USER'S MANUAL

UNINTERRUPTIBLE POWER SUPPLY (UPS)

SLC ADAPT/-X series

180, 200, 300 and 500 kVA

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.
We remain at your disposal 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 **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**.
- **Reproduction, copying, assignment to third parties, modification or total or partial translation** of this manual or document, in any form or by any means, **without previous written permission by us is prohibited**, with the company reserving full and exclusive property rights over it.

2. SAFETY INFORMATION.

2.1. USING THIS MANUAL.

The documentation for any standard device is available to the customer for download on our website **(www.salicru.com)**.

- For devices 'powered by socket,' this is the website for obtaining the user manual and **'Safety Instructions'** EK266*08.
- For devices with 'permanent connection' via terminals, a CD-ROM or pen drive containing all necessary information for connection and startup, including **'Safety Instructions'** EK266*08, may be supplied with it.

Before carrying out any action on the device relating to its installation or startup, change of location, configuration or handling of any kind, carefully read the safety instructions.
The purpose of the user manual is to provide information regarding safety and explanations of the procedures for installation and operation of the equipment. Read them carefully and follow the steps indicated in the order established.

Compliance with the 'Safety Instructions' is mandatory and the user is legally responsible for compliance and enforcement.

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 startup operations to be performed in a simple and organised manner without any doubts whatsoever.
Finally, once the equipment is installed and operating, it is recommended to save the documentation downloaded from the website, CD-ROM or pen drive in a safe and easy-to-access place, for any future queries or doubts that may arise.
The following terms are used interchangeably in the document to refer to:

- **'SLC ADAPT,' 'device,' 'unit' or 'UPS'** - Uninterruptible power supply.
  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 that stores 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 to refer to the installer and/or operator who will carry out the corresponding actions, and the same person may be responsible for carrying out the respective actions when acting on behalf, or in representation, of the above.

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.

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** and also 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 is designed, manufactured and sold in accordance with Quality Management 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 UPS has been designed in accordance with the following European and international standards:

Element	Standard reference
General safety requirements for UPSs used in areas accessible to operators	IEC62040-1
Electromagnetic compatibility (EMC) requirements for UPSs	IEC62040-2
Method for specifying the performance and testing requirements of UPSs	IEC62040-3

The product standards mentioned above incorporate relevant clauses that comply with IEC and EN standards for safety (IEC/EN/AS60950), electromagnetic emission and immunity (IEC/EN/AS61000 series) and construction (IEC/EN/AS60146 series and 60950).

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

WARNING!:
The SLC ADAPT is a modular double-conversion on-line 30 to 1500 kVA C3 category UPS.

The product's CE declaration of conformity is available to the customer upon express request to our head office.

3.2.1. First and second environment.

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 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.

4.1.1. Views of the device.

Fig. 1 to Fig. 19 show the views and dimensions (in mm) of the equipment of:

- 6 slots with 30 kVA (180 kVA) modules.
- 8 slots with 25 kVA (200 kVA) modules.
- 10 slots with 30 kVA and 50 kVA modules (300 kVA and 500 kVA).
- 12 slots with 25 kVA (300 kVA) modules.

However, due to the fact that the product is constantly evolving, slight discrepancies or contradictions may arise. If in doubt, the labeling on the equipment itself will always prevail.

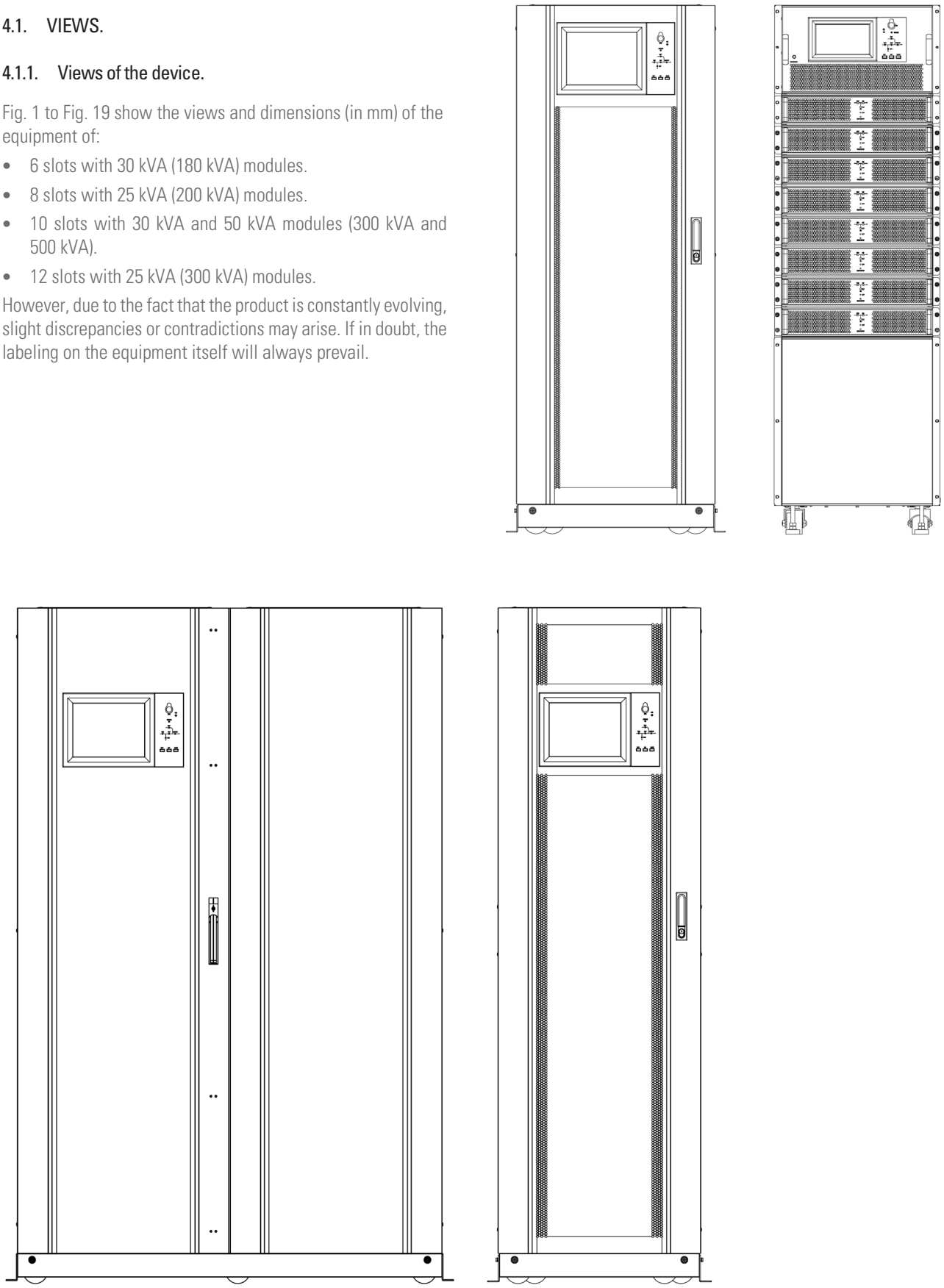


Fig. 1. General view of 6 and 8 slot cabinets (up) and 10 and 12 slots (down).

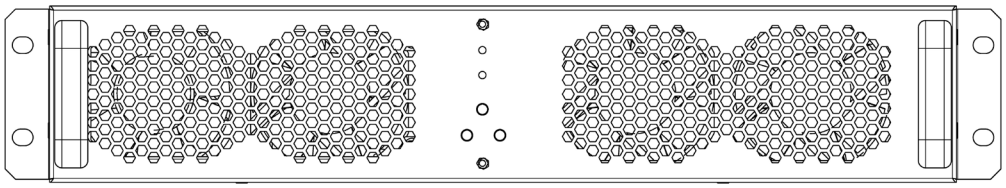


Fig. 2. Front view of the 25 kVA module (14 kVA for 3x208 Vac voltages).

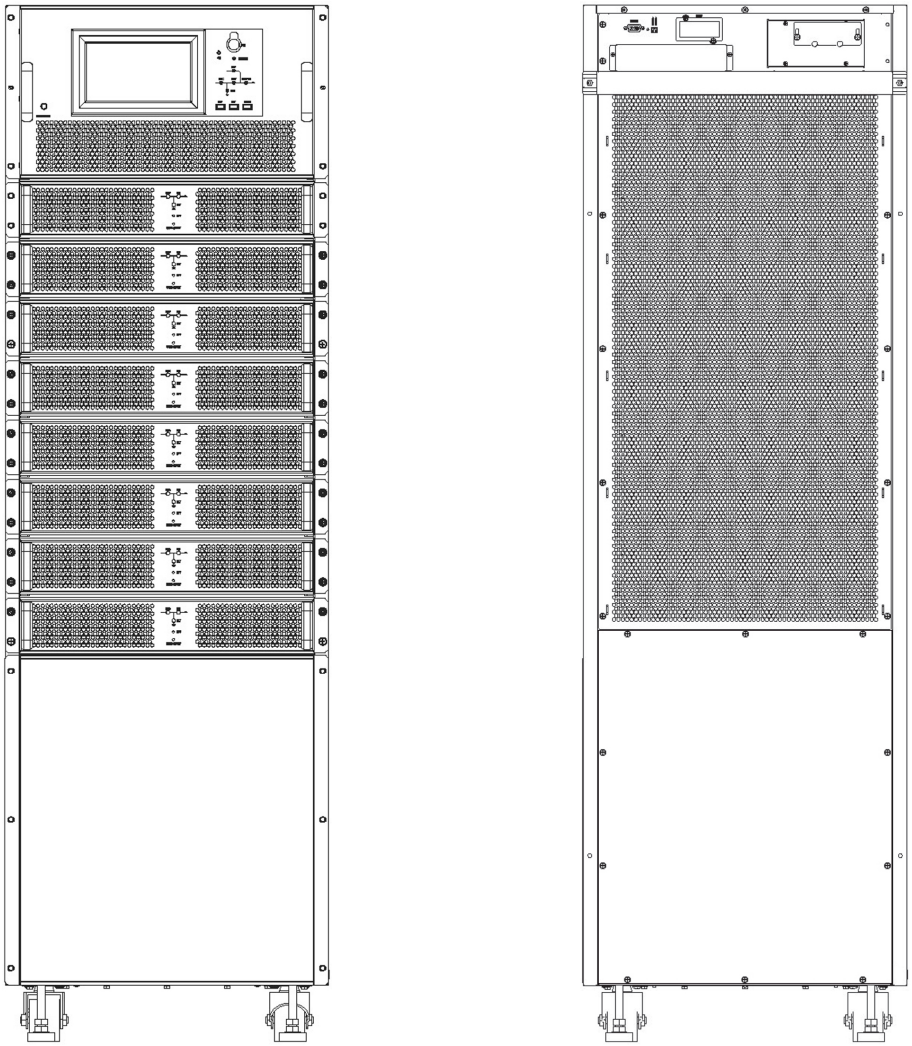


Fig. 3. Front and rear view of the 8-slot subrack - 200 kVA (112 kVA at 3x208 V) with covers in place.

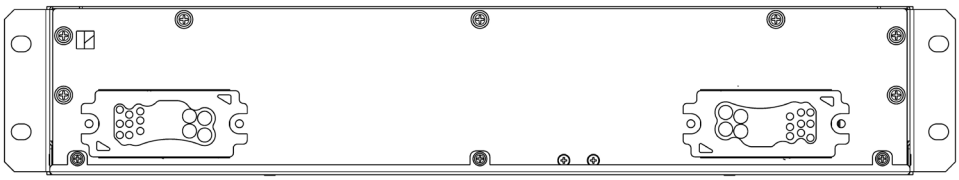


Fig. 4. Rear view of the 25 kVA module (14 kVA for 3x208 Vac voltages).

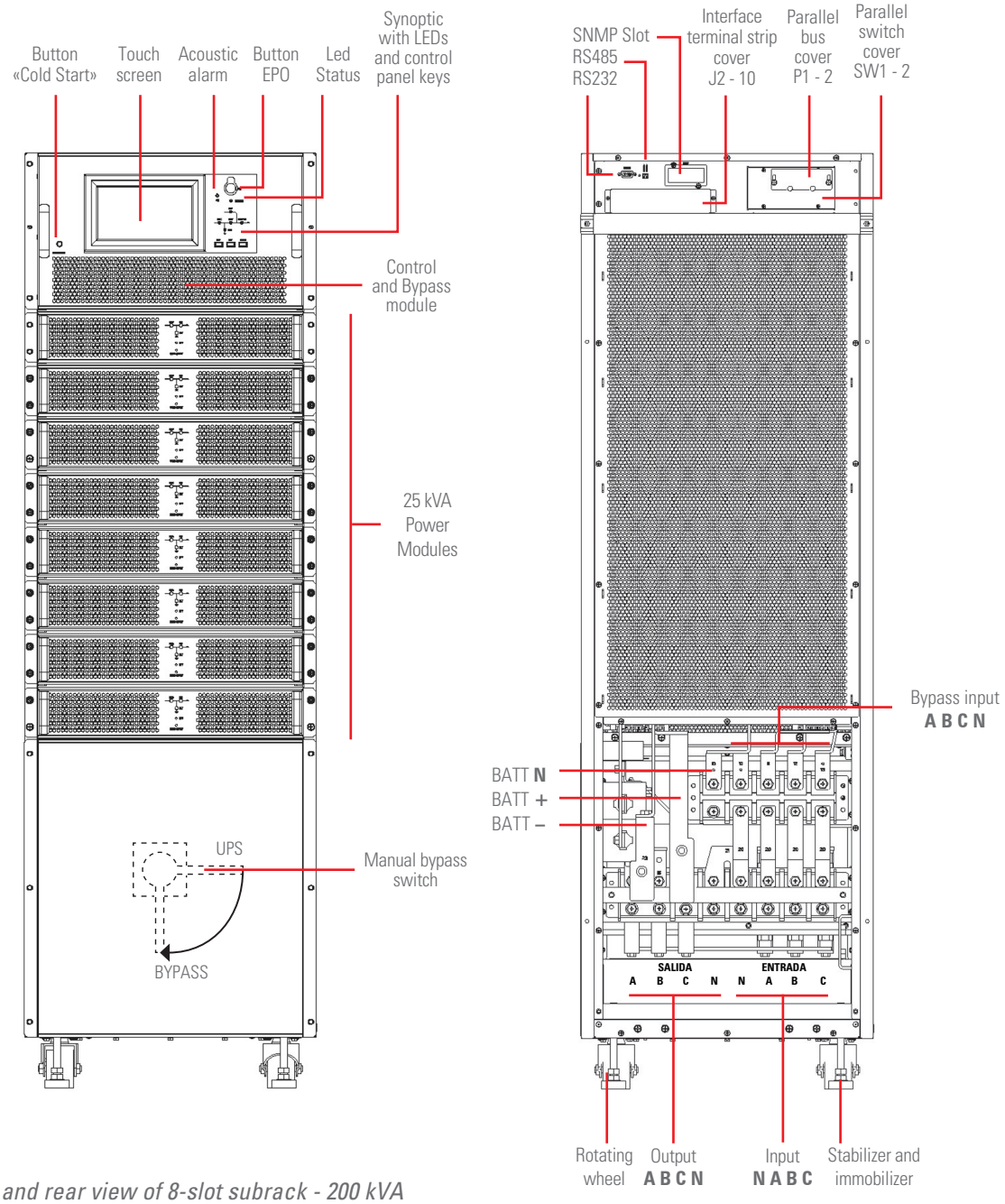


Fig. 5. Front and rear view of 8-slot subrack - 200 kVA (112 kVA at 3x208 V) with covers removed.

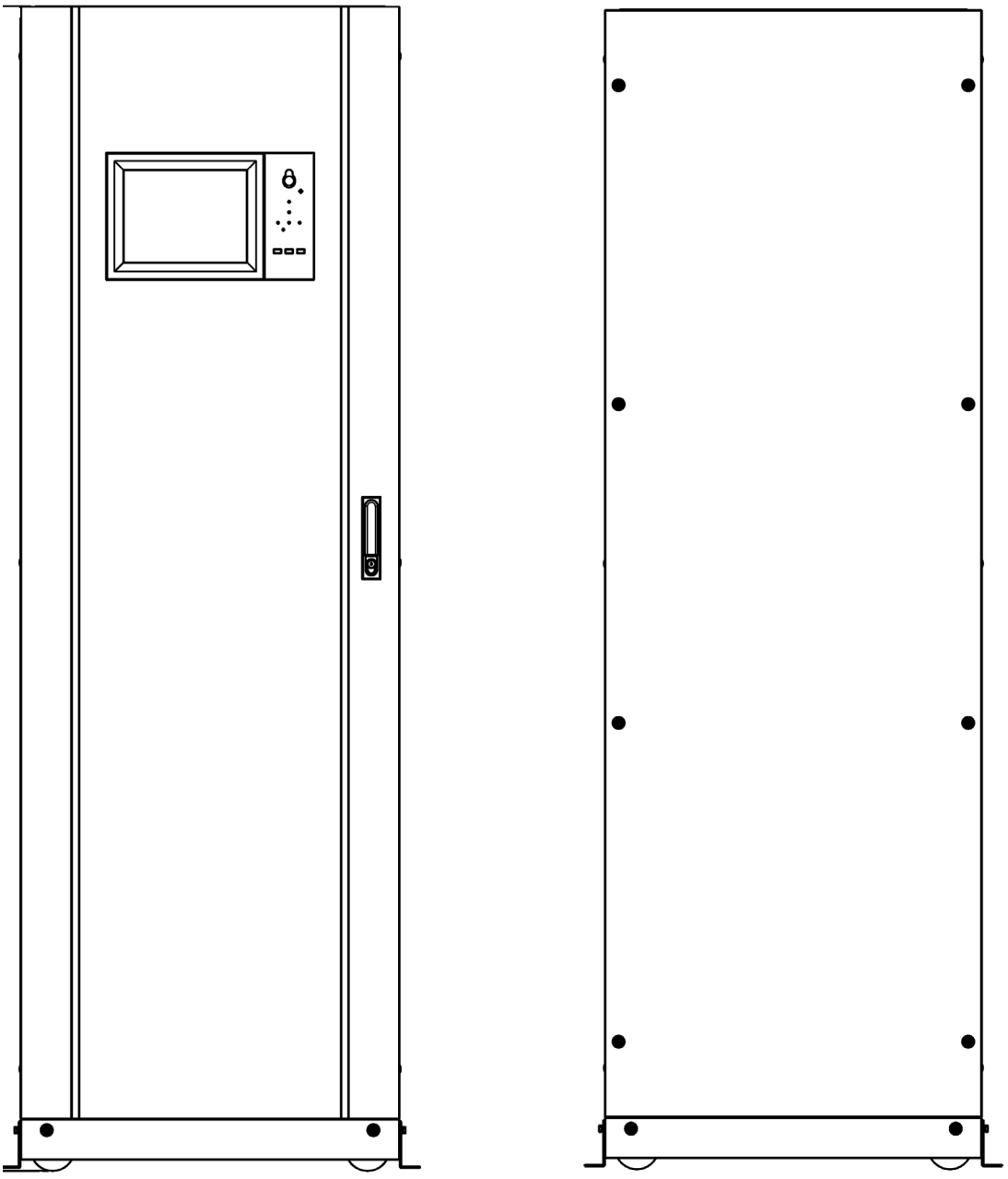


Fig. 6. Front and rear view of the 12-slot cabinet - 300 kVA (168 kVA at 3x208 V) with closed doors.

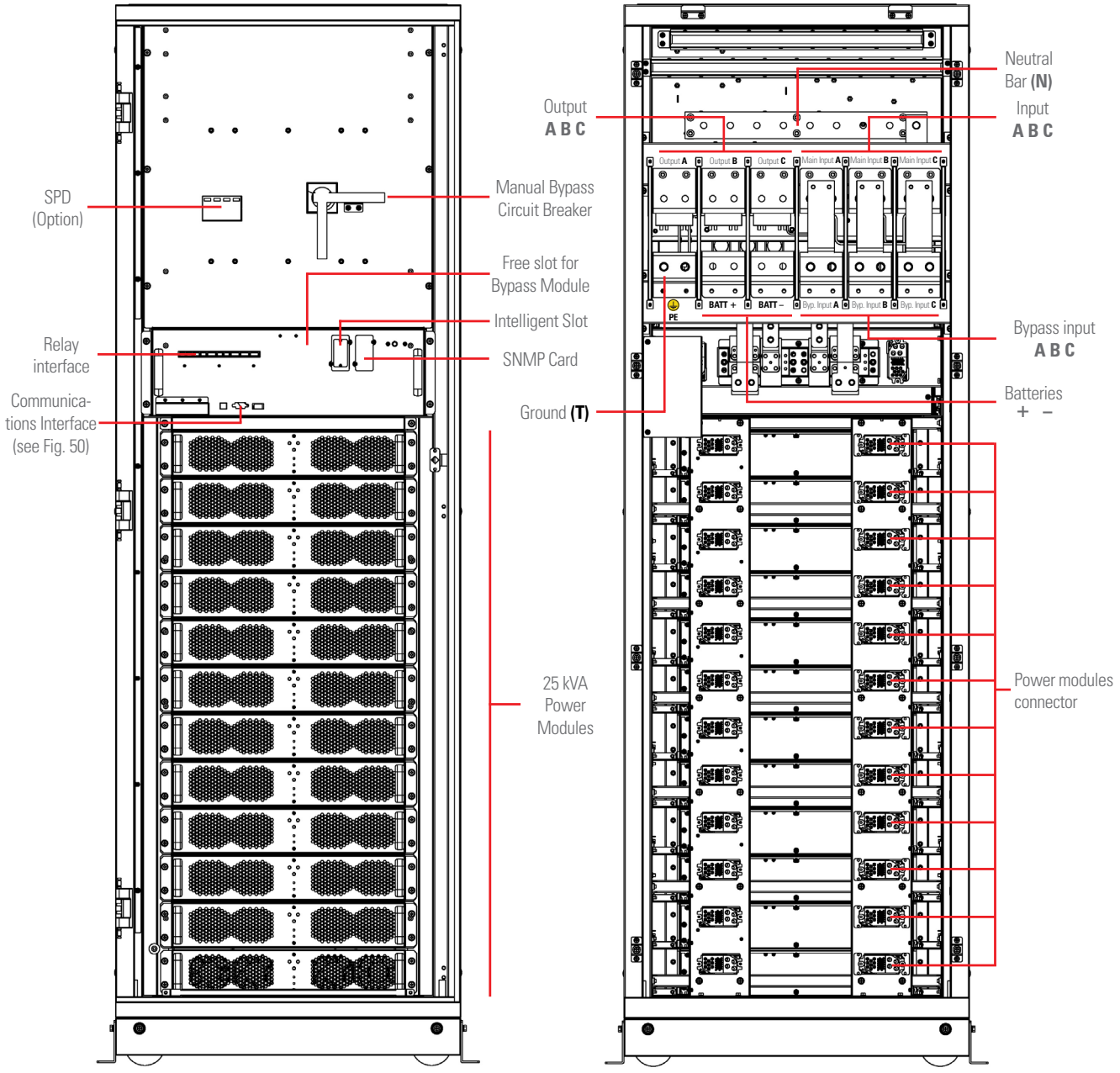


Fig. 7. Front and rear view of the 12-slot cabinet - 300 kVA (168 kVA at 3x208 V) with open doors.

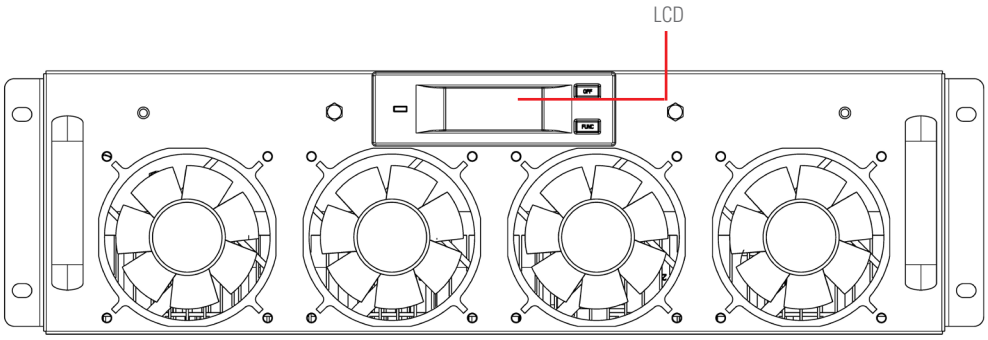


Fig. 8. Front view of 30 kVA module (20 kVA for 3x208 V AC voltages).

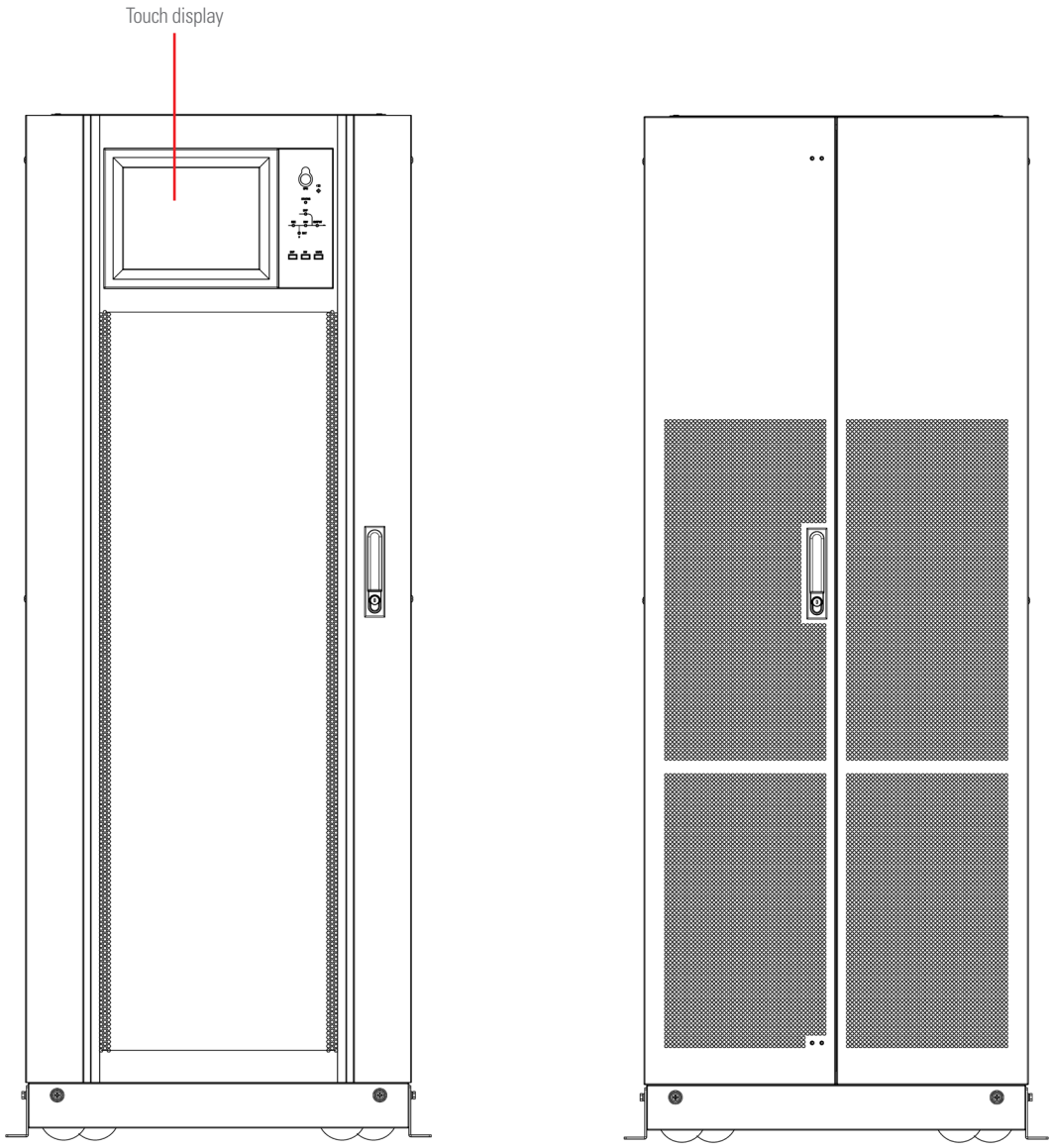


Fig. 9. Front and rear view of 6-slot cabinet - 180 kVA (120 kVA at 3x208 V) with closed doors.

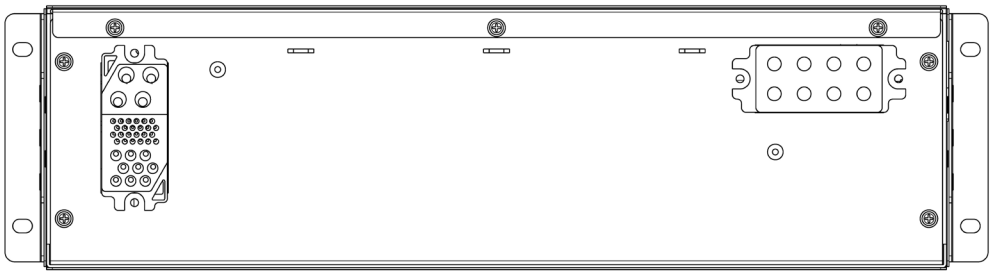


Fig. 10. Rear view of 30 kVA module (20 kVA for 3x208 V AC voltages).

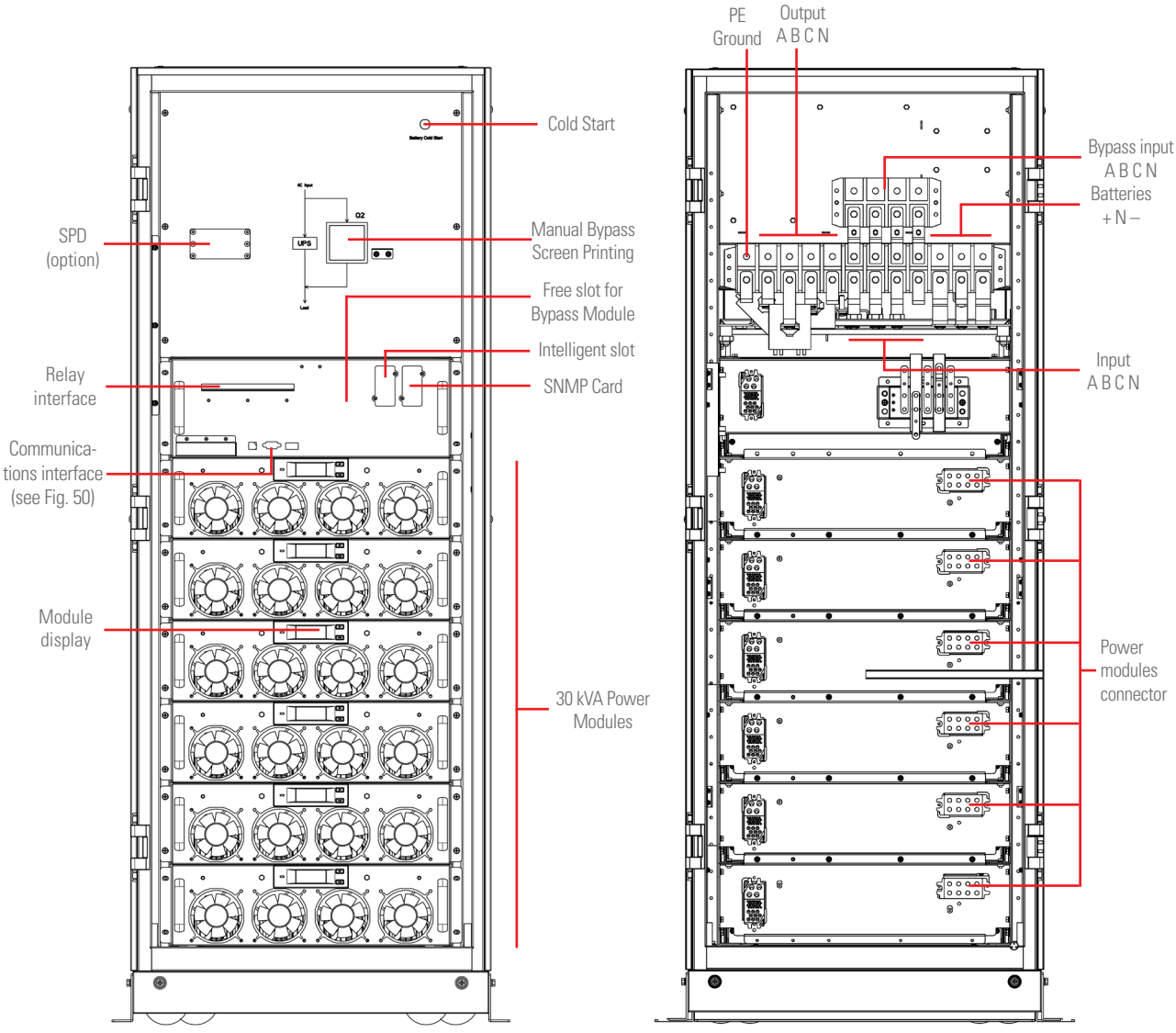


Fig. 11. Front and rear view of 6-slot cabinet - 180 kVA (120 kVA at 3x208 V) with open doors.

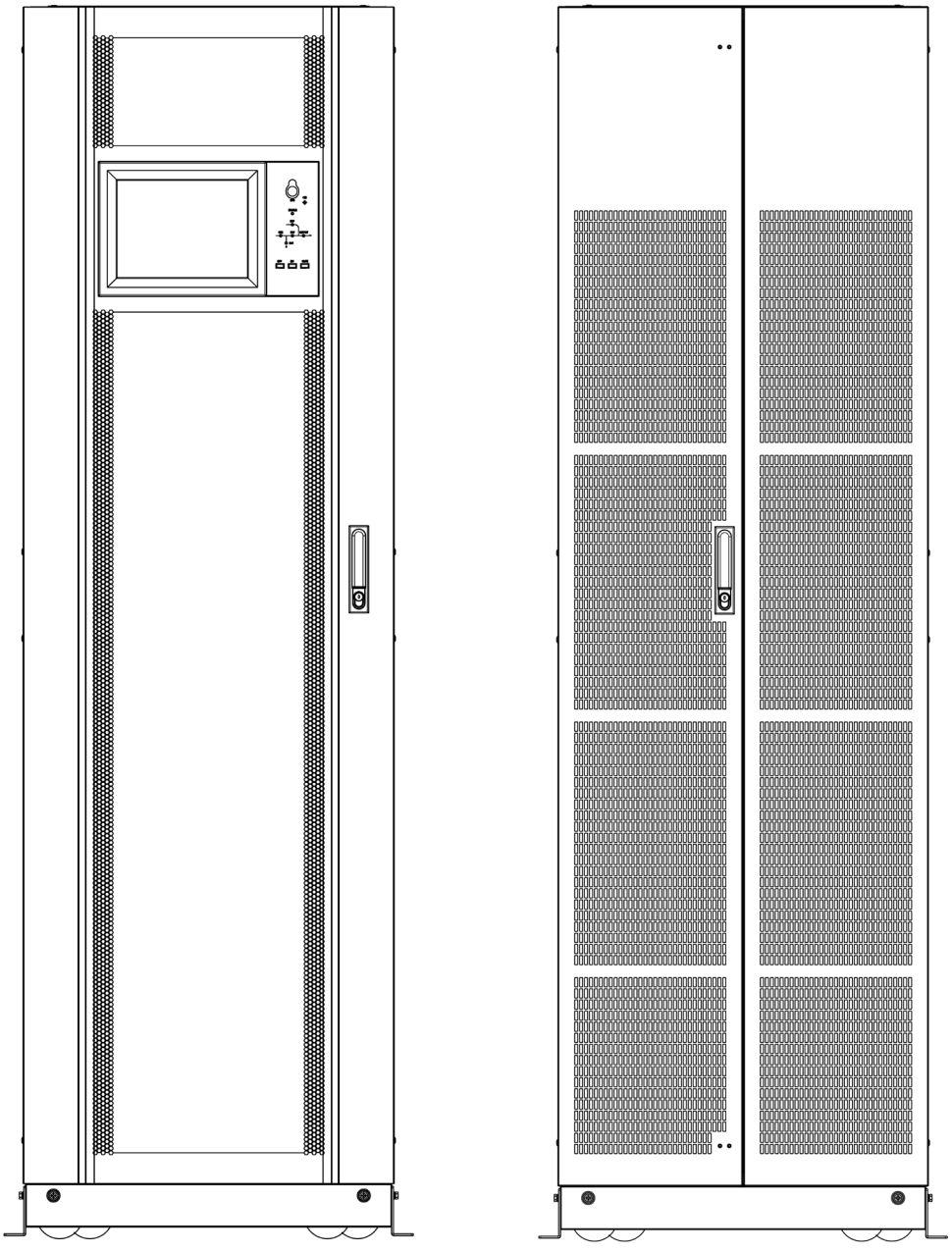


Fig. 12. Front and rear view of 10-slot cabinet - 300 kVA (200 kVA at 3x208 V) with closed doors.

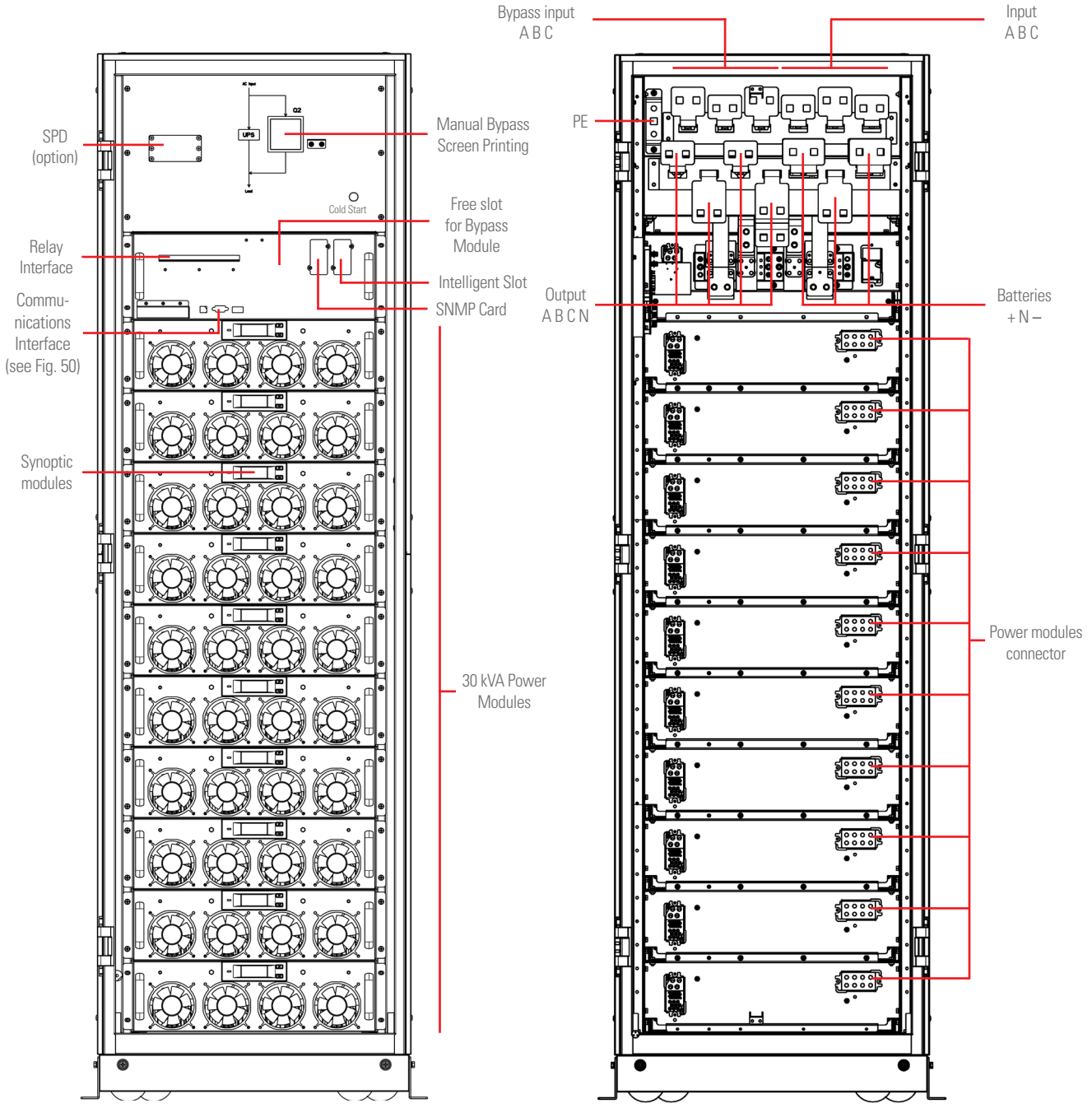


Fig. 13. Front and rear view of the 10-slot cabinet - 300 kVA (200 kVA at 3x208 V) with open doors.

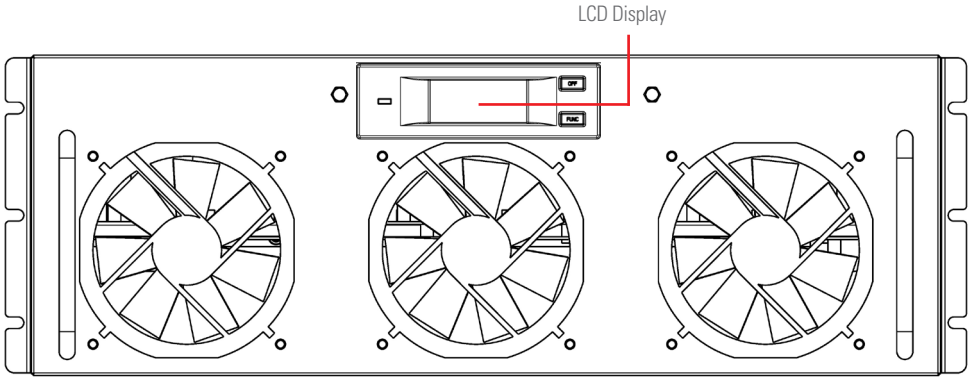


Fig. 14. Front view of the 50 kVA module (30 kVA for 3x208 Vac voltages).

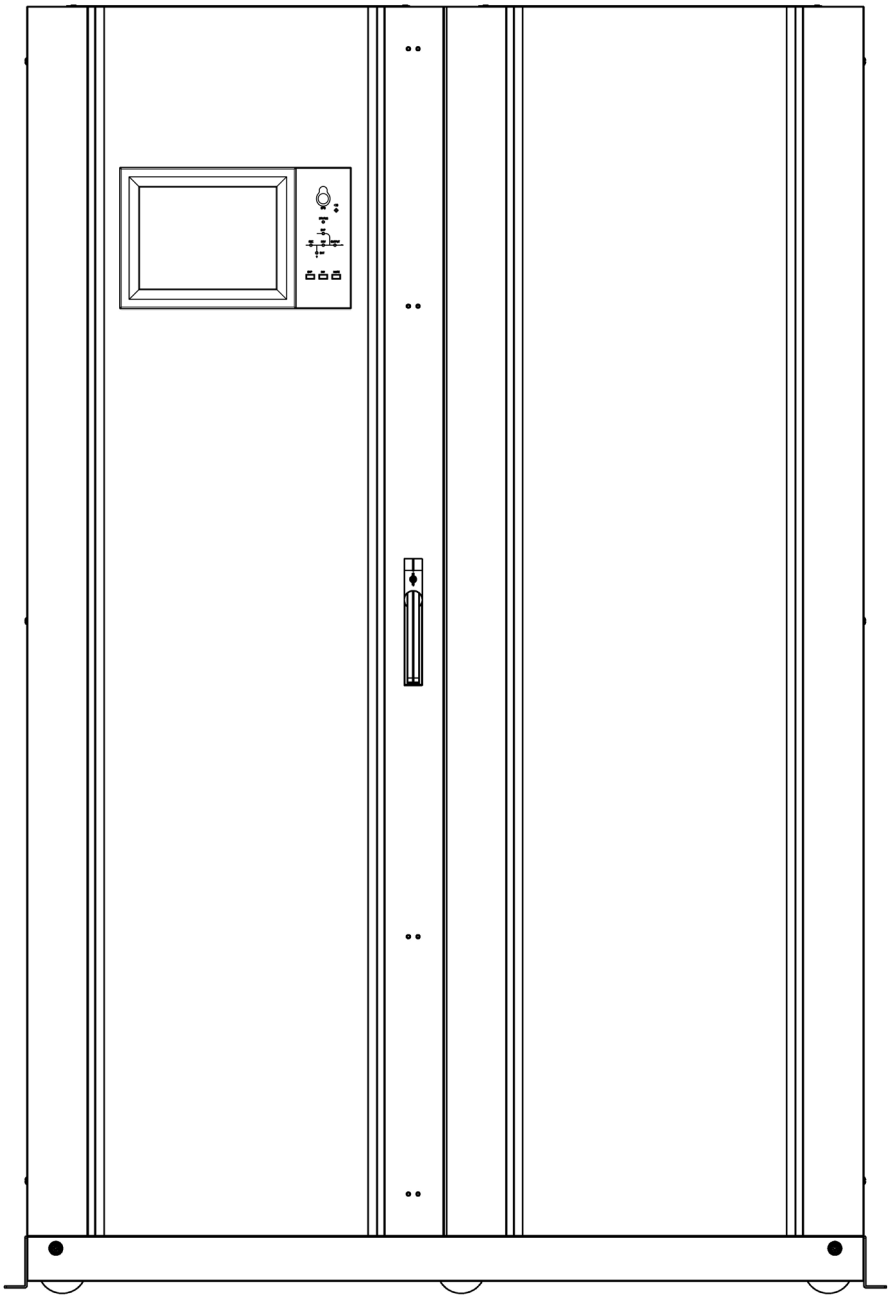


Fig. 15. Front view of the 10-slot cabinet - 500 kVA (300 kVA at 3x208 V) with closed doors.

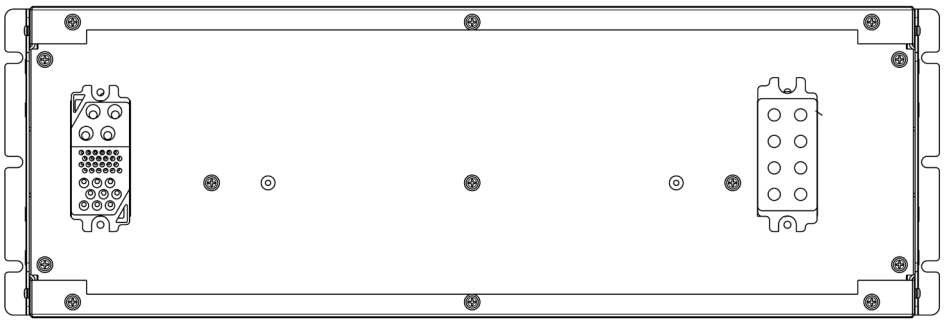


Fig. 16. Rear view of the 50 kVA module (30 kVA for 3x208 Vac voltages).

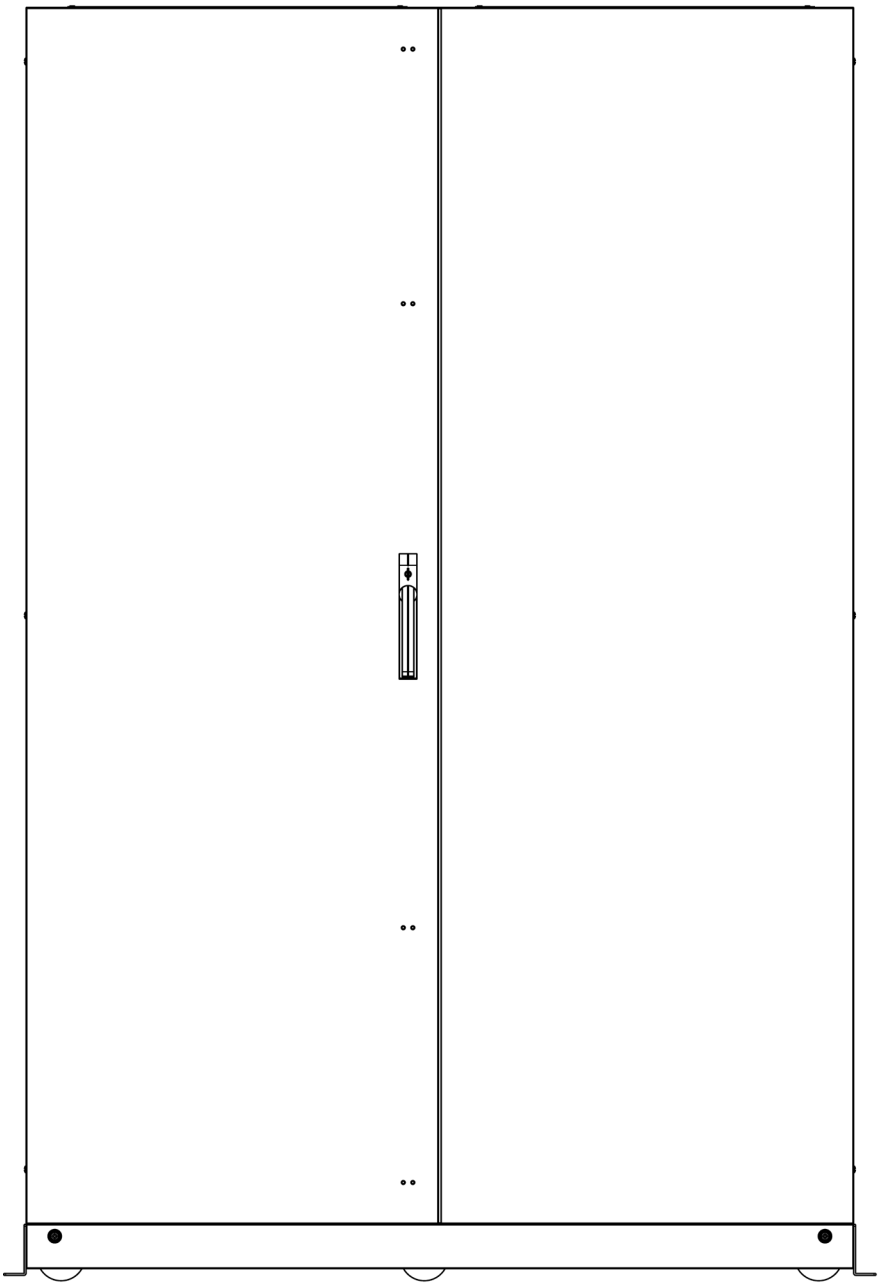


Fig. 17. Rear view of 10-slot cabinet - 500 kVA (300 kVA at 3x208 V) with closed doors.

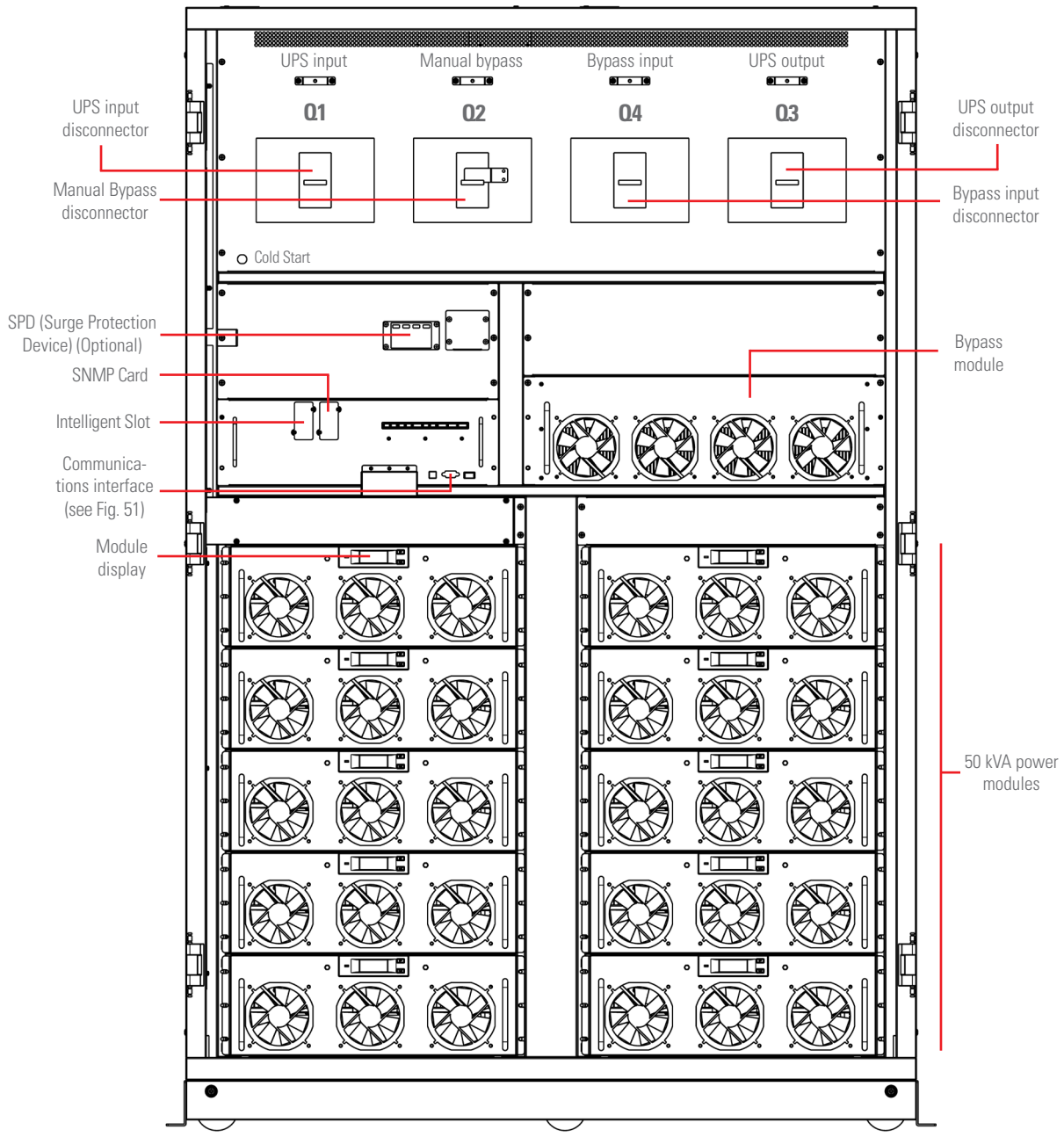


Fig. 18. Front view of the 10-slot cabinet - 500 kVA (300 kVA at 3x208 V) with open doors.

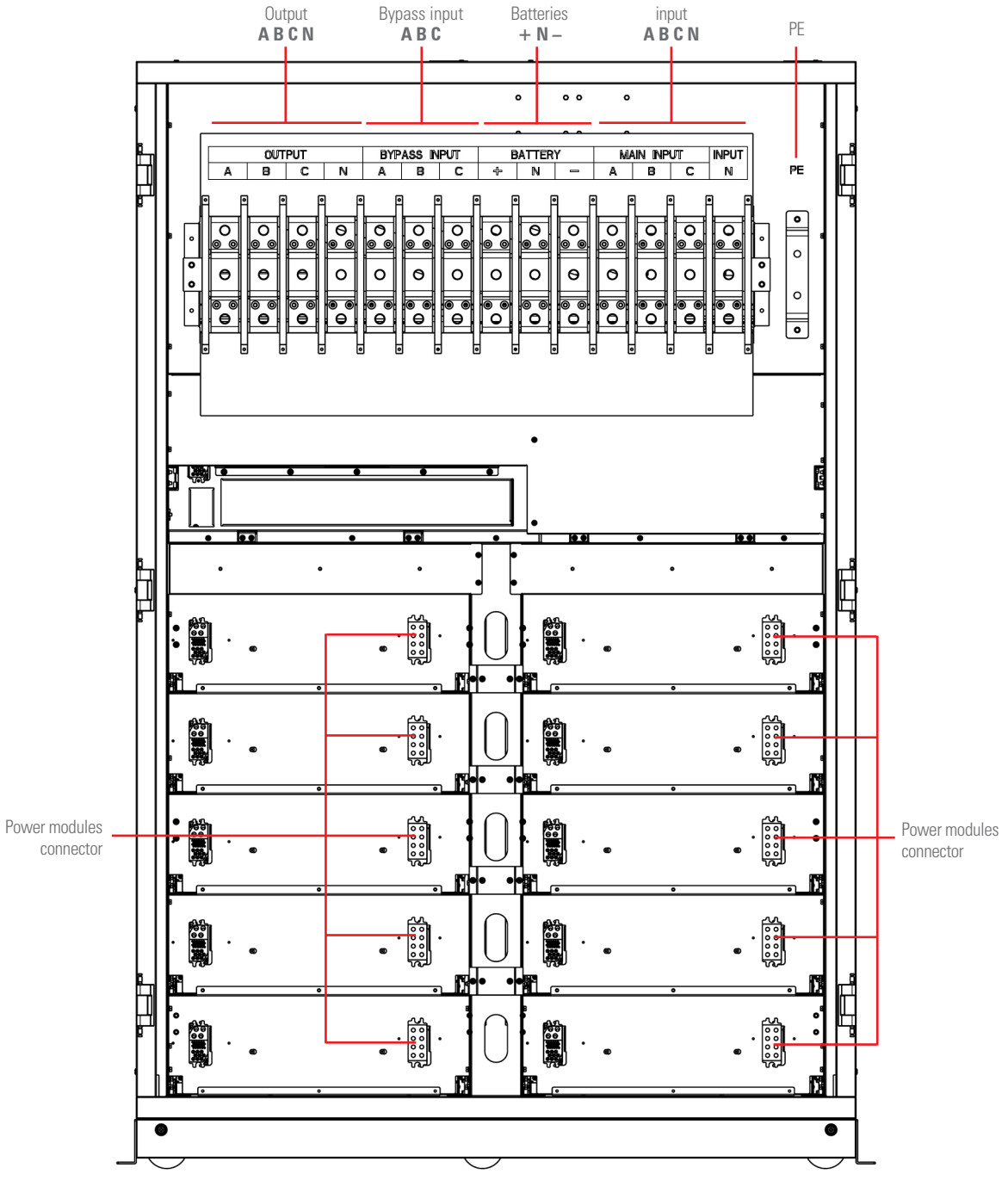


Fig. 19. Rear view of the 10-slot cabinet - 500 kVA (300 kVA at 3x208 V) with open doors.

4.1.2. Device configurations.

The following table provides information about the configuration of the UPS:

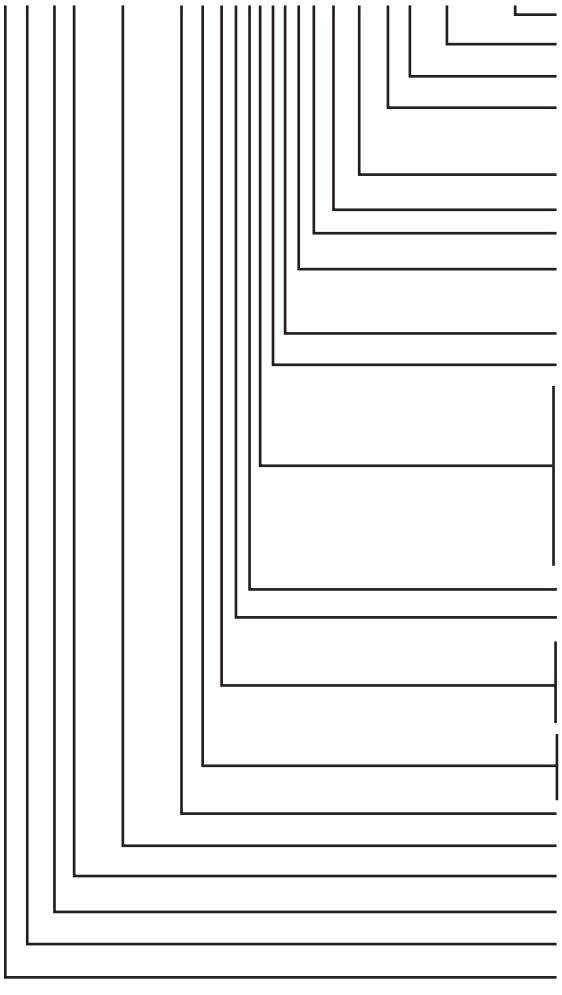
Item	Components	Quantity	Note
6, 8, 10 and 12 slot cabinet	Manual bypass	1	Requirement, installed in factory
	Bypass and monitoring module	1	
	Dust filter	1	Optional
50 kVA power module	Power module	1-12	Requirement, installed on site
30 kVA power module	Power module	1-10	
50 kVA power module	Power module	1-10	

Tab. 1. Equipment configuration.

4.2. DEFINITION OF THE PRODUCT.

4.2.1. Nomenclature.

SLC-6+1/10A-ADAPT 100X R P2LBDCS B1 0/36AB165 EE116502



EE	Special device EE.
165	Last three digits of the battery code.
AB	Letters of the battery family.
36	Number of batteries in a single branch. For banks of common batteries, all batteries in the system will be indicated.
0/	Devices prepared for standard backups.
B1	Subrack/cabinet with external batteries.
S	Ambient temperature sensor.
C	Subrack mounted on box-type BATT MOD (batteries supplied factory mounted).
D	Transient protection filter.
B	Independent bypass line.
L	Single-phase input/single-phase output device.
N	Three-phase input/single-phase output devices (independent bypass line must be included).
M	Single-phase input/three-phase output device (independent bypass line must be included). Three-phase input/three-phase output device.
2	Number of subracks/cabinets in parallel.
P	Material needed to parallel subrack/cabinets.
R	ADAPT X series device in subrack format (subrack not integrated into a cabinet).
Y	IP20 protection rating with open door and keyless lock.
X	Indication for modules with 2U height. Disregard for ≥3U modules.
100	Total power of subrack/cabinet.
ADAPT	UPS series.
A,B,C	Cabinet type.
10	Total number of slots in subrack/cabinet.
1	Number of redundant modules (disregard if none).
6	Number of modules installed in subrack/cabinet without taking into account redundancy.

4.3. GENERAL DESCRIPTION.

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

Reliability: The DSP control associated with three-level PWM technology increases the performance of the system and, together with the redundancy of the modules, manages to increase the availability 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 control display and the bypass module can be replaced without affecting the operation of the device. In addition, the system's remote management, which can be integrated into any platform, also makes operation easier. The extensive backup options available, along with smart battery charging, ensure continuous operation of the protected critical loads.

Modularity: This allows simple configurable solutions from 30 to 1500 kVA by installing 30 or 50 kVA modules in the 6-slot (30 kVA modules) or 10-slot cabinets. As composite solutions, a maximum of 30 modules can be paralleled to obtain higher power systems or N+n structures. Either way, it is only possible to install identical modules in the same cabinet and/or parallel cabinets with modules of equal power. This enables gradual growth and scaling for future expansion depending on the need for pay-as-you-grow protection, improving the total cost of ownership (TCO) and providing a high level of flexibility. At operational level, a cabinet consisting of 'N' modules 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 screw the fixing screws of the module(s). Although all of the UPS's modules incorporate a battery charger that can allocate up to 20% of its rated power to maintaining them at an optimum charge level depending on the type and number of elements, 50 A battery charger modules are available to be installed solely with the 30 kVA SLC ADAPT 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, the total power of the system, which will be reduced.

Backup: 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 system mounted in the same cabinet. Batteries owned by the customer or supplied with the UPS, depending on different factors in addition to the power and/or backup requested, can be installed in a back or one or more cabinets, always external to the UPS itself.

4.3.1. Introduction.

SLC ADAPT series UPSs basically consist of:

- 6- or 10-slot cabinet to install the power modules.
- Power modules consisting of the following blocks:
  - ❒ AC/DC PFC rectifier.
  - ❒ Battery charger.
  - ❒ DC/AC inverter.
  - ❒ Digital control and UPS management.
- Centralised bypass module: control of UPS and parallel parameters.
- Maintenance bypass.
- Control panel with touch screen (see section X for more information).
- Batteries (number, type and location depending on the backup time).
- Self-supporting 36 and 46U cabinets for the placement of the different modules.

4.3.2. Conceptual diagram of the system.

The modular UPSs of the **SLC ADAPT** series consist of power modules, a bypass and monitoring module, and a cabinet with a range of disconnectors for Input, Bypass Output and Manual Bypass. The 180 and 300 kVA UPSs only have a manual bypass switch. One or more battery branches should be installed to provide backup power in the event of a power failure. The structure of the UPS is shown in Fig. 20.

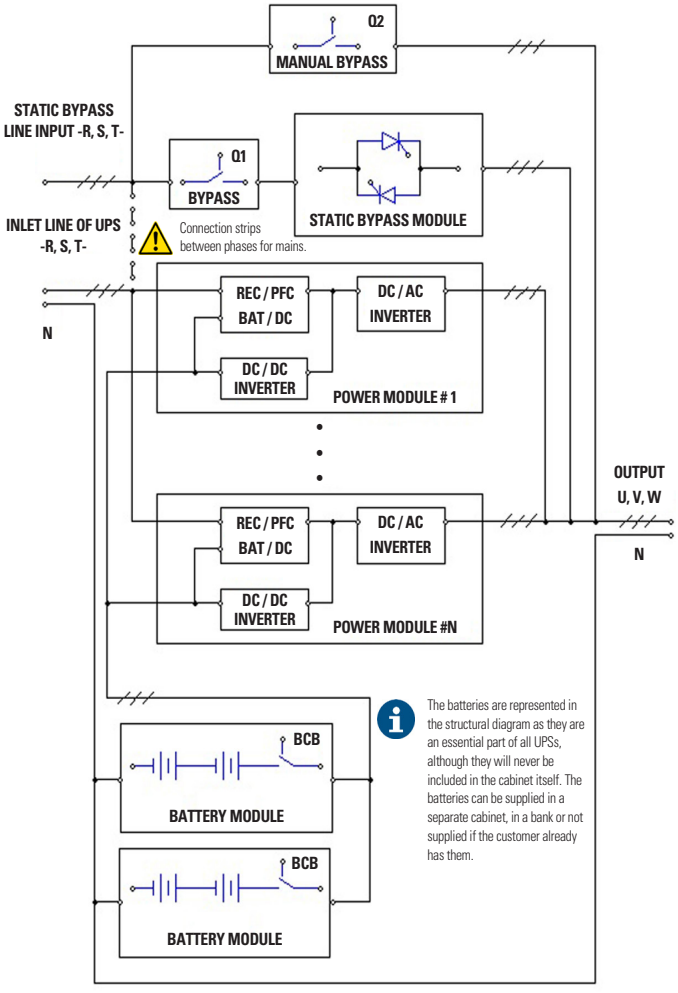


Fig. 20. Conceptual diagram of the SLC ADAPT series modular UPS.

Fig. 20 shows, byway of example, a single-line diagram of the device with three-phase input and output.
All modules in the cabinet are structured according to the same criteria, terminals for the power supply of the PFC rectifier and independent static bypass, and input, output, static bypass and manual bypass disconnectors. However, unless otherwise requested, for separate networks originally from the factory, the terminals of the phases of both blocks are connected by means of strips to provide a single common input.

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

4.3.2.1. Power modules (PM).

Power modules are the basic core of the entire **SLC ADAPT** system. 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 device consists of a number of variable modules depending on the cabinet used, a multi-parallel system is obtained with the behaviour equivalent to that of a single mono-bloc UPS and the advantages of a modular UPS.
The system supplies power to the critical load (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, electrical noise, anomalies commonly present in the commercial AC network.
This is achieved through the double-conversion 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. 20*, 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.

4.3.2.1.1. Available power ratings.

The SLC ADAPT series has two different power modules, 30 and 50 kVA, as can be seen in Fig. 2, Fig. 4, Fig. 8, Fig. 10, Fig. 14 and Fig. 18.

4.3.2.2. Static bypass.

Static transfer switch.
In the event of inverter failure, overload or overtemperature, 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. 20* 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 synchronized 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, is included and allows 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.

4.3.2.3. Extra charger modules for 180 and 300 kVA devices.

The smart charging module is designed to supply the necessary charging current for long backup applications. The module is hot swappable and has the same size and appearance of any power module, supplying an adjustable current of between 0 and 50 A. On the front, they have a high resolution LCD where the user can monitor the different load parameters in real time.
The modules are designed to be inserted in 6- and 10-slot cabinets with only 30 kVA modules - 180 and 300 kVA devices - and can be inserted in the necessary number to meet battery charging needs.

4.3.2.3.1. Wiring diagram.

As can be seen in the diagram in Fig. 21, the charger modules are connected in parallel to the power modules. The total current of the system is the sum of the current supplied by the power modules and the charger modules.

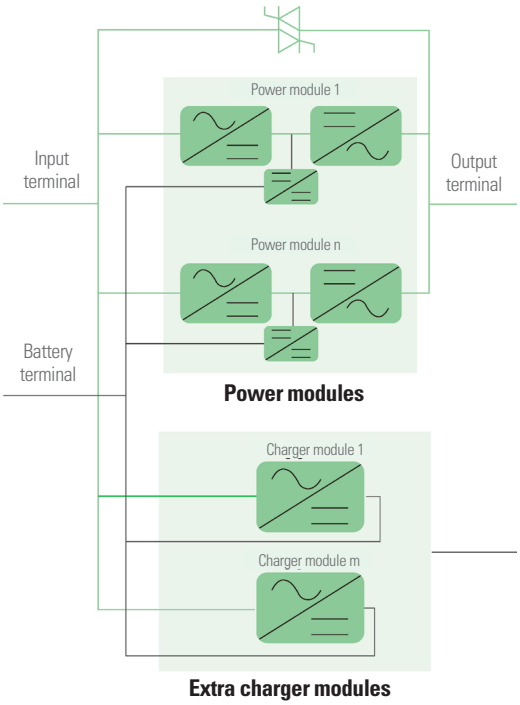


Fig. 21. Conceptual diagram of the extra charger modules.

4.3.3. UPS operating modes.

The modular double-conversion on-line UPS has the following operating modes:

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

During the description of the operating modes the operation is described referring to the PFC-rectifier and inverter parts as functional parts of a module, although there will be as many of them as there are modules connected in parallel.

4.3.3.1. Normal mode.

The inverter of each power module is responsible for powering the critical loads at all times. The rectifier/charger of the AC input powers the inverter with DC voltage while simultaneously charging the associated backup battery, either at float or quick voltage.

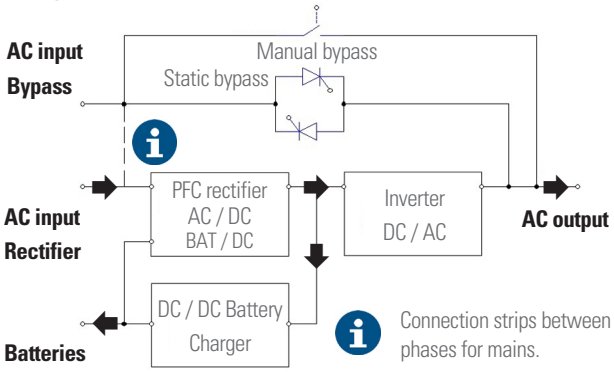


Fig. 22. Conceptual diagram of the UPS in Normal mode.

→ Indicates the direction of the energy flow.

4.3.3.2. Battery mode.

In the event of failure of the AC input power mains, the inverter, by means of the power it obtains from the battery, supplies the critical loads of the output in AC. By doing so, the power supply is not interrupted in the event of failure. Once the AC power input is restored, the 'Normal mode' function will be restored automatically without the user needing to intervene.

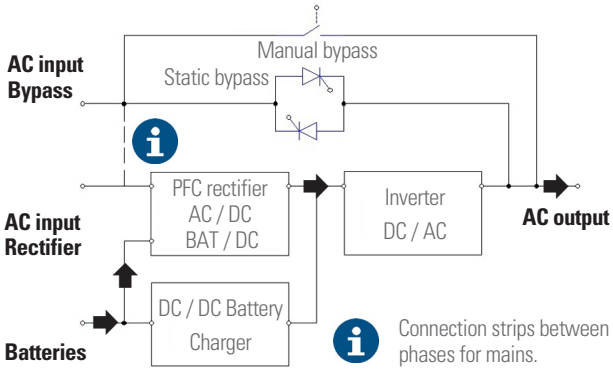


Fig. 23. Conceptual diagram of the UPS in Battery mode.

With the Battery Cold Start function, the UPS can be started without mains power. See details in section 6.1.2.

4.3.3.3. Bypass mode.

If the inverter's overload capacity is exceeded in Normal mode, or if the inverter cannot supply power to the loads for any reason, the static switch will transfer the inverter's load to bypass, without interrupting the power to the critical loads. If the inverter is not synchronised with the bypass, the static switch will transfer the load from the inverter to the bypass, interrupting the load. This is done to prevent short circuits due to the paralleling of non-synchronised AC inputs. The time of this interruption is programmable, the typical value being less than 3/4 of a cycle, e.g. less than 15 ms (50Hz) and 12.5 ms (60Hz). The transfer or retransfer action can be performed via commands through the control panel.

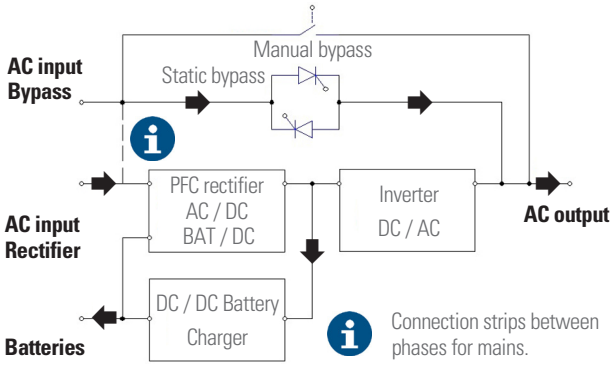


Fig. 24. Conceptual diagram of the UPS in Bypass mode.

4.3.3.4. Manual Bypass mode (maintenance bypass).

If the UPS requires intervention due to breakdown or maintenance (for example, because there is a power module, the bypass or the LCD with anomalies), 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. when fed directly from the commercial AC network.

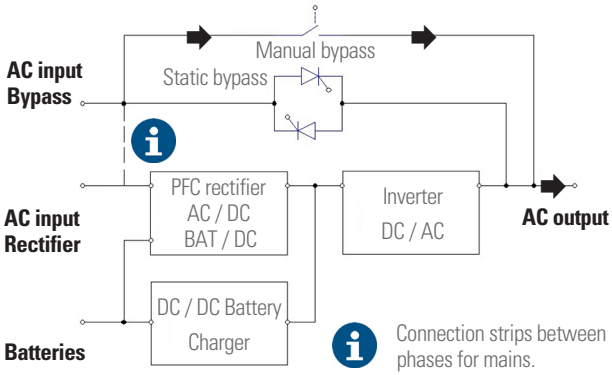


*Fig. 25. **Conceptual diagram of the UPS in manual Bypass mode (maintenance).***

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.

4.3.3.5. Parallel-Redundant mode.

This operating mode allows to obtain a greater capacity, reliability or both, being able to be configured like extension of power or like redundancy.
As a consideration to be taken into account when the cabinets are in parallel, the controller included in each one guarantees the automatic distribution of the load in all of them and all of its modules.

4.3.3.6. ECO mode.

ECO mode saves energy. In this mode, when the input voltage of the Bypass is within the ECO voltage range, the static bypass that supplies power directly to the loads is activated, leaving the inverter in standby. When the Bypass voltage or frequency is out of range, the UPS transfers the output to Inverter.

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

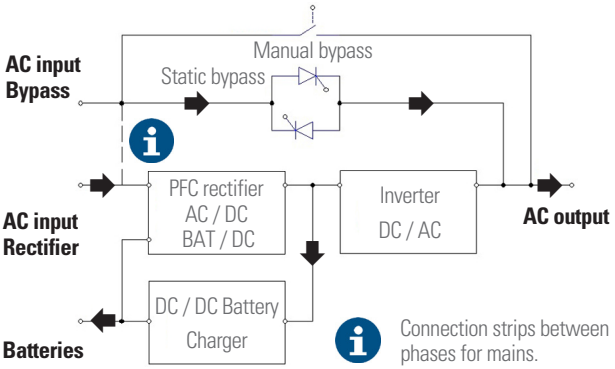


*Fig. 26. **Conceptual diagram of the UPS in ECO mode.***

4.3.3.7. Frequency converter mode.

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

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 device's protections, which will be appropriate to the selectivity indicated in Chapter *10* of this document.
- This chapter presents the relevant requirements to locate and wire the **SLC ADAPT** UPS. As each site has its own location 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 (figure recognised and defined in safety instructions EK266*08).

5.1. RECEPTION OF THE DEVICE.

- It is dangerous to handle the device when it is on the pallet, as it could overturn and cause serious impact injuries to operators and/or entrapment. 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.
- Any handling of the device must be carried out in accordance with the weights shown in the technical specifications according to the model, indicated in Chapter 9. Annexes.

Make sure that the floor or platform where the device will be installed supports the weight of the UPS, batteries and battery bank. The weight of the batteries and battery bank depends on the characteristics of each site. The weight of the UPS cabinet is shown in Tab. 2.

Capacity	Modules	Weight
180 kVA	30 kVA	369 kg
200 kVA	25 kVA	304 kg
300 kVA	25 kVA	446 kg
	30 kVA	560 kg
500 kVA	50 kVA	1350 kg

Tab. 2. Weight of the UPS (including power modules).

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 above information with the device's nameplate.
    If there are discrepancies, report the issue as soon as possible, quoting the device's manufacturing number and any 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.
  - ❒ Remove the packaging to check the contents.

Complete the unpacking according to the procedure in section 5.1.3.

- Contents.
  - ❒ The device itself.
  - ❒ On sub-racks for parallel connection, the connection bus cables.
- 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 appliances where the ambient temperature exceeds the thresholds given in chapter *10*.
- 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 at which they are exposed (see date of last charge noted on the label affixed to the packaging of the battery unit (Fig. 27).

Model information label.

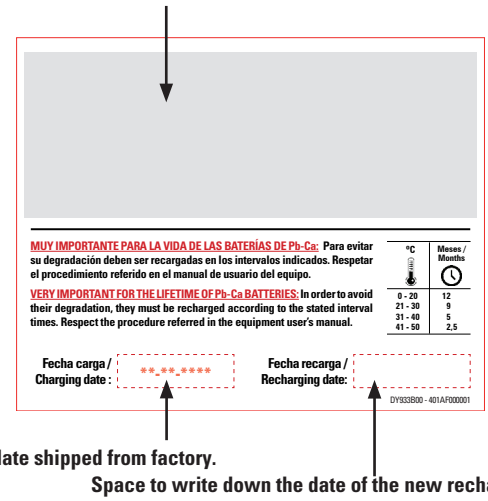


Fig. 27. Label on the packaging of the battery pack.

- ❒ After the period of time, connect the batteries with 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, stop the device, disconnect it electrically and keep 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. 27*).
- ❒ 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 and transportation to the site.

- The packaging of the device consists of wooden pallet, carton or wood envelope according to cases, polystyrene foamed corners (EPS) or polyethylene foam (EPE), polyethylene sheath and strap, all recyclable materials; so if you are going to get rid of them you must do it according to the laws in force. We recommend storing the packaging in case it should be used in the future.
- *Fig. 22* to *Fig. 24*, by way of example, show illustrations of a 6-slot cabinet.

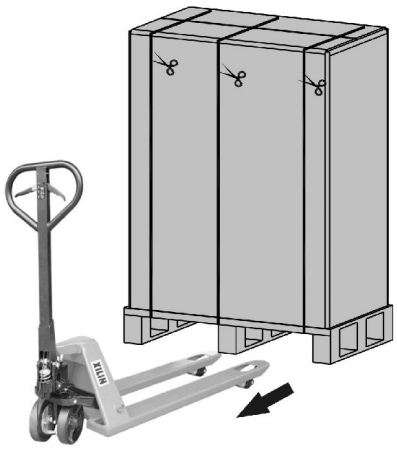


Fig. 28. Example of transfer of packed SLC ADAPT with pallet jack.

To unpack the device, open up the top of the packaging with a suitable tool and then remove the sides, as shown in Fig. 29.

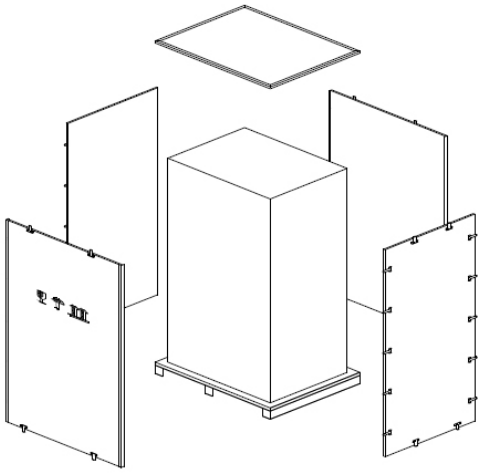


Fig. 29. Unpacking.

Remove the foam that protects the cabinet.

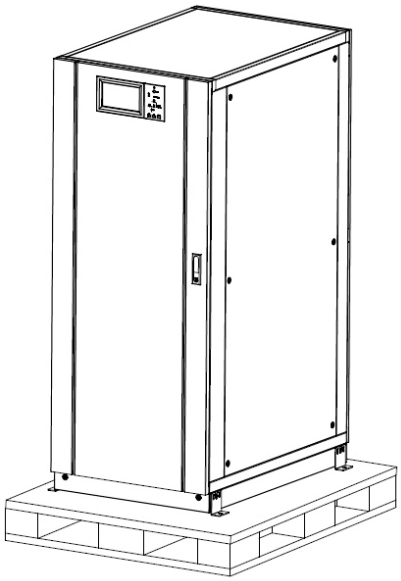


Fig. 30. Removal of protective foam.

Check the UPS.

- **a.** Visually check whether the UPS has been damaged during transportation. If it has, contact the carrier.
- **b.** Verify that the UPS contains all of the items on the list. If any item is missing, contact our company or local office.
- **c.** Remove the bolts that hold the cabinet to the wooden pallet.
- **d.** With the help of one or two people, place the cabinet in the installation location.

ATTENTION! Be careful not to damage the unit in the unpacking process.

Packing waste must be disposed of in an environmentally friendly way.

5.1.3.1. Unpacking the power module.

(Only for devices with modules packed separately.)

The steps will be as follows:

1. Gently place the module on the floor or platform.

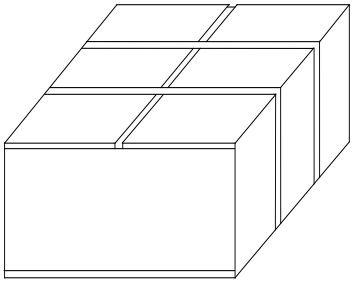
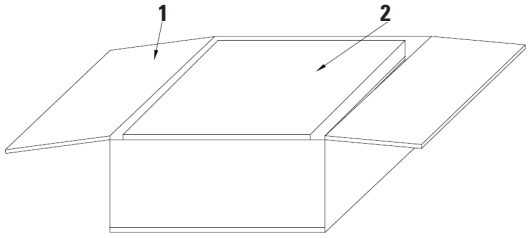


Fig. 31. Packed module.

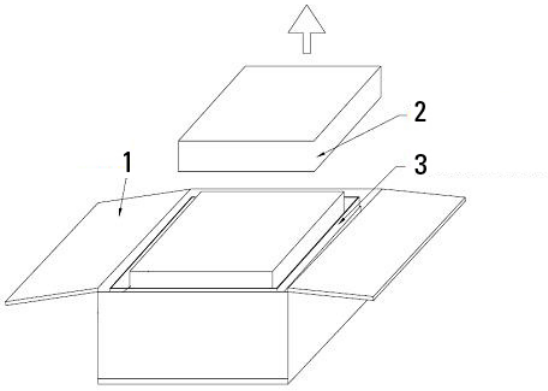
2. Cut the plastic packing tapes and open the box.



1. Cardboard
2. Protective foam

Fig. 32. Packing opening.

3. Remove the upper protective foam (Fig. 18).



1. Cardboard
2. Protective foam
3. Power module

Fig. 33. Remove protective foam.

4. Remove the UPS module with plastic packing from the cardboard box.

ATTENTION! Properly set aside the packing materials for subsequent recycling according to environmental protection regulations.

5.1.4. Siting, immobilising and considerations.

- The UPS is intended for indoor installation. The default protection rating is IP20. The device is cooled by forced convection with internal fans. Ensure that there is enough space for proper ventilation and cooling of the UPS.
- 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 will be selected according to the 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.
- 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 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.
- Keep the UPS away from water, sources of heat and flammable, explosive or corrosive materials. Do not install the UPS where there is direct sunlight, dust, volatile gases, corrosive materials or high salinity.
- Do not install the UPS in environments with conductive materials in suspension.
- The ambient temperature for battery operation is 20 to 25°C. If the batteries operate above 25°C, their service life will be reduced, and if they operate below 20°C, their capacity will be reduced.
- The batteries generate small amounts of hydrogen and oxygen at the end of their charging. Make sure that the location of the batteries is ventilated with fresh air that meets standard EN50272-2001.
- If external batteries are installed, fit the disconnectors (or fuses) of the batteries as close as possible to them. The connection cables should be as short as possible.
- Make sure that the floor or platform where the device will be installed supports the weight of the UPS, batteries and battery bank.

The cabinet of the UPS, batteries and battery bank can be installed on a concrete base or other non-combustible surface that does not vibrate and has a slope of less than 5° with respect to the horizontal.

5.1.5. 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.

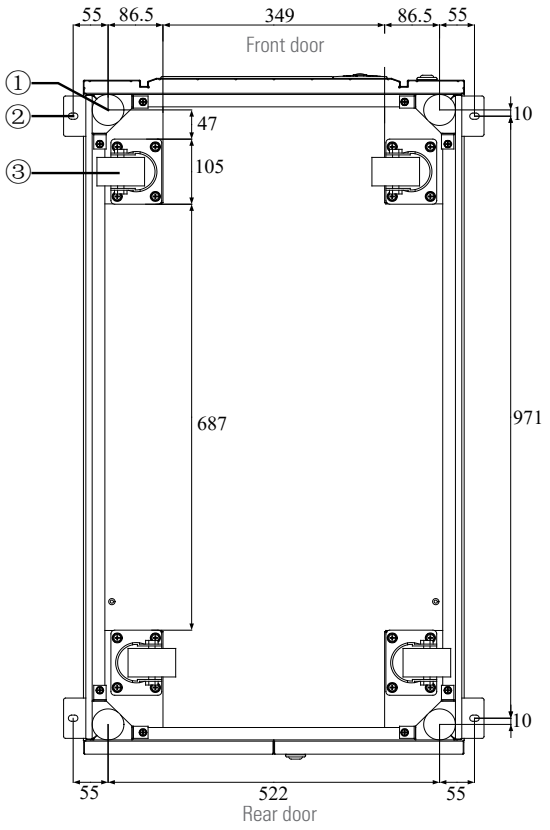
In a normal installation, the battery temperature is maintained between 15 and 25°C. Keep batteries away from heat sources or air intakes.

- The protections (fuses or disconnectors) 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.

5.2. CABINET POSITIONING.

5.2.1. 180 to 300 kVA devices.

The cabinet has two positioning systems, one by means of the base with four wheels, which is suitable for adjusting the position of the cabinet, and the other by means of anchor bolts for its final permanent installation.



①Anchor bolt.
②L-shaped plates.
③Wheels.

*Fig. 34. **Support structure for 180 kVA and 300 kVA devices (bottom view).***

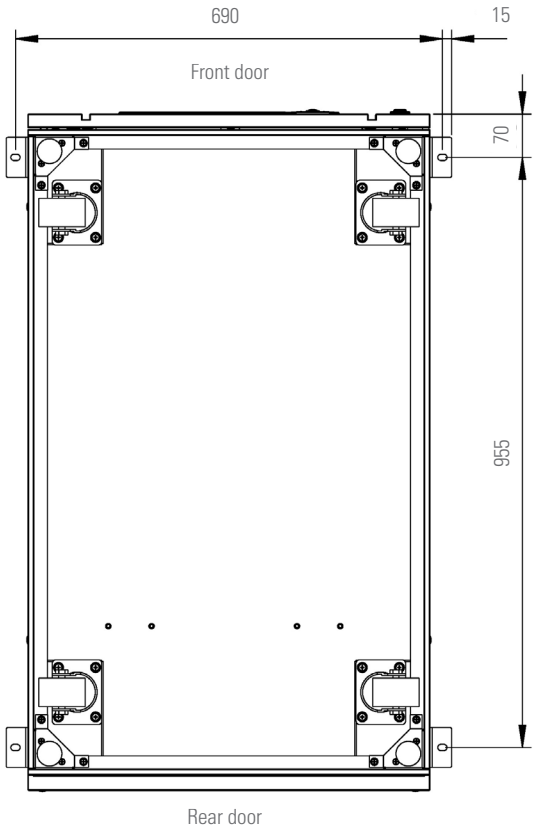


*Fig. 35. **Support structure for 300 kVA equipment with 25 kVA modules (bottom view).***

5.2.2. 500kVA devices.

The UPS cabinet can be supported on six wheels and on anchor bolts at the base. The wheels are used for temporary adjustment of position, the anchor bolts are used to keep the cabinet in its final position. The support structure and its dimensions (expressed in mm) are shown in Fig. 29.

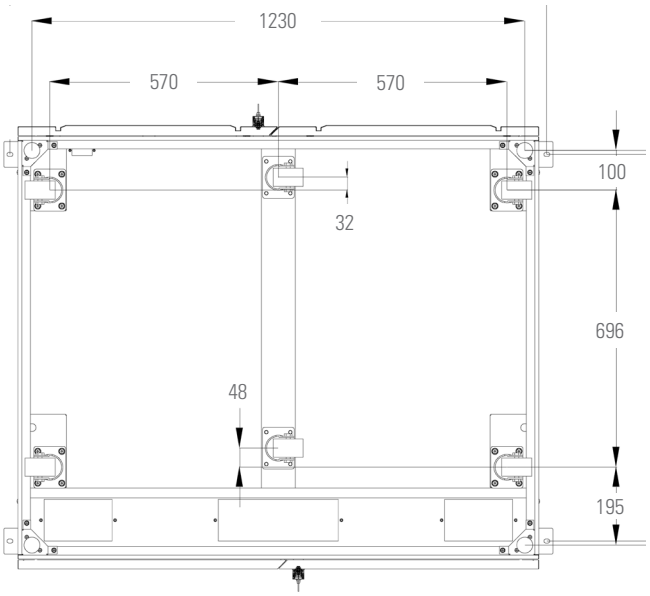


*Fig. 36. **Support structure for 500 kVA devices (bottom view).***

The steps to position the cabinet are as follows:

1. Make sure that the support structure is in good condition and that the surface where the unit will be installed is flat and strong.
2. Loosen the anchor bolts with a spanner, turning them anti-clockwise. The unit is only supported on the wheels.
3. Place the device in its final position.

Be sure to leave a space of at least 0.8m at the front of the cabinet to be able to fully open the power module door and at least 0.5 m at the back for good ventilation and cooling. The space that must be reserved for the cabinet is shown in Fig. 37.

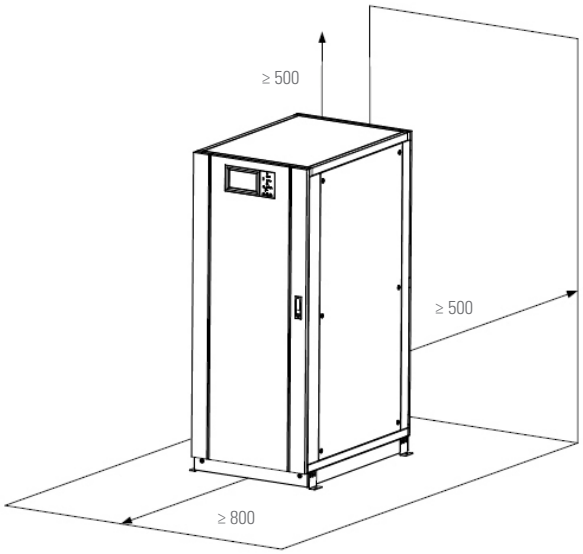


*Fig. 37. **Space reserved for the cabinet (units: mm).***

4. Tighten the anchor bolts with the spanner, turning them clockwise. The cabinet is supported on the anchor bolts.
5. Make sure that all four anchor bolts are at the same height and that the cabinet is securely fastened.
6. Final positioning completed.

If the base where the devices will be installed is not strong enough, it is necessary to use auxiliary elements that allow the weight to be distributed over a larger surface. For example, an iron plate can be placed on the base, or the support surface of the anchor bolts can be increased.

5.2.3. Batteries.

The connection between the batteries and the UPS is made through three terminals: positive, negative and neutral. The neutral line is drawn from the midpoint of the batteries connected in series, as shown in Fig. 38.

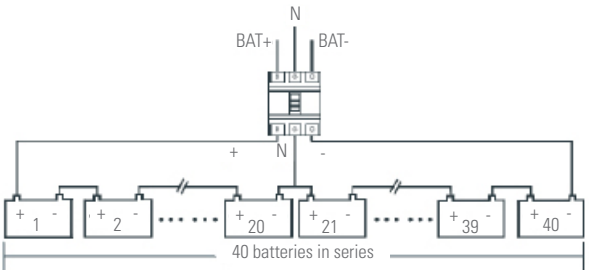


*Fig. 38. **Wiring diagram of a battery branch.***

The voltage at the battery terminals is greater than 200 V DC. Follow the safety instructions to avoid electric shock.
Make sure that the positive, negative and neutral are correctly connected between the battery terminals and the disconnector and between the disconnector and the UPS.

5.2.4. Installation of seismic kits (optional).

We take a 10-slot cabinet as an example.

Fixing to the floor

1. Make sure that the floor is flat.
2. Mark the mounting holes to the right and left as shown in Fig. 39.

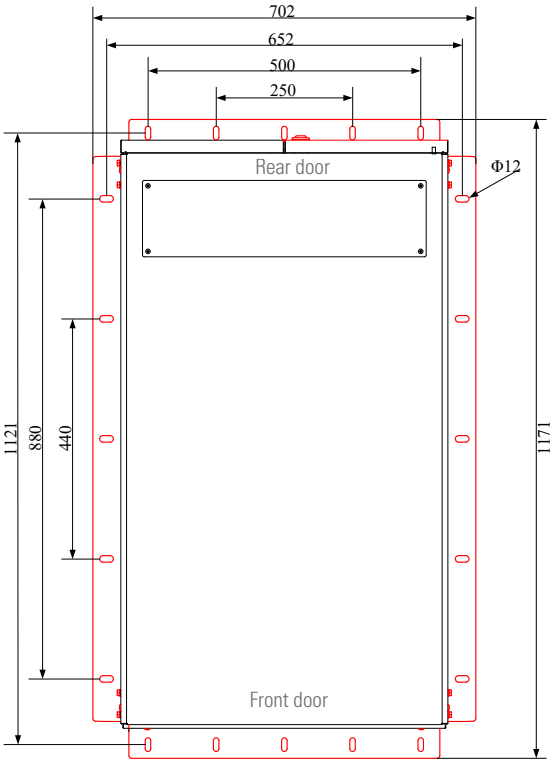
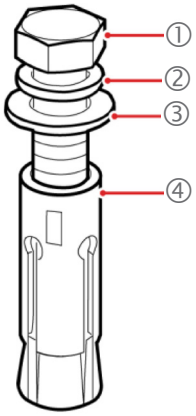


*Fig. 39. **Seismic kits and mounting holes (top view).***

3. Drill holes through the mounting hole marks and then insert the 10 x M10 expansion bolts into the holes. Fig. 40 shows an expansion bolt.
4. Move the cabinet to the installation position.
5. Use 10 x M10 expansion bolts to secure the cabinet to the floor. Tighten them.



①Anchor bolt.
②Spring washer.
③Flat washer.
④Expansion bolt.

*Fig. 40. **Expansion bolt assembly.***

Installation of steel plates

1. As per the dimensions of the mounting holes of the base of the cabinet, the steel plates should be spaced 702 mm or more, and the space between holes centres should be 652 mm. The width of the steel plates should be 50 mm or more. Determine the position for the installation of the cabinet on the steel plates.
2. Drill holes through the mounting hole marks, diameter M10.
3. Move the cabinet to the installation position.
4. Use 10 x M10×45 bolts to line up the cabinet mounting holes on the steel plates, and 10 nuts to tighten the bolts.

5.2.5. Installation of power modules.

The installation position of the power modules is shown in Fig. 41. We take a 10-slot cabinet for 30 kVA modules as an example, proceed in the same way for 50 kVA modules.

Install the power modules following a sequence from bottom upwards to prevent dangerous tilting of the cabinet due to the high centre of gravity.

The steps to install the power modules are as follows (taking as an example a 10-slot cabinet):

1. Make sure that the cabinet is well secured to the floor and insert the modules in the different slots provided for this purpose.
2. Two people, one on each side, should hold the handle and body of each module.
3. Insert the module into the slot and push it gently to the back of the cabinet.
4. Fix the module to the cabinet using the mounting holes located on both sides of the module's faceplate (see Fig. 41, on the right).
5. The installation of the power module is complete.

The procedure for the installation of the bypass module for 6- and 10-slot cabinets is the same as for the power modules.

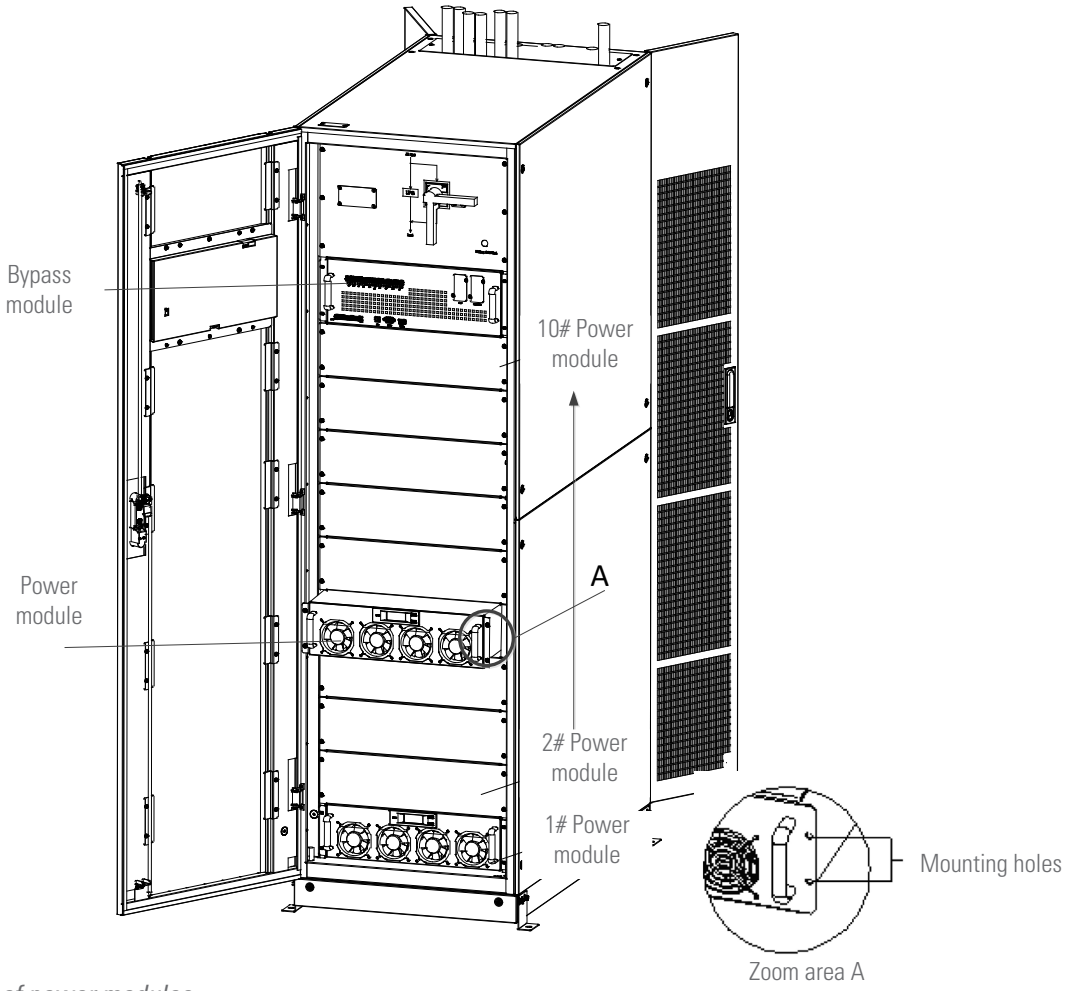


*Fig. 41. **Installation of power modules.***

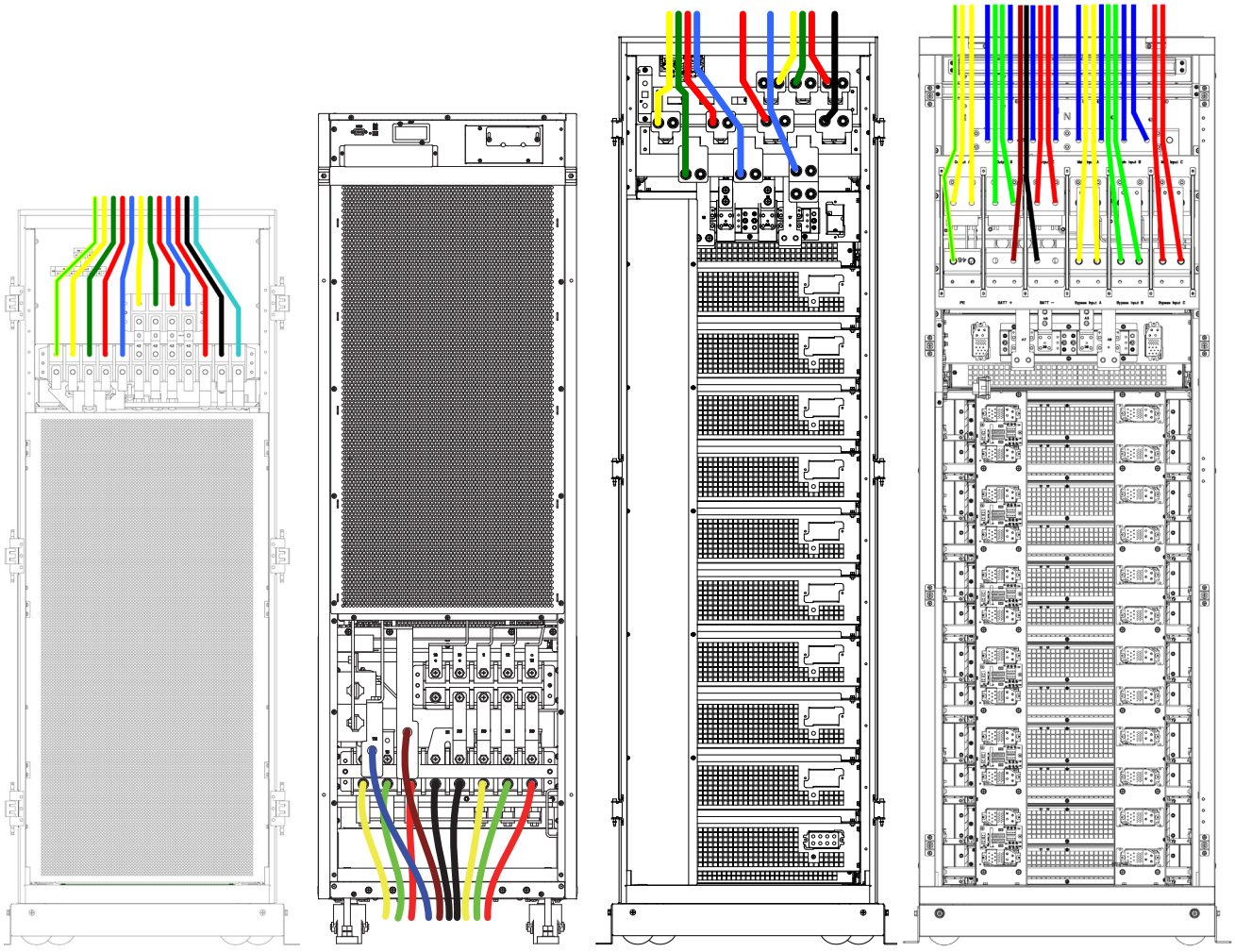
5.2.6. Installation of extra charger modules.

The procedure for the installation of extra charger modules for 6- and 10-slot cabinets and 30 kVA modules is the same as for the power modules.

5.3. CONNECTIONS.

5.3.1. Cable entry for 180, 200 and 300 kVA devices.

The cables can enter the cabinet from the top or from the bottom.
Regarding the 10-slot cabinet, the upper cable entry is standard, while the entry from the bottom requires optional parts that must be added.
Some of the different cable entry possibilities are shown in Fig. 42.



6-slot cabinet top cable entry | 8-slot cabinet bottom cable entry | 10-slot cabinet top cable entry | 12-slot cabinet top cable entry

Fig. 42. Cable entry for 6, 8, 10 and 12-slot cabinets and 25 and 30 kVA modules (rear view).

5.3.2. Cable entry for 500 kVA devices.

Cable entry can be made from the top or bottom.

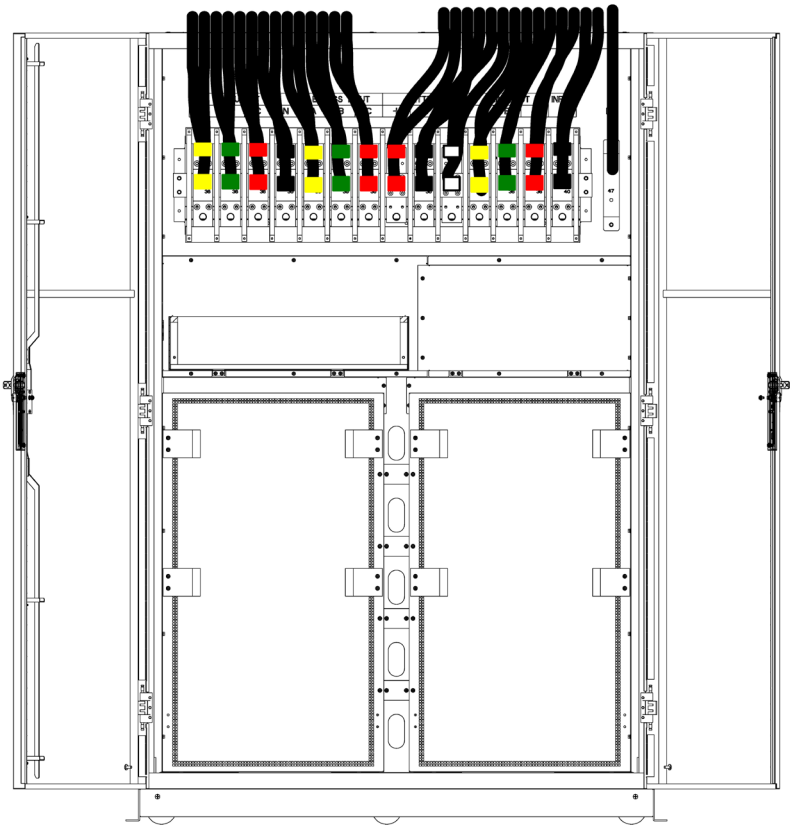


Fig. 43. 10-slot cabinet installation with cable entry at the top (rear view).

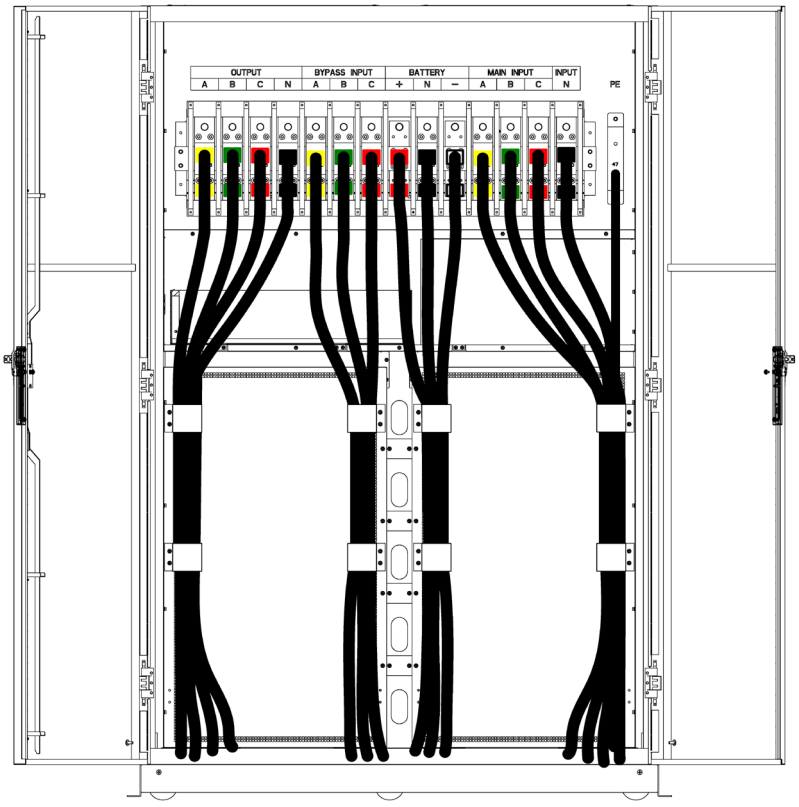


Fig. 44. 10-slot cabinet installation with cable entry at the bottom (rear view).

5.3.3. Connection to the entry.

5.3.3.1. Specifications.

Tab. 3 shows the recommended cross sections for power cables to the UPS.

Unit (kVA)			180 6 x 30	200 8 x 25	300 12 x 25	300 10 x 30	500 10x50
Mains input	Input current (A)		265	324	486	442	728
	Cable cross section (mm^2)	A	120	2*70	2*95	240	2*240
		B	120	2*70	2*95	240	2*240
		C	120	2*70	2*95	240	2*240
		N	120	2*70	2*95	240	2*240
Output	Output current (A)		260	289	434	434	722
	Cable cross section (mm^2)	A	120	120	2*95	2*120	2*240
		B	120	120	2*95	2*120	2*240
		C	120	120	2*95	2*120	2*240
		N	120	120	2*95	2*120	2*240
Bypass input	Bypass current (A)		260	289	434	434	722
	Cable cross section (mm^2)	A	120	120	2*95	2*120	2*240
		B	120	120	2*95	2*120	2*240
		C	120	120	2*95	2*120	2*240
		N	120	120	2*95	2*120	2*240
Battery input	Battery current (A)		407	497	745	677	1117
	Cable cross section (mm^2)	+	120	150	2*120	240	2*240
		-	120	150	2*120	240	2*240
		N	120	150	2*120	240	2*240
PE	Cable cross section (mm^2)	PE	70	95	120	120	240

Tab. 3. Recommended cross sections for power cables.

The recommended cross sections for power cables take into account the following conditions:

- ❒ Ambient temperature: 30°C.
- ❒ AC losses less than 3%, DC losses less than 1%. AC power cable lengths less than 50m, DC power cable lengths less than 30m.
- ❒ The voltages indicated in the table are based on three-phase 380 V systems (phase-to-phase voltage).
- ❒ If the usual load is not linear, the cross sections of the neutral lines must be multiplied by a factor of 1.5 to 1.7.

5.3.3.2. Specifications for power cable terminals.

Tab. 4 shows the specifications for power cable connectors.

Type	Port	Connection	Bolt	Tightening torque
180 kVA 300 kVA 500 kVA	Input	Crimped cables Ring terminal	M16	96 Nm
	Bypass input	Crimped cables Ring terminal	M16	96 Nm
	Battery input	Crimped cables Ring terminal	M16	96 Nm
	Output	Crimped cables Ring terminal	M16	96 Nm
	PE	Crimped cables Ring terminal	M16	96 Nm

Tab. 4. Requirements for power module terminals.

5.3.3.3. Disconnectors.

Tab. 5 shows the specifications of the disconnectors included in the UPS:

Disconnector	180 kVA	200 kVA	300 kVA	500 kVA
Mains input	-	-	-	800A/3P
Bypass input	-	-	-	800A/3P
Output	-	-	-	800A/3P
Maintenance bypass	300A/3P	-	630A/3P	800A/3P
Battery	-	-	-	1250A, 250 V DC

Tab. 5. Included disconnectors.

The use of disconnectors with built-in residual current detection (RCD) devices is not recommended.

5.3.3.4. Connection of the power cables.

Connect the power cables according to the following instructions:

1. Make sure that the rectifier and bypass input cables have no voltage when connecting them. Mark the switches so that they are not improperly activated.
2. Open the back door of the cabinet and remove the plastic cover. The battery, earth and input and output terminals are shown in Fig. 49.
3. Connect the earth wire to the PE terminal.
4. Connect the AC input wires to the input terminals and the AC output wires to the output terminals.
5. Connect the battery wires to the battery terminals.
6. Make sure that there are no errors and replace all protective covers.

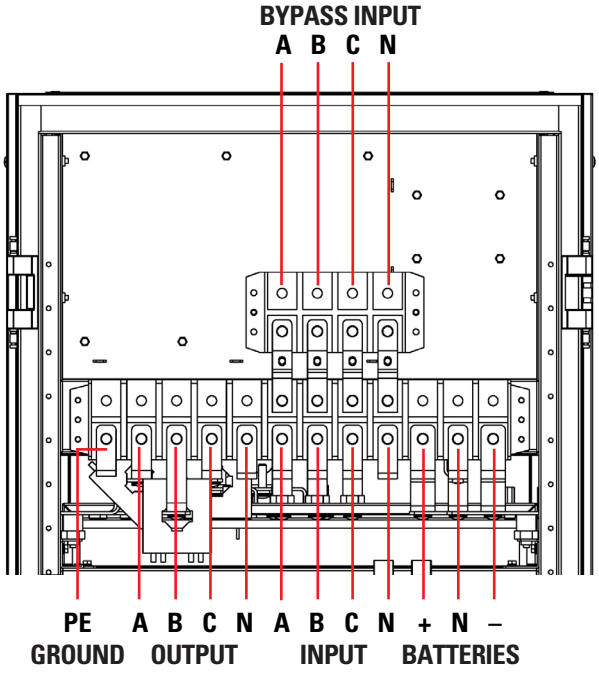


Fig. 45. Arrangement of connection terminals for 6-slot - 180 kVA devices.

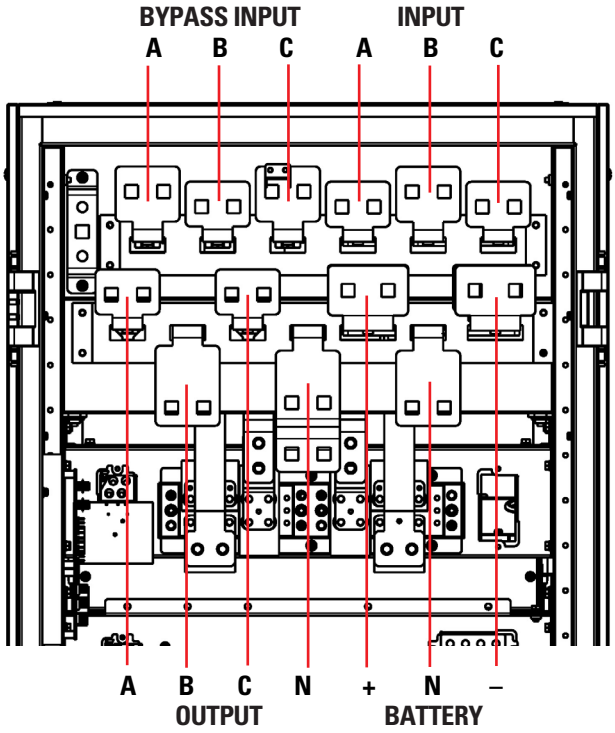


Fig. 47. Arrangement of connection terminals for 10-slot - 300 kVA devices.

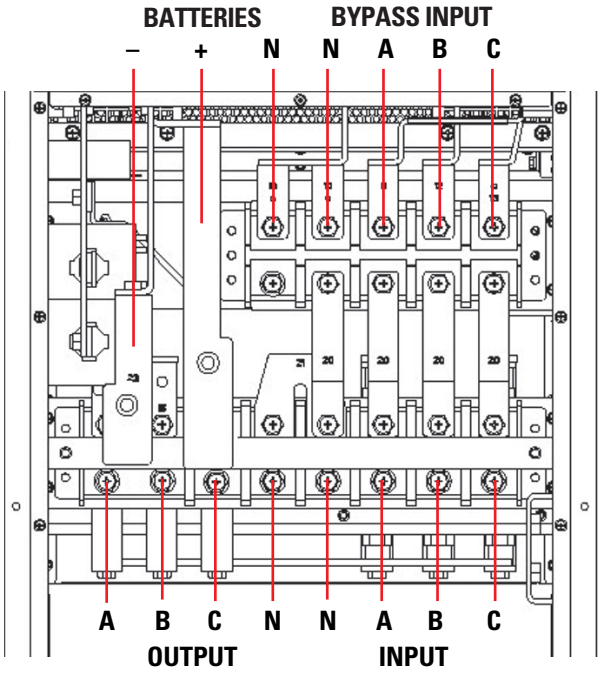


Fig. 46. Arrangement of connection terminals for 8-slot - 200 kVA devices.

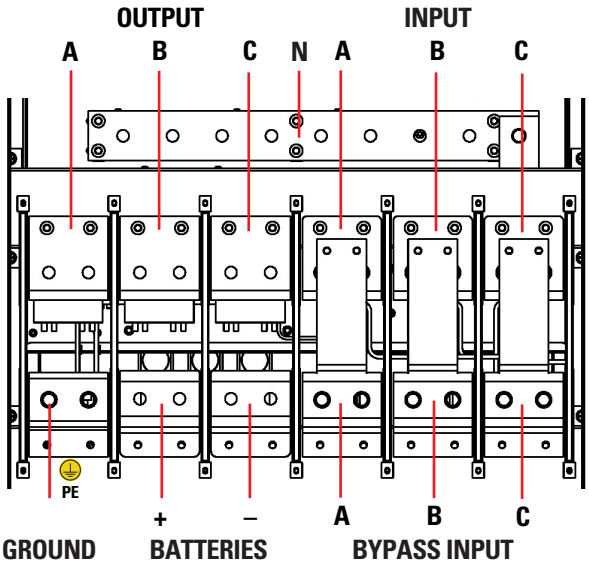


Fig. 48. Arrangement of connection terminals for 12-slot - 300 kVA devices.

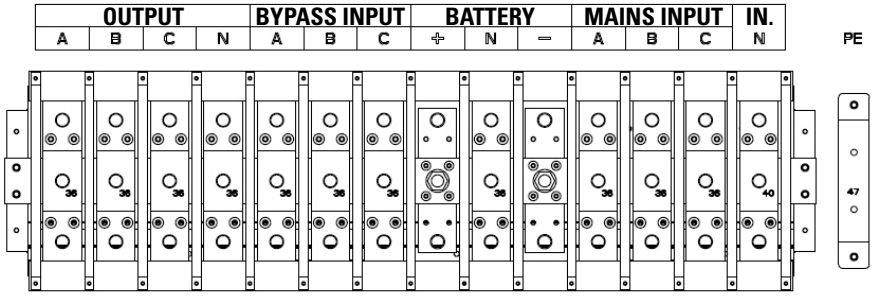


Fig. 49. Connection terminals for 500 kVA devices.

The operations described in this section must be performed by electricians or qualified technical personnel. If difficulties arise, contact our head office or local office.

Tighten the terminals to the tightening torque indicated in Tab. 4 and make sure that the phase rotation is correct.
The earth wire and the neutral must be connected as per the requirements of the applicable regulations.
The load and the UPS must be connected to the same earth.

5.3.4. Control and communication cables.

The front panel of the bypass module provides a relay interface (J2-J11) and communications interface (RS-232, RS-485, SNMP, smart slot and USB port), as shown in Fig. 50 and Fig. 51.

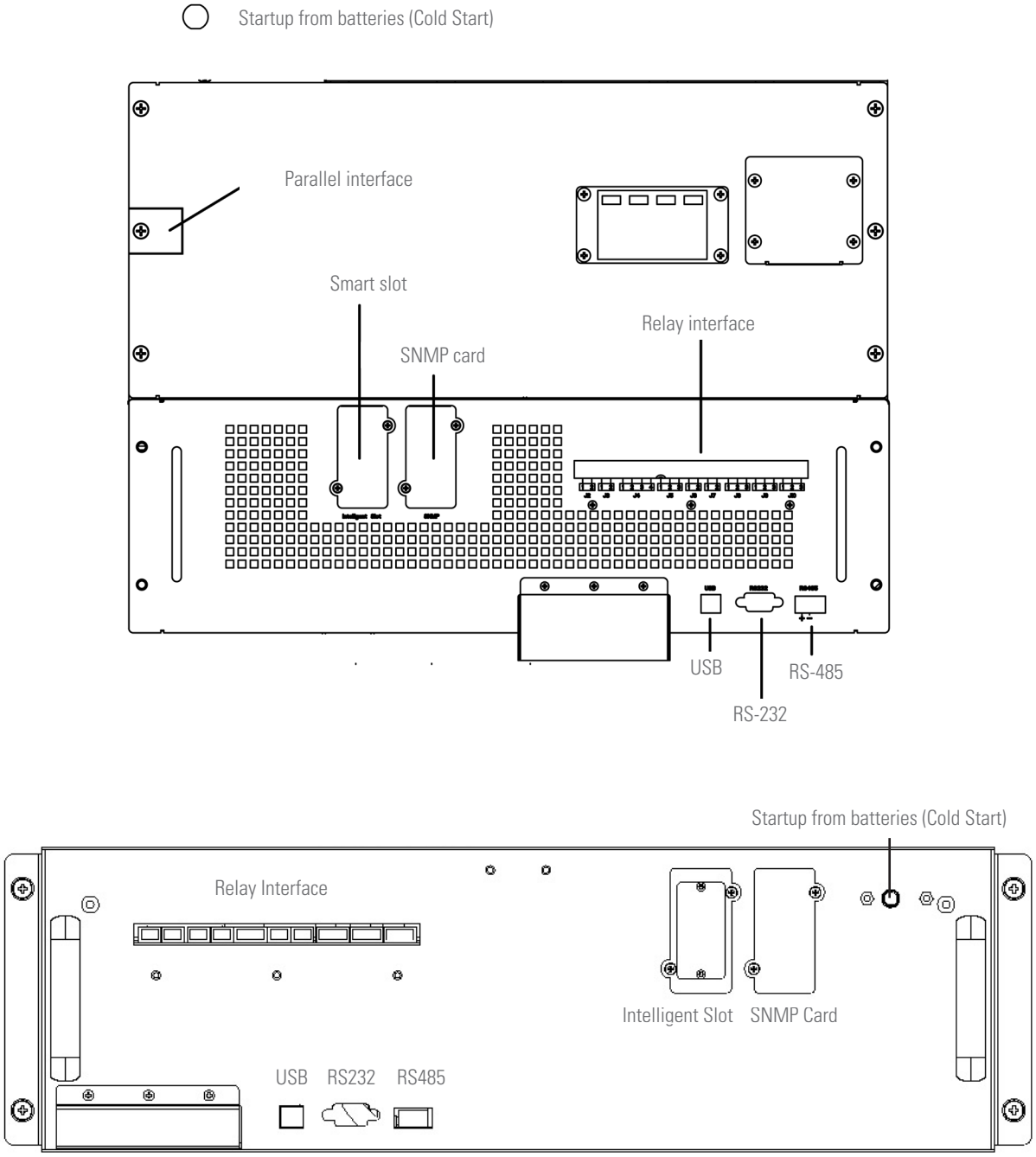


Fig. 50. Interface to relays and communications of the 180 and 300 kVA models for 30 kVA modules (top) and of the 300 kVA models for 25 kVA modules (bottom)..

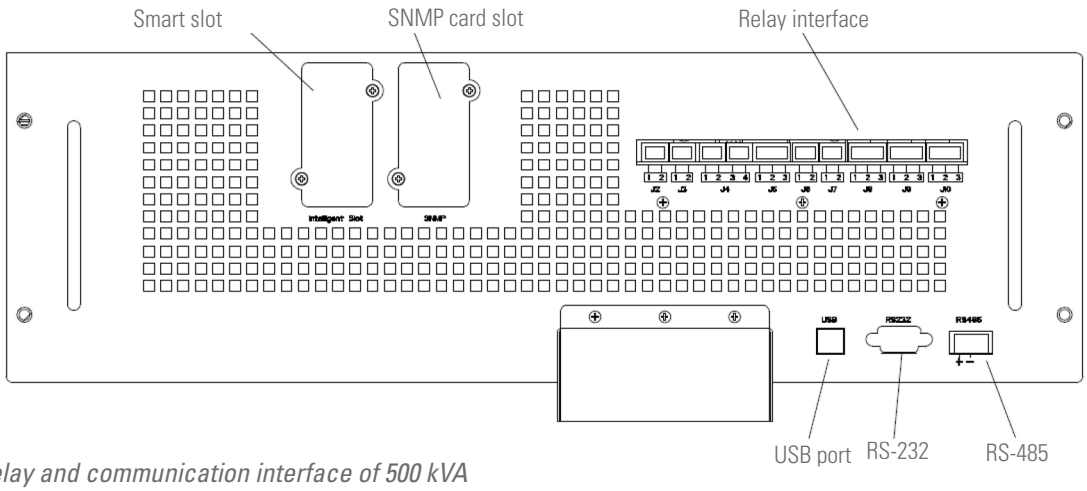


*Fig. 51. **Relay and communication interface of 500 kVA models.***

The UPS accepts an external signal from relays connected through the relay interface and Phoenix terminals. Through software programming, these signals are activated when these contacts are connected to +24 V to earth. The cables connected to the DRY terminal must be separated from the power cables. In addition, these cables must have double insulation with a typical cross section of 0.5 to 1.5 mm^2 for a maximum connection length between 25 and 50 metres.

5.3.4.1. Relay interface.

The relay interface includes ports J2-J10 [(1)]. The functions of the relay interface ports are shown in Tab. 6.

[(1)] Make sure that the rectifier and bypass input cables have no voltage when connected.

Port	Name	Function
J2-1	TEMP_BAT	Battery temperature sensor (floating voltage compensation)
J2-2	TEMP_COM	Common
J3-1	TEMP_ENV	Room temperature sensor
J3-2	TEMP_COM	Common
J4-1	EPO_NC	EPO activation when disconnecting from J4-2
J4-2	+24 V	+24 V
J4-3	+24 V	+24 V
J4-4	EPO_NO	EPO activation when connecting to J4-3
J5-1	+24 V_DRY	+24 V
J5-2	EXTER_BYPASS	'NO' auxiliary contact of external manual bypass switch.
J5-3	GND	Common
J6-1	BCB_DRV	It provides a pulse signal of +24 V / 20 mA for the remote control of the battery disconnector through its coil. This signal activates the 'Off' switch
J6-2	BCB_CONT	Status of the BCB switch. Its normally closed ('NC') auxiliary contact can be connected between this pin and the GND
J7-1	GND	+ 24 V ground reference
J7-2	BCB_ONL	Not useful. Not implemented
J8-1	BYP_ALM_NC	Normally closed ('NC') contact, STATIC BYPASS relay interface signal
J8-2	BYP_ALM_NO	Normally open ('NO') contact, STATIC BYPASS relay interface signal.
J8-3	GND	Common for STATIC BYPASS relay interface signal
J9-1	ALARM_NC	Normally closed ('NC') contact, GENERAL ALARM relay interface signal
J9-2	ALARM_NO	Normally open ('NO') contact, GENERAL ALARM relay interface signal
J9-3	GND	Common for GENERAL ALARM relay interface signal
J10-1	UTI_FAIL_NC	Normally closed ('NC') contact, AC MAINS FAILURE relay interface signal
J10-2	UTI_FAIL_NO	Normally open ('NO') contact, AC MAINS FAILURE relay interface signal
J10-3	GND	Common for AC MAINS FAILURE relay interface signal

*Tab. 6. **Functions of the relay interface ports.***

The adjustable functions for each port can be modified from the control software.

The default functions of each port are described as follows:

Output relay interface for ambient temperature detection
Ports J2 and J3 can detect, respectively, the temperature of the batteries and the environment, and be used to monitor the environment and compensate for the temperature of the batteries. The diagram of ports J2 and J3 is shown in Fig. 52 and the description in Tab. 6.

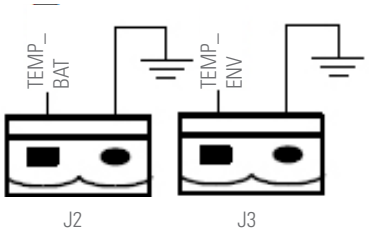


*Fig. 52. **Connection diagrams of the temperature detection ports.***

Port	Name	Function
J2-1	TEMP_BAT	Battery temperature sensor (floating voltage compensation)
J2-2	TEMP_COM	Common
J3-1	TEMP_ENV	Room temperature sensor
J3-2	TEMP_COM	Common

Tab. 7. Description of J2 and J3.

A specific temperature sensor is required for temperature detection (R25 = 5 kOhm, B25/50 = 3275): check with the manufacturer or contact the maintenance engineers when ordering.

Relay interface for remote EPO

J4 is the input port for remote EPO. During normal operation, jumper +24 V with NC and open the jumper between NO and +24 V.
The EPO trips when opening the jumper between NC and +24 V or when jumpering NO and +24 V (J4-3). The diagram of the port is shown in Fig. 53 and the description in Tab. 6.

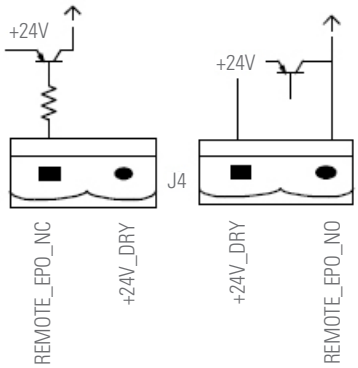


Fig. 53. Diagram of the relay interface for remote EPO.

Port	Name	Function
J4-1	EPO_NC	EPO activation when disconnecting from J4-2
J4-2	+24 V	+24 V
J4-3	+24 V	+24 V
J4-4	EPO_NO	EPO activation when connecting to J4-3

Tab. 8. Description of the input port for remote EPO.

Relay interface of the generator

The default function of J5 is the interface for the generator. The connection of pin 2 of J5 with a +24 V power supply indicates that the generator has been connected to the system. The diagram of port J5 is shown in Fig. 54 and the description in Tab. 6.

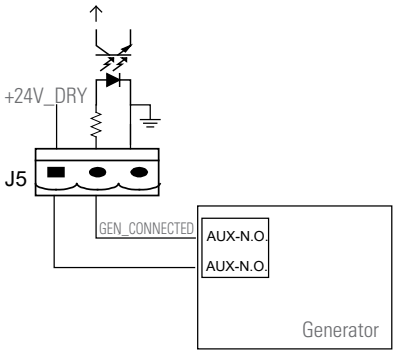


Fig. 54. Connection diagram of the connection port of the generator and interface status.

Port	Name	Function
J5-1	+24 V_DRY	+24 V
J5-2	EXTER_BYPASS	'NO' auxiliary contact of external manual bypass switch
J5-3	GND	Common

Tab. 9. Description of the interface status and generator connection.

Input port of the BCB

The default function of J6 and J7 is that of being the ports of the BCB. A diagram of the ports is shown in Fig. 55 and a description in Tab. 6.

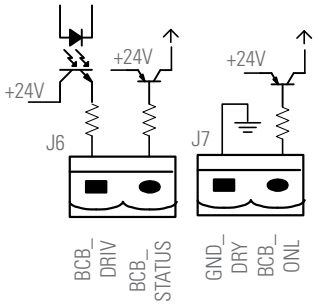


Fig. 55. Connection diagrams of the ports of the BCB.

Port	Name	Function
J6-1	BCB_DRV	It provides a pulse signal of +24 V / 20 mA for the remote control of the battery disconnector through its coil. This signal activates the 'Off' switch
J6-2	BCB_CONT	Status of the BCB switch. Its normally closed ('NC') auxiliary contact can be connected between this pin and the GND
J7-1	GND	+ 24 V ground reference
J7-2	BCB_ONL	Not useful. Not implemented

Tab. 10. Description of the BCB port.

In the default configuration, when using a disconnector with auxiliary contacts with J6-2 and J7-1 connected to auxiliary contact terminals to obtain the status of the BCB, this function must be enabled by short circuiting J7-1 and J7-2.

Output relay interface for battery warnings

The default function of port J8 is to present battery undervoltage or overvoltage warnings. When the battery voltage is lower than the programmed value, an auxiliary signal from the relay interface will be activated. A diagram of the ports is shown in Fig. 56 and a description in Tab. 6.

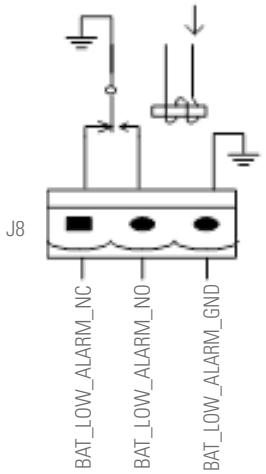


Fig. 56. Diagram of the relay interface of battery warnings.

Port	Name	Function
J8-1	BYP_ALM_NC	Normally closed (NC) contact, STATIC BYPASS relay interface signal
J8-2	BYP_ALM_NO	Normally open (NO) contact, STATIC BYPASS relay interface signal
J8-3	GND	Common for STATIC BYPASS relay interface signal

Tab. 11. Description of the relay interface of battery warnings.

Relay interface of general output alarms

The default function of port J9 is to present general alarm warnings. When one or more warnings are triggered, an auxiliary relay interface signal will be activated. A diagram of the ports is shown in Fig. 57 and a description in Tab. 6.

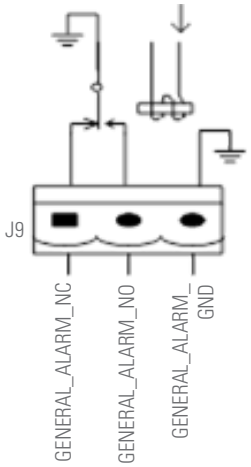


Fig. 57. Diagram of the relay interface of integrated warnings.

Port	Name	Function
J9-1	ALARM_NC	Normally closed (NC) contact, GENERAL ALARM relay interface signal
J9-2	ALARM_NO	Normally open (NO) contact, GENERAL ALARM relay interface signal
J9-3	GND	Common for GENERAL ALARM relay interface signal

Tab. 12. General description of the relay interface of general alarms.

Output relay interface for mains failure warnings

The default function of port J10 is to present mains failure warnings. When there is a mains failure, the system sends a mains failure warning and an auxiliary relay interface signal is generated. A diagram of the ports is shown in Fig. 58 and a description in Tab. 6.

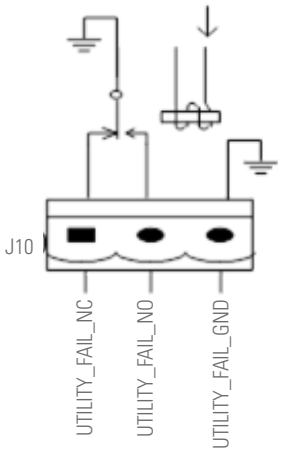


Fig. 58. Diagram of the relay interface of mains failure warnings.

Port	Name	Function
J10-1	UTI_FAIL_NC	Normally closed (NC) contact, AC MAINS FAILURE relay interface signal
J10-2	UTI_FAIL_NO	Normally open (NO) contact, AC MAINS FAILURE relay interface signal
J10-3	GND	Common for AC MAINS FAILURE relay interface signal

Tab. 13. Description of the relay interface of mains failure warnings.

5.3.4.2. Communications interface.

The RS-232, RS-485 and USB ports provide data that can be used by authorised personnel for startup and maintenance. They can also be used in the battery room for integrated or network monitoring systems.

The SNMP port (optional) is used for communications in the on-site installation.

The smart slot interface (optional) is an additional relay interface.

6. OPERATION.

6.1. STARTUP PROCEDURE.

6.1.1. Startup in Normal mode.

Once installation is complete, UPS startup must be carried out by authorised personnel. Follow the steps detailed below:

1. Make sure that all of the disconnectors are open.
2. For 180 and 300 kVA UPSs, close the external input disconnectors and the system will start. If the system has a dual input, close both disconnectors.
3. For the 500 KVA UPS, close output disconnector (Q3), then close input disconnector (Q1) and finally close bypass input disconnector (Q4). The system will start.
4. The LCD on the front of the cabinet turns on and the start screen is displayed (see Fig. 70).
5. Pay attention to the start page and LED indicators. The blinking of the rectifier LED indicates that it is starting up. LED indicator states are shown in Tab. 14.

Indicator	State	Indicator	State
Rectifier	Blinking green	**Inverter**	Off
Battery	Red	**Load**	Off
Bypass	Off	**State**	Red

Tab. 14. Rectifier startup.

6. After 30 seconds, the rectifier indicator turns green to indicate that rectifier startup is complete. The static bypass switch closes and the inverter starts. LED indicator states are shown in Tab. 15.

Indicator	State	Indicator	State
Rectifier	Green	**Inverter**	Blinking green
Battery	Red	**Load**	Green
Bypass	Green	**State**	Red

Tab. 15. Inverter startup.

7. The UPS transfers from bypass to inverter once the inverter stabilises. LED indicator states are shown in Tabla 8.

Indicator	State	Indicator	State
Rectifier	Green	**Inverter**	Green
Battery	Red	**Load**	Green
Bypass	Off	**State**	Red

Tab. 16. Powering the load.

8. The UPS is in Normal mode. When the switches of the batteries close, the UPS starts charging them. LED indicator states are shown in Tab. 17.

Indicator	State	Indicator	State
Rectifier	Green	**Inverter**	Green
Battery	Green	**Load**	Green
Bypass	Off	**State**	Green

Tab. 17. Normal mode.

- Stored settings are loaded at system startup.
- Users can see in the Historical menu all events that occurred during startup.
- Users can view information on the device by using the buttons found on the front of it.

6.1.2. Startup from Battery mode (COLD START function).

Startup from Battery mode refers to the functionality called Cold Start from batteries. The steps are the following:

1. Verify that the batteries are correctly connected and close the disconnectors.
2. Press the red Battery Cold Start button until the 'BAT' indicator blinks. It is located at the top of the front of each of the UPS cabinets. The battery powers the system.

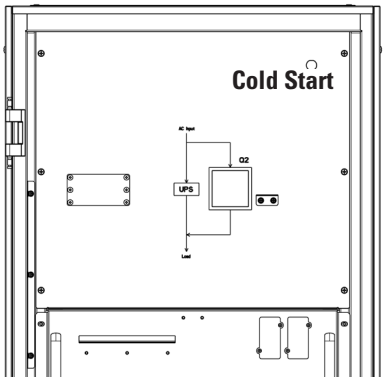


Fig. 59. Position of the Battery Cold Start button on 180 kVA devices.

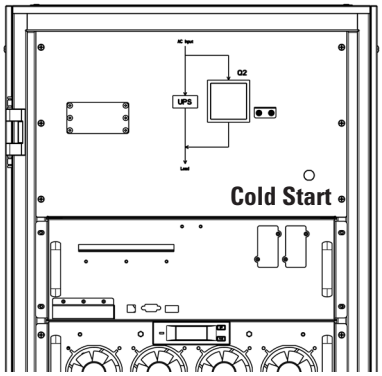


Fig. 60. Position of the Battery Cold Start button on 300 kVA devices.

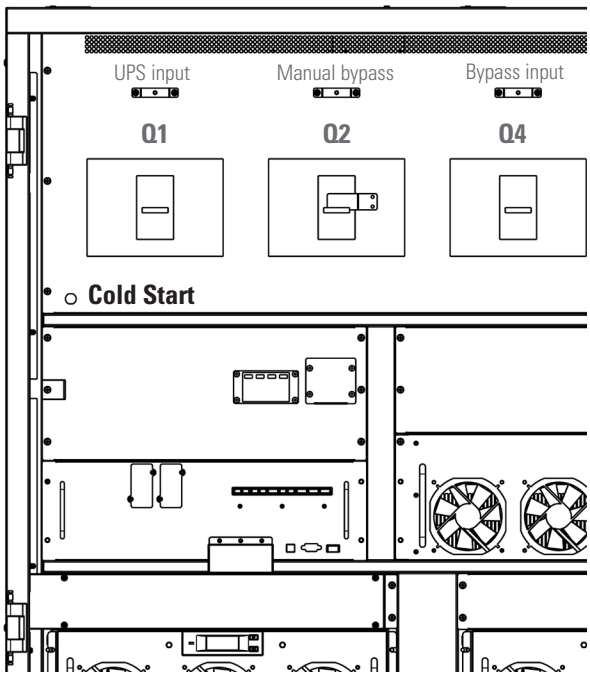


Fig. 61. Position of the Battery Cold Start button on 500 kVA devices.

3. The system then starts following the three steps in section 6.1.1 and transfers to battery mode in 30s.
   The LED indicators are shown in the following table:

Indicator	State	Indicator	State
Rectifier	Blinking red	**Inverter**	Green
Battery	Blinking green	**Load**	Green
Bypass	Blinking red	**State**	Red

Tab. 18. LED Start sequence.

4. Activate the load power supply output isolation. The system works in Battery mode.

6.2. SHUTTING DOWN THE UPS.

To shut down the UPS completely, first ensure that the load has been stopped correctly before opening the external battery disconnector, the main input disconnector (internal or external), the bypass input disconnector (internal or external, if any) one by one until the display turns off completely.

If the UPS is in bypass mode, also open the maintenance bypass disconnector.

6.3. PROCEDURE TO TRANSFER BETWEEN OPERATING MODES.

6.3.1. Transfer from Normal mode to Battery mode.

The UPS transfers to Battery mode immediately after the mains voltage fails or the voltage drops below the predefined limit.

6.3.2. Transfer from Normal mode to Bypass mode.

1. Enter the Operation menu, click on the 'transfer to bypass' icon and the system will transfer to Bypass mode.
2. Press the BYP button on the control panel for more than two seconds and the system will transfer to Bypass mode. This requires the activation of the switch located behind the front door, as shown in Fig. 62.

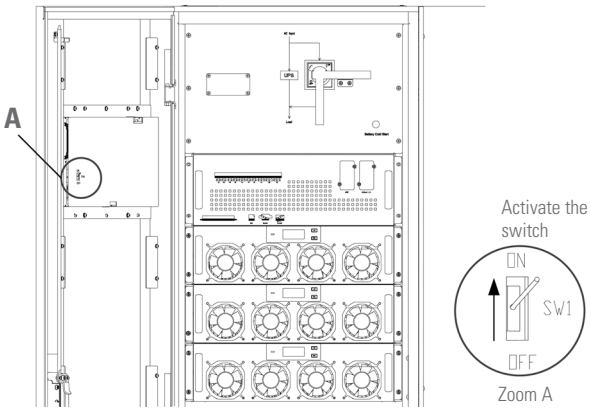


Fig. 62. Activation of manual transfer from Normal mode to Bypass mode.

Make sure that the bypass works normally before transferring to Bypass mode, otherwise it could cause a failure.

6.3.3. Transfer from Bypass mode to Normal mode.

There are two ways to transfer from Bypass mode to Normal mode:

a. Enter the Operation menu, click on the 'transfer to inverter' icon and the system will transfer to Bypass mode.
b. Press the INV button on the control panel for more than two seconds and the system will transfer to Normal mode.

Under normal conditions, the system will transfer to Normal mode automatically. This function is used when the frequency of the bypass is not synchronised or when you need to manually transfer to Normal mode.

6.3.4. Transfer from Normal mode to maintenance Bypass mode.

The following procedure is used to transfer the load from the inverter output of the UPS to maintenance bypass, usually used during repair or maintenance work.

1. Transfer to Bypass mode following the instructions in section 6.3.2.
2. The inverter and status LED indicators turn off, the alarm is activated and the inverter stops. The bypass supplies power to the loads.
3. Open the external battery disconnector and close the maintenance bypass disconnector. The load is powered through the maintenance bypass and static bypass.
4. **For 180 and 300 kVA devices:** The maintenance bypass supplies power to the loads.
5. **For 500 kVA devices:** The maintenance bypass supplies power to the loads.
   One by one, open the input disconnector (Q1), bypass input disconnector (Q4) and, finally, the output disconnector (Q3). The system will shut down.

Before performing this operation, read the messages that appear on the LCD. Make sure that the power of the bypass is correct and that the inverter is synchronised to avoid the risk of interrupting power to the load.

DANGER!
If it is necessary to carry out maintenance on the power unit, wait 10 minutes for the DC bus capacitor to completely discharge before removing the cover.

6.3.5. Transfer from maintenance Bypass mode to Normal mode.

The following procedure is used to transfer the load from maintenance bypass to the output of the inverter.

For 180 and 300 kVA devices

1. Power the UPS with the Bypass input voltage. The static bypass connects 30 seconds after the display illuminates and the green bypass LED activates. The load is then powered through the maintenance bypass and the static bypass.
2. Open the disconnector of the maintenance bypass so that the load can be powered through the static bypass. The rectifier and inverter start.
3. After 60 seconds, the system transfers to Normal mode.

For 500 kVA devices

1. Close the output disconnector (Q3), then close the input disconnector (Q1) and finally close the bypass input disconnector (Q4). The system will start up.
1. The static bypass connects 30 seconds after the display illuminates and the green bypass LED activates. The load is then powered through the maintenance bypass and the static bypass.
2. Close the external battery disconnector.
3. Open the disconnector of the maintenance bypass so that the load can be powered through the static bypass.
4. After 30 seconds, the rectifier starts, the rectifier LED is green and the inverter starts.
5. After 60 seconds, the system transfers to Normal mode.

6.4. BATTERY MAINTENANCE.

If the batteries have not been used for a long period of time, it is necessary to verify their condition. There are two methods to carry out this verification:

1. **Manual discharge**. Enter the Operation menu, as shown in Fig. 63, by clicking on the 'Battery Maintenance' icon  the system transfers to battery mode to start the discharge, stopping when the batteries reach 20% of capacity or there is an undervoltage. The user can stop the discharge by clicking on the 'Stop Test' icon  .

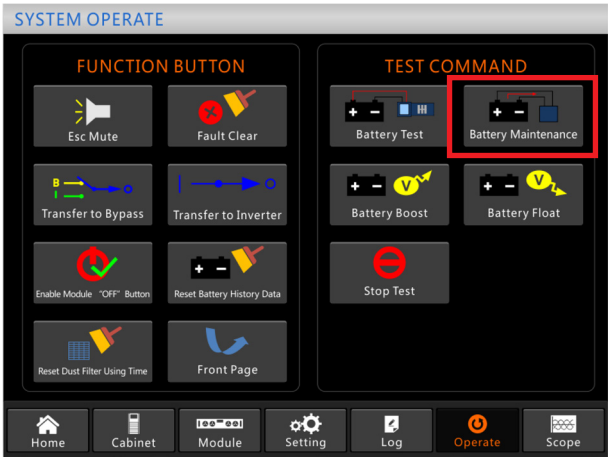


Fig. 63. Battery maintenance.

2. **Automatic discharge**. The system performs an automatic battery test once the settings are completed. The settings procedure is as follows:
   a. Enable automatic battery discharge through the 'Configure' option in the settings menu. Select 'Automatic battery discharge' and confirm (factory configuration).
   b. Period setting for automatic battery discharge. Select the 'Battery' option in the settings menu (see Fig. 64). Set the time period to 'Auto Maintenance Discharge Period' and confirm.

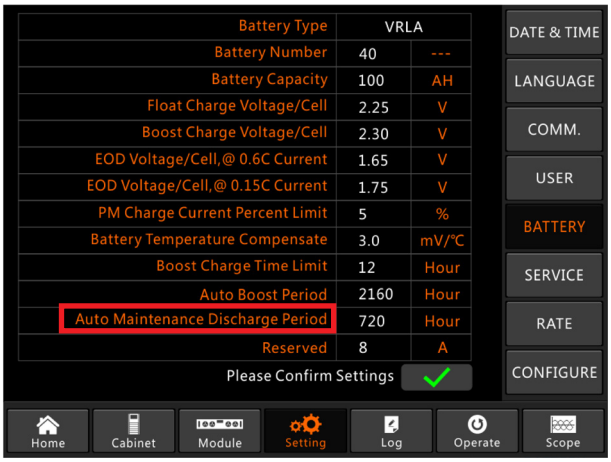


Fig. 64. Automatic battery discharge period setting.

The charge required for automatic maintenance discharge must be between 20 and 100%. Otherwise, the system will not start the process automatically.

6.5. EPO.

The EPO button is located on the control panel and has the function of turning off the UPS in emergency conditions (e.g., fire, flood, etc.). The EPO button has a protection to prevent accidental activation, see Fig. 65.
When the button is pressed, the system will turn off the rectifier and inverter, stop powering the load immediately (including the inverter and bypass) and the battery will stop charging or discharging.
If there is an input mains, the UPS's control circuit will continue to be activated but the output will turn off. To completely isolate the UPS, disconnect the mains power input. To restart the UPS, reconnect it.

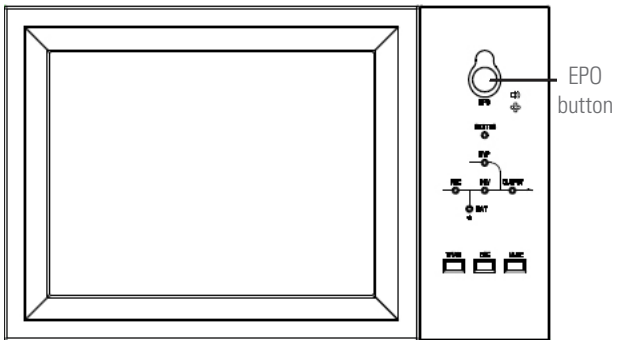


*Fig. 65. **EPO button.***

When the EPO is tripped, the load stops being powered by the UPS. Pay attention when using the EPO function.

6.6. INSTALLATION OF THE PARALLEL SYSTEM.

The UPS system allows up to three cabinets to be connected in parallel. Fig. 66 shows the connections in the case of a maximum of three UPSs in parallel.

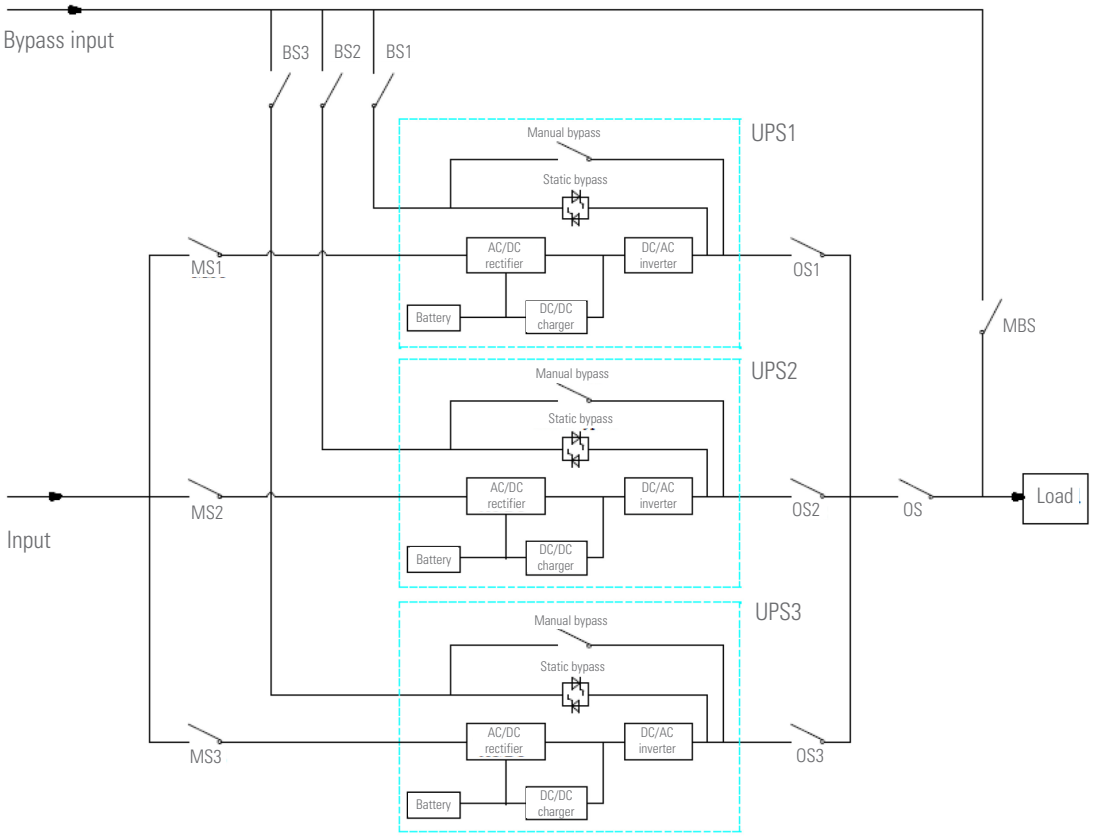


*Fig. 66. **Connection diagram of three UPSs in parallel, with independent Bypass line.***

For 6-slot cabinets, configuration with independent Bypass line is optional.

Disconnector protections: MS1, MS2 and MS3 are the main input switches for each UPS; BS1, BS2 and BS3 are the Bypass input protections; OS1, OS2 and OS3 are the output protections; OS is the protection for the main output of the system; and MBS is the protection for the manual maintenance Bypass. For better understanding, it is assumed that the UPS has only one bypass switch and the switches mentioned are external.

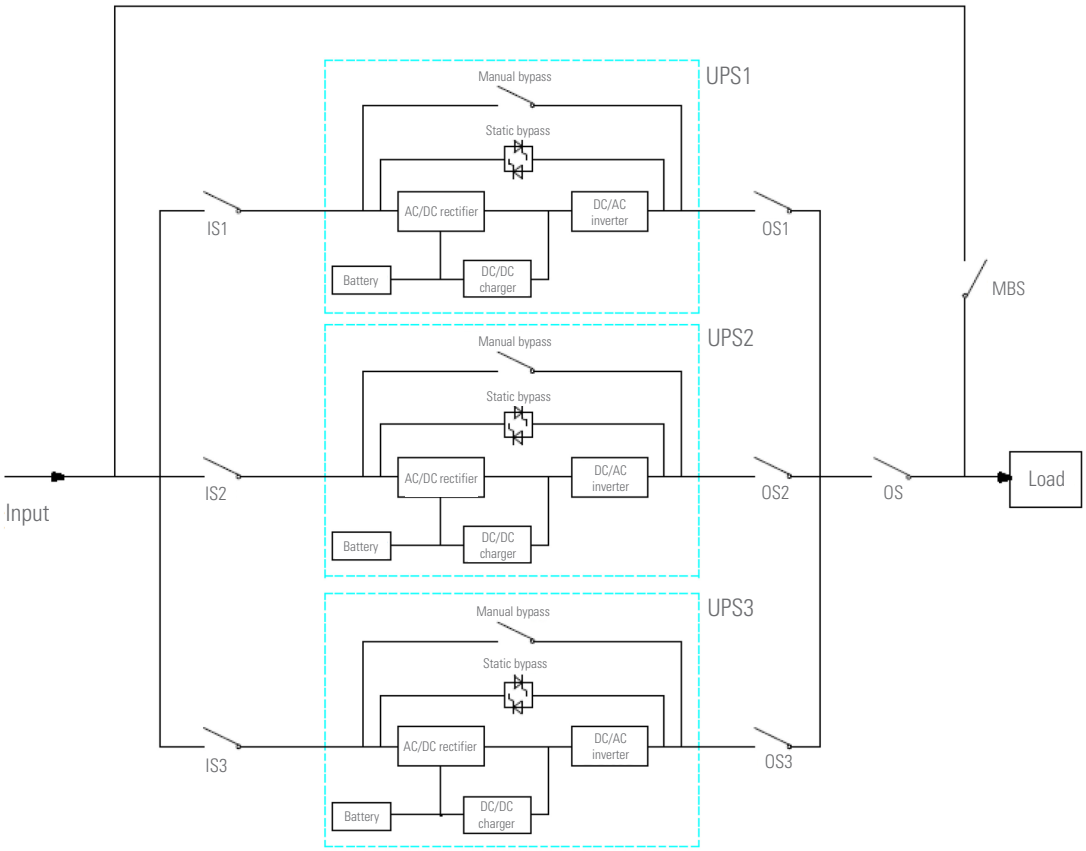


Fig. 67. Connection diagram of three UPSs in parallel, with common input.

Disconnector protections: IS1, IS2 and IS3 are the main input switches for each UPS; OS1, OS2 and OS3 are the output protections; OS is the main protection for the output of the system; and MBS is the protection for the manual maintenance Bypass. For better understanding, it is assumed that the UPS has only one bypass switch and the switches mentioned are external.

6.6.1. Location of parallel cards.

The parallel interfaces of the 180 and 300 kVA devices are located at the rear of the cabinet, as shown in Fig. 68.

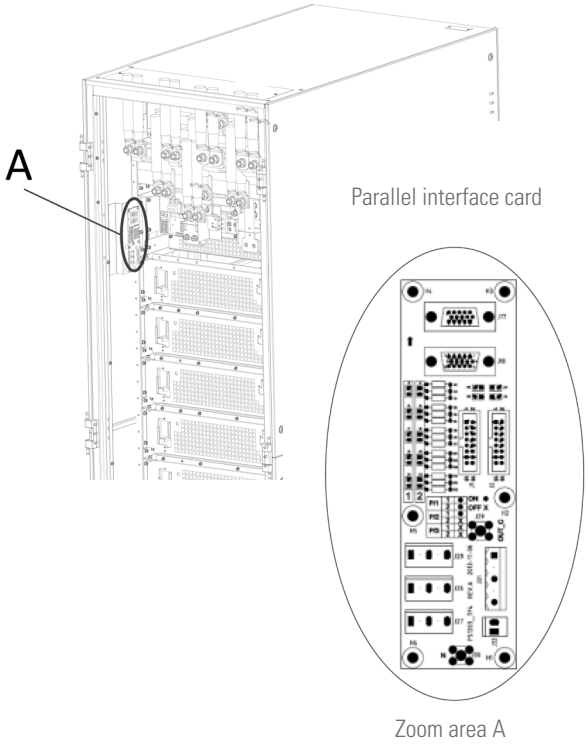


Fig. 68. Location of the parallel card in 180 and 300 kVA devices.

In 500 kVA devices, they are inside the cabinet at the front, as shown in Fig. 69.

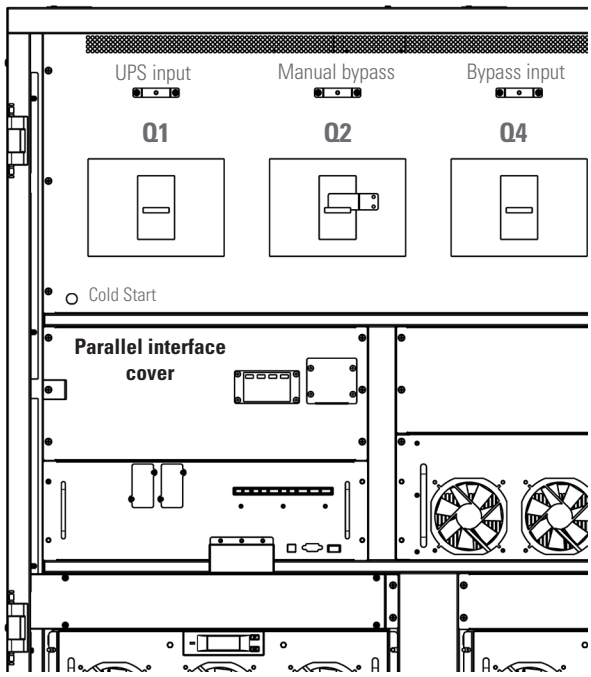


Fig. 69. Location of the parallel card in 500 kVA devices.

6.6.2. Jumper settings for parallel operation.

The settings of the jumpers of the parallel cards will be different depending on whether it is a 2 UPS or 3 UPS system.

6.6.2.1. Case of 2 UPSs in parallel.

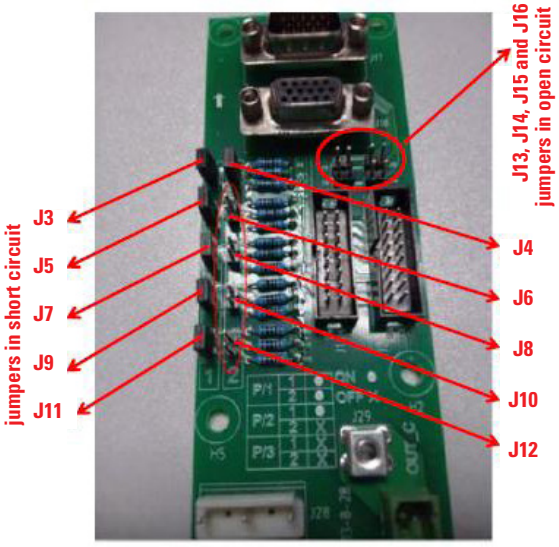


Fig. 70. Jumper setting for the case of two UPSs in parallel.

Jumpers J3, J5, J7, J9, J11 and J4 in short circuit. Jumpers J6, J8, J10, J12, J13, J14, J15 and J16 in open circuit.

6.6.2.2. Case of 3 UPSs in parallel.

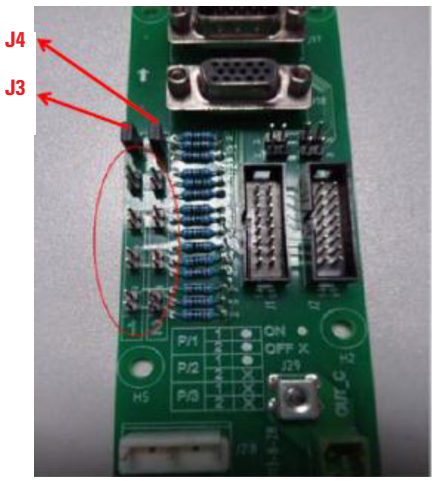


Fig. 71. Jumper setting for the case of three UPSs in parallel.

Only jumpers J3 and J4 are in short circuit. The rest are in open circuit.

6.6.3. Setting the parameters on the display screen.

The setting on the display will be the following, Fig. 72:

1. Choose the operating mode: Parallel
2. Enter the number of the UPS in parallel: 2 or 3.
3. Enter the identification of each cabinet: for 2 UPSs, the first will be 0 and the second 1; for 3 UPSs, the first will be 0, the second 1 and the third 2.

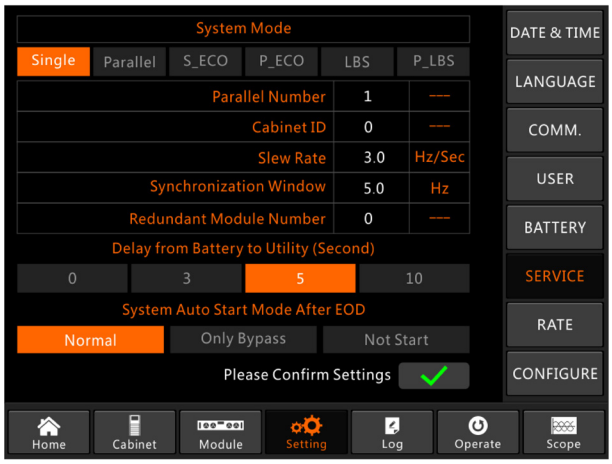


Fig. 72. Settings screen for the parallel system.

4. Keep the rest of the parameters of each UPS if there is no special requirement (keep the default settings), as shown in Fig. 73.

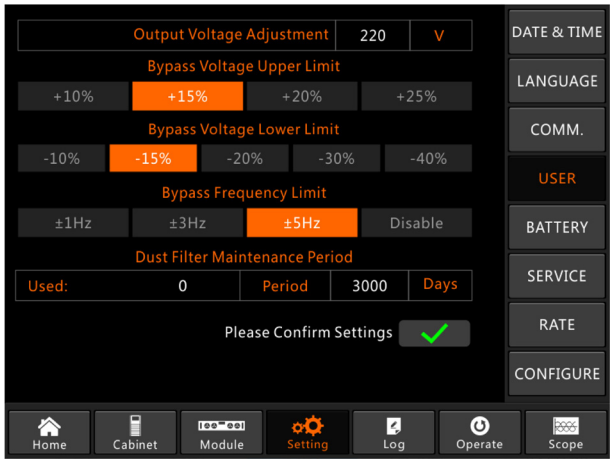


Fig. 73. User settings screen.

5. Check the label of each UPS to ensure that the model, voltage and frequency are the same.

⚠ UPSs in 6-slot cabinets can only be paralleled with 6-slot cabinets, never with 10-slot cabinets; the same must apply with 10-slot cabinets.

6. Once the above settings have been made, turn off the UPS and restart it for the changes to take effect:
   a. If there are 2 UPSs in parallel: the first should appear as (P-0/2) and the second as (P-1/2).
   b. If there are 3 UPSs in parallel: the first should appear as (P-0/3), the second (P-1/3) and the third (P-2/3), as shown in Fig. 74.

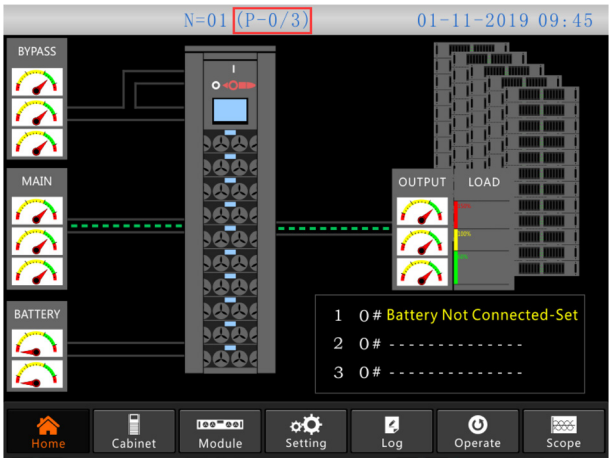


Fig. 74. Start screen of the parallel system.

6.6.4. Connection of parallel cables.

The control cables for parallel operation must connect all devices in a ring, as shown in Fig. 75.

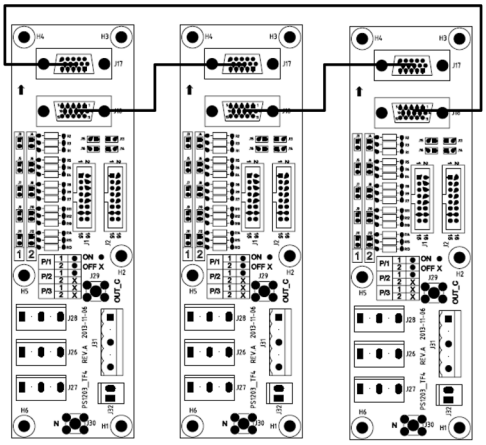


Fig. 75. Ring-parallel connection of 3 devices.

6.6.5. Verification of the parallel system.

Once all of the connections have been made, it is necessary to verify that the system is working properly.
To do so, taking as an example the system with three cabinets connected in parallel shown in Fig. 66, follow these steps:

1. First close the OS1 protection and then BS1 and MS1: the first UPS will start automatically. After about 2 minutes, the first UPS will have completed the startup and closed the battery protection of the first UPS. At this point, no alarm should appear on the display; verify that the same information shown on the nameplate of the devices characteristics is shown on the screen. If startup fails, contact an engineer or your distributor.
2. Open the battery protection of the first UPS, then also open BS1 and MS1, and finally open OS1: the first UPS should shut down completely.
3. Operate the second and third UPS as with the first mentioned above.
4. After the previous switching and with the confirmation that there is no anomaly, close OS1, OS2 and OS3 first, one by one, then close BS1, BS2 and BS3, one by one, and

finally close MS1, MS2 and MS3, also one by one. After 2 minutes, all three UPSs should start at the same time. Finally, close the battery protections of each UPS. No alarm should appear in the display.

5. Activate function  in the first UPS as can be seen below: all three UPSs should transfer to Bypass mode at the same time. Then, activate function  and the three UPSs should retransfer to Inverter mode. If everything is correct, repeat the same switching in the second and third UPS.

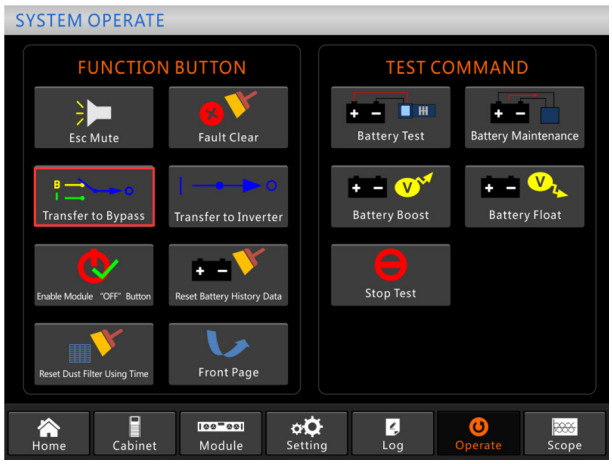


Fig. 76. Transfer to Bypass screen.

6. Close the main switch of output OS. The system is ready, the loads can be started one by one.

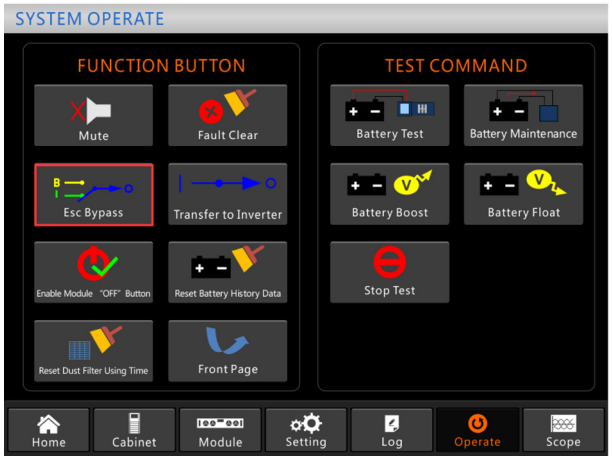


Fig. 77. Retransfer to Inverter screen.

6.6.6. Parallel system switching.

1. **Shutdown of one or more UPSs in the system**
   With the UPSs working in parallel, to turn off one or all of them, taking again the example of the 3 UPSs connected and working in parallel in Fig. 66, the switching to be performed will be:
   a. First open the battery switch of the first UPS, then open BS1, MS1 and finally OS1, in this order, and the first UPS will shut down.
   b. To restart it, work in the opposite direction: close OS1, BS1, MS1 and finally the battery switch.
   c. To stop the second and third UPS, switch in the same way, always checking that the remaining capacity of the system can support the connected loads.

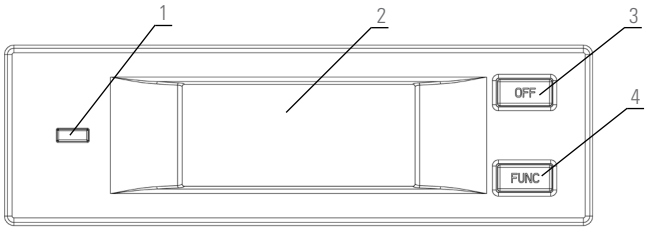
2. **Transfer from the parallel system of Normal mode to Bypass mode**
   Taking again the example of the 3 UPSs connected in parallel with dual input in Fig. 66, operate as follows:
   a. Activate 'Transfer to Bypass' on the display of any UPS and all of them will transfer to Bypass mode at the same time.
   b. Remove the metal protection of the manual Bypass switch of the UPS and switch to Bypass.
   c. Activate the maintenance Bypass switch of the MBS parallel system.
   d. Open, one by one, all of the battery switches.
   e. Open MS1, MS2 and MS3.
   f. Open BS1, BS2 and BS3.
   g. Open OS1, OS2, OS3 and OS. All UPSs will stop. The load will now be powered by the maintenance Bypass.

3. **Retransfer of the parallel system from Bypass mode to Normal mode**
   Following the same example as in Fig. 66, operate as follows:
   a. Close OS, OS1, OS2 and OS3 one by one.
   b. Turn the rotary switch of each UPS to Bypass.
   c. Close BS1, BS3 and BS3 one by one and verify approximately 20 seconds later that the static Bypass of each UPS is activated.
   d. Open the MSB Bypass general switch.
   e. Close MS1, MS2 and MS3. Approximately 30 seconds later, the rectifiers of all modules should be activated.
   f. Close all battery switches, one by one.
   g. Turn the Bypass rotary switches to UPS. After about 90 seconds, all of the UPSs should transfer to normal mode at the same time.

7. CONTROL PANEL OF THE MODULES AND THE UPS.

7.1. CONTROL PANEL OF THE MODULES.

The structure of the LCDs of each module is shown in the following Fig. 78:



1: Status LED.
2: LCD.
3: OFF button.
4. Function button.

Fig. 78. ***Control panel of the power modules.***

The control panel is divided into three functional areas: Status LED, control and operation buttons and LCD.

7.1.1. Status LED.

This LED can be illuminated green or red to indicate the different statuses and failures combining the two colours and their permanence. These combinations can be seen in Tab. 19.

No.	LED combinations	Description
1	Green short blink 1 (ON 1 sec, OFF 2 sec)	Rectifier soft start
2	Green short blink 2 (ON 2 sec, OFF 1 sec)	Inverter soft start
3	Green medium blink (ON 1 sec, OFF 5 sec)	Power module inverter in standby
4	Green long blink (ON 2 sec, OFF 10 sec)	Power module asleep (shutdown)
5	Green permanently on	UPS running
6	Red and green alternating (red 1 s, green 5 s)	Charge powered with warnings (without battery, battery in discharge, overload, etc.)
7	Red permanently on	Power module shutdown due to failure
8	Red medium blink (ON 2 sec, OFF 5 sec)	Manual or software shutdown
9	Red short blink (ON 1 sec, OFF 1 sec)	Situation none of the above

Tab. 19. ***Status and failure combinations.***

7.1.2. Operation and control buttons.

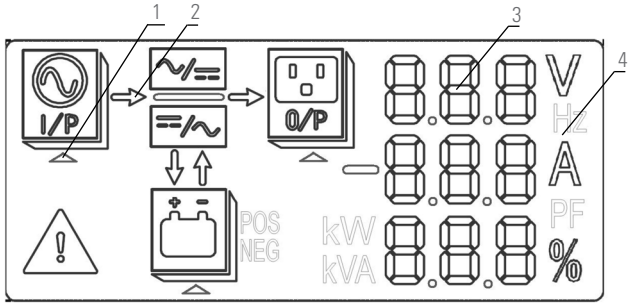
The operation and control buttons include FUNC buttons and behaviour OFF buttons:

a. The FUNC button is used to turn the pages of the display.
b. The OFF button is mainly used to turn off the module, such as in the following procedures:
  1. Enabled: LCD panel → Operate menu 

→ Enable module OFF button 
  2. Press the OFF button for 3 seconds, the power module will be excluded from the system.
c. Pressing the FUNC buttons resets the LCD.

7.1.3. LCD.

Displays module information. Its structure is shown below.



1: Selection triangle.
2: Energy flow arrow.
3: Digits.
4. Units.

Fig. 79. ***Functional parts of the LCD.***

The user can display the information of each module by pressing the FUNC button to turn the pages.

- Selecting 

The input information is shown in the Digits area: voltages and currents of the 3 phases.

- Selecting 

The output information is shown in the Digits area: voltages, currents and load percentages of the 3 phases.

- Selecting 
POS
The battery information is shown in the Digits area: battery charge/discharge positive voltage and positive current and positive bus voltage.

- Selecting 
NEG
The battery information is shown in the Digits area: battery charge/discharge negative voltage and negative current and negative bus voltage.

-  illuminated:
Failure and warning codes are displayed in the digits area. The meaning of the codes is shown in Tab. 20.

-  blinking:
  Indicates that a failure has occurred.

- The energy flow arrow of 
  a. Blinking: rectifier soft start.
  b. Illuminated: rectifier in normal operation.
  c. OFF: another situation.

- The energy flow arrow of 
  a. Blinking: Inverter starting.
  b. Illuminated: load in inverter.
  c. OFF: another situation.

- The energy flow arrow of 
  a. Blinking: low battery voltage.
  b. Illuminated: load in normal process.
  c. OFF: battery not connected.

- The energy flow arrow of 
  a. Illuminated: in discharge mode.
  b. Off: battery not connected or charging.

Unit: voltage (V), current (A), percentage (%)

When the settings on a power module have been completed, the remainder are updated in 2 seconds.

Code	Description	Code	Description
16	Input voltage abnormal	**67**	Batt. polarity inverted
18	Bypass sequence failure	**69**	Inverter protected
20	Bypass voltage abnormal	**71**	Neutral disconnected
28	Bypass frequency out of sync	**74**	Module turned off manually
30	Transfer times (from inverter to Bypass) exceed the limit by 1 hour	**81**	Charger or battery failure
32	Output in short	**83**	Loss of N+X redundancy
34	Battery EOD	**85**	EOD inhibited
38	Battery test failed	**93**	IO CAN failure in inverter
41	Batt. maintenance failure	**95**	CAN data failure
47	Rectifier failure	**97**	Power distribution failure
49	Inverter failure	**109**	Inverter jumper open
51	Overtemp. in rectifier	**111**	Temp. difference outside limits
53	Fan failure	**113**	Input current unbalanced
55	Overload	**115**	Overvoltage in DC bus
57	Overload time exceeded	**117**	Rectifier soft start failure
59	Overtemp. in inverter	**119**	Relay open
61	Inverter inhibited	**121**	Relay closed
65	Battery low	**127**	Manual transfer to inverter

Tab. 20. ***Failure and warning codes.***

7.2. UPS CONTROL PANEL.

The following figure shows the control panel:

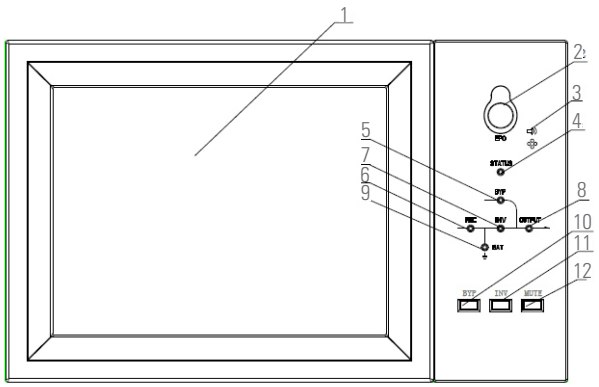


Fig. 80. ***Control panel.***

1: LCD touch screen
2: EPO switch
3: Audible alarm
4: Status indicator
5: Bypass indicator
6: Rectifier indicator
7: Inverter indicator
8: Load indicator
9: Battery indicator
10: Transfer to bypass
11: Transfer to inverter
12: Mute

The LCD of the cabinet is divided into three parts: LED indicators, control and operation buttons and LCD touch screen.

7.2.1. LED indicators.

The panel has 6 LEDs that indicate operating and failure status. The following table shows the description of each of them.

Indicator	State	Description
Rectifier indicator	Fixed green	Rectifier normal for all modules
	Blinking green	Rectifier normal for one or more modules, mains normal
	Fixed red	Rectifier failure
	Blinking red	Mains abnormal for one or more modules
	Off	Rectifier not operational
Battery indicator	Fixed green	Battery charge
	Blinking green	Battery discharge
	Fixed red	Battery abnormal (battery failure, no battery or battery inverted) or abnormal battery converter (failure, overcurrent, excess temperature), EOD
	Blinking red	Low battery voltage
	Off	Battery and battery converter normal, battery not charging
Bypass indicator	Fixed green	Load supplied by bypass
	Fixed red	Bypass abnormal or out of range, or static bypass switch failure
	Blinking red	Bypass voltage abnormal
	Off	Bypass normal

Inverter indicator	Fixed green	Load supplied by inverter
	Blinking green	Inverter on, start, synchronisation or standby (ECO mode) for one or more modules
	Fixed red	System output not supplied by the inverter, inverter failure for one or more modules
	Blinking red	System output supplied by the inverter, inverter failure for one or more modules
	Off	Inverter not operational for all modules
Load indicator	Fixed green	UPS output on and normal
	Fixed red	UPS overload time exceeded, short circuit in output or output without power supply
	Blinking red	UPS output with overload
	Off	No UPS output
Status indicator	Fixed green	Normal operation
	Fixed red	Failure

Tab. 21. ***Description of indicator status.***

There are two types of audible alarm during UPS operation.

Alarm	Description
Two short alarms and one long	General system alarm (for example: AC failure)
Continuous alarm	Serious system failure (for example: blown fuse or hardware failure)

Tab. 22. ***Description of the audible alarms.***

7.2.2. Control and operation buttons.

There are four control and operation buttons (2, 10, 11 and 12 in Fig. 80) and they are used next to the LCD touch screen. The following table describes the functions of each of them.

Button	Description
EPO	Long press, cuts load power (disconnects the rectifier, inverter, static bypass and battery)
BYP	Long press, transfer to bypass (press the 'up' button on the back of the door to activate it)
INV	Long press, transfer to inverter
MUTE	Long press to activate or deactivate the audible alarm

Tab. 23. ***Functions of the control and operation buttons.***

⚠ When the frequency of the Bypass is out of sync, it will take a short time (less than 10 ms) to transfer from Bypass to Inverter.

7.2.3. LCD touch screen.

Users can search for information, control the UPS and adjust the parameters using the LCD touch screen in a simple way. After the control system starts the auto-test, the system enters the start page and then the welcome window.

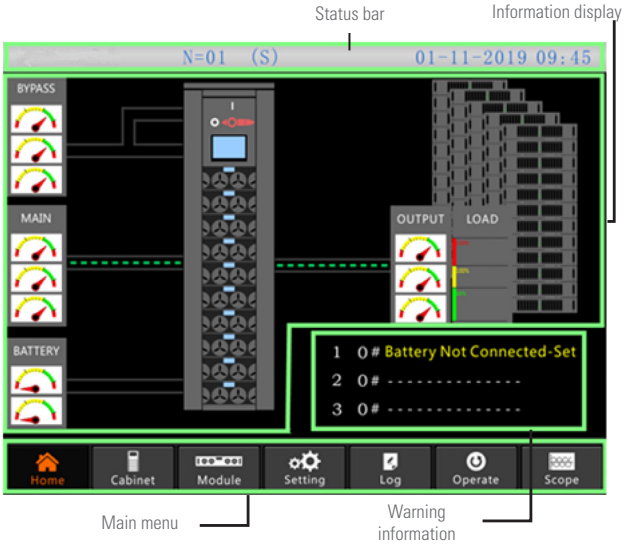


Fig. 81. ***Start page.***

The start page consists of four parts: status bar, information display, warning information and main menu.

- Status bar
  The status bar contains information about the product model, its capacity, operating mode, number of power modules and system time.
- Information display
  Users can check the cabinet information in this area.
  Bypass, mains input, battery and output voltages are displayed in the form of analogue meters.
  Loads are shown as a bar chart with percentages. The green area represents a load less than 60%; the yellow one, a load of 60-100%; and the red one, a load greater than 100%.
  The energy flow mimics the power flow.
- Warning information
  Display of the cabinet's warning information.
- Main menu
  The main menu includes: Cabinet, Module, Settings, Log, Operation and Charts. Users can control and operate the UPS to search for all parameters measured through the main menu.

The structure of the main menu is shown in the following diagram:

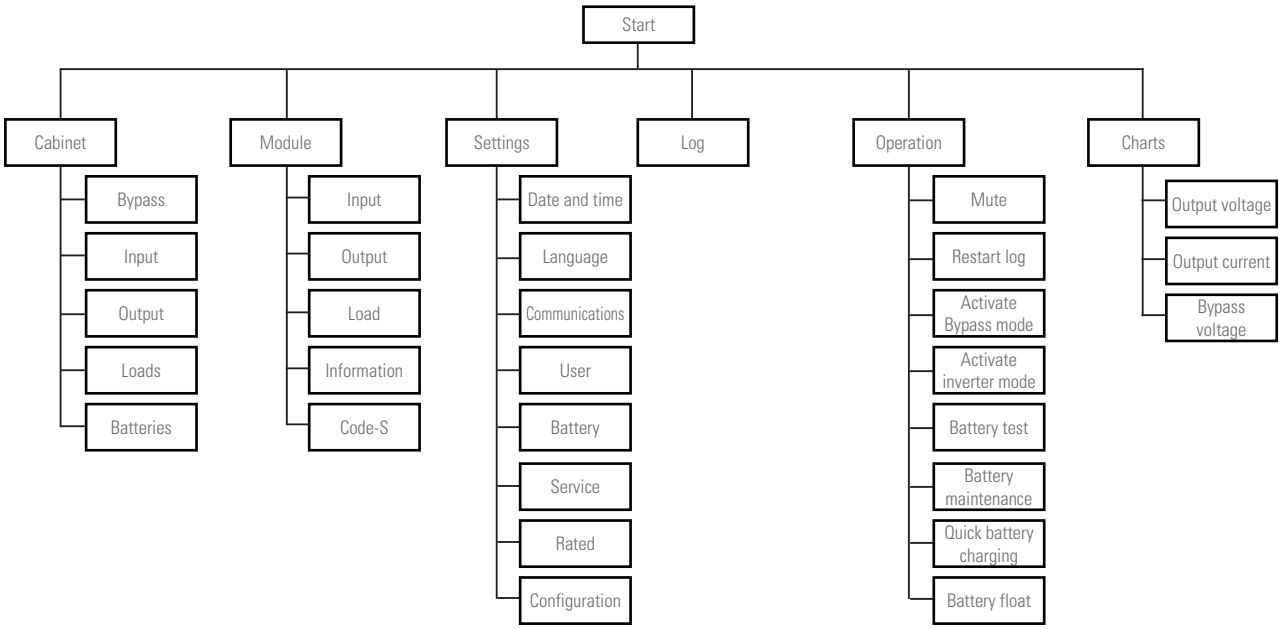


Fig. 82. Menu tree structure.

7.3. MAIN MENU.

The main menu includes Cabinet, Module, Settings, Log, Operation and Graphics, as described below:

7.3.1. Cabinet.

Press icon 

in the lower left corner of the screen to access the Cabinet screen.

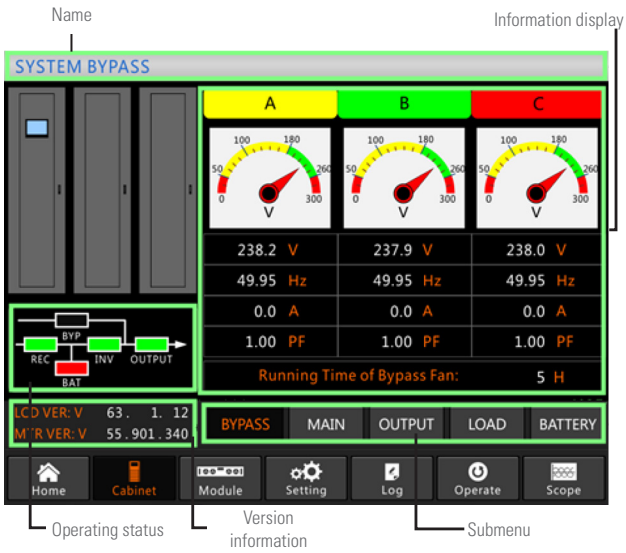
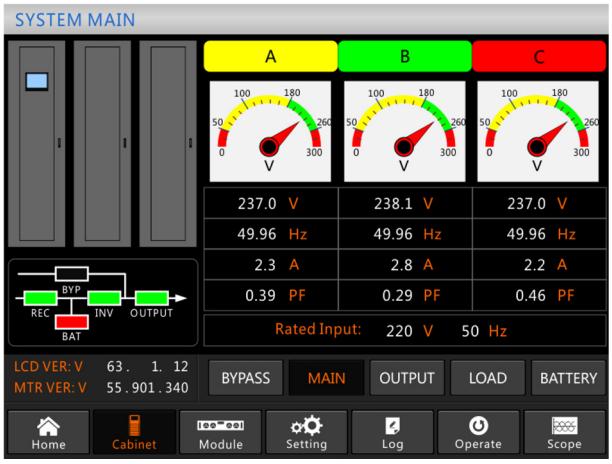


Fig. 83. Cabinet screen.

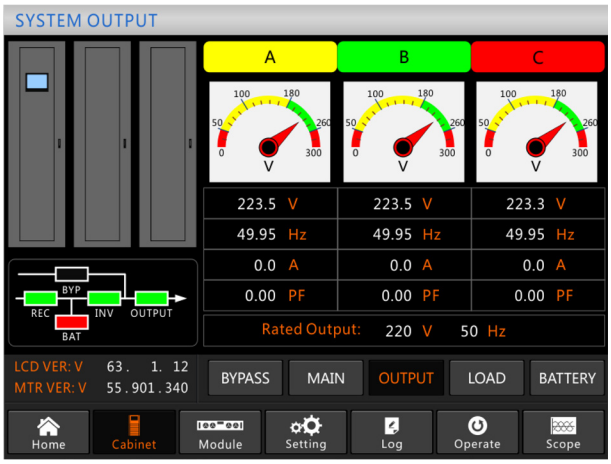
This menu includes the following parts: title, operating status, version information, submenu and information display.

- **Title**
  Displays information about the selected submenu.
- **Operating status**
  The boxes shown in the block diagram represent the different elements and show the current operating status of the UPS.
  a) Green indicates that the block is working normally
  b) White indicates the absence of the block
  c) Red indicates the absence or failure of the block
- **Version information**
  Displays version information for the LCD of the cabinet and monitor.
- **Submenu**
  Includes the submenu with options Input, Bypass, Output, Loads and Batteries.
- **Information display**
  Displays information about the submenus. The interface of each submenu is shown in Fig. 83 (Bypass option) and Fig. 73 (other options).

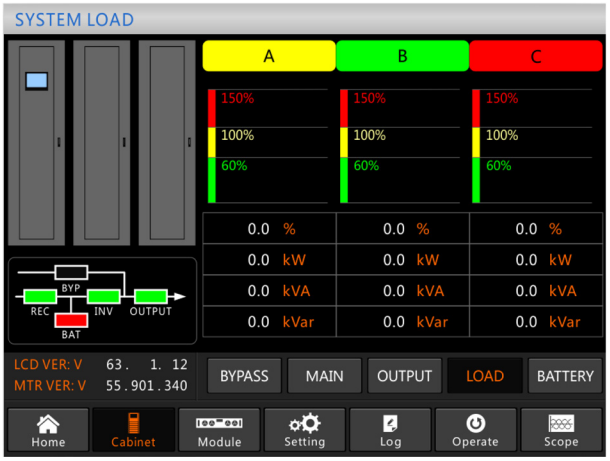
a. Interface of Input option



b. Interface of Output option



c. Interface of Loads option



d. Interface of Batteries option

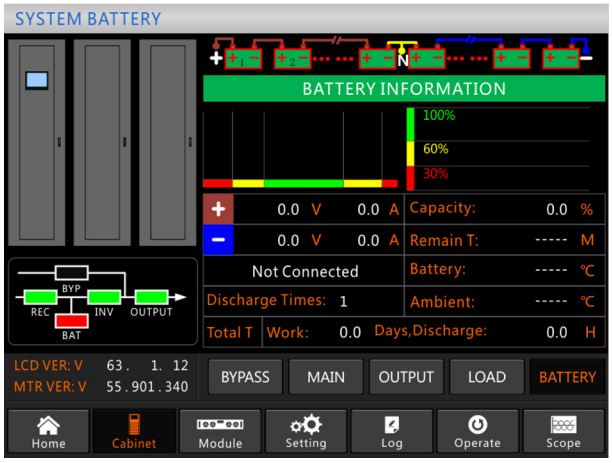


Fig. 84. Interfaces of Cabinet submenu.

Details of the Cabinet submenu:

Submenu name	Content	Meaning
Input	V	Phase voltage
	A	Phase current
	Hz	Input frequency
	PF	Power factor
Bypass	V	Phase voltage
	A	Phase current
	Hz	Bypass frequency
	PF	Power factor
Output	V	Phase voltage
	A	Phase current
	Hz	Output frequency
	PF	Power factor
Loads	kVA	Sout: Apparent power
	kW	Pout: Active power
	kVar	Qout: reactive power
	%	Load (percentage of UPS load)
Batteries	V	Battery positive/negative voltage
	A	Battery positive/negative current
	Capacity (%)	Percentage, compared to the capacity of a new battery
	T remaining (min)	Remaining battery backup time
	Battery (°C)	Battery temperature
	Ambient (°C)	Ambient temperture
	T of total work	Time of total work
	T of total discharge	Time of total discharge

Tab. 24. Description of the cabinet submenu.

7.3.2. Power module.

Press icon 

in the lower left corner of the screen to access the Module.

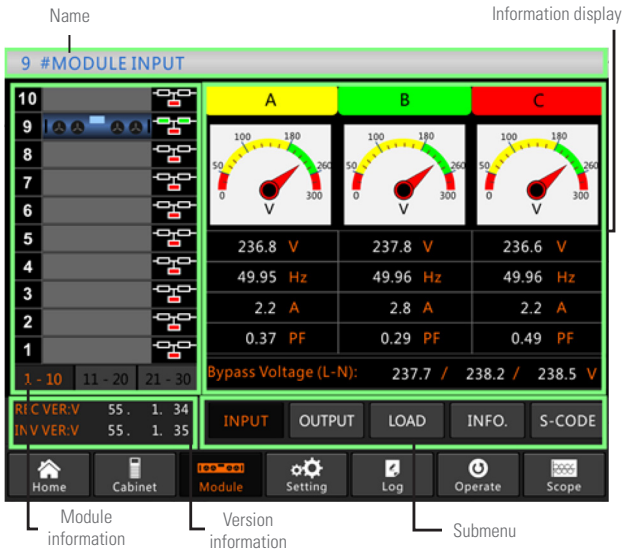
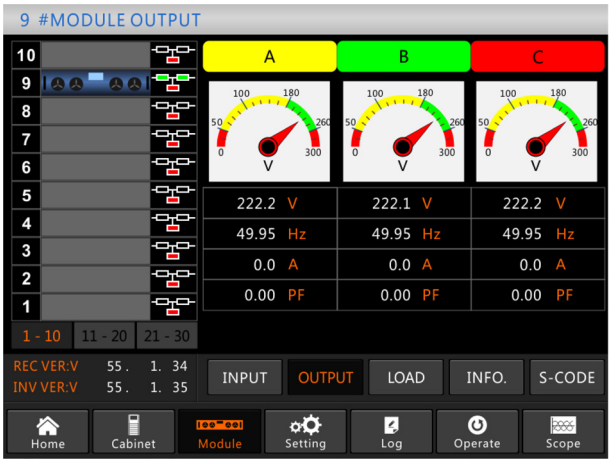


Fig. 85. Interface of the Module submenu.

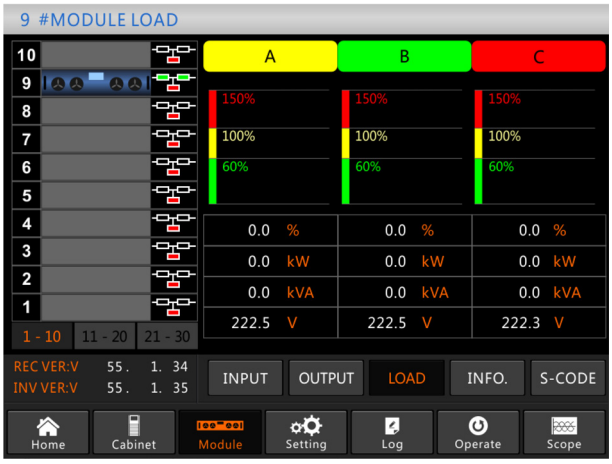
This option includes the following parts: title, information display, module information, version information and submenu.

- **Title**
  Presents the title of the submenu of the selected power unit.
- **Information display**
  Displays information about the submenus.
- **Module information**
  Users can search for module information in the 'Information display' section.
  The boxes shown in the block diagram represent the different elements and show the current operating status.
  a. Green indicates that the module is working normally
  b. Black indicates that the module is invalid
  c. Red indicates the absence or failure of the module
  For example, Fig. 85 shows information about module No. 9  . In it, one can see that the UPS is in Normal mode and that the rectifier (green rectangle) and inverter (green rectangle) are working normally. The batteries are not connected (red rectangle).
- **Version information**
  Displays version information about the rectifier and inverter of the module selected.
- **Submenu**
  The submenu includes: Input, Output, Loads, Information and S-Code.
  Users can enter the interface of each submenu by clicking directly on the icon, as shown in Fig. 85 (Input) and Fig. 75 (other options).

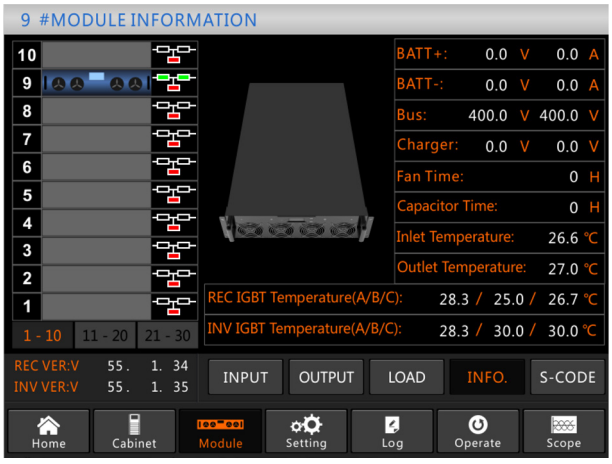
a. Interface of Output option



b. Interface of Loads option



c. Interface of Information option



d. Interface of S-Code option

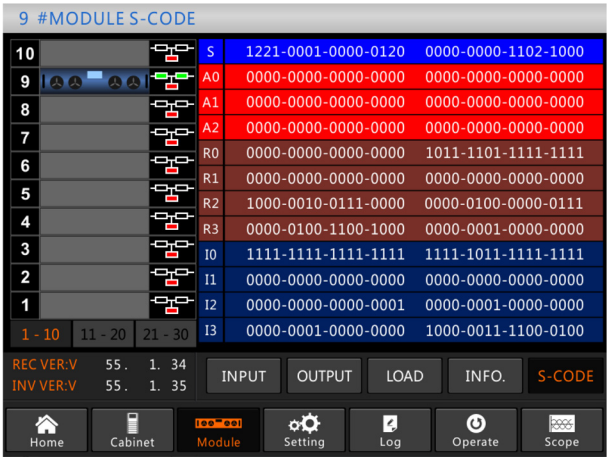


Fig. 86. Interfaces of Module submenu.

Details of power module submenu:

Submenu name	Content	Meaning
Input	V	Input phase voltage of selected module
	A	Input phase current of selected module
	Hz	Input frequency of selected module
	PF	Input power factor of selected module
Output	V	Output phase voltage of selected module
	A	Output phase current of selected module
	Hz	Output frequency of selected module
	PF	Output power factor of selected module
Loads	V	Load voltage of selected module
	%	Load (percentage of power module selected)
	kW	Pout: Active power
	kVA	Sout: Apparent power
Information	BATT+(V)	Battery voltage (positive)
	BATT-(V)	Battery voltage (negative)
	BUS(V)	Bus voltage (positive and negative)
	Charger(V)	Charger voltage (positive and negative)
	Fan time	Fan operating time of power module selected
	Inlet temperature (°C)	Inlet temperature of power module selected
	Outlet temperature (°C)	Outlet temperature of power module selected
Code-S	Failure code	For maintenance personnel

Tab. 25. Description of each Module submenu.

7.3.3. Settings.

Press icon 

at the bottom of the screen to access the Settings menu.

Submenus appear on the right side of the screen. Users can enter each Settings interface by pressing on the corresponding icon.

7.3.3.1. Date & Time setting.

The user can select the date format and set the date and time. The interface is shown below:

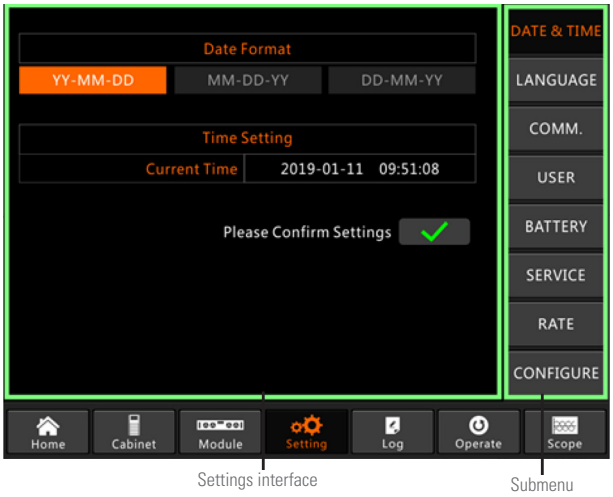


Fig. 87. Settings submenu: Date & Time.

7.3.3.2. Language setting.

The user can select the language. The interface is shown below:

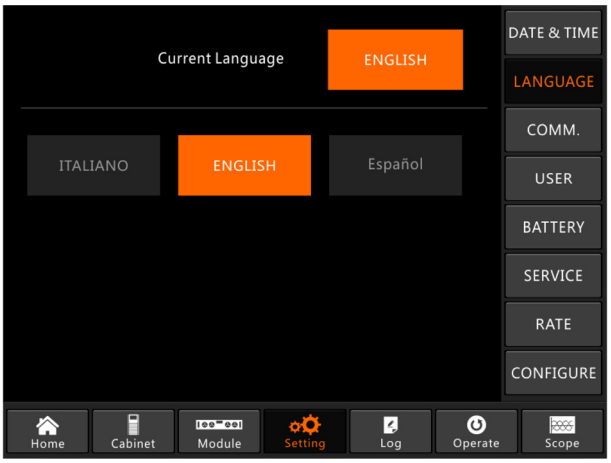


Fig. 88. Settings submenu: Language.

7.3.3.3. Communications protocol setting.

The UPS supplies communication ports RS-232 and RS-485, as well as an optional user configurable SNMP card.

If the RS-232 port is used, the MODBUS protocol must be selected. If the RS-485 port or SNMP card is used, the 'SNT' option must be selected.
This settings screen is shown in the following Fig. 89:

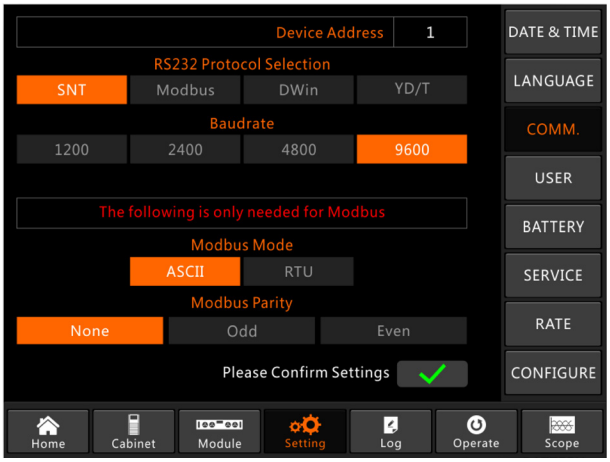


Fig. 89. Settings submenu: Communications.

7.3.3.4. User settings.

Users can adjust the output voltage to above or below the stipulated voltage range. The full scale is 1 V. It is also possible to adjust the voltage and frequency range of the Bypass. This screen is shown in the following Fig. 90:

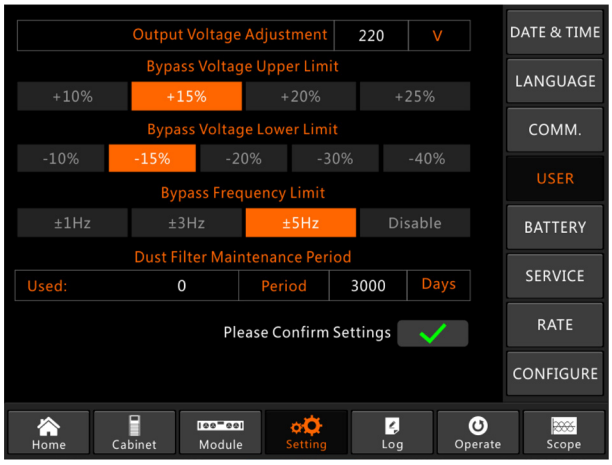


Fig. 90. Settings submenu: Interface of the user.

7.3.3.5. Battery settings.

The battery settings must be done after the first shutdown or when a change has been made to them. This can be configured through the LCD control panel, Fig. 81 and Fig. 82, or through the control software, Fig. 83.

- **Battery type setting:** this setting can only be done using the monitoring software. The system currently supports lead acid and lithium batteries (LFPB).
- **Battery number setting:**
  - For lead-acid batteries: The rated voltage of an element is 12 V - consists of 6 cells of 2 V each. For setting, if the number of batteries is 40, this means that there are 40 elements: ± 20 for both + and - signs.
    In the case of 2V cells (usually for large capacities), the number of batteries should match the number of elements, since the number of cells will be 240 (6 * 40) or ± 120 for both + and - signs.
    The setting range for the number of batteries is between 36 and 44 (even number).
  - For lithium batteries: The voltage of each cell of this type of battery is 3.2 V. Therefore, if 40 lead-acid battery elements are used, in the case of lithium batteries, the number will be 150 (12/3.2 = 3.75 x 40 = 150) or, in other words, ± 75 elements for both + and - signs.
    The setting range for the number of batteries is between 140 and 180 elements. The end of backup voltage will be 360V and the highest voltage 620 V.
- **Battery capacity setting:**
  The user can adjust the capacity value of a battery element. For example, if the system is configured with 40 elements of 12 V/100 Ah, the battery capacity should be 100Ah, and if with 240 elements of 2 V/1000 Ah, it should be 1000 Ah.
  In the case of specifying more than one branch of batteries in parallel, the value of the overall capacity should be that of one branch by the number of branches. For example, if we configure 2 branches of 40 elements of 12V/100 Ah, the resulting capacity would be 200 Ah. The system limits the charging current according to the battery capacity. For lead-acid batteries, the charging current is 0.2C, and for lithium batteries it will be 0.3C. For example, for a 20-slot UPS configured with 40 elements of 12 V/500 Ah, the UPS will be able to supply a maximum charging current of 192 A but, due to the charging current limit (0.2C), it will not exceed 100 A (0.2*500).
- **Float and quick charging voltage setting:**
  For quick charging, the system charges the battery at constant current. Once complete, the system will go into float charging.
  For lead-acid batteries, the default float voltage is 2.25 V/element and the quick charging voltage is 2.35 V/element.
  For lithium batteries, the float and quick charging voltage is 3.45V/element.
- **End of backup voltage setting (EOD voltage):**
  An EOD voltage of 0.6C is given when the discharge current is greater than 0.6C; an EOD voltage of 0.15C is given when the discharge current is less than 0.15C. The EOD voltage will decrease linearly while it is between 0.15C and 0.6C, as shown in the following chart:

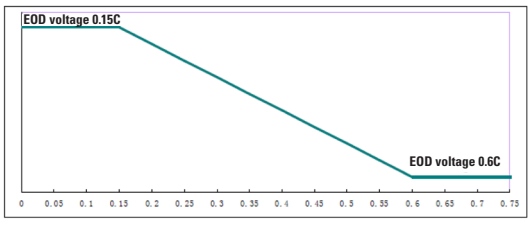


Fig. 91. EOD end of backup voltage behaviour.

For lead-acid batteries, the suggested voltage is 1.65 V/cell to 0.6C and 1.75 V/cell to 0.15C.
For lithium batteries, 2.7 V/cell for both.

- **Current percentage limit setting:**
  This setting is used to limit the charging power, this being 20% of the active power of the UPS. If the number of batteries is 40 elements (at 12 V), the maximum current that a module can supply according to the current limitation (as a percentage) is shown in Tab. 26.
  The existing charging current is also limited by the battery capacity (see the Battery capacity setting section).

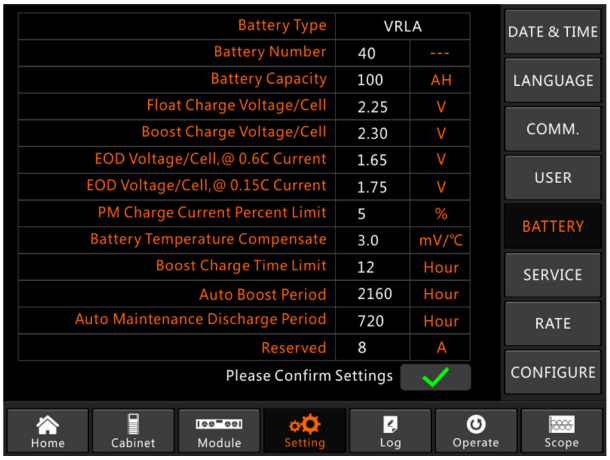


Fig. 92. Settings submenu: Lead-acid batteries.

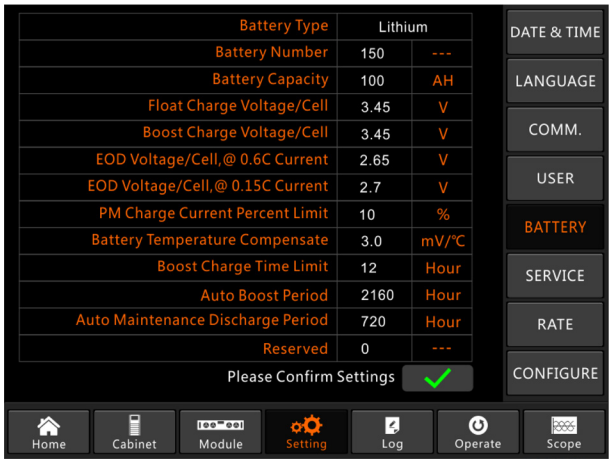


Fig. 93. Settings submenu: Lithium batteries.

Fig. 94. Configuration through the control software.

Current limit (%)	Maximum charging current (A)		
	25 kVA module	30 kVA module	50 kVA module
FPout	1	0,9	0,9
1	0,46	0,50	0,83
2	0,93	1,00	1,67
3	1,39	1,50	2,50
4	1,85	2,00	3,33
5	2,31	2,50	4,17
6	2,78	3,00	5,00
7	3,24	3,50	5,83
8	3,70	4,00	6,67
9	4,17	4,50	7,50
10	4,63	5,00	8,33
11	5,09	5,50	9,17
12	5,56	6,00	10,00
13	6,02	6,50	10,83
14	6,48	7,00	11,67
15	6,94	7,50	12,50
16	7,41	8,00	13,33
17	7,87	8,50	14,17
18	8,33	9,00	15,00
19	8,80	9,50	15,83
20	9,26	10,00	16,67

Tab. 26. Current limit per power module.

- **Temperature compensation setting:**
  This setting is optional and requires the connection of an NTC temperature sensor to contact J2. The UPS will adjust the charging current based on the ambient temperature. The standard temperature is set at 25 °C, meaning that when it rises to 26 °C the UPS will reduce the charging current to 18 mV/element, and when it drops to 24 °C, the UPS will increase the current.
- **Quick charging limit time setting:**
  The system will transfer to float voltage when quick charging has run out of the scheduled time, which can range from 1 to 48 hours.
- **Automatic quick charging time setting:**
  At the scheduled time, the system quick charges the battery.
- **Automatic maintenance discharge period setting:**
  When the automatic maintenance discharge period is reached, the system will discharge the batteries. This function is enabled by the monitoring software, as shown in the image:

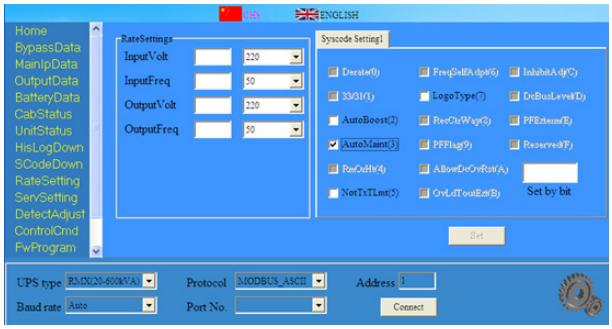


Fig. 95. Automatic maintenance discharge period activation.

The EOD voltage at the end of discharge backup in self-maintenance is 1.05 times the normal EOD voltage at the end of backup.

- **Extra charger module current limit setting:**
  It is possible to set the maximum current of the extra charger modules to between 0 and 50 A both through the settings menu shown in Fig. 87 or control software shown in Fig. 96.
  To do so, connect the monitoring software (MTR) to the UPS (see the connection procedure in the monitoring software manual).
  Follow this sequence to change the currents: Serv-Setting->Battery Setting->Charge Module Current Limit (option).

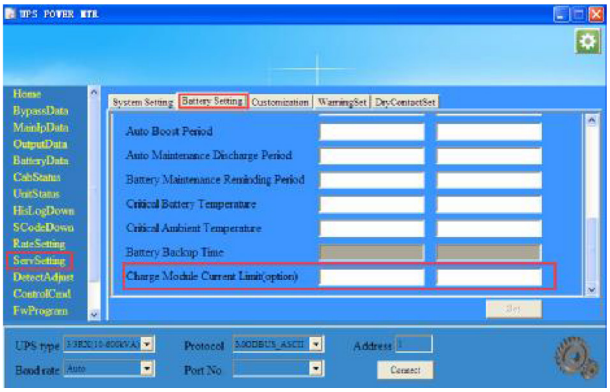


Fig. 96. Extra charger module maximum current setting.

The total charging current that the system can supply (C_{total}) will be the sum of all of the current that the power modules can supply on one side ($N*C_{pm}$), plus that of the extra chargers ($M*C_{cm}$) on the other, as reflected in the following formula:

$$C_{total} = N*C_{pm}+M*C_{cm}$$

Where,
N is the number of power modules and C_{pm} the setting value of the charging current of each module.
M is the number of extra charger modules and C_{cm} is the current value of the charging current of each module.

Therefore, the formula to apply would be:

$$C_{total} \leq 0.2 * \text{Battery capacity (0.2C)}$$

If $N*C_{pm} \geq 0.2C$, the extra charger module will not supply charging current to the battery.
If $N*C_{pm} < 0.2C$, the extra charger module charging current setting should not exceed $(0.2C - C_{cm})/M$.

- **Service settings:**
  The user can select the system's work mode. If the system is configured in parallel, it is possible to adjust the specific parameters, the number of redundant modules, etc., as can be seen in Fig. 97:

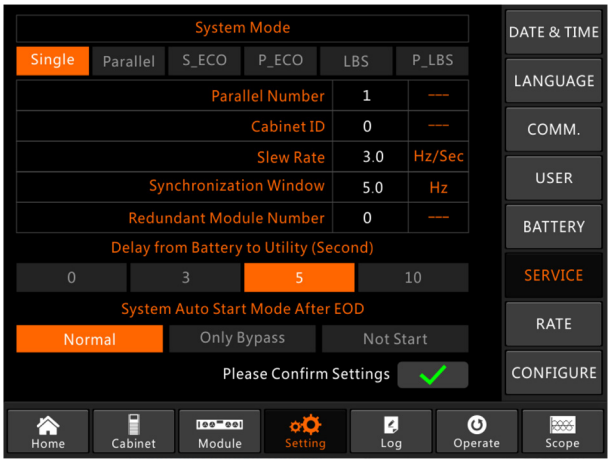


Fig. 97. Settings submenu: Service.

The following table describes the submenus.

Submenu name	Content	Meaning
Date and Time	Date format setting	Three formats: (a) year/month/day, (b) month/day/year, (c) day/month/year
	Time setting	Setting time
Language	Current language	Language in use
	Language selection	English and simplified Chinese can be selected (the setting is activated immediately after the language icon is pressed)
Communications	Device address	Communication address setting
	RS-232 protocol selection	SNT, Modbus, YD/T and Dwin protocols (for factory use)
	Baud rate	SNT, Modbus and YD/T baud rate setting
	Modbus mode	Modbus mode setting: ASCII and RTU can be selected
	Modbus parity	Modbus parity setting
User	Output voltage modification	Output voltage setting
	Bypass voltage upper limit	Bypass operating voltage upper limit, the following can be selected: +10%, +15%, +20%, +25%
	Bypass voltage lower limit	Bypass operating voltage lower limit, the following can be selected: -10%, -15%, -20%, -30%, -40%
	Limited bypass frequency	Operating frequencies allowed for bypass, the following can be selected: ±1 Hz, ±3 Hz, ±5 Hz
	Dust filter maintenance period	Dust filter maintenance period setting

Submenu name	Content	Meaning
Batteries	Battery number	Battery number setting (12V)
	Battery capacity	Battery AH setting
	Float charging voltage/cell	Float charging voltage per battery cell (2 V) setting
	Quick charging voltage/cell	Quick charging voltage per battery cell (2 V) setting
	EOD voltage (end of charge)/ cell, @0.6C current	EOD voltage per battery cell for charging current @0.6C
	EOD voltage (end of charge)/cell, @0.15C current	EOD voltage per battery cell for charging current @0.15C
	Charging current percentage limit	Charging current (percentage of rated current)
	Battery temperature compensation	Battery temperature compensation coefficient
	Quick charging time limit	Quick charging time limit setting
	Automatic quick charging period	Automatic quick charging period configuration
	Automatic maintenance discharge period	Automatic maintenance discharge period setting
	Charging module current limit (option)	Extra charger module maximum charging current setting
Service	System mode	System mode setting: single, parallel, single parallel, ECO parallel, LBS, LBS parallel
Rated	Rated parameter configuration	For factory use
Configura-tion	System configuration	For factory use

*Tab. 27. **Description of the settings submenu.***

Users have several permissions to configure the settings:

a. For the Date and Time, Language and Communications options, the user can set preferences without entering a password.

b. For the User option, the user must enter a password and the settings must be configured by the startup personnel.

c. For the Batteries and Service options, a second level authentication is necessary and the settings must be configured by the personnel responsible for device operation.

d. For the rated value and configuration menus, third-level authentication is necessary and settings can only be configured at the factory.

'C' refers to the number of amps. For example, if the battery is 100 Ah, C = 100 A.

Make sure that the number of batteries configured through the menu or control software is identical to the actual number of batteries installed. Otherwise, it will cause severe damage to the batteries or device.

7.3.4. Log.

Press icon 

at the bottom of the screen to access the history. The history is displayed in reverse chronological order (that is, the first one, which appears on the screen as no. 1, is the most recent) and shows information about events, warnings and failures and the date and time of occurrence and disappearance.

Each event recorded in the table includes the sequence number, content of the event and indication of the time of the event.

- Sequence number of the event.
- Event content: shows information about events, warnings and failures (0# means that the event happened in the cabinet, n# means that the information was sent for the nth power module).
- Time of the event.
- Total items: shows the total number of events. The system can record 895 events. If this number is exceeded, the system will delete the oldest ones.
-  Scroll through the event pages.

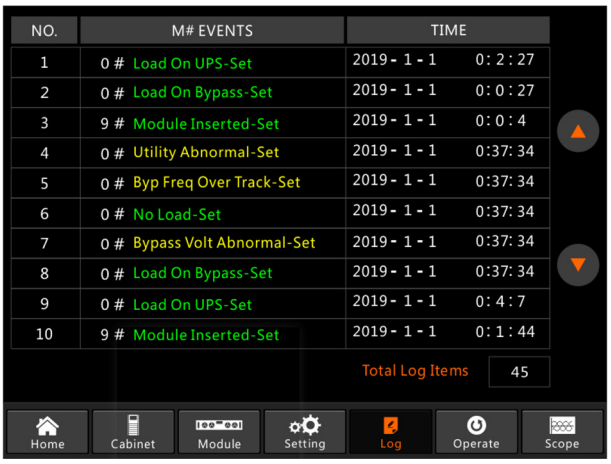


*Fig. 98. **Interfaces of the Log menu.***

The following table shows details of all UPS events that can be displayed in the log window.

No.	Event	Description
1	Failure cleared	Failure cleared manually.
2	Restart log	History deleted manually.
3	Load in UPS	Inverter powering load.
4	Load in bypass	Bypass powering load.
5	No load	No load.
6	Quick battery charging	Charger working in quick charging mode.
7	Battery float	Charger working in float charging mode.
8	Battery discharge	Battery discharging.
9	Battery connected	Battery connected.
10	Battery not connected	Battery not connected.
11	Maintenance CB closed	Manual maintenance disconnector closed.
12	Maintenance CB open	Manual maintenance disconnector open.
13	EPO	Emergency power off.
14	Module power insufficient	The available capacity of the power module is less than the load capacity. Reduce the load capacity or add power to the module to ensure that the capacity of the UPS is sufficient.
15	Generator input	The generator is connected and a signal has been sent to the UPS.
16	Abnormal mains	The mains voltage or frequency exceeds the upper or lower limit resulting in rectifier shutdown. Check the input phase voltage of the rectifier.
17	Bypass sequence error	Voltage sequence of bypass inverted. Check power cables connected correctly.
18	Bypass voltage abnormal	This alarm is triggered by an inverter software routine when the bypass voltage amplitude or frequency exceeds pre-set limits. The alarm will automatically reset if the bypass voltage returns to normal. Check if there are any alarms such as 'bypass disconnector open', 'bypass sequence error' or 'loss of input neutral'. If there are, eliminate them. 1. Then check and confirm if the bypass voltage and frequency displayed on the LCD are in the range of the settings. Note that the rated voltage and frequency are specified respectively as 'output voltage' and 'output frequency'. 2. If voltage displayed is abnormal, measure actual bypass voltage and frequency. If measurement abnormal, check bypass power supply. If an alarm is activated frequently, use the configuration software to increase the upper limit of the bypass, taking into account the user suggestions.
19	Bypass module failure	Bypass module has failed. This failure is blocked until it shuts down. Bypass fan failure.
20	Bypass module overload	Bypass current above pre-set limit. If bypass current below 135% of rated current, only one alarm is generated in UPS.
21	Bypass overload Tout	Overload status of bypass continues and has reached overload time limit.
22	Bypass frequency too high	This alarm is triggered by an inverter software routine when the bypass voltage frequency exceeds pre-set limits. The alarm will automatically reset if the bypass frequency returns to normal. Check if there are any alarms such as 'bypass disconnector open', 'bypass sequence error' or 'loss of input neutral'. If there are, eliminate them. 1. Then check and confirm if the bypass frequency displayed on the LCD is in the range of the settings. Note that the rated frequency is specified as 'output frequency'. 2. If voltage displayed is abnormal, measure actual bypass frequency. If measurement abnormal, check bypass power supply. If an alarm is activated frequently, use the configuration software to increase the upper limit of the bypass, taking into account the user suggestions.
23	Time limit Tx exceeded	The load is in bypass because the output overload transfer and retransfer are set at specific times. The system can recover automatically and transfer back to the inverter within an hour.
24	Output short circuit	Output short circuited. First check if there are any problems with the loads. Then check for problems with terminals, power sockets or other power distribution units. If failure resolved, press 'Failure cleared' to restart UPS.
25	Battery EOD	Inverter off due to low battery voltage. Check mains failure status and recover mains power as soon as possible.
26	Battery test	System transfers to Battery mode for 20 seconds to check battery status.
27	Battery test OK	Battery test is OK.
28	Battery maintenance	System transfers to Battery mode until it has a voltage of 1.1*EOD for maintenance of battery branch.
29	Battery maintenance OK	Battery maintenance is OK.
30	Module inserted	Power module has been inserted into system.
31	Module removed	Power module has been removed from system.
32	Rectifier failure	Failure of rectifier in power module no. N. Rectifier has failed resulting in its shutdown and battery to discharge.
33	Inverter failure	Failure of rectifier in power module no. N. Rectifier failure has caused it to shut down and battery to discharge.

34	Rectifier overtemperature	Overtemperature of rectifier in power module no. N. Temperature of IGBT rectifier is too high to keep it running. This alarm is triggered by a signal from temperature control device installed in IGBT rectifier. UPS recovers automatically after overtemperature signal disappears. In case of overtemperature, check: 1. If ambient temperature is too high. 2. If ventilation is obstructed. 3. If there is a failure in fans. 4. If input voltage is too low.
35	Fan failure	At least one fan fails in power module no. N.
36	Output overload	Output overload in power module no. N. Alarm appears when load exceeds 100% of rated power. Alarm automatically resets when overload condition disappears. 1. Check which phase is overloaded through load percentage (%) displayed on LCD to confirm that alarm is real. 2. If alarm is real, measure actual output current to confirm if displayed value correct. Disconnect any non-critical loads. In parallel systems, this alarm will be triggered if load is severely unbalanced.
37	Inverter overload Tout	Overload time limit of inverter in power module no. N has been reached. Overload status of UPS continues and overload time has run out. Note: The most overloaded phase is the one that first indicates that time has run out. If timer activated, 'unit overload' alarm should also be activated, since load is above rated value. When the time runs out, the inverter switch opens and the load transfers to the bypass. If load drops below 95% for two minutes, system returns to transferring to inverter mode. Check the load percentage (%) displayed on the LCD to confirm that the alarm is real. If LCD shows an overload, check actual load and confirm if UPS has an overload before alarm occurs.
38	Inverter overtemperature	Overtemperature of inverter in power module no. N. The inverter's heat sink temperature is too high to keep it running. This alarm is triggered with a signal from the temperature control device installed in the IGBT inverter. UPS recovers automatically after overtemperature signal disappears. In case of overtemperature, check: 1. If ambient temperature is too high. 2. If ventilation is obstructed. 3. If there is a failure in fans. 4. If inverter overload time has run out.
39	UPS inhibition	Prevents system from transferring from bypass to UPS (inverter). Check: 1. If capacity of power module is sufficient for load. 2. If rectifier is ready. 3. If bypass voltage is normal.
40	Manual transfer to bypass	Transfers manually to bypass.
41	Cancellation of manual transfer to bypass	Cancels the 'manual transfer to bypass' command. If UPS has manually transferred to bypass, this command allows you to transfer to inverter.
42	Battery voltage low	Battery voltage is low. Before the end of the discharge, the 'low battery voltage' warning will appear. Afterwards, the battery will have a discharge capacity of three minutes at full charge.
43	Battery inverted	Battery cables not connected correctly.
44	Inverter protection	Protection of inverter in power module no. N. check: 1. If inverter voltage is abnormal. 2. If inverter voltage is very different to that of other modules. If so, adjust inverter voltage of power module separately.
45	Loss of input neutral	The neutral mains cable has been lost or is not detected. For three-phase UPSs, it is recommended that the user use a three-phase disconnector between the input power supply and the UPS.
46	Bypass fan failure	At least one of the fans of the bypass modules has failed.
47	Manual shutdown	Manual shutdown of power module no. N. The power module turns off the rectifier and inverter and there is no inverter output.
48	Manual quick charging	Manually forces the charger to operate in quick charging mode.
49	Manual float charging	Manually forces the charger to operate in float charging mode.
50	UPS blocked	The power module of the UPS cannot be shut down manually.
51	Parallel cable error	Error in parallel cable. Check: 1. If one or more parallel cables are disconnected or not connected correctly. 2. If parallel cable is disconnected. 3. If parallel cable is OK.
53	Loss of N+X redundancy	N+X redundancy lost. There are no redundant power modules X in the system.
54	System inhibition due to EOD	The system does not supply power after the batteries are in EOD (end of backup).
55	Battery test failure	Failure in battery test. Check if the status of the UPS is normal and if the battery voltage exceeds 90% of the float voltage.
56	Battery maintenance failure	Check: 1. If status of UPS is normal and there are no alarms. 2. If battery voltage exceeds 90% of float voltage. 3. If load exceeds 25%.

57	Ambient overtemperature	Ambient temperature exceeds limit of UPS. Air conditioners should regulate ambient temperature.
58	Rectifier CAN failure	Rectifier CAN bus communication is abnormal. Check that communication cables are connected correctly.
59	Inverter IO CAN failure	Inverter CAN bus IO signal communication is abnormal. Check that communication cables are connected correctly.
60	Inverter CAN data failure	Inverter CAN bus data communication is abnormal. Check that communication cables are connected correctly.
61	Power sharing failure	Difference in output current of two or more power modules in system is above limit. Adjust the output voltage of the power modules and restart the UPS.
62	Synchronous pulse failure	Synchronisation signal between modules is abnormal. Check that communication cables are connected correctly.
63	Input voltage detection failure	Input voltage of power module no. N is abnormal. Check: 1. If input cables are connected correctly. 2. If input fuses are broken. 3. If mains is normal.
64	Battery voltage detection failure	Battery voltage is abnormal. Check: 1. The state of the batteries. 2. The state of the battery fuses in power input board.
65	Output voltage failure	Output voltage is abnormal.
66	Bypass voltage detection failure	Bypass voltage abnormal. Check: 1. If bypass disconnector is closed and in good condition. 2. If bypass cables are connected correctly.
67	Inverter jumper failure	IGBT inverters damaged and open.
68	Output temperature error	Power module output temperature exceeds set limit. Check: 1. State of fans. 2. State of PFC and inverter inductors. 3. If passage of air is obstructed. 4. If ambient temperature is too high.
69	Input current unbalanced	Difference in input currents between all phase pairs exceeds 40% of rated current. Check: 1. If rectifier fuses or diodes, or IGBT or PFC diodes are damaged. 2. If input voltage is abnormal.
70	DC bus overvoltage	DC bus capacitor voltage exceeds set limit. UPS turns off rectifier and inverter.
71	Rectifier soft start failure	While soft start procedures end, DC bus voltage is below set limit. Check: 1. If rectifier diodes are damaged. 2. If PFC or IGBT are damaged. 3. If PFC diodes are broken. 4. If SCR or IGBT drivers are abnormal. 5. If soft start resistors or relays are abnormal.
72	Relay connection failure	Inverter relays open and cannot work or fuses damaged.
73	Relay short circuit	Inverter relays short circuited and cannot be opened.
74	PWM sync failure	Pulse width modulation sync signal abnormal.
75	Smart Sleep	UPS operates in Smart Sleep mode. In this mode, the power modules will enter Smart Sleep mode on a rotating basis. This achieves greater reliability and efficiency. It is necessary to confirm that the remaining capacity of the power modules is sufficient to power the load. If the user adds loads to the UPS, it is necessary to confirm that the capacity of the operational modules is sufficient. If the capacity of the new loads is not clear, it is advisable to 'wake up' the power modules that are in Smart Sleep mode.
76	Manual switch to inverter	Manually switches UPS to inverter. Used to switch UPS to inverter when bypass frequency not synchronised. Interruption time can exceed 20ms.
77	Input overcurrent Tout	Input overcurrent time limit reached and UPS transfers to Battery mode. Check if input voltage is too low and load is too high. If this is the case, if possible, increase input voltage or disconnect some loads.
78	No inlet temperature sensor	Inlet temperature sensor not connected correctly.
79	No outlet temperature sensor	Outlet temperature sensor not connected correctly.
80	Inlet overtemperature	Inlet air overtemperature. Make sure UPS operating temperature between 0 and 40°C.
81	Capacitor time reset	DC bus capacitor time reset.
82	Fan time reset	Time reset for fans.
83	Battery history reset	Battery data history reset.
84	Bypass fan time reset	Time reset Bypass fans.
85	Battery overtemperature	Battery temperature is high. Optional.
86	Bypass fan replacement	Bypass fans have reached end of service life. Replacement recommended. New fans must be activated with software.
87	Capacitor replacement	Capacitors have reached end of service life. Replacement recommended. New capacitors must be activated with software.
88	Fan replacement	Power module fans have reached end of service life. Replacement recommended. New fans must be activated with software.

89	Inverter IGBT driver lock	Inverter IGBTs are turned off. Check: 1. If power modules are installed correctly in cabinet. 2. If fuses between rectifier and inverter are damaged.
90	Battery dead	Battery service life expired. Replacement of batteries for new ones recommended. New ones must be activated with software.
91	Bypass CAN bus failure	CAN bus between bypass module and cabinet abnormal.
92	Dust filter expired	Clean or replace dust filter.
102	Wave activation	Waveform saved during UPS failure.
103	Bypass CAN bus failure	Bypass and cabinet communicate with each other through CAN bus. Check: 1. State of connector and signal cable. 2. If control card is abnormal.
105	Firmware error	For manufacturer's use only.
106	System setting error	For manufacturer's use only.
107	Bypass overtemperature	Bypass module overtemperature. Check: 1. If there is bypass overload. 2. If ambient temperature exceeds 40°C. 3. If bypass SCRs are correctly installed. 4. If bypass fans are normal.
108	Duplicate module ID	There are at least two modules set with the same ID card as the power connector. Set the ID in the correct sequence.

*Tab. 28. **UPS event list.***

The text colours indicate the event levels:
- ❒ Green: there is an event;
- ❒ Grey: there is an event and it has been deleted;
- ❒ Yellow: there is a warning;
- ❒ Red: there is a failure.

7.3.5. Operate menu.

Press icon Operate at the bottom of the screen to access the Operate menu.

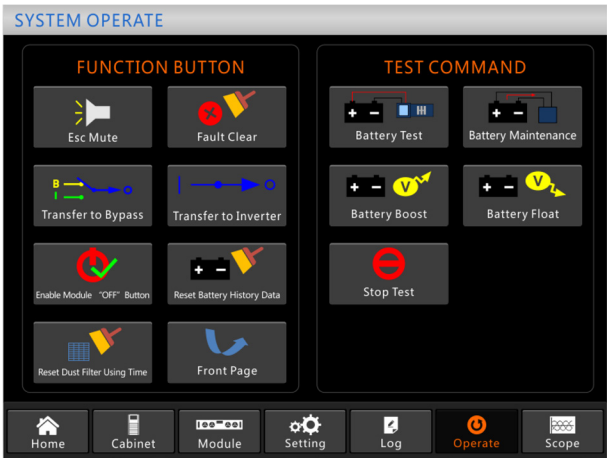


*Fig. 99. **Operation menu.***

The FUNCTION BUTTONS and TEST COMMANDS can be accessed from the Operate menu. The available options are described below:

FUNCTION BUTTONS

- Mute/Reset audible alarm
  Press Mute or Esc Mute to mute or reset audible alarm.

- Clear failures
  Press Fault Clear to clear failures.

- Transfer to Bypass mode and exit Bypass mode
  Press Transfer to Bypass or Esc Bypass to transfer to Bypass mode or cancel this command, respectively.

- Transfer to inverter
  Press Transfer to Inverter to switch from Bypass mode to Inverter mode.

- Activate power module 'OFF' button
  Press Enable Module "OFF" Button to activate power module off switch.

- Reset battery history
  Press Reset Battery History Data to restore battery history data. Battery history data includes discharge times, days in operation and discharge hours.

- Reset dust filter usage time
  Press Reset Dust Filter Using Time to clear dust filter usage time. Includes usage days and maintenance period.

TEST COMMANDS

- Battery test
  Press Battery Test, the system transfers to Battery mode to check its condition. Make sure that the bypass is operating normally and the battery has more than 25% of load.

- Battery maintenance
  Press Battery Maintenance, the system transfers to Battery mode. This function is used for battery maintenance. Make sure that the bypass is operating normally and the battery has more than 25% of load.

- Quick battery charging
  Press 

, the system starts quick charging.

- Battery float
  Press 

, the system starts float charging.

- Test stop
  Press 

, the system stops battery test or maintenance.

7.3.6. Charts.

Press 

in the bottom right of the screen. The system enters the Charts menu.

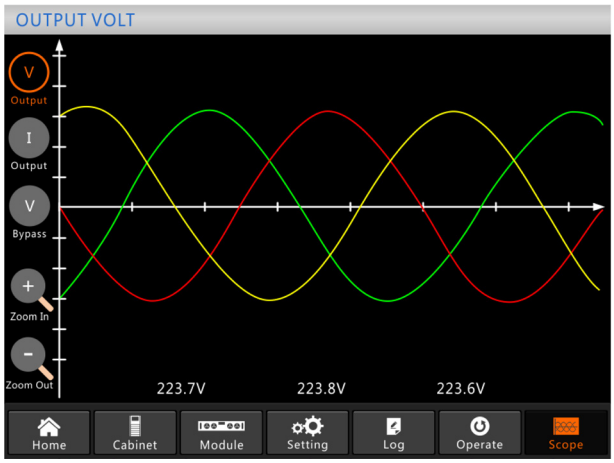


*Fig. 100. **Charts menu.***

Users can see the output voltage, output current and bypass voltage waveforms by touching the corresponding icon on the left side of the interface. The size of the waveforms can be enlarged or reduced.

Press 

to display the three-phase output voltage.

Press 

to display the three-phase output current.

Press 

to display the three-phase bypass voltage.

Press 

to expand the waveform.

Press 

to reduce the waveform.

8. MAINTENANCE, WARRANTY AND SERVICE.

This chapter introduces the maintenance of the UPS, including the maintenance instructions for the power modules, monitoring of the Bypass module and method used to replace the dust filter.

8.1. PRECAUTIONS.

Only qualified maintenance personnel can maintain the power, control and bypass units.

1. The power unit must be disassembled from top to bottom to prevent tilting of the cabinet.
2. To ensure safety prior to power and control unit maintenance, use a multimeter to measure the voltage between the operational parts and earth to ensure that it is not dangerous. For example, make sure that the DC voltage is less than 36 V DC, and the maximum AC voltage is less than 30 V AC.
3. Hot swapping is not recommended in the control and bypass units. These units can only be deactivated when the UPS is in maintenance Bypass mode or when it is completely shut down.
4. After removing the power unit from the cabinet, wait 10 minutes before opening the cover.

8.2. POWER MODULE MAINTENANCE INSTRUCTIONS.

Confirm that the UPS is operating in Normal mode and that the Bypass is operating normally before removing the power unit to be repaired.

1. Make sure that the remaining power modules will not overload.
2. Turn off the power unit:
   a. Activate the LCD panel → Operate menu 

→ Activate the 'OFF' icon  on the power module.
   b. Press the 'OFF' button on the power unit panel for 3 seconds. The power unit exits the system.
3. Remove the mounting screws on both sides of the front of the power unit and remove it using two people.
4. Wait 10 minutes before removing the cover for repair.
5. After the repair, reinstall the power unit in the cabinet, it will join the system automatically.

8.3. MAINTENANCE INSTRUCTIONS.

8.3.1. CONTROL AND BYPASS UNIT MAINTENANCE INSTRUCTIONS.

Confirm that the UPS is operating in Normal mode and the Bypass is operating normally.

1. Transfer the system to Bypass mode using the LCD control panel (see chapter 6.3.4), the load is now powered by the maintenance Bypass.

   a. For 6-slot cabinets (180 kVA), the control module and the Bypass module form a single module, remove it directly after removing the screws that secure it to the cabinet structure.
   b. For 10-slot cabinets (300 and 500 kVA), the control module and the Bypass module are separated, remove them directly one after another after removing the screws that secure them to the cabinet structure.
2. Once maintenance is finished, reinsert the modules and tighten the fixing screws.
3. Transfer the UPS from maintenance Bypass mode to Normal mode (see chapter 6.3.5).

8.4. BATTERY MAINTENANCE.

- Pay attention to all of the safety instructions concerning batteries indicated in section 1.2.3 of the EK266*08 manual.
- The service life of the batteries directly depends on the ambient temperature and other factors such as the number of charges and discharges, as well as their depth. Their service life is designed to be between 3 and 5 years if the ambient temperature to which they are exposed is between 10 and 20 °C. Different types of battery with different service lives are available upon request.
- SLC ADAPT series UPSs require minimum upkeep. The batteries used in the standard models are lead acid, sealed, valve regulated and maintenance free, or lithium. The only requirement is to charge the batteries regularly to extend their life expectancy.
  While the UPS is connected to the mains supply, whether or not it is running, it will keep the batteries charged and also offer protection from overcharging and deep discharge.

8.4.1. Notes for the installation and replacement of the battery.

- If it is necessary to replace any connection cables, original materials can be purchased through our **T.S.S.** or authorised distributors. Using inappropriate cables can lead to overheating in connections, resulting in a fire hazard.
-  Inside the device, there are permanent dangerous voltages even without mains supply present through its connection to the batteries and especially in UPSs where the electronics and batteries share a box.
  Also take into consideration that the battery circuit is not isolated from the input voltage, so there is a risk of discharge with dangerous voltages between the battery terminals and the earth terminal, which is in turn connected to earth (any metal part of the device).
  Repair and/or maintenance work must be carried out by our **T.S.S.** except for the replacement of batteries, which can be performed by qualified personnel familiar with them. No other person should handle them.

8.5. REPLACE DUST FILTER (OPTIONAL).

There are 3~4 dust filters behind the front door of the UPS (see Fig. 101). Each filter is held in place by staples on each side. The procedure to replace the filters is as follows:

1. Open the front door and locate the filters at the back.
2. Remove the support.
3. Remove the old dust filters and replace them with clean ones.
4. Replace the support.

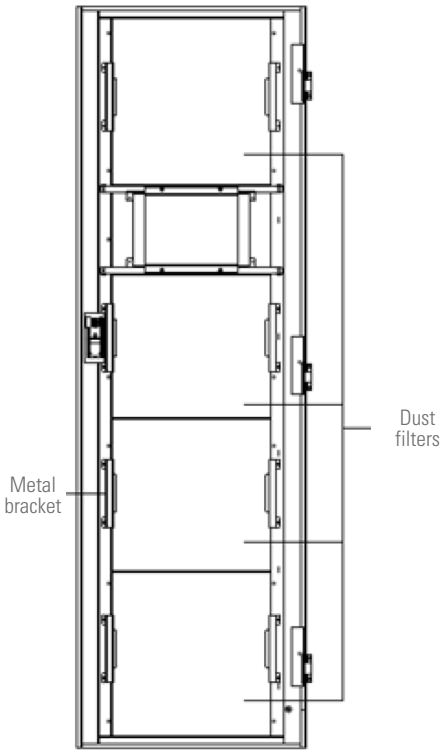


Fig. 101. Dust filters inside the front door.

8.6. WARRANTY CONDITIONS.

8.6.1. 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. You are recommended to do so as soon as possible so that it can be included 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 **T.S.S.** in the event of a fault.

8.6.2. 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, accident, fire, lightning or other hazards, or any other actions beyond its intended use. Nor shall it cover any compensation for loss or damage.

8.7. TECHNICAL SERVICES NETWORK.

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

9. ANNEXES.

9.1. GENERAL TECHNICAL SPECIFICATIONS.

MODEL	**SLC ADAPT**					
TECHNOLOGY	**On-line double conversion, three-level PWM, DSP control**					
INPUT	**3 x 380 / 400 / 415 V AC**			**3 x 208 / 220 V AC**		
MODULES AVAILABLE (kVA / kW)	**25 / 25**	**30 / 27**	**50 / 45**	**14 / 14**	**20 / 18**	**30 / 27**
Rated AC voltage	3 x 380 / 400 / 415 V (3F + N)			3 x 208 / 220 V (3F + N)		
Voltage range	- 43 % + 20 % [1]					
Frequency	50 / 60 Hz					
Frequency range	40 - 70 Hz					
Total harmonic distortion (THDi)	≤ 3 %					
Power factor	> 0,99					
OUTPUT						
Rated voltage	3 x 380 / 400 / 415 V (3F + N)			3 x 208 / 220 V (3F + N)		
Accuracy	± 1% (static mode) / ± 1.5% (dynamic mode)					
Frequency	50 / 60 Hz					
Total harmonic distortion (THDv)	≤ 1 %					
Power factor	1	0,9				
Crest factor	3:1					
Total efficiency in On-line mode	> 96 %	> 95 %	> 96 %	> 96 %	> 95 %	> 96 %
Total efficiency in Battery mode	> 96 %	> 95 %	> 96 %	> 96 %	> 95 %	> 96 %
Total efficiency in Eco mode	99 %					
Permissible overload	125% for 10 min / 150% for 1 min					
STATIC BYPASS						
Type	Static thyristor					
Voltage	3 x 380 / 400 / 415 V (3F + N)			3 x 208 / 220 V (3F + N)		
MANUAL BYPASS						
Type	Uninterrupted					
BATTERIES						
Type	Lead-acid, lithium iron phosphate. Maintenance-free SLA, NiCd					
Number	36 (18 + 18) 40 (20 + 20) 44 (22 + 22)			22 (11 + 11)		
Charging voltage regulation	Batt-watch					
Charger maximum power	20% of total system power					
COMMUNICATION						
Display	10,4"					
Ports	RS-232, RS-485, relays and USB					
Free slots	1 x SNMP / 1 x extended relays					
GENERAL						
Operating temperature	0 ºC ÷ + 40 ºC					
Relative humidity	Up to 95%, non-condensing					
Operating altitude	2,400 masl [2]					
Acoustic noise at 1 metre	< 65 dB (A)		< 72 dB (A)	< 65 dB (A)		< 72 dB (A)
Dimensions (D x W x H) (mm)	790 x 460 x 85 (2U)	790 x 460 x 134 (3U)	700 x 510 x 178 (4U)	790 x 460 x 85 (2U)	790 x 460 x 134 (3U)	700 x 510 x 178 (4U)
Weight (kg)	18	34	45	18	34	45
SYSTEMS						
Maximum no. modules per system	8 o 12	6 o 10	10	8 o 12	6 o 10	10
Maximum power per system (kVA)	200 o 300	180 o 300	500	112 o 168	120 o 200	300
Maximum no. systems in parallel	3					
STANDARDS						
Safety.	EN 60950-1; EN IEC 62040-1					
Electromagnetic compatibility (EMC).	EN IEC 62040-2					
Operation	VFI-SS-111 as per EN-IEC 62040-3					
Quality and Environmental Management	ISO 9001 and ISO 14001					

[1] Depending on charge percentage

[2] Power degradation for higher altitudes up to a maximum of 5,000 masl.

SYSTEMS	I/O VOLTAGE	NO. MODULES (#)	MOD. POWER (kVA/kW)	MAX. POWER (kVA/kW)	DIMENSIONS (1) (D x W x H mm)	WEIGHT (kg)
SLC-#/25-ADAPT 112X A	3 x 208 / 3 x 220 V	1 a 8	14 / 14	112 / 112	916 x 482 x 1550	178 ÷ 304
SLC-#/20-ADAPT 120 A	3 x 208 / 3 x 220 V	1 a 6	20 / 18	120 / 108	1100 x 600 x 1600	199 ÷ 369
SLC-#/25-ADAPT 168X A	3 x 208 / 3 x 220 V	1 a 12	14 / 14	168 / 168	960 x 650 x 2000	230 ÷ 446
SLC-#/20-ADAPT 200 A	3 x 208 / 3 x 220 V	1 a 10	20 / 18	200 / 180	1100 x 600 x 1600	199 ÷ 369
SLC-#/30-ADAPT 300 A	3 x 208 / 3 x 220 V	1 a 10	30 / 27	300 / 270	1100 x 600 x 1600	199 ÷ 369
SLC-#/30-ADAPT 180	3 x 380 / 3 x 400 / 3 x 415 V	1 a 6	30 / 27	180 / 162	1100 x 600 x 1600	199 ÷ 369
SLC-#/25-ADAPT 200X	3 x 380 / 3 x 400 / 3 x 415 V	1 a 8	25 / 25	200 / 200	916 x 482 x 1550	178 ÷ 304
SLC-#/25-ADAPT 300X	3 x 380 / 3 x 400 / 3 x 415 V	1 a 12	25 / 25	300 / 300	960 x 650 x 2000	230 ÷ 446
SLC-#/30-ADAPT 300	3 x 380 / 3 x 400 / 3 x 415 V	1 a 10	30 / 27	300 / 270	1100 x 600 x 2000	200 ÷ 560
SLC-#/50-ADAPT 500	3 x 380 / 3 x 400 / 3 x 415 V	1 a 10	50 / 45	500 / 450	1100 x 1300 x 2000	945 ÷ 1350

(1) Batteries located in additional cabinets.

9.2. GLOSSARY.

- **AC.** Alternating current is electric current in which the magnitude and direction vary cyclically. The waveform of the most commonly used alternating current is that of a sine wave, since this achieves a more efficient transmission of energy. In certain applications, however, other periodic waveforms are used, such as triangular or square.
- **Bypass.** Manual or automatic, this is the physical connection between the input of an electrical device and its output.
- **DC.** Direct current is the continuous flow of electrons through a conductor between two points with different potential. Unlike AC, in DC, electrical loads always circulate in the same direction from the point of greatest potential to the lowest. Although DC is commonly identified as a continuous current (for example, that supplied by a battery), any current that always maintains the same polarity is continuous.
- **DSP.** Digital signal processor. A DSP is a processor or microprocessor-based system that has a set of instructions, hardware and optimised software for applications that require numerical operations at very high speed. Because of this, it is especially useful for the processing and representation of analogue signals in real time: in a system that works in this way (real time) samples are usually received from an analogue/digital converter (ADC).
- **Power factor.** The power factor, PF, of an AC circuit is defined as the ratio between active power, P, and apparent power, S, or as the cosine of the angle formed by the current and voltage factors, designated in this case as cos f, where f is the value of the angle.
- **GND.** This stands for GROUND or EARTH and, as the name indicates, refers to the potential of the 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 interface (electronics) is the port (physical circuit) through which signals are sent or received from one system or subsystem to another.
- **kVA.** A volt-ampere is the unit used for apparent power in electrical current. In DC, it is practically equal to real power but, in AC, it can differ from this depending on the power factor.
- **LCD.** Liquid crystal display, a device invented by Jack Janning, who was an employee of NCR. It is an electrical system for data presentation formed by 2 transparent conductive layers and a special crystalline material in the middle (liquid crystal) which have the ability to orientate light as it passes through.
- **LED.** Light-emitting diode, a semiconductor device (diode) that emits light that is almost monochromatic, that is to say, it has a very narrow spectrum when it is polarised directly and is penetrated by an electric current. The colour (wavelength) depends on the semiconductor material used in the construction of the diode, and can vary from ultraviolet, passing through the visible light spectrum, to infrared, the latter called IRED (infra-red emitting diode).
- **Circuit breaker.** A circuit breaker is a device capable of interrupting the electrical current of a circuit when it exceeds certain maximum values.
- **Disconnector.** Mechanical disconnecting device with two alternative positions with a separation between contacts that satisfies the minimum physical spacing between the two parts of the mains where it is located. In case of failure of the circuit in which it is located, it opens its contacts automatically, thus isolating the failure. They can open or close circuits only when they are without loads.
- **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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The Technical Service and Support (T.S.S.) network, Commercial network and warranty information are available in website:
www.salicru.com

Product Range
Uninterruptible Power Supplies (UPS)
Lighting Flow Dimmer-Stabilisers
DC Power Systems
Static Inverters
Photovoltaic Inverters
Voltage stabilisers

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