# **USER'S MANUAL**



**UNINTERRUPTIBLE POWER SUPPLY** 

# **SLC** serie ADAPT X



### **General** index

#### 1. INTRODUCTION.

1.1. THANK-YOU LETTER.

### 2. SAFETY INFORMATION.

- 2.1. USING THIS MANUAL.
- 2.1.1. Conventions and symbols used.
- 2.1.2. Safety considerations.

#### 3. QUALITY ASSURANCE AND STANDARDS.

- 3.1. STATEMENT BY THE MANAGEMENT.
- 3.2. STANDARDS.
- 3.2.1. First and second environment.
- 3.2.1.1. First environment.
- 3.2.1.2. Second environment.
- 3.3. ENVIRONMENT.

### 4. PRESENTATION.

- 4.1. VIEWS.
- 4.1.1. Views of the subracks.
- 4.2. DEFINITION OF THE PRODUCT.
- 4.2.1. Subrack and battery module nomenclatures.
- 4.3. GENERAL DESCRIPTION.
- 4.3.1. Introduction.
- 4.3.2. Architecture.
- 4.3.2.1. Structural diagram.
- 4.3.2.2. Parallel system.
- 4.3.3. Operating modes.
- 4.3.3.1. Normal mode.
- 4.3.3.2. Battery mode.
- 4.3.3.3. Auto-start mode (automatic start).
- 4.3.3.4. Bypass mode.
- 4.3.3.5. Manual bypass mode (maintenance bypass).
- 4.3.3.6. Parallel-Redundant Mode.
- 4.3.3.7. ECO mode.
- 4.3.4. Battery management (factory preset settings).
- 4.3.4.1. Basic functions.
- 4.3.4.2. Advanced functions.
- 4.3.4.3. Protection of batteries.

### 5. INSTALLATION.

- 5.1. RECEPTION.
- 5.1.1. Reception, unpacking and contents.
- 5.1.2. Storage.

- 5.1.3. Unpacking.
- 5.1.4. Transport to the site.
- 5.2. LOCATION.
- 5.2.1. Location of the ADAPT X.
- 5.2.2. Room for the batteries.
- 5.2.3. Physical location.
- 5.3. ENTRY OF THE CONNECTION CABLES.
- 5.4. PROTECTIVE DEVICES AND CROSS SECTION OF THE CONNECTION CABLES.
- 5.4.1. Input, bypass and output.
- 5.4.2. Battery installation and maintenance.
- 5.4.2.1. General recommendations.
- 5.4.2.2. Installing the batteries. Preliminary considerations before connecting them and their protections.
- 5.4.3. Access to the interior of the subrack for its connection.
- 5.5. CONNECTION.
- 5.5.1. Connecting the device to the mains.
- 5.5.2. Separate static bypass line connection. In version B only.
- 5.5.3. Connection of the output, terminals (X6 to X9).
- 5.5.4. Connection of the battery terminals of the equipment with those of the battery module.
- 5.5.5. Earth bonding terminal connection.
- 5.5.6. Parallel connection, 6-slot subracks only.
- 5.5.6.1. Parallel bus connection.
- 5.5.7. Interface and communications.
- 5.5.7.1. Digital inputs, dry contacts and communications.
- 5.5.7.2. Analogue input of battery and ambient temperature probes.
- 5.5.7.3. Signal input of the remote EPO button (Emergency Stop).
- 5.5.7.4. External manual bypass auxiliary contact input.
- 5.5.7.5. Signal shunt trip circuit breaker of BCB battery switch and auxiliary contact.
- 5.5.7.6. Dry contacts.

### 6. OPERATION

- 6.1. INTRODUCTION.
- 6.2. COMMISSIONING OF THE UPS.
- 6.2.1. Controls before commissioning.
- 6.2.2. Commissioning.
- 6.3. TRANSFER PROCEDURES BETWEEN OPERATING MODES.
- 6.3.1. Transfer from Normal Mode to Bypass Mode.
- 6.3.2. Transfer from Bypass Mode to Normal Mode.
- 6.4. OPERATIONS OF THE MANUAL BYPASS SWITCH (MAINTENANCE).

- 6.4.1. Procedure to switch from Normal Mode to Maintenance Bypass Mode.
- 6.4.2. Procedure to switch from Maintenance Bypass Mode to Normal Mode.
- 6.5. EPO PUSH BUTTON (EMERGENCY STOP). PROCEDURE.
- 6.5.1. Complete shutdown of the UPS, with EPO.
- 6.5.2. UPS restart after complete shutdown with EPO.
- 6.6. AUTOMATIC RESTART.
- 6.7. OPERATING INSTRUCTIONS FOR MAINTENANCE OF POWER MODULES.
- 6.7.1. Maintenance guide for power modules.
- 6.7.1.1. With the system operating in Normal Mode and the normal bypass voltage and frequency, with at least 1 power module as redundant:
- 6.7.1.2. No power modules operating as redundant:
- 6.8. OPERATING INSTRUCTIONS FOR MAINTENANCE OF THE BYPASS AND MONITORING MODULE.
- 6.8.1.1. With the system operating in Normal Mode and normal bypass voltage and frequency, transfer the load over the manual bypass.
- 6.9. LANGUAGE SELECTION.
- 6.10. CHANGING THE CURRENT DATE AND TIME
- 6.11. LEVEL 1 CONTROL PASSWORD.

# 7. MONITORING PANEL WITH LCD TOUCH SCREEN.

- 7.1. INTRODUCTION.
- 7.2. DIAGRAM OF ENERGY FLOW TO LEDS.
- 7.2.1. Acoustic alarm.
- 7.3. DESCRIPTION OF THE SCREENS SHOWN ON THE LCD TOUCH SCREEN.
- 7.3.1. Start menu or main screen.
- 7.3.2. System information menu.
- 7.3.3. Information menu of the module or power modules (PM).
- 7.3.4. Setting menu.
- 7.3.5. Setting menu.
- 7.3.6. Operation menu.
- 7.3.6.1. Function icons.
- 7.3.6.2. Command icons.
- 7.3.7. Oscilloscope menu.

### 8. OPTIONAL

- 8.1. INSTALL AN SNMP DRIVE.
- 8.2. ROOM TEMPERATURE SENSOR.

# 9. WARRANTY.

9.1. WARRANTY CONDITIONS.

- 9.1.1. Terms of the warranty.
- 9.1.2. Exclusions.
- 9.2. TECHNICAL SERVICES NETWORK.

#### 10. PRODUCT SPECIFICATIONS.

- 10.1. INTERNATIONAL STANDARDS.
- 10.2. ENVIRONMENTAL CHARACTERISTICS.
- 10.3. MECHANICAL CHARACTERISTICS.
- 10.4. ELECTRICAL CHARACTERISTICS.
- 10.4.1. Electrical characteristics (rectifier input).
- 10.4.2. Electrical characteristics (DC Bus or DC).
- 10.4.3. Electrical characteristics (Inverter output).
- 10.4.4. Electrical characteristics (Bypass input).
- 10.5. EFFICIENCY.

USER'S MANUAL EMI3 SERVOMOTOR VOLTAGE STABILISER

3

# 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 familiarize yourself with its content, since the more you know and understand the equipment the greater your satisfaction, level of safety and optimization of its functionalities will be

We remain at your disposal for any additional information or queries that you may wish to make.

Yours sincerely.

- The equipment described herein is capable of causing significant physical damage in the event of improper handling. For this reason its installation, maintenance and/or repair must be carried out exclusively by our personnel or by qualified personnel.
- Although no effort has been spared to ensure that the information in this user manual is complete and accurate, we are not responsible for any errors or omissions that may exist.
  - The images included in this document are for illustrative purposes and may not represent exactly the parts of the equipment shown, therefore they are not contractual. However, any divergence that may arise will be remedied or solved with the correct labelling on the unit.
- Following our policy of constant evolution, we reserve the right to modify the characteristics, operations or actions described in this document without prior notice.
  - Consequently, the contents of this manual may differ from the latest version available on our website. Check that you have the latest version of the document (listed on the back cover, on the logo of our brand) and download it from the
- 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 authorization by our firm is prohibited, with the full and exclusive property rights over the same being reserved by our firm.

### 2. SAFETY INFORMATION.

#### 2.1. USING THIS MANUAL.

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

- For equipment "powered by socket". This is the intended portal for obtaining the user manual and safety instructions EK266\*08.
- For equipment "with permanent connection", connection to terminals. Although it can be downloaded from the website, a CD-ROM or Pen Drive can be delivered with the UPS with all the necessary information for its connection and commissioning, including EK266\*08 safety instructions.

Before carrying out any action on the equipment relating to its installation or commissioning, change of location, configuration or manipulation of any kind, you must read the safety instructions carefully.

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 equipment is delivered properly labelled for the correct identification of each of the parts, which together with the instructions described in this user manual allows the operations of installation and commissioning to be performed in a simple and orderly manner without having any doubts whatsoever.



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

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.



When a system differs from that shown in the figures in Section 4, except when the number of modules connected in parallel and/or the technical specifications are modified, additional explanatory annexes will be edited if deemed appropriate or necessary. These will usually be printed on paper.

This user manual is useful for **SLC ADAPT X** subrack equipment, with the following configurations:

- Model with two slots. It allows the installation of one or two modules.
- Model with four slots. It allows the installation of between one and four modules.
- Model with six slots. It allows the installation of between one and six modules and is parallelable in turn with five subracks

Conceptually, they are designed to be assembled into a 19" rack cabinet, whether they share the batteries or not.

While the customer can perform these adaptations on their

own or otherwise, we can also manufacture any configuration on demand

For those systems shipped from the factory and assembled in a rack cabinet, we have the supplementary and generic EL096\*00 document in which the parts (connection terminals, switching mechanisms, etc.) and the corresponding operations are identified.

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

"SLC ADAPT X, ADAPT X, ADAPT, UPS, system, equipment or unit.".- Uninterruptible Power Supply ADAPT series of subfamily X.

Depending on the context of the phrase, it can refer either to the actual UPS itself or to the the UPS and the batteries, regardless of whether it is all assembled in the same metal casing - box - or not.

- "Batteries or accumulators".- Group or set of elements that stores the flow of electrons by electrochemical means.
- "T.S.S.".- Technical Service and Support.
- "Client, 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 of, or in representation of, same.

#### 2.1.1. Conventions and symbols used.

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

For more information, see section 1.1.1 of document EK266\*08 on **"Safety instructions"**.

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

### 2.1.2. Safety considerations.

- While the security-related considerations will be dealt with in more detail in Section 5, the following will be taken into account:
  - □ Inside the battery cabinet there are accessible parts with HAZARDOUS VOLTAGE and consequently risk of electric shock, so they are classified as RESTRICTED ACCESS ZONES. Therefore, the key of the battery cabinet will not be available to the OPERATOR or USER, unless such person has been properly instructed. In case of intervention inside the battery cabinet either during the connection, preventive maintenance or repair procedure, it will be taken into account that **the voltage of the battery set exceeds 400 V DC** and consequently safety measures must be taken.
  - □ Any operation of connecting and disconnecting the cables or handling inside a cabinet will not take place for around 10 minutes in order to allow the internal discharge of the capacitors of the equipment. Even so, check with a multimeter that the voltage at terminals is less than 36 V.
  - ☐ In case of installation in neutral IT mode, the switches, circuit breakers and thermal magnetic protection must cut the NEUTRAL in addition to the three phases.

# 3. QUALITY ASSURANCE AND STANDARDS.

#### 3.1. STATEMENT BY THE MANAGEMENT.

Our goal is customer satisfaction, therefore this Management has decided to establish a Quality and Environment Policy, through the implementation of a Quality and Environmental Management System that will enable us to comply with the requirements demanded in the **ISO 9001** and **ISO 14001** 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 client'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 X product** is designed, manufactured and marketed in accordance with **EN ISO 9001** Quality Assurance. The mark  $C \in C$  indicates conformity to the EEC 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 certain hazardous substances in electrical and electronic equipment -RoHS-.

According to the specifications of the harmonized 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 60950-1**. Information technology equipment. Safety. Part 1: General requirements.
- **EN-IEC 62040-2**. Uninterruptible Power Supplies -UPS-. Part 2: EMC requirements.



The manufacturer is not liable in case of modification or intervention on the equipment by the user.



#### **WARNING:**

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

It is not appropriate to use this equipment in basic life support applications [BLS], where a failure of the former can render vital equipment out of service or significantly affect its safety or effectiveness. It is also not recommended in medical applications, commercial transport, nuclear installations, or other applications or loads, where a failure of the product can lead to personal or material damages.



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

#### 3.2.1. First and second environment.

The environment examples that follow cover most UPS installations.

#### 3.2.1.1. First environment.

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

#### 3.2.1.2. Second environment.

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

#### 3.3. ENVIRONMENT.

This product has been designed to respect the environment and manufactured according to **ISO 14001**.

# Recycling of the equipment at the end of its useful life:

Our company undertakes to use the services of authorized 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, according to the specific regulations of the country where the equipment 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.

6 salicau

# 4. PRESENTATION.

#### 4.1. VIEWS.

#### 4.1.1. Views of the subracks.

The illustrations in Fig. 1 to 3 are represented with the maximum of modules installed in each subrack, although the unit may differ mainly due to the number of integrated modules depending on the required power.

Basically the operation and technical specifications are the same, except for the indicated power.

The copper rods placed between the connection terminals that can be seen in the illustrations Fig. 1 to 3, correspond to equipment with three-phase input and output, with a common input for the rectifier and the static bypass. Fig. 6 to 11 shows all possible input and output configurations.

The subracks incorporate a control panel with 7" colour touch screen as an interface between the equipment and the enduser, which provides different information through menus structured in categories (see section 7).

In the system of subracks connected in parallel, each one has its own control panel through which the individual parameters can be checked.

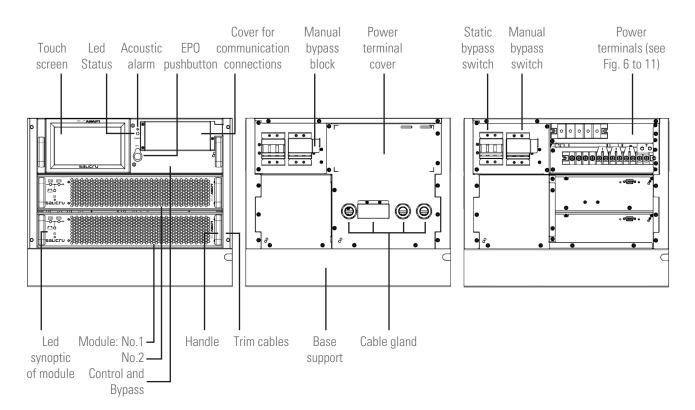


Fig. 1. Subrack model with 2 slots, to install 1 or 2 modules.

7

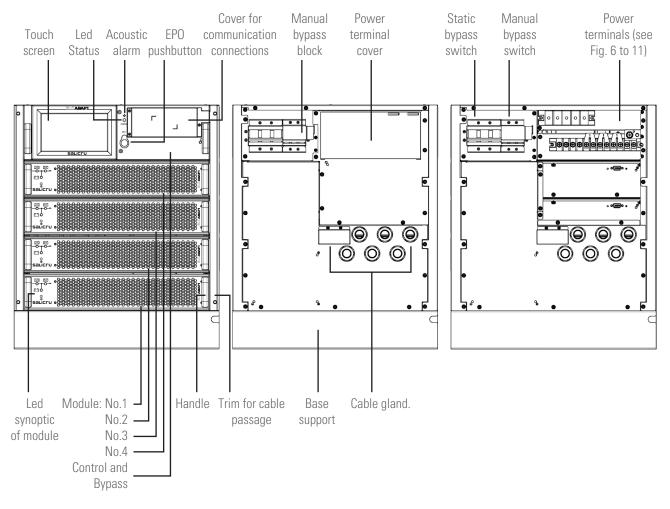


Fig. 2. Subrack model with 4 slots, to install between 1 and 4 modules.

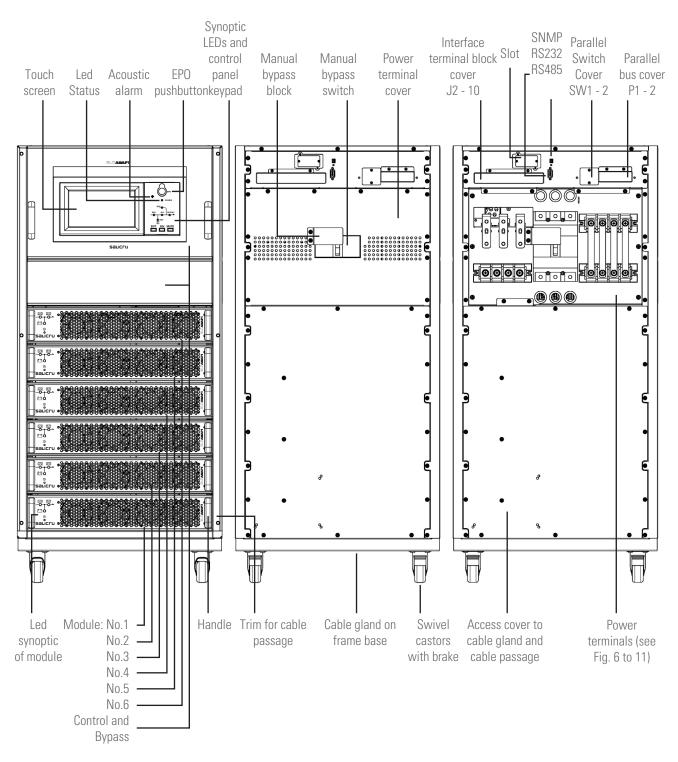
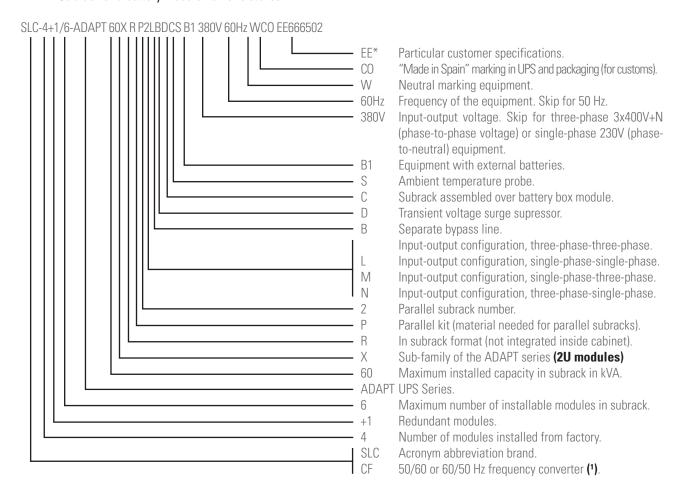


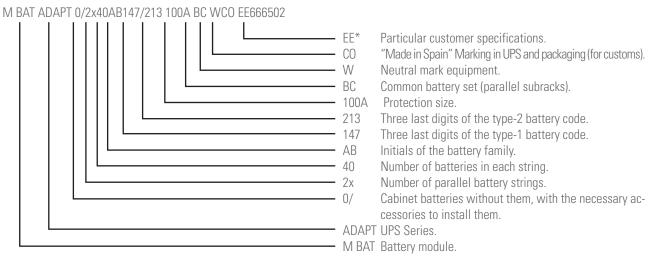
Fig. 3. Subrack model with 6 slots, to install between 1 and 6 modules.

9

#### 4.2. DEFINITION OF THE PRODUCT.

#### 4.2.1. Subrack and battery module nomenclatures.







**(B1)** The equipment is supplied without batteries and without the accessories (screws and electric cables). Predictably the batteries will be installed in an external cabinet or rack. On request, the cabinet or rack and the necessary accessories can be supplied. For an equipment ordered without batteries, their acquisition, installation and connection will always be borne by the customer and **under their responsibility**. However, our **T.S.S.** may be required to intervene in order to carry out the necessary installation and connection work.

The data concerning the batteries in terms of quantity, capacity and voltage are indicated on the battery label affixed to the side of the equipment nameplate, **strictly observe** these data and the connection polarity of the batteries.



For equipments with separate static bypass line, an isolation transformer must be installed between any of the two power lines of the UPS (rectifier input or static bypass), to avoid the direct connection of the neutral of the two lines through the internal

connection of the equipment. This applies only when the two power lines come from two different grids, such as:

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



(1) In the case of UPSs with different input and output frequencies or frequency converters, the static bypass is disabled and the manual bypass switch of the equipment must not be operated, because the input frequency and the frequency required by the load are different.

#### 4.3. GENERAL DESCRIPTION.

The SLC ADAPT X series is classified as an on-line double conversion Uninterruptible Power Supply with DSP control and three-level IGBT inverter technology, modular topology and high flexibility.

**Reliability:** The DSP control associated with three-level PWM technology extends the system efficiency and, together with module redundancy, significantly extends the mean time between failures. MTBF.

**Availability:** Its "hot-swap" modules can be added or replaced during operation, thereby improving the 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 facilitates operation. The extensive back-up options available, along with smart battery charging, ensure continuous operation of the protected critical loads.

**Flexibility:** It allows configurable solutions from 10 to 450 kVA, combining power modules of 10 and 15 kVA with the different available subracks of 2, 4 and 6 slots and the parallel of up to 5 subracks of the last one, only this last format allows its paralleling.

This enables the gradual upgrading and scaling of the power of the equipment according to the need for protection "pay as you grow", improving the total cost of ownership [TCO] and a high level of flexibility.

At the operational level it is considered as a single UPS, a subrack formed by 'N' modules or different subracks connected together in parallel.

Any expansion or structural modification in the number of modules is possible even during normal operation, without implying that the hot-swappable system should stop, all with the help

of a screwdriver used to remove or tighten the fixing screws of the module/s.

**Input-output configuration:** Originally the system can be shipped from the factory with different types of input and output or can be modified at site by our **T.S.S.** and/or distributors

It is not allowed or authorized to change the configuration by the end-user, since this involves the modification of copper rods between the power terminals by the addition or removal of them, in order to get the required configuration, moreover changes are necessary in the parameters of the access menus by "Password" through the control panel.

The possible input/output configurations are:

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

In 10 kVA modules, the output power factor 1 is kept for any of the configurations.

**Autonomy:** The capacity of the batteries determines the back up time of the system that will supply its usual source of energy during the mains failures. The battery set is always common to any module assembled in the same subrack.

Batteries, owned by the customer or supplied together with the UPS, and depending on different factors in addition to the power and/or autonomy requested, can be installed on a rack in one or more cabinets, or in the cabinet of the equipment itself when the subrack is assembled in a 19" rack cabinet.

Typology of the		Input and output	Power per	Subrack power range (kVA)			System power range (kVA)			
power	power supply		module	Number of modules per subrack			Number of subracks of 6 slots in parallel			
Input	Output	(V)	(kVA)	1 2	1 4	1 6	2	3	4	5
III	III	3x380 3x415								
I	I	(Three phases + N)	10	10 20	10 40	10 60	10 120	10 180	10 240	10 300
ı	III	220 240								
III	ı	(Phase and neutral								
III	III	-N-)	15	15 30	15 45 <sup>(1)</sup>	15 90	15 180	15 270	15 360	15 450

<sup>(1)</sup> Maximum 3 modules of 15 kVA due to the limitation of the static bypass block.

Tabla 1. SLC ADAPT X configurations and their power range.

#### 4.3.1. Introduction.

The SLC ADAPT X series UPS basically consists of:

- Subrack with 2, 4 or 6 slots to install the power modules.
- Power modules, consisting of the following blocks:
  - PCF-Rectifier-AC/DC-.
  - Battery charger.
  - Inverter -DC/AC-.
  - Digital control and UPS management.
- Centralized bypass module: control of UPS and parallel parameters.
- Maintenance bypass
- Control panel with touch screen (see section 7 for more information).
- Batteries (Quantity, type and location depending on the back-up time).

#### 4.3.2. Architecture.

### 4.3.2.1. Structural diagram.

Fig. 4 shows a single-line diagram of the equipment with three-phase input and output, as an example.

All subrack units are structured according to the same criteria, separate power supply for the PFC-rectifier and static bypass. However, unless otherwise requested, separate grids, originally from the factory will connect the terminals of the phases of both blocks by means of the copper rods in order to have a single common input.



When separate power supplies are required, it is mandatory to remove the copper rods between phases of both blocks before connecting the power cables, leaving the one for the neutral terminals.

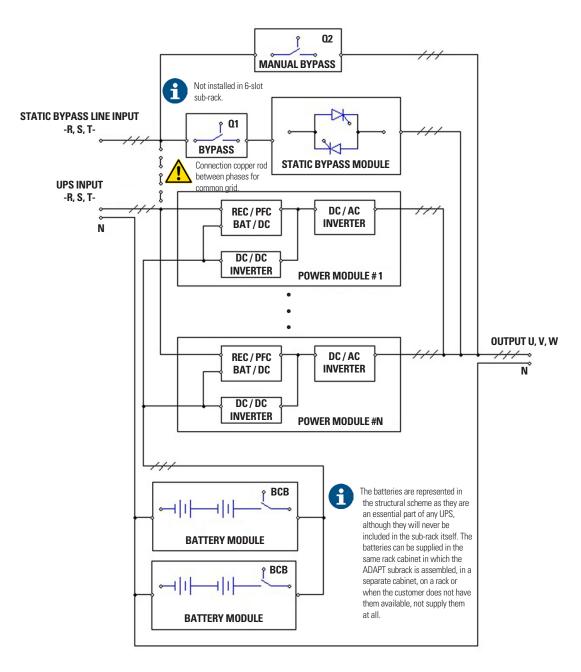


Fig. 4. Structural single-line diagram as an example.

#### 4.3.2.1.1. Power modules -PM-.

The power modules are the basic core of the SLC ADAPT X system. Apart from the static bypass block and the LCD touch screen, each power module contains all the converters and functionalities of a traditional UPS. Since this equipment is structured by a number of variable modules depending on the subrack used, a multi-parallel system is obtained with the behaviour equivalent to the stand alone 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 power outages or blackouts, sine wave flucutations, electrical noise, anomalies commonly present in the commercial AC grid.

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 it can be seen in Fig. 4, the AC power supplied to the UPS input is converted to 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. In case it fails, the PFC-Rectifier changes the input source of the AC network to the batteries, feeding similarly through the output of the UPS to the load for a limited time, the back-up time is determined by the battery set.

# 4.3.2.1.2. Static Bypass.

#### Static transfer switch.

In case 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. 4 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 fault, it will automatically transfer to the static bypass line. In order to provide a clean transfer (without no break) 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 the periods of maintenance or fault, is included and allows continuous feeding of the critical load while the UPS is out of service.

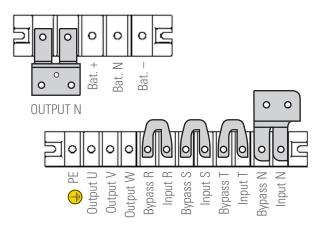


When the UPS is operating on bypass mode (over static bypass) or manual bypass mode (maintenance or repairing period), the connected loads are not protected against power outages or blackputs, overvoltages, voltage and/or frequency fluctuations, as they are directly fed from the commercial AC grid.

### Input terminals of the UPS and Static Bypass.

Fig. 5 shows the physical layout of the terminal block for the 2 and 4-slot subracks as well as the 6-slot subrack.

These illustrations show the connection copper rods between the terminals of both inputs (PFC-rectifier input and static bypass) for a common supply, usually the most common one.



Terminal block in 2-slot and 4-slot subrack.

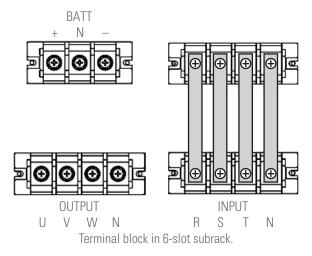


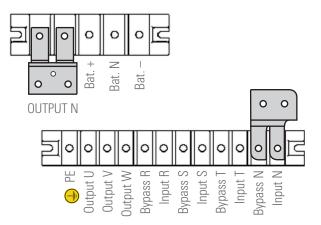
Fig. 5. Terminal block for three-phase/three-phase configuration and common input (PFC-rectifier and static bypass).

When separate AC mains are available to separately feed the PFC-rectifier and static bypass inputs, the connection copper rods between the phases must be removed depending on the available subrack model -see Fig. 6-.

In this configuration, the static bypass and maintenance bypass share the same AC source independent of the PFC-rectifier source.



Although the ADAPT X equipment is configurable in terms of type of input and output, any modification by the customer or user is restricted, since in addition to modifications in the connection copper rods, it is necessary to make settings through the password-restricted screen, exclusively reserved to **T.S.S.** or distributors.



Terminal block in 2-slot and 4-slot subrack.

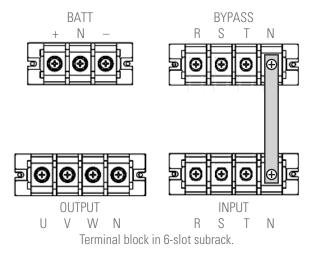


Fig. 6. Terminal block for three-phase/three-phase configuration and separate inputs (PFC-rectifier and static bypass).

The illustrations of Fig. 5 and 6 show the arrangement of the connection terminals on three-phase/three-phase input/output equipment. For other configurations see Fig. 7 to 10.

#### 4.3.2.1.3. Manual bypass switch for maintenance.

The equipment has a manual bypass switch useful for periods of preventive maintenance or repairing. This switch transfers the load power directly onto the AC input mains, allowing the intervention on the UPS without disturbing the feeding of the loads.



When the UPS is operating in bypass mode (over static bypass) or manual bypass mode (maintenance or repairing period), connected equipment is not protected against power outages or blackouts, overvoltages, voltage and/or frequency fluctuations, as they are directly fed from the commercial AC grid.

Before operating this switch it is necessary to transfer the load power over the static bypass through the respective command from the touch screen. The switching of the power mode on the static bypass and from that to the manual bypass is done without interruption in the supply of the load.



When a subrack is assembled inside a cabinet, the input, output and static bypass protections must be installed, as well as a manual bypass switch, on the front of the enclosure itself to facilitate all operations.

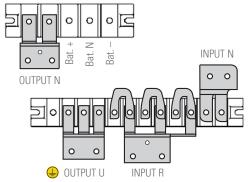
Respect the selectivity indicated in the documentation referred to in the "Recommended Installation" document downloaded from the website or supplied in the CD-ROM or Pen Drive.

Section 6.4 describes all operations related to the manual maintenance bypass.

#### 4.3.2.2. Parallel system.

#### 4.3.2.2.1. Parallel system considerations.

- All UPS modules have hardware and software that is suitable and compatible with the requirements of parallel systems
- Although all modules installed in a subrack are internally connected in parallel, the parallel connection between subracks is only possible in those of 6 slots, with their series available on the communication board for this function, having a maximum of up to 5 subracks -30 modules. The resulting power range, according to the input-output typology, and the individual power of each module, is reflected in Tab. 1.
- The hardware adjustments referring to the change of input and output configuration are reserved exclusively to the manufacturing process itself or subsequently at site process performed by the T.S.S.
- The subracks are supplied with a single power terminal and control bus connectors.
  - Depending on the power of the system the input and output connections are made by cables or against a busbar when the currents or the installation condition it.
  - Using the DB15 signal connectors, the control bus is connected in the form of a closed ring, linking the different subracks that configure the system in parallel.
  - Smart parallel logic provides maximum flexibility to the user. For example, shutting down or starting up a parallel system can be done in any sequence, through any subrack. In a parallel system as in a single subrack, transfers between Normal and Bypass modes and vice versa are synchronized. For example, once an overload of a parallel system is detected and processed, it is automatically transferred to Bypass. If the overload disappears, the parallel system automatically recovers the normal operation, transferring the load from Static Bypass to the Inverter.
- Usually the sizing of a parallel system is based on the power required by the loads, plus the modules in redundancy that are estimated with the expression N+n; where "N" is the number of modules in parallel in order to obtain the required nominal power and "n" is the number of redundant equipments.
  - Beyond this planned over-sizing, all the modules are operated by load sharing, delivering the same power to get the total amount required, which implies a lower efficiency than desired.



Terminal block in 2-slot and 4-slot subrack.

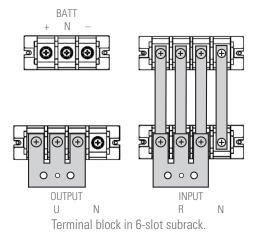
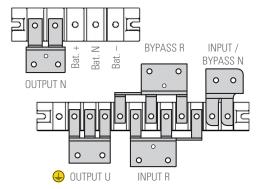


Fig. 7. Single-phase/single-phase configuration and common input.



Terminal block in 2-slot and 4-slot subrack.

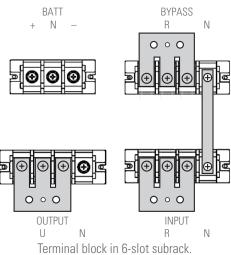
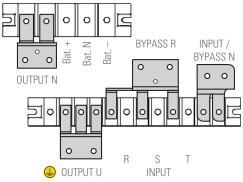


Fig. 8. Single-phase/single-phase configuration and separate inputs.



Terminal block in 2-slot and 4-slot subrack.

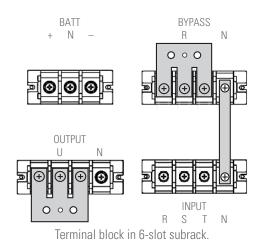
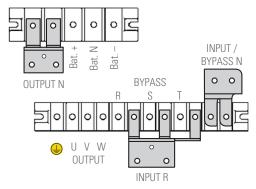


Fig. 9. Three-phase/single-phase configuration and separate inputs.



Terminal block in 2-slot and 4-slot subrack.

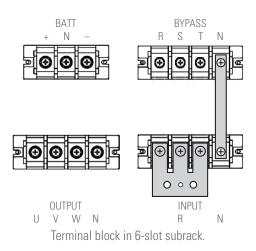
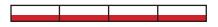


Fig. 10. Single-phase/three-phase configuration and separate inputs.

In order to solve this problem and increase the efficiency of the system, one of the two sleep modes can be activated from factory or subsequently by the **T.S.S.**:

- □ Smart Sleep. This advanced technology applied to the UPS ADAPT series, allows you to look for the point of maximum efficiency, even when working with small loads. This is achieved by activating one of the two possible modes, although each has a different purpose:
  - Normal Sleep mode. The inverter of the modules with the option activated is in standby, with its output disconnected from the load. The time for them to finish operating is a few seconds.
  - Deep Sleep mode. All the power converters of the modules with the option activated are completely off and the output is disconnected from the load. The time for them to finish operating is a few minutes.
- □ In addition to this and to get the same ageing of all the modules, a cycling function is available. This consists of alternating the stopped modules with those that are running. The minimum programmable cycling period is three months.

Distribution of the load in normal operation.



Distribution of loads and cycling of the UPS.

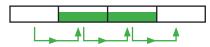


Fig. 11. Graphic example of normal operation or cycling modes.

### 4.3.2.2.2. Features of the parallel system

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

- 1. All UPSs must be identical.
- 2. Must be powered by the same AC line.
- **3.** In case of equipment with separate bypass line, the power supply grid will be the same for all of them.
- **4.** Both power supplies, points 2 and 3, must be referenced to the same neutral potential.
  - Isolation transformers are optionally available for installations where both sources do not share the same neutral reference or where it is not available.

# 4.3.3. Operating modes.

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

- Normal mode.
- Battery mode.
- Auto-start mode (automatic start).
- Bypass Mode.

- Manual bypass mode (maintenance bypass).
- Parallel-Redundant Mode
- FCO 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 modules connected in parallel there are.

#### 4.3.3.1. Normal mode.

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

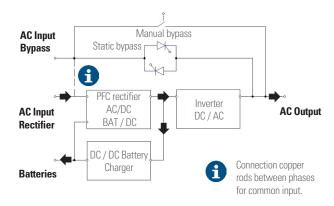


Fig. 12. Flowchart in Normal Mode.

#### 4.3.3.2. Battery mode.

This mode is activated in the event of any fault in the AC mains, in which the PFC-rectifier switches its AC mains input power to the battery. The inverter, powered from the batteries, supplies power to the critical load. This automatic transition from "Normal Mode" to "Battery Mode" is performed with no break in the output voltage.

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

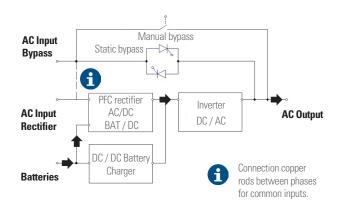


Fig. 13. Flowchart in Battery Mode.

#### 4.3.3.3. Auto-start mode (automatic start).

If there is a failure of the AC input power for an extended period of time, the battery may reach the end of discharge -EOD- and the inverter switches off. If the "Auto Recovery after EOD" (factory preset) UPS setting is set, the device will restart after the the AC power is restored.

#### 4.3.3.4. Bypass mode.

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

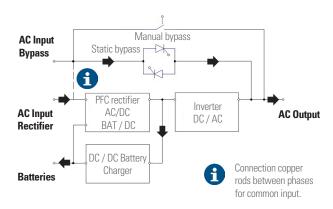


Fig. 14. Flowchart in Bypass mode.

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

# 4.3.3.5. 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 display 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 repairing period), the connected equipment is not protected against power outages or blackouts, overvoltages, voltage and/or frequency fluctuations, ... when are directly fed from the commercial AC grid.



#### DANGER:

During Manual Bypass Mode, the input, output and bypass terminals [version B] are under potential, although all modules are 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 of them until you remove them 4-5 cm from the socket, in order to remove them from the connector on the backplane of the equipment.

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

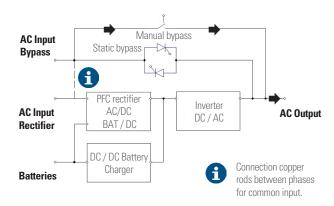


Fig. 15. Flowchart in Manual bypass mode (maintenance bypass).

#### 4.3.3.6. Parallel-Redundant Mode.

This operating mode allows to obtain a greater capacity, reliability or both, being able to be configured like upgrading of power or like redundancy.

In addition in the subracks of 6 slots can be configured in parallel up to 5 subracks. The controller included in each one guarantees the automatic sharing of the load in all of them and in all its modules.

### 4.3.3.7. ECO mode.

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



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

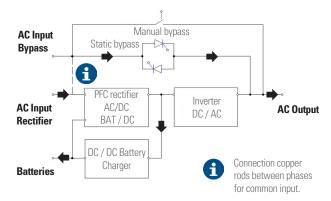


Fig. 16. Flowchart in ECO mode.

### 4.3.4. Battery management (factory preset settings).

#### 4.3.4.1. Basic functions.

Charging at constant current.

The charge current of the battery responds to the formula of  $\underline{I}_{ch} = 0.2 \times \underline{C}$ 

The UPS is designed to provide 100% of its nominal power to the load and additionally has a unique reserve power to charge the batteries that can be set between 0 and 20% of the rated power of the UPS, depending on the capacity of the batteries and the charging current.

• Fast charging at constant current.

This voltage can be set according to the requirements of the battery type. For example, for valve-regulated lead-acid batteries -VRLA-, the maximum fast charge voltage should not exceed 2.4 V / cell.

Floating load.

The floating voltage can be set to the type of batteries. For batteries -VRLA-, the floating voltage must be between 2.2 V and 2.3 V. By default it is set to 2.25 V.

Compensation of the floating voltage according to temperature

The compensation value of this voltage can be set according to the temperature and type of batteries. To do this, it is necessary to install the supplied temperature sensor in the battery cabinet. The compensation range is 0 to 5 mV /  $^{\circ}\text{C}$  and the default value is 3 mV /  $^{\circ}\text{C}$ .

Protection of the battery by end of discharge -EOD-.
 If the battery voltage is lower than the value set as end of discharge voltage -EOD-, the battery voltage converter BAT / DC will turn off and the batteries will be disconnected to avoid a deep discharge that could be destructive. The value is adjustable between 1.6 to 1.75 V / cell -VRLA-.

#### 4.3.4.2. Advanced functions.

- Two battery-related tests can be performed as long as there are no alarms or warnings on the UPS.
  - Battery test:
    - Transfer the system to the battery mode for 20 seconds to test its correct status.
  - Maintenance of batteries:
    - Transfer system to "Batteries Mode" up to the voltage value -1.05 x EOD voltage of the battery pack.

- The minimum conditions for running the battery test are as follows:
  - ☐ The battery voltage should be greater than 90% of the floating voltage.
  - Minimum load of 25 to 100% of the nominal capacity of the UPS.
  - Executable in one of two ways:
    - Manually. Using the Battery Maintenance Test command on the LCD panel
    - Automatically. By enabling the Auto-Test with the self-test interval setting (configurable from 720 to 3000 hours).

#### 4.3.4.3. Protection of batteries.

Low battery alarm.

The low battery alarm is activated prior to the end of discharge -EOD- alarm. When activated it has about minutes of autonomy at full load.

• End of discharge protection -EOD-.

When the battery voltage reaches this minimum value, the battery block is disconnected to avoid the deep discharge that could irreversibly damage them. There are two voltage levels of end of discharge and the actual is calculated by interpolating the following two values:

- -EDO- Voltage / Cell @ 0.6 C Discharge current. By default 1.65 V / cell.
- -EDO- Voltage / Cell @ 0.15 C Discharge current. By default 1.75 V / Cell)

The end of discharge voltage values are factory configurable from 1.6 to 1.75 V / cell.

• Battery protection disconnect alarm -MCB-.

This alarm will be available when using the mechanism provided for the external batteries, a circuit breaker -MCB-with shunt trip release voltage connected to the control circuit of the UPS. The alarm will be activated if the battery protection -MCB- is switched off.

Activation and deactivation of this protection is done through the EPO button on the control panel or remote EPO.

# 5. INSTALLATION.

- Read and respect the Safety Information, described in section 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 faults in the equipment and/or loads connected to it.
- In addition to the user manual itself and the safety instructions, other documents are available on the Website, on the CD-ROM or the Pen Drive, referred to as "Recommended installation". Consult and use them as a guide to define the sections and protections of the installation.
- This section introduces the relevant requirements for locating and wiring the SLC ADAPT X modular UPS. Because each site has its particularities of location and installation, it is not the purpose of this section to provide precise step-by-step instructions, rather it should be used as a guide for general procedures and practices to be observed by qualified personnel (figure recognized and defined in safety instructions EK266\*08).

#### 5.1. RECEPTION.

- All subracks are supplied on wood pallet mechanically attached to it, with a cardboard packaging or protection wood according to model. While the risk of dump is minimized, it will be handled with caution, especially for subracks with 6 slots because of their greater height and when there is slope.
  - It is dangerous to manipulate the equipment on the pallet in an unwise way, as it could overturn and cause serious or very serious injury to the operators as a result of the impact due to possible fall 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 location of the unit.
- Use the most suitable means to move the UPS while it is packed, with a transpalet or forklift.
- Any manipulation of the equipment will be done according to the weights indicated in the section «9. Annexes» in the technical specifications according to model.

#### 5.1.1. Reception, unpacking and contents.

- · Reception. Check that:
  - ☐ The data on the label affixed to the packaging correspond to those specified in the order. Once the UPS is unpacked, check the previous data with those of the equipment nameplate.
    - If there are discrepancies, file the disagreement as soon as possible, quoting the equipment serial number and the delivery note references.
  - It has not suffered any mishaps during transportation (packaging and impact indicator in perfect condition).
     Otherwise, follow the protocol indicated on the label attached to the impact indicator, located on the packaging.
- Unpacking.
  - ☐ To check the contents it is necessary to remove the packaging.
    - **a**

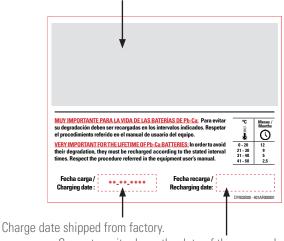
Complete the unpacking according to the procedure of section 5.1.3.

- Content.
  - ☐ The equipment itself.
  - Documentation of the equipment in computer support CD-ROM or Pen Drive. In default download from the Web.
- 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.

- Equipment 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 equipment in its original packaging as it has been specifically designed to ensure maximum protection during transport and storage.
- Do not store the devices where the ambient temperature exceeds the thresholds given in section 'Annexes'.
- When a battery pack is supplied with the subrack of the UPS, either in a cabinet, loose to be installed in a cabinet of its property, to be installed on a rack or in any other way and not installed together immediately, it will be stored in a cool, dry and ventilated place, at a controlled temperature 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. 17).

Data label corresponding to the model.



Space to write down the date of the new recharge.

Fig. 17. Label on the packaging of the battery pack.

- After the period of time, connect the batteries with the equipment and this to the mains following the safety and connection instructions.
- ☐ Proceed to commissioning. See Section 6.
- ☐ Leave it in this mode for at least 12 hours.
- Once the battery recharging is completed proceed to stop the equipment, disconnect it electrically and save the UPS and the batteries in their original packaging,

- noting the new date of recharge of the batteries in the field of the label see Fig. 17.
- ☐ Units that are part of a parallel system will be treated as individual equipment for battery recharging and therefore no additional connection is required.

#### 5.1.3. Unpacking.

 The packaging of the equipment consists of wooden pallet, carton or wood enclosure 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.

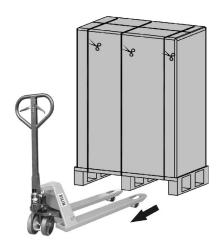


Fig. 18. Example of transfer of packed ADAPT X with pallet jack.

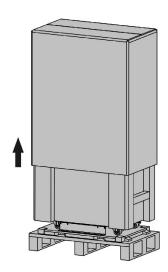


Fig. 19. Example of removal of carton enclosure.

To unpack the equipment, cut the straps of the carton enclosure and remove it as if it were a cover (see Fig. 18 and 19) or disassemble it with the necessary tools if the casing is made of wood; remove the corners and the plastic sheath and the UPS will be naked on the pallet. The Figs. 18 to 20 shows the 6-slot subrack as an example.

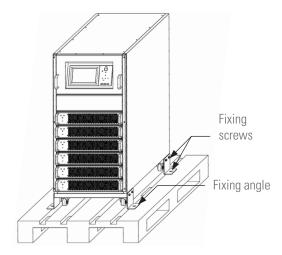


Fig. 20. Equipment unpacked as an example on pallet.

- Remove the screws and/or the fixing angles, indicated in Fig. 20.
- With the help of one or two people on each side, download it from the wooden pallet. Pay special attention to the subrack with 6 slots, as incorporating castors could fall from the pallet and cause an accident, beyond the material damage itself.

### 5.1.4. Transport to the site.

- If the receiving area is far from the installation site, it is recommended to move the ADAPT X using a pallet truck or other suitable means of transport, assessing the distance between the two points, the weight of the unit, the characteristics of the passageway and site (floor type, floor resistance kg/m²,...).
- The 6-slot subracks incorporate four castors (with mechanical locking), so it is easy to move it to the installation site once unpacked.
- However, when the distance is considerable, it is recommended to move the packaged equipment to the immediate vicinity of the installation site and its subsequent unpacking.

#### 5.2. LOCATION.

#### 5.2.1. Location of the ADAPT X.

- The following premises will be taken into account when locating a modular UPS ADAPT X, as this is a safety equipment in terms of power and not to prevent or invalidate its own role:
  - □ Not suitable for outdoor installation. Protection degree by default IP20.
  - ☐ The location will be in a ventilated room, controlled temperature and humidity to keep the equipment in the environmental parameters within the specified operating range. The cooling capacity of the air conditioner will be selected according to the heat losses of the UPS and other equipment that can cohabit in the same room.
  - ☐ The room will have adequate filters to prevent dusty or lint-free environments from contaminating the

equipment and adversely affect its proper operation or generate as a direct or indirect fire with a strict preventive maintenance control.

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

- ☐ The modules are equipped with three internal speed regulated fans. The air flow is channeled from the front to the rear. Do not block the cooling holes or obstruct the air flow.
  - The subrack modules allow full integration into a rack cabinet without cooling grids on the side.
- ☐ To allow comfortable operation of personnel, it is recommended to leave a free space on the front of 1 m that allows loosely open the door of a rack cabinet and facilitate the operations of removal or installation of additional modules.
  - It is necessary to leave a minimum of 50 cm in the back for free circulation of cooling air exhausted by the fans.
- ☐ When the conditions of the room are extreme, it will be necessary to install an external cooling system to force the cooling air flow.
- ☐ The acoustic level of the cooling system is high and invalidates the equipment to install it in the same room where office personnel work.
- Only intended for mounting on concrete or other noncombustible surface.
- ☐ For the battery cabinets supplied by our brand, the battery trays are extracted frontally. Leave a free space on the front of 1 m for the installation of batteries and preventive maintenance.
- ☐ In general comply with all the conditions indicated in the safety instructions (document EK266\*08).

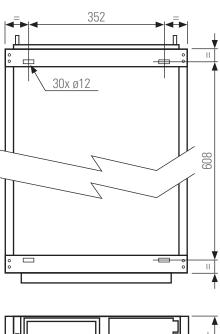
#### 5.2.2. Room for the batteries.

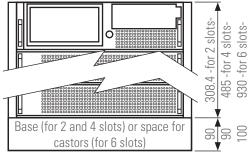
- The batteries generate quantity of hydrogen and oxygen during the charging process, reason why it is indispensable condition to have a good air flow of the room.
- The stability and ambient temperature of the room where the battery is located is an important factor that determines the capacity to store the energy during the chemical process that occurs during the charge. In the same way, these factors influence the reverse chemical process that occurs in the discharge in the event of an energy demand and that they have a significant effect on shortening the useful life of the same.

The nominal operating temperature of a battery is 20°C. Operating above this temperature will reduce its duration or life and operating below it will reduce its storage capacity. If the average operating temperature of the battery increases from 20°C to 30°C, the service life will be reduced by 50%. If the operating temperature exceeds 40°C, the service life will be reduced exponentially.

- In a normal installation, the battery temperature is maintained between 15 and 25°C. Keep batteries away from heat sources or air intakes.
- When external batteries are used, the protections (fuses or circuit breakers) should be mounted as close as possible to the batteries and their connecting cables between them and the UPS should be as short as possible.

#### 5.2.3. Physical location.





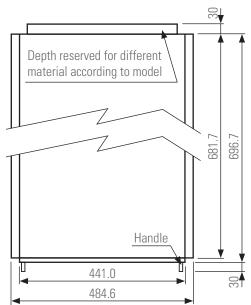


Fig. 21. Maximum subrack dimensions and fixing points.

Initially the subracks of 2 and 4 slots are equipment designed to be integrated in a rack type cabinet.

Although they can be used as desktop equipment, it is necessary to fix them to a solid surface through the holes in the base (see Fig. 21), respecting compliance with the regulation stating "Only intended for mounting on concrete or other noncombustible surface" and considering the following premise:

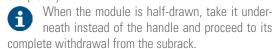


Do not leave the equipment at ground level as it is usually the area with the highest solid elements in suspension and through the permanent forced cooling itself penetrate inside causing short or long term breakdowns of all kinds.

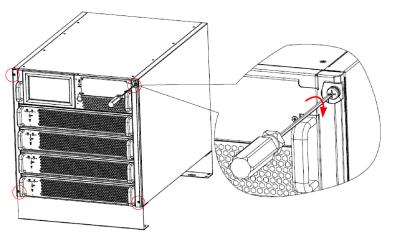
For obvious reasons, this location is more prone to risk factors such as falling of liquids on the equipment, unintentional impacts, obstruction of the ventilation grids by materials placed in front of the equipment, ..., which can lead to serious or very serious damages. And also leaves the control panel in a plane or inconspicuous position.

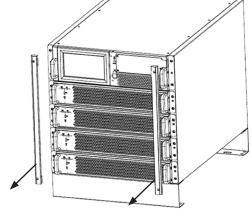
- With regard to the subrack of 6 slots, although it can be integrated in a rack type cabinet, the structure itself is designed to operate as an equipment. This subrack has castors with mechanical lock for immobilization.
- In subrack equipment intended for installation inside a rack cabinet, the following actions will be performed according to the model for adaptation. Consider that the illustrations in Fig. 22, although they belong to the subracks of 4 slots except some punctual for those of 6 slots, are taken as representative of the whole range:

- Remove the two fixing screws from one of the side trim and the trim itself.
- **b.** Operate as in point **a.** with the other trim.
- **c.** Remove all the fixing screws of the modules leaving the fixing of the bypass module with the control panel.
- d. Using the two handles located on the sides, pull the module on the top of the subrack until it is unplugged from the connector on the backplane. Do not remove it completely.

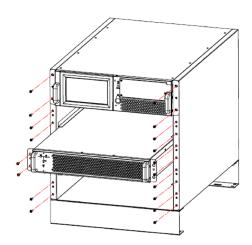


The removal of modules will always be initiated by the one located at the top of the subrack, in order to keep the center of gravity as low as possible.

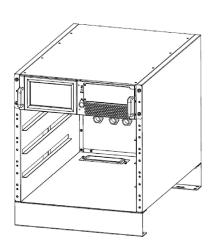




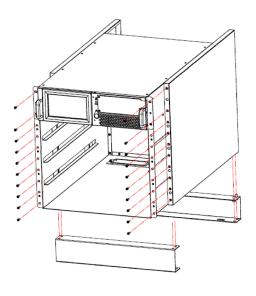


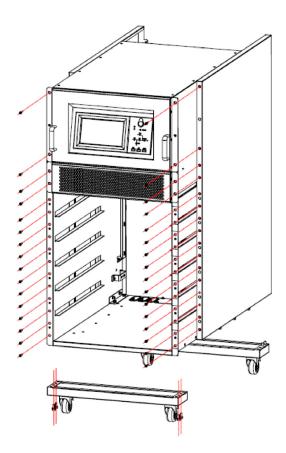


c - d - e



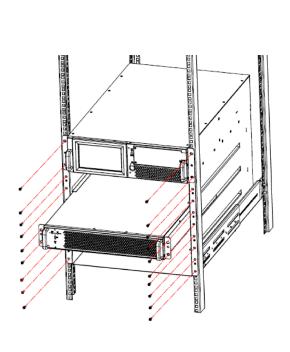
**e.** When more modules are available, operate as at point **d.** for the extraction of the remaining ones, continuing for the one located at the highest point of the subrack.

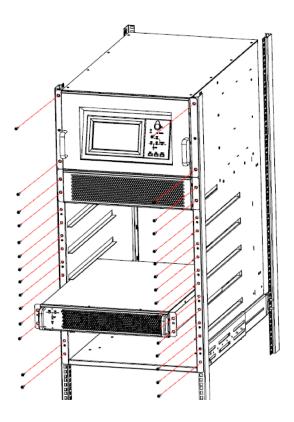




f - g

Fig. 22. Previous steps for the installation of the subrack in rack cabinet.





h- i

Fig. 23. Installation of subrack in rack cabinet.

- **f.** Remove the fastening screws of the side covers, both front and rear and the fixing brackets of the sockets in the models of 2 and 4 slots or the set of supports with the castors in the 6 slots.
- **g.** Remove the side covers and the brackets or supports with the castors.
- **h.** Install the support rails or lateral angles in the rack cabinet on which the subrack will be installed, place the subrack on them and fix them. A simulation of how it will look will be shown in Fig. 23.
- i. Place all the modules, starting with the lowest one in the subrack until they are connected to the corresponding slot on the bottom of the backplane and fastened with the screws.
  - In any subracks system the module below is assigned as No. 1, in addition to keeping the centre of gravity lower and stable.
- j. Place the trim on the left side, facing the device frontally.
  - The trim of the opposite side will be placed at the end of the connection, since the channel that generates the trim itself is used to pass the dry contact signals, see Fig. 28.
- k. The mounting of the terminal protection cover of the subrack on its rear side can be removed and omitted, since the cabinet will have the corresponding rear cover.
- Any mechanization for the adaptation of the subrack in the rack cabinet is always carried out before installing the modules, thoroughly cleaning the metal shavings that may be generated during the operations.
- The mounting of the terminal protection cover of the subrack on its rear side can be removed and omitted, as the rack cabinet by means of its covers will completely close the perimeter of the first one.

In any case, the front door and the back cover will have the necessary ventilation grids.

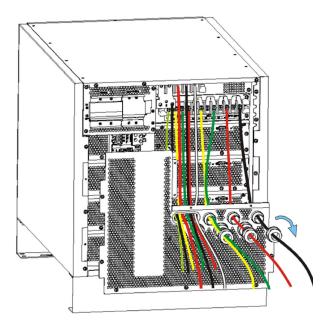


Fig. 24. Cable entry in subrack of 2 and/or 4 slots through means in rear cover.

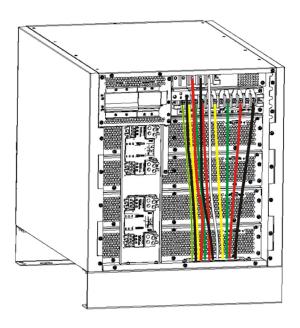


Fig. 25. Cable entry in subrack of 2 and/or 4 slots through the base.

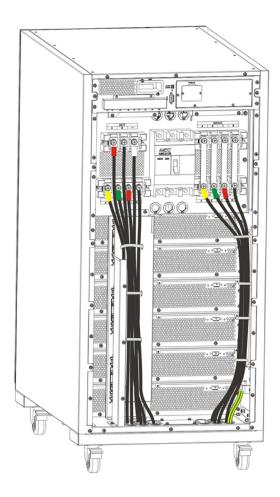


Fig. 26. Cable entry in subrack of 6 slots through the base.

#### 5.3. ENTRY OF THE CONNECTION CABLES.

The 2-slot and 4-slot subracks have a cable gland in the terminal protection cover and an elliptical hole behind a metal part as a cover. Any one of them is valid for the passage

of the connection cables, as it avoids the entry of foreign materials and vermin into the enclosure -see Fig. 24-.

If any of these means is not enough or another mode is preferred, at the base of the subrack there is a mechanized cover at the user's discretion and in which it can be fitted with larger cable glands than those ones provided -see Fig.

The 6-slot subracks have two elliptical holes in the base of the subrack -see Fig 26-. Make the necessary cuts that allow the passage of cables.

On the same base and between the two elliptical holes there is a metal plate that can be extracted and mechanized for the assembly of cable glands.

It is imperative to fix the cables to the points provided as shown in Fig. 26, so as do not obstruct the air cooling outlet.

### 5.4. PROTECTIVE DEVICES AND CROSS SECTION OF THE CONNECTION CABLES.

#### 5.4.1. Input, bypass and output.

- The subracks do not incorporate protections, nor switches to operate by the user, except a manual bypass switch in the rear side of the equipment.
  - In addition, models with 2 and 4 slots have a static bypass circuit breaker switch on the rear side, but should be considered as internal protection.
- Protection or external manual bypass panel:
  - ☐ It is necessary to have an external protection panel provided with the switches of input, output, and static bypass (the last one on models with separate bypass line only).
    - In addition it is highly recommended to include a manual bypass switch to facilitate preventive maintenance or repairing operations, so we will refer to it as a manual bypass panel instead of a protection panel.
  - ☐ For parallel systems of 6-slot subracks, it is essential to have a manual bypass panel. The panel switches must allow a subrack to be isolated from the set of systems in parallel in the event of any anomaly and to feed the loads with the rest, either during preventive maintenance or during the failure and repair of some of them.
- On request we can supply an external protection panel or manual bypass panel for a single unit or a manual bypass panel for a parallel system.
  - You can also choose to manufacture it, depending on the version and configuration of the equipment or system available and the documentation downloaded from the Website or attached on the CD-ROM or Pen Drive related to the "Recommended installation".
- On the nameplate of the subrack you can check all the values referring to the main characteristics related to the equipment. However, the currents indicated correspond to the higher power model manufactured in that subrack at the same voltage and configuration of the input and output. That is, considering that it incorporates all the modules for which it has capacity.
- In the documentation downloaded from the website or supplied with the CD-ROM or Pen Drive, the user manual, the EK266\*08 safety instructions and the informa-

tion on the "Recommended installation", technical data and single-line diagrams on the connection of the system to the installation, are also available.

These data are useful for determining the minimum protections and cross cable sections to be installed at the input and output of the ADAPT X, taking into account their nominal voltage, input-output configuration and the number of modules installed in parallel in the subrack.



It is possible to opt for any of the two solutions in relation to the size of the panel protections:

- **a.** Protections size according to the power installed in the subrack. For future upgrading will require the updating of the sizes when the protection is adjusted to the installation.
- **b.** Protections size considering maximum upgrading power or up to where future scaling extension is envisaged. This option is the most economically beneficial if future expansions are envisaged.

It is recommended that the cross cable section of the panel be suitable for option "b.".

In order to determine the particular technical features of the system in the respective table of specifications, only the number of modules working in parallel will be taken into account, but not those ones that operate in redundant. Pay attention to the notes indicated in the tables and that are conditioning to determine the respective data provided, although the installer will be responsible for defining the particularities of the installation (cross cble sections, protections size, ...), since it is the person who has all the information regarding the system's location environment.

All values given in the tables are calculated for a maximum total cable length of 30 m between the distribution panel, equipment and loads.

- ☐ For longer lengths correct the cross sections to avoid voltage drops, respecting the regulations or standards corresponding to the country.
- ☐ In the same documentation and for each configuration, the information for «N» units in parallel (in 6-slot subrack), as well as the characteristics of «Backfeed protection» is available.
- In parallel systems, the length and cross section of the cables from the protection panel to each UPS and from the UPS to the panel will be the same for all of them without exception.
- The cross section of the cables must always be considered in relation to the size of the terminals of the power block and/or switches, so that they are correctly fastened in their entire section for optimum contact between the two elements.
- Only rated currents are printed on the nameplate of the equipment as indicated by the EN-IEC 62040-1 safety standard. For the calculation of the input current, the power factor and the equipment's own performance have been considered.
- If peripheral input, output or bypass elements such as transformers or autotransformers are added to the UPS or parallel system, the currents indicated on the nameplates of these elements must be considered in order to use the appropriate sections, in compliance with the local and/or national Low Voltage Electrotechnical Regulation.
- When a galvanic isolation transformer is added to an UPS

or parallel system as an option, as standard or installed on its own account, either on the input line, on the bypass line, on the output or in all of them, they must be fitted with protection against indirect contacts (earth leakage breaker; RCD) at the output of each transformer, since due to its own isolation feature it will prevent the tripping of the protections placed in the primary winding of the transformer in case of electric shock in the secondary winding (output of the isolation transformer).

- We remind you that all the isolation transformers installed or factory supplied, have the output neutral grounded through a bridge between the neutral terminal and ground. If the isolated output neutral is required, this bridge must be removed, taking the precautions indicated in the respective local and/or national low voltage regulations.
- For the passage of cables to the interior of the subrack, there are cable glands mounted on the metal structure, in addition a blind plate mechanized at the user's discretion.
- In case of installation in neutral IT mode, the switches and circuit breakers protection must cut the NEUTRAL in addition to the three phases.

#### 5.4.2. Battery installation and maintenance.

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

#### 5.4.2.1. General recommendations.

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

be replaced, stored in a sulfuric acid resistant container and disposed of in accordance with applicable laws.

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

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

## □ In your installation.

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

nals of the battery to external mechanical stresses of tension or twisting, as they can damage their internal connection and in very serious cases ignite.

 The connection diagram of the batteries is shown in Fig. 27.

### Precautions in connection.

- The operations referred to the connection between batteries that configure the battery block are reserved to our **T.S.S.** or in its defect to the distributor, reason why they are not treated in the user documentation.
  - For those cabinets where user-owned batteries are installed, the operations will be carried out and/ or supervised by **qualified** personnel under their responsibility.
- Check that the battery is not connected or grounded, as it may cause an electric shock. Otherwise disconnect the electrical connection.
- The battery pack can be configured to 32, 36, 40 and 44 12V elements and it is set at the factory with the number of cells according to the battery set supplied or the number of items requested when the batteries are owned by the user. If not, 32 elements [16 + 16] will be calibrated, with an information label for the user.
- The connection of the battery pack to the UPS will be done before connecting the equipment to the AC mains or with the load.
- DANGER, POTENTIAL OF LETHAL BATTERIES. Pay attention when handling the battery connection cables and all parts associated with them. Terminal block battery voltage greater than 400 V DC.
- Inside the battery cabinet there are accessible parts with HAZARDOUS VOLTAGE and consequently risk of electric shock, so they are classified as RESTRICTED ACCESS AREAS. Therefore the key of the battery cabinet will not be available to the OPERATOR or USER, unless it has been properly instructed or is a qualified person. This cataloging is applicable to battery rooms, regardless of whether they can be installed or not on a rack.
- Do not operate the battery switches until indicated.
- The protection of batteries will always be carried out at least with fuses and their physical arrangement will be conditioned to the tangible location of the batteries themselves.

The following are the different assemblies made by our firm and the location of the battery protection for each case, which is necessary for the operations of running and stopping the assembly:

- a. Batteries integrated in the same cabinet as the equipment or in its homologous version of "0/" and "/" in which space is reserved to include them.
- **b.** Batteries installed or planned to be installed partly in the own cabinet of the UPS and the rest in another cabinet or other cabinets or rack.
- c. Batteries installed in one or more independent cabinets, depending on the requested support

- time or "0/" and "/" versions, in which their backup configuration reserves the necessary space for the location of the batteries.
- As a result of the arrangement of the batteries, the switch and/or the respective protection shall be arranged as follows and identified in the illustrations in document EL096\*00 according to each case as: Assemblies type 'a.'.
  - **1.** Battery disconnect switch, identified as **(Q3)**. Assemblies type **'b.'** and **'c.'**.
  - **1.** In UPS cabinet. Battery disconnect switch, identified as **(Q3)**.
  - **2.** In every battery cabinet. Depending on protection size:

Battery fuse-holder switch with 3 fuses, referenced as **(F3)**.

Or battery disconnect switch, identified as **(08)** and three internal fuses not accessible to the user.

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

Any modification (extension or reduction of installed modules) will necessarily involve the **revision and/or adaptation** of the installation (cross sections, protection sizes, ...).

- ☐ In the same way, it is recommended to enlarge the battery pack in case of power upgrading to maintain the back-up time as much as possible.
- ☐ The original factory battery circuit is open.



Operate the switch and/or place the fuses in the corresponding fuse holder switch and operate to "ON" only when indicated, not before. Failure to do so may cause irreversible damage to the equipment or serious and/or very serious accident to the installer by exposing it to a possible electric shock during the connection of the UPS to the battery pack or to the battery cabinet.

Do not operate the battery fuse holder switch and/ or the disconnect switch when the equipment is run-

In assemblies made by our firm, these mechanisms **are not load break type switches**.

When a equipment or the parallel system is expected to be out of service for an extended period of time, the complete shutdown must be carried out beforehand and the 3 fuses of the fuse holder switch of the equipment or the battery module are removed for safety and stored in a safe place.

# 5.4.3. Access to the interior of the subrack for its connection.

- All subrack units in the SLC ADAPT X series have the following connection elements:
  - ☐ Terminal block for power. Depending on the type of the input and output, some terminal strips are supplied between terminals to obtain the required configuration (see Fig. 6, 7 and 8).
  - Separate terminal block connectors for digital inputs and dry contacts signals.
  - Terminal block connector for RS485.
  - □ DB9 connector for RS232.
  - Slot ready to integrate the SNMP card.
  - ☐ The 6-slot subracks also have HDB15 / DB15 connectors for the parallel bus.
- All power connection terminals (input, output and batteries) are located on the back of the subracks, behind a protective cover. Only T.S.S. personnel or qualified personnel are authorized to remove these covers for connection.
  - Do not remove more covers than indicated. Access to other internal parts is reserved exclusively for **T.S.S.**
- The dry contacts connectors are arranged in:
  - 2-slot and 4-slot subracks. On the front of the UPS, behind the metal cover located next to the control panel.
  - G-slot subracks. On the back of the UPS, behind a metal protective cover.
- Consider the cross section of the cables and crimped terminals at their ends, in relation to the surface and size of the terminals, to obtain optimum contact between them.
- At the end of the wiring tasks, the equipment must be fitted with the corresponding covers firmly attached. This includes the right lateral frontal profile, used as a channel for the passage of the interface cables and related at the point 'j.' of section 5.2.3.

### 5.5. CONNECTION.

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

Do not apply power to the equipment before the first commissioning.

- This equipment is suitable for installation in networks with power distribution system TT, TN-S, TN-C or IT, taking into account at the time of installation the particularities of the system used and the national electrical regulation of the destination country.
- In equipment with three-phase input will feed the system with 4 wires (3 phases and Neutral), being essential the neutral in the power of all three-phase system

Optionally we can supply an isolation transformer to generate the neutral, in those mains supply that do not have it. Only in single-phase equipments and in compliance with the nominal supply voltage of the equipment, it is possible to dispense with the neutral and to replace it with another phase in its absence. In this case and in equipment with

- independent bypass line, as in any equipment, respect the rotation of the phases when connecting the input and bypass, using the same pair of phases in both inputs.
- In equipments with three-phase input connected to an ITtype power distribution system, breakers, differentials and circuit breaker protections must cut the NEUTRAL in addition to the three phases.
- All the connections of the equipment including the control ones will be done with all the switches at rest position and with no power supply (power supply line switch of the equipment in «Off» position).
- Do not connect ADAPT X devices in parallel with different firmware versions, settings and/or back-up times. Follow all instructions for connecting up to 5 subracks in parallel (6-slot subracks only).
- The tightening torques of the screw terminals are as follows:
  - ☐ For screw with M6 thread, tightening torque of 5Nm.
  - ☐ For screw with M8 thread, tightening torque of 13Nm.
  - ☐ For screw with M10 thread, tightening torque of 25Nm.
- The parallel connection of 6-slot subracks will be carried out as described in sections 5.5.1 to 5.5.5 and for each one of them, and is subject to having its manual bypass panel for both the installation procedure, start-up and future maintenance.

### 5.5.1. Connecting the device to the mains.

- As it is an equipment with protection against class I electrical shock, it is essential to install the protective earth conductor to the terminal identified as . Connect this conductor before supplying voltage to the input terminals.
- In accordance with the safety standard EN-IEC 62040-1, in equipments without independent bypass line, the installation must be equipped with an automatic backfeed protection system, such as a contactor, which prevents the occurrence voltage or hazardous energy on the UPS input line during a mains failure.

The standard is applicable regardless of whether the power supply is single-phase or three-phase, and for individual units of subracks as well as for each of the UPS subracks of a parallel system.

All values are calculated for a maximum total cable length of 30 m between the distribution board, equipment and loads.

- There can be no derivation of the line from the Backfeed protection to the UPS, since the safety standard will not be complied with.
- Warning labels shall be affixed to all primary power switches installed in areas remote from the equipment to alert electrical maintenance personnel of the presence of a UPS in the circuit.

The label shall bear the following text or an equivalent:

### Before working on the circuit.

- Isolate the Uninterruptible Power Supply (UPS).
- Check the voltage between all terminals, including the protective earth.



#### Backfeed voltage risk of the UPS.

Connect the input cables to the respective terminals according to the configuration of the available equipment, considering the illustrations in Fig. 5 to 10 in terms of the connection points of the cables.

# □ Connection to a three-phase input network:

Connect the RSTN power cables to the input terminals, respecting the rotation of the phases and the neutral indicated in the labeling of the equipment and in this manual. If the phase rotation is not respected the equipment will not work.

It is essential to connect the input neutral

### □ Connection to a single-phase input network:

Connect the RN power cables to the input terminals, respecting the rotation of the phases and the neutral indicated in the labeling of the equipment and in this manual. Failure to observe the phase and neutral rotation will cause serious damage to the equipment.

Where there are discrepancies between the labeling and the instructions in this manual, labeling shall always prevail

For systems in parallel, it will be necessary to repeat the connections that go from the panel to each equipment.

- Generally, the equipment is supplied ready for supplying through a single terminal block (common power for the rectifier and for the static bypass line). However, when both functional blocks are fed through two independent lines, it will be mandatory to remove the bars or copper rods that connect the terminals of the respective phases and leave the connecting bar or plate between the two neutral terminals.
- The input neutral for the rectifier supply and the input neutral for the bypass line supply must be the same. In any case, consider that in the equipment both will be united through the bar or plate that joins the two terminals.
- Frequency conversion mode. You can use the equipment with the frequency converter configuration, activating this function through the control panel menus. For connection purposes, the order of connection of the phase or phase and neutral cables shall be respected.

If the equipment operates as a frequency converter, it **is mandatory to** remove the connection plates between the UPS input terminals and the separate bypass line and leave the bypass input connection unconnected.

# 5.5.2. Separate static bypass line connection. In version B only.

- nect this conductor before supplying voltage to the input terminals
- In accordance with the safety standard EN-IEC 62040-1, in equipment without a separate static Bypass line, the installation must be equipped with an automatic backfeed protection system, such as a contactor, which prevents the occurrence voltage or hazardous energy on the UPS input line during a power failure or any other for the bypass line. The standard is applicable regardless of whether the power supply is single-phase or three-phase, and for individual units, as well as for each of the UPS subracks of a parallel system.
- There can be no derivation of the line from the Backfeed protection to the UPS, since the safety standard will not be complied with.
- Warning labels shall be affixed to all primary power switches installed in areas remote from the equipment to alert electrical maintenance personnel of the presence of a UPS in the circuit.

The label shall bear the following text or an equivalent:

#### Before working on the circuit.

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



### Backfeed voltage risk of the UPS.

 Connect the bypass input cables to the respective terminals according to the configuration of the available equipment, considering the illustrations in Fig. 5 to 10 in terms of the connection points of the cables.

# □ Connection to a three-phase bypass network:

Connect the R-S-T-N power supply cables to the bypass terminals, respecting the rotation of the phases and the neutral indicated in the labelling of the equipment and in this manual. If the phase rotation is not respected the equipment will not work.

It is essential to connect the input neutral.

#### ☐ Connection to a single-phase bypass network:

Connect the R-N power supply cables to the bypass terminals, respecting the rotation of the phases and the neutral indicated in the labelling of the equipment and in this manual. Failure to observe the phase and neutral rotation will cause serious damage to the equipment.

Where there are discrepancies between the labelling and the instructions in this manual, labelling shall always prevail

For systems in parallel, it will be necessary to repeat the connections that go from the panel to each equipment.

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

#### 5.5.3. Connection of the output, terminals (X6 to X9).

- As it is an equipment with protection against class I electrical shock, it is essential to install the protective earth conductor to the terminal identified as . Connect this conductor before supplying voltage to the input terminals.
- Connect the output cables to the respective terminals according to the configuration of the available equipment, considering the illustrations in Fig. 5 to 10 in terms of the connection points of the cables.

#### ■ Three-phase output connection:

Connect the loads to the U-V-W-N output terminals, respecting the rotation of the phases and the neutral indicated in the labelling of the equipment and in this manual. If the phase rotation is not respected the equipment will not work.

Where there are discrepancies between the labelling and the instructions in this manual, labelling shall always prevail.

#### ■ Single-phase output connection:

Connect the loads to the U-N output terminals, respecting the rotation of the phase and the neutral indicated in the labelling of the equipment and in this manual. Failure to observe the phase and neutral rotation will cause serious damage to the equipment.

Where there are discrepancies between the labelling and the instructions in this manual, labelling shall always prevail.

For systems in parallel, it will be necessary to repeat the connections that go from the panel to each equipment.

- Frequency converter mode. You can use the equipment with the frequency converter configuration, activating this function through the control panel menus. For connection purposes, the order of connection of the phase or phase and neutral cables to the load or loads shall be respected.
- With regard to the protection to be placed at the output of the protection panel or manual bypass, we recommend the distribution of the output power in at least four lines. Each of them will have a circuit breaker switch of adequate value. This type of output power distribution will allow that in the event of a fault in any of the devices connected to the equipment, which provokes a short circuit, does not affect more than the line that is broken. The remaining connected loads will have continuity assured due to the tripping of the protection, only in the line affected by the short circuit.

# 5.5.4. Connection of the battery terminals of the equipment with those of the battery module.

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

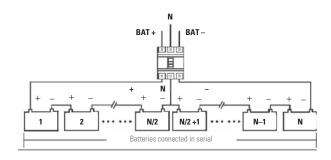


Fig. 27. Typical connection of battery set.

- As it is an equipment with protection against class I electrical shock, it is essential to install the protective earth conductor to the terminal identified as . Connect this conductor before supplying voltage to the input terminals
- The connection between the terminals of the cabinet or battery pack and the UPS will always be made through the supplied cable bundle, respecting the polarity indicated in the labelling of each unit and the colour of the cables or their identification at the ends through heat shrink sleeve (red for positive '+', blue for common 'N' and black for negative '-').

It is imperative to respect this rule and not to extend the bundle supplied.

- For extended back-up time in which more than one module or battery cabinets are supplied, the connection will always be in parallel between them and in turn with the equipment. Respect the rule indicated in the previous point for the connection.
- For the subracks of 6 slots in parallel will not change the
  connection of the batteries with the UPS, since each group
  of batteries connects directly with its UPS.
   However, there is also another possibility, a set of batteries
  inside a cabinet or installed on a rack, common for a subrack system with 6 slots in parallel.
- Danger of electric shock. If after starting up the UPS, it is necessary to disconnect the battery cabinet, it must carry out a complete shutdown of the equipment. Open the battery fuse holder switch (F3) or the battery disconnect switch (Q8) located in the accumulators cabinet and/or the fuse holder switch or disconnect switch (Q3) on the UPS.

Wait at least 5 minutes until the filter capacitors have been discharged.

### 5.5.5. Earth bonding terminal connection.

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

#### 5.5.6. Parallel connection, 6-slot subracks only.

When we talk about parallel in this section we refer to subracks, since the parallelization of modules is a characteristic of the entire ADAPT series.

It is possible to parallel up to a total of 5 subracks of 6 slots regardless or not of the number of them installed in each one, although it is advisable to be uniform numerically, this will depend on the level of redundancy required.

#### 5.5.6.1. Parallel bus connection.

• The communications line -COM- constitutes a very low voltage safety circuit.

To preserve the quality must be installed separately from other lines carrying dangerous voltages (power distribution line).

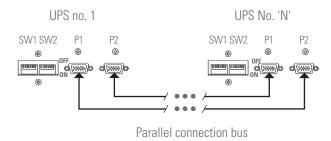


Fig. 28. DB15 connectors on the communication bus.

Parallel connection bus. Use the 15-wire signal shielded bundle and DB15 connectors at the ends to attach a maximum of 5 subracks with the sequence shown in Fig. 28. Each cable bundle has a male and a female connector at the ends, which must be connected between two correlative equipments. It is imperative to close the bus loop in parallel. The length of the parallel cable is about 1.5 meters and should not be prolonged under any circumstances due to the risk of interferences and failures in the communication that this would entail.

Fig. 28 shows an installation with two equipments in parallel. For five, operate similarly to close the communications bus.

Parallel bus settings. Although up to five equipments
can be connected in parallel, it is necessary to change the
position of the "Mini DIP Switch" SW1 and SW2 located on
the back of the device, depending on the number of parallel
subracks.

The equipment is shipped from the factory adjusted to the requested requirements. When it is necessary to modify the initial configuration in number of units, the position of SW1 and/or SW2 must be changed according to Tab. 2 and by application by PC inform each equipment. These actions are exclusively reserved for the **T.S.S.** or the distributor.

Subracks in parallel	SW1	SW2
1	OFF	OFF
2	ON	OFF
3	OFF	OFF
4	OFF	OFF
5	OFF	OFF

Tabla 2. SW1 and SW2 selection, units parallel system.

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

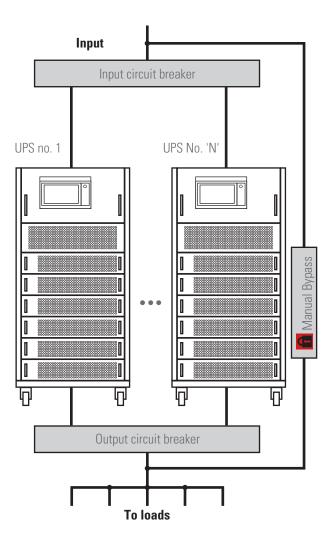


Fig. 29. Example of parallel system, with a single AC network and manual bypass panel.

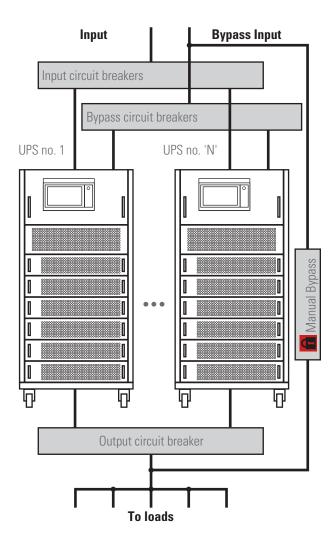


Fig. 30. Example of parallel system, with separate static bypass line and manual bypass panel.

 Beyond the communication bus, it is necessary to provide the installation with parallel systems, a panel provided with the individual input and output protections and a manual bypass with mechanical locking. See Fig. 29 or 30 depending on whether or not separate static bypass line.
 For more information see the documentation for the "Recommended installation"

#### 5.5.7. Interface and communications.

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

#### 5.5.7.1. Digital inputs, dry contacts and communications.

The subracks of the ADAPT X series UPS incorporate the following connections as standard for communication with external equipment peripherals or with other identical equipment:

- Four digital inputs through terminal strip.
- Three dry contacts via terminal strip.
- Communication via RS232 and RS485 ports .
- Pre-installation to integrate SNMP card without having to modify internal wiring.

 DB15 connectors for the parallel connection with other identical ADAPT X devices. Only in 6-slot subracks.

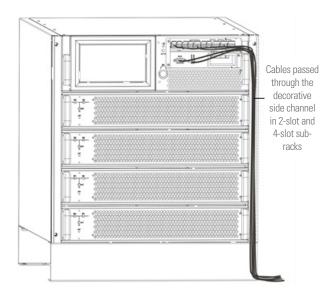


Fig. 31. Control cables pass through the inside of the front trim in 2-slot and 4-slot models.

All communications related connectors are grouped together on the control panel and are accessible from the same front for the 2 and 4 slot models after removing the cover that completely covers them - see Fig. 29- or the back of the device for models with 6 slots in which only a protective cover has the communications through terminal block - see Fig. 30-.

In the 2 and 4 slot models, it is possible to route the communication cables through the right side trim of the subrack, since the profile of the part itself generates a natural channel that makes it possible, see Fig. 28.

The communication module has the following connections via terminal block:

- Temperature probes input.
  - Probe for the compensation of the floating voltage of batteries. Parameter shown on the control panel display.
  - ☐ Probe for measuring the ambient temperature. Parameter shown on the control panel display.
- Signal input of the external EPO button (\*).
- Auxiliary contact input of the external manual bypass switch (maintenance bypass) (\*).
- Signal trip input of the BCB battery switch (\*).
- Shunt trip release voltage controller of the BCB battery circuit breaker (\*).
- Dry contacts, static bypass alarm
- Dry contacts, general alarm.
- Dry contacts, mains failure alarm



In option the mechanisms necessary for their interaction can be provided.

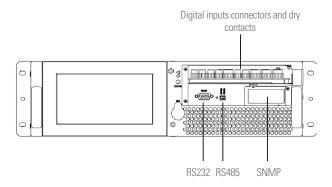


Fig. 32. Communication connections in 2 and 4 slot models.

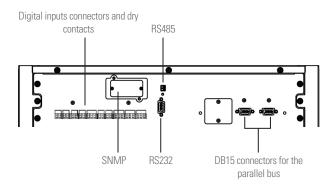


Fig. 33. Communication connections in 6 slot models.

All cables connected to the terminal block of digital inputs and dry contacts must be twisted cables with double insulation, shielded, and cross-section between 0.5 and  $1.5~\text{mm}^2$  for a length of between 25 and 50~m.

# 5.5.7.2. Analogue input of battery and ambient temperature probes.

Two connectors are available for the input of external sensors. One placed in the battery pack and utility to compensate the floating voltage depending on the temperature of the batteries. The second optional probe measures the ambient temperature of the room where it is placed and moves it for reading on the control panel.

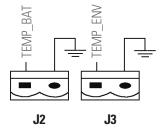


Fig. 34. Terminal block J2 and J3 for connection the probes.

Pin	Reference	Function	
J2-1	TEMP BAT	Battery temperature probe (floating voltage	
	TLIVII _DAT	compensation)	
J2-2	TEMP_COM	Common	
J3-1	TEMP_ENV	Ambient temperature probe	
J3-2	TEMP_COM	Common	

**Note:** The probes are designed to be connected to the JP2\* and JP3\* terminals are identical (R25=5 Ohm, B25/50=3275). However, one is supplied by default, which is connected to the JP2\* terminals since due to its functionality it has relevant effects on the batteries. For more information contact our sales department, the T.S.S. or, failing this, the distributor.

#### *Tabla 3.* Pinout terminal block for temperature probes.

### 5.5.7.3. Signal input of the remote EPO button (Emergency Stop).

The UPS has the EPO function (Emergency Power Off). This function can be activated by pressing the button on the control panel of the UPS and protected by a transparent plastic cover to avoid unwanted shutdowns or through a remote EPO provided by the user.

The contacts of the external EPO button are connected to the JP4 connector, taking into account the following indications of the adjacent note:



#### NOTE:

- The action on the EPO button will completely shutdown the UPS: the rectifier, the inverter and the static bypass. However, will not disconnect the AC input power source. To disconnect it is necessary to turn the input circuit breaker of the protection panel or manual bypass (external of the equipment) to "Off" position when the EPO is activated.
- 2. Terminals 1 and 2 of J4 are factory short circuited with a jumper. If the remote EPO function is not used, this jumper will be set and the circuit open between pins 3 and 4. When connecting an external EPO button, the connection with the pushbutton itself will be considered.
- 3. Regardless of whether you are operating with a single subrack or with several subracks in parallel in the particular case of 6-slot, points 1 and 2 are applicable on all systems. For parallel systems, connect the same J4 signal from all of them and in parallel to the same EPO pushbutton, see Fig 36.

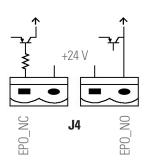
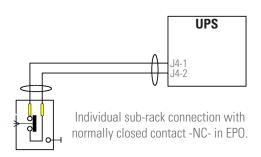
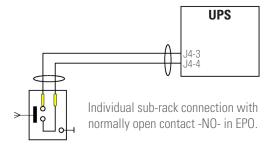


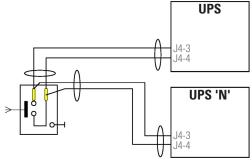
Fig. 35. Terminal block J4 for connection with external EPO.

Pin	Reference	Function
J4.1	EPO_NC	Activating the EPO when disconnecting from J4-2
J4.2	+24V	+24V,
J4.3	+24V	+24V,
J4.4	EPO_NO	EPO activation when connected to J4-3

Tabla 4. Pinout terminal block for connection with external EPO pushbutton.







Parallel sub-racks connection with normally open contact -NO- in EPO.

Fig. 36. External EPO connection with device or devices.

# 5.5.7.4. External manual bypass auxiliary contact input.

When the circuit is closed between these terminals via the auxiliary contact of the external manual bypass switch (normally open NO), the equipment is informed that the switch is in the maintenance position. In this condition the supply of the loads will be direct fed from the commercial grid and any anomaly will be transmitted directly to the load connected to the output of the UPS.

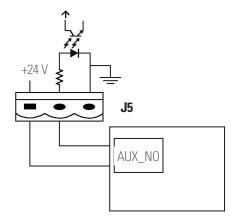


Fig. 37. Terminal block J5 for connection with external manual bypass switch.

Pin	Reference	Function
J5-1	+24V_DRY	+24V
J5-2	EXTER_BYPASS	Auxiliary contact -NO- of external manual bypass switch
J5-3	GND	Common

Tabla 5. Pinout terminal block for connection with external manual bypass.

# 5.5.7.5. Signal shunt trip circuit breaker of BCB battery switch and auxiliary contact.

A pulsing signal can be supplied via pin J6.1 to switch the battery circuit breaker to "Off" through the EPO. It is not possible to rearm it by the same medium.

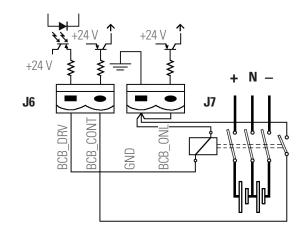


Fig. 38. Terminal block J6 and J7 for connection to BCB.

Pin	Reference	Function
J6.1	BCB_DRV	It provides a pulse signal of +24 V / 20 mA for the remote control of the battery circuit breaker through its shunt trip. This signal turns the switch «Off».
J6.2	BCB_CONT	Status of the BCB switch. Its normally closed auxiliary contact -NC- can be connected between this pin and the GND.
J7.1	GND	+ 24V ground reference
J7.2	BCB_ONL	Not useful. Not implemented.

Tabla 6. Pinout terminal block for connection to external BCB.

# 5.5.7.6. Dry contacts.

Switched contacts of three relays, corresponding to three signals of the dry contacts, are supplied through terminal blocks J8, J9 and J10. Tab. 7 shows the pinout of all of them. The voltage and maximum current applicable to these contacts is 250 V AC 3A.

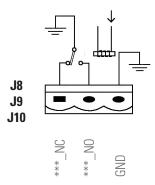


Fig. 39. Terminal block J8, J9, and J10 dry contacts.

Pin	Reference	Function
J8-1	BYP_ALM_NC	Normally closed contact -NC-, dry contacts signal STATIC BYPASS.
J8-2	BYP_ALM_NO	Normally open contact -NO-, dry contacts signal STATIC BYPASS.
J8-3	GND	Common for dry contacts signal STATIC BYPASS.
J9-1	ALARM_NC	Normally closed contact -NC-, dry contacts signal GENERAL ALARM.
J9-2	ALARM_NO	Normally open contact -NO-, dry contacts signal GENERAL ALARM.
J9-3	GND	Common for dry contacts signal GENERAL ALARM.
J10-1	UTI_FAIL_NC	Normally closed contact -NC-, dry contacts signal, AC MAINS FAULT.
J10-2	UTI_FAIL_NO	Normally open contact -NO-, dry contacts signal AC MAINS FAULT.
J10-3	GND	Common for dry contacts signal AC MAINS FAULT.

*Tabla 7.* Pinout terminal block for dry contacts.

# 6. OPERATION

#### 6.1. INTRODUCTION.

The operating modes of the SLC ADAPT X, in respect to the nature of the output voltage, are defined in the Tab. 8. This section describes the different procedures in each operation mode, including transfers between them, the UPS settings and procedures to enable the inverter to "On/Off".

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

Tab. 8. Operating modes.

#### Note:

- During the description of the user manual the term bypass and control module, bypass and monitoring module or MBS is used to refer to the same sub-rack. The same applies to the power module term or PM.
- See section 7 [Description of the control panel], for everything related to the functionality of the buttons and the touch screen.
- There are some parameters that can modify the operation
  of the UPS described in this section. These parameters are
  set at the factory settings and later only modifiable by our
  staff of T.S.S. or by the distributor to be password protected.

#### Power switches.

- The sub-rack system of 2 and 4 slots incorporates two switches, circuit breakers, one for the input bypass line and the other for the manual bypass or maintenance line, which by default is mechanically secured to prevent wrong manoeuvrings. All other transfers are processed automatically using internal control logics.
  - Instead, the 6-slot sub-rack system has only the manual bypass circuit breaker, which by default is also mechanically locked.
- In any case, the installation must have an external panel
  with the circuit breaker for input, output, a static bypass
  if applicable and a manual bypass. The protection size
  will be of the current adjusted to the installed power, unless a short-term extension is foreseen, in which it can be
  adapted to this one.



The "Recommended installation" document supplied with the user manual defines the protection

size, their selectivity, the number of poles according to the input/output configuration and the cross cable section of each line. This information is a reference guide and the user is ultimately responsible for checking and applying the necessary corrective factors according to the installation itself and the local or national regulations or standards. In the same documentation, the information is also available for the parallel sub-racks of 6 slots, shown as a mere example in Figs. 29 and 30.

### 6.2. COMMISSIONING OF THE UPS.

#### 6.2.1. Controls before commissioning.

Before starting the device:

- Check that all connections have been made properly and with sufficient tightening torque, respecting the labelling of the equipment and the instructions of section 5.
- Check that the static bypass switch on the sub-rack, the module or battery modules and the protection panel are in the "Off" position.
- Make sure that all loads are "Off".
- It is very important to proceed in the established order.
- Refer to Fig. 1 to 3 for parts of the equipment.
- Fig. 29 and 30 show a manual bypass panel for parallel system of "N" equipments, with common AC line and with independent inputs for rectifier and bypass. In both, the installation will match the number of protections to the available parallel sub-rack.

Although the internal and external manual bypass switches have the same functionality, the latter one has a higher performance because it allows complete isolation of the equipment during periods of preventive maintenance, repairing or replacement.

The following sections describe all the steps to be performed considering the availability of a manual bypass panel, although for a single sub-rack it may be a protection panel [same panel but without the manual bypass mechanism].

#### 6.2.2. Commissioning.

- The first commissioning of the equipment or a parallel system is reserved for authorized personnel, whether T.S.S. or a distributor. This operation activates the start of the product warranty and among other jobs a test and calibration at site of the equipment is also started, but which is not described in this document.
- Follow this procedure to start the UPS from a total shutdown position.

Proceed as follows:

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



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

# 2. Supply voltage to the external manual bypass panel

Observe the wiring diagrams of the external manual bypass panels shown in Fig. 40. It shows the two possible options, with a single AC input network or with separate networks for the rectifier and the separate bypass.

3. Turn on the circuit breakers of the manual bypass panel in the following order: Output, Input and Bypass [equipment version B, with separate bypass line].

Turn on the circuit breaker of the static bypass of the back of the sub-rack [models with 2 and

The LCD touch screen starts up. The rectifier indicator flashes during start-up. The rectifier enters the normal operating state and after around 20 seconds the rectifier indicator stops flashing red to remain permanently active in green. After initialization, the static bypass remains active, supplying voltage to the output terminals from the AC network with its green bypass indicator. Tab. 9 shows the colour and status of the LEDs at the end of the actions in step 3, as well as the parity of the bypass and monitoring module and power module indications

Led		Ds in bypass ng module of:	Number of LEDs	Colour	
Leu	2 and 4 slots	6 slots	in power module		
Rectifier	NO	YES	YES	Green	
Batteries	N0	YES	YES	Red	
Bypass	NO	YES	NO	Green	
Inverter	NO	YES	YES	Off	
Output	N0	NO YES		Green	
Status	s YES YES		YES	Red	

Tab. 9. Status indications with inverter off.

4. The inverter starts automatically. The inverter indicator flashes during start-up in red colour. After approximately 1 minute, the inverter is operating and the output on the bypass is transferred to the inverter. The bypass led switches is turned off and the inverter led turns to green. The UPS is operating in Normal Mode. Tab. 10 shows the status of the LEDs.

Led		Ds in bypass ng module of:	Number of LEDs	Colour	
	2 and 4 slots	6 slots	in power module		
Rectifier	N0	YES	YES	Green	
Batteries	NO	YES	YES	Red	
Bypass	NO	YES	NO	Off	
Inverter	NO	YES	YES	Green	
Output	NO	YES	NO	Green	
Status	s YES YES		YES	Red	

Tab. 10. Status indications with inverter running.

5. Turn on the protection or circuit breaker of batteries. The red led of the batteries is turned off a few minutes later and then turns green. They will be charged by the equipment charger. Tab. 11 shows the status of the LEDs.

Led		Ds in bypass ng module of:	Number of LEDs	Colour	
Leu	2 and 4 slots	6 slots	in power module		
Rectifier	NO	YES	YES	Green	
Batteries	N0	YES	YES	Green	
Bypass	NO	YES	NO	Off	
Inverter	N0	YES	YES	Green	
Output	NO	YES	NO	Green	
Status	YES YES		YES	Green	

Tab. 11. State indications in normal mode and charging batteries.



# 

- The MBS for sub-racks of 2 and 4 slots has one led and the sub-racks of 6 slots has six leds. Both have a graphical synoptic of six indicators and can be viewed when accessing the "System" screen
- All power modules have a synoptic of four LEDs, replicated in the diagram of the bypass and monitoring module for equipment with 6 slots.

menu, see chapter 7.

The MBS LEDs reflect the status and behaviour of the complete sub-rack system and the LEDs of the module reflect the individual status and behavior of each of

In general in 6-slot equipments and for normal operations or operating mode changes, any alteration of status in an MBS led is reproduced in its module or power modules counterpart, but not necessarily in reverse. In addition, any action or incident on an MP will be reflected on the MBS screen.

The LEDs can be displayed in three states, off, on or flashing and in green or red when it is two-colour.

Consider that if the UPS is shutdown for over temperature, overload or other cause, it will restart automatically when the reason for it ends and therefore the alarm signal disappears.

## 6.3. TRANSFER PROCEDURES BETWEEN OPERATING MODES.

### 6.3.1. Transfer from Normal Mode to Bypass Mode.

From the main menu at the bottom of the touch screen, click on the "Operation" drop-down icon and on the icon to switch to Bypass Mode.

**NOTE:** In Bypass Mode, the load is fed directly from the mains instead of the direct output voltage of the inverter. The connected loads are exposed to the incidents of the commercial AC grid.

## 6.3.2. Transfer from Bypass Mode to Normal Mode.

 From the main menu at the bottom of the touch screen, click on the "Operation" drop-down icon and on the icon to switch to Normal Mode. After the inverter is started, the UPS will switch to Normal Mode.

# 6.4. OPERATIONS OF THE MANUAL BYPASS SWITCH (MAINTENANCE).

# 6.4.1. Procedure to switch from Normal Mode to Maintenance Bypass Mode.

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

Before performing this operation, read the LCD panel messages to ensure that the bypass power supply is stable [equipment input voltage] and that the inverter is synchronized with the bypass voltage. This is important to avoid the risk of breaking the power supply to the load.

1. Click on the icon \_\_\_\_\_ in the "Operation" menu. The "Inverter" indicator on the diagram will flash green and the "Status" indicator will turn red. In addition, the acoustic alarm will be activated. The load will be transferred to the static bypass and the inverter will be set to Standby.



## NOTE:

To silence the acoustic alarm click on the icon the "Operation" menu. This action cancels the acoustic alarm, but does not delete the warning message on the screen, which disappears when the alarm condition ends.

2. Remove the mechanical lock of the manual bypass switch from the external panel and turn it to "On". The load will be fed directly from the mains via the manual bypass.

When a protection panel is provided instead of a manual bypass panel, the mechanical lock of the manual bypass switch in the back of the sub-rack must be removed manually and turned "On" as this switch will not be available in the panel. It is recommended in this operating mode [Bypass mode] and condition [manual bypass panel defect] to perform the following actions:

- ☐ Remove the fixing screws of the side trim profiles.
- ☐ Remove the fixing screws of all PMs and MBS.
- ☐ Slightly pull the handles at the ends in each one of them until you remove them 4-5 cm from the socket, to remove them from the connector on the backplane of the equipment.

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

- **3.** Switch the protection or the battery circuit breaker of the battery cabinet to "Off" position.
- **4.** Switch the circuit breakers of the manual bypass panel to the "Off" position in the following order: Output, Input and Bypass [equipment version B, with separate bypass line].

5. Initiate timely maintenance tasks.



#### NOTE:

To remove a faulty module it is not necessary to switch the device to "Bypass Mode", since a power module can be removed while the system is in operation. It is recommended to check that the power of the load does not exceed the residual operating modules and to stop the power module by means of the "On/Off" button located next to the LED indications of the synoptic on its front. Use an object of diameter  $\leq 3$  mm, such as a small screwdriver, to insert it into the hole indicated as "O" and press for around 5-6 seconds on the button located inside.



Wait for around 10 minutes for the DC bus capacitor set is fully discharged before removing a module.

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

Do not open the subrack or modules, there is a high risk of electric shock that can be deadly.

 When the UPS is operating in "Manual Bypass Mode" (maintenance or repairing period), the connected equipment is not protected against power outages or blackouts, overvoltages, voltage and/or frequency fluctuations, ... when fed directly from the commercial AC grid.

# 6.4.2. Procedure to switch from Maintenance Bypass Mode to Normal Mode.

- **1.** Reset all the modules of the system when they have been extracted as indicated in point 2 of the previous section 6.4.1. Insert and fix them.
- 2. Turn on the circuit breakers of the manual bypass panel in the following order: Bypass [equipment version B, with separate bypass line], Input and Output.
  - The LCD touch screen starts up. The rectifier indicator flashes during its start-up. The rectifier enters the normal operating state and after around 20 seconds the rectifier indicator stops flashing red to remain permanently active in green. After initialization, the static bypass remains active, supplying voltage to the output terminals from the AC mains and the bypass indicator turns green. Check this last point on the diagram and/or the LCD before proceeding.
- 3. Turn the manual bypass switch on the external panel to "Off" and set the mechanical lock back.

  In installations with protection panels [without manual bypass switch], turn the manual bypass switch on the subrack to "Off" and place its mechanical lock.

It is necessary for safety to place the mechanical blocking of the switch, otherwise there is a risk of improper operation of the switch at any time, with the consequent destruction of the UPS and load.

**4.** After around 60 seconds approximately, the UPS transfers the load on the inverter. Switch the protection or the battery circuit breaker of the battery cabinet to the "On" position.

# 6.5. EPO PUSH BUTTON (EMERGENCY STOP). PROCEDURE.

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

## 6.5.1. Complete shutdown of the UPS, with EPO.

- **1.** If a shutdown is planned or scheduled, stop the loads beforehand. In case of emergency, go directly to step 2.
- 2. Press the EPO button on the bypass and monitoring module.
- **3.** Turn the protection or the battery circuit breaker of the battery cabinet to the "Off" position.
- **4.** Turn the circuit breakers of the manual bypass panel to the "Off" position in the following order: Bypass [equipment version B, with separate bypass line], Input and Output.



The EPO condition will be cleared when the input panel switch is turned "Off".

The UPS is completely out of service.

## 6.5.2. UPS restart after complete shutdown with EPO.

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

- **1.** Once you press the EPO button, you need to end the procedure before attempting to restart the system.
- 2. Restart the UPS as described in section 6.2.2.

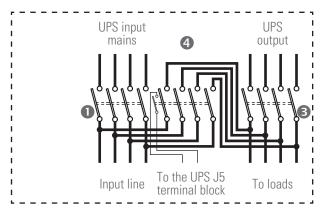
The EPO condition will disappear when the input switch indicated in the previous section is turned off, since the alarm will be cleared.

### 6.6. AUTOMATIC RESTART.

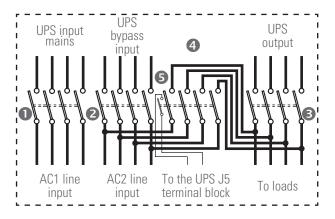
When the UPS is operating in Normal Mode and the input mains fails, it will automatically switch to Batteries Mode, where the loads are fed from the inverter from the energy stored in the batteries. If the mains fault goes on beyond the possible power that the battery set can supply, the end of discharge is reached and the UPS will stop.

The UPS will restart automatically by supplying output voltage:

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



External manual bypass panel, with common inputs for rectifier and static bypass.



External manual bypass panel with separate inputs for rectifier and static bypass.

## **Functionality of the switches:**

- Input circuit breaker.
- Static bypass circuit breaker line 2.
- 3 Output circuit breaker.
- Manual bypass circuit breaker -maintenance Bypass-.
- It is necessary to connect the auxiliary contact of the manual bypass switch on the external panel, with the J5 terminal block of the communication block of the UPS as a preventive action. In case of wrong or untimely switching of the manual bypass switch to "On" with the equipment in "Normal Mode", this auxiliary contact will force the transfer of the equipment to "Bypass Mode". In this way avoiding a short circuit and the destructive consequences that can be associated with same.

If you are purchasing a manual bypass panel, you must ensure that you have the auxiliary contact normally open -NO-which should be advanced to the closed position.

In parallel systems the manual bypass mechanism will have as many auxiliary contacts as parallel units there are for their separate connection.

Fig. 40. Internal wiring diagram of an external manual bypass panel for a device.

# 6.7. OPERATING INSTRUCTIONS FOR MAINTENANCE OF POWER MODULES.

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

## 6.7.1. Maintenance guide for power modules.

- 6.7.1.1. With the system operating in Normal Mode and the normal bypass voltage and frequency, with at least 1 power module as redundant:
- 1. Click on the icon \_\_\_\_\_ in the "Operation" menu to enable the power module shutdown function.
- 2. Using the "On/Off" button next to the LED indications on the front panel, manually stop the power module. Use an object of diameter ≤ 3 mm, such as a small screwdriver, to insert it into the hole indicated as "O" and press for around 5-6 seconds on the button located inside.
- **3.** Remove the fixing screws of the side trim profiles and the power module fixing screws.

Slightly pull the handle on each end of the module and remove it 4-5 cm from the socket to remove it from the connector on the backplane of the device.

Wait around 10 minutes and remove it from its slot.



To ensure safety, check with an instrument the voltage of the DC bus, which should be below 60 V

## 6.7.1.2. No power modules operating as redundant:

- **1.** Click on the icon in the "Operation" menu to switch to "Bypass Mode".
- 2. Click on the icon \_\_\_\_\_ in the "Operation" menu to enable the power module shutdown function.
- Manually stop the power module by pressing the button "
   O" for around 5-6 sec.
- **4.** Remove the fixing screws of the side trim profiles and the power module fixing screws.

Slightly pull the handle on each end of the module and remove it 4-5 cm from the socket to remove it from the connector on the backplane of the device.

Wait around 10 minutes and remove it from its slot.



To ensure safety, check with an instrument the voltage of the DC bus, which should be below 60  $\rm V$ 

- **5.** After the end of the maintenance operations, insert the power module until it is at the end of its slot to connect to the "backplane" of the equipment. After around 2 min the power module will activate automatically adding to the parallel of the rest of the modules.
- **6.** Insert and tighten the fixing screws of the module.
- 7. Fit the side profiles, their screws, and fix them in place.

# 6.8. OPERATING INSTRUCTIONS FOR MAINTENANCE OF THE BYPASS AND MONITORING MODULE.



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

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

- 6.8.1.1. With the system operating in Normal Mode and normal bypass voltage and frequency, transfer the load over the manual bypass.
- Manually stop the inverter. The UPS will transfer to Bypass Mode.
- **2.** Remove the mechanical lock of the manual bypass switch from the external panel and turn it to "On". The load will be fed directly from the mains via the manual bypass.

When a protection panel is provided instead of a manual bypass panel, the mechanical lock of the bypass switch from the back of the sub-rack must be removed manually and turn it to "On" as this switch will not be available in the panel.

- **3.** Turn the protection or the battery circuit breaker of the battery cabinet to "Off" position.
- **4.** Turn the circuit breakers of the manual bypass panel to the "Off" position in the following order: Output, Input and Bypass [equipment version B, with separate bypass line].
- **5.** Remove the fixing screws of the side trim profiles and the MBS fixing screws.

Slightly pull the handle on each end of the module and remove it 4-5 cm from the socket to remove it from the connector on the backplane of the device.

Wait around 10 minutes and remove it from its slot. Carry out the appropriate maintenance.

**6.** After the end of the maintenance operations, insert the bypass and monitoring module until it is at the end of its slot to connect to the "backplane" of the equipment.

All UPS configuration parameters are stored in the bypass and monitoring module. Any replacement entails the necessary programming of the same parameters as the original module. This task is reserved exclusively for **T.S.S.** personnel or distributors.

Replacing one bypass module with another one without carrying out the corresponding configuration can lead to serious or very serious faults.

- 7. Insert and tighten the fixing screws of the module.
- 8. Fit the side profiles, their screws, and fix them in place.
- **9.** Proceed as described in section 6.4.2. to switch back to Normal Mode.

The force that has to be made to connect the MBS to the backplane of the equipment is higher than for the MPs, since the terminals of the connector are of a greater section.

## 6.9. LANGUAGE SELECTION.

The menus displayed on the LCD touch screen and the display of parameters and data are available in 3 languages:

- Spanish.
- English.
- Portuguese.

To select a language, perform the following:

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

## 6.10. CHANGING THE CURRENT DATE AND TIME

To change the system date and time, proceed as follows:

- 1. Click on the icon in the "Main" menu to enter the setup menu on the LCD.
- 2. Select the "Date and Time" menu.
- 3. Enter the new date and time. Press ENTER to confirm.

## 6.11. LEVEL 1 CONTROL PASSWORD.

The system is password protected to control unauthorized operations. In section 7.3.5 of the "Operation" menu, the various available functions that can be set and the level of the Password that limits them are displayed as icons.

The user can only perform operations protected by PSW # 1. The default PSW # 1 is 1203.

# 7. MONITORING PANEL WITH LCD TOUCH SCREEN.

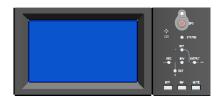
This chapter describes the functions and instructions for operation of the monitoring panel with LCD touch screen, including detailed information on the menus, warning screens and list of alarms from the UPS.

## 7.1. INTRODUCTION.

Physically, the monitoring panel with LCD touch screen and static bypass are part of the same unit as a module, although they are individual entities with their own functionalities. Through the LCD panel you can operate and control the UPS, check all measurements and parameters, equipment status and batteries, and historical and event logs. The two monitoring panels available are shown in Fig. 41



### Monitoring panel installed in sub-racks of 2 and 4 slots.



# Monitoring panel installed in the sub-rack of 6 slots.

Fig. 41. Monitoring panels with LCD touch screen.

Basically the LCD monitoring panel is divided into three functional areas:

- LCD touch screen with structured menus.
- Flowchart of power LEDs and "Status" indicator and audible alarm.
  - ☐ The flowchart is only available in the sub-racks of six slots and it is information that appears replicated in the "Cabinet" menu of the touch screen.
    - Additionally each power module has its own energy flowchart, but obviously without the bypass and output indicators.
  - ☐ The "Status" LED and acoustic alarm are present in all sub-racks.
- EPO emergency stop push button and function keys.
  - ☐ The EPO push button with the protective cover is available on all equipments.
  - ☐ The BYP, INV, and MUTE shortcut keys are only available in six-slot sub-racks.

For further information see Tab. 12.



**NOTE:** The data and values presented in this document are mere examples, so they will be different from those displayed on your unit.

Indicator	Function	Availability
REC	Rectifier	
BAT	Batteries	
ВҮР	Bypass	In 6-slot sub-racks
INV	Inverter	
OUTPUT	Output to loads	
STATUS	Status	In all sub-racks

Tab. 12.Functionality and availability of the LEDs in the sub-rack.

Operation keys	Function	Availability
EPO	Emergency power off breaks the load power for the rectifier, the inverter and the static bypass. If battery protection with shunt trip is available, the battery power is also cut off by acting on the shunt trip mechanism.	In all sub-racks
ВҮР	Shortcut key for transferring from Normal Mode to Bypass Mode	
INV	Shortcut key for transferring from Bypass Mode to Normal Mode	In 6-slot sub-racks
MUTE	Key to silence the audible alarm	

Tab. 13.Functionality and availability of the push buttons on the sub-rack.

### 7.2. DIAGRAM OF ENERGY FLOW TO LEDS.

The operating mode of the equipment is represented by the LEDs of the energy flow. The status description of the LEDs is shown in Tab. 14.

LED indicator	Status	Description		
	Green	Rectifier operation, correct on all modules.		
	Flashing Green	At least one of the rectifiers of the modules is starting up.		
RECT - Rectifier	Red	At least one of the rectifiers of the modules is failing.		
	Flashing Red	The input of at least one module is wrong.		
	Off	Rectifier does not work.		

LED indicator	Status	Description	
	Green	The battery is charging.	
	Flashing Green	The battery is being discharged.	
BAT - Batteries	Red	Batteries are wrong (battery fault, battery or inverted batteries) or the battery converter is abnormal (fault, over current or over temperature), EOD.	
	Flashing Red	Low battery voltage.	
	Off	Batteries and battery converters are correct, batteries are not being charged.	
	Green	Output supply from the Bypass	
BYP -	Red	Bypass module fault or static bypass switch fault.	
Bypass	Flashing Red	Wrong Bypass voltage.	
	Off	Bypass voltage is correct, but the Bypass module does not work.	
	Green	The inverter is feeding the load.	
	Flashing Green	Inverter starting, synchronizing or UPS operating in ECO Mode - Standby	
INV - Inverter	Red	At least one inverter of a module is failing. The inverter does not supply voltage to the load connected to the output.	
	Flashing Red	At least one inverter of a module is failing. The inverter supplies voltage to the load connected to the output.	
	Off	The inverter is not running on all modules.	
	Green	The UPS is supplying output voltage and is correct.	
OUTPUT - Load	Red	Short circuit at the output, no output or maximum output overload time exceeded.	
	Flashing Red	Output overload	
	Off	No output voltage	
STATUS -	Green	Correct operation.	
Status	Red	Fault.	

*Tab. 14. Description of the Led indications.* 

## 7.2.1. Acoustic alarm.

The acoustic alarm of the UPS has two tones that can be activated during operation, see Tab. 15.

Modulation	Availability		
Two short beep,	Indicates that the system is in a status of general		
followed by one	alarm (for example when there is an input mains		
long beep	failure).		
Continuous beep	Indicates that the system is in a status of urgent alarm (for example fuse blown up or system fault).		

Tab. 15. Acoustic alarm tones.

# 7.3. DESCRIPTION OF THE SCREENS SHOWN ON THE LCD TOUCH SCREEN.

## 7.3.1. Start menu or main screen.

The main screen is shown in Fig. 42 as an example that can be displayed on the LCD monitoring panel. It is basically divided into four areas: System information, Power flow, Current warnings or Alarm window, and Main menu.

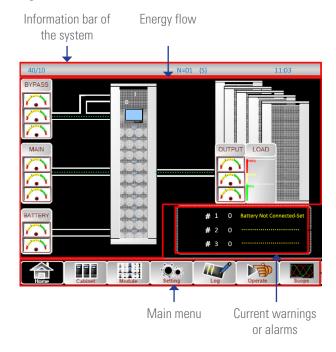


Fig. 42. Home screen or main screen.

Icon	Description
Home	Main screen: Return to the main menu page.
Cabinet	System information: Bypass, main, output (voltage, current, power factor, frequency), battery information (capacity, remaining time, days worked in this mode, battery temperature, ambient temperature) information on the load (percentage of active, reactive load, apparent load).
Module	<b>Information of the power modules:</b> input, output, load, S-code, module information).
Setting	<b>Configuration:</b> Date and time, language, communications, user (password 1), selection of batteries, selection of service, selection of parameters, configuration.
Log	Data logger: It shows the events that have occurred.
Operate	Actions regarding the system: Mute ON/OFF, clear fault, transfer to bypass, transfer to inverter, allow module "Off", reset historical data of batteries, restart time of use of dust filters, batteries' test, maintenance of batteries, recharge boosting of batteries, float batteries, stop test.
Scope	<b>Waveforms:</b> Oscillogram of the output voltage, output current, bypass voltage.

Tab. 16. Description of the home or main menu icons.

In Fig 43 the menu and sub-menus tree can be checked in expanded form from the home or main screen.

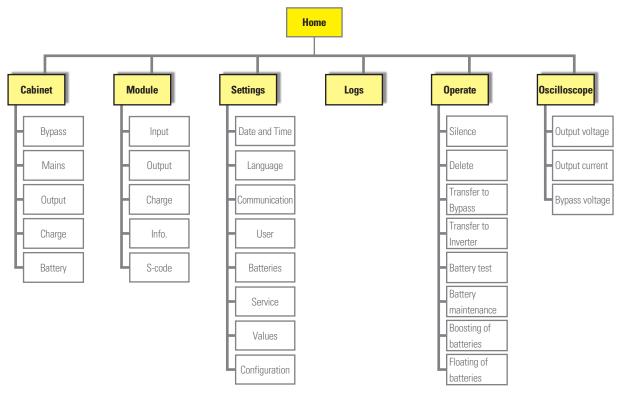


Fig. 43. Menu tree.

Tab. 17 shows the data represented in the upper bar of the "System Information" in Fig. 42.

This information appears only on the [Home] main screen. Grouping information related to the UPS of the equipment model, module numbers, unit mode, current date and time. This information is not necessary to operate with the UPS and that shown in Fig. 42 is a mere example.

Display contents	Meaning			
40/10	Maximum power system with all installed modules / unit			
	power module			
N = 01	1 power module installed in the system			
	Unit mode.			
	S: A single unit.			
(S)	P-0/1: parallel mode.			
	E: ECO mode.			
	PE-0/1: ECO parallel mode.			
11:03	Date and time			

Tabla 17. Description of the UPS system information.

## 7.3.2. System information menu.

Click on the menu screen to obtain system information. Information similar to that shown in Fig. 44 will be displayed for the Bypass sub-menu. The values of the parameters are mere examples.

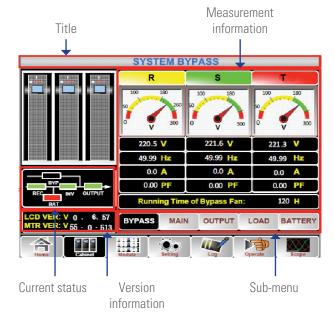


Fig. 44. Cabinet information menu. Bypass sub-menu.

In addition to the Bypass sub-menu, the Main input and Output menus display similar information. In the header of the screen you can see the title of the analysed sub-menu that we use to guides us.

For each of the three sub-menus the values of the voltage, current, frequency and power factor parameters are shown. By emulating a diagram for the LEDs, the energy flow of the current status is represented.

The version information provides references on the LCD firmware version and monitoring.

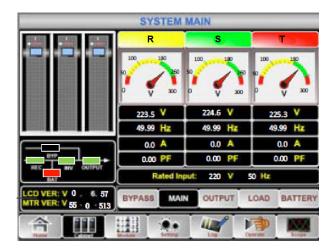


Fig. 45. Cabinet information menu. Main sub-menu.

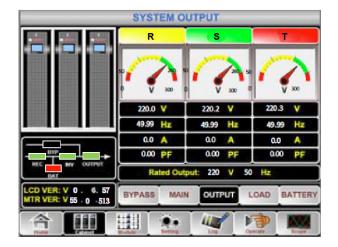


Fig. 46. Cabinet information menu. Output sub-menu.

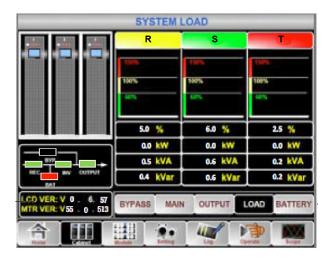


Fig. 47. Cabinet information menu. Load sub-menu.

In the system menu there are two additional sub-menus, Load and Battery. The Load information includes the load percentage,

the active load, the reactive load and the apparent load, see Fig 47. The battery information includes the number of batteries, voltage, current, remaining capacity, remaining discharge time, discharge times, operating days, discharge hours, battery temperature and ambient temperature, see Fig. 48.

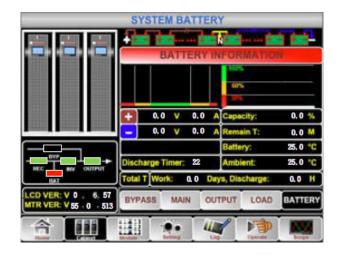


Fig. 48. Cabinet information menu. Battery sub-menu.

## 7.3.3. Information menu of the module or power modules (PM).

• Click on the menu screen to obtain information about the module or power modules.

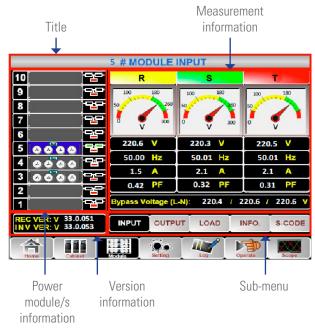


Fig. 49. Information menu of the module or power modules. Main sub-menu.

The values of the voltage, current, frequency and power factor, input and output parameters are displayed, the first two submenus, for input see Fig 49- and for output see Fig 50.

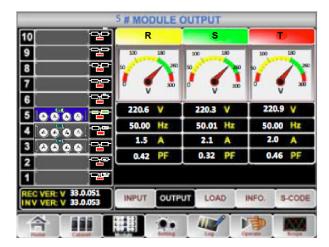


Fig. 50. Information menu of the module or power modules.

Output sub-menu.

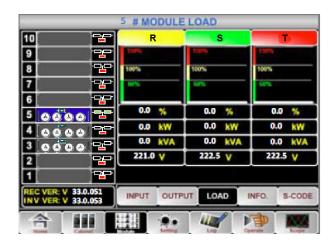


Fig. 51. Information menu of the module or power modules. Load sub-menu.

The information in the Load sub-menu includes the load percentage, the active load and the apparent load, see Fig 51. There are two other sub-menus, those for information and S-Code. The first one provides the following information measured by each module:

- Battery voltage [positive and negative].
- Battery currents [positive and negative].
- DC bus voltages [positive and negative].
- Fan operating time.
- Operating time of DC capacitors.
- Inlet air temperature.
- Air temperature exhausting.
- Three temperatures of the rectifier IGBT [three-phase].

• Three temperatures of the inverter IGBT [three-phase]. The second, the S-Code, shows the event codes for each power module. It is useful for the **T.S.S.**, see Fig 53.



Fig. 52. Information menu of the module or power modules. Information sub-menu.

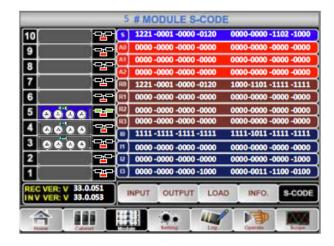


Fig. 53. Information menu of the module or power modules. S-Code sub-menu.

Tab. 18 shows the meaning between the bits and the status of the [S-Code] module and Tab. 19 shows the meaning between the bits and the module's alarm [A-Code]. The information in the R Code and the I-Code refers to special rectifier and inverter status bits and the interpretation of their meaning is exclusively restricted to our **T.S.S.** or to the distributor.

32 BIT 4 BIT Module	Madala	INFORMATION	LOG VALUES					
	INFORMATION	0	1	2	4	8		
1			Load status	None	UPS	BYP	Another module	
2	1		REC Status	Off	Soft start-up	Normal work		
3			INV status	Off	Soft start-up	Normal work		
4			BYP status	Out of range	Correct for supply			
5			Status of batteries	Not connected	Increase	Floating	Discharge	Not operational
6			Reserved					

00 DIT	4 DIT		INFORMATION		LOG VALU	JES												
32 BIT	4 BIT	Module	INFORMATION	0	1	2	4	8										
7	0		Reserved															
8	2		Reserved															
9			Status of manual bypass switch	Open	Closed													
10	3		Reserved															
11	3		Reserved															
12			Positive battery connection status	Not connected	Connected													
13			Negative battery connection status	Not connected	Connected													
14	4		INV enabled status	Activated inhibition	Allow it to be turned on													
15			INV supply status	Do not allow supply	Ready for supply	Feeding												
16													In generator	No generator	In generator			
17				Reserved														
18			Reserved															
19	1	S (1)	Reserved															
20			Battery protection shunt trip	Tripping signal not activated	Active tripping signal													
21			Battery protection connection status	Not connected	Connected													
22	2		Battery protection status	Open	Closed													
23			EPO status	EPO not activated	EPO activated													
24			Extracted module	Connected	Extracted													
25			INV available	INV unavailable	Available													
26	3		End of commissioning	In process of start-up	End of start-up process													
27	J		Reserved															
28			Reserved															
29			Reserved															
30	4		Reserved															
31	, T		Reserved															
32			Reserved				1											

<sup>(1)</sup> See Tab. 17.

Tabla 18. Meaning between bits and state of the equipment.

00 DIT	4 DIT		INFORMATION	LOG VALUES		
32 BIT	4 BIT	Module	INFORMATION	0	1	2
1			Synchronous fault	Synchronized	Not synchronized	
2	1		Input mains fault	Correct	Fault	
3			REC fault	Correct	Fault	
4			INV Fault	Correct	Fault	
5			Reserved			
6	1		Reserved			
7	2		Reserved			
8			Reserved			
9			Reserved			
10	2	3	Reserved			
11	3		Reserved			
12	1	[	Reserved			
13			Phase R input overcurrent	Correct	Fault	
14			Phase S input overcurrent	Correct	Fault	

		1	LOG VALUES				
32 BIT	4 BIT	Module	INFORMATION	0	1	2	
15	4		Phase T input overcurrent	Correct	Fault		
16	4	] [	Phase R output voltage fault	Correct	Fault		
17			Phase S output voltage fault	Correct	Fault		
18	1		Phase T output voltage fault	Correct	Fault		
19	'		Reserved				
20			Reserved				
21		1 [	Reserved				
22	2		Positive bus voltage fault	Correct	Low voltage	Overvoltage	
23		A0	Negative bus voltage fault	Correct	Low voltage	Overvoltage	
24		Au	Input current unbalanced fault	Correct	Fault		
25		lΓ	Input voltage fault	Correct	Fault		
26		ΙΓ	Input frequency fault	Correct	Fault		
27	3	ΙĪ	Input phase rotation fault	Correct	Fault		
28		ΙĪ	REC soft start	Correct	Fault		
29		] [	REC IGBT overcurrent	Correct	Fault		
30	4		Reserved				
31	4		REC overtemperature	Correct	Fault		
32		i i	Positive bus overvoltage fault	Correct	Fault		
1			Negative bus overvoltage fault	Correct	Fault		
2		ΙĪ	Fan fault	Correct	Fault		
3	1	ΙĪ	Reserved				
4		1 [	Reserved				
5		i 1	Positive bus undervoltage fault	Correct	Fault		
6		i i	Negative bus undervoltage fault	Correct	Fault		
7	2	i i	Positive battery reserved	Correct	Fault		
8		ΙĪ	Negative battery reserved	Correct	Fault		
9		1	Reserved				
10		i i	Reserved				
11	3	i i	Positive charger voltage fault	Correct	Undervoltage	Overvoltage	
12		i i	Negative charger voltage fault	Correct	Undervoltage	Overvoltage	
13		i	Reserved				
14		I	Reserved				
15	4	i i	Positive charger fault	Correct	Fault		
16		i i	Negative charger fault	Correct	Fault		
17		A1 -	Low voltage positive batteries	Correct	Fault		
18		l þ	Low voltage negative batteries	Correct	Fault		
19	1		Positive battery EOD	Correct	Fault		
20		[	Negative battery EOD	Correct	Fault		
21		1 h	Loss of neutral input	Correct	Fault		
22		[	BYP sequence fault	Correct	Fault		
23	2		BYP voltage fault	Correct	Fault		
24		l f	Reserved				
25		1 h	Reserved				
26	3	i t	Reserved				
27		i †	BYP frequency out of range	Correct	Fault		
28		l þ	Reserved		1		
29		1 h	Reserved		1		
30			Overload time exceeded	Correct	Fault		
31	4	i t	Reserved		1		
32			Reserved		1		

				LOG VALUES			
32 BIT	4 BIT	Module	INFORMATION	0	1	2	
1			Manual stop	Normal	Stop		
2	1	ΙΓ	INV protection	Correct	Fault		
3		ΙΓ	Transfer timeout, 1 hour	Correct	Fault		
4		l	INV power feedback	Correct	Fault		
5		1 Г	Reserved				
6		ΙΓ	Reserved				
7	2	ΙΓ	Reserved				
8	ĺ	ΙΓ	INV overtemperature fault	Correct	Fault		
9		i r	INV IGBT overcurrent	Correct	Fault		
10		ΙΓ	Reserved				
11	3	ΙΓ	Overload	Normal	Overload		
12	ĺ	ΙΓ	Relay or INV fuse fault	Correct	Fault		
13		ĺΓ	Reserved				
14	1	l	Reserved				
15	4	ΙΓ	Reserved				
16	1	A2	Reserved				
17			Reserved				
18			Output short circuit	Correct	Fault		
19	'		Battery test	None	Correct	Fault	
20		l	Battery maintenance	None	Correct	Fault	
21		ΙГ	Reserved				
22	2	lΓ	Reserved				
23	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		Reserved				
24			Reserved				
25			Reserved				
26	,	lΓ	Reserved				
27	3	ΙÍ	Reserved				
28		j ľ	Reserved				
29		l [	Reserved				
30	1	l [	Reserved				
31	4		Reserved				
32			Reserved				

Tabla 19. Meaning between bits and state of the equipment.

# 7.3.4. Setting menu.

Click on the menu screen to change any of the UPS configuration parameters.

The available sub-menus are indicated in Tab. 20:

The last four, Battery, Service, Rate and Configure are modifiable only by the **T.S.S.** or the distributor.

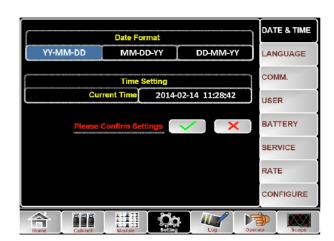


Fig. 54. Setting Menu.

Sub-menu	Contents	Meaning				
DATE & TIME	Setting the date format	Three possible formats: (a) year / month / day, (b) month / day / year, (c) day / month / year				
	Time setting	Current date and time settings				
LANGUAGE	Current language	Language in use.				
LANGUAGE	Language selection	Selectable between Spanish, English and Portuguese.				
	Device Address	Communication Address setting				
	RS232 protocol selection	SNT protocol, ModBus protocol, Dwin (for use in factory) or YD / T protocol.				
COMM. (Communications)	Transmission speed	Setting the Baud Rate of the SNT, ModBus and YD/T: 1,200, 2,400 4,800, 9,600, 14,400, or 19,200				
	Modbus Mode	Setting mode for Modbus: ASCII and selectable RTU				
	Modbus parity	Parity setting for Modbus: None, Odd or Even				
	Output voltage settings	Output voltage adjustment from 210 to 230 V				
	Bypass voltage upper margin, for Bypass available	Upper adjustment, Bypass voltage range: +10, +15, +20 or +25% (default to +20%)				
USER	Bypass voltage lower range, for available Bypass	Lower adjustment, Bypass voltage range: -10, -15, -20, -30 or -40% (default to -20%)				
(Accessible through Password 1203)	Bypass frequency limit	Tolerance Bypass frequency setting: $\pm$ 1, $\pm$ 3, $\pm$ 5 Hz or Inhibit - the system accepts any Bypass frequency (default to $\pm$ 3 Hz)				
	Period of maintenance of the dust filter	Setting the dust filter maintenance period: From 30 to 3,000 days.				
BATTERY	Battery settings. Contact the <b>T.S.S.</b> or the distributor					
SERVICE	Service settings. Conf	tact the <b>T.S.S.</b> or the distributor				
RATE	Rate settings. Conta	act the <b>T.S.S</b> . or the distributor				
CONFIGURE	Configuration settings. C	Contact the <b>T.S.S.</b> or the distributor				

Tabla 20. Description of details of the Configure submenu.

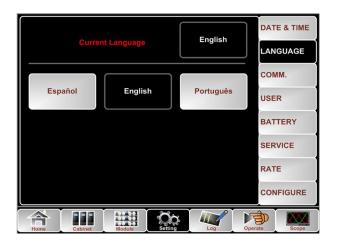


Fig. 55. Setting Menu. Sub-menu language.



Fig. 56. Setting Menu. Communication sub-menu.

# 7.3.5. Setting menu.

Click on the menu screen to obtain the UPS data logger. Use icons or scroll through the events.

Tab. 21 provides the complete list of all events that the UPS can

display on the log history screen.

When frequent repetitions of events are detected, it is recommended to contact the **T.S.S.** or the distributor.

This menu is of great help to the **T.S.S.** when it comes to determining certain incidents and/or possible anomalies. The intervention actions involving some events are exclusively reserved for the **T.S.S.** or the distributor.

NO.	UPS events			
1	Clear fault			
2	Clear log			
3	Load on the UPS			
4	Load on the Bypass			
5	No load			
6	Quick-load battery			
7	Floating battery			
8	Battery in discharge			
9	Connected battery			
10	Battery is not connected			
11	Manual bypass switch "On"			
12	Manual Bypass switch "Off"			
13	EPO			
14	Lack of modules			
15	Generator input (it is necessary to configure a digital input to detect this signal)			
16	Faulty input			
17	Bypass sequence fault			
18	Abnormal Bypass voltage			
19	Bypass module fault			
20	Bypass module overload			
21	Time exceeded of the overload Bypass module			
22	Bypass frequency out of range.			
23	Bypass transfer number exceeded			
24	Short circuit at the output			
25	Low battery (EOD)			
26	Battery test ON			
27	Battery test correct			
28	Battery maintenance			
29	Bat maintenance correct			
30	Inserted module			
31	Removal of the power module			
32	Rectifier fault			

NO.	UPS events			
33	Inverter fault			
34	Rectifier overtemperature			
35	Fan fault			
36	Output overload			
37	Inverter overload time exceeded			
38	Inverter overtemperature			
39	Inhibited UPS			
40	Manual transfer of static bypass			
41	Quit manual transfer of static bypass			
42	Battery low voltage			
43	Wrong battery polarity			
44	Inverter protection			
45	Input neutral fault			
46	Bypass fan fault			
47	Manual shutdown			
48	Manual quick charge			
49	Manual floating charge			
50	UPS blocked			
51	Parallel cable fault			
52	Loss of N + X redundancy			
53	End of discharge system inhibited			
54	Battery test fault			
55	Battery maintenance fault			
56	Ambient overtemperature			
57	Rectifier bus CAN fault			
58	Inverter bus CAN fault			
59	Inverter bus CAN data fault			
60	Shared load fault			
61	Synchronous pulse fault			
62	Input voltage detector fault			
63	Battery voltage detector fault			
64	Output voltage fault			
65	Bypass voltage detector			

NO.	UPS events				
66	Inverter IGBT fault				
67	Air temperature exhausting fault of a module				
68	Unbalanced input current				
69	DC bus overvoltage				
70	Rectifier soft start fault				
71	Connection relay fault				
72	Short-circuit relay				
73	PWM synchronous fault				
74	Module in smart standby				
75	Manual transfer to inverter				
76	Input overcurrent time exceeded				
77	No input temperature probe				
78	No output temperature probe				
79	Overtemperature of the air inlet				
80	Reset capacitor time				
81	Reset fans' time				
82	Reset battery data logger				
83	Reset time fans' static bypass				
84	Battery overtemperature				
85	Life cycle of the static bypass fan worn				
86	Life cycle of the capacitors of the modules worn				
87	Life cycle of the fan of the power modules worn				
88	Driver's Inverter IGBT blocked				
89	Batteries depleted				
90	Bypass bus CAN fault				
91	Life cycle of the particle filter exhausted				
92	Battery test fault				
93	Stopping of the battery test				
94	Wave saved				
95	Bypass bus CAN fault				
96	Firmware fault				

NO.

UPS events

NO.	UPS events		
97	System configuration fault		
98	Static bypass overtemperature		
99	Duplicate ID modules		

Tabla 21. List of events.

## 7.3.6. Operation menu.

Click on the menu screen to access the different functions and commands.

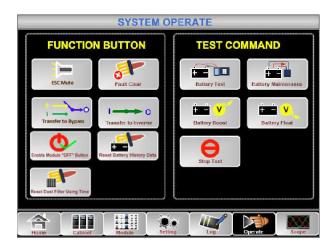


Fig. 57. Setting Menu.

#### 7.3.6.1. Function icons.

- Detail of the functionality of each icon:
  - Direct access without password.
  - Manual fault clearing or alarm. Access with PSW # 1 key.
  - Manual transfer to bypass or exit bypass mode.

Access with PSW # 1 key.

Manual transfer to inverter.

The difference between touching this icon or leaving the bypass mode is that if for some reason the inverter cannot connect to the output automatically, this icon forces the transfer with an interruption of around 20 ms.

Access with PSW # 1 key.

Activates the "Off" push button on the front of the power module "O", to enable the individual stoppage of any of them.

Direct access without password.

- Clears battery history data including download dates and times and number of downloads. It is usually recommended to reset the battery data logger, after changing them by new ones.

  Access with PSW # 1 key.
- Delete dust filter data including days and maintenance period. This is usually done after changing the filter or cleaning it.

Direct access without password.

#### 7.3.6.2. Command icons.

- Detail of the functionality of each icon:
  - Battery test command. The UPS switches to battery mode, the mains indicator LED is off and the battery LED flashes green. If the battery is not correct or fails, the UPS will trigger an alarm and return to normal mode or transfer to bypass mode.

To perform this test, ensure that:

- There is no alarm or warning.
- The battery voltage is higher than 90% of the floating voltage.

If the battery is correct, the UPS will transfer back to normal mode after 20 seconds. If the battery test fails, the UPS will include the alarm in the historical  $\log$ .

Access with PSW # 2 key, restricted to the **T.S.S.** or the distributor.

Battery maintenance command. The UPS switches to battery mode, the mains indicator LED is off and the battery LED flashes green.

To perform this test, ensure that:

- There is no alarm or warning.
- The battery voltage is higher than 90% of the floating voltage.

If the battery is correct, the UPS will transfer back to normal mode when the battery voltage is approximately 105% of the end of discharge voltage [EOD].

Access with PSW # 1 key.

Allows the charger to enter manual charging mode quickly, to force the boost charge.

Direct access without password.

Allows the charger to enter floating load mode manually.

Direct access without password.

Useful for stopping battery test or battery maintenance.

Direct access without password.

# 7.3.7. Oscilloscope menu.

Tap on the menu screen to view the waveform of the output voltage and current, and the bypass voltage.

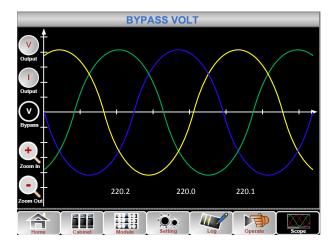


Fig. 58. Oscilloscope menu.

# 8. OPTIONAL

#### 8.1. INSTALL AN SNMP DRIVE.

All SLC ADAPT X units have a slot for the inclusion of the SNMP electronic card. Depending on the sub-rack model, the slot is physically located on the front or on the back of the equipment.

- In the sub-racks of 2 and 4 power slots, it is located behind the cover giving access to the communication connections , located next to the monitoring panel with touch screen, see Fig 59.
  - ☐ To install the SNMP card:
    - **1.** Remove the screws securing the access cover to the communication connections.
    - 2. Remove the cover. The slot is visible.
    - **3.** Remove the fixing screws of the slot cover and the part as a cover.
    - Install the SNMP card in the slot and fix it with the screws.
    - **5.** Make the relevant connections.
    - **6.** Fit the protective cover of the communication connections and the fixing screws of the communication.

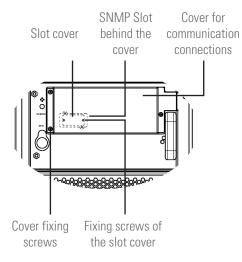


Fig. 59. Slot for SNMP in sub-rack of 2 and 4 slots for power modules.

- In the sub-racks of 6 power slots, it is located on the back of the equipment, see Fig 60.
  - ☐ To install the SNMP card:
    - **1.** Remove the fixing screws of the slot cover and the part as a cover.
    - Install the SNMP card in the slot and fix it with the screws.
    - 3. Make the relevant connections.

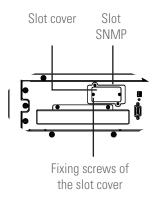


Fig. 60. Slot for SNMP in 6-slot sub-rack for power modules.

## 8.2. ROOM TEMPERATURE SENSOR.

This is a probe that incorporates a resistance of R = 5k with B25 / 50 = 3275 K  $\pm$  1% to display the room temperature on the screen.

Fig. 61 shows the terminal pinout of the terminal block located on the connector block of the digital inputs and dry contacts for the temperature probes.

The room probe is connected to J3.

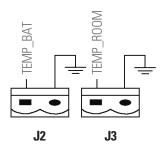


Fig. 61. Terminal block J2 and J3 for connection with sensors.

# 9. WARRANTY.

## 9.1. WARRANTY CONDITIONS.

# 9.1.1. Terms of the warranty.

On our website you will find the warranty conditions for the product you have purchased where you can also register it. It is recommended to do so as soon as possible to include it in the database of our Technical Service and Support **(T.S.S.)**. Among other advantages, it will be much more flexible to carry out any regulatory procedure for the **T.S.S.** intervention in case of a hypothetical fault.

## 9.1.2. Exclusions.

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

## 9.2. TECHNICAL SERVICES NETWORK.

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

# 10. PRODUCT SPECIFICATIONS.

## 10.1. INTERNATIONAL STANDARDS.

Information	Standards	
General and safety requirements for UPS used in user access areas.	EN50091-1-1/IEC62040-1-1/AS 62040-1-1	
Electromagnetic compatibility (EMC) requirements for UPS	EN50091-2/IEC62040-2/AS 62040-2 (C3)	
Method of specifying the performance and test requirements of UPS	EN50091-3/IEC62040-3/AS 62040-3 (VFI SS 111)	

Note: The above product standards incorporate relevant compliance clauses with the generic IEC and EN standards for safety (IEC / EN / AS60950), electromagnetic emissions and immunity (IEC / EN / AS61000 series) and construction (IEC / EN / AS60146 series and 60950).

Tabla 22. Standards applied.

## 10.2. ENVIRONMENTAL CHARACTERISTICS.

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

Tabla 23. Environmental characteristics.

# 10.3. MECHANICAL CHARACTERISTICS.

Sub-rack specifications	Units	20/10 and 30/15	40/10 and 45/15	60/10 and 90/15
Dimensions (Depth × Width × Height)	mm	745 × 490 × 400 (7U) 745 × 490 × 580 (11U)		800 × 490 × 1035
Weight	Kg.	30.5 41		70
Colour	-	black		
Degreeof protection, IEC60529	-	IP20		

Power module specifications (MP)	Units	10 kVA	15 kVA
Dimensions (Depth × Width × Height)	mm	645 × 485 × 85 (2U)	
Weight	Kg.	15.3 15.5	
Colour	-	black	

Bypass and monitoring module specifications (MBS)	Units	2-slot and 4-slot sub-racks	6-slot sub-rack	
Dimensions (Depth × Width × Height)	mm	395 × 485 × 130	380 × 485 × 380	
Weight	Kg.	4.5	13.5	
Colour	-	bla	nck	

Tabla 24. Mechanical characteristics.

# 10.4. ELECTRICAL CHARACTERISTICS.

# 10.4.1. Electrical characteristics (rectifier input).

Information	Units	Parameters
Input ratings	V AC	380/400/415 (3-phase, sharing the neutral with the bypass input)
Input voltage range	%	-40 +25
Nominal frequency	Hz	50/60 (margin: 40 70)
Input power factor	KW / KVA, full load	0.99
THD	THDI %	4

*Tabla 25.* Rectifier input characteristics.

# 10.4.2. Electrical characteristics (DC Bus or DC).

Information	Units	Parameters	
Battery bus nominal voltage	V DC	Not indicated by user, factory set to ± 192 V (for 32 batteries). ± 216 V (for 36 batteries) ± 240 V (for 40 batteries) ± 264 V (for 44 batteries), margin of each branch: -17.5 +20%	
Number of elements	32 44 (for 12V batteries), 192 264 (for 2 V batteries). Even numbers of batteries v centre point connected to Neutral.		
Floating voltage	V / cell (VRL)	2.25 V / cell (selectable from 2.2 2.35 V / cell) Mode of charging to current and constant voltage	
Voltage compensation according to temperature	mV / C° / cl -3.0 (Selectable: 0 5.0 / 25 or 30°C, or inhibited)		
Voltage ripple	% V floating	≤1	
Current ripple	% C10	≤5	
Boost charge load voltage	V/cell (VRLA)	2.4 V / cell (selectable from 2.30 2.45 V / cell) Mode of charging to current and constant voltage	
End of discharge voltage	V/cell (VRLA)	1.65 V/cell (selectable from: 1.60 1.750 V/cell) @ 0.6C discharge current 1.75 V/cell (selectable from: 1.65V 1.8 V/cell) @ 0.15C discharge current (The end of discharge voltage (EOD) changes linearly within the range set according to the discharge current)	
Battery charging power	KW	10% * UPS capacity (selectable from: 1 20% * UPS capacity)	

Tabla 26. Characteristics of parameters related to batteries.

# 10.4.3. Electrical characteristics (Inverter output).

Information	Units	Parameters
Rated voltage (1)	V AC	380/400/415 (3-phase and sharing the neutral with the bypass input and with the rectifier input).
Frequency (2.)	Hz	50/60
Overload	%	110 (for 1 h) 125 (for 10 min) 150 (for 1 min) > 150 (for 200 ms)
Overcurrent	% 300 (overcurrent limitation for 200 ms)	
Non-linear load capacity (3.)	%	100
Neutral current capacity	%	170
Static voltage stability	%	$\pm$ 1 (balanced load) $\pm$ 1.5 (100% unbalanced load)
Dynamic voltage response (4.)	%	±5
THD	%	<1 (linear load)
Sync Window	-	Rated frequency ± 2 Hz (selectable: ±1 ±5 Hz)

Information	Units	Parameters
Max. setting of the synchronization of the nominal frequency	Hz/s	1: selectable: 0.1 5
Inverter voltage range	% V AC	±5

#### Notes:

- 1. Factory setting is 400 V. Authorized personnel can set it to 380 or 415 V.
- 2. Factory setting is 50 Hz. Authorized personnel can set it to 60 Hz
- 3. EN50091-3 [1.4.58] 3:1 crest ratio
- 4. IEC62040-3 / EN50091-3 including 0 .. 100.. 0% transient load, the recovery time is half-cycle in order to have 5% of the stable output voltage.

Tabla 27. Inverter characteristics.

# 10.4.4. Electrical characteristics (Bypass input).

Information	Units	20	30	40	45	60	90	
Rated voltage	V AC	380/400	)/415 (three-ph		s sharing neutr ce from neutra		tifier input and delivering	
At 380 V		30	45	61	68	90	135	
Rated current At 400 V	А	29	44	58	65	87	130	
At 415 V		28	42	56	63	84	126	
	%	<125 (permanent) <110 (permanent)						
Overload			<		<130 (for 5 min.)			
Overioau		<150 1(for 1 min.)						
		> 150 (for 300 ms)						
Superior bypass line protection	-	Circuit breaker (125% of rated output current). IEC60947-2 C characteristic						
Rated current of neutral line	А	1.7 × ln						
Frequency (Hz)	Hz	50/60						
Transfer time between bypass and inverter	ms	Synchronized shifting: ≤1						
	-	Top margin: +10, +15, +20 or +25; default: +15					15	
Bypass voltage range V AC	%	Lower margin: -10, -20, -30 or -40; default: -20						
	-	(Acceptable delay of the stable bypass voltage: 10s)						
Margin of bypass frequency	%	±2.5, ±5, ±10 or ±20; default: ±10						
Sync Window	Hz	Nominal frequency ±2 Hz (selectable from ± 0.5 ± 5 Hz)						

Notes:

The factory setting is 400 V. Authorized personnel can set it to 380 or 415 V.

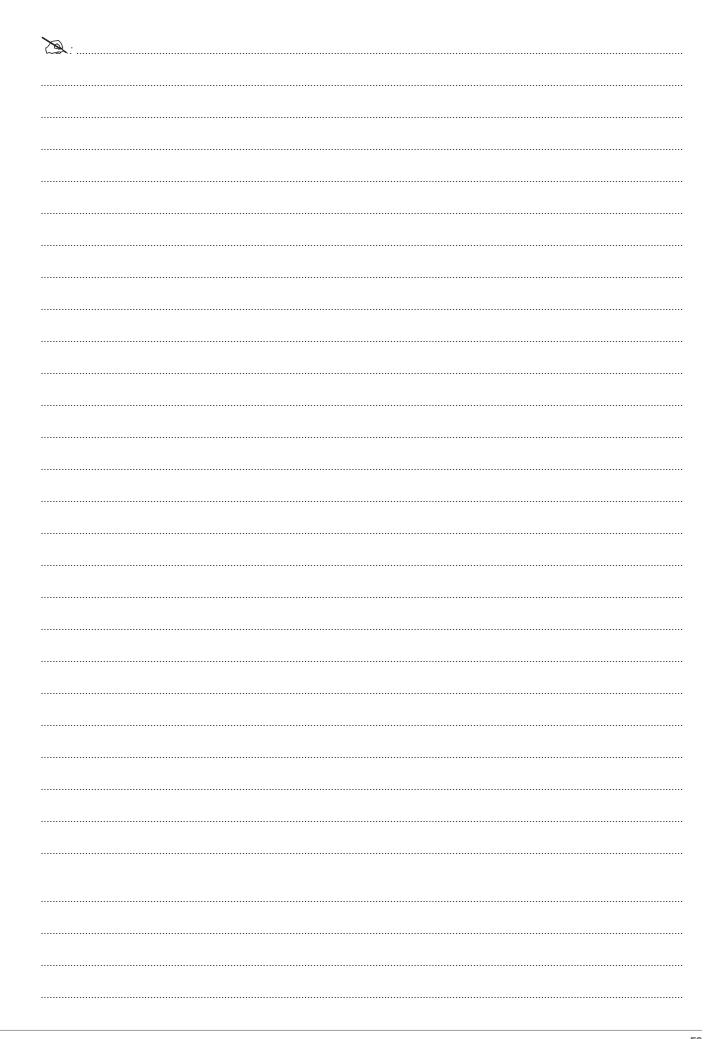
Authorized personnel can select 50 or 60 Hz. If the UPS is selected as a frequency inverter, then the bypass mode will not be available.

Tabla 28. Bypass input characteristics.

# 10.5. EFFICIENCY.

	Details				
Normal double-conversion mode	% 95 max.				
Eco-mode	%	99			
Discharge batter	Discharge battery mode (Nominal voltage of batteries 480 V and full linear load)				
Battery module	%	94.5			
Maximum air exchange	m³/min	4.5 / power module, 3.02 / bypass module			

Tabla 29. Efficiency characteristics.





Avda. de la Serra 100 08460 Palautordera

#### **BARCELONA**

Tel. +34 93 848 24 00 Fax +34 93 848 22 05 services@salicru.com SALICRU.COM



The Technical Service and Support (T.S.S.) network, Commercial network and warranty information are available in

www.salicru.com

## **Product Range**

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



@salicru\_SA



www.linkedin.com/company/salicru





