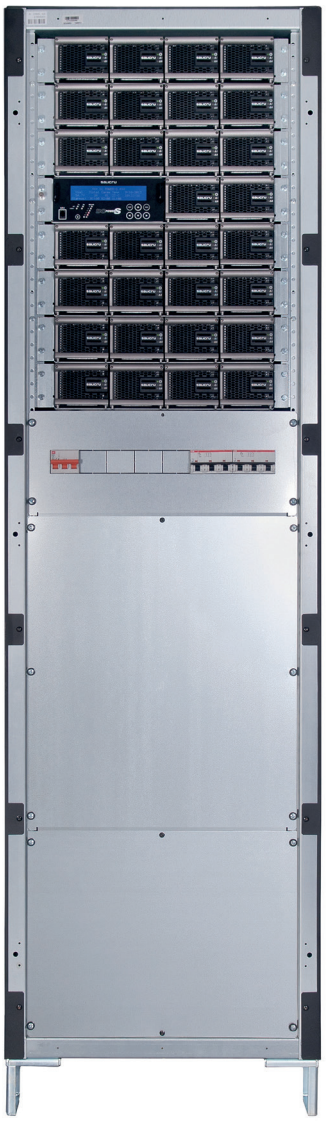
DC POWER SYSTEMS



DC POWER-S Series

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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 familiar with its contents, because as much you understand and know the equipment, the higher will be the satisfaction degree, safety level and functionality optimization.

We remain at you 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 the here described equipment must be done by our staff or **specifically authorised**.
- Although no effort has been spared to guarantee that the information in this manual is complete and accurate, we are not responsible of any errors or omissions that may exist.

  The images included in this document are for mere illustration and may not accurate represent the parts of the equipment showed. However, the differences that may arise will be smoothed or solved with the correct labelling on the unit.
- According to our policy of constant evolution, **we reserve the right to modify the specifications, operating or described actions in this document without forewarning**.
- All **reproduction, copy, third party concession, modification or part or total translation** of this manual or document, in any form or medium, **without the previous written authorization** of our firm, it is prohibited, reserving of the complete and exclusive property right over itself.

2. Information for safety.

2.1. Using this manual.

- The purpose of the DC Power-S documentation is to provide the information relating to safety and explanations over the installation and operating procedures of the equipment.

  The generic documentation of the equipment is supplied in digital format in a Compact Disc (CD) and it also includes among others documents, the own user's manual of the system and other manuals of constituent parts like Control and Communication Modules.
- Together with this user's manual and included in the same documentation CD, it is supplied the EK266*08 document relating to «**Safety instructions**».

  Before doing any action over the equipment regarding the installation or commissioning, changing the location of the equipment, setting or any kind of manoeuvring, read them carefully.

  Compliance as regards to «Safety instructions» is mandatory, being the user the legal responsible regarding to its observance and application. Read them carefully and follow the stated steps in the established order.
- Products assembled in SUBRACK and RACK are designed to be fit in a predetermined set and to be done by professionals.
  - ❒ Its installation has to be planned and executed by qualified personnel, who will be the responsible in applying the safety and EMC regulations and standards that regulate the particular installations to which the product is dedicated.

  For DC Power-S equipments assembled in RACK, remind that an important number of electrical connection points without any kind of protection are visible and accessible directly with the hands, so there is a **high risk of receiving an electrical discharge**.

  Due to the topology of this assembling, its protection degree is IP00, so it will be **mandatory to endow it with the appropriate protection degree**, either with an individual metallic enclosure or integrated in a cabinet together with other equipments that belong to the installation.
- The equipments are delivered duly labelled for the correct identification of each of its parts, and together with the instructions of this user's manual allowing doing any of the commissioning and erection operations, in an easy, ordered way, without doubt.

  Finally, once the equipment is installed and in operation, it is recommended to keep the documentation CD in a safe and easy access place, for future consults or doubts that could arise.
- When the system differs from the one shown in figures of section 4, less by the quantity of rectifier modules connected in parallel, by implementing or excluding parts and/or modifying technical specifications, additional explanatory annexed will be edited in case they were needed. As usual They will be supplied in hardcopy.
- The following terms are used in the document to be referred to:
  - ❒ «**DC Power-S, equipment, rectifier-charger, system, DC energy system or unit**».- DC Switch Mode Power Supply.

    Depending on the context of the sentence, there can be reference to the rectifier Module or Modules or to the joint including the batteries, whatever the assembling is.
  - ❒ «**Batteries or accumulators**».- Group or set of elements that stores the electron flow by electrochemical means.
  - ❒ «**S.T.S.**».- Service and Technical Support.
  - ❒ «**User or client**».- Both are used and for the sense, to be referred to the fitter and/or operator, who will make the corresponding actions, being able to fall in that person the responsibility of making the respective actions when acting in the name or on behalf of himself.

2.1.1. Conventions and used symbols.

Some symbols can be used and shown in the equipment, batteries and/or user's manual context.

For more information, see section 1.1.1 of EK266*08 document relating 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, through:

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

- **IEC/EN 61204-7.** - Low voltage power supplies, d.c. output. Part 7: Safety requirements.
  - ❒ Reference Standard: **IEC/EN 60950-1.** - Information technology equipment. Safety. Part 1: General requirements.
- **IEC/EN 61204-3.** - DC low voltage supply devices. Part 3: Electromagnetic Compatibility (EMC).

The manufacturers responsibility is excluded in the event of any modification or intervention in the product by the customer's side.

This is a Class A equipment. It may cause radio interference in a residential, commercial or light industrial environment. This equipment is not designed to be fitted in a residential, commercial or light industrial environment; in case of connection to the public electricity mains, it might be required to the user to take all appropriate means in order to reduce the interferences.

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

3.3. Environment.

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

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 recovered product at the end of its useful life (contact your distributor).

Packaging:

To recycle the packing, follow the legal regulations in force.

Batteries:

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

4. Presentation.

The power supply systems from DC Power-S series are compact, flexible and modular equipments. These equipments are adaptable to the environment location or they can be supplied in any of their available structures.

In any case, they allow to upgrade the power and/or back up time as soon as the needs are increased or to implement some options in future, which have not been foreseen initially, in order to be adapted to the new requirements that could arise in the installation, i.e. to extend the communications of the equipment.

Although the Rectifier Module is the minimum expression as equipment that can supply DC voltage from an AC input voltage (see Fig. 1), by only itself can't work, and it is required the Control Module, which supervises and manages the input and output measurements, battery charging currents, critical and non-critical loads control, communication channels with the environment,... According to the current needs, there is a basic Communication module, which is supplied as standard, being able to extend it.

The basic and minimum structure of the DC Power-S system is the subrack version (See Fig. 2), which will be made up by:

- A rectifier module.
- A control module.
- A 19" subrack and 4 U height with its telescopic fixing guides, which includes the «Backplane» to plug the two previous quoted modules.
- A communication module.
- Input, battery and output terminal block.
- And input, battery and output protections.

The whole will be supplied as a completely finished unit, ready to be installed in a cabinet by means of the telescopic fixing guides.

As it can be noticed, the subrack has the capacity to house up to two rectifier modules of the same features, so the basic unit can be itself upgraded.

For other configurations, different kind of cabinets with different capacities are available, allowing from a minimum of one rectifier to generate structures up to 30 rectifiers, which is the maximum number that the control module can manage, therefore powers up to 81 kW. This way it is adapted to the most of the end-user's installations.

The illustrations of this chapter show the different manufactured versions or structures as standard and they only expect to be a mere guide to identify the described parts in this user's manual. Regarding the physical layout of the DC Power-S modules and other parts, control module included, is not always the same for all the systems and there could be differences as a result of the quantity of rectifier modules that the system has, without affecting to the operating of the DC energy power supply.

Regarding the illustrations of this document, together with the correct labelling of the own equipment, simplify the identification of each part and therefore they improve the interpretation of the documentation, which favours the understanding of the installation and/or commissioning and shutdown procedures of the system.

The DC Power-S system can be supplied in the following versions:

- 19" Subrack with 4 U height and designed to be installed in a cabinet by means of the fixing guides (See Fig. 2).

  Batteries both they are supplied together or the end-user already have them, can be fitted in the same cabinet.

  Any other possibility is feasible, but as it is the most economic, it is the simplest way.
- Table top case system, which has separators parts -feet- in its base (See Fig. 3).

  Batteries both they are supplied together or the end-user already have them, have to be fitted in a closed enclosure or rack as minimum.
- Case system with capacity to house the batteries. From the table top version, a case with swivel casters can be added to its base, which will allow housing a determined battery set (See Fig. 4).

  The housing of this case is limited and it is not foreseen to upgrade it for very long back up times. In such case, it will be necessary to go to other versions.
- System of 1210 mm rack cabinet height, with additional levellers feet of 110 mm, so the total height will be 1320 mm. It is available in 600x600 and 600x800 mm cabinet base dimensions.

  Initially, the rectifier is based on «N» modules that take part of the cabinet and the rest is free for batteries housing (See Fig. 5 and 6).
- System of 2010 mm rack cabinet height, with additional levellers feet of 110 mm, so the total height will be 2120 mm. It is available in 600x600, 600x800 and 800x800 mm cabinet base dimensions.

  Initially, the rectifier is based on «N» modules that take part of the cabinet and the rest is free for batteries housing (See Fig. 7 and 8).
- 1210 mm battery cabinet height, with additional levellers feet of 110 mm, so the total height will be 1320 mm. It is available in 600x600 and 600x800 mm cabinet base dimensions. (See Fig. 9 and 10).
- 2010 mm battery cabinet height, with additional levellers feet of 110 mm, so the total height will be 2120 mm. It is available in 600x600, 600x800 and 800x800 mm cabinet base dimensions (See Fig. 11 and 12).

As an option, 210mm lifting feet with their respective covers for perimeter closing can be supplied, in order to replace the 110mm standards ones.

The cable entry into the equipment is foreseen through the bottom of the cabinet, therefore the terminal blocks will be located in this area. Nevertheless, under particular requirements it can be done through the top, so it will mean to invert the equipment layout, because the terminal blocks will be at the top, followed by the protections.

Figures 5 to 8 show a number of «N» rectifier modules connected in parallel as an example and as mere user guide, with the most frequent devices and requested options. If any of the related parts in the illustrations are not available in your unit, ignore any reference or action over themselves. When its appropriate, an additional explanatory annex documents will be edited for those equipments manufactured with special requirements.

Any DC Power-S has protections, nevertheless depending on the power and voltage they can vary:

- Input.

  Circuit breaker protection for currents up to 160 A or fuses for higher currents.
- Batteries.

  Circuit breaker protection, fuse switch or fuses plus switch, depending on the battery current and voltage. The protection will always be with two poles for a floating output voltage. Do not break with load.
- Output.

  Output switch. Do not break with load.

Also the equipments can have different options, which the most import are:

- Batteries to provide back up time to the system. They can be sealed or flooded PbCa type, NiCd, ...
- DC outgoing distribution, by means of circuit breaker protections, fuse switch or fuse plus switch, depending on the battery current and voltage.

  The protection will always be with two poles for a floating output voltage. For outputs with the positive or negative earthed, protections will always be single pole, in order to not break the earthed pole.

  As terminal block in the DC outgoing distribution with floating output, will be used the own terminals of the protections.

  For outputs positive or negative earthed, the terminal of each single pole protection of the alive pole will be used as terminal and the available rod of the earthed pole as general terminal.
- Auxiliary contacts of the input, battery and output protections, as well as the outgoing distribution.

  Any protection can have a switch and independent auxiliary contact, extended to an exclusive terminal strip for them.
- Lighting arrestor.
- Output dropping voltage.
- Output voltage positive or negative earthed. As standard, it is floating.
- Extended communications.
- Wireless-link communication.
- Other IP protection degrees.

4.1. Equipment views.

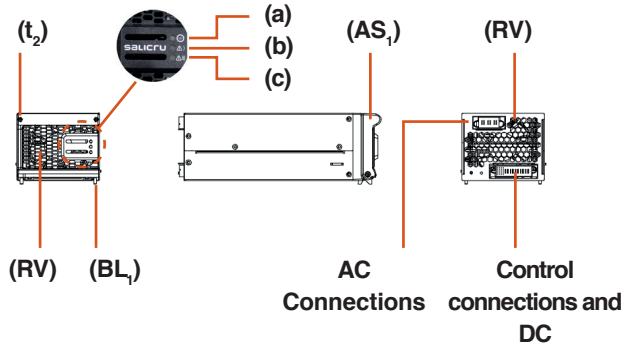


Fig. 1. *Rectifier module view (M_{rect}).*

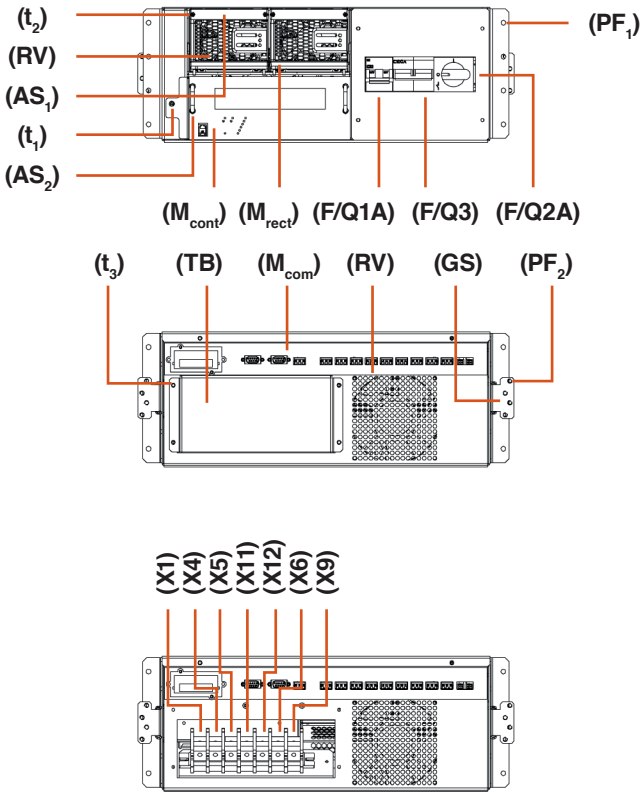


Fig. 2. *19" subrack and 4U height view.*

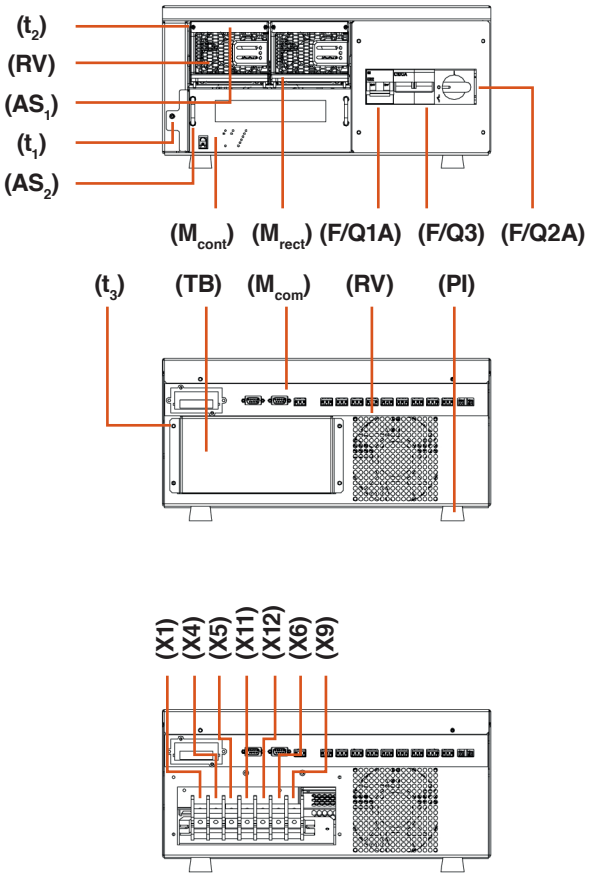


Fig. 3. *Table top case view.*

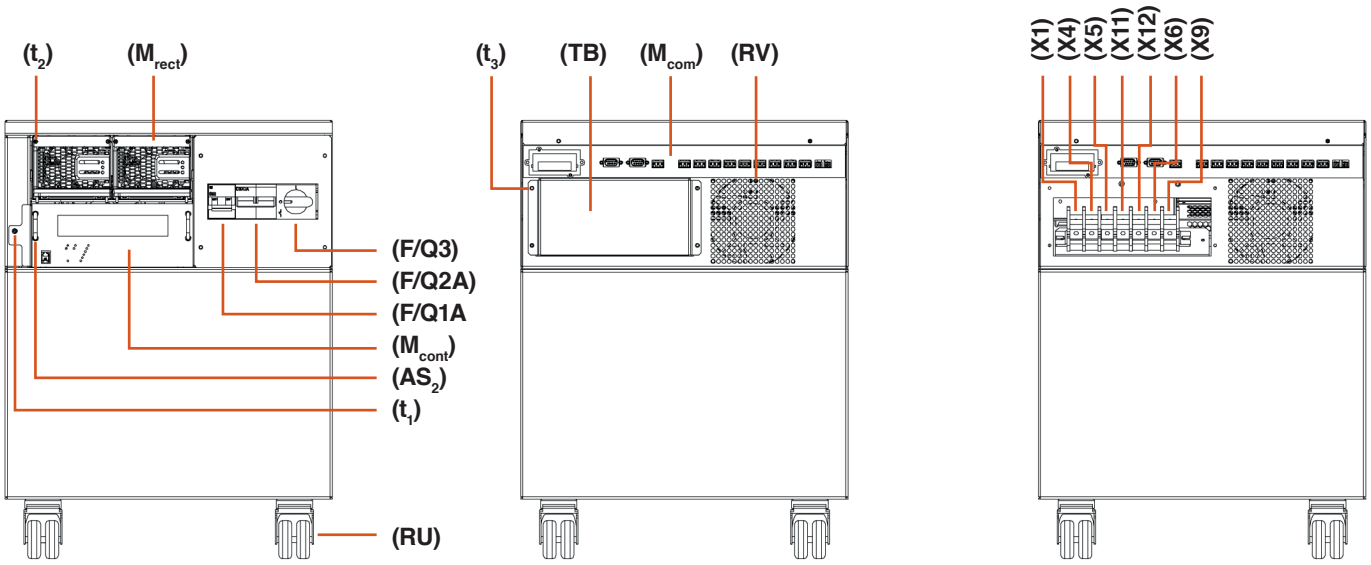


Fig. 4. *Case with casters view.*

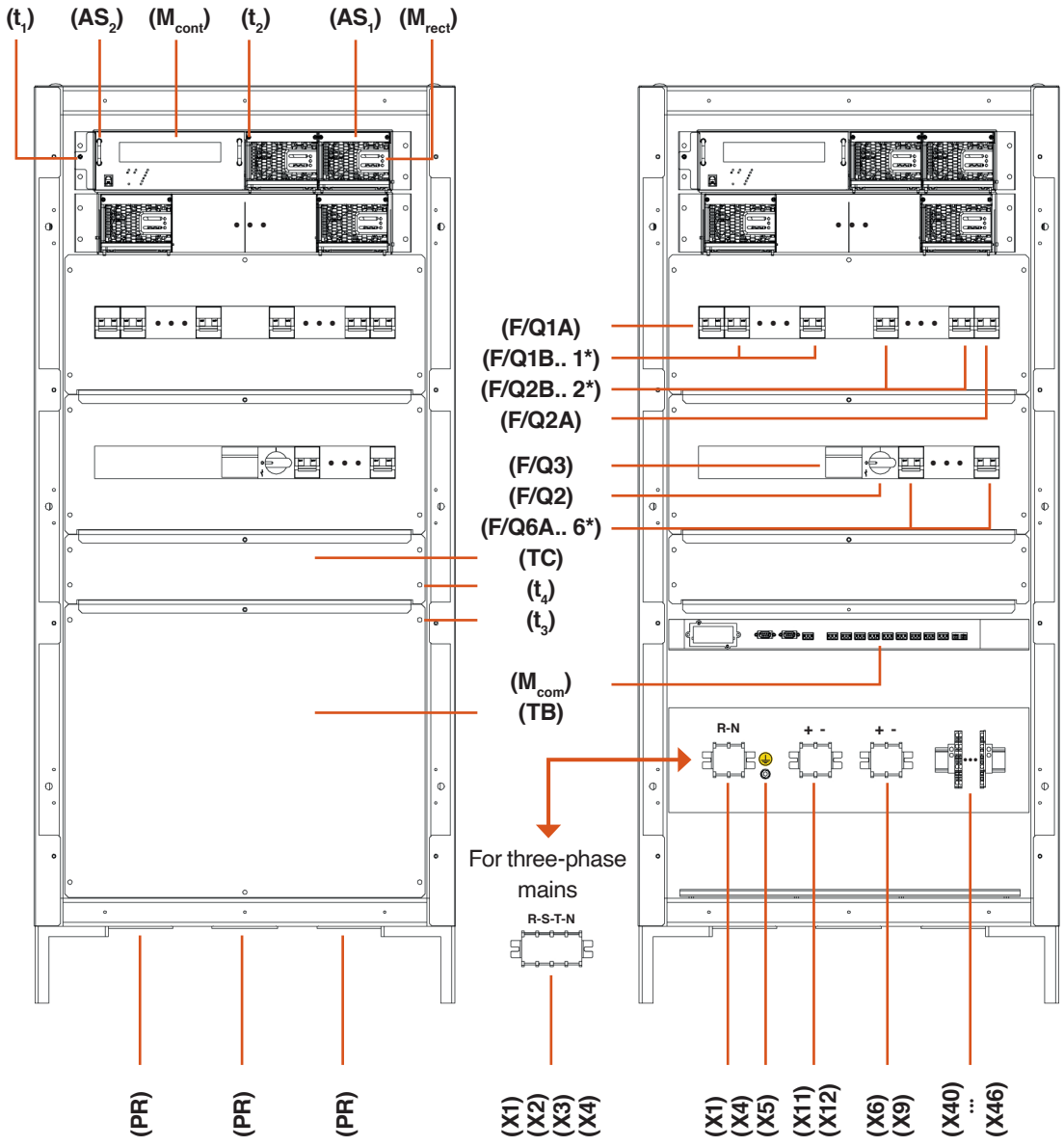


Fig. 5. *Front view of a system in a 605x605x1315 mm cabinet.*

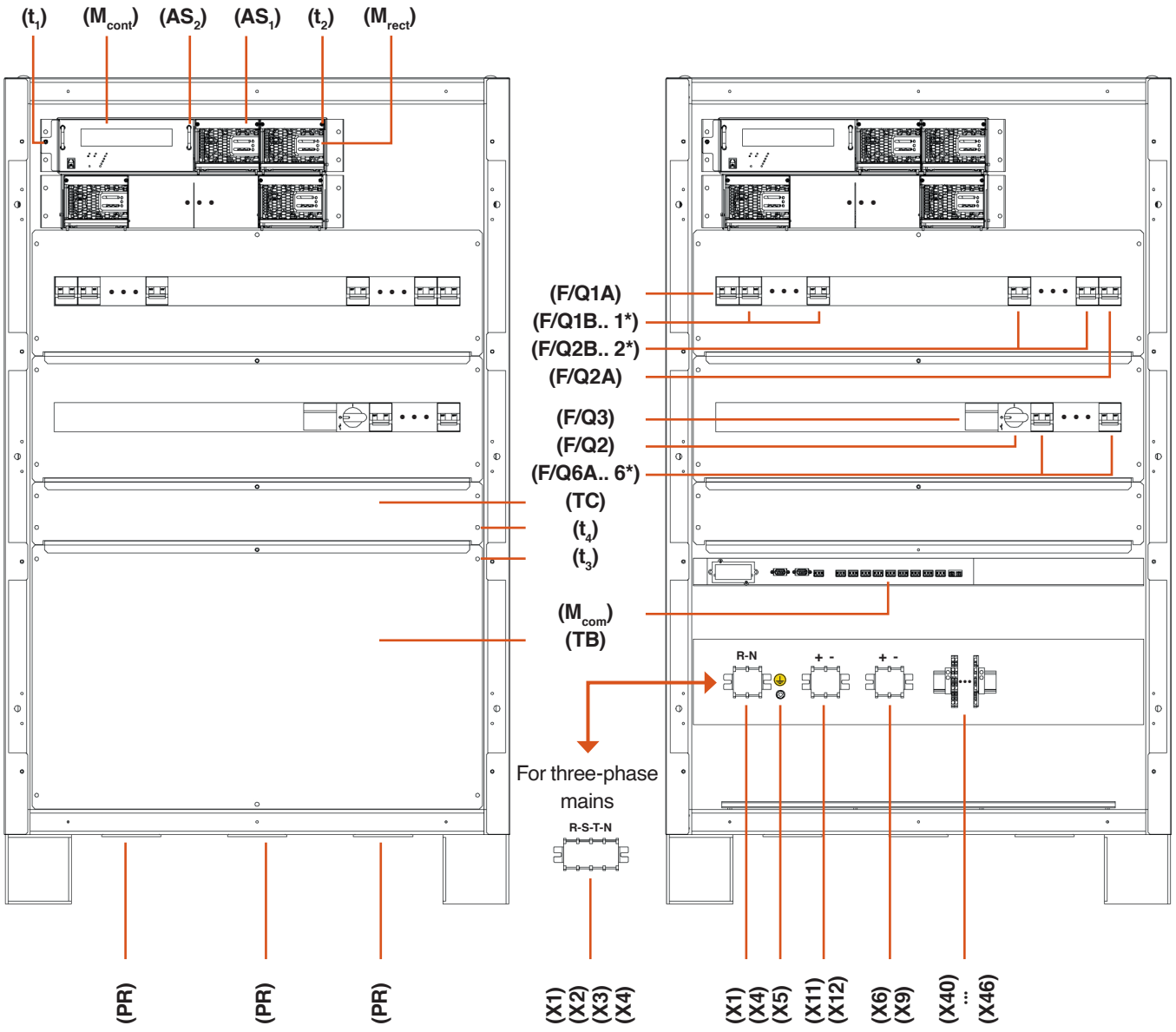


Fig. 6. *Front view of a system in a 605x805x1315 mm cabinet.*

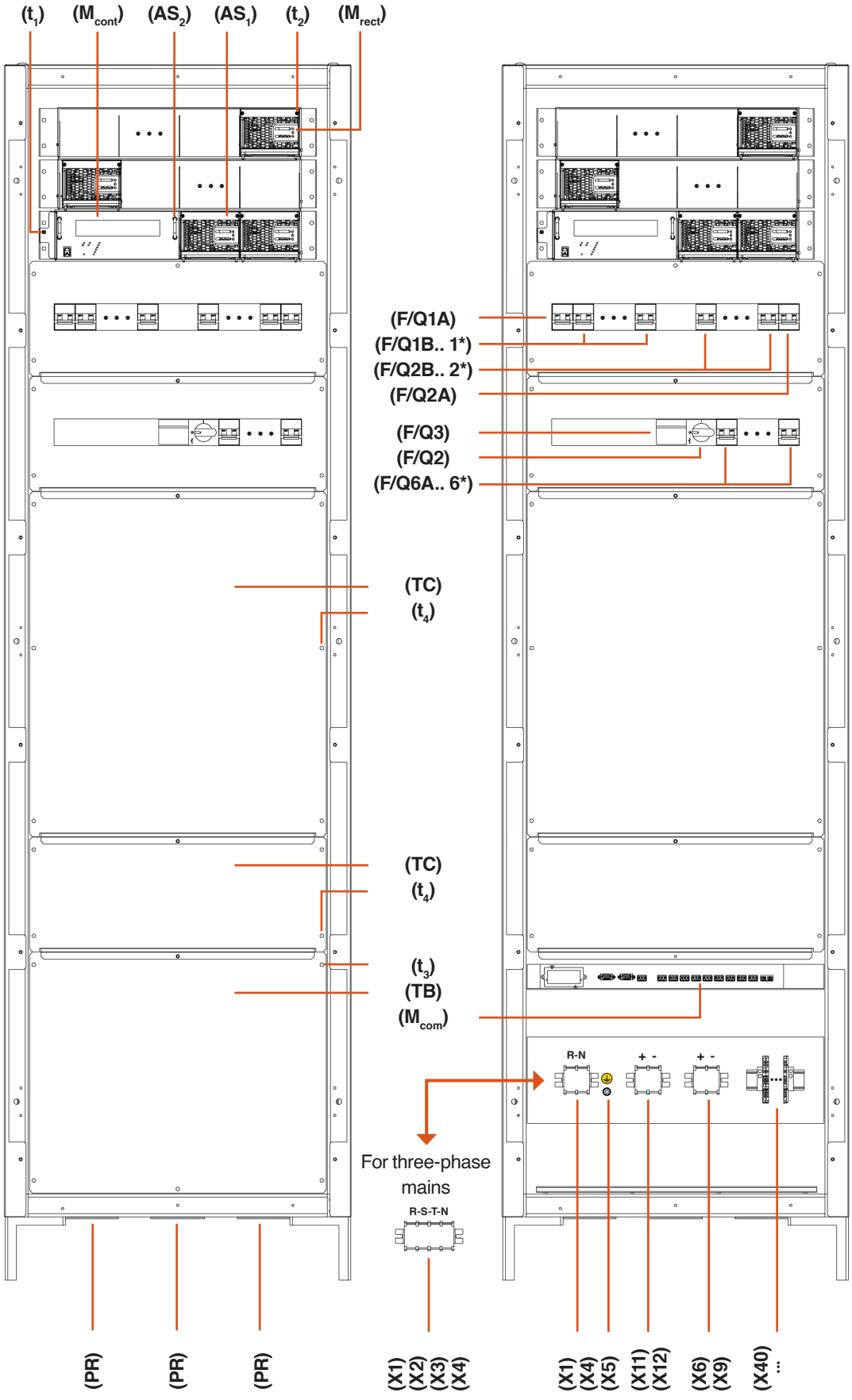


Fig. 7. *Front view of a system in a 605x605x2115 mm cabinet.*

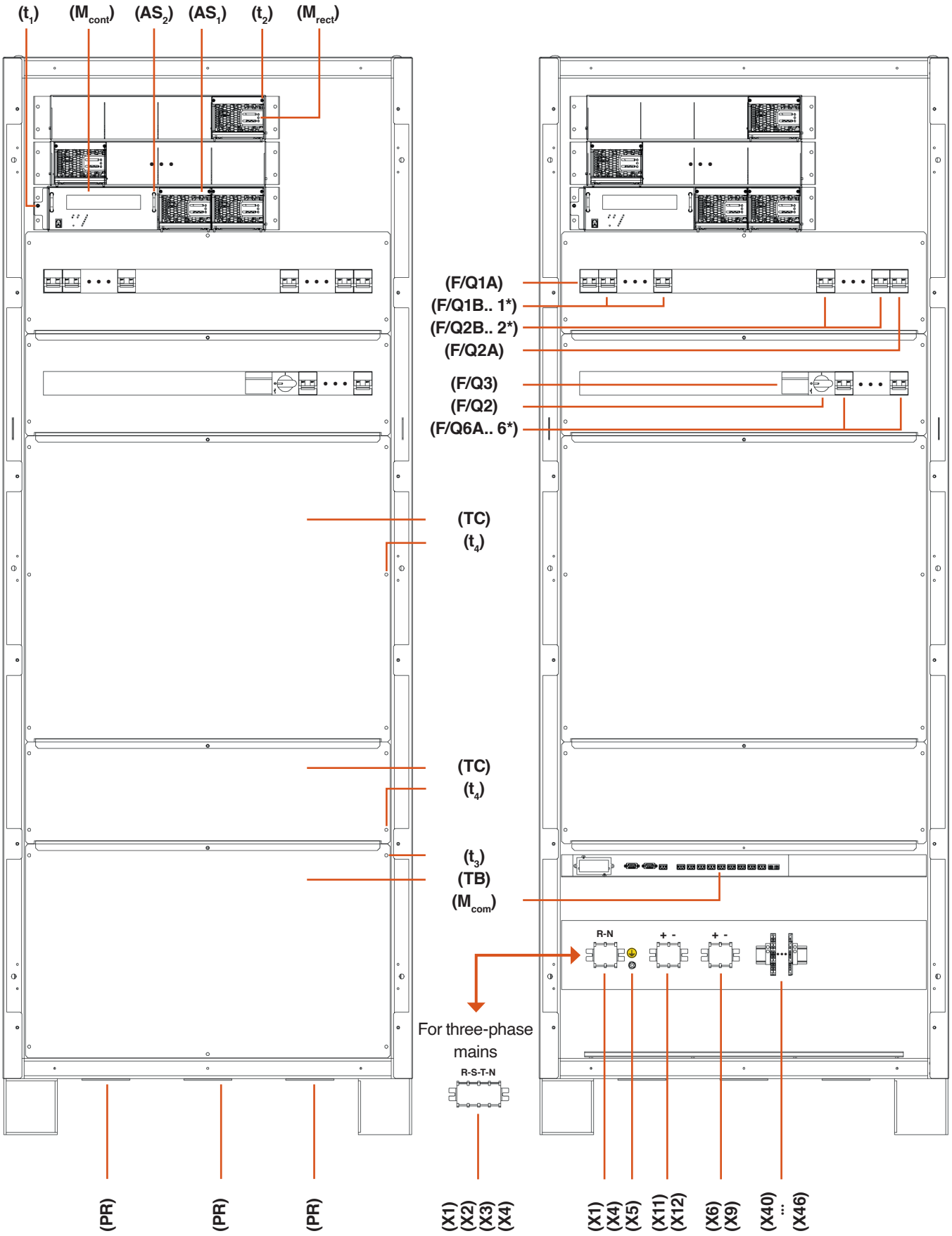


Fig. 8. *Front view of a system in a 605x805x2115 mm cabinet.*

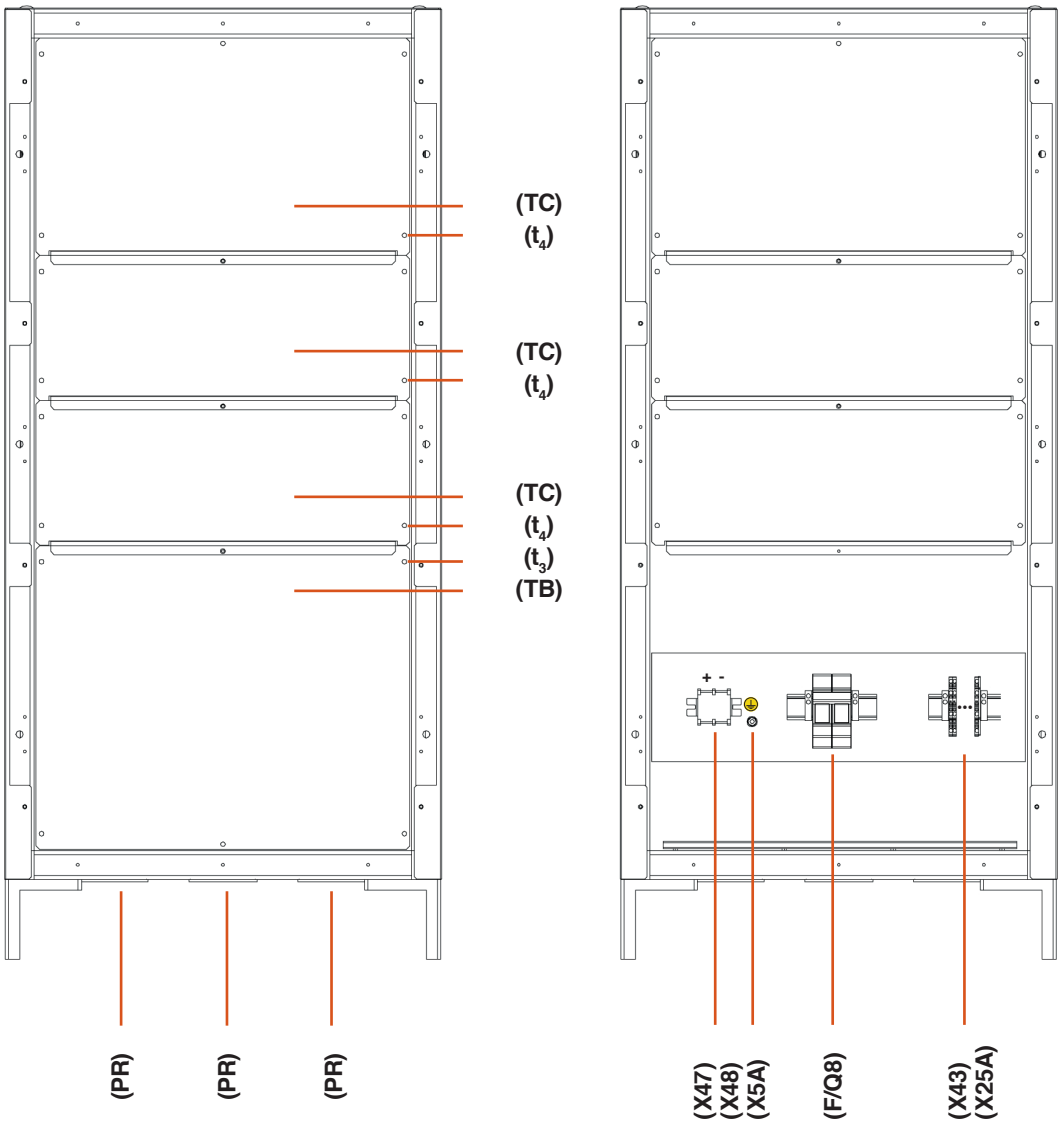


Fig. 9. *Front view of 605x605x1315 mm battery cabinet.*

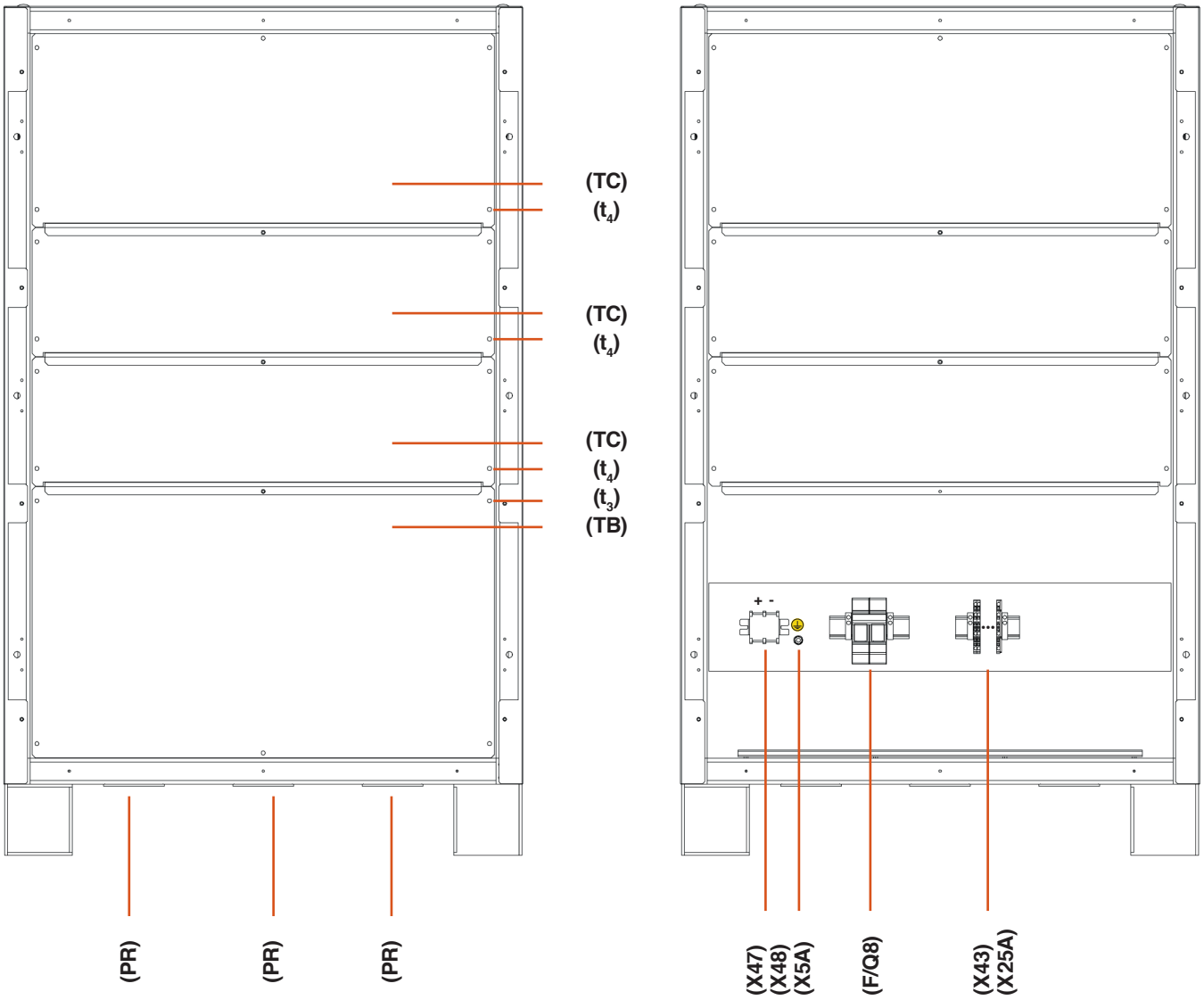


Fig. 10. *Front view of 605x805x1315 mm battery cabinet.*

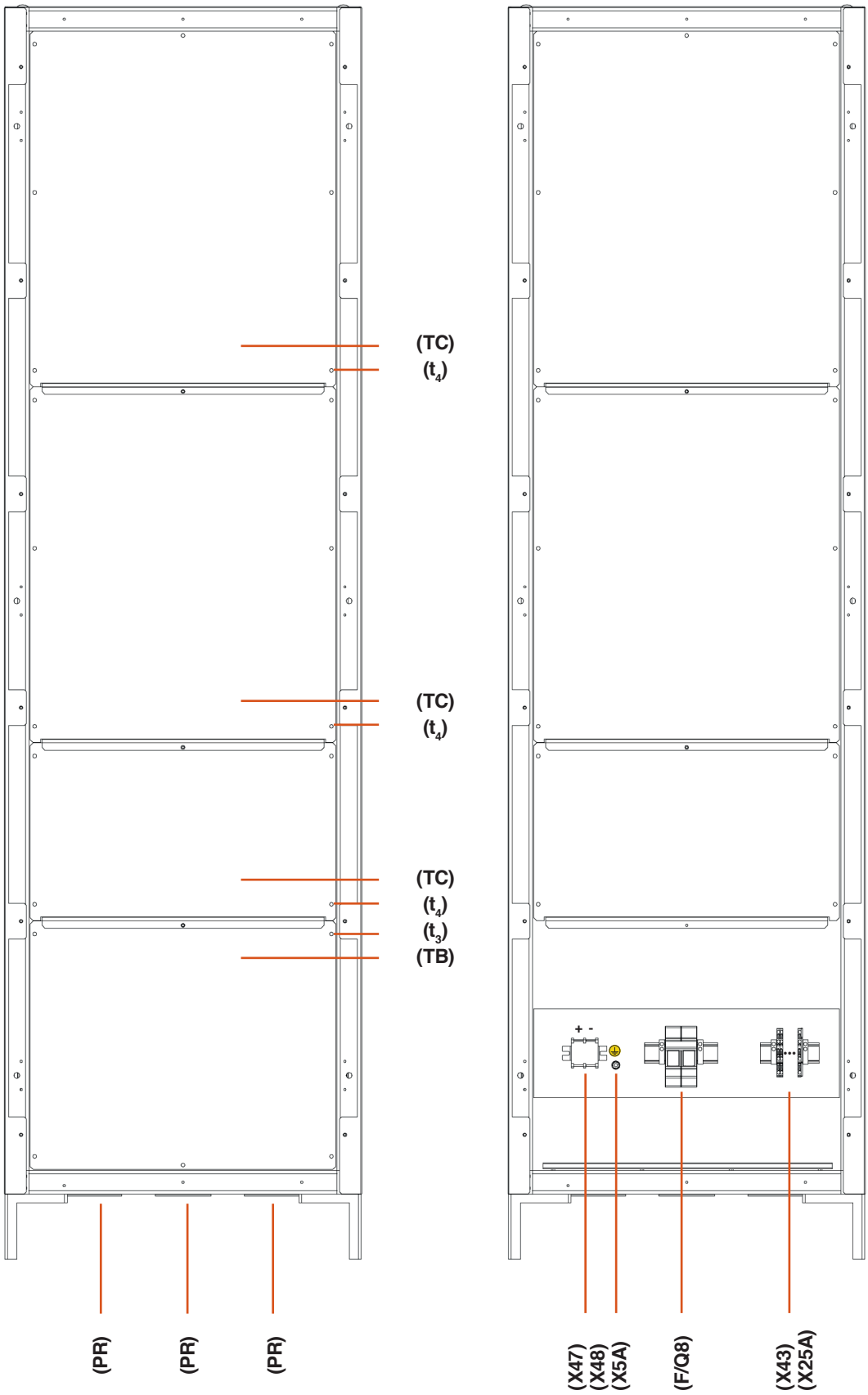


Fig. 11. *Front view of 605x605x2115 mm battery cabinet.*

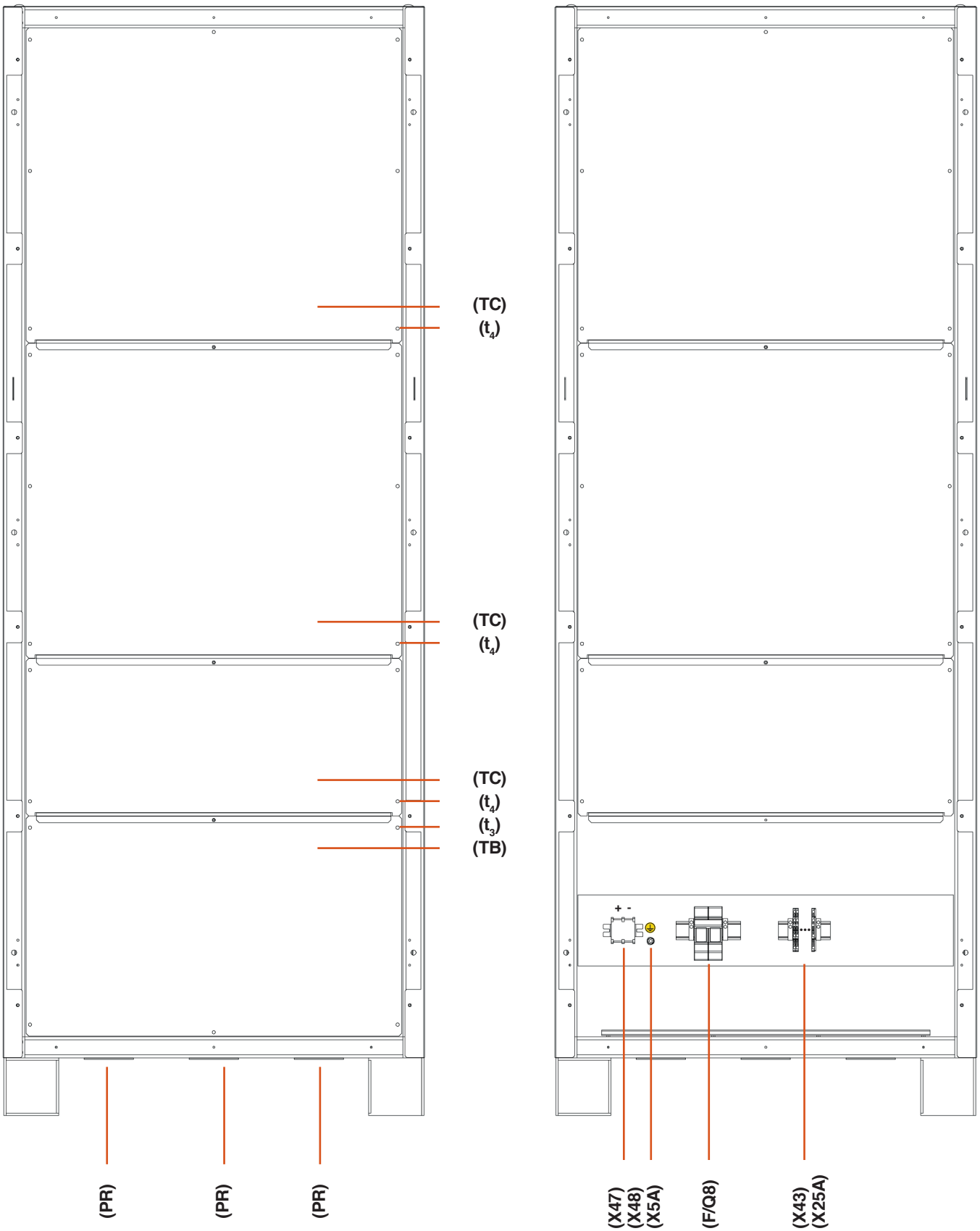
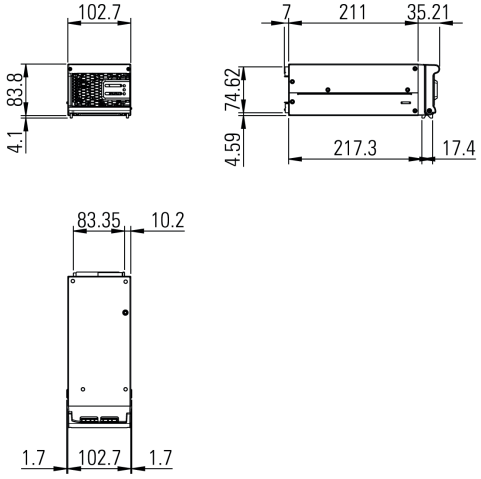


Fig. 12. *Front view of 605x805x2115 mm battery cabinet.*

4.1.1. Dimensional drawings.



Rectifier module dimensions.

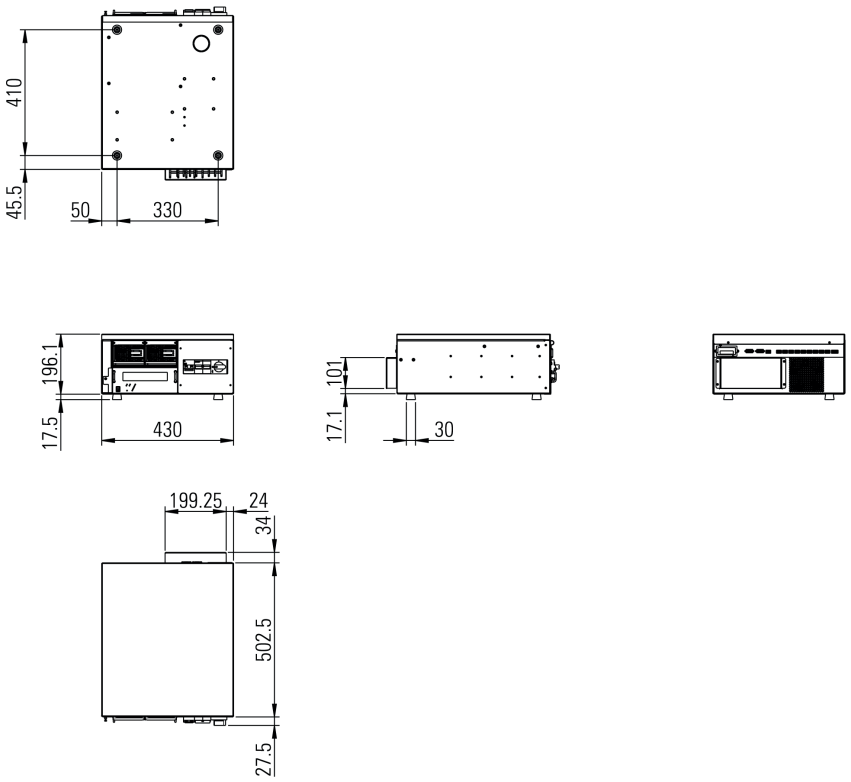
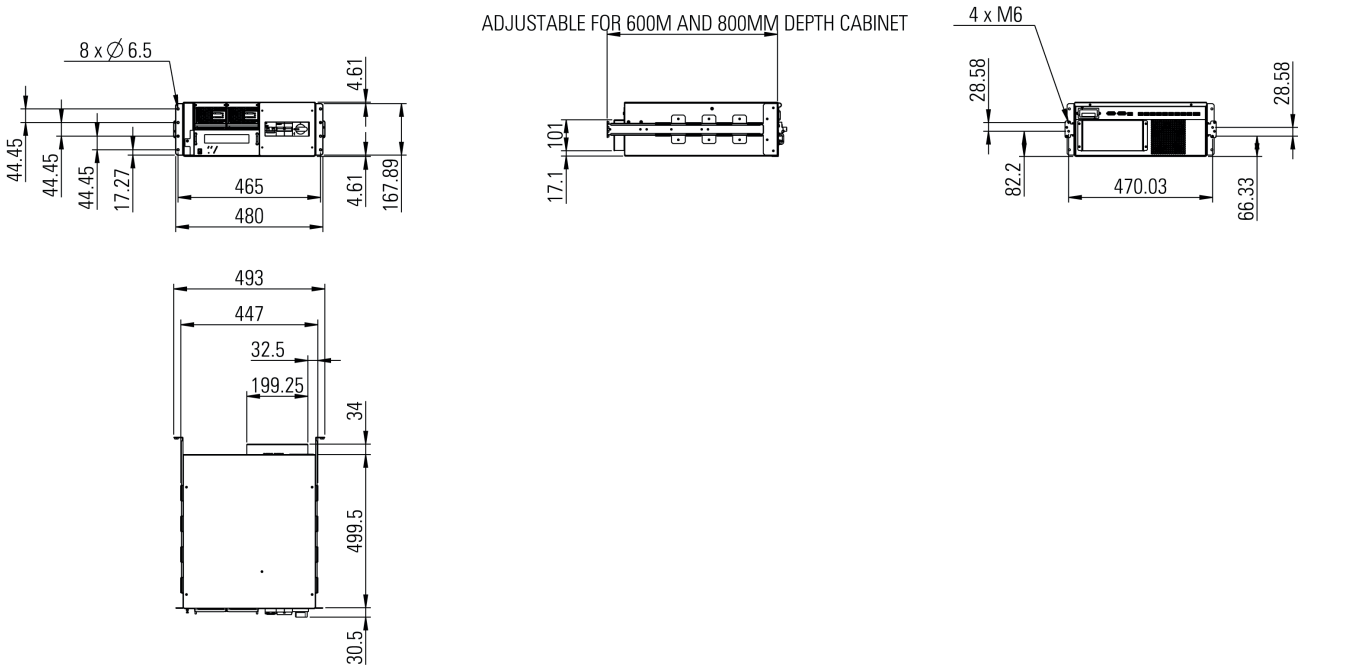
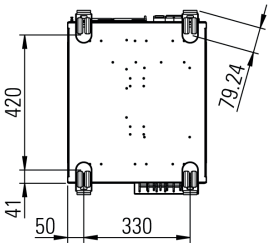
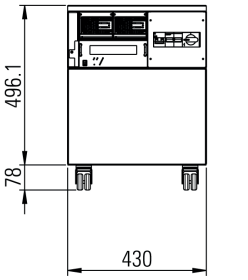


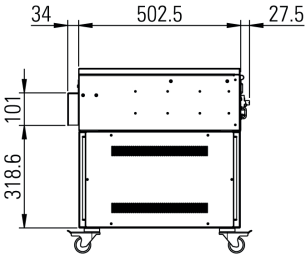
Table top case dimensions.

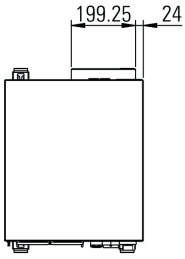


19" subrack dimensions.

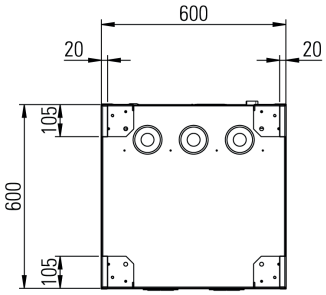


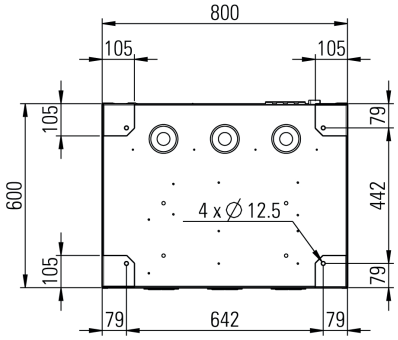


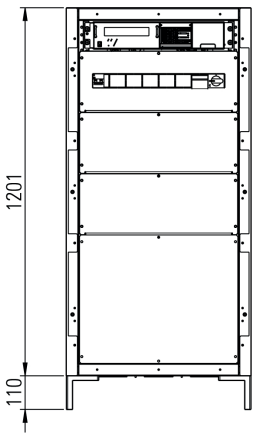


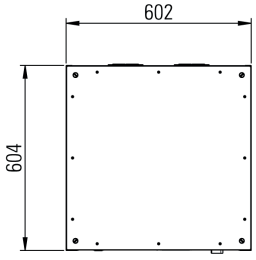


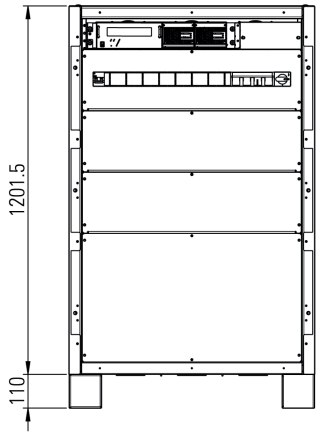
Case with casters dimensions.

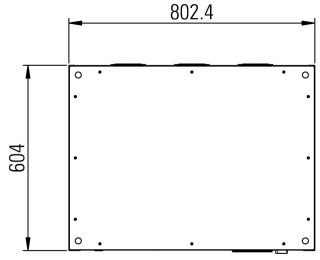








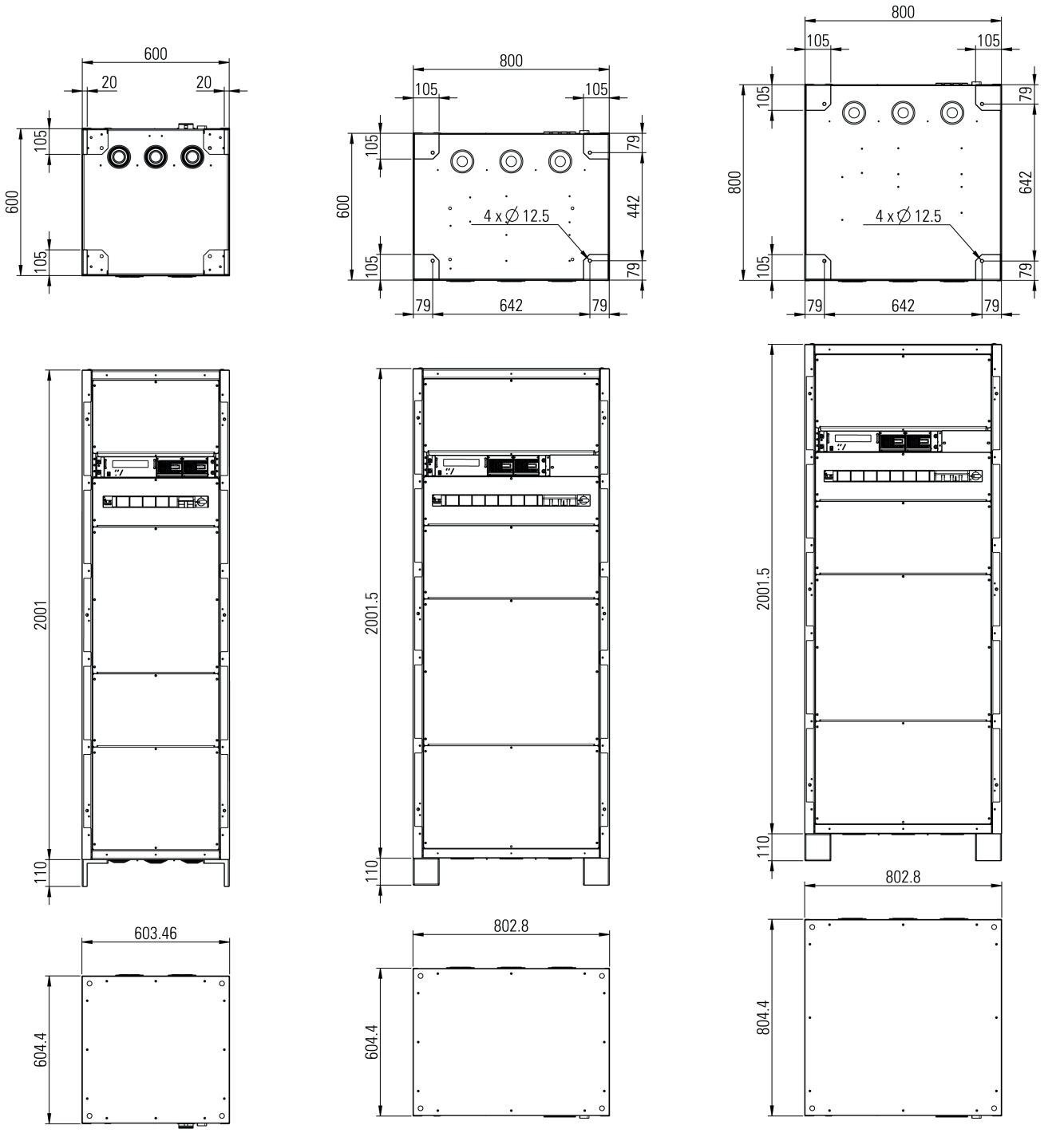




Cabinet dimensions:

605x605x1315 mm.

605x805x1315 mm.



Dimensions for equipment cabinets or batteries, regardless illustration:

605x605x2115 mm. 605x805x2115 mm. 805x805x2115 mm.

Fig. 13. *Dimensional drawings.*

4.1.2. Legends corresponding to the equipment views.

Connection parts.

(X1) AC input terminal, phase R.

(X2) AC input terminal, phase S. (0)

(X3) AC input terminal, phase T. (0)

(X4) AC input terminal, neutral N.

(X5) Terminal or rod for main protective earth (⏚) and bonding (⏚), of DC Power-S.

(X5A) Terminal or rod for bonding (⏚), of the battery cabinet. (1)

(X6) Output terminal, positive (+).

(X9) Output terminal, negative (–).

(X6A.. 6*) Outgoing distribution terminals, positive (+). The own terminals of the outgoing distribution will be used as standard and under request only, there will be a terminal strip with «n» terminals. (2)

(X9A.. 9*) Outgoing distribution terminals, negative (–). The own terminals of the outgoing distribution will be used as standard and under request only, there will be a terminal strip with «n» terminals. (2)

(X11) Positive battery terminal (+), in a system cabinet. Equipments with batteries or part of them fitted out of the DC Power-S cabinet only.

(X12) Negative battery terminal (-), in a system cabinet. Equipments with batteries or part of them fitted out of the DC Power-S cabinet only.

(X25A) Terminals for the electrolyte level probe in battery cabinet or rack (equipments including the optional probe only).

(X40) Auxiliary contact terminals, input or general input protection **(F/Q1A)**. (3)

(X41A.. 41*) Auxiliary contact terminals, single input protections for each rectifier module **(F/Q1B.. 1*)**. (1)

(X42) Auxiliary contact terminals, battery protection in the DC Power-S cabinet **(F/Q3)**. (3)

(X43) Auxiliary contact terminals, battery protection in the accumulator cabinet **(F/Q8)**. (1) (3)

(X44A.. 44*) Auxiliary contact terminals, single output protections for each rectifier module **(F/Q2B.. 2*)**. (3)

(X45) Auxiliary contact terminals, output or general output protection **(F/Q2A)**. (3)

(X46) Auxiliary contact terminals, general outgoing distribution protection **(F/Q2)**. (3)

(X46A.. 46*) Auxiliary contact terminals, single outgoing distribution protection **(F/Q6A.. 6*)**. (3)

(X47) Positive battery terminal (+), in the battery cabinet. (1)

(X48) Negative battery terminal (–), in the battery cabinet. (1)

Connection parts and instructions of the communication module (M_{com}).

See EN030* user's manual.

Protection and manoeuvring parts.

(F/Q1A) Input or general input circuit breaker or fuses, two or three poles depending on the power supply typology. (4)

(F/Q1B.. 1*) Two poles input circuit breaker protections for each rectifier. (4)

(F/Q2) Two poles output or general outgoing distribution protection. (2) (4)

(F/Q2A) General output rectifiers switch of two poles. DO NOT BREAK WITH LOAD. (2) (4)

(F/Q2B.. 2*) Two poles output circuit breaker protections for each rectifier. (2) (4)

(F/Q3) Two poles battery protection, fitted in the system cabinet. Depending on the current and voltage, the protection can be a switch plus fuses. DO NOT BREAK WITH LOAD. (2) (4)

(F/Q6A.. 6*) Two poles outgoing distribution protection. (2) (4)

(F/Q8) Two poles battery protection, fitted in the battery cabinet. Depending on the current and voltage, the protection can be a switch plus fuses. DO NOT BREAK WITH LOAD. (2) (4)

Optical indications of the rectifier module (M_{rect}).

(a) Correct output indication. Green colour led.

(b) Standby module indication, it doesn't supply output voltage. Yellow colour led.

With leds **(a) + (b) turned on, in green and yellow colour respectively**, the indication as warning mode means that the rectifier is working at maximum current conditions. The rectifier is self-limited and it gives the maximum power that it can supply.

(c) Alarm indication, due to over temperature, short-circuit or fault. The rectifier is blocked and out of service meanwhile the causes are present. Red colour led.

Optical indications and instructions of the control module (M_{cont}).

See user's manual EN021*.

Other parts, abbreviations and auxiliary elements.

(A_{bat}) Battery cabinet.

(A_{rect}) Rectifier system cabinet, basically to be referred to the complete equipment, with or without batteries.

(AB) Clamp for fixing the cables to the rod **(BF)**.

(AS_1) Toggle handle of rectifier module **(M_{rect})**.

(AS_2) Handle of control module **(M_{cont})**.

(BB) Battery shelves. Removable shelves to fill the flooded PbCa or NiCd batteries.

(BF) Rod for fixing the connection cables by means of clamps.

(BL_1) Mechanical lock of rectifier module.

(BL_2) Mechanical lock through screws for removable battery shelves.

(BZ) Plinth base to fix it to a solid surface. Cabinets with removable battery shelves only.

(CM) Hoisting lugs to lift the cabinet (optional).

The structure is not ready to be lifted with the batteries fitted in.

(CT) Lock with handle and ratchet or cam, for front door cabinet. A lock with key can be fitted as an option **(LL)**.

(GS) Telescopic guide for subrack.

(LL) Key for block and unblock the locking **(CT)**.

(M_{com}) Communication module.

(M_{cont}) Control module.

(M_{rect}) Rectifier module.

(MB) Cable bundle for connecting the battery cabinet with the rectifier one (batteries fitted in separate cabinet only).

(MD) Connection cable bundle among cabinets with electrolyte probe, when batteries are supplied in separate cabinet (option included only).

If batteries are fitted in the rectifier cabinet, this electrical connection cable bundle is already pre-connected with the probe from factory.

(MS) Cable bundle with temperature probe **(R103)**.

(P_A) Fixing points of the plinth-base to a solid surface. Cabinets with removable battery shelves.

(PF) Front door of rectifier and/or battery cabinet (optional).

(PF_1) Fixing points at the front of the subrack.

(PF_2) Fixing points of the telescopic guide **(GS)** of the subrack.

(PI) Elevator parts -feet-.

(PR) Cable gland for cable entry.

(R103) Probe of temperature/battery floating voltage.

(RN) Cable gland slot for entering the connection cables.

(RU) Casters.

(RV) Cooling grid.

(t_1) Bolt for control module fixing **(M_{cont})**.

(t_2) Bolt for rectifier module fixing **(M_{rect})**.

(t_3) Bolt for terminal cover fixing **(TB)**.

(t_4) Bolt for battery protection cover fixing **(TC)**.

(TB) Terminal cover.

(TC) Blind cover.

(0) Three-phase equipments only.

(1) Connection or manoeuvring parts of the battery cabinet. Systems with accumulators or part of them installed in a separate cabinet or rack only.

(2) DC outgoing distribution unit, with circuit breaker protections, switched fuses or switch plus fuses, depending on the output current and voltage.
The protection will always be with two poles for floating output voltages. For outputs with the positive or negative earthed, protections will always be single pole, in order to not break the earthed pole.
In systems with floating voltages, the own terminals of the own protections will be used as outgoing distribution terminals.
For outputs positive or negative earthed, the terminal of each single pole protection of the alive pole will be used as terminal and the available rod of the earthed pole as general terminal.

(3) Auxiliary contact option of the protections or switched of the system.

(4) Protections or switches can have an auxiliary contact as an option.

Regarding the protections, this manual uses the acronyms **(F/Q*)**, and to be referred to fuses **(F)** or to the circuit breakers **(Q)**, which in accordance with the regulations, they must be identified with those acronyms. The letter **(Q)** is also used to identify a simple switch too.

4.1.3. Nomenclature.

Rectifier module.

DC-50-S 48-230 WCO EE553000-3

EE*	Rectifier with particular specifications of the client.
CO	“Made in Spain” marking (customs only).
W	Neutral equipment brand.
230	Nominal input voltage.
48	Nominal output voltage.
S	Series of the equipment.
50	Total output current of the module at floating voltage
DC	Rectifier.

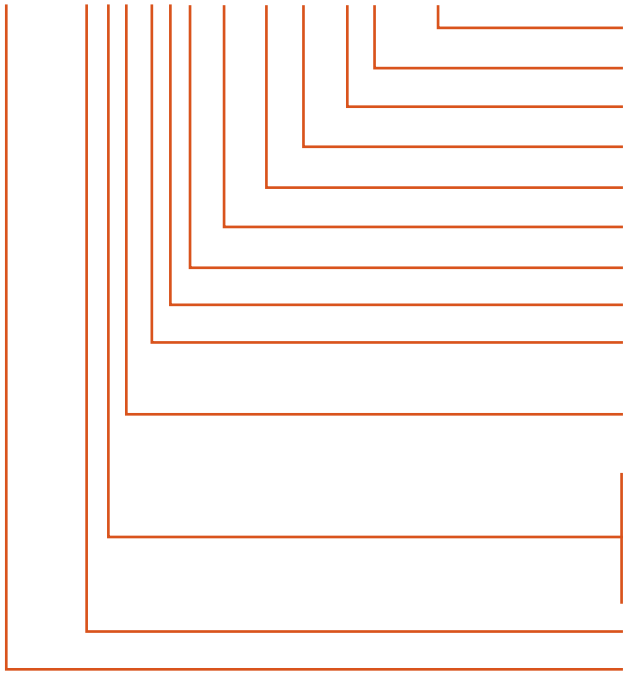
Rectifier system.

DC-6/50-S 300A48-0/2/4x4AB147/213-3x400 COM WCO EE553000

EE*	System with particular specifications of the client.
CO	“Made in Spain” marking (customs only).
W	Neutral equipment brand.
COM	Extended communications: Dry contacts 4 to 9, electrolyte level probe for flooded batteries.
3x400	Nominal input voltage. Omit for 230V.
/213	Last three characters of the battery code type 2.
147	Last three characters of the battery code type 1.
AB	Letters of the battery family.
4	Quantity of batteries in one string.
4x	Quantity of battery strings of type 2 in parallel. Omit, when there is only one string of each type.
2/	Quantity of battery strings of type 1 in parallel. Omit for one string and one type of batteries only.
0/	It means rectifier without batteries, but ready to install them (space and accessories are supplied). (5)
0A/	It means rectifier without batteries, accessories to install them are not supplied. (6)
48	Floating nominal output voltage.
-48	Nominal floating voltage with positive earthed.
+48	Nominal floating voltage with negative earthed.
300A	Total output current of the system at floating voltage.
S	Series of the equipment.
50	Total output current of the module at floating voltage.
6/	Quantity of modules installed in the system currently. Omit for 1 module.
DC	Rectifier.

Battery cabinet.

MOD BAT DC S 0/2/4x4AB147/213 50A WCO EE553000



EE*	Battery module with particular specifications of the client.
CO	“Made in Spain” marking (customs only).
W	Neutral equipment brand.
300A	Protection size.
/213	Last three characters of the battery code type 2.
147	Last three characters of the battery code type 1.
AB	Letters of the battery family.
4	Quantity of batteries in one string.
4x	Quantity of battery strings of type 2 in parallel. Omit, when there is only one string of each type.
2/	Quantity of battery strings of type 1 in parallel. Omit for one string and one type of batteries only.
0/	It means rectifier without batteries, but ready to install them (space and accessories are supplied). (5)
0A/	It means rectifier without batteries, accessories to install them are not supplied. (6)
S	Series of the equipment.
MOD BAT DC	Battery module for rectifier.

(5) For equipments requested without batteries, the acquisition, installation and connection of them is borne and responsibility of the client.
The data of the batteries about in quantity, capacity and voltage are stated in the labelling of batteries sticked next to the nameplate of the equipment, **respect both this data and the connection polarity of the batteries strictly**.

(6) It means that the equipment is supplied neither the corresponding batteries nor accessories (bolts and electrical cables). Under request is possible to supply the needed accessories to install and connect the batteries.

5. Single line diagram, description and structural diagram of the system.

All rectifiers are autoadressing, Plug-in and Hot swap type through the front of the cabinet, and it is not needed any special tool, just a screwdriver. This feature allows removing the faulty modules and/or insert new modules into the system, without the need of shutdown the system, on condition that the drain power is not higher than the modules in service.

5.1. Single line diagram.

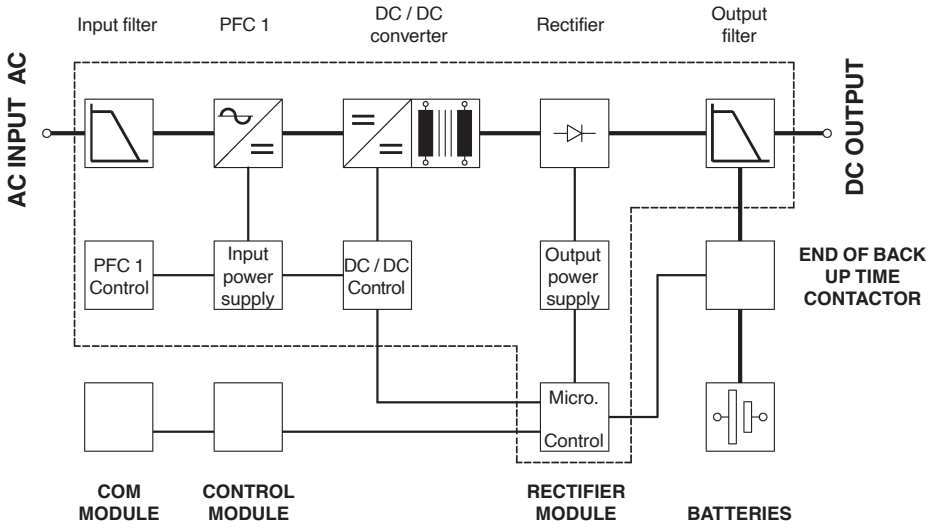


Fig. 14. *Single line diagram.*

5.2. Description.

The operating principle of the Rectifier Module, entails transforming the alternating input voltage, fitted out with a line filter previously, into a direct voltage by converting, rectifying and controlling.

By means of a ultrafast transistors with high quality performances and starting from a direct voltage of 385 V DC , an alternating voltage of 90kHz is generated by means of a DC / DC converter. Then, it is rectified by ultrafast diodes and fitted out with an efficient filtering system.

A transformer of special power, which galvanically isolates the input from output, decreases the high frequency alternating voltage to the required value to generate the final wanted direct voltage.

The output voltage and current are managed by the pulse width modulation of the transistors, fitted in the primary of the transformer. The resulting Rectifier Module/s are available in powers of 1000, 2000 and 2700 W and in voltages 24, 48, 110, 125 or 220 V DC.

The rectifier input is single phase, which allows manufacturing systems in both configurations, single or three phase, depending on the needs of the end-user and the power of the equipment.

The parallelable feature of the rectifiers and the capacity of storing energy in the batteries for long back up times, makes the DC Power-S appropriate for different kind of high technology applications.

5.2.1. Control Module.

The Control Module supervises and manages the complete DC Power-S system by means of a microprocessor, which is in charge of controlling the settings and displayed measurements in the own LCD panel too: input and output measurements, battery charging currents, critical and non-critical load control, communication channel with the environment, ... The maximum quantity of rectifiers in parallel that it can manage is 30, being able to get systems up to 81 kW, with «N+n» redundant configuration options.

5.2.2. Communication Module (COM).

Any system includes the basic version of the Communication Module (COM) which has three programmable dry contacts, RS232/485 channel mutually exclusive between them, battery temperature probe for its measurement and compensating the floating voltage of itself and one slot for the Ethernet/SNMP adaptor. Its extended version includes six additional dry contacts and the input of the electrolyte level probe for flooded batteries.

5.2.2.1. Dry contacts.

By means of the communication interface with dry contacts and digital inputs, it can interact with the environment in the event of alarms of the system or notifications received by the environment.

By default the standard dry contacts from 1 to 3 are preset from factory, being able to reprogram them. The other 6 are optional and programmable too, being able to set one of the available alarms in the system or to associate more than one alarm to the same dry contact.

5.2.2.2. COM ports.

There are two RS232 ports supplied through DB9 connectors and labelled as COM1 and COM2. In case of installing the telemaintenance SICRES card option, COM1 is disabled.

Also, there is a RS485 in COM3 port, which is supplied in 3 pins connector.

The RS232 from COM2 channel and RS485 from COM3 channel are mutually exclusive between them, so they can't be used at the same time.

5.2.2.3. Telemaintenance SICRES card (option).

The telemaintenance SICRES card allows monitoring, analysing and giving technical support in real time, 24 hours per day, 7 days a week by professionals of our firm, decreasing the MTTR (Mean Time To Repair) against any unexpected event.

During the monitoring, a data logger of the events and alarms is generated, which allows an exhaustive analysis of the equipment, giving a valuable information of the operating trend, so in this way the potential future problems can be identified. Likewise, each month, it is sent a detailed report to the client of the status of the equipment.

5.2.3. Operating modes.

- Normal mode.

  Load is supplied from rectifier modules directly. Meanwhile the system takes the energy from the AC electrical commercial mains and supplies DC energy to the loads. At the same time, batteries are kept on floating mode, because they are connected in parallel with the output of the system. For those cases that the system is overloaded, battery will take any inrush current that system is not able to supply.
- Emergency mode.

  In case of mains fault, the connected load to the system is still being supplied, but now by the batteries instead of the rectifier modules. There is not any break in the power supply to the loads, during the transference from normal to emergency modes and vice versa.
- Recharging mode.

  When the electrical mains is restored, the rectifier starts automatically and recharges the batteries and supplies the loads at the same time. It means that the DC output voltage will always be the same as the battery voltage.

5.2.4. Cycling function and Smart mode.

Usually the system is sized to the estimated power of the loads, plus the battery charging current and finally the redundant modules are added to the system. But in most of the cases, as the rectifier modules are connected in parallel and sharing the load, all of them works at half power, which means having a lower efficiency.

To solve this phenomena, the Control Module includes the Smart mode. This operating mode entail in shutdown the redundant modules and any of those ones that are not needed to, in order to get the correct quantity of modules operating at the maximum efficiency level (this figure can be set through the LCD panel). In case of failure of any of them, the Control Module will start up any of the shutdown modules (on Standby) to replace the faulty module. This way, an optimal efficiency of the system is get along its lifetime.

In order to age all the parts and elements equally when the Smart mode is enabled, the Control Module has the cycling function. This function entails in swapping the shutdown modules with the ones that are already started up, therefore the aging is the equal for all of them. The preset cycling period is 10 hours, nevertheless the client can set it at the required time.

SMART-mode.

Load sharing on normal operating.

Rectifier load sharing and cycling on Smart mode.

Fig. 15. *Graphic of the possible operating modes of the system.*

5.2.5. Battery.

Even tough the AC input mains fails, the equipment will operate as an autonomous power supply, by providing voltage to the load connected at the output of the equipment, because it has a battery that will supply the energy.

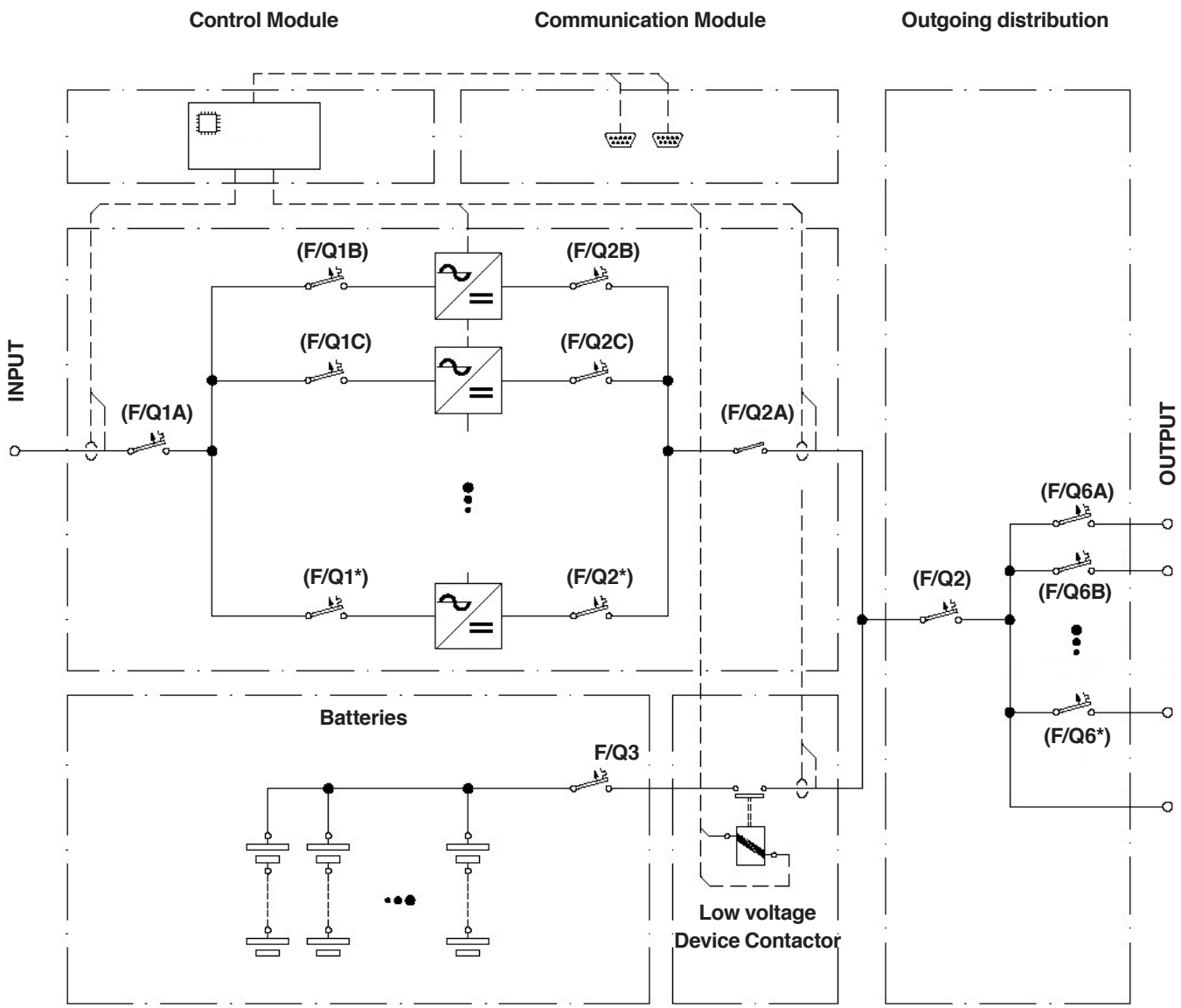
To keep the battery in the optimal status, the system monitors the current and voltage of the battery at any time, as well as the temperature of the battery room to make the corresponding compensations, in order to prolong the battery lifetime to the maximum.

A low voltage contactor protects the batteries from being complete depleted, avoiding their irreversible deterioration, particularly in the PbCa batteries.

The system can charge any type of batteries of PbCa or NiCd, either sealed or with maintenance. A electrolyte level probe can be added, as an option, to the batteries with maintenance, which will trigger an alarm in case of low electrolyte level in the battery cells.

The rectifier cabinet has protections in both poles, which as well as its own functionality, it allows connecting and disconnecting the battery set to the rectifier.

5.3. Structural diagram as an example.



Batteries can be fitted in the same cabinet of the rectifier, in one or more separate cabinets or due to the configuration in both cabinets. Battery protection is fitted in the system cabinet and it is identified in the manual as **(F/Q3)** and the battery cabinet/s as **(F/Q8)**. Each cabinet will always have its own protection.

Regarding the protections, this manual uses the acronyms (F/Q*), and to be referred to fuses (F) or to the circuit breakers (Q), which in accordance with the regulations, they must be identified with those acronyms. The letter (Q) is also used to identify a simple switch.

Fig. 16. *Structural example of a system.*

6. Equipment reception.

6.1. Reception and unpacking.

- On receiving the equipment, check that it has not been damaged during transport. Otherwise make the needed claims to your supplier or in lack of him to our firm. Also check that the data in the label sticked in the packaging of the equipment corresponds to the ones stated in the purchase order. If discrepancies exist, make the nonconformity as soon as possible, by quoting the serial number of the equipment and the references in the delivery note.
- Once the reception is finished, it is advisable to pack the equipment again in its original packaging till its commissioning in order to protect it against mechanical impacts, dust, dirt, etc.
- Depending on the requested model, the packaging will consist of the following materials:
  - ❒ Rectifier module.

    Cardboard packaging, polyethylene foam PE and antistatic plastic bag.
  - ❒ Subrack or case system.

    Cardboard packaging, expanded polystyrene corners (EPS), polyethylene bag and polyester strip.
  - ❒ System in a case with casters or cabinet.

    Wooden pallet, cardboard packaging, expanded polystyrene corners (EPS), polyethylene bag and polyester strip.

    Equipments in cabinet are supplied over a wooden pallet, when it is only requested in the purchase order .
- All of them are recyclable materials., so if it were required to dispose them, do it in accordance to the regulation in force

  It is advisable to keep the packaging in case it were needed in the future.
- The unpacking of the equipment do not entail any problem and it is described the procedure for system in a cabinet only, because it is the most complex due to its volume (see Fig. 17). Respect the following stated procedure:
  - ❒ Cut the polyester strip «❶» and remove the plastic corners «❷».
  - ❒ Remove the top cover «❸».
  - ❒ Remove the four corners «❹».
  - ❒ Remove the cardboard packaging «❺». To take it out, lift it up completely.

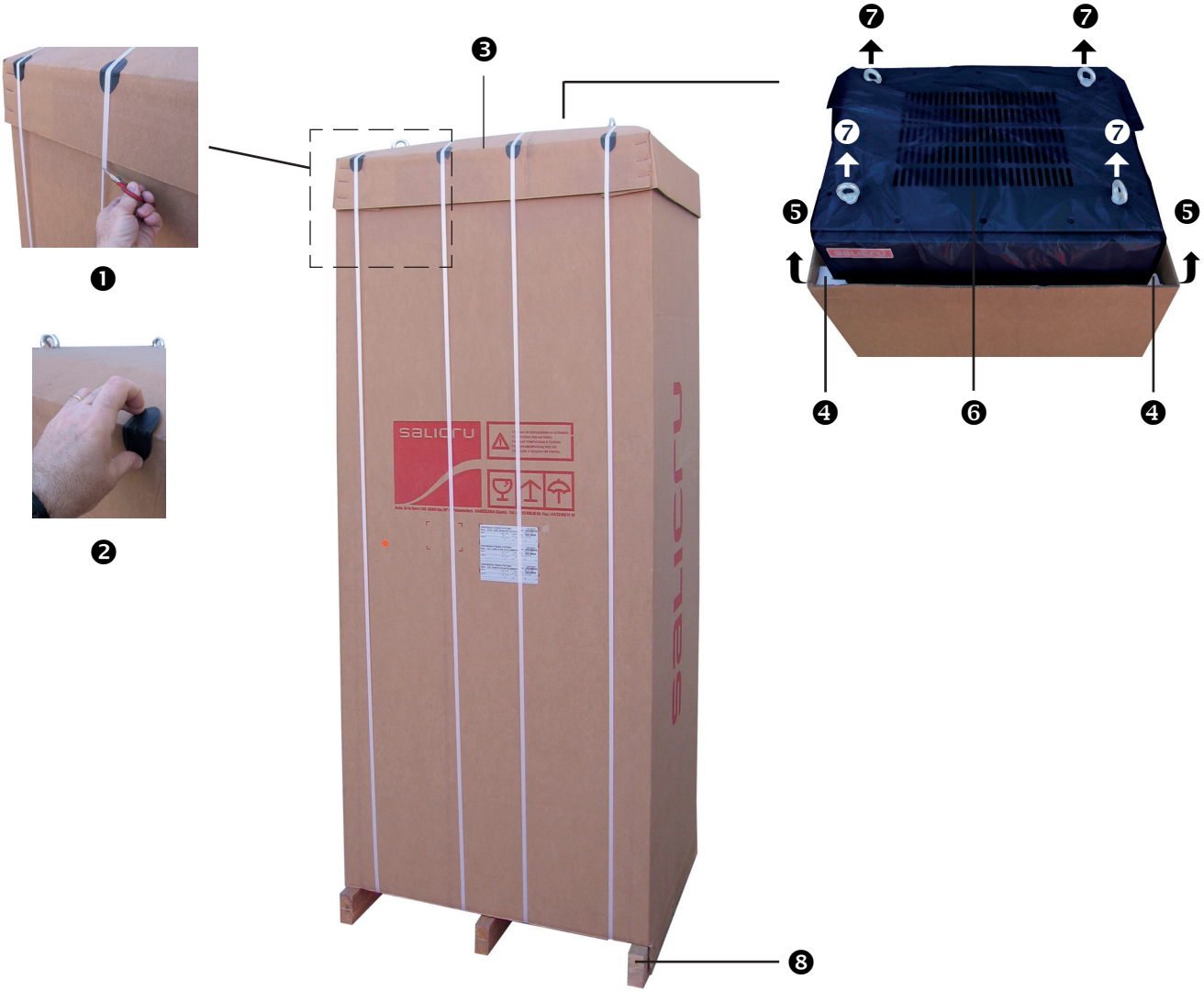


Fig. 17. *Unpacking process of system in a cabinet.*

❒ The equipment will be nude over the pallet with its plastic bag «❻». Remove it by pulling from the top.

In general the systems in cabinets are supplied without pallet, unless it is requested in the purchase order, because its base allows entering a pallet jack or electrical fork-lift truck to make easy its transport till its location, so it is already designed among other functions to replace it.

For those equipments with pallet and/or hoisting lugs, both when they are specifically requested, proceed as follows:

❒ Lift the equipment through the hoisting lugs «❼» **(CM) with the available mechanical means**, considering that the maximum weight will not exceed from **290 kg** in its most complex configuration of 30 modules and without batteries, because they are not supplied already fitted in the cabinet system.

To calculate the maximum estimated weight of a configuration type, add the weights stated in the Table 1, considering the quantity of modules in the equipment.

So, for system with 5 rectifiers in a 605x605x2115 mm cabinet, the maximum estimated weight will be:

Maximum estimated weight; 110 + (5 x 3) + 35 = **160 kg**

❒ Remove the wooden pallet «❽».

❒ Before placing the equipment and/or battery cabinet/s in their final location, check the features of the floor are the suitable ones to support the weight of itself or themselves.

Therefore, pay attention to the total weight that the system will have, once the batteries are fitted in or in the battery cabinet/s:

– Systems with batteries fitted in the same cabinet.

To the maximum estimated weight, add the weight of the batteries stated in the packing list. In case of supplying them in more than one pallet, add the weight of each pallet.

Total weight; 160 kg + battery weight.

– Systems with batteries fitted in a separate cabinet and for each cabinet.

To calculate the total approximate weight of the battery cabinet add the weight of the batteries stated in the packing list. In case of supplying them in more than one pallet, add the weight of each pallet.

So, the weight of a 605x605x2115 mm battery cabinet will be:

Total weight; 110 kg + battery weight.

Rack cabinet depth x width x height (mm)	Cabinet and mechanical parts approx. weight (kg)	Electrical parts approx. weight (kg)	Single module weight (kg)
615x615x1320	65	25	3 (7)
615x815x1320	87	30	
615x615x2120	110	35	
615x815x2120	145	45	
815x815x2120	180	55	

NOTE: In the equipments with optional front door increases 35 mm the depth.

(7) Approx. total weight of a system without batteries, add the partial weights of the mechanical and electrical parts and to the result add the modules weight, considering that the last one is get from multiplying the quantity of modules that system has by the single weight of it.
For the battery weight, check the note in the «Packing list».

Table 1. *Approx. weights fractioned cabinet DC Power-S.*

❒ Systems with flooded batteries or NiCd batteries and removable shelves, fix the cabinet to the floor through the holes in its plinth-base **(BZ)** before fitting the batteries.

- Together with the documentation of the rectifier, 4 beauty bolts are supplied to replace the hoisting lugs **(CM)** in systems in cabinets (it is requested the option hoisting lugs only). Once the equipment is placed and fixed to the plinth or floor, proceed to replace them.

6.2. Packing list and contents.

- Depending on the model of the equipment, quantity of cabinets that make it up, each cabinet has an individual packaging or bulk.

  Also, to consider that the battery set is supplied packaged in one or more pallets depending on the weight of themselves.

  Check that the quantity of available bulks correspond with the ones stated in the packing list document.

6.3. Storage.

- The storage of the equipment, will be done in a dry and cool place, and protected from rain, dust, water jets or chemical agents. It is advisable to keep each equipment and battery set, inside their original packaging because they have been designed to assure the maximum protection during transport ant storage.
- ⚠ Batteries are supplied packaged in one or more pallets depending on the model, separate from the DC Power-S cabinet and/or the own battery cabinet.

  In any case, pay attention to the supplied circuit diagram regarding to polarity, position, orientation and connection of each battery and between batteries, as well as between the battery set and the own system when they share the cabinet.
- Whatever the type of battery of the equipment is, the battery design lifetime **is regulated by the official European organisation EUROBAT**, considering among others features or conditions, the temperature, floating voltage, number of charge and discharge cycles, depth of discharge, etc ...

  As the temperature is a very influential factor in the expected lifetime of the battery and fulfilling the recommendations of this organisation, as far as you can, the storage and operating temperature should not exceed over 20 ºC, because the degradation will be considerable higher.
- Before using the equipment with batteries where the back up time is determined by them, for first time or after a long period of time of no use (6 months maximum), it has to be connected to the power supply to charge the batteries for a minimum period of time of 12 hours.

  Although the equipment can operate with the batteries discharged, it has to be kept in mind the possible risk of a long mains fault during the first operating hours, so the available back up time in the equipment batteries, can be lower than the expected.

7. Installation.

- Together with this user's manual and regarding to «**Safety instructions**», it is included in the same CD of documentation, the EK266*08 document.

  Before doing any action over the equipment regarding the installation or commissioning, change location, setting or any kind of manoeuvring, read them carefully.

  Compliance as regards to «Safety instructions» is mandatory, being the user the legal responsible regarding to its observance and application. Read them carefully and follow the stated steps in the established order.
- Before proceeding to the installation or commissioning of the system, check that all the information relating to the equipment is available, otherwise request it.

  The user´s manual and any linked information is a mere reference guide, which has to be kept for future consults that may arise.
- If the instructions **are not in total or partial understood and in special those ones referred to safety, do not carry** on with the installation or commissioning tasks, because there could be a **risk on your or on the other/s persons safety**, being able **to make serious injuries, even the death**, also it can cause **damages to the equipment and/or loads and installation**.
- The local electrical regulations and the different restrictions of the client's site can invalidate some recommendations included in the manuals. When discrepancies exist, the user has to comply with the local regulations in force.
- Check the data of the nameplate are the required by the installation. Its location will depend on the type of the enclosure used in the equipment:
  - ❒ Subrack and case models.

    It is sticked at the back of the equipment, close to the terminals.
  - ❒ Cabinet models.
    - – Equipments without front door. It is sticked at the back of the terminal cover **(TB)**.
    - – Equipments with front door **(PF)**. It is sticked at the back of the front door, approximately at the height of the terminals.
- Systems can be supplied from factory with the rectifier modules not connected to the «Backplane» of the equipment, due to requirements of the client, transport or other reasons.

  In this case , the modules will be supplied unitary packaged and put over one of the battery shelves or base of the system cabinet, fixed by plastic wraps. In case of lack of space, they will be supplied in the battery cabinet, in the same conditions and failing that in a single and separate packaging.

  Subrack or case models, will be supplied inside the same packaging of the system.
- Subrack models are designed for its fitting in 19" rack cabinet. Therefore, it is provided a telescopic guides **(GS)** located in both sides and joined to the own structure of the equipment mechanically. The ends of these guides have threaded holes of M6 as fixing points **(PF_2)**, which together with the holes located in the front of the equipment **(PF_1)** allows it mechanical fixing to the cabinet.
  - ❒ Proceed as follows by means of two operators intervention:
    - – Depending on the case, remove the rear and side cover/s or open the front door of the cabinet. Remind to put them back or to close the door once the physical installation, erection and commissioning of the equipment is finished.
    - – Check that at the front of the cabinet and at the height that the subrack is going to be installed, there are threaded anchored points (nuts) and they are equidistant with the own ones at the front of the equipment.
    - – With an operator at each side, take the subrack through it sides and introduce it in the cabinet at the wanted height, by taking it with one hand at its base at each side and with the other hand put the bolts of M6 in the points **(PF_1)** at the front to fix it to the cabinet frame (do not tighten them completely).
    - – By taking the equipment with one hand at the bottom of each side, stretch the guides **(GS)** till the end and put the bolts at each side in order to secure the subrack to the cabinet by means of the points **(PF_2)** and tighten them completely.
    - – Tighten the bolts at the front completely.
- Depending on the model, the following actions will be needed to access to the connection parts, to install batteries or to access to the rectifier modules to be inserted in the system:
  - ❒ Subrack and case models. Any connection part is located at the back of the equipment.
    - – Connectors relating to communications are accessible directly.
    - – To access to the power terminals, it is needed to remove the screws **(t_3)** and the terminal cover **(TB)**.
  - ❒ Cabinet models. Any connection part, both power and communication are protected. To access to them, proceed as follows:
    - – Equipments with no front door.

      Remove the screws **(t_3)** and terminal cover **(TB)**. The connection parts will be at sight.
    - – Equipments with front door (increases 35 mm the depth).

      The equipment can be supplied completely closed, with a front door **(PF)** that can be completely blind or to have a transparent window to check the control module.

      The door has two locks **(CT)** one of them with ratchet for 1320 and 2120 mm cabinet height, preferably with triangular key **(LL)** of 8 mm. Also it can be supplied with other models of locks like: lock with key **(LL)**, of fast opening with doorknob, with slot for flat screwdriver or through retractable knob with ratchet lock or cam-lock with or without key blocking **(LL)**.

      To access to the connection terminals:

      Open the front door by means of the lock **(CT)**.

      Remove the screws **(t_3)** and terminal cover **(TB)**. The connection parts will be at sight.

      When blind covers are fitted in, remove the screws **(t_4)** and all the blind covers **(TC)**. The packaged rectifier modules will be at sight, as well as the shelves to fit the batteries in, if it is foreseen to install them in the same cabinet.

      For systems with batteries in a separate cabinet, open the front door **(PF) and remove the screws (t_3) and (t_4)**, as well as the covers **(TB) and (TC)**. The connection parts will be at sight.

In cabinets of systems and/or batteries, where the battery shelves are removable, there will not be blind covers and they will have front door.

- Finally, after doing the connection and/or erection tasks, it is mandatory to leave the cabinet/switch the cover/s put it or them back and the front door closed.
- The floor where the system is installed will be ready to support the weight of itself and it will be duly levelled, otherwise the metallic frame will support unnecessary and bad torques.

  These deformities can mean a serious and dangerous problem depending on their degree, especially in the rectifier cabinets with batteries fitted inside or battery cabinets, because as higher is the weight to be supported, the most the structure will suffer.

  Optically, there could be slopes in the cabinet as regards to the flat of the floor and/or between covers and top, being this the lesser evil in comparison with the damages in the frame.
- It is mandatory to fix the cabinet/s to a solid and safe floor, when the shelves are removable:

  It has been stated the overturn risk of the cabinet when pulling from the battery shelves out, with the consequent risk of serious injuries for the operator, so it is imperative required to stick **visible warnings about the need of fixing the cabinet to the floor with parts that guarantee a total and permanent solidity before starting fitting the batteries in**.

  Proceed as follows:

  ❒ Make the needed works to have a solid floor and levelled with the fixing points by means of threaded studs of M12 and with a length thread about 3 cm.

  Fig. 18 shows the mechanization in the base of the 600x800 and 800x800 mm cabinet, bottom cabinet view.

  ❒ Put the equipment and/or battery cabinet over the mechanised floor.

  ❒ Fix the cabinet base-plinth **(BZ)** to the floor, through the foreseen fixing points **(P_A)** of ø 12.5 mm, by means of nuts and washers of M12.

  ❒ Repeat this task for every cabinet, if there is more than one unit.
- Although the actions of the previous step have been done properly, do not pull out more than one battery shelf, there is high risk of mechanical torques in the own frame.

7.1. Operative for inserting and removing modules from the system.

- Pay attention to this point when the system is supplied from factory with the modules not assembled only. Use it as a removing and inserting guide of a unit.
- For systems without the modules and depending on the model, break the strip that fix them to the cabinet of the system, or battery cabinet or open the particular packaging of each one of them..

7.1.1. Inserting or removing a module from a system.

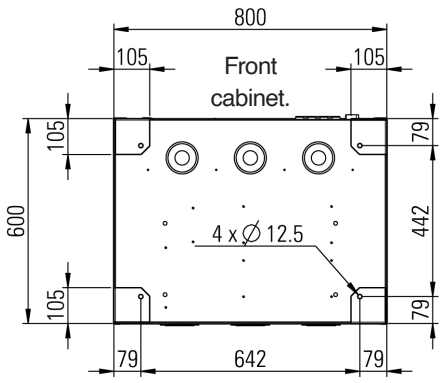
- Procedure to insert a module.

  ❒ Take a packaged rectifier, remove it out from its cardboard case, remove the protection foam and the anti-static bag.

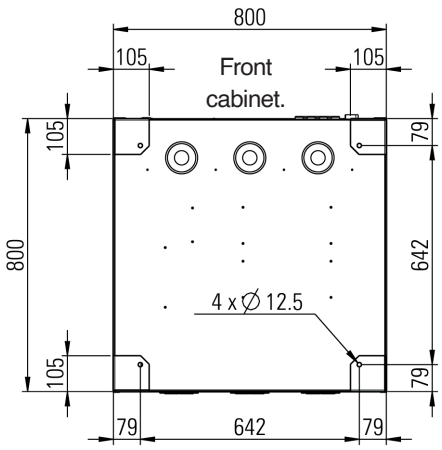
  ❒ Loosen the two screws with safety washer **(t_2)** to release the handle **(AS_1)**.

  The handle pivot over an axis arranged in the front bottom part of the module. Open it till the maximum, in order to hide the mechanical lock **(BL_1)** located at both sides of its base, and allow the entrance of the module into the subrack.

  Do not insert the rectifier module in the subrack **without opening the handle (AS_1) till the maximum** , because the mechanical lock could be damaged or broken.



Cabinet with base 600x800.



Cabinet with base 800x800.

Fig. 18. *Mechanization of the cabinet base.*

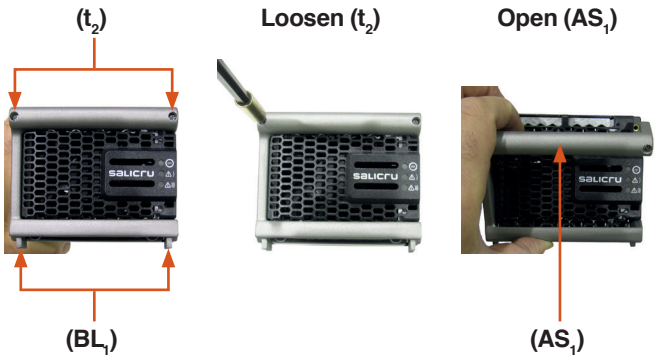


Fig. 19. *Release of the handle (AS_1).*

❒ Confront the rectifier module in any of the slots foreseen for them in the DC Power-S cabinet and insert it with the needed force in order to connect it to the «Backplane».

There is not risk of error, because the module is guided by the natural channel of the own compartment and at its back part side there is a pivot to centre it, which also confers the needed rigidity to avoid that the connectors suffer mechanical efforts less the ones for its own function of the electrical contact.

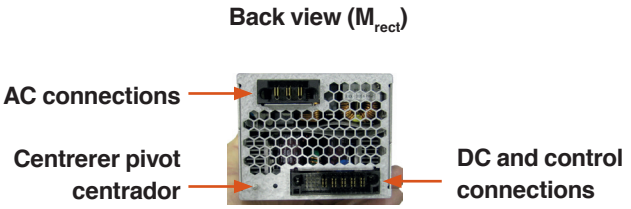


Fig. 20. *Rear view of the rectifier module.*

❒ Push the handle **(AS_1)** till closing it and leaving it die down with the front of the module. With this action the mechanical lock **(BL_1)** will fit in a perforate of the subrack. Tighten both screws **(t_2)** to immobilize the lock.

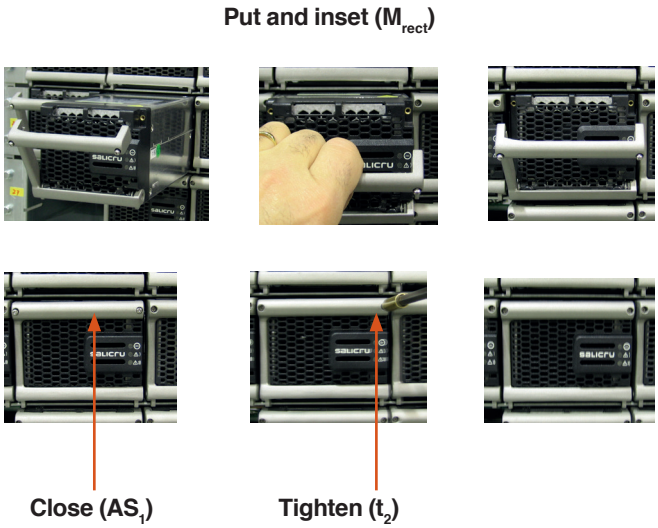


Fig. 21. *Procedure to insert and remove a module in a system.*

❒ Proceed in the same way for the rest of rectifiers.

- Procedure to remove a module.
  - ❒ Loosen both screws with safety washer **(t_2)** to release the module handle **(AS_1)** .
  - ❒ Toggle the handle **(AS_1)** till open it completely, in order to lift the mechanical lock **(BL_1)** and pull from it to disconnect the module from the «Backplane».
  - ❒ Remove the module completely.
  - ❒ To replace the module by another one, it is necessary to validate the technical features of power and voltage are the same in both.
  - ❒ Put the new rectifier, paying attention to the procedure of inserting a module.

7.2. Take care of your safety.

- All electrical connections and disconnections of cables from the equipment, including the control ones, will be done with no power supply and switches on rest position «O» or «Off».
- Before proceeding to fit the batteries in physically check that protections or switches of the system are in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.

  When the protection is done by means of fuses, they are supplied inserted in the fuse holder, because the batteries are not supplied already fitted in the cabinet. This way misleading and losses are avoided.
- Batteries are always supplied out from the own equipment cabinet or battery cabinet. Therefore, it will be needed to fit and connect them in according to the supplied diagram together with the documentation, by using the supplied accessories like rods, cables and bolts.

  Start the procedure by fitting the batteries in the lowest shelf in order to settle the cabinet and getting the lowest centre of gravity and go to the next level as soon as the shelf is completely filled.
- In systems with removable selves, it is mandatory to introduce them as soon as they are filled, therefore unnecessary mechanical torques over the frame will be avoided, which can mean structural twists.
  - ❒ To remove each battery shelf **(BB)**, is needed to remove the two screws **(BL_2) that fix it as mechanical lock** , which are located at the front and in both sides.
  - ❒ Leave the connection between levels for the end, otherwise there is risk of electrical discharge.
  - ❒ Complete the battery shelves one by one, interconnect the batteries among them and introduce the battery shelf in, as soon as the single works in each one of them is finished.

    Put both screws **(BL_2) which act as mechanical lock** and tighten them.
  - ❒ Next, proceed to connect the batteries between levels, paying attention to the safety instructions stated in this document and EK266*08.
- Once the batteries are interconnected, take caution, because dangerous voltage between the terminals of several batteries or between one of them and the earth can exist, depending on the total voltage of the set.
- In systems with back up time 0/ or 0A/, the battery acquisition, installation and connection will be borne by the client and under his responsibility. Battery data relating to quantity, capacity and voltage are stated in the battery label sticked beside the nameplate of the equipment, **respect these data strictly**, the polarity of the battery connection and the supplied circuit diagram together with the documentation and the DC Power-S.

- Battery handling and connection, will be done or supervised by personnel with specific knowledge only.

  Before doing any action, disconnect the batteries. Check that current is not present and there is not dangerous voltage between both terminal ends of the battery set.

  The battery circuit is isolated from the input voltage, in those equipments with floating output voltage, nevertheless it will not be, in those equipments with earthed output voltage. Therefore, dangerous voltages can exist between the terminals of the battery set and earth.

  Check the system does not have input voltage before doing any action over the batteries, otherwise the rectifier will supply DC voltage to the cables connected to the battery set, with the consequent risk.

- Do not forget that a DC Power-S with batteries is a generator of electrical energy, both batteries are fitted or not in the own cabinet of the own equipment, so the end-user must take the needed cautions against direct or indirect contact.

  If the batteries are connected to the equipment and their protection are turned «On», it is irrelevant the fact of having turned «On» the DC Power-S or not to mains as well as the position of its protection (On or Off).

  The output terminals will supply voltage meanwhile the battery set has energy, unless the output switch **(F/Q2)** is turned «Off» or in case of having an outgoing distribution, the general protection of the outgoing distribution or each one of the single protections of the outgoing distribution are turned «Off».

7.3. To keep in mind.

- Installation location will be roomy, cooled and with easy access. Neither obstruct the cooling grids nor install the equipment outdoors.
- Input, output and main protective earth cross cable sections will be in harmony with the nominal current of the nameplate, being essential requirement to meet the regulations or standards of the country.
- A wrong connection or manoeuvring, can cause failures in the equipment and/or connected loads to it. Read the instructions of this manual carefully and follow the stated steps in the established order.
- In the base of the cabinet there are cable bushing cones **(PR)**, to isolate the connection cable entering from the metallic surface of the cabinet.

  Cut them according to the suitable section in order to allow entering the input, output and battery (systems with separate battery cabinet only) cables.

  Under request some cabinets can have a cable gland plate **(RN) for the cable entry**, instead of the cable bushing cones **(PR)**.
- All the cables will be fixed with clamps **(AB)** to the rod **(BF)**, in order to immobilize them and avoid possible yank outs that could cause false contacts, cable disconnections, ... etc, and therefore equipment faults and/or possible risk of electrical discharges.
- As an example and mere guide for the end-user, figures 5 to 8 show the quantity of «N» rectifier modules connected in parallel, with the most frequent requested devices and options. If any of the related parts in the illustrations are not available in your unit, ignore any reference or act over them. Whenever it is considered appropriate, additional explanatory annexes will be created, for those equipments manufactured under particular requirements.

7.4. Main protective earth terminal or rod (X5) and/or (X5A).

- It is advisable and it is forced by the country regulations or standards, to connect the device to earth.

  Make sure that all the loads connected to the equipment are only connected to the earth bonding terminal (X5). The fact of not restricting the earthing of the load or loads to this single point will create backfeed loops to earth that will affect to the quality of the power supplied.

  All the terminals identified as main protective earthing terminal (⏚), are joint among them and connected to the ground of the cabinet.
- In those models with separate battery cabinet, joint the main protective earth terminal or rod **(X5) of the** rectifier, with the earth bonding terminal **(X5A)** of the battery cabinet **(⏚)**, by using the foreseen cable in the battery cable bundle.
- DC Power-S can be supplied from factory with the positive pole connected to earth, negative to earth or floating. In the nameplate and in the terminal labelling, it is identified the connection type by means of the sign «+» or «–», written down before the output voltage figure, which will indicate the alive pole.

  It is very important to assure that the loads that are being connected to the equipment have the same type of connection of itself, otherwise it will mean a risk for the personnel and the destruction of the installation and annexes equipments.

  By default and if it is not stated, all the equipments are supplied with floating output voltage.
- It is recommended to use shielded cables for communications, as well as the connection of the own shield to earth through the terminal or rod **(X5)**.

7.5. Connection of the system with the battery set or cabinet. Terminals (X11) - (X12) and (X47) - (X48).

- This operation is only destined to connect the battery terminals of the system with the respective of the battery cabinet/s, although the batteries belong to the client or they are supplied together with the equipment.

  Any instructions referred to the physical fitting of each cell in the cabinet of the system or battery, is described in section 7.2.
- All protections or switches of the system has to be in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.

  As the fuses are supplied inserted in the fuse holder, to avoid misleading and losses, it is important to check that the switches are opened (Off).

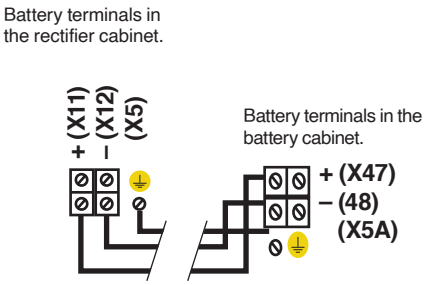


Fig. 22. *Connection of the battery cabinet to the system.*

- Connect the cable bundle, in general it is supplied, between the terminals **(X11)** - **(X12)** of the system and **(X47)** - **(X48)** of the battery or rack cabinet, by respecting the colour of the cables (red for (+), black for (–) and green-yellow for the earth bonding (⏚)) as week as the polarity stated in the labelling of the equipment (see Fig. 22).
- ⚠ In those systems with more than one battery cabinet/ rack, keep in mind to connect them in parallel and with the own system too, depending on each particular case. In any case, the supplied battery circuit diagram with the documentation will always prevail.

7.6. Connection to AC mains. Terminals (X1), (X2), (X3) and (X4).

- All protections or switches of the system has to be in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.

  ⚠ As the fuses are supplied inserted in the fuse holder, to avoid misleading and losses, it is important to check that the switches are opened (Off).
- ⚠ It is mandatory to earth the equipment (⏚) through the main protective earth terminal or rod **(X5)**, making sure that it is done before turning on the input voltage of the equipment.
- Connect the power supply cables to terminals **(X1)** and **(X4) for single phase equipments or (X1)**, **(X2)**, **(X3)** and **(X4)** for three phase equipments, by respecting the phase and neutral rotation, stated in the labelling of the DC Power-S.

7.7. Connection of the loads.

- ⚠ It is mandatory to earth the equipment (⏚) through the main protective earth terminal or rod **(X5)**, making sure that it is done before turning on the input voltage of the equipment.
- DC Power-S can be supplied from factory with the positive pole connected to earth, negative to earth or floating. In the nameplate and in the terminal labelling, it is identified the connection type by means of the sign «+» or «–», written down before the output voltage figure, which will indicate the alive pole.

  ℹ **By default and if it is not stated, all the equipments are supplied with floating output voltage.**

  ⚠ It is **very important** to assure that the loads that are being connected to the equipment have the same type of connection of itself, otherwise it will mean a risk for the personnel and the destruction of the installation and annexes equipments.
- The typology of the output protection is determined and established as follows:
  - ❒ Floating output, two poles protection.
  - ❒ Positive pole connected to earth, single pole protection in the negative pole.
  - ❒ Negative pole connected to earth, single pole protection in the positive pole.

  The typology of the output protection is applicable to the battery switch or protection and to any protection of the DC outgoing distribution.

7.7.1. No DC outgoing distribution. Terminals (X6) and (X9).

7.7.1.1. Floating output.

- All protections or switches of the system has to be in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.
- Connect the loads or busbar to the output terminals **(X6)** and **(X9)**, by respecting the colour of the cables (red for positive and black for negative) and the polarity stated in the labelling of the equipment.
- Connect the earth of load or loads to the earth terminal or rod **(X5)**.
- It is recommended to distribute the output in several lines with two poles type protection elements each one (fuse switches or circuit breakers), to be installed by the client.

7.7.1.2. Output with the positive earthed.

- All protections or switches of the system has to be in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.
- Connect the loads or busbar to the output terminals **(X6)** and **(X9)**, by respecting the colour of the cables (red for positive and black for negative) and the polarity stated in the labelling of the equipment.
- Connect the earth of load or loads to the earth terminal or rod **(X5)**.
- It is recommended to distribute the output in several lines with single pole type protections elements each one in the negative pole (fuse switches or circuit breakers), to be installed by the client.

7.7.1.3. Output with the negative earthed.

- All protections or switches of the system has to be in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.
- Connect the loads or busbar to the output terminals **(X6)** and **(X9)**, by respecting the colour of the cables (red for positive and black for negative) and the polarity stated in the labelling of the equipment.
- Connect the earth of load or loads to the earth terminal or rod **(X5).**
- It is recommended to distribute the output in several lines with single pole type protections elements each one in the positive pole (fuse switches or circuit breakers), to be installed by the client.

7.7.2. With DC outgoing distribution. Terminals (X6A.. 6*) and (X9A.. 9*).

7.7.2.1. Floating output.

- All protections or switches of the system has to be in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.
- Connect the loads to the two poles protections of the outgoing distribution terminals directly, considering the current limit of each one of them and the own connected load. As an option an outgoing terminal strip can be supplied. Both has the connection points labelled in Fig. 5 to 8 as **(X6A.. 6*)** and **(X9A.. 9*)**.

  Respect the colour of the cables (red for positive and black for negative) and the polarity stated in the labelling of the equipment.
- Connect the earth of load or loads to the earth terminal or rod **(X5)**.

7.7.2.2. Output with positive earthed.

- All protections or switches of the system has to be in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.
- Outgoing distribution:
  - ❒ By default to the protection terminals.

    Connect the negative of the loads to the single pole protections of the outgoing distribution terminals directly **(X9A.. 9*)**, considering the current limit of each one of them and the own connected load.

    Connect the positive of the loads to the common rod, which has several bolts as terminals **(X6A.. 6*)** and at the same it is connected to earth.
  - ❒ Terminal strip as an option.

    An outgoing terminal strip can be supplied with the corresponding negative terminals to each protection **(X9A.. 9*). Connect the negative of the loads to these terminals**.

    Connect the positive of the loads to the common rod, which has several bolts as terminals **(X6A.. 6*)** and at the same it is connected to earth.

  Respect the colour of the cables (red for positive and black for negative) and the polarity stated in the labelling of the equipment.
- Connect the earth of load or loads to the earth terminal or rod **(X5)**.

7.7.2.3. Output with negative earthed.

- All protections or switches of the system has to be in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.
- Outgoing distribution:
  - ❒ By default to the protection terminals.

    Connect the positive of the loads to the single pole protections of the outgoing distribution terminals directly **(X6A.. 6*)**, considering the current limit of each one of them and the own connected load.

    Connect the negative of the loads to the common rod, which has several bolts as terminals **(X9A.. 9*)** and at the same it is connected to earth.
  - ❒ Terminal strip as an option.

    An outgoing terminal strip can be supplied with the corresponding positive terminals to each protection **(X6A.. 6*). Connect the negative of the loads to these terminals**.

    Connect the negative of the loads to the common rod, which has several bolts as terminals **(X9A.. 9*)** and at the same it is connected to earth.

  Respect the colour of the cables (red for positive and black for negative) and the polarity stated in the labelling of the equipment.
- Connect the earth of load or loads to the earth terminal or rod **(X5)**.

7.8. Communication module.

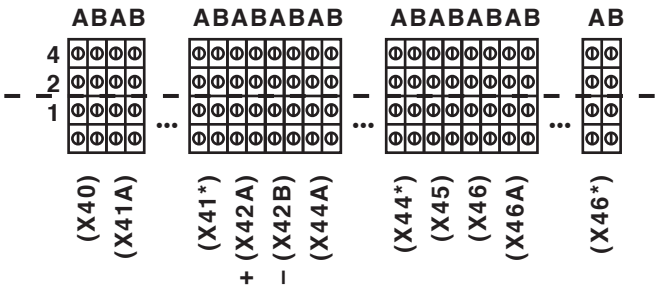
- The system has a communication module described in the user's manual EN030*. This module has two versions, the basic on, which is included in all DC Power-S systems as standard and the extended one.

7.9. Terminal strip, auxiliary contacts of the protections of the system.

- As an option the DC Power-S can incorporate auxiliary contacts (C-NC-NO) in any of the standard protections or switches of the equipment -Input, Output and Batteries- and/or in any of the options -Single input protection for each rectifier, single output protection for each rectifier, General outgoing distribution and/or outgoing distribution-.

  These auxiliary contacts are supplied connected to a terminal strip of double or triple tiers (see Fig 23) and they have the function to inform about the tripping or manoeuvring of any protections or switches. This information can be used to trigger , i.e., an external alarm owned by the client.
- The voltage and current features that can support these contacts are 250 V AC 1 A. Use cables of 1 mm^2 cross section as minimum, but better to use 2,5 mm^2, to connect them to the auxiliary terminals.
- Table 2 shows the correlation of the auxiliary terminals with the function of the protection or switch. If the equipment does not have auxiliary contacts in any of the protections or switches, ignore that reference and proceed with the rest of connections.

Internal connection side

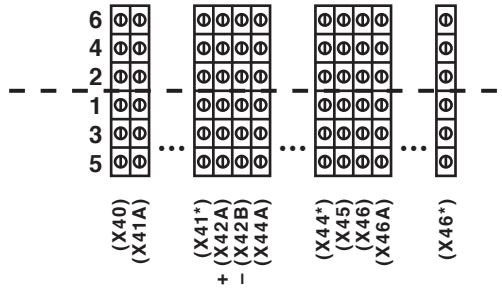


Client connection side (cable entry through the base of the cabinet)

Pin A1.- Contact normally closed (NC).
Pin B1.- Contacto normally opened (NO).
Pin A3 y B3.- Common.

Pin-out of the double tier terminal strip.

Internal connection side



Client connection side (cable entry through the base of the cabinet)

Pin 3.- Contact normally closed (NC).
Pin 5.- Contact normally opened (NO).
Pin 1.- Common.

Pin-out of the triple tier terminal strip.

Fig. 23. *Pin-out of the auxiliary contact terminal strip of the cabinet of the system.*

Auxiliary terminal reference	Protection or switch function
(X40)	Input.
(X41A.. 41*)	Input individual protection of each module.
(X42) [8]	Batteries.
(X42A) [8]	Battery positive (+).
(X42B) [8]	Battery negative (–).
(X44A.. 44*)	Output individual protection of each module.
(X45)	General output.
(X46)	Output or general outgoing distribution.
(X46A.. 46*)	Outgoing distribution.

[8] For equipments with floating output:

When the physical protection means a single element (circuit breaker), there will be one auxiliary contact only, so there will be a single group of terminals only (**X42**). If the protection is done by fuses, the will be two auxiliary contacts, one for each pole, so there will be two groups of terminals **(X42A)** and **(X42B)** for the selective identification, as it is shown in Fig. 23.

For equipments with the positive or negative output earthed:

In this case, as the protection will be single pole, there will be only one group of terminals for the auxiliary contact **(X42)**, corresponding to the alive pole (the one not connected to earth).

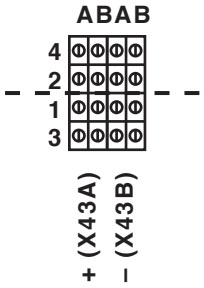
Table 2. *Correlation between auxiliary terminals and the function of the protection or switch, of the cabinet of the system.*

7.10. Terminal strip, auxiliary contacts of the protections of the battery cabinet.

- As an option the battery protection of the DC Power-S battery cabinet can incorporate auxiliary contacts (C-NC-NO).

  This auxiliary contact is supplied connected to a terminal strip of double or triple tier (see Fig 24) and they have the function to inform about the tripping or manoeuvring of the protections. This information can be used to trigger , i.e., an external alarm owned by the client.

Internal connection side

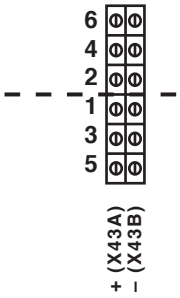


Client connection side (cable entry through the base of the cabinet)

Pin A1.- Contact normally closed (NC).
Pin B1.- Contacto normally opened (NO).
Pin A3 y B3.- Common.

Pin-out of the double tier terminal strip.

Internal connection side



Client connection side (cable entry through the base of the cabinet)

Pin 3.- Contact normally closed (NC).
Pin 5.- Contact normally opened (NO).
Pin 1.- Common.

Pin-out of the triple tier terminal strip.

Fig. 24. *Pin-out of the auxiliary contact terminal strip of the battery cabinet.*

- The voltage and current features that can support these contacts are 250 V AC 1 A. Use cables of 1 mm^2 cross section as minimum, but better to use 2,5 mm^2, to connect them to the auxiliary terminals.
- Table 3 shows the correlation of the auxiliary terminals with the function of the protection. If the equipment does not have the auxiliary contact ignore that reference.

Auxiliary terminal reference	Protection or switch function of the battery cabinet
(X43) [9]	Batteries
(X43A) [9]	Battery positive (+)
(X43B) [9]	Battery negative (–)

[9] For equipments with floating output:

When the physical protection means a single element (circuit breaker), there will be one auxiliary contact only, so there will be a single group of terminals only (**X43**). If the protection is done by fuses, the will be two auxiliary contacts, one for each pole, so there will be two groups of terminals **(X43A)** and **(X43B)** for the selective identification, as it is shown in Fig. 24.

For equipments with the positive or negative output earthed:

In this case, as the protection will be single pole, there will be only one group of terminals for the auxiliary contact **(X43)**, corresponding to the alive pole (the one not connected to earth).

Table 3. *Correlation between auxiliary terminals and the function of the protection or switch, of the battery cabinet.*

7.11. Electrolyte level probe option, terminal (X25A).

- The communications line (interface) constitutes a very low safety voltage circuit. To preserve the quality, it must be installed aside from other lines that have dangerous voltages (power distribution line).
- Flooded batteries, either PbCa or NiCd are supplied from factory with the suitable electrolyte level, nevertheless after a period of time, due to too much charges and discharges, the ambient temperature or other factors, this level can drop.

  Although the electrolyte level of all elements is always controlled in the periodical preventive maintenance services, it can be considered that the liquid dropping in an equipment is similar, no to say identical, in all the accumulators. For the purpose of guaranteeing a higher and permanent control over this parameter, an electrolyte level probe can be installed in one of the batteries. This probe is supplied assembled in the top of the element in one of the batteries.

  Conceptually, when the probe is in contact with the electrolyte, it acts as a conductor, and an electrical circuit is closed. In case of liquid dropping the probe does not conduct because the circuit is opened, therefore an alarm is triggered in the LCD panel of the equipment.
- Proceed as follows.

  ❒ In cabinets sharing the DC Power-S and batteries:

  – The probe is pre-connected from factory to the communication module and bridled to the frame of the cabinet, at the height of one of the battery shelves and with the comfortably cable length needed for removing the battery shelf out. Cut the bridle to release it.
  – Remove the bolts **(BL_2) as mechanical locking mode** to release the corresponding battery shelf and remove it out.
  – Remove the top of one of the accumulators, better from one of the centre of the battery block, and replace it by the one with the probe.

    For its correct contact with the electrolyte, check that the top with the probe has been entered till the bottom.
  – Push the battery shelf in and put the bolts **(BL_2) back as mechanical locking mode**.

  ❒ In battery cabinets separate from DC Power-S:

  – In case of systems with more than one cabinet, the electrolyte level probe can be found in the cabinet that has the terminal **(X25A)**.
  – The probe is pre-connected from factory to the terminal **(X25A)** and bridled to the frame of the battery cabinet, at the height of one of the battery shelves and with the comfortably cable length needed for removing the battery shelf out. Cut the bridle to release it.
  – Remove the bolts **(BL_2) as mechanical locking mode** to release the corresponding battery shelf and remove it out.
  – Remove the top of one of the accumulators, better from one of the centre of the battery block, and replace it by the one with the probe.

    For its correct contact with the electrolyte, check that the top with the probe has been entered till the bottom.
  – Remove the two wires bundle **(MD) from inside of the rectifier cabinet and connected at its opposite end to the communication module (M_{com})**, through the cable bushing cones **(PR)** located at its base and insert it into the battery cabinet through their respective cable bushing cones **(PR)** located in its base.

    Connect whatever the wire of the bundle **(MD) to** terminals 1 and **3** of terminal **(X25A)**.
  – Push the battery shelf in again and put the bolts **(BL_2) back as mechanical locking mode**.

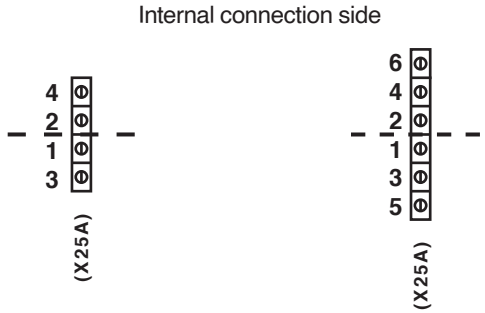


Fig. 25. *Auxiliary contact terminal strip pinout of the electrolyte level probe, in the battery cabinet.*

8. Rectifier start up and shutdown.

- All protections or switches of the system has to be in «Off» position, and in particular the one belonging to batteries in the equipment **(F/Q3) and its homologous (F/Q8) in the battery cabinet**, in case there were an external battery set.

  As the fuses are supplied inserted in the fuse holder, to avoid misleading and losses, it is important to check that the switches are opened (Off).
- Check that it has been respected the stated in section 7 Installation.
- With loads shutdown, turn on the commercial power supply to the input terminals:
  - ❒ For single phase equipments, terminals **(X1)** and **(X4)**.
  - ❒ For three phase equipments, terminals **(X1)**, **(X2)**, **(X3)** and **(X4)**.

8.1. First commissioning or after a complete shutdown.

- Ignore any manoeuvring of the not available switches or protections in your system.
- Turn the protection or switch **(F/Q3)** and/or **(F/Q8)** to «On».

  Battery protection of the system and/or battery cabinet **IS NOT A LOAD BREAK TYPE SWITCH**. Do not turn it meanwhile the system is supplying output voltage through the batteries.
- Turn the input or general input protection **(F/Q1A) t**o «On».
- In systems with single input protections **(F/Q1B.. F/Q1*)** for each module, turn them «On».
- In systems with single output protections **(F/Q2B.. F/Q2*)** for each module, turn them «On».
- Turn the general output protection **(F/Q2A)** to «On».

  Output switch of the system **IS NOT A LOAD BREAK TYPE SWITCH**.
- Turn the output or general outgoing distribution protection **(F/Q2)** to «On».
- Turn the outgoing distributions protections **(F/Q6A.. F/Q6*)** to «On».
- The own leds of each module will light according to the status of each rectifier. See section 9.
- The system has a control module described in the user's manual EN021*. By means of itself, the DC Power-S can be managed and monitored and control the operating mode.
- Start up the loads.

8.2. Shutdown of the system.

- Ignore any manoeuvring of the not available switches or protections in your system.
- Shutdown the loads.
- Turn the outgoing distributions protections **(F/Q6A.. F/Q6*)** to «Off».
- Turn the output or general outgoing distribution protection **(F/Q2)** to «Off» .
- Turn the general output protection **(F/Q2A)** to «Off».

  Output switch of the system **IS NOT A LOAD BREAK TYPE SWITCH**.
- In systems with single output protections **(F/Q2B.. F/Q2*)** for each module, turn them «Off».
- In systems with single input protections **(F/Q1B.. F/Q1*)** for each module, turn them «Off».
- Turn the input or general input protection **(F/Q1A) t**o «Off».
- Turn the protection or switch **(F/Q3)** and/or **(F/Q8)** to «Off».

  Battery protection of the system and/or battery cabinet **IS NOT A LOAD BREAK TYPE SWITCH**. Do not turn it meanwhile the system is supplying output voltage through the batteries.

9. Optical indications of the rectifiers.

9.1. Optical indications.

a) Correct output indication. Green colour led**.**

(b) Standby module indication, it doesn't supply output voltage. Yellow colour led.

With leds **(a) + (b) turned on, in green and yellow colour respectively**, the indication as warning mode means that the rectifier is working at maximum current conditions. The rectifier is self-limited and it gives the maximum power that it can supply.

(c) Alarm indication, due to over temperature, short-circuit or fault. The rectifier is blocked and out of service meanwhile the causes are present. Red colour led.

9.2. Control Module.

- The system has a control module, which is described in the user's manual EN021*. By means of itself, the DC Power-S can be managed, monitored and control its operating.

10. Maintenance.

10.1. Basic maintenance guide.

Batteries must be replaced at the end of their useful life.

For equipments manufactured with particular requirements , it is possible to find dangerous voltages and hot or very hot metallic parts (heatsinks) inside the rectifier cabinet even with the equipment disconnected from mains.

The direct contact can cause electrocutions and burns. All the operating, less the fuse replacing located in the external switches, must be done by authorised technical staff only.

When replacing any fuse, it has to be of the same type, size, format and dimensions.

Battery protection of the system and/or battery cabinet **IS NOT A LOAD BREAK TYPE SWITCH**.

10.1.1. Batteries.

The useful lifetime of the batteries depends on the ambient temperature and other factors like the quantity of charging and discharging cycles and the deep discharges done.

In the safety user's manual EK266*08 there is a specific section dedicated to batteries, respect the indications stated in the strictly.

10.2. Replacing a rectifier module.

10.2.1. Insertingorremovingamodulefromthe system.

For any task related to remove or insert any rectifier module in a system, proceed as section 7.1.1 states.

This task can be done in hot and it is only needed to check the features of the new module to be inserted in the system, are identical to the removed rectifier.

Once the new module is fitted in the operative system, it will be auto-addressed and it will be started up automatically.

10.3. Warranty conditions.

The limited warranty supplied by **our company** only applies to those products that you acquire for commercial or industrial use in the normal development of your business.

10.3.1. Warranty terms.

Warranty terms for the product that you have acquired can be found in our Website, register the equipment in it. It is strongly recommended to do it as soon as possible, in order to include it in the Service and Technical Support **(S.T.S.)** database. Among other advantages, it will be easier to make any regulatory process for the **S.T.S.** intervention in case of an hypothetical fault.

10.3.2. Out of scope of supply.

Our company is not forced by the warranty if it appreciates that the defect in the product doesn't exist or it was caused by a wrong use, negligence, installation and/or inadequate testing, tentative of non-authorised repairing or modification, or any other cause beyond the foreseen use, or by accident, fire, lightnings or other dangers. Neither it will cover, in any case, compensations for damages or injuries.

10.4. Technical service networks.

The Service and Technical Support (S.T.S.) coverage both national and international, can be found in our Website.

11. Annexes.

11.1. General technical specifications.

INPUT	
AC voltage (V)	Single phase 220 / 230 / 240. Three phase 3x380 / 3x400 / 3x415 (5 wires: 3 phases + N +PE)
Input voltage window , phase to neutral (V)	90.. 290 (10)
Frequency (Hz)	50 / 60
Power factor	> 0.99 (PFC)
THDi	< 5 %
Efficiency	Up to 95.5 %
OUTPUT	
Nominal DC voltage (V)	24 / 48 / 110 / 125 / 220
Voltage range setting (%)	–15.. +25
Accuracy (%)	± 1
Psophometric noise	< 2mV
Load sharing among modules	Active parallel
Power per module (W)	1000 / 2000 / 2700
Maximum quantity of parallel modules	30
Maximum power of a system with parallel modules (kW)	30 / 60 / 81
Rectifier output current (A)	See table 5
BATTERIES	
Type	PbCa (sealed or flooded) or NiCd
Type of charge	Constant IU in accordance with DIN 41773
Battery charging current	0.1.. 0.3 C adjustable
Recharging time	Up to 80% in 4 hours (0.2 C)
Floating voltage	2.28 V/cell (PbCa) / 1.4.. 1.45 V/cell (NiCd)
Boost voltage charge	2.5 V/cell (PbCa) / 1.5 V/cell (NiCd)
Exceptional voltage charge	2.7 V/cell (PbCa) / 1.65 V/cell (NiCd)
Protecctions	Against over voltage, under voltage and over charge
Floating voltage / ambient temperature compensation	Yes, customized according to battery features (mV / ºC)
Electrolyte level probe for flooded batteries (PbCa, NiCd, ..)	Option
PROTECTION AND MANOEUVRIN PARTS	
Input or general input	Circuit breaker or switch+ fuses
Batteries	Circuit breaker o fuses
Output or general output	Switch
Single input modules	Circuit breaker (Option)
Single output modules	Circuit breaker (Option)
General outgoing distribution	Circuit breaker (Option)
Distribución de salida	Circuit breaker (Option)
COMMUNICATION AND ALARMS	
Slot	Yes, one as standard (pre-wired)
SNMP / Telemaintenance	NIMBUS, option
DB9 connector (COM1)	RS232. With NIMBUS unit, it is inhibited
DB9 connector (COM2)	RS232. Exclusive from COM3
DB9 connector (COM3)	RS485. Exclusive from COM2
Dry contacts (RELAYS)	3 dry contacts, extendable to 9. See user'rs manual EN030*, communication module
Battery voltage compensation according to temperature	By means of the probe fitted in the battery set
Low electrolyte level (for flooded batteries type)	Option. By means of the probe fitted in one of the bateries
GENERALS	
Dielectric strength	4000 V AC for 1 minute
Protection degree	IP20
Cooling	Forced and individual per module
Acoustic nouse at 1 metre	< 55 dBA (average)
Rectifier operating temperature	–20 ºC to +55 ºC (11)
Rectifier storage temperature	–40 ºC to +70 ºC (12)
Relative humidity	Up to 95 % non-condensing
Maximum operating altitude	Up to 3000 m.a.s.l.
Mean Time Between Failures (MTBF)	250,000 h
Mean Time To Repair (MTTR)	15 minutes
Colour of the external covers	RAL-9005
Frame, supports and accessories	Galvanised and preformed sheeted steel
Battery shelves	Electrolytic galvanised sheet steel
Weights (kg)	Dependin on the configuration, see table 6 (12)
Dimensions (mm)	According to the model, see Fig. 13
LCD PANEL	
Control module	See user's manual EN021*.
STANDARDS	
Safety	IEC/EN 61204-7, IEC/EN 60950-1
Electromagnetic Compatibility (EMC)	IEC/EN 61204-3
Marking	CE.
Quality and environmental management	ISO 9001 and ISO 14001
Certification body	SGS

(10) Power derating for voltages lower than 190 V AC.

(11) Power derating for temperatures higher than +45 ºC.

(12) Without batteries.

Table 4. *General specifications.*

Output voltage V DC	Module			System	
	Model	Power (kW)	Current (A)	Current (A)	Power (kW)
24	DC-36-S	1	36	36.. 1080	1.. 30
	DC-70-S	2	70	70.. 2100	2.. 60
48	DC-18-S	1	18	18.. 540	1.. 30
	DC-36-S	2	36	36.. 1080	2.. 60
	DC-50-S	2,7	50	50.. 1500	2.7.. 81
110	DC-8-S	1	8	8.. 240	1.. 30
	DC-16-S	2	16	16.. 480	2.. 60
	DC-22-S	2,7	22	22.. 660	2.7.. 81
125	DC-7-S	1	7	7.. 210	1.. 30
	DC-16-S	2	16	15.. 450	2.. 60
	DC-20-S	2,7	20	20.. 600	2,7.. 81
220	DC-4-S	1	4	4.. 120	1.. 30
	DC-8-S	2	8	8.. 240	2.. 60
	DC-10-S	2,7	10	10.. 300	2,7.. 81

Table 5. *Module and system particular specifications.*

Rack cabinet depth x width x height (mm)	Cabinet and mechanical parts approx. weight (kg)	Electrical parts approx. weight (kg)	Single module weight (kg)
615x615x1320	65	25	3 (13)
615x815x1320	87	30	
615x615x2120	110	35	
615x815x2120	145	45	
815x815x2120	180	55	

NOTE: In the equipments with optional front door increases 35 mm the depth.

(13) Approx. total weight of a system without batteries, add the partial weights of the mechanical and electrical parts and to the result add the modules weight, considering that the last one is get from multiplying the quantity of modules that system has by the single weight of it.
For the battery weight, check the note in the «Packing list».

Table 6. *Approx. weight calculation of a DC Power-S system.*

11.2. Glossary.

- **AC.-** It is nominated as alternating current (CA abbreviation is Spanish and AC in English) 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.
- **DC.-** The direct current (CC in Spanish, DC in English) is the continuous electron flow through a cable between two points with different potential. Unlike the alternating current (CA in Spanish and AC in English), 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.
- **GND.-** The term ground, as its name states, refers to the potential of the earth surface.
- **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.
- **The thyristor (gt.: gate).-** is an electronic component based on semiconductors elements that uses the internal feedback to make a switching. The materials, which is based on, are semiconductor type, so it means, depending on the temperature that they are they can work as isolators or conductors. They are unidirectional devices because the current can only flow in one direction. Usually they are used in electrical power control.

  Some power supplies are defined as thyristor and silicon controlled rectifier (SCR) synonyms; 1 others define the SCR as a thyristor type, the same as for the DIAC and TRIAC devices.
- **Battery.-** It is a device able to store energy in a chemical way and, later on, by using electrochemical procedures to produce electrical energy. This cycle can be repeated for a determined number of times. It is a secondary electrical generator; so it means, a generator, which can't work if electricity has not been supplied previously, by means of the so-called charge procedure.
- **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.
- **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 the maximum set values are exceeded.

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VENEZUELA
VIETNAM

Product Range

Uninterruptible Power Supply (UPS)
Lighting Flow Dimmer-Stabilizers (ILUEST)
Switch Mode Power Supplies
Static Inverters
Photovoltaic Inverters
Voltage Stabilisers and Power Line Conditioners

Nota: Salicrú can give other electronics solutions according to the application specifications or technical specifications.