the address and coordinates.

12.2.2. Use of and access to the remote maintenance portal.

4. Click on **SAVE** to complete the process.
   If there is an error in the creation of the device, you will be notified on screen. Contact technical support if necessary.
5. Once the device has been successfully created, it will be displayed in the list of devices on the "Devices" page.

12.2.2.4.1. Automatic registration with QR Code.

1. Scan the QR code located on the front of the device. Most mobile phones and tablets have tools for scanning QR codes, but if yours does not, you must install one from the app store.

   After scanning the code, a registration page will open in the browser of your phone or tablet.

   You must log in to register the device. If you do not yet have a SALICRU account, you can create one by clicking on the 'Create account' link.

2. Fill in the blank spaces on the form. The basic data of the device will already be preset and cannot be changed.

   We recommend that you provide a clear and concise description to identify the product. That way, if you have registered other SALICRU devices, you can use this field to easily differentiate between them.

   The device's location and the corresponding time zone are both obligatory fields. To add the device's location you can search for it using the option Search location, which will open an interactive map, or you can manually enter the address and coordinates.

3. Click on SAVE to complete the process.

   If there is an error in the creation of the device, you will be notified on screen. Contact technical support if necessary.

4. Once the device has been successfully created, it will be displayed in the list of devices on the "Devices" page.

12.2.2.1. Creating notifications associated with a device.

After you have successfully registered a device, you can configure its alarm notifications. To do this, go to the "Notifications" section in the vertical navigation bar.

Make sure you have registered a device first, otherwise you will not be able to associate any notifications with your user.

To create a new notification, press the "+ add new notification" button. This will open a form for the creation of the new notification.

Important: Each user can only set up one notification for each device. However, email accounts and phones can be associated so that more than one person can receive the same notification.

Within the creation form, select the device for which you wish to create a notification using the "Device" drop-down menu. Once selected, the possible alarm groups available will be displayed. Select one or more of them according to your needs.

Finally, select the desired type of notification in the "Enabled notifications" section. There are three types: web page, email and SMS. If none is selected, no alarm notifications of any kind will be displayed and you must go directly to the device details to check its status.

12.2.2.1.1. Web notifications.

With these notifications enabled, a pop-up message will be displayed on the website itself when an alarm occurs. Note that these notifications will only be displayed if the user is logged in and browsing the remote maintenance website.

12.2.2.1.2. Email notifications.

This type of notification will allow you to receive an email each time an alarm is enabled. The default notification email will be directly associated with the user who created it and can be viewed on the same page (non-editable field). To change the default email address, access the user profile.
Extra email addresses can be added in the same notification. Press "Add email" and enter an additional address.

Fig. 51. Add an extra email address.

Please note that the notification will now be sent to the default email address and all others associated.

12.2.2.1.3. SMS notifications.

With this notification you will receive an SMS message on your mobile phone every time an alarm is triggered. As with emails, the default phone number will be associated directly with the user who created it as a non-editable field. To change the phone number, access the user profile.

You can also add more phone numbers. Press "Add phone number" and enter the number. Please note that the notification will now be sent to the default phone number and all others associated.

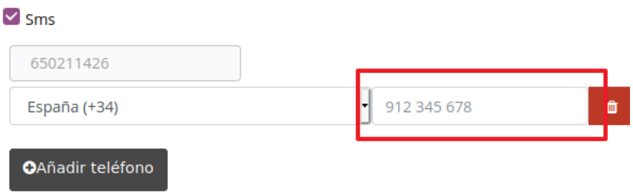


Fig. 52. Add another phone number.

12.2.2.2. Password recovery.

If you cannot remember your password, you can reset it by clicking on the 'Reset password' option on the Login screen.

You will be asked to enter the email address that is linked to your account. Click on 'Send' to continue the process.

Fig. 53. Lost password recovery page.

You will receive an email allowing you to reset your password. Remember to check the Spam folder if you cannot find the email in your inbox.

After you click on the link contained in the email you will be able to create a new password. Click on **'Save'** to set the new password.

12.2.2.3. General technical specifications

In the *Tab. 25* below lists the technical specifications of the NIMBUS card:

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

Tab. 25. Technical specifications of the NIMBUS card.

12.3. ANNEX III. GLOSSARY

- **AC.**- Alternating current is electric current in which the magnitude and polarity 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 at different potentials. 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 surface of the Earth.
- **IGBT**.- An Insulated Gate Bipolar Transistor 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 (electronic) interface is the port (physical circuit) through which signals are sent or received from one system or subsystem to others.
- **kVA**.- The 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 forward biased and an electric current passes through it. 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 infra-red, the latter called IRED (infra-red emitting diode).
- **Thermal-Magnetic Circuit Breaker**.- A thermal-magnetic circuit breaker is a device capable of automatically interrupting the electrical current in a circuit when it exceeds certain maximum values.
- **Disconnector or Isolator Switch**.- Mechanical disconnecting device with two alternative positions with a separation between contacts that satisfies the minimum physical spacing between the two sections of the mains to which it is connected. 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.
- **On-line mode**.- A device is said to be on-line when it is connected to a system, is operative, and normally has its power supply connected.
- **Inverter**.- An inverter is a circuit used to convert DC into AC. The function of an inverter is to change a DC input voltage to a symmetrical AC output voltage, with the magnitude and frequency desired by the user or designer.
- **Rectifier**.- In electronics, a rectifier is the element or circuit that converts AC into DC. This is done by using rectifier diodes, whether solid state semiconductors, vacuum valves or gaseous valves, such as those containing mercury vapour. Depending on the characteristics of the AC power that they use, they are classified as single-phase when they are powered by a mains phase or three-phase when they are powered by three phases. Depending on the type of rectification, they can be half wave when only one of the half cycles of the current is used or full wave when both half cycles are used.
- **Relay**.- A relay is an electromechanical device that functions as a switch controlled by an electrical circuit in which, by means of an electromagnet, a set of one or several contacts is activated to enable other independent electrical circuits to be opened or closed.
- **SCR**.- Silicon controlled rectifier, commonly known as a thyristor, a 4-layer semiconductor device that works as an almost ideal switch.
- **THD**.- Total Harmonic Distortion. Harmonic distortion occurs when the output signal of a system does not equal the signal that entered it. This lack of linearity affects the waveform because the device has introduced harmonics that were not in the input signal. Since they are harmonic, that is to say, multiples of the input signal, this distortion is not so dissonant and is less easy to detect.

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