

INSTALLATION MANUAL



UNINTERRUPTIBLE POWER SUPPLY (UPS)

SLC X-TRA 500 and 800 kVA

SALICRU



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1. Introduction.

1.1. Acknowledgement letter.

We would like to thank you in advance for the trust you have placed in us by purchasing this product. Read this instruction manual carefully in order to be familiarized with its contents, because, as much as you know and understand the equipment the highest will be your satisfaction and safety levels and their features will be optimized too.

We remain at your entire disposal for any further information or any query you should wish to make.

Yours sincerely.

SALICRU

- The equipment here described **can cause important physical damages due to wrong handling**. This is why, the installation, maintenance and/or fixing of itself must be done by our staff or qualified **personnel exclusively**.
- Although we have made every effort to guarantee a complete and accurate information in this user's manual, we are not responsible for any errors or omissions that may exist.

The images included in this document are mere illustrations and they could not represent the part of the equipment exactly, therefore they are not contractual. Nevertheless, differences that could exist will be alleviated or solved with the correct labelling of the equipment.

- According to our policy of constant evolution, **we reserve the right to modify the specifications, operating or described actions in this document without forewarning**.
- **Any reproduction, copy or third party concession, modification or partial or in whole translations** of this manual or document, in any format or media, **is prohibited without the previous written authorization of our firm**, being reserved the full and exclusive ownership right over it.

2. Information for safety.

2.1. Using this manual.

The generic information of the equipment is supplied in digital format in a CD-ROM, and it includes among other documents the own user's manual of the system and the EK266*08 document concerning to «**Safety instructions**». Before doing any action over the equipment regarding installation or commissioning, change of location, setting or handling, read them carefully.

This user's manual is intended to provide information regarding the safety and to give explanations about the procedures for the installation and operating of the equipment. Read them carefully and follow the stated steps in the established order.



Compliance as regards to “Safety instructions“ is mandatory, being the user the legal responsible regarding to its observance and application.

The equipments are delivered duly labelled for the correct identification of any their parts, which combined with the instructions described in this user's manual, allows the end-user to make any operating of both installation and commissioning, in an easy and ordered way without doubt.

Finally, once the equipment is installed and operative, for future requests or doubts that could arise, it is recommended to keep the CD-ROM documentation in a safe place with easy access.

The following terms are used in the document indistinctly to be referred to:

- «**SLC X-TRA, X-TRA, equipment, unit or UPS**».- Uninterruptible Power Supply.
- Depending on the context of the sentence, it can be referred either to the own equipment or to the equipment with batteries, although all is assembled in one cabinet or metallic enclosure.
- «**batteries or accumulators**».- Group or set of elements that store the electron flow through electrochemical means.
- «**T.S.S.**».- Technical Service & Support.
- «**client, fitter, operator or end-user**».- are used indistinctly and by extension, to be referred to the fitter and/or operator which will make the corresponding actions, being responsible the same person about the actions to take on behalf of himself.
- In case of installations with IT neutral regime, the switches, circuit breakers must break the NEUTRAL a part from the three lines.

2.1.1. Conventions and used symbols.

Some symbols can be used and shown in the equipment and/or in the description of this user's manual.

For more information, see section 1.1.1 of EK266*08 document as regards to «**Safety instructions**».

3. Quality and standard guarantee.

3.1. Declaration of the management.

Our target is the client's satisfaction, therefore this Management has decided to establish a Quality and Environmental policy, by means of installation a Quality and Environmental Management System that becomes us capable to comply the requirements demanded by the standard **ISO 9001** and **ISO 14001** and by our Clients and concerned parts too.

Likewise, the enterprise Management is committed with the development and improvement of the Quality and Environmental Management System, by means of:

- The communication to all the company about the importance of satisfaction both in the client's requirements and in the legal and regulations.
- The Quality and Environmental Policy diffusion and the fixation of the Quality and Environment targets.
- To carry out revisions by the Management.
- To provide the needed resources.

3.2. Standard.

The **SLC X-TRA** product is designed, manufactured and commercialized in accordance with the standard **EN ISO 9001** of Quality Management Systems and certified by SGS body. The **CE** marking shows the conformity to the EEC Directive by means of the application of the following standards:

- **2014/35/EU.** - Low Voltage Directive (LVD).
- **2014/30/EU.** - Electromagnetic Compatibility (EMC).
- **2011/65/EU.** - Restriction of Hazardous Substances in electrical and electronic equipment (RoHS).

In accordance with the specifications of the harmonized standards. Standards as reference:

- **EN-IEC 62040-1.** - Uninterruptible power supply (UPS). Part 1-1: General and safety requirements for UPS's used in accessible areas by end users.
- **EN-IEC 60950-1.** - IT equipments. Safety. Part 1: General requirements.
- **EN-IEC 62040-2.** - Uninterruptible power supply (UPS). Part 2: Prescriptions for Electromagnetic compatibility (EMC).
- **EN-IEC 62040-3.** - Uninterruptible power supply (UPS). Part 3: Methods of operation specification and test requirements.



In case of any modification or intervention over the equipment by the end-user, the manufacturer is not responsible.



WARNING!:

SLC X-TRA. This is a category C3 UPS product. This is a product for commercial and industrial application in the second environment - installation restrictions or additional

measures may be needed to prevent disturbances.

Pay attention to those systems used in vital signs maintenance, medical applications, commercial transport, nuclear power stations, as well as other applications or loads where a failure in the product can cause serious personal injuries or material damages.



Declaration of conformity CE of the product is at the client disposal under previous request to our headquarters offices.

3.2.1. First and second environment.

The following examples of environment cover the majority of UPS installations.

3.2.1.1. First environment.

Environment that includes residential, commercial and light industrial premises directly connected without intermediate transformers to a public low-voltage mains supply.

3.2.1.2. Second environment.

Second environment: Environment that includes all commercial, light industry and industrial establishments other than those directly connected to a low-voltage mains that supplies buildings used for residential purposes.

3.3. Environment.

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

Equipment recycling at the end of its useful life:

Our company commits to use the services of authorised societies and according to the regulations, in order to treat the whole recovered product at the end of its useful life (contact your distributor).


Packaging:

To recycle the packaging, follow the legal regulations in force, in accordance with the particular norm of the country where the equipment is installed.

Batteries:

The batteries mean a serious danger for health and environment. The disposal of them must be done in accordance with the regulations in force.

4. Installation.

-  It is compulsory the compliance in terms of the safety instructions, being the legal responsible the user regarding to its observance. Read carefully them and follow the stated steps in the established order. The local electrical regulations and the different restrictions of the user's location, can invalidate some recommendations included in the manuals. When discrepancies exist, the user has to comply the local regulations.

- The purpose of this manual is to provide the explanations and procedures for the installation and operating of the equipment. Before installing and using the equipment, be sure that the instructions included in this manual and the rest of the support documentation have been read.





If the instructions in the supplied documentation are not total or partial understood, do not continue with the installation and operation tasks, because it could be a risk for your safety and even for the other people, apart from the own equipment and/or loads and installation.

- Manual and technical support documents are relating to the product, so they have to be kept close to the equipment in an accessible place. In case of losing them, ask for a documentation duplicate.
- Check that all nameplate data are the required for the installation.
- A wrong connection or manoeuvring, can make faults in the UPS and/or loads connected to itself. Read carefully the instructions of this manual and follow the stated steps in the established order.
- This UPS **has to be installed and used by qualified personnel only**.



Any intervention in the UPS **by personnel with no specific preparation**, means an electrical shock risk, besides of possible injuries to third persons, UPS or loads and/or installation faults.


Any person is defined as qualified, if he has experience in assembling, starting up and control the correct operating of the equipment, if he has the requirements to make the work and if he has read and understood all the written in this manual, and in particular the safety instructions. Such preparation is only considered valid, if it is certified by our company.

-  **Do not connect in parallel equipments from SLC X-TRA** with different features, versions, configurations, back up times or duplicated addresses (like two equipments that although they are identical has the same address because they belong to two different parallel systems).
- In any parallel system there is only one assigned address for each one of the equipments that makes it, being the MASTER the one with the lowest numerical range and the next correlative numbers the SLAVES.
-  When acquiring only one equipment from **SLC X-TRA** series with parallel kit, foreseen for future upgrading, only the instructions relating to the basic equipment will be attended, because it can't operate in another mode because it is an installation with only one equipment.
- It is advisable and very useful, not to say essential, to equip the parallel system installation, with a panel with separate protections for input, output and static bypass (the last one will not be needed for those equipments with common line for bypass and input), besides a manual bypass. Protection panel allows isolating only one equipment from the parallel


system, against any fault and supply the loads with the rest ones during its preventive maintenance or fixing.

- An external manual bypass panel for a single unit or parallel system can be purchased under request.

Also, it can be manufactured by yourself by keeping in mind the version and configuration of the available equipment or system and the attached documentation in the CD-ROM as regards to «Recommended installation diagram».

-  In parallel systems, cable length and cross cable section for any UPS from the protection panel to itself and vice versa will be the same for anyone without any exception.

4.1. Important safety instructions.

-  As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (⊕). Connect the conductor, before connecting the power supply to UPS input
- The distribution panel will have installed a residual current device from 300 to 500 mA sized to the suitable power of the system. When the input and bypass lines are common, the RCD device will be common for both lines. This premise will be applied for equipments in redundancy connection too.
- All connections in the equipment, including those for control (interface, remote control, ...), will be performed with the switches at rest and without any mains present (UPS power line input switch and those equipments with separate bypass line the bypass switch to "Off").
- Do not forget that the UPS is an electrical generator, so users must take all necessary precautions against direct or indirect contacts.
- The equipments have adhesive labels with indications for risks; these labels have to be visible and replaced in case of damaging.
- Warning labels should be placed on all primary power switches installed in places away from the equipment to alert the electrical maintenance personnel of the presence of a UPS in the circuit.
- The label will bear the following text or an equivalent one:

Before working in this circuit.

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



Risk of voltage feedback from UPS.

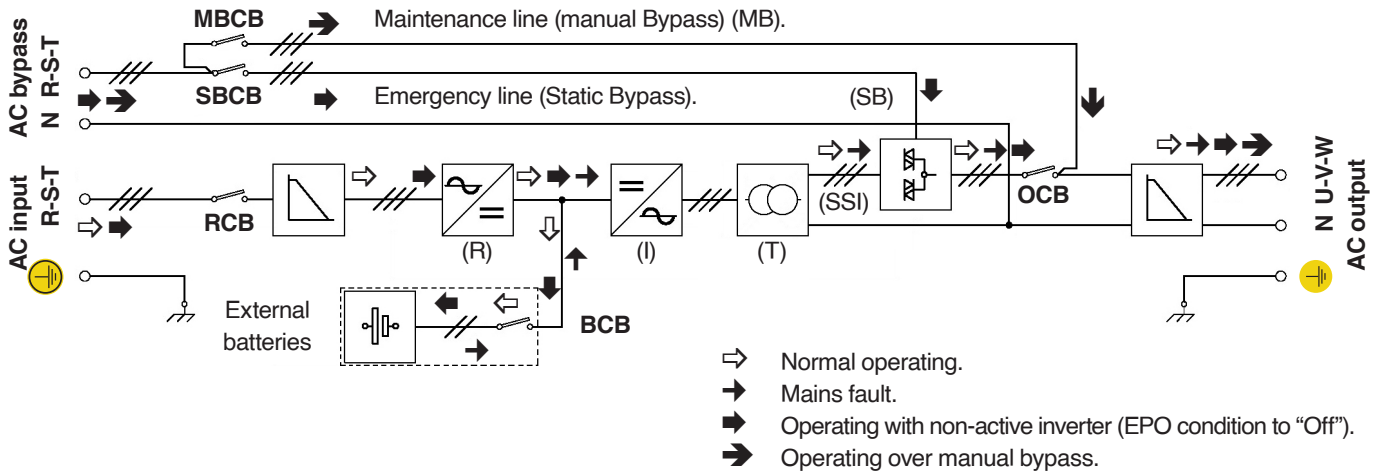
- When supplying voltage to a UPS of this series, consider that although the inverter is turned «Off» (deactivated) it doesn't mean that there is not any voltage in the output terminal strip, because these equipments always have static bypass line, separate or common to the rectifier line.

To break the output power supply completely, turn the switches **RCB, SBCB** and **OCB** to «Off» position.

Also, it is possible that the UPS might be supplying output voltage through the manual bypass, so this must be considered for the purpose of safety. If the output power supply of the UPS has to be interrupted in this situation,

deactivate the switch **MBCB**. For models higher than 300 kVA, the equipment does not incorporate this manual bypass switch and it is only possible to acquire it as an option for its external installation to UPS enclosure.

- Inside the UPS there are dangerous voltages, never open the cabinet, the access has to be done by authorised and competent personnel. In case of maintenance or fault, consult the closest **(S.T.S.)**.
- Cross cable sections used to supply the equipment and loads must be accordingly to the nominal current stated in the nameplate stuck in the equipment, by respecting the Low Voltage Electrotechnical Regulation.



- All power supply electrical cables of the equipments and loads, interfaces, etc, have to be fixed to immovable parts, otherwise they will be exposed to wrenches.
- Take care with the battery terminals because they are not isolated from the AC input line, existing the risk of dangerous voltage between the battery and earth terminals.
- In an optimal installation, the battery cabinet/s will be installed as close to the equipment as possible, but respecting the minimum peripheral distanced stated in section 5.3.4, this way the cable length of the DC voltage connection will be reduced and consequently the dropping voltage losses should be kept in mind due to the importance of the battery operating during the mains failures, although they are minimised.


Logically in the parallel systems, the equipments and their battery cabinets will be arranged attending the premises stated in the previous paragraph to this point.

- In order to avoid a total discharge of the batteries and as a safety measure after a long power supply break and when ending the working day, loads and equipment has to be shut-down by following the described operation.
- For long period of time of disconnection, consider the connection of the equipment once per month for ten hours as minimum, in order to recharge the batteries, avoiding the irreversible degradation of them. On the other hand, the storage will be done in a fresh and dry place, never outdoor.

4.1.1. Safety instructions regarding to batteries.


- The manipulation and connection of the batteries shall be done and supervised by personnel with battery knowledge only.
 - Batteries themselves, are supplied separate from the metallic cabinet, among other reasons, is because the cabinet is designed to store the batteries but not to support the mechanical efforts linked to the transport.
- Once the location of the equipment and battery cabinet/s is finished and always respecting the indications stated in this

document, proceed to fit the batteries in the own cabinet and to make their internal connection, following the supplied diagram inside the own battery cabinet together with rest of the auxiliary parts like bolts and nuts, cables or connection copper bars.

 Only personnel with battery and/or DC voltage knowledge, is authorised to make or supervise the connection of them. It is very dangerous to make these works without the needed training.

There is a high risk of electrical discharge with serious or very serious consequences even the death.

- For units requested without batteries, the acquisition, installation and connection of the batteries will always be done by the customer and under his responsibility. The relative data to the batteries as far as number, capacity and voltage are indicated in the battery label stuck beside the nameplate of the equipment, respect these data strictly, the battery polarity connection and the circuit diagram provided with this documentation.




 Only personnel with battery and/or DC voltage knowledge, is authorised to make or supervise the connection of them. It is very dangerous to make these works without the needed training.

There is a high risk of electrical discharge with serious or very serious consequences even the death.

- The battery voltage can involve the risk of electric shock and can produce high short circuit currents. Observe the following preventive measures before manipulating any terminal block identified in the labelling as «Batteries».
- Disconnect the corresponding protection elements.
 - When connecting a battery cabinet to the equipment, respect the cable's polarity and colour (red-positive; black-negative) indicated in the manual and in the corresponding labelling.




- Wear rubber gloves and shoes.
- Use tools with insulated handles.
- Removes watches, rings or other metal objects.
- Do not place metal tools or objects on the batteries.
- Never manipulate with your hands or through conducting objects, do not short either the battery terminal block of the equipment or the battery enclosure.
- Never short the battery terminals as it involves a high risk. It involves the detriment of the equipment and batteries
- Avoid mechanical efforts and impacts.
- Do not open or mutilate the battery. Released electrolyte is harmful and toxic to the skin and eyes.
- Do not dispose the batteries in a fire and high temperatures. The batteries may explode.
- In case of contact of the acid with parts of the body, wash immediately with plenty water and call urgently the nearest medical service.
- Batteries involve a serious risk for the health and for the environment. Their disposal should be done according to the existing laws.

4.1.2. Transport and handling.


- During transport and handling of the product, pay attention to the avoid bending or deforming parts and to change isolation distances.
-  **Weight is not distributed.**
UPS weight is not distributed uniformly. Pay attention when transporting and location approaching handling, because there is risk of dumping.
-  **Before starting any handling movement,** check that there is not any person in the vicinity. Consider the serious consequences that an equipment dropping over a person could have and even the death in extreme cases due to crushing.
- On receiving the device, make sure that it has not suffered any damage in transport. In case of any doubt of the total integrity of the packaging or the internal product make all pertinent claims to the transport agency and/or distributor, and in their lack to our company, by quoting serial number and references in the delivery note. Claims have to be done in the following 6 days to the product reception and it is mandatory to inform to the transport agency, regardless of any other action.
-  **Danger of injury due to mechanical faults.**
WARNING Mechanical faults of the electrical parts are a serious danger for the personnel, the own equipment, load/s and installation. Do not make installation works and/or commissioning, in case of detecting damages in the product.
- If it were necessary to return the equipment back, use the original packaging always.
- Once the reception is finished, it is suitable to pack the UPS again till its commissioning in order to protect it against mechanical shocks, dust, dirt, etc...



4.1.3. Installation.

- Installation of the product has to be done respecting the indications of the technical support documentation, even the current safety indications.
- It is essential to keep in mind the following points:
- This product has to be placed over a platform that can support the weight of the equipment and assure its vertical position;

- UPS has to be installed in an area with restricted access in accordance with the standard CEI EN 62040-1-2;
- Do not place the equipment close to liquids or in an environment with excessive humidity.
- Do not allow that liquid or objects enter inside the equipment.
- Do not cover the cooling grids.
- Avoid direct sunlight to the equipment and do not place it near to heat sources.
-  **Particular environment conditions.**
UPS is designed to support normal conditions of climate and environment, as the technical specifications state: altitude, operating ambient temperature, relative humidity, transport and storage environment conditions. It is necessary to take particular protection measures in case of unusual conditions:
 - Harmful smoke, dust, abrasive dust.
 - Humidity, vapour, saline air, bad weather of water filtering.
 - Explosive vapour or gas mixture.
 - Extreme variation temperature.
 - Bad cooling.
 - Conductor or radiant heat coming from other sources.
 - Powerful electromagnetic fields.
 - Higher radioactive levels than in the environment.
 - Fungus, vermin, parasites, etc.
-  **Use by authorised personnel only.**
All transport, installation and commissioning operations have to be done by qualified and trained personnel.
UPS installation has to be done in accordance with the local and national regulations on the part of the authorised personnel.
-  **Do not modify the equipment.**
Do not make any modification in the equipment, because it could cause failures in itself, injuries to third persons or yourself, load/s failures and/or in the installation.
Maintenance and fixing has to be done by authorised personnel only. Contact with our company or search through our website the nearest Service and Technical Support point (S.T.S.).

4.1.4. Electrical connection.



- The connection of the UPS to mains has to be done by respecting the current regulation.
- Check the data in the nameplate are the required ones by the installation.
-  **Check the conformity of the documentation.**
UPS has to be installed in accordance with the regulations of HD 384.4.42 S1/A2 and the standard CEI 60364-4-482 - chapter 482: fire protection.
Before doing the connection to mains, make sure that you have the approval from the electrical energy distribution to do it, in accordance with the current national regulations.
All connections have to be done by qualified personnel; before connecting the equipment, check that:
 - AC mains connection cables have the corresponding protection (fuses or circuit breaker switch).
 - Nominal, frequency and phase rotation from AC power supply is the suitable one.
 - Polarity connection between UPS and battery cabinet is correct.

- The possible earth dispersion has been controlled.
- UPS is connected to the following power supplies:
 - Battery DC voltage.
 - Mains AC voltage.
 - Bypass AC voltage.
-  **Danger of injuries due to electrical shock.**
 The equipment is exposed to high voltages, so it is important to follow the safety directives before doing any work over the UPS:
 - Connect the earth conductor to its terminal or bar, before doing any other connection.
 - Disconnect the battery switch or any other protection element, before manipulating and/or connecting the cables to the UPS.
-  **Danger of injuries due to electrical shock.**
 If the input switch has been fitted in an different area from the UPS, put the following label in a visible place about the equipment:

Before working in the circuit.



- Isolate the Uninterruptible Power Supply (UPS).

4.1.5. Operating.

- Installations where the UPS belongs to, have to meet all the current safety regulations (technical staff and safety practice at work). This device has to be commissioned, manipulated and disconnected by authorised personnel only.
- Calibration settings can only be changed by using the original software.
-  **Danger of injuries due to electrical shock.**
 During the operation, energy conversions are made inside the equipment, which mean the presence of high voltage and currents.
 - Before start up the equipment, check that all covers and door are closed.
-  **Danger due to toxic substances contact.**
 The supplied batteries with the UPS contain a small quantity of toxic substances. Nevertheless and to avoid accidents, follow the following rules:
 - Do not turn ON the UPS if the temperature and humidity levels exceed the established limits in the technical specifications.
 - Do not put the batteries in contact with the fire (risk of explosion).
 - Do not open the battery (released electrolyte is harmful to the skin and eyes).
 - Batteries involve a serious risk for the health and for the environment, their disposal should be done according to the existing laws.

4.1.6. Maintenance.


- Maintenance and fixing tasks are reserved for authorised and qualified personnel only. Before doing any action relating to this tasks check that the UPS is completely disconnected from AC mains (input power supply) and DC (batteries).
- Even disconnecting all the internal switches of the equipment, there is voltage at the AC input terminal block. To isolate the UPS completely, it is necessary to install external switches at the input and bypass lines.

- Also, after turning off and the possible disconnection from the AC power supply, inside the equipment there are dangerous voltages due to the slow discharge of the capacitors. It is better to wait for 5 minutes as minimum before opening the UPS doors.
-  **Danger of injuries due to electrical shock.**
 The possible interventions inside the equipment can only be done in case of lack of voltage and by respecting the safety regulations:
 - Check that the battery switch, usually located in the same cabinet or rack, is turned "Off".
 - Isolate the equipment completely by turning the external switches of the AC lines (input and bypass).
 - Wait for 5 minutes as minimum, to discharge the capacitors.
-  **High temperature of some components.**
 After shutdown and disconnecting the UPS some components could be very hot (transformers, heatsinks, etc), it is advised to use protection gloves.

4.1.7. Storage.

Keep the UPS into its original packaging, and dry place, safeguard from rain, protected from dust and temperatures between -10°C a +70°C.

In the storage of the equipment, the particular protection measures will be kept in mind in case of unusual conditions.

-  **Particular environment conditions.**
 UPS is designed to support normal climatic and environment conditions, as it is stated in the technical specifications: altitude, operating ambient temperature, relative humidity, transport and storage ambient conditions. It is necessary to take protection particular measures in case of unusual conditions:
 - Harmful smoke, dust, abrasive dust.
 - Humidity, vapour, saline air, bad weather or water filtering.
 - Explosive vapour or gas mixture.
 - Extreme variation temperature.
 - Bad cooling.
 - Conductor or radiant heat coming from other sources.
 - Powerful electromagnetic fields.
 - Higher radioactive levels than in the environment.
 - Fungus, vermin, parasites, etc.



4.2. To keep in mind.

- Do not install the equipment in corrosive, dusty environments and even outdoors.
- Do not obstruct the cooling grids by entering objects through themselves or other orifices.
- Leave space in the equipment peripheral for the air cooling flow (see section 5.3.5.).
- Location will be spacious, ventilated, far from heat sources and easy access.
- Place the equipment the closest to the power supply and loads to be supplied.
- Do not put materials over the equipment or parts that obstruct the correct visualization of the synoptic.

- Do not clean the equipments with abrasive, corrosive, liquids or detergent products. To clean the equipment, wipe over a damp cloth and then dry it. Avoid sprinkling or spillage that could enter through the slots or cooling grids.
- Avoid direct sunlight, because it contributes to increase the temperature of the equipment significantly and even more in summer months, where the impact will be higher.
- All UPSs from **SLC X-TRA** series and the battery sets have terminal blocks as connection parts for power and connectors for communications, located inside the equipment.
 - Open the front doors of the equipment to access to them.
 - When connection tasks are ended, close the doors.
- Currents stated in table 1 for each model, correspond to the immediate higher circuit breaker protection.
- Cross cable section of input, output and bypass lines, are determined from the currents stated in the table 1 according to the power of the equipment, by respecting the Local and/or National Electrotechnical Regulation. For those models with common bypass line (**X-TRA-CB**), pay attention to the input line values only.

Model	Power (kVA)	Currents (A)			
		Input	Bypass	Output	Battery
SLC-500-XTRA	500	800	800	800	945
SLC-800-XTRA	800	1250	1250	1250	1520

Table 1. Currents depending on the models



- The switchgear or external manual bypass panel:
 - At least, the installation will have one protection for the short-circuit in the power supply line of the UPS.
 - For single equipments, it is recommended to install an external manual bypass panel, equipped with input, output and manual bypass protections.
 - For parallel systems, **it is essential** to install a switchgear or manual bypass panel. The switches of the panel must allow isolating one UPS from the system, in case of any failure and allow feeding the loads with the rest ones, either during the preventive maintenance tasks or during the failure and its reparation.
-  The documentation delivered together with this user's manual and/or CD-ROM or Pen Drive, includes information regarding the «Recommended installation diagram» for each input and output configuration. This documentation shows the wiring circuit diagrams, as well as the protection and cross cable sizes that are connected to the equipment, considering the nominal voltage. All the figures are calculated for a **total maximum cable length of 30 m** between the switchgear panel, equipment and loads.
 - For longer lengths, correct the cross cable sections in accordance with the Regulations or standards of the country, in order to avoid dropping voltages.
 - In the own documentation and for each configuration, it is available the information for «N» equipments in parallel, as well as the features of the «Backfeed protection» (for models up to 300 kVA).
-  In parallel systems, the length and cross cable section that connect the switchgear or manual bypass panel with each UPS must be the same for all of them, with no exception.
- The cross cable section must be always according to the size of the own terminals of the switches, in such way that

the wire is embraced properly, in order to guarantee an optimal contact between both parts.

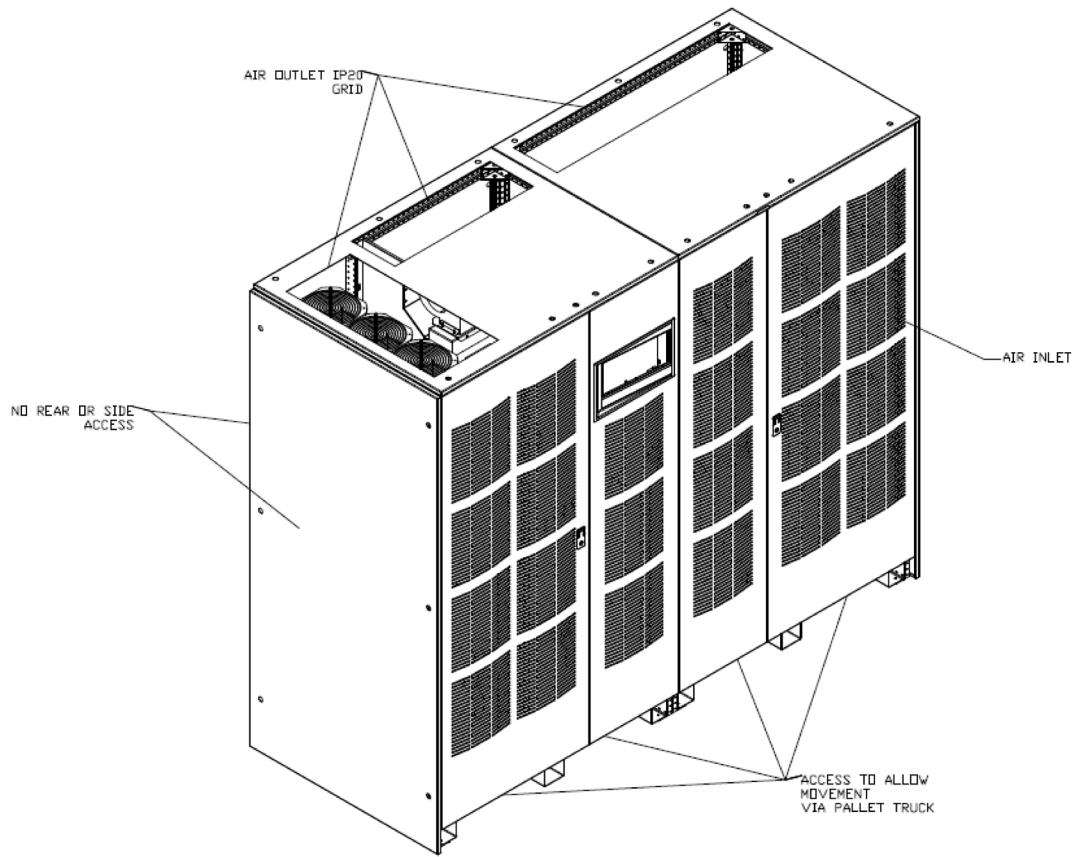
- In the nameplate of the equipment, it has only printed the nominal currents as it states the safety regulation EN-IEC 62040-1. To calculate the input current, it has been considered the power factor and the own efficiency of the equipment.

It is better to install protections and cross sections according to the currents in table 1.

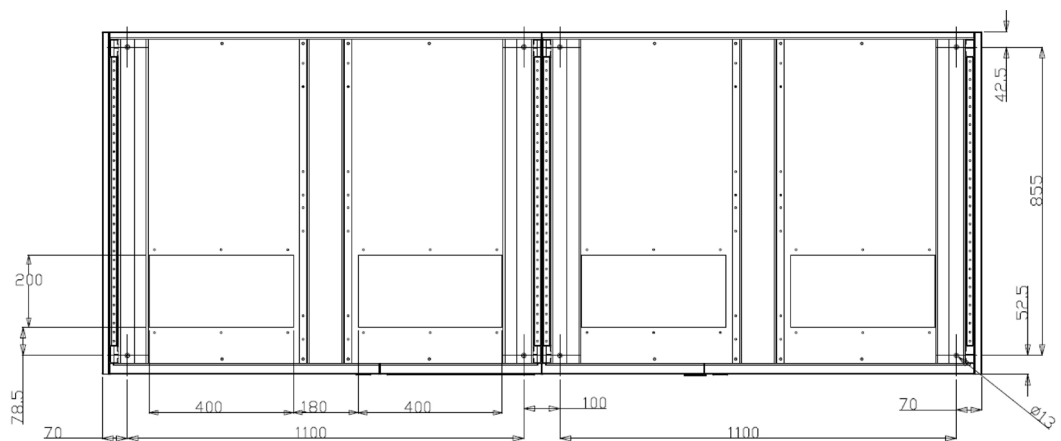
Overload conditions is considered as a nonpermanent and exceptional mode.

- If it is added peripherals to the input, output or bypass like transformers or autotransformers to the UPS, the currents stated in the own nameplates of those elements has to be considered in order to use the suitable cross sections, by respecting the Local and/or National Low Voltage Regulation.
 - When an equipment incorporates a galvanic isolation transformer, as standard, as an option or either installed by yourself, either at the UPS input, bypass line, output or at all of them, protections against indirect contact has to be fitted in (residual current device) at the output of each transformer, because its specification of isolation will prevent the triggering of the protections fitted in the primary of the transformer in case of electrical shock in the secondary (output of the isolation transformer).
 - Remind you that all external isolation transformers and supplied from factory to be installed at the output, has the neutral of the secondary connected to earth by means of a cable bridge between both terminals. If it were required an isolated output neutral, remove this cable bridge, keeping the precautions stated in the respective local and/or national low voltage regulations.
 - Input entry cable is foreseen through the bottom.
 - Batteries are always installed in one or more cabinets, or in a particular rack under request, but they are always separate from the own UPS cabinet.
-  Only personnel with battery and/or DC voltage knowledge, is authorised to make or supervise the connection of them. It is very dangerous to make these works without the needed training.
- There is high risk of electrical discharge with serious or very serious consequences even the death.
-  **Important for safety.** Do not turn the battery switch **BCB fitted in the cabinet/s of the accumulators** to “On” till it is indicated, because irreversible damages can be done to the equipment, load/s, installation or even injuries to persons.

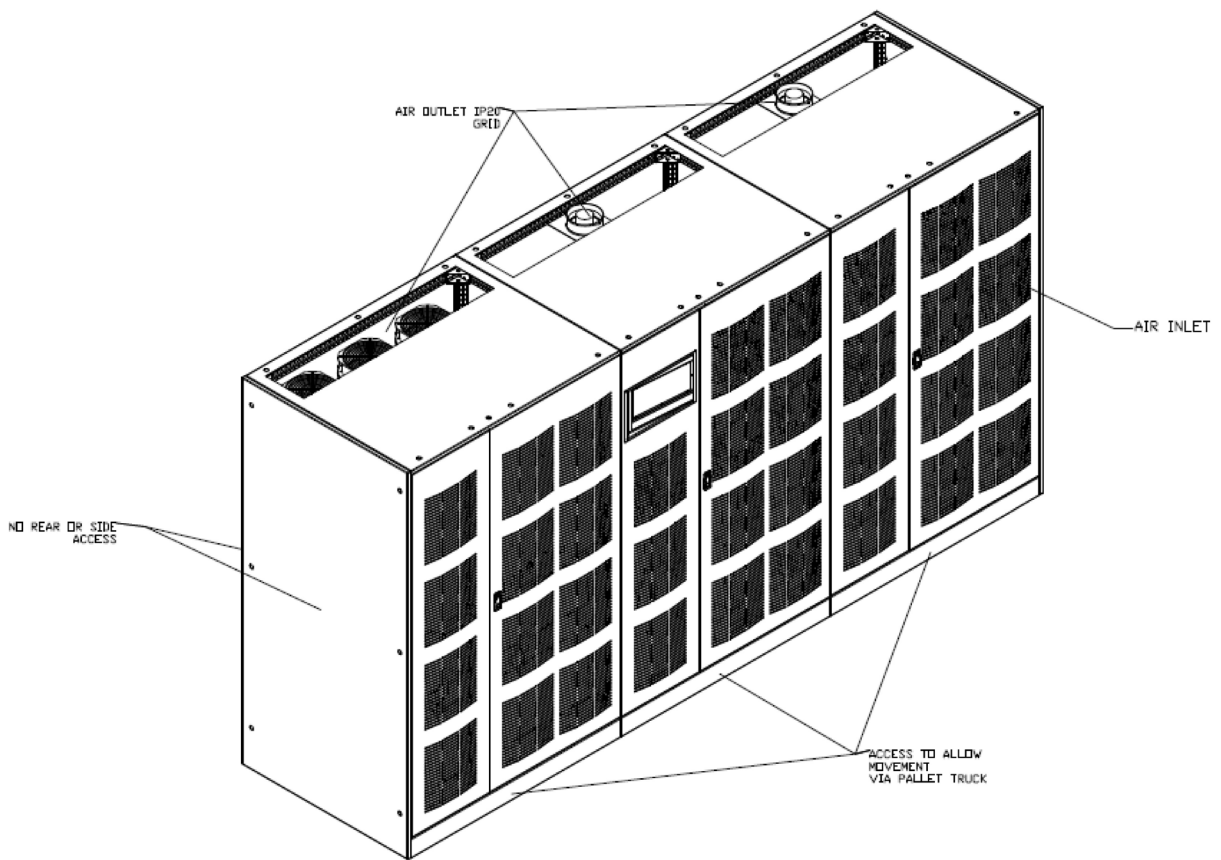
4.3. General views



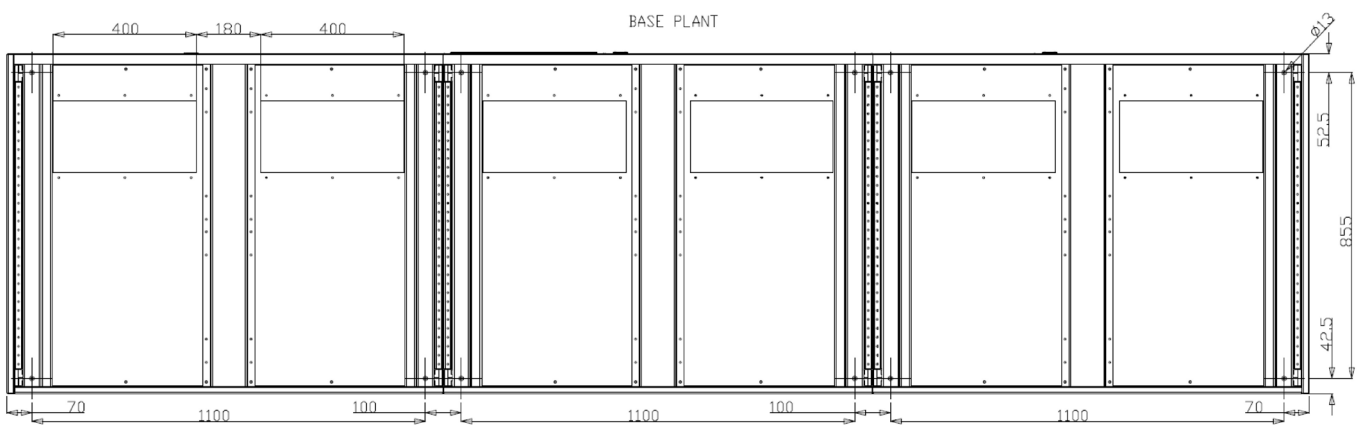
SLC-500-XTRA: Air inlet and outlet for cooling



SLC-500-XTRA: Entry cables opening




SLC-800-XTRA: Air inlet and outlet for cooling




SLC-800-XTRA: Entry cable opening

4.4. Reception of the equipment.

4.4.1. Assembly procedure for 500 and 800 kVA

 IMPORTANT: DON'T CONNECT THE UNIT TO THE MAINS UNTIL HAVING CLEARED ALL THE POINTS OF THIS PROCEDURE.

 IMPORTANT: READ CAREFULLY ALL THE WARNINGS AND SECURITY RECOMMENDATIONS INCLUDED IN THE MANUAL.

1. UNPACKING

- a. Cut the fixing ribbons that hold the carton to the pallet
- b. Remove the carton box towards the upper direction, without cutting it, to avoid damaging the UPS.
- c. Remove the plastic cover by unfixing its lower side from the pallet and pulling it upwards. Don't cut it to avoid damaging the UPS.



Fig. 1. Remove the plastic cover

- d. Remove all the protecting wrapping elements that cover the different connections. Do not use any cutting object to avoid damaging the UPS.



Fig. 2. Remove all the protecting wrapping elements

- e. Repeat the operation for the second body of the cabinet.
- f. **Case of 500 kVA:** To continue with this guide, we will call "A" the cabinet that has the control panel and "B" the cabinet that has no control panel.



Fig. 3. Cabinets 500 kVA with control panel and without control panel

- g. **Case of 800 kVA:** To continue with this guide, hereinafter we will call "A" the cabinet that has the black lateral panel mounted on the left side, "B" the unit with the control console and no panels on the sides and "C" the cabinet that has the black lateral panel mounted on the right side.

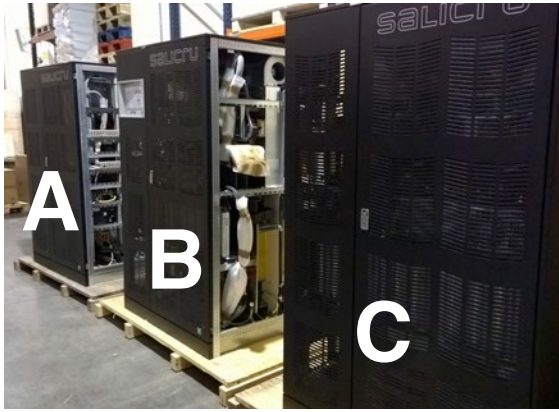


Fig. 4. Cabinets 800 kVA with control panel and without control panel

2. UNLOADING

- a. In each UPS body (A, B) or (A, B and C), remove manually the front base cover by pulling it out from the sides. You will not need any tool to do that as it's fitted by manual pressure. Once removed handle it with care in order to preserve the part appearance.

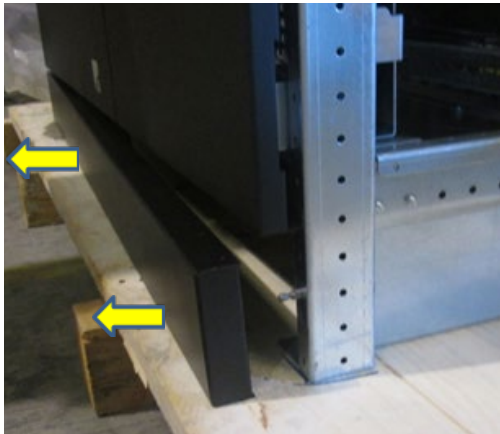


Fig. 5. Removing the base

- b. Remove the screws that are fixing the cabinets to the pallet.
- c. **Case of 500 kVA:** Identify the 7 mm Ø holes on the upright profiles of the left side of B cabinet (3 on each profile placed on the lower, middle and upper side of the profile). These holes are bigger than the others which are 5mm Ø), so that the supplied bolts can pass through them without tapping, as we will use them to fix the 2 bodies of the cabinet. Once you place the 2 bodies side to side, you will not be able to see these holes anymore so, it's recommended to mark them in the inner side of the profile, as well, to make the fitting operation easier.

Remove the bolts nuts and washers mounted in the 2 cooper bars (marked R+ and 46) placed in the right side of the A cabinet. Don't throw them as will be needed later on for the connection process.



Fig. 6. Removing of the bolts nuts and washers

- d. **Case 800 kVA:** Later on, each cabinet must be tightened to another one through 6 holes. Identify the 6+6 holes of 7mm diameter on the front and rear upright profiles of the cabinet sides (3 on each profile placed on the lower, middle and upper side of the profile). These holes are bigger than the others (which are 5mm Ø), so that the supplied bolts can pass through them without tapping, as we will use them to fix the 2 bodies of the cabinet. Once you place the bodies side to side, you will not be able to see these holes anymore so, it's recommended to mark them in the inner side of the profile to make the fitting operation easier. The fitting operation will be explained on point #18.



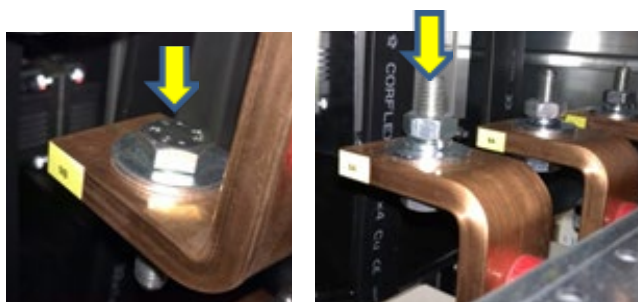
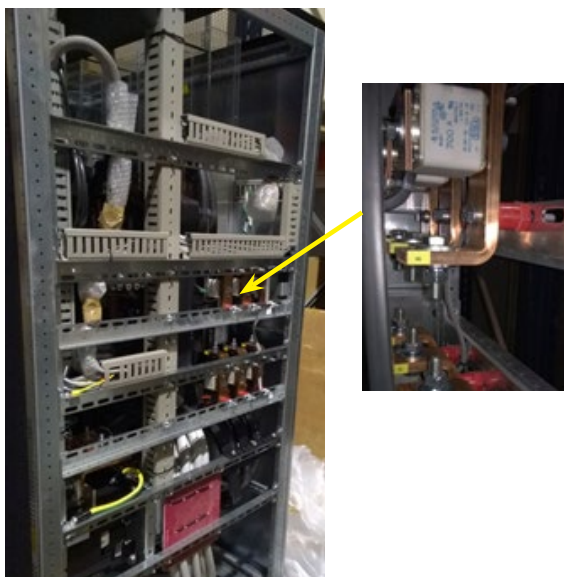
Fig. 7. Identification of the 7 mm Ø holes

- e. **Case 500 kVA:** Now you can carefully download the cabinets from the pallet one by one. Be aware that both cabinets may have different weights. Refer to the manual and packing list in order to use a forklift with enough power, according to each cabinet weight.
- f. Place the cabinets on the final destination following precisely all the recommendations given in the manual. Always keep in mind that A cabinet must be place on the left side of B cabinet. Try to place the cabinets as close as possible in order to make easier the assembly operation. Be careful not to damage the cabinets and their connecting elements during the operation.



Fig. 8. Placement of the cabinets

- g. Once placed, you can put back the front base cover plates removed during the operation #7.
- h. **Case 800 kVA:** In the right side of the “A” cabinet, remove the bolts, nuts and washers from the 6 cooper bars marked as 7A, 8A, 9A, 7B, 8B and 9B. Don't throw them as will be needed later on for the connection process (operation #19).

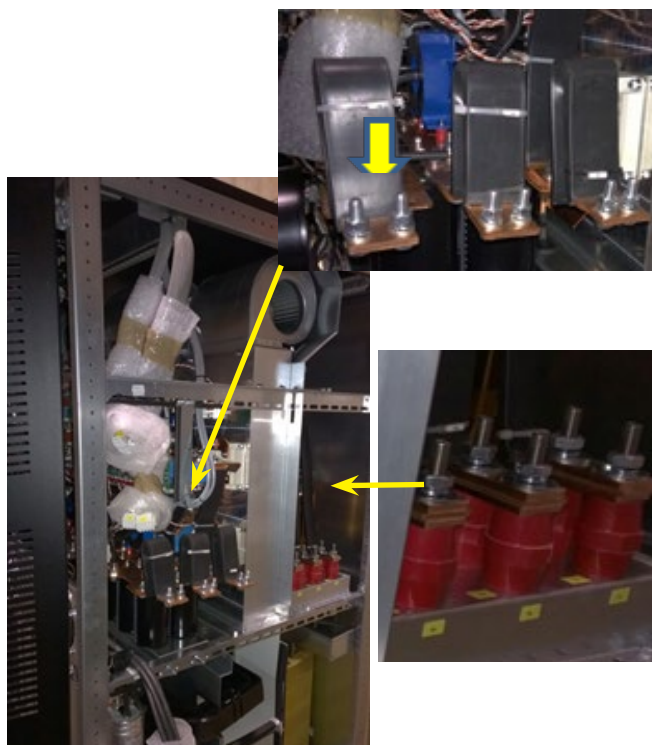


- i. In the left side of the “B” cabinet, remove the protecting film and cut the plastic ties that are fastening the thin cooper bars through the holes (be careful not to cut the

ties that are holding the name labels. After this, slightly separate the upper and lower cooper plates as they will be connected to the bars detailed in point number 9, each one to the equivalent corresponding reference (7A, 8A, 9A, 7B, 8B and 9B) (operation #19).



- j. On the right side of the “B” cabinet, remove the bolts, nuts and washers from the 3 cooper bars marked as +R, 46. -R. Also remove the nuts and washers from the 6 red pillars that are fixing the 3 cooper bars named as 9B, 8B and 7B. Don't throw any of the elements removed in this point as they will be needed later on for the connection process (operation #29 and #30).



- k. Unfasten the screws that are fixing the cabinets to the pallet.
- l. Now you can carefully download the cabinets from the

pallet one by one. Be aware that both cabinets may have different weights. Refer to the manual and packing list in order to use a forklift with enough power, according to each cabinet weight. Also, confirm that the ground will be able to stand the UPS weight before placing it in the final destination.

- m. Place the cabinets on the final destination following precisely all the recommendations given in the manual. For SLC-800-XTRA model assembly, it is mandatory to have a rear clearance of around 500~600mm. Always keep in mind that A cabinet must be placed on the left side of B cabinet and C cabinet on its right side. Try to place the cabinets as close as possible in order to make easier the assembly operation. Be careful not to damage the cabinets and their connecting elements during the operation. Make sure that any cable gets trapped amongst the cabinets.

After assembly, the unit could be placed against the wall (if there is a safe method of moving such a wide unit). Alternatively, cabinets B and C can be firstly assembled with the mentioned rear clearance, later place cabinet A and B-C against rear wall, and finally assembly A to B-C from the front-inner part of A.



- c. Remove the 2 screws in the left side of the top inner right panel of the A cabinet. Once they are unfastened, the panel can be opened like a door. These last 2 operations will give us a clear and wide access to the connection are between the cabinets, from the front side of the UPS.



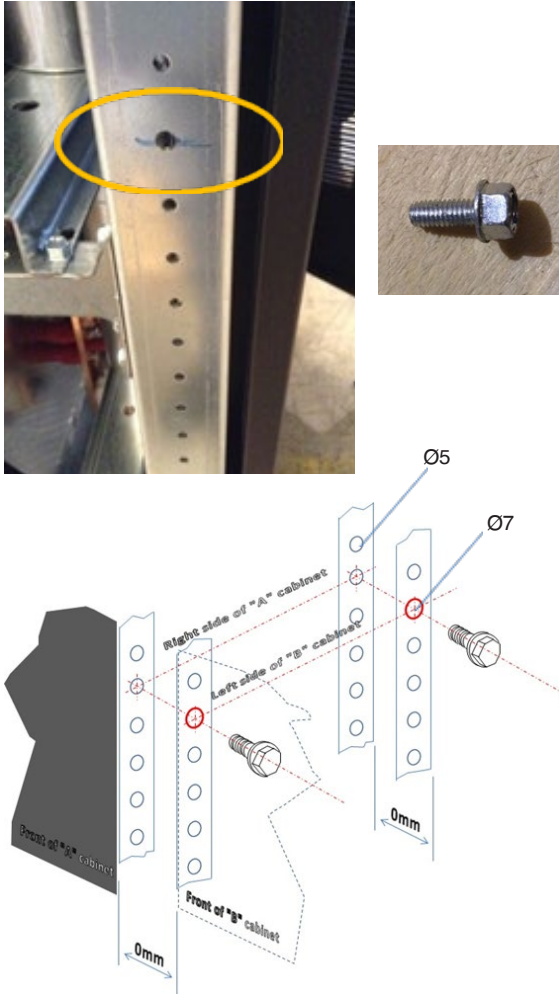
3. ASSEMBLY 500 kVA

- a. Unlock the doors and open them completely. The 2 main big doors are easily open while the 2 small doors are fixed by bolts that should be removed.
- b. To access easily the intermediate area from where the cabinets must be connected amongst them, remove the bolts fixing the inner panels (upper and lower) on the left side of B cabinet and equally the lower panel in the right side of the A cabinet. The breaker handles will come out together with the panel, making this operation easy.

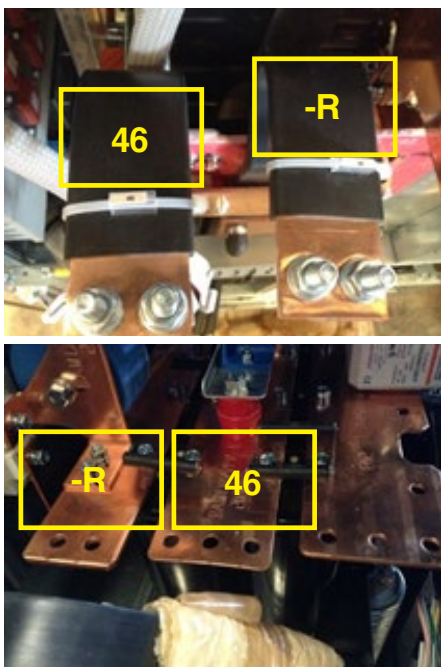


- d. From the inner left side of the “B” cabinet, identify the total of six 7mm Ø holes that were described in point#9. You will have to tighten the 2 cabinets through these holes using the 6 self-taping screws provided in a separate plastic bag, proceeding as described in the scheme below. The 2 cabinet bodies’ sides must be perfectly aligned and in even contact on the front and rear edges (there should not be any gap between the 2 upright profiles to be fixed (the drawing is showing a gap with the purpose to make a more clear description but

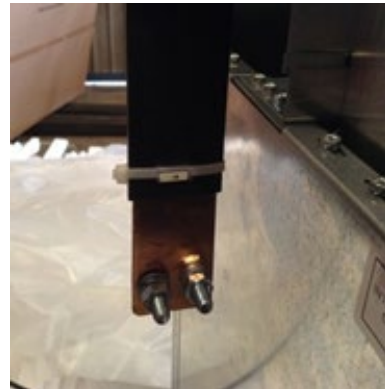
you should follow the 0mm indication).



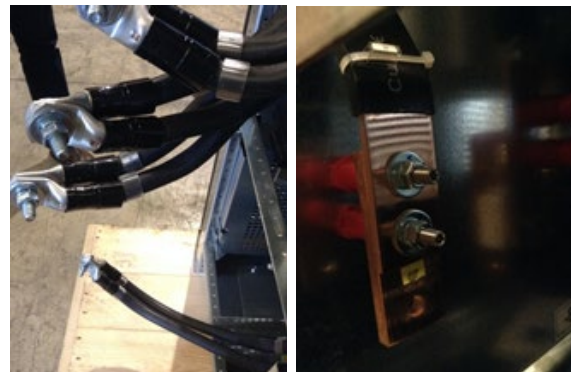
- e. Connect the cooper bars named 46 and -R to the coincident bars on the other cabinet (500 kVA) and 7B/8B/9B/7A/8A/9A to the corresponding bars (name and position) on cabinet A (800 kVA). You will need to use the bolts, nuts and washers removed on point#9.



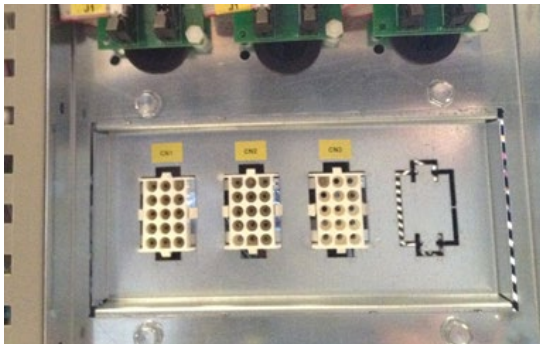
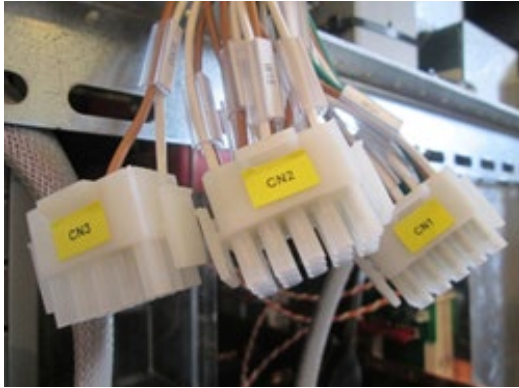
- f. Connect the cooper bar named +R (placed on the left side of B cabinet) to the vertical plate of the A cabinet marked in the picture.



- g. Connect the power cables named 21, 22, 23 and 24 to the corresponding bars 21N, 22R, 23S, 24T.



- h. Plug the aerial connectors CN1, CN2 and CN3 from the A cabinet to the connector board place on the B cabinet, following the matching indication. These connectors have polarity to avoid a connection mistake, if you feel that the connection is difficult make sure the aerial connector is in the right position.

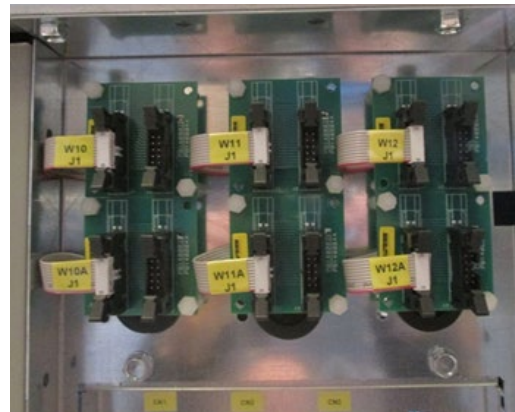
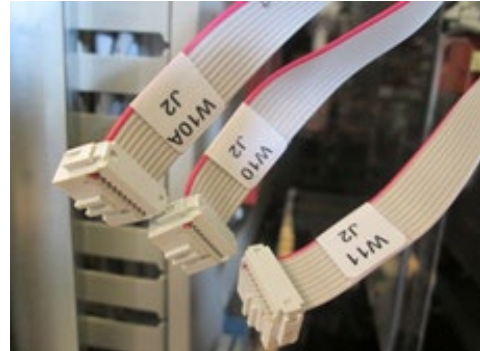


- i. Connect the aerial connector W22/N to the corresponding aerial plug with the same name, placed in the opposite cabinet.



- j. Plug the aerial connectors W10, W11, W12, W10A, W11A and W12A from the A cabinet to the flat connector sockets in the board place on the B cabinet, following

the matching indication. These connectors have polarity to avoid a connection mistake, if you feel that the connection is difficult make sure the aerial connector is in the right position.



- k. Do the operation #16 reversely locking the inner upper right door of the A cabinet and tightening the fixing bolts properly.
- l. Put back all the inner panels removed on operation #15. In the cover includes the breaker handle, make sure it's properly fixed to the breaker axis. Make sure to use the same bolts you removed.
- m. Lock the outer small doors fixing them with the provided bolts (2 for every door, in top and bottom edges).
- n. Lock the doors.
- o. After finishing all this procedure, refer to the manual for the following operations.

4. ASSEMBLY 800 kVA

- a. Unlock the doors and open them completely. The 2 main big doors are easily open using the lock handle, while the 2 small doors of B and C cabinets are fixed by bolts that should be removed.
- b. To access easily the intermediate area from where the cabinets must be connected through, remove the bolts fixing the inner lower panel on the right side of the A cabinet. The breaker handle will come out together with the panel, making this operation easy.

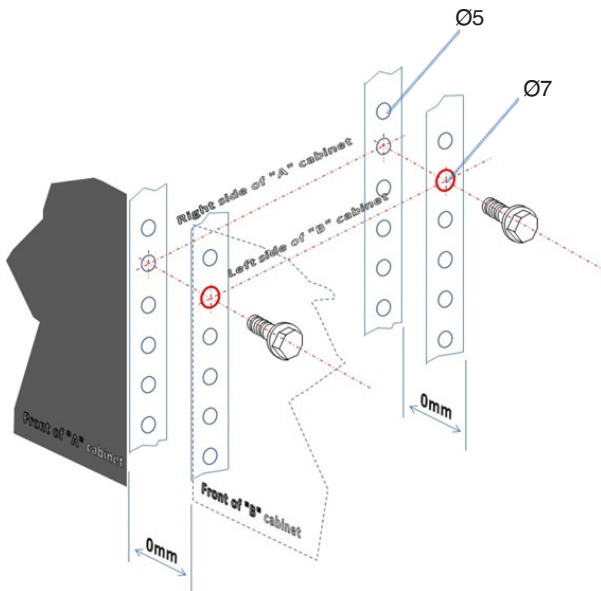


- c. Remove the 2 screws in the left side of the top inner right panel of the A cabinet. Once they are unfastened, the panel can be opened like a door. These last 2 operations will give us a clear and wide access to the connection are between the cabinets, from the front side of the UPS.

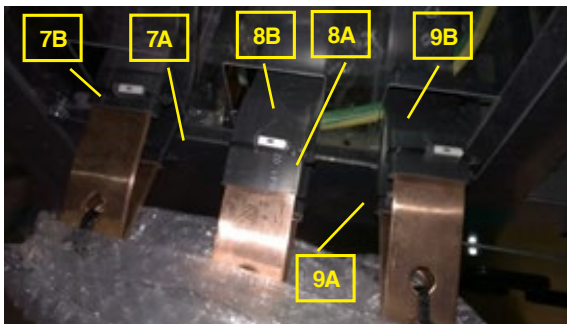


- d. From the inner side of the corresponding cabinet, identify the six 7mm holes that were described in point#8. You will have to tighten each 2 cabinets through these holes using the 6 self-tapping screws provided in a separate plastic bag, proceeding as described in the scheme below. The cabinet bodies' sides must be perfectly aligned and in even contact on the front and rear edges (there should not be any gap between the 2 upright profiles to be fixed (the drawing is showing a gap with the purpose to make a more clear description but you should follow the 0mm indication)). Make sure that the bolt is inserted from the side where the hole diameter is bigger, otherwise the cabinets will not get fastened together.

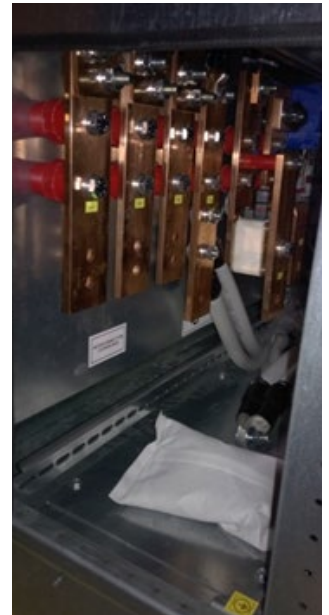




- e. Connect the slim cooper bars, from cabinet B, named 7B/8B/9B/7A/8A/9A to the corresponding bars (name and position) on cabinet A. You will have to bend the slim bars to get the proper position to connect them through the holes using the bolts, nuts and washers removed on point#9.



- f. Search the power cables named 21, 22, 23 and 24 from cabinet A, pull them gently out towards cabinet B, through the hole that cabinet B has on the lower right area of its left side, and connect them to the free holes on corresponding terminal cooper bars named as 21N, 22R, 23S, 24T.



- g. Plug the aerial connectors CN1, CN2 and CN3 from the A cabinet to the connector board place on the B cabinet, following the matching indication. These connectors have polarity to avoid a connection mistake, if you feel that the connection is difficult, make sure the aerial connector is in the right position.



- h. Connect the aerial connector W22/N from cabinet A to the corresponding aerial plug with the same name, placed in the left side of cabinet B.



- i. Plug the aerial connectors W10, W11, W12, W10C, W11C, W12C, W53, W54, W55, W61, and W18A from the A cabinet to the flat connector sockets in the board place on the B cabinet, following the matching indication. These connectors have polarity to avoid a connection mistake, if you feel that the connection is difficult, make sure the aerial connector is in the right position.

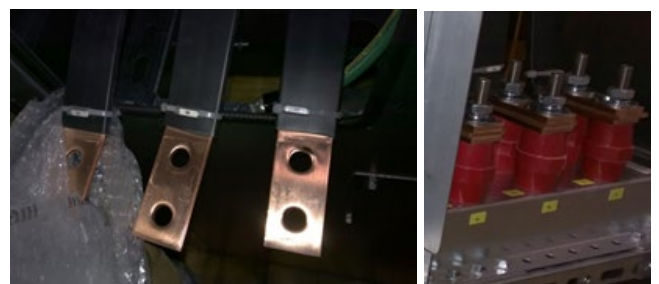


- j. Plug the aerial connector W26 from the A cabinet, into the flat connector that is free in the back side of the control panel PCBA, placed in B cabinet's door.



- k. In the 800 kVA, connect the ground cable (Yellow and Green) from cabinet A to the M10 bolt placed in cabinet B for that purpose, marked with the international ground symbol. If necessary, cut the black tie that is holding the cable to the frame parts of cabinet A. Be very careful not to damage the cable during the operation.

- l. Do the operation #17 reversely locking the inner upper right door of the A cabinet and tightening the fixing bolts properly.
- m. Put back all the inner panels removed on operation #16. In the cover includes the breaker handle, make sure it's properly fixed to the breaker axis. Make sure to use the same bolts you removed.
- n. Open the front doors of B and C cabinets following step #15.
- o. Connect the slim cooper bars, from cabinet C, named 7B/8B/9B to the bolts of the red isolating barrels placed on the left side of cabinet B using the nuts and washers removed on point#11. Do not remove the barrels or the bars that are already mounted over them, at any moment.



- p. Connect the slim cooper bars, from cabinet B, named +R/46/-R to the corresponding (by position) thin cooper plates on cabinet C using the bolts, nuts and washers removed on point#11.



- q. Plug the aerial connectors CN4 and CN5 from the B cabinet to the connector board place on the C cabinet, following the matching indication. These connectors have polarity to avoid a connection mistake, if you feel that the connection is difficult, make sure the aerial connector is in the right position.



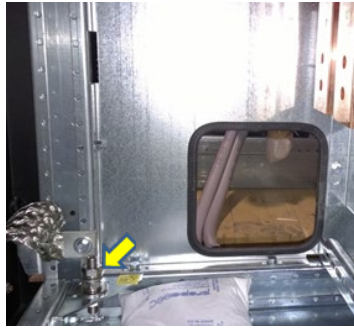
- r. Plug the aerial connectors W10B, W11B, W12B, W10AB, W11AB, W12AB, W53B, W54B, W55B and W61 from the B cabinet to the flat connector sockets in the board place on the C cabinet, following the matching indication. These connectors have polarity to avoid a connection mistake, if you feel that the connection is difficult, make sure the aerial connector is in the right position.



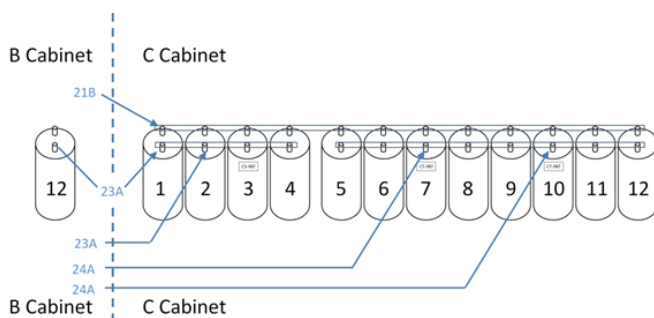
- s. Find the 4 grey power cables on the lower right side of Cabinet B marked as 21N, N3-S3, N2-S2 and N1-S1. Pull them gently through the small window placed in the left side (bottom-right) of cabinet C and connect them to each cooper terminals matching each cable with each bar, according to the names in their labels.



- t. Connect the free terminal of the front ground cable (Yellow and Green) from cabinet B to the M10 bolt placed in cabinet C for that purpose, marked with the international ground symbol. If necessary, cut the black tie that is holding the cable to the frame parts of cabinet B. Be very careful not to damage the cable during the operation.



- u. There are 5 black cables hanging in the right side of Cabinet B, marked as 21B, 23A, 23A, 24A, 24A that must be connected to the bolts of the capacitors CS-INT, CT-INT, in cabinet C, following the schematic below. Please follow strictly the connection points, taking into account when the connection must be made in the front bolt or in the rear bolt of the capacitors.



- v. Lock the outer small doors fixing them with the provided bolts (2 for every door, in top and bottom edges).
- w. Lock the doors.
- x. Once placed, you can put back the front base cover plates removed during operation #7.
- y. After finishing all this procedure, refer to the manual for the following operations.

4.4.2. Location and minimum distances for UPS cooling.

- UPS can be placed at any location, meanwhile it comply with all the safety instructions stated in section 5.1, considering the weights stated in table 2.
- All equipments, with no exception, will be installed by respecting the minimum distances for free air cooling flow stated in table 3, attending the proximity till the closest adjoining walls and rest of the nearest equipments. Marks stated in this table consider the needed space for daily inspection, manipulation, as well as for preventive maintenance and/or fixing tasks.

4.4.3. Footprint and weights.

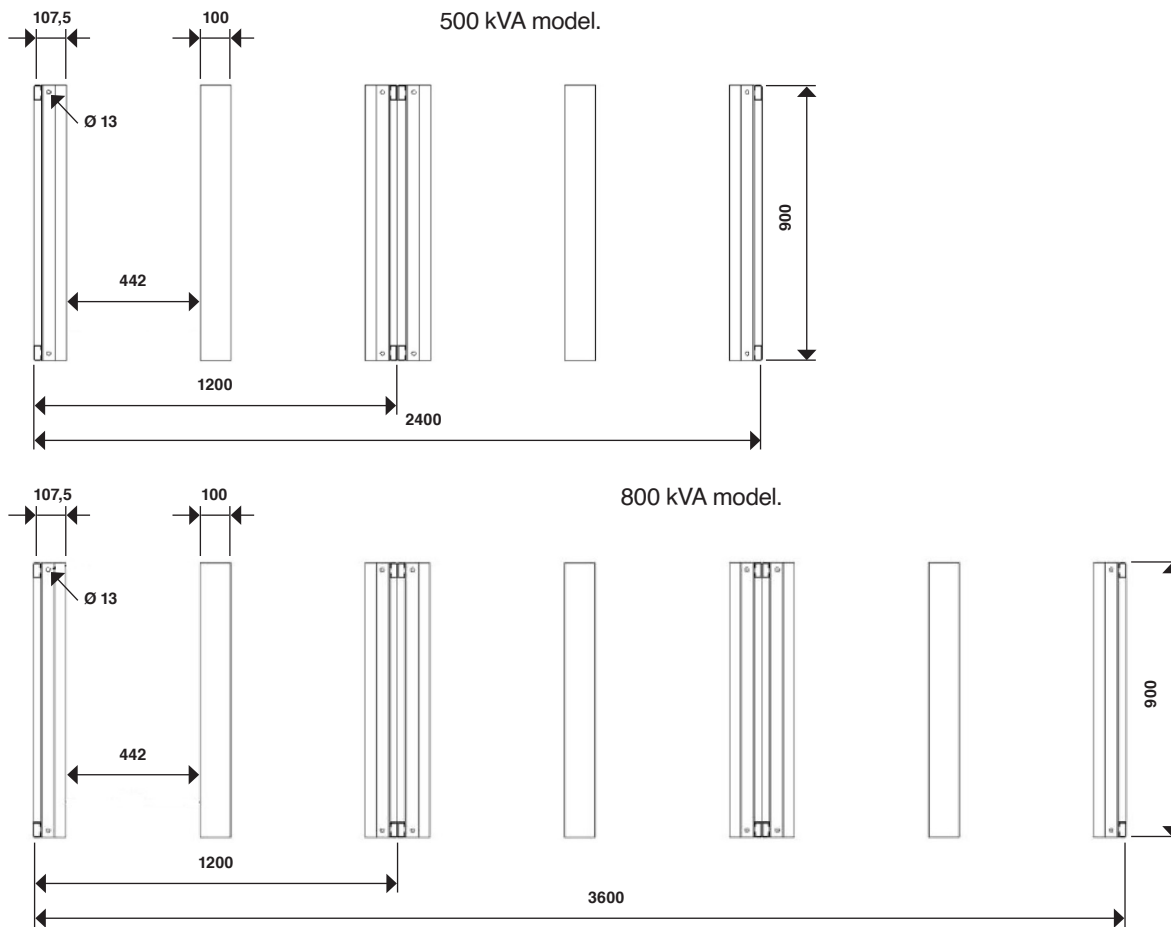
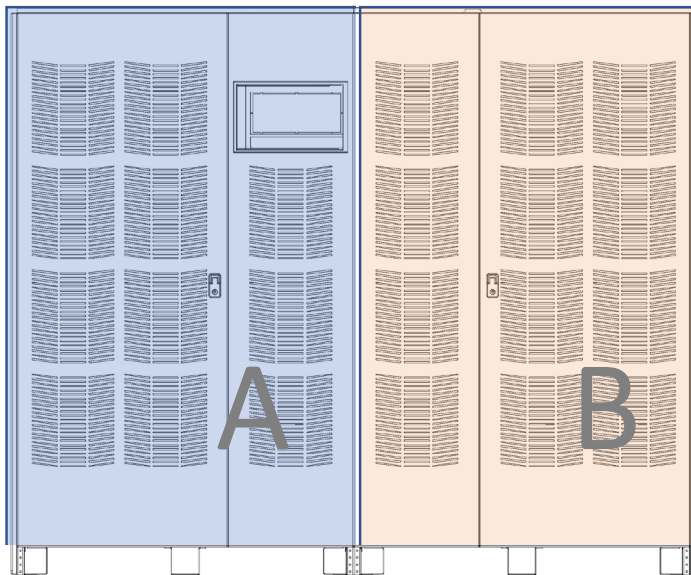
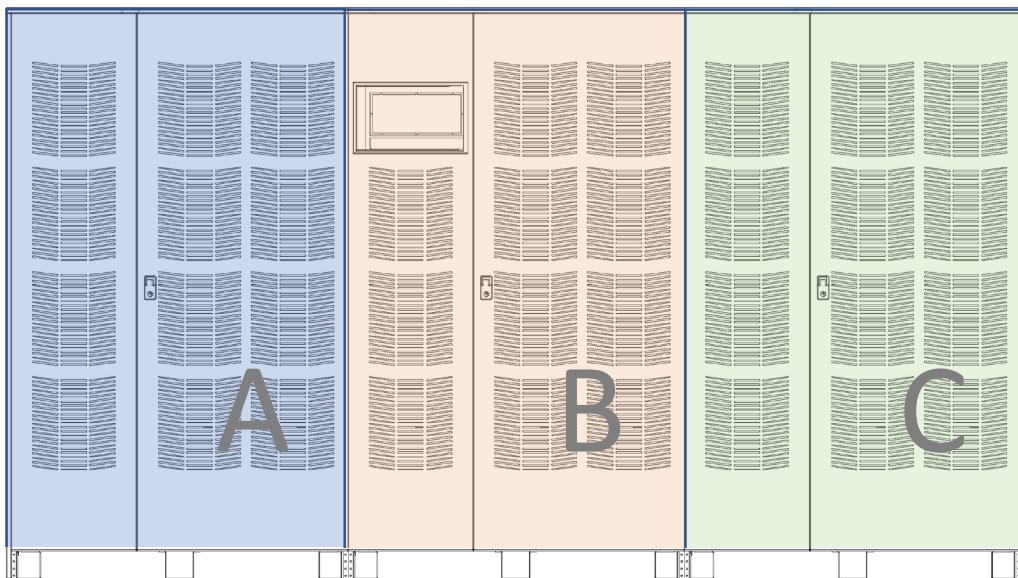


Fig. 9. Base plan equipments.



500 kVA model.



800 kVA model.

	A-BLOCK	B-BLOCK	C-BLOCK	Total Weight (kg)
SLC-500-XTRA	750	1350	-	2100
SLC-800-XTRA	500	1480	1450	3430

Table 2. Weight depending on the model.

4.4.3.1. Minimum distances from the walls and ventilation

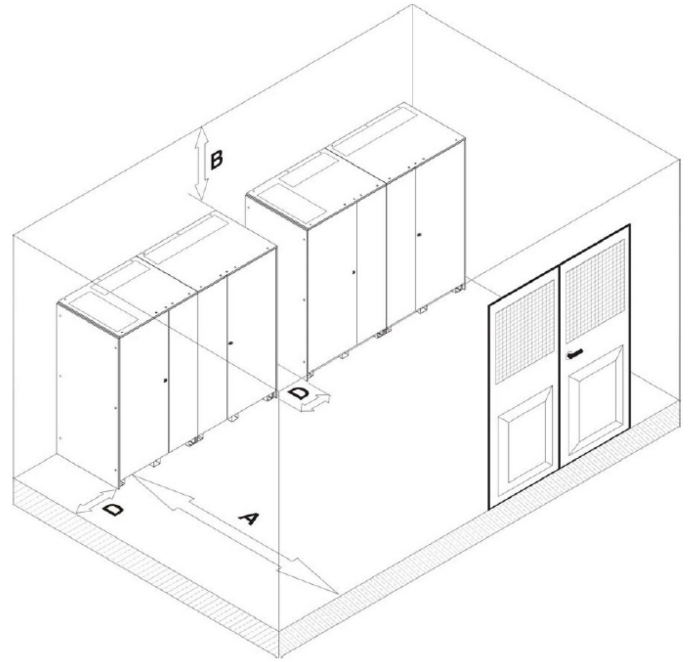
The UPS must be so installed as to ensure its serviceability and to allow a correct air flow as much as possible.

With regard to the minimum distances from the walls, for all of the UPS sizes the same installation conditions apply as indicated in the table below.

Model	Power (kVA)	Minimum distances of the UPS for a correct cooling (mm).		
		A	B	D
SLC-500-XTRA	500	1000	700	50
SLC-800-XTRA	800	1000	700	50

Note 1: See Fig. 11 to find out the correlation with marks A, B and D.

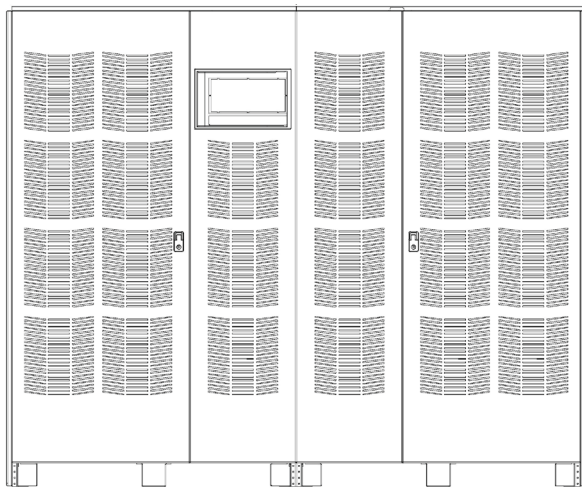
Note 2: For SLC-800-XTRA model assembly, it is mandatory to have a rear clearance of around 500 ~ 600 mm.



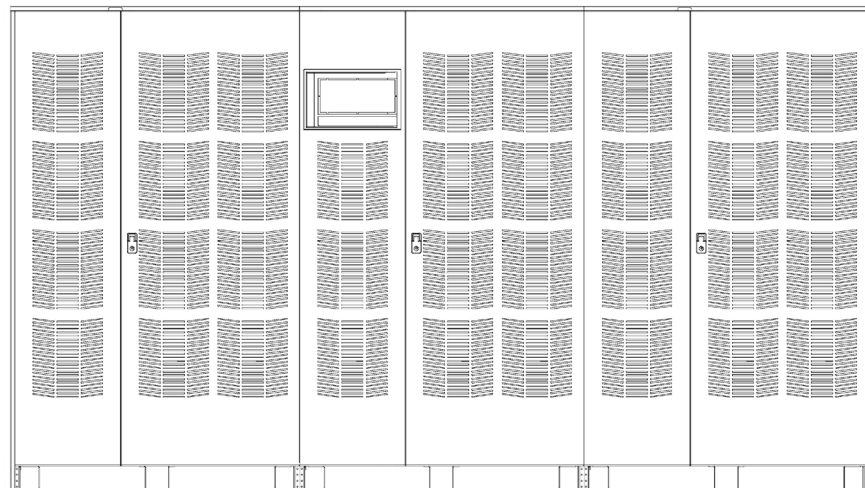
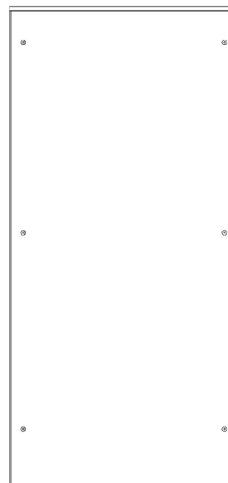
400 to 800 kVA models.

Fig. 10. Minimum adjoining distances of the equipment..

Table 3. Minimum adjoining equipment distances.



500 kVA model.



800 kVA model.



Fig. 11. Front and side views of the UPS.

- Table 4 shows the minimum air flow to cool the equipment.

⚠ Deficiency of air flow cooling will block the equipment, but not immediately, because the over temperature is acquired with over time and in proportion to the load level connected to the output.

Next are stated some possible external causes to the equipment, which involves a bad cooling. Review and correct.

- Adjoining distances with walls or other equipments are not correct.
- Cooling grid blocking.
- To be located in room with wrong conditioning and/or dimensions.
- Room completely sealed, avoiding the air cooling exhausting.

Model	Power (kVA)	Minimum air flow cooling of the equipment (m ³ /h)
SLC-500-XTRA	500	4000
SLC-800-XTRA	800	7000

Table 4. Minimum air flow cooling of the equipment.

4.4.4. Heat losses

The UPS must be installed to ensure its serviceability and to allow a correct air flow, in order to allow exhausting the following heat losses:

Model	Power (kVA)	Heat losses (BTU/h)
SLC-500-XTRA	500	105435
SLC-800-XTRA	800	166171

Table 5. Heat losses.

4.4.5. Dimensions.

- Dimensions of the equipment and battery cabinet for basic standard autonomies are reflected in table 5.

Due to obvious reasons, dimensions of battery racks are not stated, because they are tailor-made for each customer particular application.

Model	Power (kVA)	Cabinet dimensions (Depth x Width x Height) in (mm).
		UPS
SLC-500-XTRA	500	990 x 2440 x 2020
SLC-800-XTRA	800	990 x 3640 x 1920

Table 6. Dimensions.

4.4.6. Environment conditions of the installation.

- Air is classified in the standard EN 60721-3-3 (Environment parameter classification and their seriousness - Use in position assigned protected from outdoors), according to the climatic, biological and active mechanical and chemical substances conditions.

Installation location has to comply with the determined requirements to guarantee the respect to the suitable conditions of the equipment.

- Climatic conditions according to the technical specifications.

Environmental parameter.	Values
Minimum operating temperature (°C).	-10
Maximum operating temperature (°C).	+40
Minimum relative humidity (%).	5
Maximum relative humidity (%).	95
Condensation.	NO
Raining with wind (water, snow, hail, etc).	NO
Water from no rain origin.	NO
Ice formation.	NO

Table 7. Environmental conditions.

- Biological conditions classification (EN 60721-3-3).

Environmental parameter.	Class.		
	3B1	3B2	3B3
c) Flora	NO	Presence of mold and fungus, etc	Presence of mold and fungus, etc
d) Fauna	NO	Presence of vermin or other animals that could damage the unit, termites are excluded.	Presence of vermin or other animals that could damage the unit, termites are excluded.

Table 8. Biological conditions

- Active mechanical substances classification (EN 60721-3-3).

Environmental parameter.	Class			
	3S1	3S2	3S3	3S4
d) sand [mg/m ³]	No	30	300	3000
e) dust (Suspension) [mg/m ³]	0,01	0,2	0,4	4,0
f) dust (Sedimentation) [mg/(m ² · h)]	0,4	1,5	15	40
Places where precautions have been taken to minimize the dust presence. Places far from dust sources	x			
Places with no precautions to minimize the presence of dust but far from dust sources		x		
Places near to sand or dust sources			x	
Places near to workstations where they produce sand or dust or in geographical areas with high presence of sand brought by the wind or dust in the air.				x

Table 9. Active mechanical substances classification.

☐ Active chemical substances classification (EN 60721-3-3).

Environmental parameter.	Class					
	3C1R	3C1L	3C1	3C2	3C3	3C4
j) Marine salts	No	No	No	Saline fog	Saline fog	Saline fog
k) Sulphur dioxide [mg/m ³]	0,01	0,1	0,1	1,0	10	40
l) Hydrogen sulphide [mg/m ³]	0,0015	0,01	0,01	0,5	10	70
m) Chlorine [mg/m ³]	0,001	0,01	0,1	0,3	1,0	3,0
n) Hydrochloric acid [mg/m ³]	0,001	0,01	0,1	0,5	5,0	5,0
o) Hydrofluoric acid [mg/m ³]	0,001	0,003	0,003	0,03	2,0	2,0
p) Ammonia [mg/m ³]	0,03	0,3	0,3	3,0	35	175
q) Ozone [mg/m ³]	0,004	0,01	0,01	0,1	0,3	2,0
r) nitric oxide (in values equivalent to nitrogen dioxide) [mg/m ³]	0,01	0,1	0,1	1,0	9,0	20
Places with a monitored and controlled atmosphere strictly (clean space category)	X					
Places with controlled atmosphere continuously		X				
Places in rural and urban areas with low industry activity and moderate traffic.			X			
Places in urban areas with activities and/or high traffic.				X		
Places near the industries with chemical emissions					X	
Places inside industrial installations. Emission of contaminant chemical substances very concentrated.						X

Table 10. Active chemical substances classification.

UPS is designed to be installed indoor, never outdoors, according to the following specifications:

K	Climatic conditions	According to data sheet
B	Biological conditions	3B1 (EN 60721-3-3)
C	Active chemical substances	3C2 (EN 60721-3-3)
S	Active mechanical substances	3S2 (EN 60721-3-3)

Table 11. Specifications of the equipment location.

In case that the environment conditions of the installation location do not meet the stated requirements, other measures have to be taken to decrease the excess values.

4.5. Electrical connection.

- ⚠ This equipment is ready to be installed in mains with power distribution system TT, TN-S, TN-C or IT, keeping in mind when doing the connection the particulars of the used system and the national electrotechnical regulation of the destination country. Nevertheless and as a result that the equipment needs the Neutral for its operation, in IT distribution systems is

essential to fit an isolation transformer to create it.

- Electrical connection of the equipment is responsibility of the company that makes the installation of the product, manufacturer or distributor are not responsible of the possible faults due to the wrong connections, less those ones done by itself.
- UPS has to be installed and used by qualified personnel only.



Any intervention in the UPS by not trained personnel means a risk of electrical shock and injuries to third persons or yourself, UPS and load/s failures and/or in the installation.

Any person is defined as qualified, if he has experience in assembling, starting up and control the correct operating of the equipment, if he has the requirements to make the work and if he has read and understood all the written in this manual, and in particular the safety instructions. Such preparation is only considered valid, if it is certified by our company.

- ⚠ **Check that switch is at position "SR"**. Before using the UPS, make sure that switch "SR" (Service switch) is on "NORMAL" position and keep it in this position during its operation. To use such switch, consult the service manual.
- Cross cable section of input, output and bypass lines, are determined from the currents stated in table 1 according to the power of the equipment, by respecting the Local and/or National Low Voltage Electrotechnical Regulation. For models with common bypass line (**X-TRA-CB**) take only the values of the input line.
- Cables have to be selected according to technical, economical and safety aspects. Their selection and sizing in the technical point of view depends on the voltage, current that UPS consumes, mains, bypass, battery, external temperature and dropping voltage. Finally, it is important to keep in mind the position of the cable.
- More clarifications regarding their selection and sizing can be found in the CEI standards, in particular at the CEI 64-8.
- Among the main causes of damages in the cables, there are the "short-circuit currents" (short currents but very high) and the "overload currents" (high currents of long duration). Protection systems usually used to protect the cables are the circuit breakers or fuses.
- Protection switches are selected according to the maximum short-circuit current ($I_{sc\ max}$), useful to establish the breaking power of the circuit breakers, and from the minimum short-circuit current ($I_{sc\ min}$) needed to determine the maximum duration of the protection of the protected line. Protection against short-circuits the line interferes too, before than the thermal and electrothermal effects of the overloads that could damage the cable and their connections.
- During the electrical installation, respect the phase and neutral rotation. Connection terminals of the cables are at the front of the UPS, under the switches. To have access to terminal blocks take out the protection cover, by removing the fixing screws preciously.
- Diagrams from figures 23 to 26 shows as an example the connection of three equipments in parallel of different power rates, with separate bypass line (see fig. 23 and 25), and with common bypass line (see fig. 24 and 26).

For parallel connection of several units, which are referred in the previous figures or in the different power structures, proceed consequently.

4.5.1. Connection.

- ⚠ As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth (⚡)). Connect the conductor to the terminal, before connecting the power supply to the UPS input.

⚠ Mains connection

The connection to the mains must be carried out with protection fuses between the mains and the UPS.

The use of differential protection devices in the line supplying the UPS is unadvisable. The leakage current to ground due to the RFI filters is rather high and it can cause spurious tripping of the protection device.

According to CEI EN62040-1 standard, in order to take into account the UPS' leakage current, residual current devices having adjustable threshold can be used.

- ⚠ In parallel systems, length and cross section of the cables that goes from protection panel to UPS and vice versa will have the same size for all of them with no exception.
- Connect the power supply cables N-R-S-T or R-S-T to the input terminal block, **respecting the rotation of the neutral and phases** only indicated on the label of the device and in this manual. If the order of the phases is not respected, the device will not operate.

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

- Warning labels should be placed on all primary power switches installed in places away from the device to alert the electrical maintenance personnel of the presence of a UPS in the circuit.

The label will bear the following or an equivalent text:

Before working on this circuit

- Isolate Uninterruptible Power System (UPS).
- Then check for Hazardous Voltage between all terminals including the protective earth.

⚠ **Risk of Voltage Backfeed.**

Power (kVA)		500	800
Input Fuses (A)	Rectifier	3 x 800	3 x 1250
	Bypass	3 x 1000	3 x 1600
Input cables (mm ²)	Rectifier	3 x 2 x 185	3 x 2 x 300
	Bypass	4 x 2 x 240	4 x 2 x 400
Ground cables (mm ²)		240	400
Output cables (mm ²)		4 x 2 x 240	4 x 2 x 400
Battery cables (mm ²)		2 x 2 x 240	2 x 2 x 400

Table 12. Electrical connection data (see installation diagram).

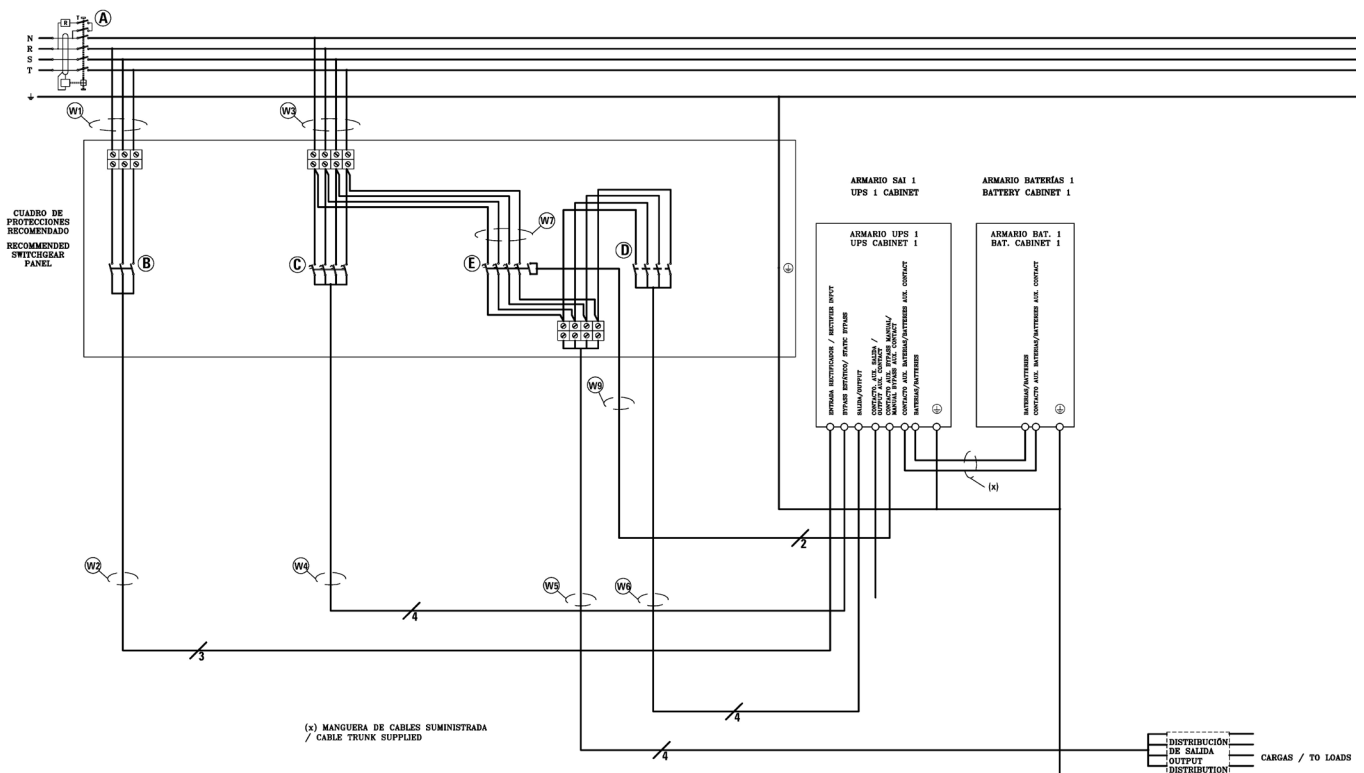


Fig. 12. Installation diagram.

4.5.2. Backfeed protection device

The back-feed protection device, as indicated by the EN 62040-1 Standard, is optional and can be installed during the UPS production phase; the installation on site can only be carried out by skilled personnel.

The device is a contactor that automatically disconnects the bypass line in case of failure of the static switch, in order to avoid voltage feed-back on the input terminals during the a mains failure.

The use of a device installed inside the UPS allows a higher flexibility of use, as only the bypass line is cut leaving the rectifier battery charger in operation.

The use of an external device forces the user to separate the UPS supply lines (rectifier and bypass) if the flexibility and availability of the UPS are supposed to be kept unaltered.

The following table shows the main electrical characteristics of the external sectioning device in case this solution is chosen.

Backfeed protection device		
UPS power (kVA)	500	800
Maximum operating voltage (Vac)	690	
Minimum rated current (A)	1000	1600
Category	AC-1	

Table 13. *Backfeed protection device electrical characteristics*

- **X-TRA-CB** equipments (common bypass line) for powers >300kVA the UPS has the "Backfeed protection" as standard. For standard equipments (with separate bypass line), there is no neutral terminal at the rectifier input.



There can be no derivation in the line that goes from the «Backfeed protection» to the UPS, as the standard safety would be infringed

4.5.3. Terminal boards

UPS is provided with terminal boards for the connection of power cables and of auxiliary connections.

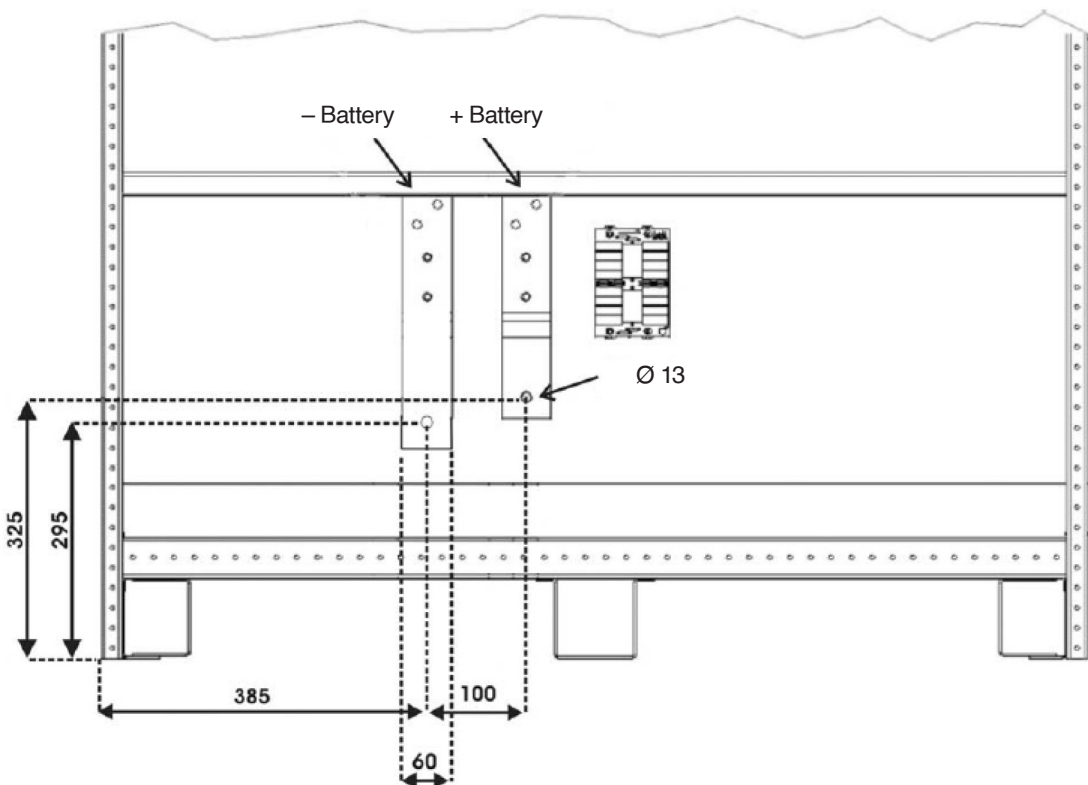
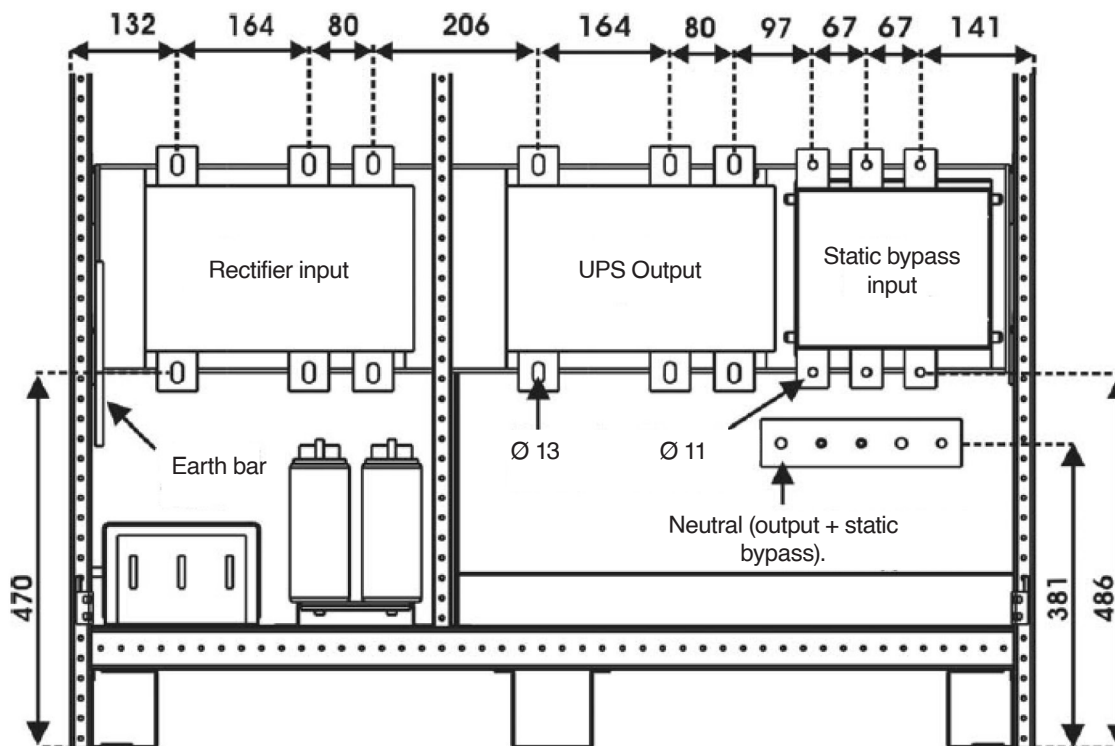


Fig. 13. Terminal block layout from 500 to 800 kVA UPS (front view).

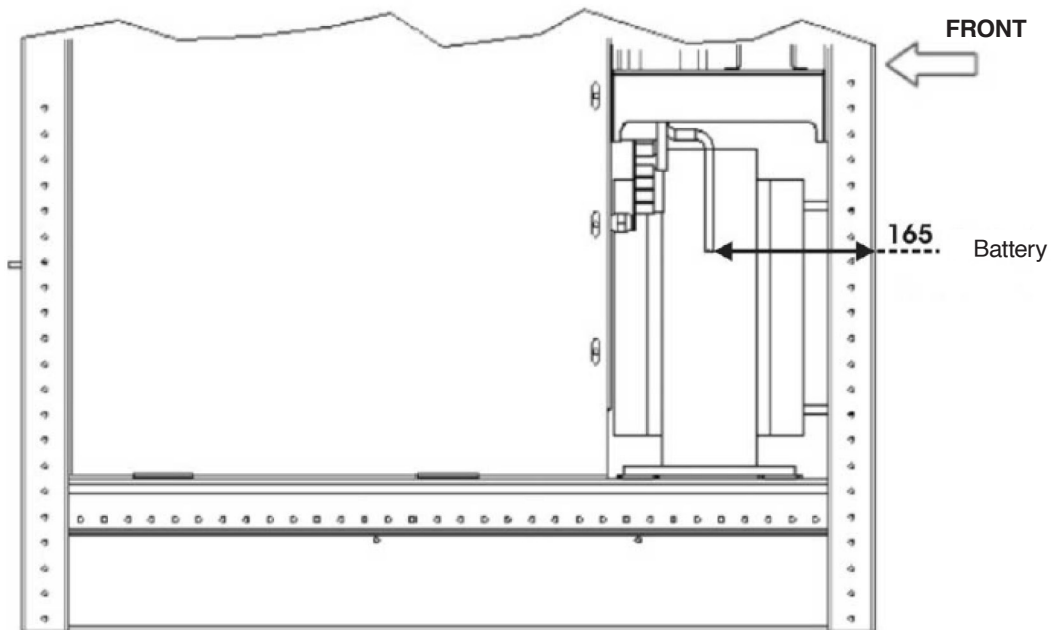
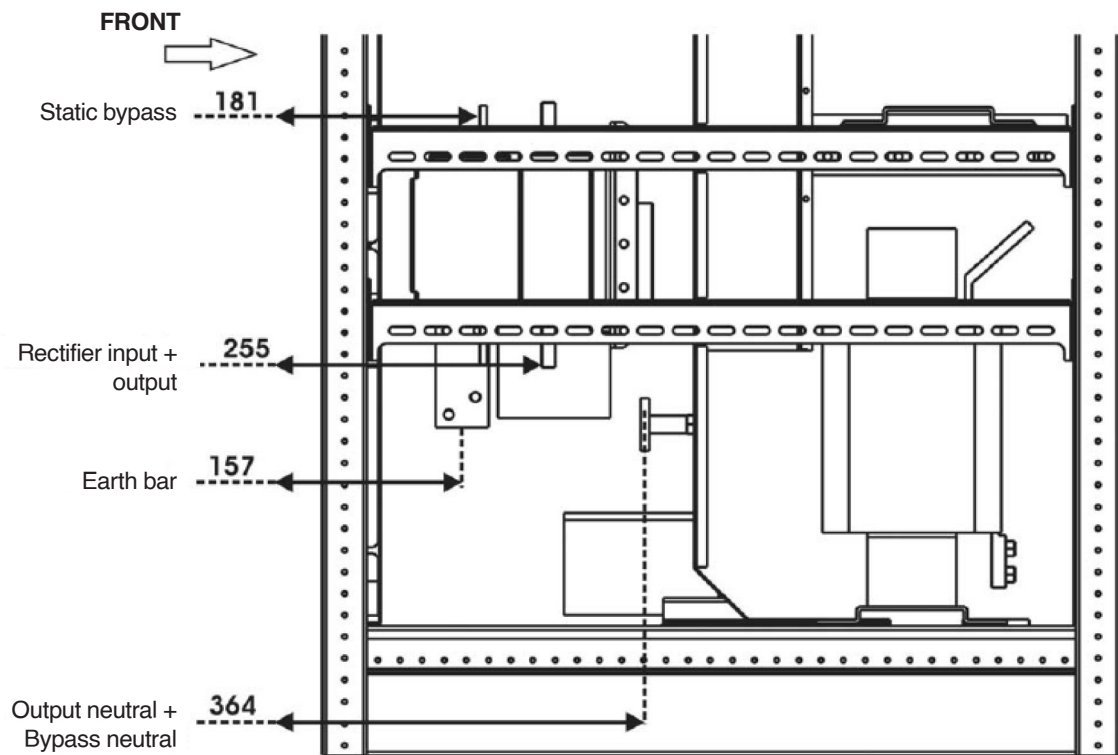








Fig. 14. Terminal block layout from 500 to 800 kVA UPS (side view).

4.5.4. Connection of the output (to loads).


-  As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor or bar (connect earth (⊕)). Connect the conductor or bar to the terminal, before connecting the power supply to the UPS input.
-  In parallel systems, length and cross section of the cables that goes from protection panel to UPS and vice versa will have the same size for all of them with no exception.
Connect the loads cables N-U-V-W to the output terminals, respecting the rotation of neutral and phases indicated on the label of the device and in this manual. If the order of the phases is not respected, the device will not operate.
- When there are discrepancies between the labelling and the instructions of this manual, the label will always prevail.
- With respect to the protection that must be placed at the output of the UPS, we recommend that the output power should be distributed in at least four lines. Each one should have a magnetic thermal protection switch of a value of one quarter of the nominal power. This type of power distribution will mean that in the event of a breakdown in any of the machines connected to the device causing a short-circuit, it will affect no more than the line that is faulty. The rest of the connected loads will have their continuity assured due to the triggering of the protection, only the line affected by the short-circuit will trip.

4.5.5. Connection of batteries (cabinet or rack).

-  As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth (⊕)). Connect the conductor to the terminal or bar, before connecting the power supply to the UPS input.
-  Only personnel with battery and/or DC voltage knowledge, is authorised to make or supervise the connection of them. It is very dangerous to make these works without the needed training.
-  Danger of shock due to electrical discharge.
With voltage present in the battery cables, there is a high risk of electrical discharge. Before manipulating the battery terminals or connection cables, check it:
 - Battery switch of the cabinet or rack (BCB) has to be in position "Off". Or by default put it properly.
In systems with more than one cabinet, proceed in the same way with all of them.
- UPS connection with battery rack will be done with the supplied cable trunk, by connecting one side to UPS terminals and the other one to battery cabinet or rack terminals, always respecting the stated polarity in the labelling of each battery block and this manual, and the colour of the cables (red for positive, black for negative, green-yellow for earth bonding).
- Keep in mind that if it is supplied more than one battery pack, the connection will always be in parallel among them and the equipment. That is to say, black cable, from the negative of the UPS to the negative of the first battery rack and from this one to the negative of the second battery rack, and so on. Please, proceed in the same way for red cable for positive and green-yellow for earthing.
-  **Danger or electrical discharge.**
If after starting up the UPS, it is required to discon-

nect the battery cabinet, the equipment has to be completely shutdown and turn the battery switch located in the battery cabinet or rack "Off". Wait at least 5 min. till the filter capacitors have been discharged

4.5.6. Connection of main input earth terminal (⊕) and the earth bonding terminal (⊕).

-  As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth (⊕)). Connect the conductor to the terminal or bar, before connecting the power supply to the UPS input.
- Make sure that all the loads connected to the UPS are only connected to the protective earth bonding terminal (⊕). The fact of not restricting the earthing of the load or loads and/or the batteries case/s or cabinet/s to this single point will create return loops to earth which will affect the quality of the power supplied.
- All terminals identified as earth bonding (⊕), are joined together, to the main protective earthing terminal (⊕) and to the frame of the device.

4.5.7. Connection of the auxiliary contact terminal strip.

- It is advisable to separate the control or signal lines from power lines (energy distribution lines).
- Auxiliary contacts supplied by the UPS allow improving the safety and reliability of the equipment, when it is connected with any foreseen external control or parts.
 - External manual Bypass panel.
 - Diesel generator.
 - Battery auxiliary contact.
 - Remote emergency power off button (EPO).
 - Output auxiliary contact.
- Terminal strip of 8 pins is included in each equipment (see figure 27), auxiliary contacts are supplied to be connected to the stated parts or controls. To do it, use cross cable sections of 6 mm².

Physical layout of the auxiliary strip depends on the power of the equipment (see figures 28, 29 and 30). In any case all of them are properly labeled on the equipment.

4.5.7.1. Diesel generator (DIESEL MODE)

- Auxiliary contact of the Diesel Generator, terminals XD1-XD2.
- A normally open contact must be connected to terminals XD1-XD2. When this contact is closed (with option 'Diesel Mode' enabled), the microprocessor will interpret the command and the rectifier will then reduce its battery recharging voltage to the value set.

4.5.7.2. Battery auxiliary contact.

- Auxiliary contact of the battery; terminals BAC1-BAC2.
- The auxiliary contact of the disconnecter and the battery fuse of all of the accumulator cabinets will be connected in series, with the pins of the auxiliary terminal strip of the device identified as BAC1-BAC2.
- Through this connection, the system reports the status of the disconnecter and/or battery fuses.

4.5.7.3. Output emergency shutdown (EPO).

- Auxiliary contact of the EPO; terminals EAC1-EAC2. By default, the device is supplied from the factory with a cable (PU) connected between both terminals to close the circuit.
- Load power supply can be broken remotely through these pins. Connect a button (EPO) with normally closed contact in the pins EAC1-EAC2, after removing the cable (PU). When operating the button and open the circuit, the static switches and bypass are opened, breaking the power supply to the loads.

4.5.7.4. Auxiliary contact of the output switch.

- In equipments with parallel kit (P), an auxiliary terminal strip of two terminals (XAUX.1 and XAUX.2) is supplied. In electrical terms, they are the extension of the auxiliary normally opened contact (NO) of the output switch of the equipment.
By default, the device is supplied from the factory with a cable (PU) connected between both terminals to close the circuit.
Do not remove this connection in single equipments with parallel kit, because although the equipment will work properly, it would trigger the «output switch opened» alarm.
- In those installations with parallel equipments, and considering the need of having a protection or manual bypass panel, this cable connected between both terminals (XAUX.1 and XAUX.2) in each UPS as a bridge mode must be removed. Then connect these terminals to the auxiliary terminal strip (NO contact) of the output switch corresponding to each UPS and fitted in the protection or manual bypass panel.
- In case of purchasing a protection panel by yourself, it is a must to check that the output switch has available the auxiliary contact to connect the terminal strip (XAUX.1 and XAUX.2) of each equipment. The type of this auxiliary contact must be normally opened (NO) and advanced to the opening preferably.

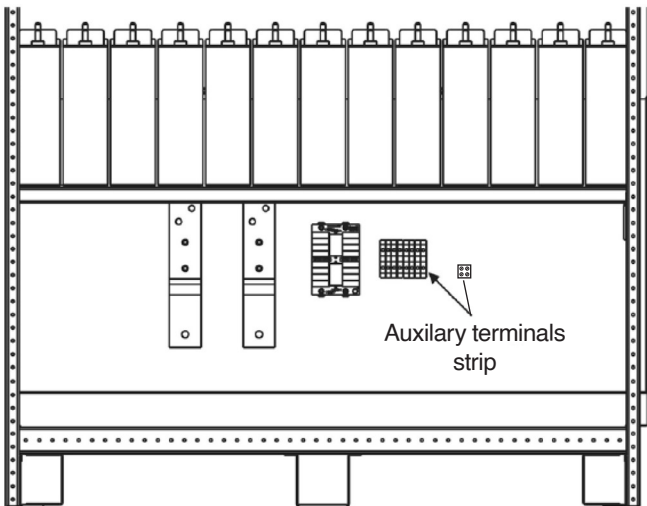



Fig. 15. Auxiliary terminal strip layout from 400 to 800 kVA models.

MBY-1	MBY-2	XD-1	XD-2	BAC-1	BAC-2	EAC-1	EAC-2
⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
●	●	●	●	●	●	●	●
⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗

Fig. 16. Auxiliary terminals

4.5.8. Interfaces.

-  Communication line (COM) is a circuit of very low safety voltage. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (power distribution lines).
- UPS has the following serial interfaces to make an external communication of the operating status and parameters (see figures 31, 32 and 33):
 - RS232/USB: It is used to connect the management and monitoring software.
 - MODBUS: It is destined to transmit the data outside through the MODBUS protocol (RS485).
 - PARALLEL (option): It is used in the communication between UPSs in those parallel configurations.
 - SNMP (option): It is used to transmit the data outside through the IT network.
 - SELECTOR: NORMAL/BYPASS.
 - SELECTOR: NORMAL/SERVICE.

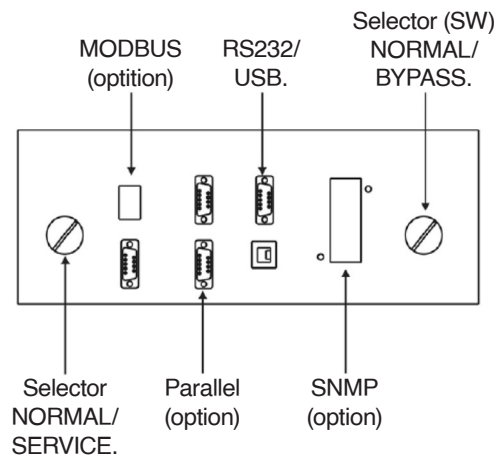


Fig. 17. Interface from 400 to 800 kVA.

4.5.9. Connection of dry contacts card (Option).


-  Communication line (COM) is a circuit of very low safety voltage. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (power distribution lines).
- Dry contact communication port is an option, it provides a digital signal in dry contact format with a maximum applicable voltage and current of:
 - 1 A (resistive load) 50 V DC.
 - or 1 A 120 V AC.
 This channel makes possible the dialogue between the equipment and other machines or devices.



Fig. 18. *Dry contact card (option).*

- Electrical connection is done over the terminal strip of the same option card directly (see figure 34), which supplies a changeover contact for each one of the 8 available relays/alarms for its free using.
- The most common use of this type of ports is to supply the needed information to the closing file software.

Relay	Alarm (A) / Status (E)	Status	M1		Led	
			Pins	Status	Ref.	Status
RL1	(A) General alarm	Not activated	2-3	Open	D1	Off
			1-2	Closed		
RL2	(A) Mains fault	Not activated	5-6	Open	D2	Off
			4-5	Closed		
RL3	(A) End of back up time (battery depleted)	Not activated	8-9	Open	D3	Off
			7-8	Closed		
RL4	(A) Inverter out of range	Not activated	11-12	Open	D4	Off
			10-11	Closed		
RL5	(A) On bypass (load over bypass)	Not activated	14-15	Open	D5	Off
			13-14	Closed		
RL6	(E) Booster Ok	Activated	17-18	Closed	D6	Off
			16-17	Open		
RL7	(E) Load supplied from inverter	Activated	20-21	Closed	D7	Off
			19-20	Open		
RL8	(E) Bypass OK	Activated	23-24	Closed	D8	Off
			22-23	Open		

Table 14. *List of alarms from dry contacts interface (option).*

5. Annexes.

5.1. General technical specifications.

Power (kVA)		500	800
Active power (kW)		450	720
RECTIFIER INPUT			
Technology	PFC - IGBT		
Three phase nominal voltage (3 phases) or (3 phases + N)	3x380V / 3x400V / 3x415V (As standard the equipment has terminal blocks for two input lines, one for rectifier (3 phases) and the other one for bypass (3 phases + N). As an option it can be requested with only one common line for both lines (3 phases + N)).		
Input voltage range	+ 15% / -20% (for 3x400V).		
Frequency	50 / 60 Hz \pm 5 Hz (45 to 65 Hz).		
Nominal input current (A)		686	1107
Maximum input current (A)		784	1247
Power factor	> 0.99.		
Total harmonic distortion (THDi)	25 % load	< 10 %.	
	50 % load	< 7 %.	
	75 % load	< 5 %.	
	100 % load	< 3 %.	
DC output voltage	600 V		
Accuracy of output voltage	\pm 1 %.		
Sectable walk-in time	Selectable from 5.. 30 sec.		
Sectable hold-off	Selectable from 5.. 300 sec.		
Input protections	Internal fuses.		
BATTERY CHARGER			
Charging current (A)		80	120
Additional charger with inverter power derating -Adjustable up to- (A)		100	200
Equalising voltage	750 V DC		
Ripple voltage	1 % rms		
Charging levels	IU in accordance with DIN41773		
Battery test	YES		
End of autonomy alarm	496 V DC		
INVERTER			
Technology	PWM; IGBT transistors.		
Three phase nominal voltage (3 phases + N)	3x380V / 3x400V / 3x415V.		
Accuracy	Steady state -balanced load-: \pm 1 %. Steady state -unbalanced load-: \pm 2 %. Dynamic state -load steps 20% - 100% - 20%: \pm 5 %.		
Dynamic response time	< 20 ms		
Frequency	50 / 60 Hz synchronised \pm 2 % (others under request). Battery mode (no mains) \pm 0,001 Hz.		
Maximum slew rate	1 Hz/s.		
Wave shape	Sinewave.		
Total output voltage harmonic distortion	Linear load: THDv < 1 %. Non-linear load (EN-62040-3): THDv < 5 %.		
Phase shifting	Balanced load	120 \pm 1%.	
	Unbalanced load	120 \pm 1%	
Dynamic response time	10 ms. to 98% of static value.		
Permissible overload	> 100 %.. 125 %	10 minutes.	
	> 125 %.. 150 %	1 minute.	
	> 150 %.. 199 %	10 seconds.	
	at 200 %	-	
Permissible crest factor	3 to 1.		
Efficiency (%)	25 %	> 92.	
	50 %	> 96.	
	75 %	> 96.	
	100 %	> 96.	

Power (kVA)		500	800
Active power (kW)		450	720
Short-circuit current (A)	Phase-Neutral (P-N)	2282	3652
	Phase-Phase (P-P)	1304	2086
	Three-Phase (P-P-P)	1108	1774
Short-circuit feature	Current limited to 1.5 times the current (depending on the active power), during 5 seconds.		
Fault clearance capability	10 ms (fuse characteristic GI at 20% of the nominal current).		
STATIC BYPASS			
Type	Solid state with antiparallel thyristors		
Bypass line	Independent. As standard the equipment has terminal blocks for different input lines, one for rectifier and the other one for bypass, because the rectifier doesn't need the neutral and the inverter has an isolation transformer (DC voltage is galvanically isolated). As an option it can be requested with only one common input for both lines.		
Nominal voltage	Three phase 3x380V / 3x400V / 3x415V (4 cables: 3 phases + N).		
Voltage range	±10 %		
Frequency	50 / 60 Hz		
Frequency range	±(1.. 5) ± 10% adjustable.		
Overload	150 %	Permanent.	
	1000 %	20 ms.	
Activation criteria	Controlled by microprocessor.		
Transference time	Immediate. No transfer time. No power supply break.		
Bypass transference	Static bypass test, inverter test, inverter shutdown, end of autonomy.		
Inverter retransference	Automatic; blocked to bypass after 6 transfereces in 2 minutes.		
MANUAL BYPASS (MAINTENANCE)			
Type	Option		
Type	Make before break (Loads always supplied).		
Nominal voltage	Three phase 3x380V / 3x400V / 3x415V (4 cables: 3 phases + N).		
Frequency	50 / 60 Hz.		
GENERAL			
Technology	On-line, double conversion, DSP control.		
Stages	IGBT rectifier.		
	Battery charger (DC/DC).		
	Batteries.		
	DC/AC inverter with PWM technology with transformer.		
	Static Bypass.		
	Manual Bypass.		
Power factor	0.9.		
Installation with current genset	Genset power 1,2 to 1,25 times the UPS power.		
Contactor -Backfeed protection- in static bypass	Incorporates as standard.		
Efficiency AC / AC (%)	@25 % load	> 92.	
	@50 % load	> 95.	
	@75 % load	> 95.	
	@100 % load	> 94,5.	
	Eco-mode	> 98.	
Heat losses	100 % load (kW)	30.9	48.7
	100 % load (kcal/h)	26.5	41.7
Cooling	Forced (front door air inlet and exhausted through the top cover).		
Air cooling flow (m³/h)	4000	7000	
Acoustic noise level at < 1 m (dB)	< 60		
Maximum operating altitude	< 1000 m a.s.l.. Derate 0.5 % for each 100 m up to 2000 m.		
Relative humidity	< 95 % non-condensing		
Ambient temperature	Operating	0.. 40 °C	
	Storage (with batteries)	-10.. +50 °C	
	Storage (without batteries)	-10.. +70 °C	
Protection degree	IP20 (Optional IP31)		
Standards	Safety	EN-IEC 62040-1, EN-IEC 60950-1	
	EMC	EN 62040-2	
	Functionality	EN 62040-3	
	Quality	ISO 9001, ISO 14001	
	Marking	CE	

Power (kVA)		500	800
Active power (kW)		450	720
Screw terminals	Metric thread	Input, Output and Batteries M12 / Bypass M10	
	Tightening torque (Nm)	69.. 85 / 40.. 50	
UPS dimensions (mm)	Depth	990	
	Width	2440	3640
	Height	2020	1920
UPS weight (kg)		2100	3430
Static weight -floor for UPS- (kg/m ²)		1027	1111
Foreseen transport for the equipment		By forklift	
Cabinet and door colours		RAL 9005	
BATTERIES			
Type		Sealed AGM or VRLA maintenance free.	
Average lifetime		10 years.	
Batteries 12 V connected in series		By default 50 and up to 52 (adjustable).	
Floating voltage at 25 °C (V DC)		680 / 707	
Minimum discharge voltage (V DC)		496 / 516	
Inverter input power -at nominal Load- (kW)		467	747
Inverter input current -at nominal load-minimum Vdc- (A)		941	1.507
Battery Protection (external to the UPS)		By fuse + switch (only with extension of autonomy)	
Test baterías		Included as standard	
Capacity (Ah)		100	115
Typical standard back up time		5	6
Cabinet dimensions -Depth x Width x Height- (mm)		855 x 1305 x 1905	
Quantity of cabinets for standard back up time		2	3
Weight per cabinet (kg)		1800	1925
Foreseen transport		By forklift.	
Cabinet and door colours		RAL 9005	
CONTROL PANEL WITH LCD			
Measures	Power	Input (kVA), Output (kW and kVA), load percentage.	
	Voltages	Input, output, bypass, inverter, DC bus (rectifier output), battery.	
	Currents	Input, output, battery.	
	Frequencies	Input, output, bypass, inverter.	
	Autonomies	Minutes and percentage.	
Alarms and status		See section 7.3.3.2.	
Acoustic alarm		YES	
Data logger	Logs	250 events.	
	Information	Alarm + date and time of activation.	
Control panel screen		LCD panel of 2 rows x 30 characters/line.	
LED indicators		AC rectifier, DC bus, battery MCBs, inverter, bypass, AC bypass, maintenance bypass, supplied loads, EPO, technical service (S.T.S.)	
Configurations	Modes	Eco-mode, On-Line, Frequency converter, UPS single or parallel.	
	Languages	Spanish, English, Italian, German, French, Portuguese, Polish and Turkish.	
Controls		Acoustic alarm silencer, On/Off, time setting, bypass transference, battery test.	
COMMUNICATIONS			
Ports		RS-232 and USB	
Dry contracts		Optional (General alarm -NO-, mains fault -NO-, low battery -NO-, inverter out of range -NO-, bypass -NO-, booster OK -NC-, inverter -NC-, bypass OK -NC-.	
Maximum applicable current and voltage to the dry contacts		1 A 120 V AC or 1 A 50 V DC	
Quantity of free slots		2 (One for SNMP and another one for MODBUS protocol).	
Monitoring software		UPSMAN.	
RS-232 port format		DB9.	
Communication protocol		Private.	
MODBUS protocol		Option.	
RS-485 port		Option.	
Terminal strip for remote emergency power off		YES. The button will be user own.	
Terminal strip for diesel genset		YES	
Auxiliary contact input for external manual bypass MBCB		YES	

Power (kVA)	500	800
Active power (kW)	450	720
Auxiliary contact input for external battery BCB	YES	
OPTIONS		
Parallel kit / redundant	Up to 6 equipments in parallel as maximum.	
Extended back up times	Wide range (consult).	
BACS II	Monitoring, managing and alarms of the batteries.	
Dry contacts (relay interface)	8 switched and separate contacts.	
MODBUS protocol + RS-485 interface	Maximum distance 800 m.	
Remote telemanagement adaptor	SICRES.	
Ethernet/SNMP or GPRS adaptor	Maximum distance 500 m.	
Monitoring, management and shutdown software	UPSMAN.	
Temperature probe for battery cabinet	It compensates the battery charge voltage depending on the temperature.	
Common input connection	It joints the two AC mains of the equipment (input and bypass).	
Top entry cable	Conduit for cables up the input terminals.	
External maintenance bypass panel	External to the equipment.	
Remote monitoring panel ⁽¹⁾	4 separate optical alarms + 2 status optical indications and 1 acoustic alarm.	
Autotransformer	Adaptor for other voltages.	
Isolation transformer	With galvanic isolation between input-output, it allows to adapt to other voltages.	

⁽¹⁾ It requires the "Dry contact (relay interface)" card.

5.2. Glossary

- **AC.-** It is nominated as alternating current to the electrical current in which the magnitude and direction varies in a cyclic way. The most common wave shape of the alternating current is sinewave, because the energy transmission is better. Nevertheless, some applications could need other period wave shapes, like triangular or square.
- **Bypass.-** Manual or automatic, it is the physical junction between the input and the output electric device.
- **DC.-** The direct current is the continuous electron flow through a cable between two points with different potential. Unlike the alternating current, in direct current the electrical loads always flow in the same direction from the highest potential point to the lowest one. Although, usually the direct current is identified with the constant current (for example the one supplied by the battery), it is continuous any current that always maintain the polarity
- **DSP.-** It is the acronym of Digital Signal Processor. A DSP is a system based on a processor or microprocessor that has instructions in it, a hardware and an optimized software to develop applications where numerical operations are needed with very fast speed. Due to this, it is very useful to process analogical signals in real time: in a system that runs in this way (real time) samples are received, usually coming from an analogical/digital converter(ADC).
- **Power factor.-** It is defined as power factor, p.f., of an alternating current circuit, as the ratio between the active power, P, and the apparent power, S, or as the cosines of the angle that make the current and voltage vectors, designating as $\cos \varphi$, being φ the value of that angle.
- **GND.-** The term ground, as its name states, refers to the potential of the earth surface..
- **IGBT.-** The Insulated Gate Bipolar Transistor is a semiconductor device that is used as a controlled switch in power electronic circuits. This device has the feature of the gate signal of the effect field transistors with the capacity of high current and low voltage saturation of the bipolar transistor, combining an isolated FET gate for the input and a bipolar transistor as switch in a single device. The triggering circuit of the IGBT is as the MOSFET one, while the driving features are like the BJT.
- **Interface.-** In electronic, telecommunications and hardware, an interface (electronic) is the port (physical circuit) through which are sent or received signals from a system or subsystems toward others.
- **kVA.-** The voltampere is the unit of the apparent power in electrical current. In direct current is almost equal to the real power but in alternating current can defer depending on the power factor.
- **LCD.-** LCD acronym of Liquid Crystal Display, device invented by Jack Janning, who was employee of NCR. It is an electric system of data presentation based on 2 transparent conductor layers and in the middle a special crystal liquid that have the capacity to orientate the light when trespassing.
- **LED.-** LED acronym of Light Emitting Diode, is a semiconductor device (diode) that emits light almost monochrome with a very narrow spectrum, it means, when it is direct polarized and it is crossed by an electric current. The colour, (wave longitude), depends on the semiconductor material used in its construction, being able to vary from the ultraviolet one, going through the visible spectrum light, to the infrared, receiving these last ones the denomination of IRED (Infra Red Emitting Diode).
- **Circuit breaker.-** A circuit breaker or switch, is a device ready to break the electrical current of a circuit when it overcomes the maximum set values.
- **On-Line mode-** Regarding to an equipment, it is on line when it is connected to the system, and it is in operation, and usually has its power supply turned on.
- **Inverter.-** An inverter, is a circuit used to convert direct current into alternating current. The function of an inverter is to change an input voltage of direct current into a symmetrical output voltage of alternating current, with the required magnitude and frequency by the user or the designer.
- **Rectifier.-** In electronic, a rectifier is the element or circuit that allows to convert the alternating current into direct current. This is done by rectifier diodes, which can be solid state

semiconductors, vacuum or gassy valves as the mercury vapour. Depending on the features of the alternating current power supply used, it is classified as single phase, when they are fed by a single phase electrical mains, or three phase when they are fed by the three phases. Depending on the rectification type, they can be half wave, when only one of the current semi-cycles is used, or full wave, where both semi-cycles are used.

- **Relay.**- The relay (in French relais, relief) is an electromechanical device that works as a switch controlled by an electric circuit where, through an electromagnet, a set of contacts are moved and it allows to open or to close other independent electric circuits.



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