



Premium
Powering Your Challenge

FLEXSTORM SERIES



USER MANUAL

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2 Safety



READ THE INSTRUCTIONS BEFORE USE

- Please familiarise yourself with the information contained in this document "Safety Instructions" before operating the FLEXSTORM SERIES inverter.
- **The purpose of this manual is to instruct and assist the operator** to be safe and avoid accidents when operating the loader family.
- **Full compliance with the safety instructions** in this document **is mandatory** to avoid endangering your own safety or the safety of others.
- **If the instructions are not fully understood, do not proceed with** the installation, start-up or shut-down and maintenance of the equipment.
- This document is **complementary to the user manual** and must therefore be kept inside the cabinet in the drawer provided for this purpose.
- Due to the policy of continuous improvement, **the content of this manual is subject to change without notice**. This manual may contain variations from the installed product depending on software or hardware upgrades. PREMIUM PSU reserves the right to change product specifications or performance.
- This document may not be edited or reproduced in whole or in part without the permission of PREMIUM PSU
- Visit our website www.premiumpsu.com for more information or contact technical support.



WARNING!

- **To prevent accidents and injuries**, the following safety instructions for handling our equipment must be observed.
- Failure to follow these instructions **may result in fire damage, explosion or indirect contact**.
- Do not store or use the unit in locations near explosive, flammable and/or corrosive gases, high humidity, heat sources, or in locations with vibration, shock hazard or high salinity. The permissible ambient conditions are defined in the datasheet of the equipment.
- Our equipment should **only be handled by experienced and appropriately authorised personnel** .
- **Electrostatic discharges can cause failures** in any of the electronic components; when being handled, appropriate measures must be taken to avoid damage.



ELECTRICAL HAZARDS

- The system operates with a supply voltage of 400 VAC. This voltage is dangerous and can cause personal injury in case of contact with conductive parts of the equipment.
- When accessing the interior of the FLEXSTORM SERIES, there is a potential danger of coming into contact with live parts. **Disconnect the input and the battery before carrying out any manipulation**.
- **Batteries and capacitors do not accept reverse charging**.
- **Do not short-circuit the battery**.

- **External voltages.** When disconnecting a piece of equipment, it is also necessary to consider possible external voltages and feedback of the powered equipment. Special care must also be taken with the voltage at the output and the battery.
- **Use in accordance with the intended purpose.** The device must only be used for its intended purpose. Any use not in accordance with the purpose is prohibited. PREMIUM PSU cannot be held liable for damages resulting from improper use. In such a case, the user must assume sole responsibility for the risk. Use in accordance with the intended purpose defined in this manual. The device may only be exposed to the permissible environmental influences, which are specified in the technical data of the device.
- **Prohibition of arbitrary modifications.** The device may not be modified with regard to construction or safety technology without the express consent of PREMIUM PSU. Any modification excludes a liability on the part of PREMIUM PSU for damage caused by the modification. In particular, all repair work, soldering on printed circuit boards and the replacement of components, modules and printed circuit boards is prohibited without the express approval of PREMIUM PSU. If spare parts are used, only original PREMIUM PSU parts may be used. PREMIUM PSU declines any liability resulting from improper, negligent or incorrect installation of the equipment, or incorrect connection of the equipment.



FLAMMABLE MATERIALS

- **Be aware of the location of protective devices and means**, such as fire extinguishers, alarms, emergency showers and evacuation routes, etc.
- Never bring any flame or spark close to the battery. **Do not smoke.**
- **Do not leave tools or metal objects on top of the battery.** When replacing a battery, the negative (ground) terminal shall be disconnected first. When installing a battery, the negative terminal (ground) shall be connected last.
- The **terminal clamps must be properly tightened** and covered with a light coat of petroleum jelly.
- **Avoid any work involving the detachment of metal particles** on the battery or its components.
- A lead-acid battery does not explode by itself; two factors must be present: the release of gases, especially hydrogen, and the proximity of an ignition source.



DANGER OF CORROSION

- It is important to bear in mind certain measures for immediate action in the event of an accident, especially if the operator is hit by acid.
- In case of acid splashes in the eyes, they should be **washed immediately with plenty of water and a doctor should be consulted immediately.**
- You should not eat or smoke if your hands have touched any lead substance without first washing them thoroughly.
- In the event of an explosion, places affected by battery debris, especially drinking fountains, tools, clothing, etc., shall be thoroughly cleaned.

3 Abbreviations

3.1 General information

FCA - Switched Mode Power Supply

NiCd - Nickel Cadmium

EMC - Electromagnetic Compatibility

CS - Current Sharing

TSS - Technical Support Services

3.2 Modules

FDS - Single Power Module of 125V_{DC} 20A (Premium PSU)

LMS - Control Module (Premium PSU)

DAS - Communications Module (Premium PSU)

RMS - 19" subrack enclosure (Premium PSU)

ACC-REMO-0001 - Relay Module (Premium PSU)

ACC-CUSE-0001 - Hall Effect Current Sensor

ACC-TESE-0001 - Temperature sensor

3.3 Electrical elements

Q__ - Thermomagnetic circuit breaker

K__ - Auxiliary contact

X__ - Connector

ST__ - Surge arrester

S__ - Selector

AC__ - Accessory

D__ - Distributor

C__ - Cable

CN__ - Gutter

AC__ - Accessory

4 Standards

IEC/EN 61204-7. - Low voltage DC output power supplies.

IEC/EN 62368-1. - Audio and video, information and communication technology equipment. Parte1: Safety requirements.

IEC/EN 61000-3-2. - Electromagnetic compatibility (EMC). Part 3-2: Limits. Limits for harmonic current emissions (< 16A).

IEC/EN 61000-3-3 - Electromagnetic compatibility (EMC). Part 3-2: Limits. Limitation of voltage variations, voltage fluctuations and flicker in public low-voltage supply networks for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.

IEC/EN 61000-3-11. - Electromagnetic compatibility (EMC). Part 3 - 11: Limits of voltage variations, voltage fluctuations and flicker in public low-voltage supply networks. Equipment with input current ≤ 75 A and subject to conditional connection.

IEC/EN 61000-3-12. - Electromagnetic compatibility (EMC). Part 3-12: Limits for harmonic currents produced by equipment connected to public low-voltage networks with input current > 16 A and ≤ 75 A per phase.

IEC/EN 61000-6-2. - Electromagnetic compatibility (EMC). Part 6-2: Generic standards. Immunity in industrial environments...

IEC/EN 61000-6-4. - Electromagnetic Compatibility (EMC). Part 6-4: Generic standards. Emission standard in industrial environments.

IEC/EN 61000-6-5. - Electromagnetic Compatibility (EMC). Part 6-5: Generic standards. Immunity for equipment used in power plant and substation environments.

5 Introduction

Please familiarise yourself with the information contained in safety considerations before operating the FLEXSTORM SERIES inverter.

This user manual contains the information for the correct use of the FLEXSTORM SERIES converter, it must be kept inside the cabinet in the drawer provided for this purpose.

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6 Description

6.1 Basic characteristics



Figure 1 - FLEXSTORM-80 SERIES equipment

125 Vdc Power Supply Equipment for Control, Protection and Communications of Electrical Substations.

- Full battery-free operation.
- Local monitoring of status and parameters via touchscreen display.
- Local monitoring of status and parameters via RS232 port.
- Monitoring and configuration via Ethernet.
- Remote monitoring with 7 configurable alarm relays.
- Embedded WEB server.
- Current Sharing active.
- Redundancy (4+1) expandable by one module.
- Interchangeable power and control modules in operation.
- Galvanic isolation between AC and DC of 4kV.
- Surge protected at the input.

The FLEXSTORM SERIES units, supplied with an input voltage of 400VAC, act as switched AC/DC converters, with galvanic isolation between input and output.

The power modules transform the energy coming from the mains into a stabilised DC voltage, providing isolation between input and output.

The function of the FLEXSTORM SERIES is that of an uninterrupted power supply system, the mission of which is to keep the charges powered at all times. To this end, it allows:

- An uninterrupted power supply within the specified range.
- Protection against both normal operations (start-up, punctual overloads, etc.) and exceptional operations (short-circuits, permanent overloads at its output, etc.).
- A battery charge that minimises charging time and maximises battery life by adjusting the float and fast charge voltage to the ambient temperature and avoiding deep discharges.

The following table shows the general electrical, environmental and mechanical characteristics of the equipment.

AC INPUT CHARACTERISTICS	
Mains input voltage	400 / 230 Vac
Mains voltage range	-15%...+10%
Mains frequency range	48...52 Hz (+10%, 10 seconds)
DC OUTPUT FEATURES	
Nominal output voltage	125 V
Battery voltage	125 V
Voltage range	104.5...137.75 V
Number of modules Model 80A	5 x SDS (Power), expandable 1 module 1 x LMS (Control) 1 x DAS (Display and Communications)
Number of modules Model 60A	4 x SDS (Power), expandable 1 module 1 x LMS (Control) 1 x DAS (Display and Communications)
Number of modules Model 40A	3 x SDS (Power), expandable 1 module 1 x LMS (Control) 1 x DAS (Display and Communications)
Maximum permanent current	80 A / 60A / 40A
Total power output [Vout=137.75; Iout=20A]	11.2 kW / 8.4 kW / 5.6 kW
Ripple	90 mV (FDS)
Performance: (Under conditions of input voltage, output voltage and rated power)	>92%
CHARGER FEATURES	
Battery type	NiCd
Nominal battery voltage	125V
Number of elements	88...95 elements
Battery capacity	296...340 Ah
Maximum battery charging current: (parameterizable)	0.2C (Conventional battery) 0.1C (Ultra low maintenance battery)
Temperature measurement precision	± 1 °C
ENVIRONMENTAL CHARACTERISTICS	
Operating temperature	-10...50°C
Storage temperature	-40...85°C
Relative humidity	95% without condensation
Cooling	Natural / forced convection (modules)
Altitude	<1000m
MECHANICAL CHARACTERISTICS (Rectifier cabinet)	
Dimensions	600x600x2200mm (W x D x H)
Weight	<600 kg
Protection level	IP20
MECHANICAL CHARACTERISTICS (Battery cabinet)	
Dimensions	600x600x2200mm (W x D x H)
Weight	<650 kg
Protection level	IP20

Table 1 - Electrical, Environmental and Mechanical Characteristics

In normal operation, the equipment supplies the permanent consumption of the installation and keeps the battery charged to the nominal float voltage.

The battery is charged using the U-I method. That is, at constant current and constant voltage (see Figure 2).

In the event of a power failure, the battery maintains the output voltage. Once the mains power supply is restored, the charger-rectifier automatically returns to the initial situation.

The charger can supply power to the customer's load and charge the battery at the same time. The process is automatic, there is no need for manual intervention (local or remote) in the whole process of operation of the charger-rectifier.

If mains power is available, the charger-rectifier allows operation with and without battery. A disconnection of the battery does not cause any output interruption.

When there is no battery, the output voltage will be the float voltage.

It also incorporates a high-precision temperature sensor in the battery area that allows optimal charging of the battery depending on its temperature.

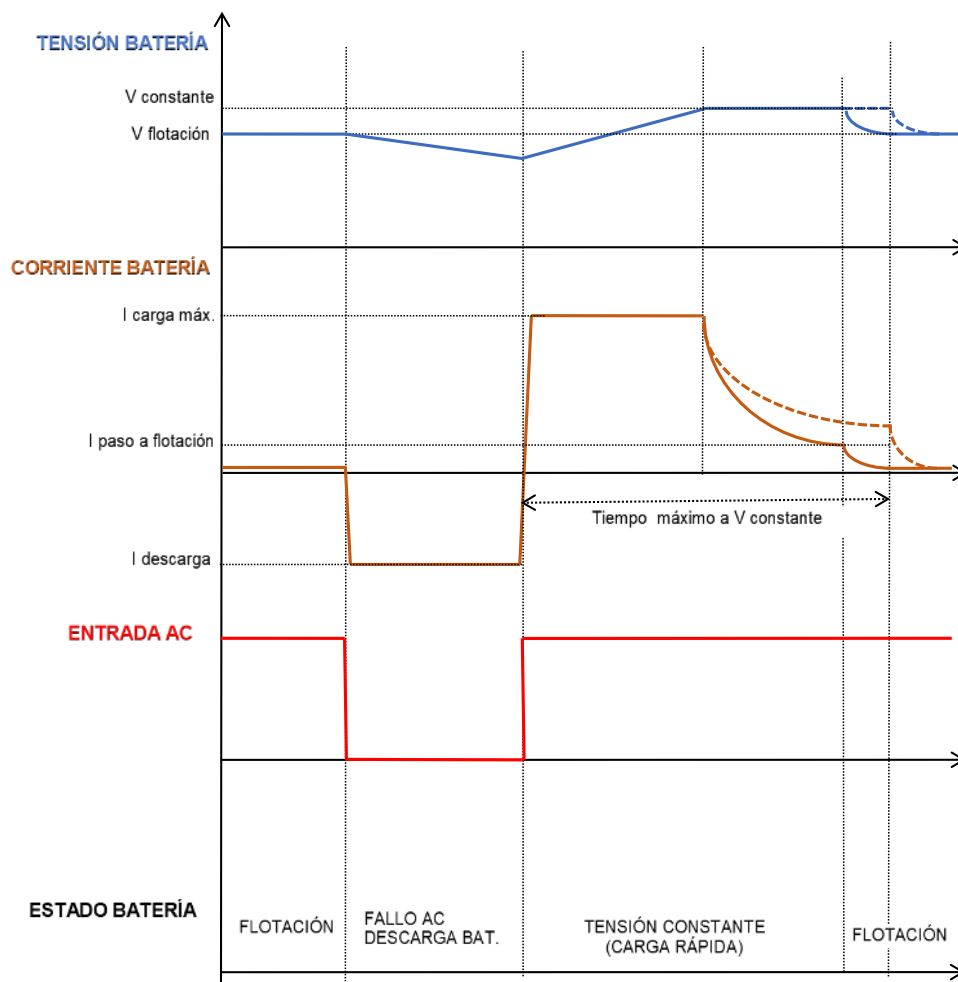


Figure 2 - Battery charging and discharging process

6.2 System

As shown in the block diagram at Figure 3, the system consists of:

- 1- 19" RMS Subrack for connection of up to 6 FDS power modules and 1 control module (LMS)
- 2- Control module (LMS): Responsible for managing battery charging, alarms, sensing, etc.
- 3- FDS: power module up to 3kW and 21A output.
- 4- Communications module (DAS): In charge of local and Ethernet communications. It has a touch screen display for local viewing and configuration.
- 5- ACC-CUSE-0001 (x5): Hall effect current sensor
- 6- ACC-TESE-0001: Temperature sensor
- 7- ACC-REMO-0001: Module for up to 8 alarm relays
- 8- Electrical switchgear and control gear: connection, protection and communication elements

The FLEXSTORM-80 SERIES system is equipped with 5 power modules in parallel in order to obtain a maximum output current of 80A, one of the power modules is in redundancy, and the product has the capacity to be expanded by an additional module, thus increasing the total power of the equipment. In addition to the 80A output configuration, there are two other options, 60A and 40A output. All of them with one module in redundancy and the ability to expand their rated power capacity by one module.

In terms of electrical switchgear, the equipment installed is:

- Two three-phase input connectors and a switch to select which connector will power the equipment.
- Input circuit breaker to cut off the power supply to the system.
- Surge arrester, with interchangeable cartridges, at the inlet. It has an auxiliary contact to monitor the protection status.
- Single-pole magneto-thermal circuit breakers in all power inputs and outputs of the FDS power modules.
- Double-pole magneto-thermal circuit breakers at the output of both the system and the battery output. These have an auxiliary contact for monitoring.
- Output and battery connector, for connection to load and batteries respectively.
- Potential-free connectors for local alarm cables.

The function of each of the key components of the FLEXSTORM SERIES system is detailed below.

6.2.1 RMS

Mechanical enclosure with 19" Subrack mounting that provides the ability to interface the FDS power modules with the LMS control module. All sensors, alarms, communications, auxiliary contacts, etc. are connected to it.

6.2.2 FDS Power module

The main function of this module is power conversion and galvanic isolation. It is powered by single-phase input voltage with extended range. The output voltage is configurable via PMBus via the LMS control module. It has an active CS function.

6.2.3 LMS Control Module

It can be operated with three-phase input voltage or from battery. Its main function is battery charge management. This module receives all the system inputs, voltages, currents, temperatures, etc. and

manages the outputs, alarms, voltage configurations, etc. It makes decisions according to the configuration desired by the user. Communicates with DAS.

6.2.4 DAS Communications module

Equipped with a touch screen display, this module allows the system to be configured locally or via an Ethernet connection and has a web server for remote configuration.

6.2.5 ACC-TESE-0001 Temperature sensor

Battery temperature sensor, the user must position where to place the temperature probe according to thermal criteria.

6.2.6 ACC-REMO-0001 Alarm relay module

External module with up to 8 relays, offers potential-free contacts. The user has access to the three relay contacts (NO, NC and C) for greater versatility when interconnecting the equipment.

6.2.7 ACC-CUSE-0001 Current sensor

Hall-effect current sensor, the device has five current sensors in all variants. It is used to monitor and/or regulate the input, output and battery current of the equipment.

6.3 Configuration

The device can be configured via Ethernet (web server) or via local RS232 connection with standard computer media without the use of proprietary applications and without the need for measuring devices.

Modification of settings such as: float voltage, voltage step per °C of temperature, load voltage, etc. is considered as configuration.

6.4 Block diagram

Schematic of the 125 Vdc power supply equipment for Control, Protection and Communications of Electrical Substations.

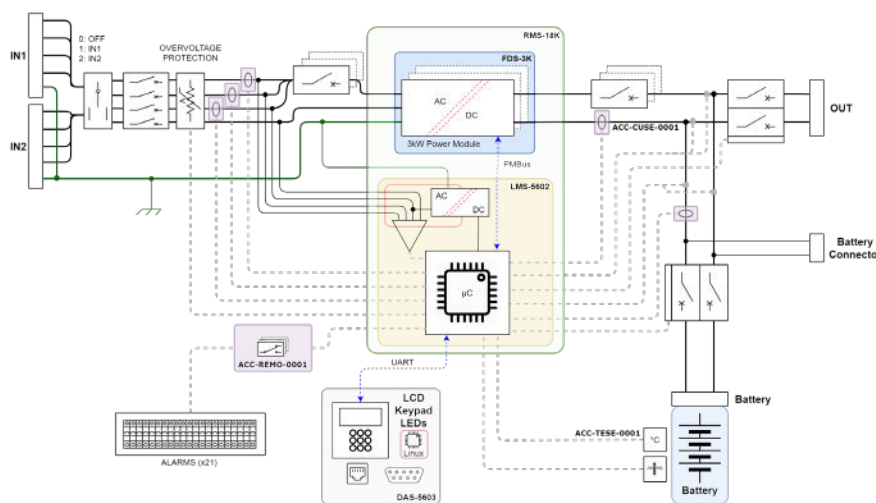


Figure 3 - FLEXSTORM SERIES System Block Diagram

6.5 Electrical diagram

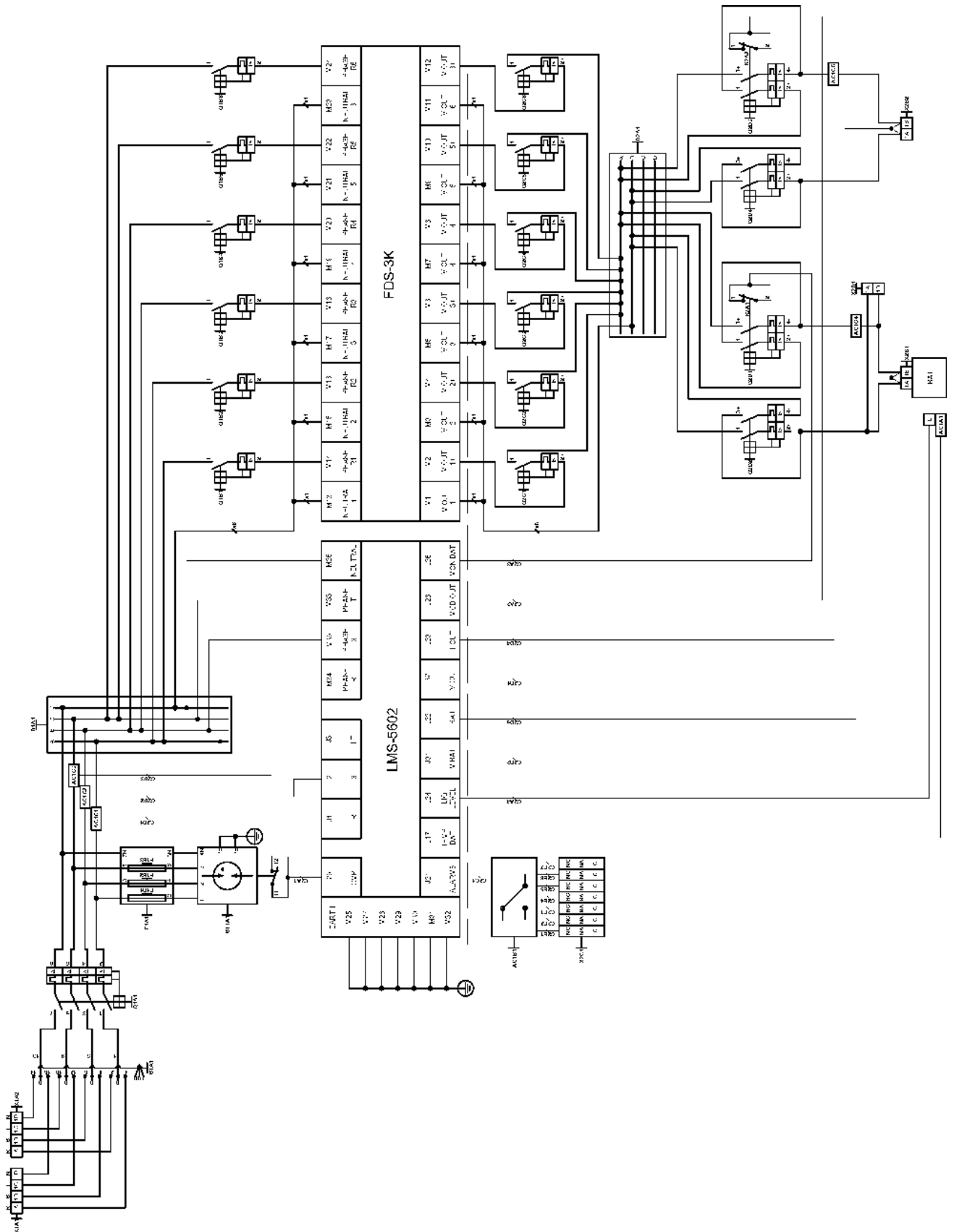


Figure 4 - Wiring diagram of the FLEXSTORM SERIES equipment (Example model 80A)

6.6 Mechanical dimensions rectifier cabinet

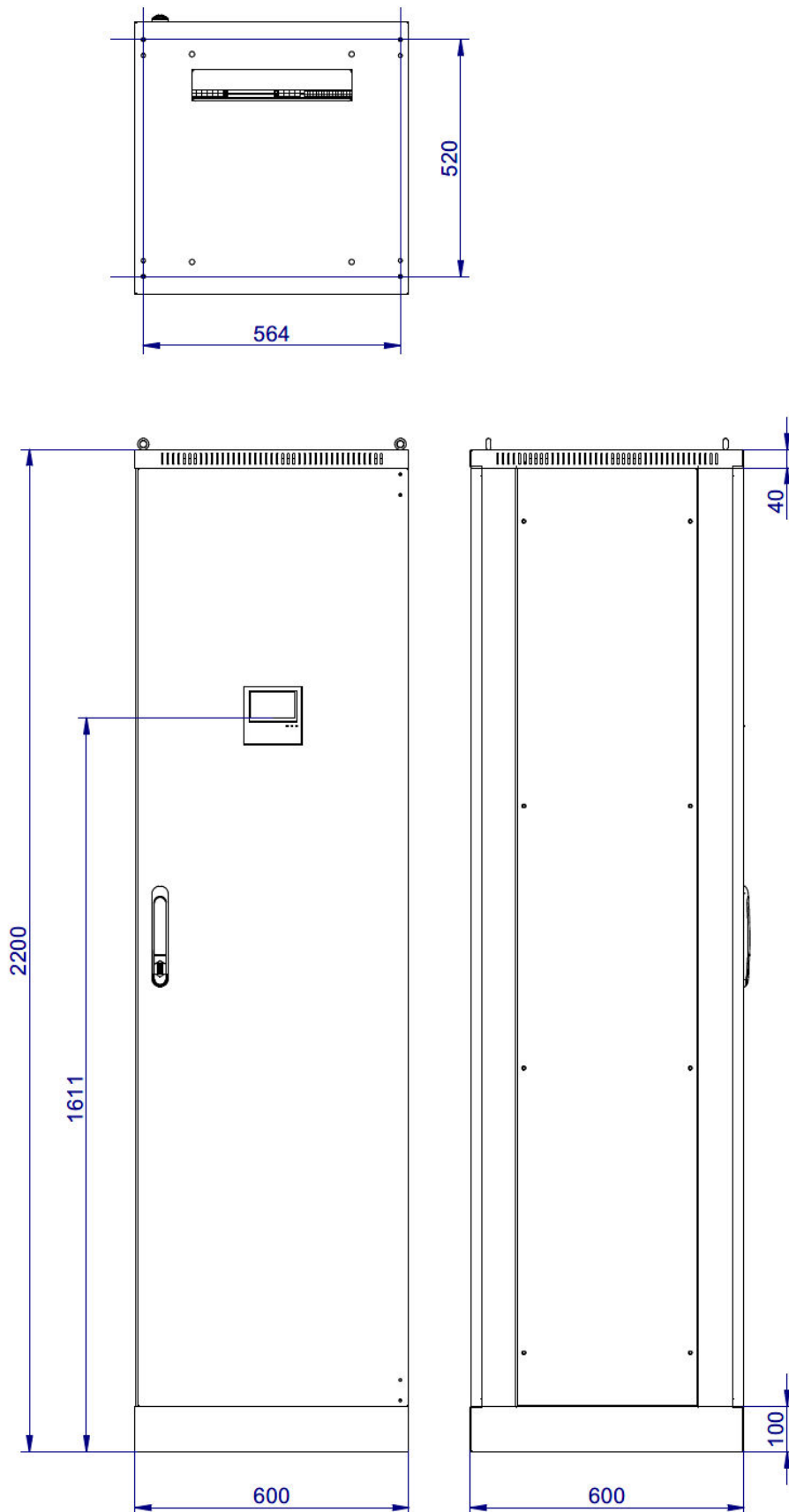


Figure 5 - External dimensions of rectifier cabinet (mm)

6.6.1 Component distribution

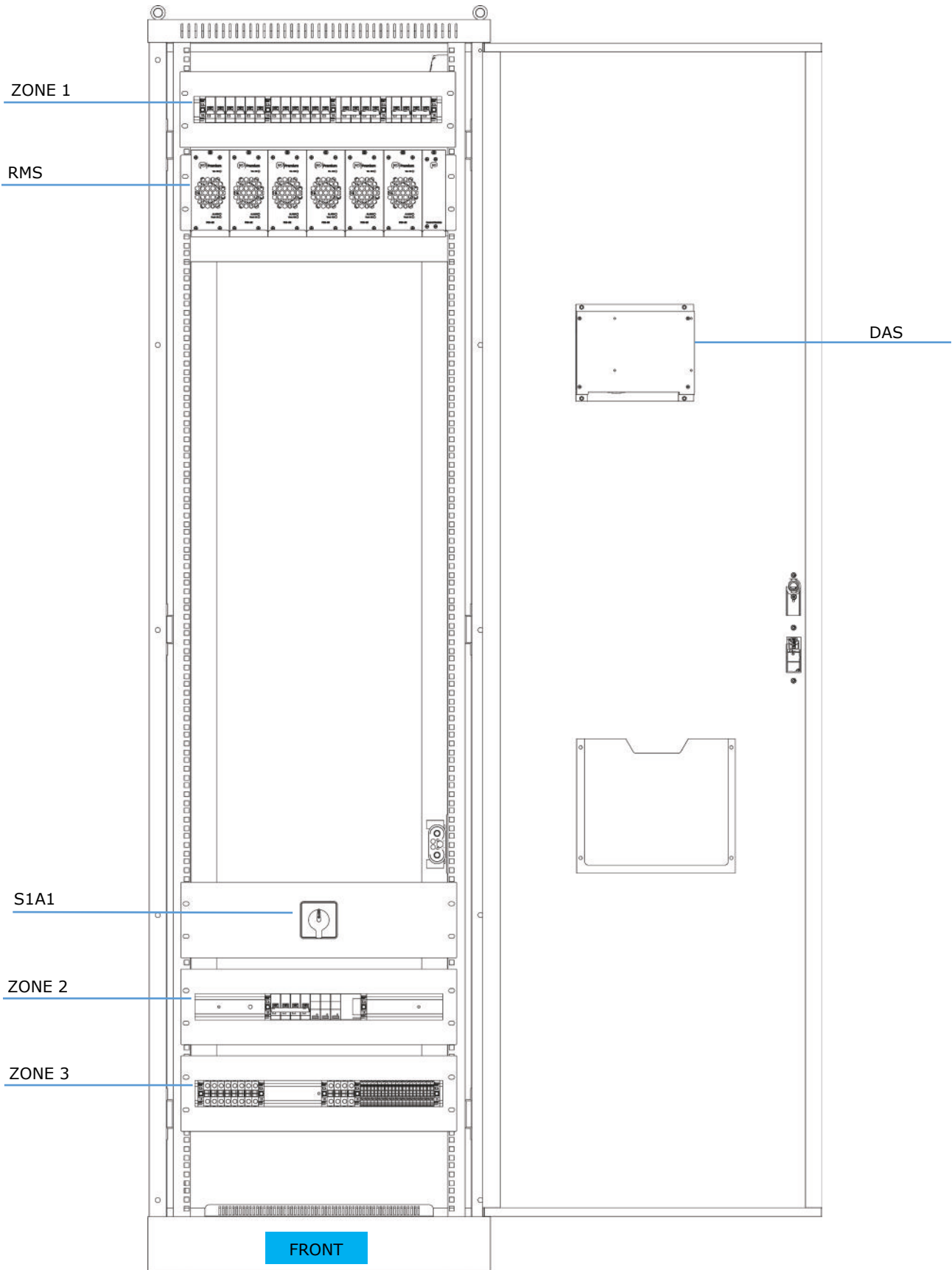


Figure 6 - Distribution of components. Front view.

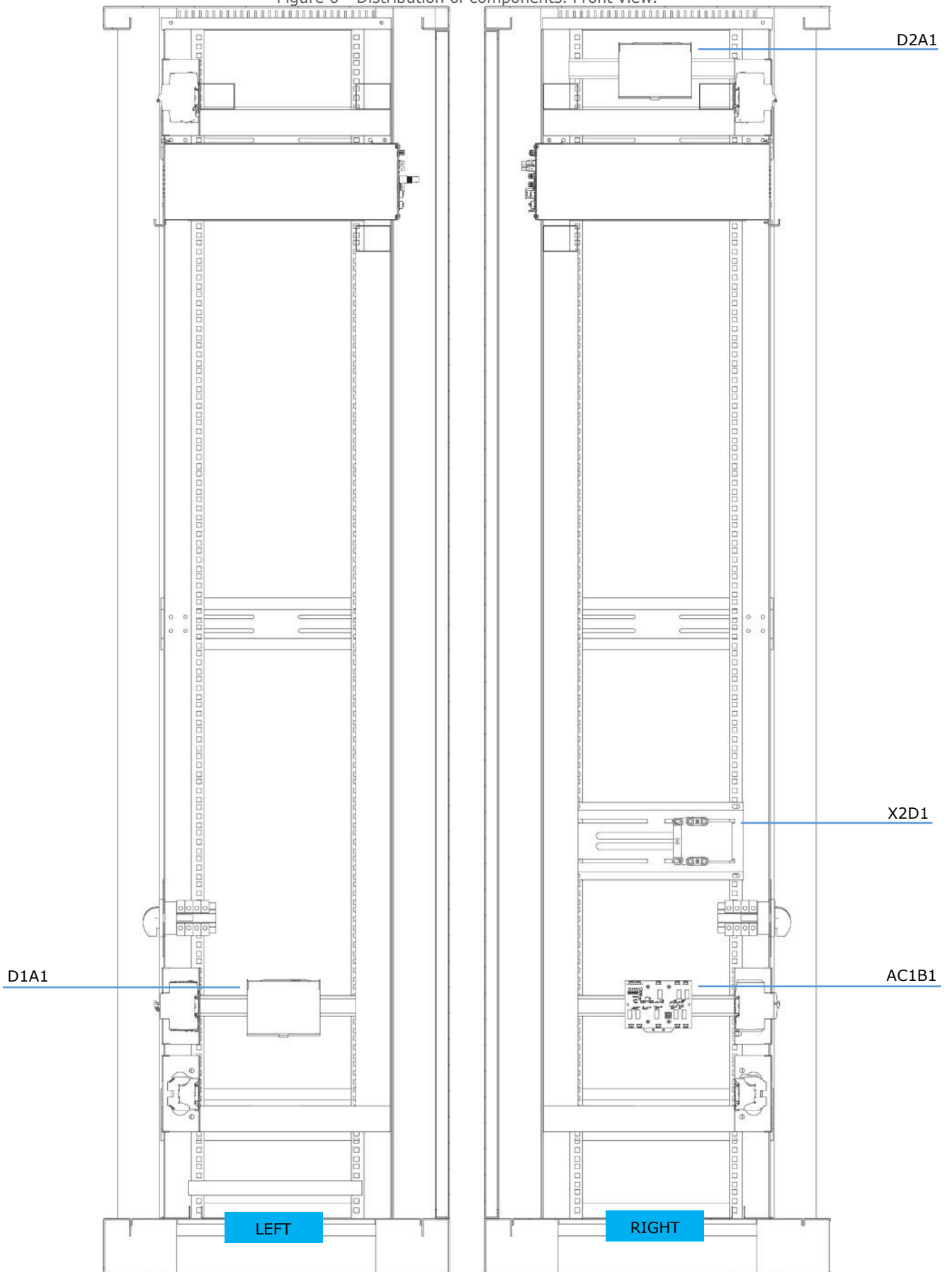


Figure 7 - Distribution of components. Left and right cut

ZONE 1

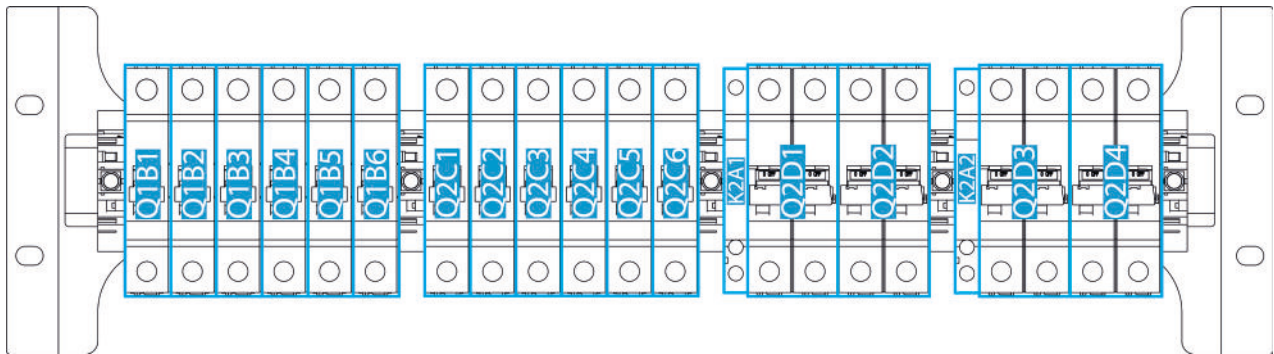


Figure 8 - Components Zone 1

ZONE 2

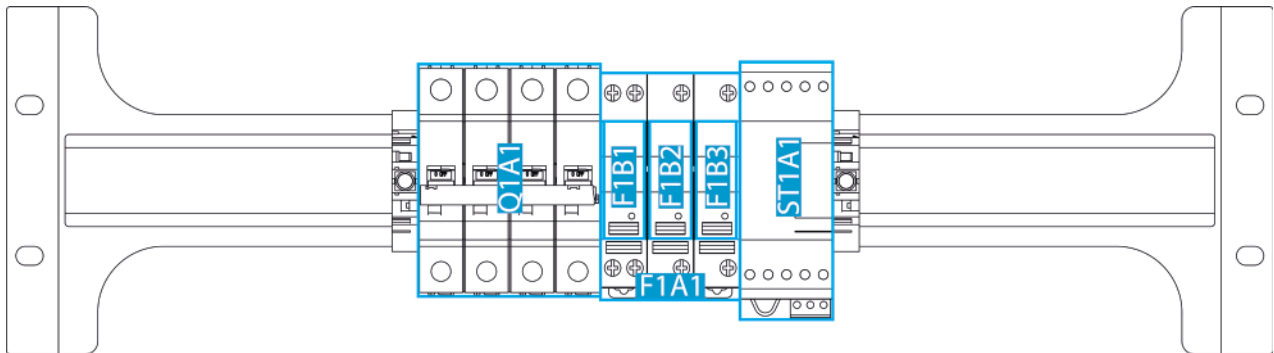


Figure 9 - Components Zone 2

ZONE 3

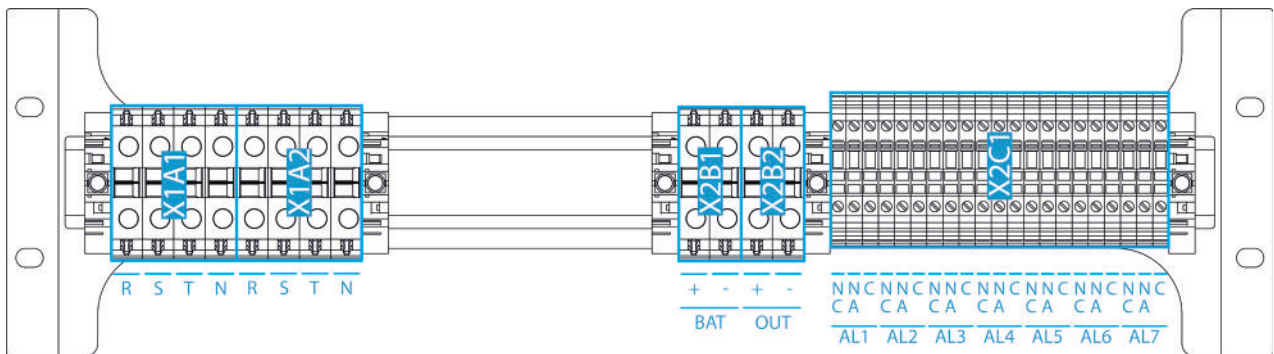


Figure 10 - ComponentsZone 3

Component table

COMPONENT	DESCRIPTION
RMS	Subrack 19" mechanical enclosure for up to 6 FDS and 1 LMS.
DAS	Communications module with touch screen display.
S1A1	3-position input supply voltage selector.
AC1B1	ACC-REMO-0001: Alarm relay module.

X2D1	Battery discharge safety connector.
D1A1 and D2A2	Wiring distributor.
Q1B1	Single-pole single input circuit breaker. Module 1.
Q1B2	Single-pole single input circuit breaker. Module 2.
Q1B3	Single-pole single input circuit breaker. Module 3.
Q1B4	Single-pole single input circuit breaker. Module 4.
Q1B5	Single-pole single input circuit breaker. Module 5.
Q1B6	Single-pole single input circuit breaker. Module 6.
Q2C1	Single-pole single-output circuit breaker. Module 1.
Q2C2	Single-pole single-output circuit breaker. Module 2.
Q2C3	Single-pole single-output circuit breaker. Module 3.
Q2C4	Single-pole single-output circuit breaker. Module 4.
Q2C5	Single-pole single-output circuit breaker. Module 5.
Q2C6	Single-pole single-output circuit breaker. Module 6.
K2A1	Auxiliary contact associated with the battery MCB.
Q2D1	Double-pole battery circuit breaker. Positive.
Q2D2	Double-pole battery circuit breaker. Negative.
K2A2	Auxiliary contact associated with the general output circuit breaker of the system.
Q2D3	Double-pole output circuit breaker. Positive.
Q2D4	Double-pole output circuit breaker. Negative.
X2C1	Relay contacts associated with Alarms.
X1A1	Three-phase input voltage terminal for power supply input 1.
X1A2	Three-phase input voltage terminal for power supply input 2.
Q1A1	General 3P+N input circuit breaker.
ST1A1	Surge arrester with interchangeable cartridges.
X2B1	General battery terminal.
X2B2	General output terminal of the equipment.
F1A1	3-pole fuse holder 10.3x38mm
F1B1, F1B2 and F1B3	Fuses for F1A1

Table 2 - Description of components

6.7 Mechanical dimensions battery cabinet

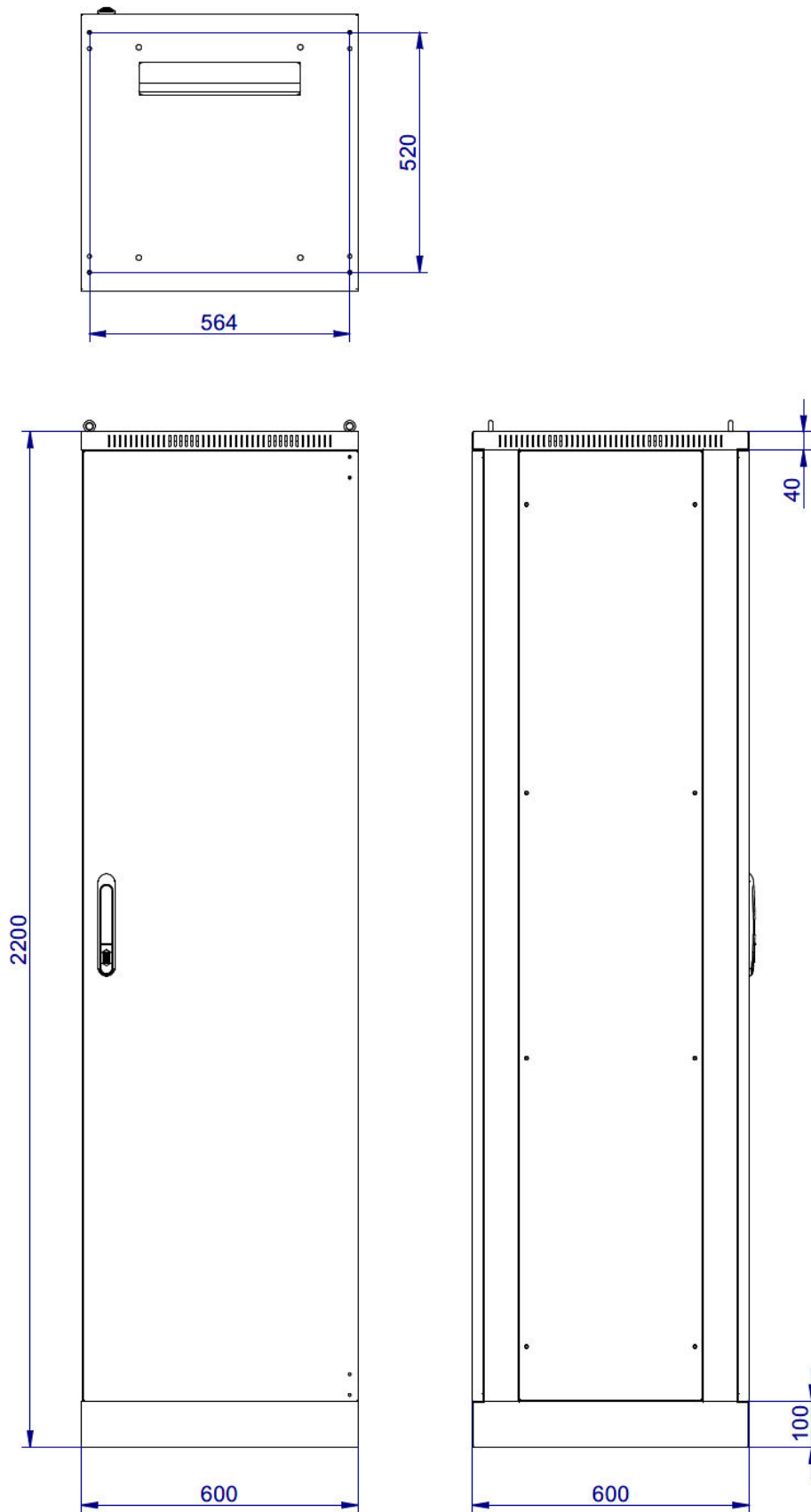


Figure 11 - External battery cabinet dimensions (mm)

6.7.1 Component distribution

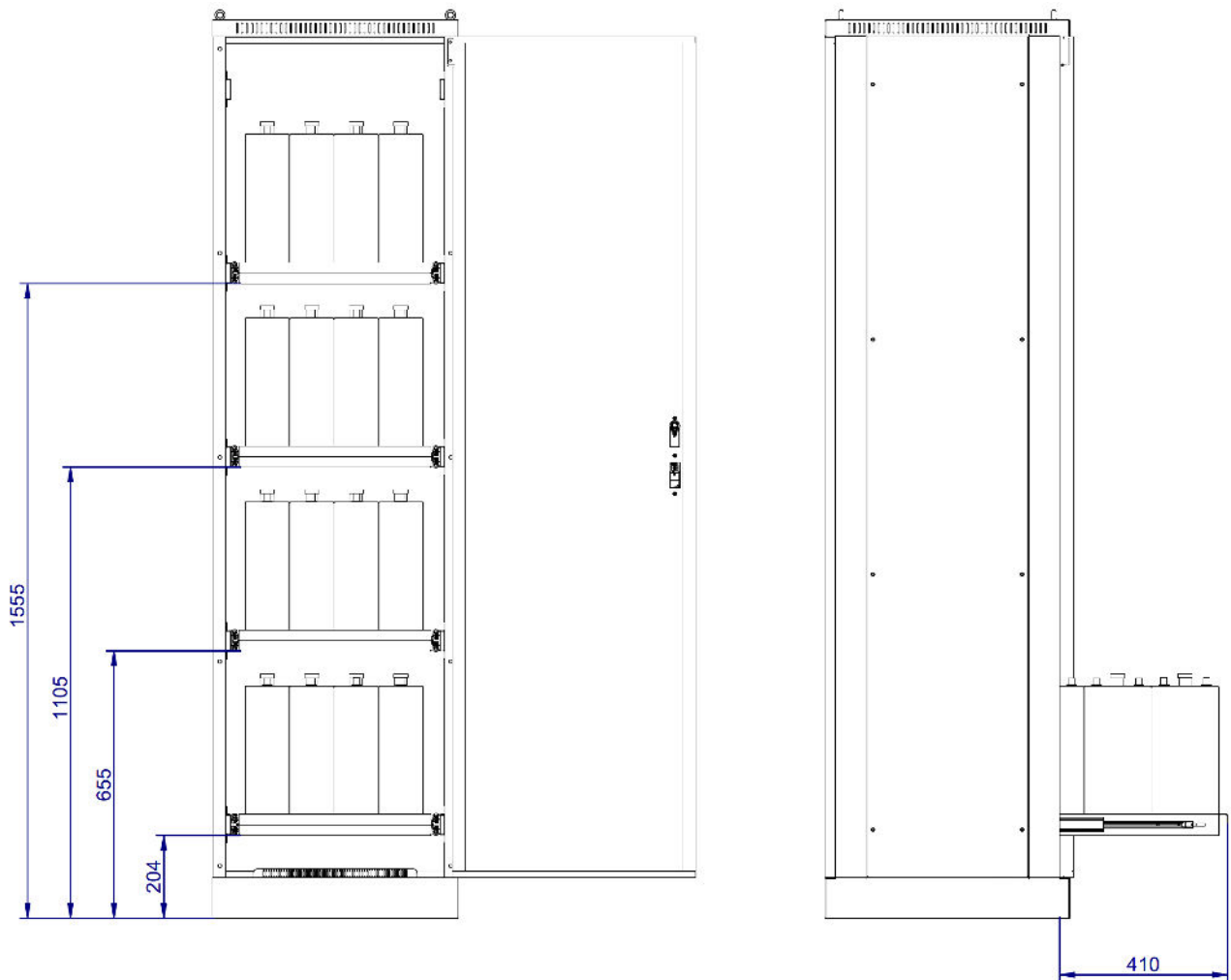


Figure 12 - Battery distribution

6.8 Map of screens

6.8.1 Start-up

When the system is started, the display of the communication module (DAS) shows the screen of Figure 13.



Figure 13 - Equipment start-up

6.8.2 Main screen

The main screen can be accessed after the unit has been started or while the unit is booted by touching the touch screen. On this screen you can see the input parameters, output parameters, battery status and system configuration. The initial screen is shown below.

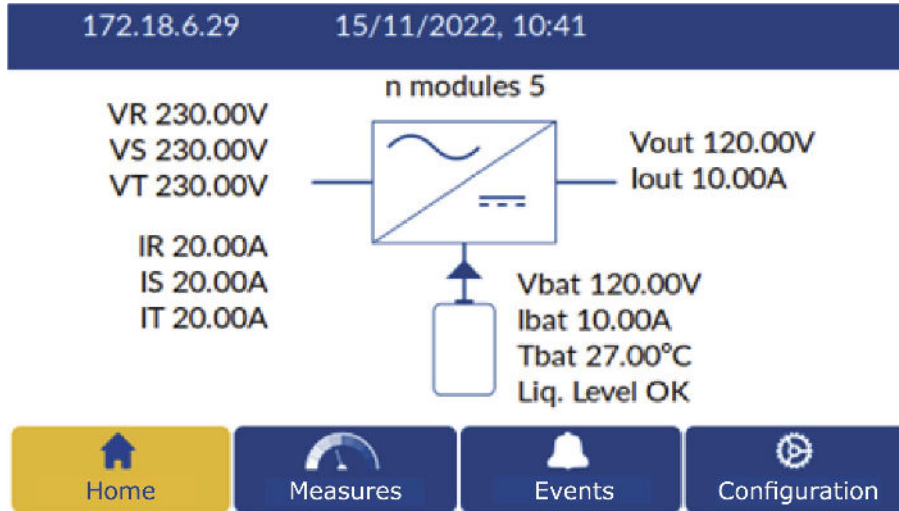


Figure 14 - Initial screen

For more information on the data displayed on the screen, please refer to the communication systems description document.

As can be seen at the bottom of the screen shown at Figure 14, the display is divided into four sections: the initial screen, the Measurements section, Events and Configuration.

6.8.3 Measurements

By tapping on the measurements section, the image of Figure 15 is displayed. In this screen you can access the measurements of each power module individually and the measurements of the complete system by returning to the screen shown in Figure 14.



Figure 15 - Measurement screen

In the individual modules section (Figure 16), you can access the individual information of each module, and can navigate between the different modules detected by the control module (LMS). To change the module to be displayed, it can be done by using the blue arrows on the screen or by using the navigation panel itself, touching on the grid and directly selecting the desired module.

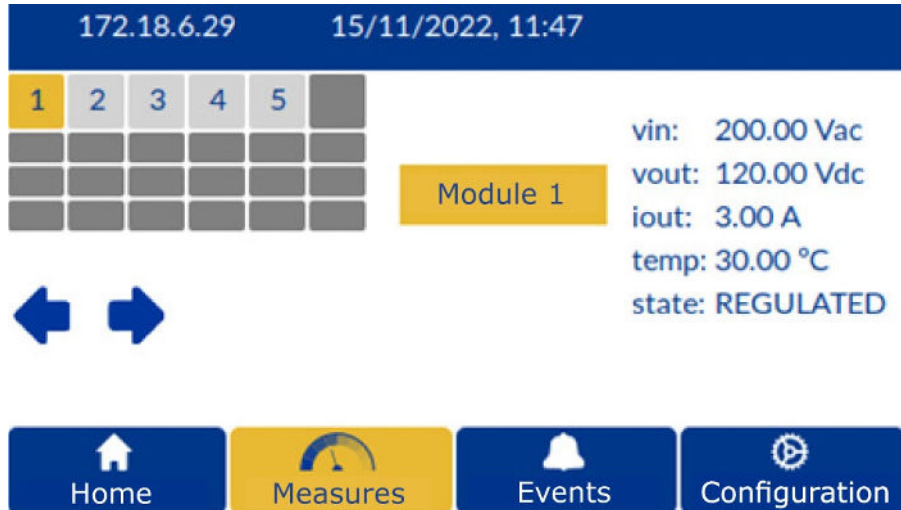


Figure 16 - Measurements screen - Independent modules

6.8.4 Events

Accessing the Events section, via the screen shown in Figure 14, displays the screen of Figure 17. It displays the event log with information about each event, such as the date, time and quick description of the event.

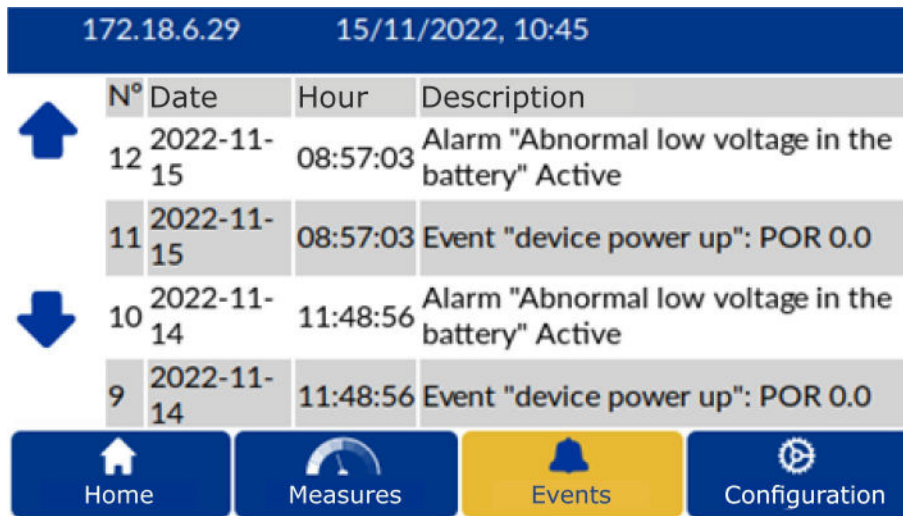


Figure 17 - Event screen

6.8.5 Configuration

The system configuration can be accessed from any screen (Figure 18). Here you can select which type of configuration you want to access, the system configuration, the general configuration of the equipment or the actions that can be carried out locally.

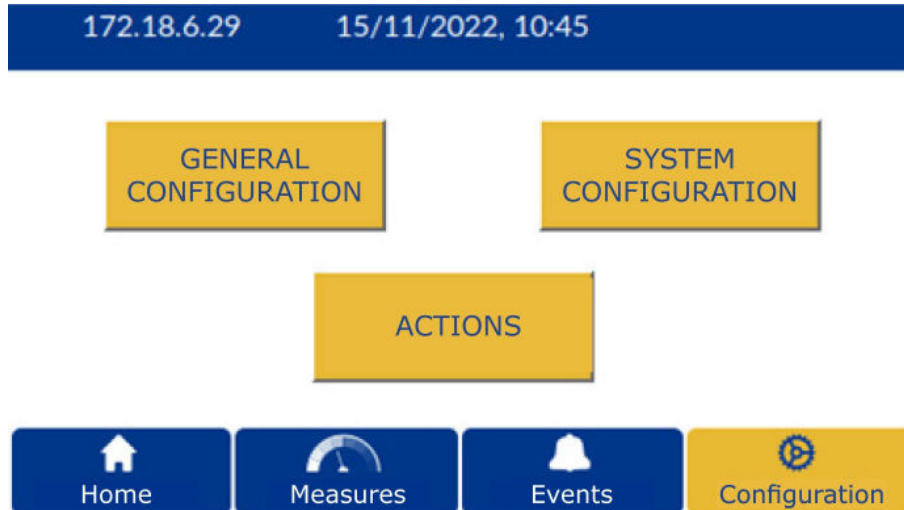


Figure 18 - Configuration screen

See 11.1 for more detailed information.

6.8.6 Alarms

In the top right corner of all screens, there is a bell icon, tapping this icon takes you to the alarm screen, shown at Figure 19. In this screen you can see the status of the alarms; those that are correct in green, and the active alarms in red.

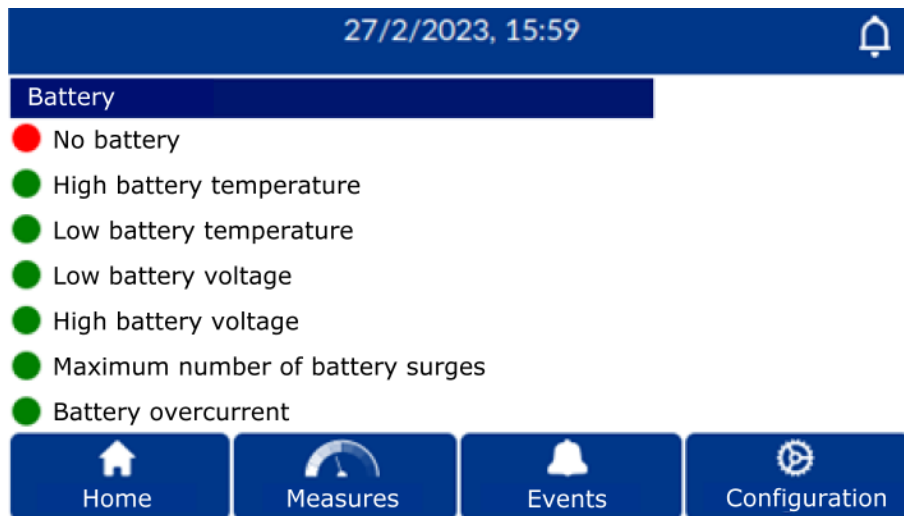


Figure 19 - Alarm screen

7 Reception of the equipment

The reception of the FLEXSTORM SERIES system will consist of different packages with different characteristics depending on the inner product. The packages to be received are:

- The rectifier cabinet.
- Battery cabinets. Depending on the number and type of batteries ordered for the system.

Once the packages have been received, the first step to be taken is to carry out a visual inspection of the whole to check for any mishaps that may have occurred during transport. If this is not the case, complaints must be made.



Figure 20 - Correct transport packaging

7.1 Storage

After the acceptance inspections have been carried out, it is recommended to store the equipment in its original packaging until it is put into operation, as this packaging is intended to protect the equipment during transport and storage.

Equipment must be stored in a dry, ventilated place, protected from water splashes or chemical agents.

As a battery-powered device, temperature is a very influential factor in its service life, so the storage temperature should not exceed 20°C.

For prolonged storage, due to the degradation of some components due to lack of use, the equipment should be planned to be started up for at least 8 hours every 6 months. No charge needs to be applied

to the output. If the ambient temperature conditions are $<15^{\circ}\text{C}$ or $>35^{\circ}\text{C}$, the equipment should be started up more frequently.

The storage conditions specified in the following table shall be ensured.

Environment	Remarks	Limits	Unit
Storage temperature	Maximum limits	0...40	$^{\circ}\text{C}$
Relative humidity	Without condensation	5...90	%
Altitude	Above sea level	<1000	m
Store in non-aggressive environments			
Start up the equipment every 6 months, or if the ambient temperature is $<15^{\circ}\text{C}$ or $>35^{\circ}\text{C}$, start up every 3 months			

Table 3 - Storage conditions

7.2 Unpacking

For the correct unpacking of the cabinets, the following instructions should be followed to avoid any mishap during the process.

1. Remove the cling film wrapping.
2. Cut all polyester strapping around the enclosure.
3. Remove the cardboard envelope.

It is recommended not to break the packaging in case of future use.

4. Remove the plastic bag covering the cabinet in the same way.

Once all the equipment has been unpacked, it is recommended that a second check is carried out to ensure:

- It has not been damaged during transport.
- That all components are in their correct position.
- Internal wiring has not been damaged (check for disconnected connections, broken terminals, etc.).

In the event that any anomaly is found, the appropriate complaints must be made.

5. Lift the cabinet through the eyebolts.
6. Remove the pallet.
7. Place the cabinet in its selected location for use.






Before installing the enclosure, check that the floor is level and can support the weight of the enclosure.

8. Secure the enclosure to the floor and proceed with the installation of the remaining components.

8 Mechanical installation and grid connection

Refer to the safety instructions of the equipment before carrying out any manipulation on the equipment.

Read the following warnings carefully before proceeding with the installation, commissioning, shutdown or maintenance of the equipment.

-  **Compliance with the safety instructions is mandatory and the user is legally responsible for** operating the equipment safely and avoiding accidents. Read these instructions carefully and follow the steps given in the order.
- Have all the necessary material described in this document at hand before starting to handle the equipment.
-  If you **do not fully understand these instructions, do not proceed** with installation or commissioning, as this may endanger **your safety and/or the safety of others**.
-  In the event of a discrepancy between this manual and the local electrical regulations or restrictions at the customer's location, the relevant local electrical regulations shall prevail.
-  The surface on which the enclosures are installed must be prepared to support the weight of the enclosure and must be properly levelled. Otherwise, the enclosure structure may be subjected to unnecessary and/or damaging mechanical stresses.
- The cabinets must be fixed to the floor using the fixings provided. With elements that guarantee a permanent fixation.
-  It is required that the need to secure the enclosure firmly to the floor to prevent it from tipping over is signalled by clearly visible notices. With elements that guarantee a permanent fixation.


8.1 Warning!

- All connections and disconnections must be made without voltage at the input and with all protections in the open state.
- Precautions should be taken when batteries are connected. Dangerous voltages may exist.
- The connection and handling of the batteries shall be carried out by personnel with specific knowledge. Before taking any action, disconnect the batteries and check that there is no voltage at the battery terminals.
- Check that there is no input voltage before handling.
- In case of having the batteries connected to the equipment and the protections activated, independently of having voltage at the input, the equipment will have voltage at the output as long as the batteries have capacity for it.
- The equipment shall be installed in a spacious, airy and easily accessible location. Ventilation openings must not be blocked.
- The equipment must not be installed outdoors.

- The input, output and earthing cables must be correctly dimensioned according to the rated current of the equipment.
- Incorrect or faulty connection can lead to equipment or load failures.
- The base of the cabinet is fitted with a rodent-proof grille. Pass the cables through this grid and fix it in place.

8.2 Connection diagram

8.2.1 Ground connection

- The equipment must be earthed, as required by regulations.
- All earth connections must be made to the grounding plate provided for this connection, using different grounding points can cause problems.
- All elements marked with the symbol  must be connected to the grounding plate of the enclosure.
- All adjacent enclosures must be earthed via the grounding plates provided for this purpose.
- Ensure that the loads connected to the output are compatible with the installed equipment, otherwise the start-up of the equipment may put personnel, equipment and installation at risk.

8.2.2 Battery

- Before connection, make sure that all system protections are disabled (open). In particular those concerning the battery.
- Pay particular attention to the **polarity of the battery cables**.
- Use the terminals indicated in the section 6.6.1 for battery connection.

8.2.3 AC Network

- Before connection, make sure that all system protections are disabled (open). In particular those concerning the battery.
- Check all earth connections. They must be connected to the board provided for this connection.
- Connect the three-phase AC input cables through the connectors provided for this purpose, as detailed in section 6.6.1.

8.2.4 Exit

- Before connection, make sure that all system protections are disabled (open). In particular those concerning the battery.
- Check all earth connections. They must be connected to the board provided for this connection.
- Ensure that the loads connected to the output are compatible with the installed equipment, otherwise the start-up of the equipment may put personnel, equipment and installation at risk.

- Connect the load cables to the terminals provided for this purpose, as detailed in section 6.6.1.

8.2.5 Alarms

- Refer to the configuration to understand the operation of each alarm.
- The alarm relay module offers three contacts for each alarm, so that the user can configure it as desired. Each alarm can be selected as a normally open (NO) or normally closed (NC) contact.
- Connect the alarm cables to the terminals provided. Connect according to the desired functionality of each alarm.
- Once the installation is complete, configure the status of each alarm via the web or touch display of the communications module.

8.2.6 Communications module (DAS)

- The communications module is pre-installed and wired from the factory.
- Check that the internal RJ45 communication cable is properly connected.

8.3 Installation or replacement of modules in the system

8.3.1 Power module

To carry out the installation or complete replacement of a power module (FDS), the procedure shall be as follows:

1. Disconnect the output circuit breaker corresponding to the module to be removed (Q2C_).
2. Disconnect the input circuit breaker corresponding to the module to be removed (Q1B_).
3. Wait for the "Vout OK" LED on the module to go out.
4. Unscrew the upper screw of the module to be replaced.
5. Pull the module by its handle until it is completely removed.

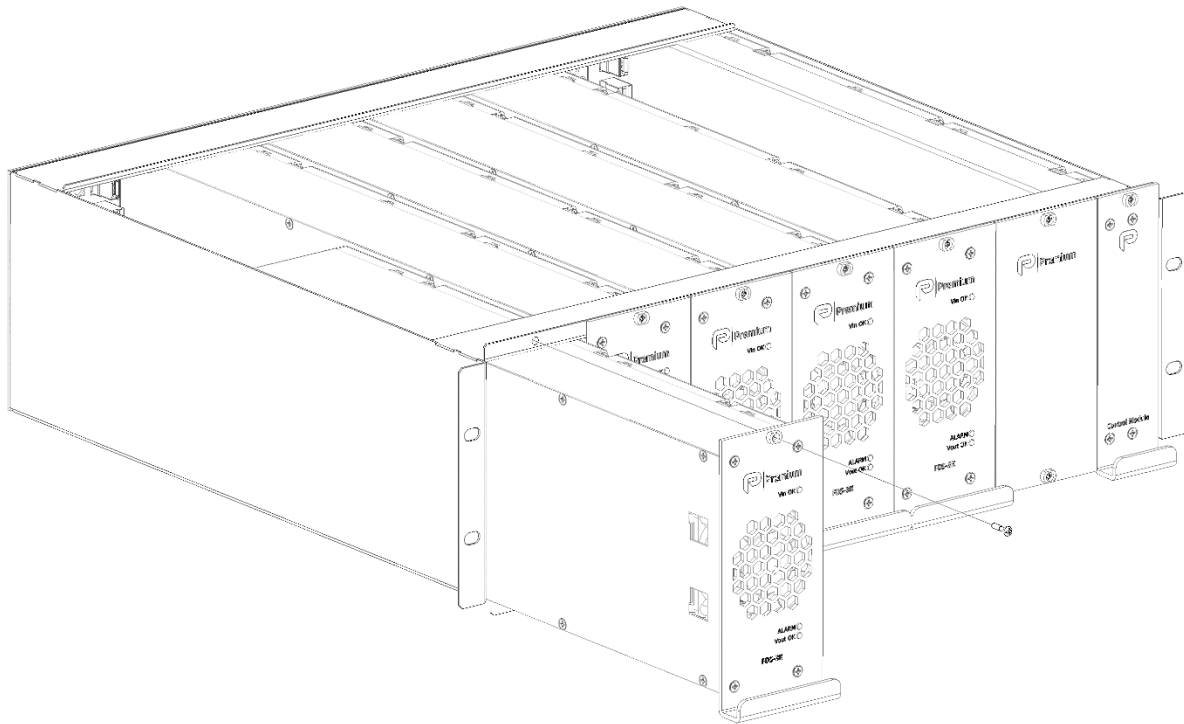


Figure 21 - Power module installation

To mount the new FDS power module, the process must be repeated in reverse order.

1. Insert the new module until it connects to the rear PCB.
2. Screw the module to the RMS.
3. Connect the output circuit breaker corresponding to the module (Q2C_).
4. Connect the input circuit breaker corresponding to the module (Q1B_).
5. If the module has been installed correctly, the "Vin OK" and "Vout OK" LEDs should be on and green, the "ALARM" LED should remain off.

8.3.2 Control module

For the installation or complete replacement of a control module, the procedure shall be as follows:

1. Unscrew the upper screw of the module to be replaced.
2. Pull the module by its handle until it is completely removed.

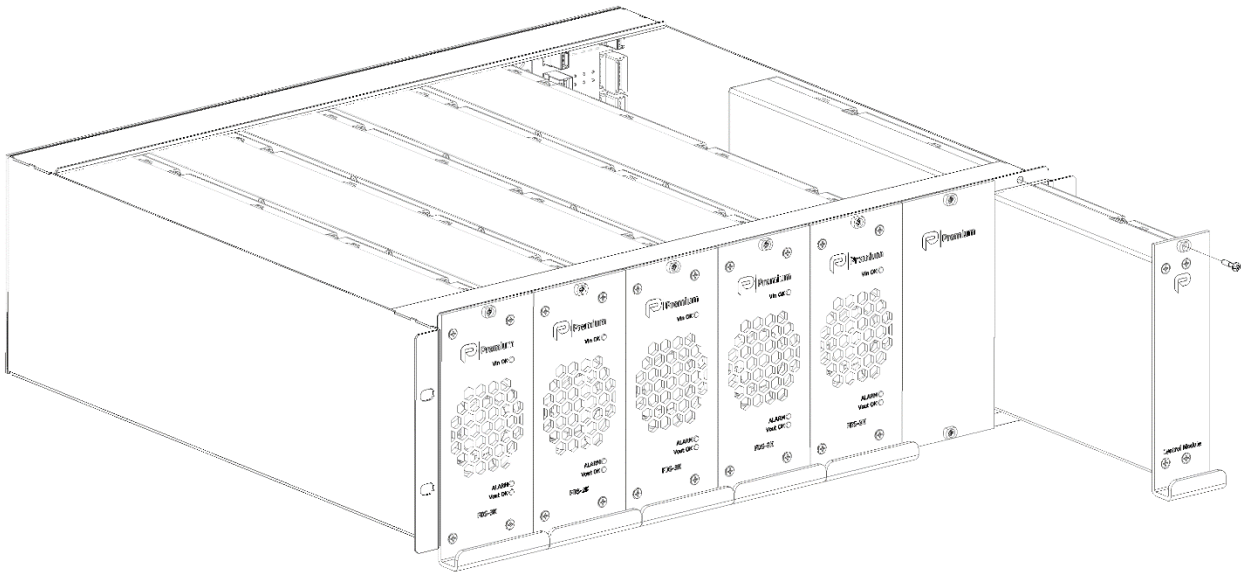


Figure 22 - Control module installation

To mount the new control module, the process must be repeated in reverse order.

1. Insert the new module until it connects to the rear PCB.
2. Screw the module to the RMS.
3. If the installation has been carried out correctly, the door display should announce successful communication with the newly installed module.

8.3.3 Communications module

The communication module is delivered mounted on the cabinet door. If replacement is necessary, please refer to 10.3 or to the repair manual of the equipment.

9 Start-up and shutdown

9.1 Start up

9.1.1 Before starting

- All system protections (Q1A1...Q2D4) are disabled (contact open). Pay special attention to the battery output and load output circuit breaker (Q2D1...Q2D4).
- The selector (S1A1) is in position "0".
- Make sure that nothing is connected to the battery test connector (X2D1).
- Check the correct earthing of all enclosure components.
- Connect the three-phase input cable must be connected to the selected connector X1A1 or X1A2.

9.1.2 Connection

To start up the system correctly, follow the order given below:

1. Set the input power supply by means of the selector switch (S1A1), select the desired power connector.
2. Turn the general input circuit breaker (Q1A1) to "On" position. Observe that the communications module starts.
3. Switch the input circuit breakers (Q1B1...Q1B6) corresponding to the installed modules to "On" position.
4. Switch the output circuit breakers (Q2C1...Q2C6) corresponding to the installed modules to "On" position.
5. Observe that the individual "Vin OK" and "Vout OK" LEDs of each module light up.



For the correct configuration of the system, consult the configuration section of the equipment's user manual.

6. Check that the system display does not indicate any errors.
7. Turn the output and battery circuit breakers (Q2D1...Q2D4) to "On" position, when the system display indicates it.

9.2 General shutdown of the system

For a correct and safe shutdown of the system, follow the order given below:

1. Deactivate all charges.
2. Switch the general output circuit breakers (Q1D3...Q1D4) to "Off" position.
3. Switch the output circuit breakers (Q2C1...Q2C6) corresponding to the installed modules to "Off" position.
4. Switch the input circuit breakers (Q1B1...Q1B6) corresponding to the installed modules to the "Off" position.
5. Turn the general input circuit breaker (Q1A1) to "Off" position.
6. Switch the battery circuit breakers (Q1D1...Q1D2) to "Off" position.
7. Wait 4 minutes before handling the equipment.

10 Repairs and Maintenance

10.1 Power Module (FDS)

10.1.1 Complete module

See 8.3.1 for information on replacing the power module (FDS).

10.1.2 Fan

To replace the fan of a power module (FDS) due to a failure, the procedure shall be as follows:

1. Disconnect the output circuit breaker corresponding to the fan module to be removed (Q2C_).
2. Disconnect the input circuit breaker corresponding to the fan module to be removed (Q1B_).
3. Wait for the "Vout OK" LED on the module to go out.
4. Unscrew the upper screw of the module.
5. Pull the module by its handle until it is completely removed.

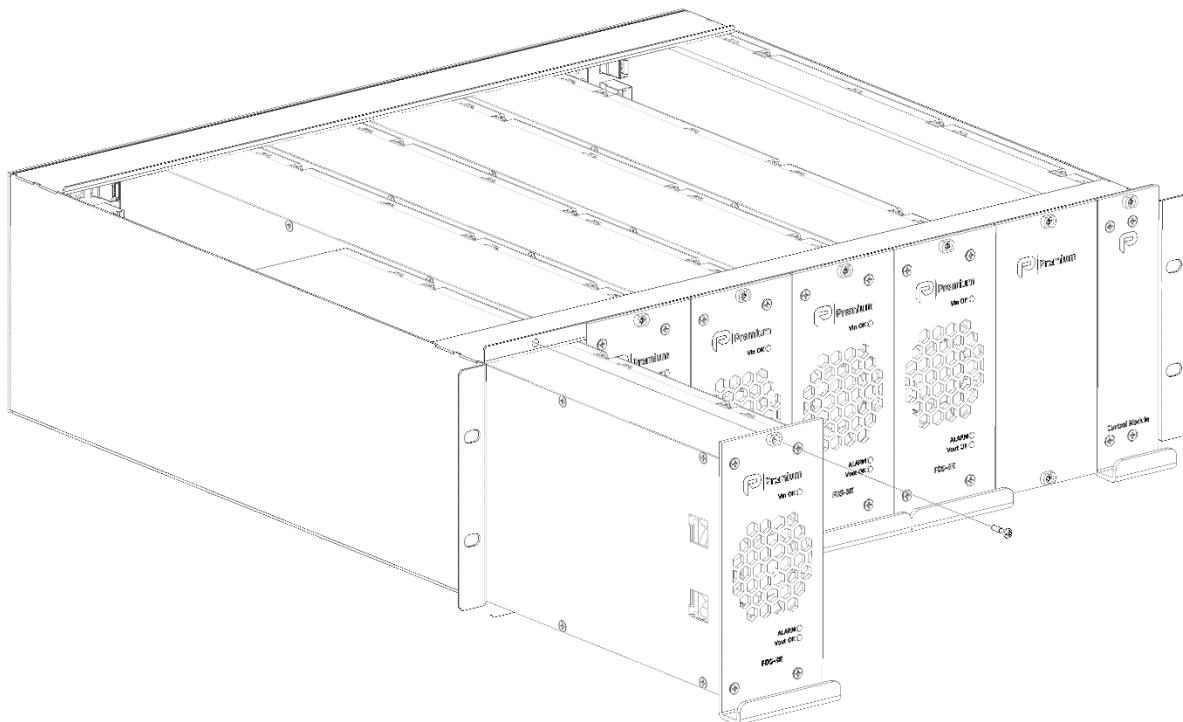


Figure 23 - Replacing fan. Step 1.

6. Remove the front cover of the module by unscrewing the 4 screws indicated.

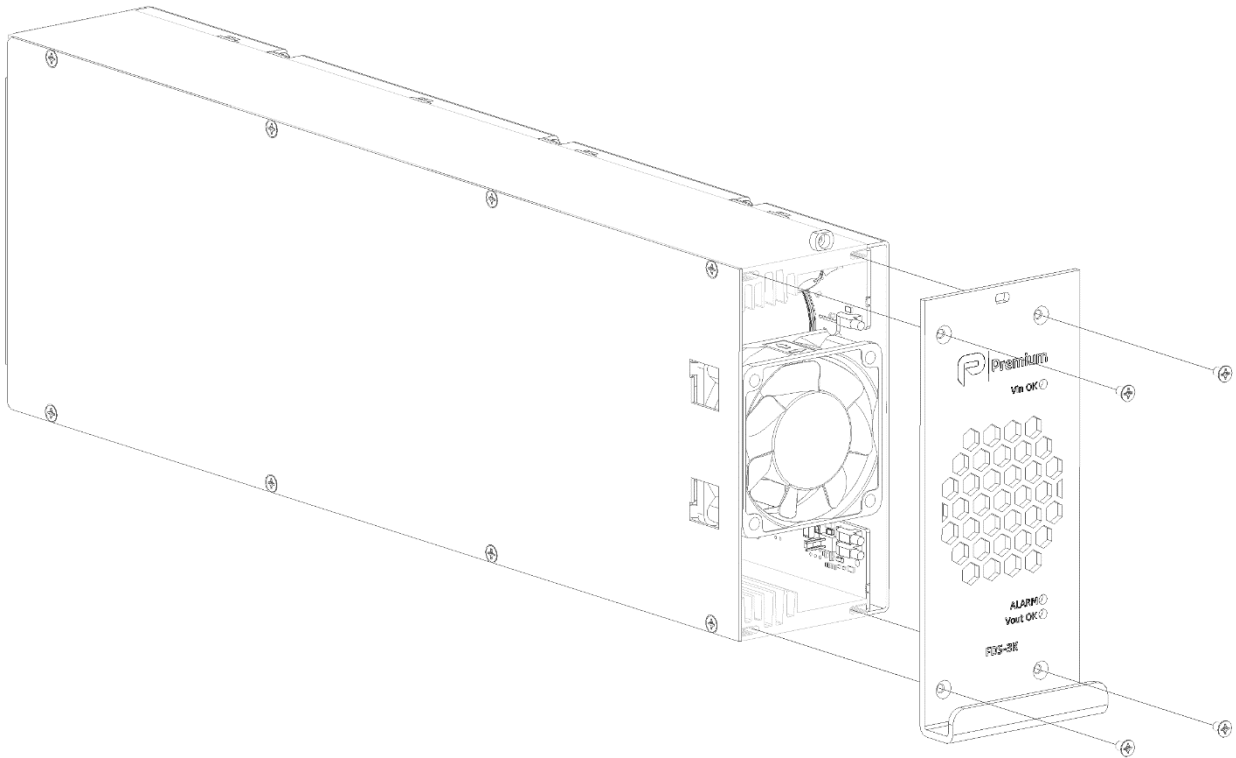


Figure 24 - Fan replacement. Step 2.

7. Disconnect the fan and pull it out of the PCB and the cover tabs.

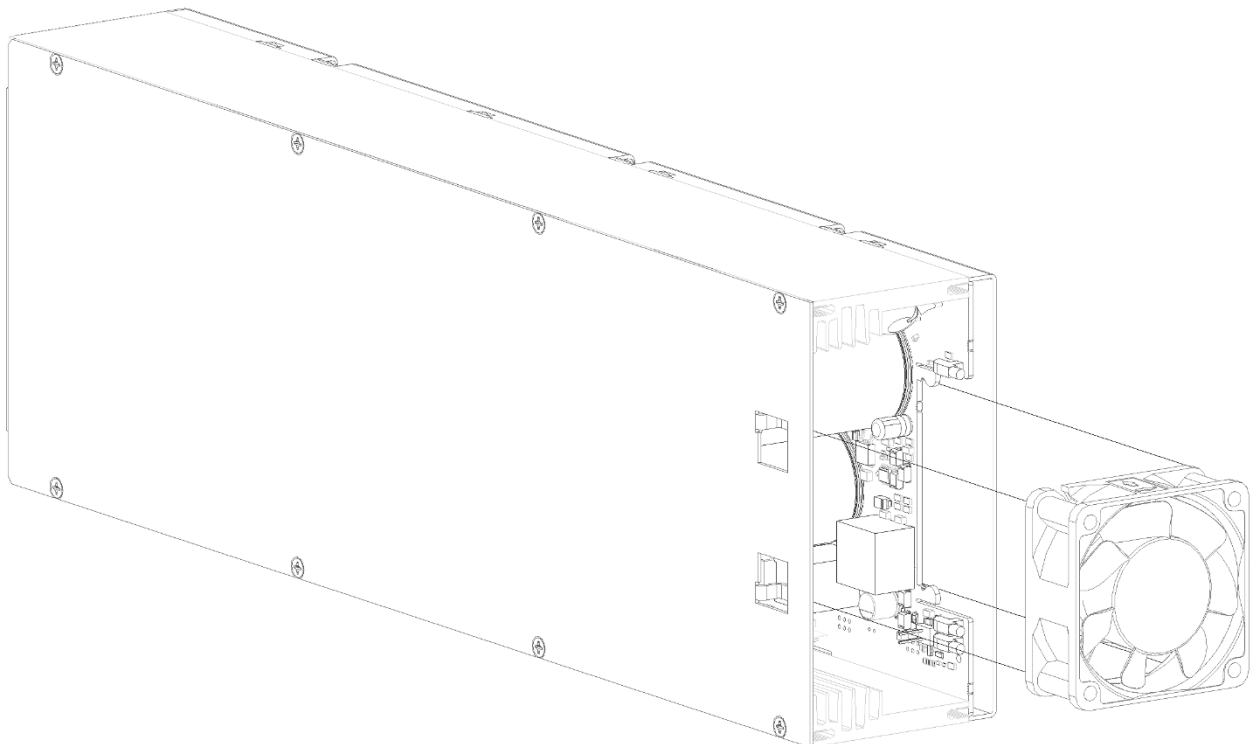


Figure 25 - Replacing fan. Step 3.

To mount the new fan, the process must be repeated in reverse order.

1. Connect the new fan to the module and insert it until it fits the PCB and is securely fastened by the tabs on the side of the module.
2. Screw on the front cover of the module with the four screws.
6. Insert the new module until it connects to the rear PCB.
3. Screw the module to the RMS.
4. Connect the output circuit breaker corresponding to the module (Q2C_).
5. Connect the input circuit breaker corresponding to the module (Q1B_).

10.2 Control Module (LMS)

See 8.3.2 for information on replacing the control module (LMS).

10.3 Communications module (DAS)

To replace the communications module due to a failure, the procedure shall be as follows.

1. Disconnect any connections to the communications module (RJ45, Ethernet, etc.)
2. Remove the nuts for fastening to the enclosure.
3. Remove the communications module by unplugging it from the cabinet turrets and the panel.

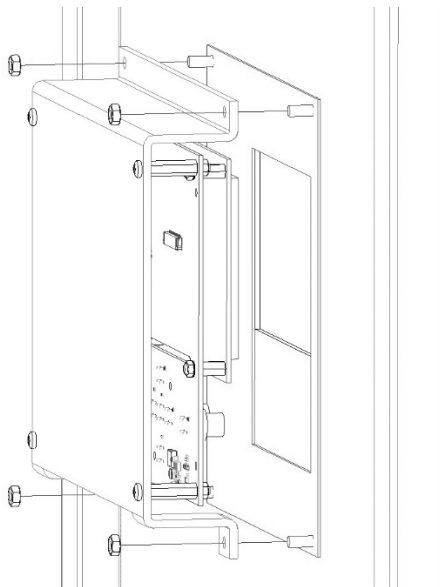


Figure 26 - DAS substitution. Step 1.

4. Remove the 4 nuts and washers shown in the picture.
5. Remove the communications module.

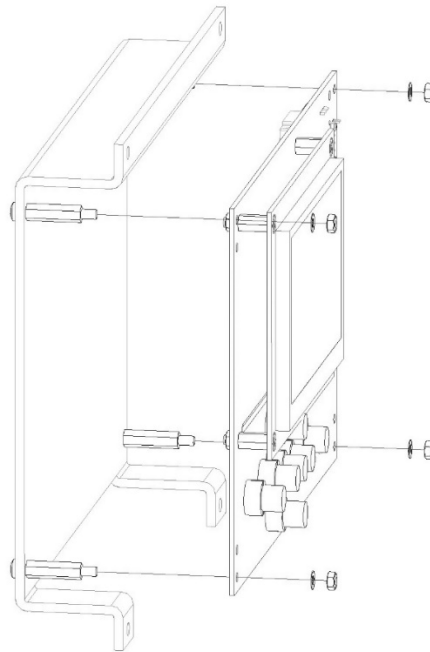


Figure 27 - DAS substitution. Step 2.

To mount the new communications module, the process must be repeated in reverse.

1. Place the new module and fit it between the 4 turrets.
2. Secure the module with the 4 washers and 4 nuts removed earlier.
3. Mount the communications module in the cabinet by fitting it between the 4 turrets and the panel.
4. Fix it to the cabinet with 4 nuts removed earlier.
5. Connect up to the control module using the RJ45 cable provided.
6. Once the system has been started, the display should show the main screen without communication failures with the control module. In case of any further problems, please contact the PREMIUM PSU TSS.

11 User configuration

The user has the freedom to configure the equipment via the web, remotely, or via the door display, locally.

11.1 Display (DAS)

To become familiar with the screen system of the FLEXSTORM SERIES equipment, see section 6.3.

The display provides access to general settings, system configuration and certain actions that can be performed locally. From the initial screen of the system (Figure 14) you can access the configuration section, Figure 18 is displayed on the screen. Through this you can select which type of configuration you want to access. The following configurations are available.

11.1.1 System configuration

If the system configuration is accessed, the screen shown in Figure 28 will appear. This displays the language, the current date and time. Figure 28 shows the "Read Mode", to modify the system parameters, access as a user with permissions through the process shown in the section 11.1.4.

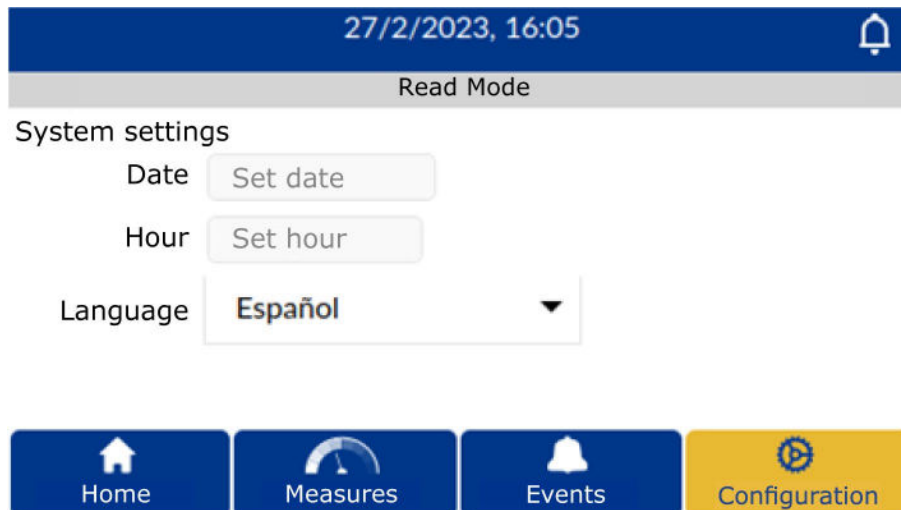


Figure 28 - Display - General configuration

Once logged in as a user with permissions, the configurable parameters will be unlocked.

11.1.2 General configuration settings

By accessing the general configuration screen, the screen shown at Figure 29 appears. Here you can view the current system configuration. If desired, there is also the option to edit the configuration. To access this configuration, the user must follow the procedure shown in the section 11.1.4.

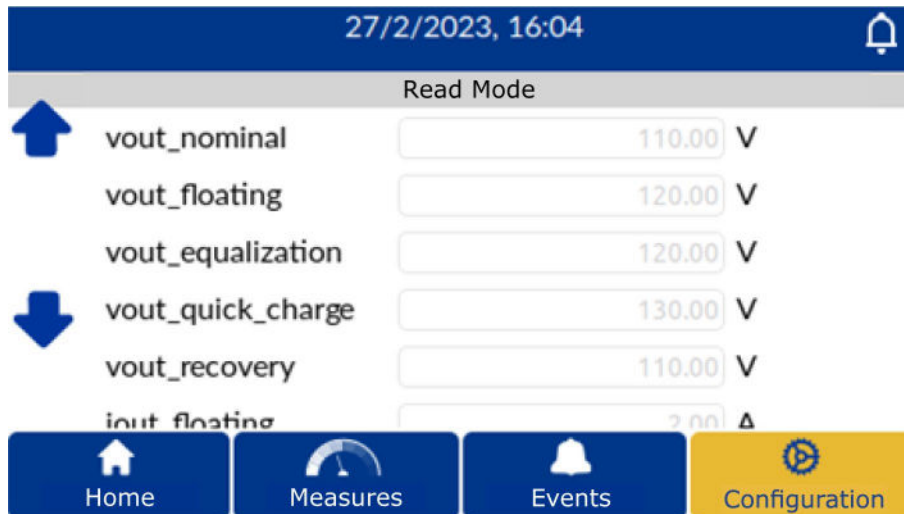


Figure 29 - Display - System configuration

Once the user is authenticated, the configurable parameters will be unlocked. Showing Figure 30.

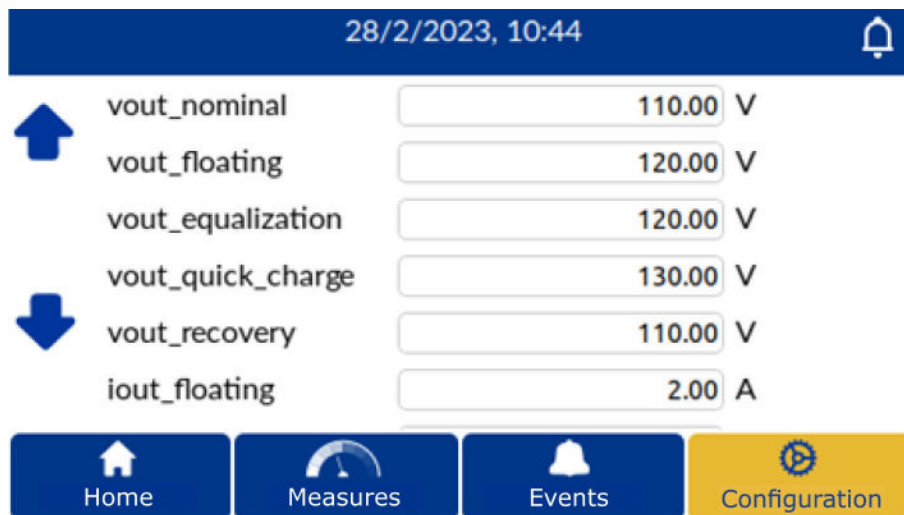


Figure 30 - Display - System configuration - User with permissions

At this point the user can modify certain parameters, as long as they are within the working ranges of the system.

11.1.3 Actions

This configuration allows for quick and easy predefined configurations. By accessing it via the "Actions" button in Figure 18, the screen of Figure 31 appears, where you can select the action to be taken.

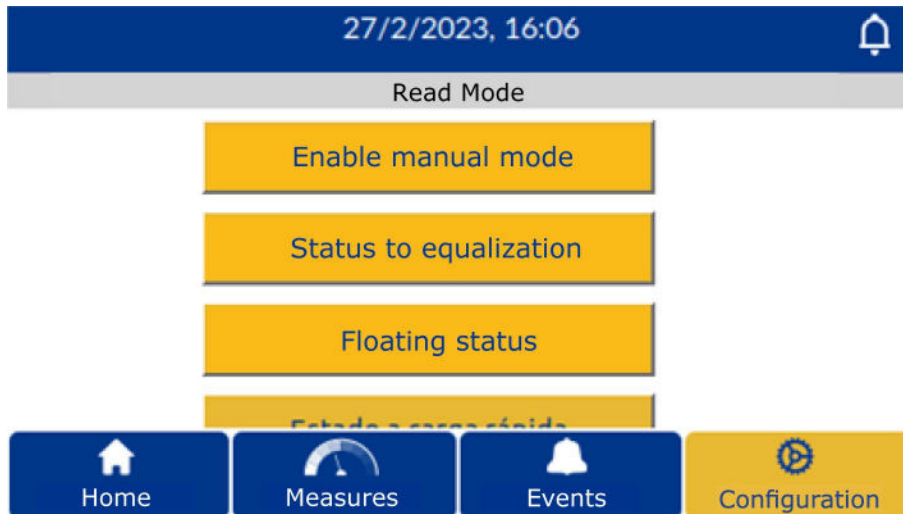


Figure 31 - Display - Configuration - Actions to be performed locally

For more information on the actions that can be performed locally, please refer to the FLEXSTORM SERIES communication systems description document.

11.1.4 Editing mode

In order to be able to configure parameters, it is necessary to identify yourself as a user with permissions. This process is accessed by tapping on the screens where "Read Mode" appears, then the Figure 32 will appear, enter the password and accept it with the button to the right of the "0" key. In this way the configurable parameters will be unlocked and editable.



Figure 32 - Display - Identification screen

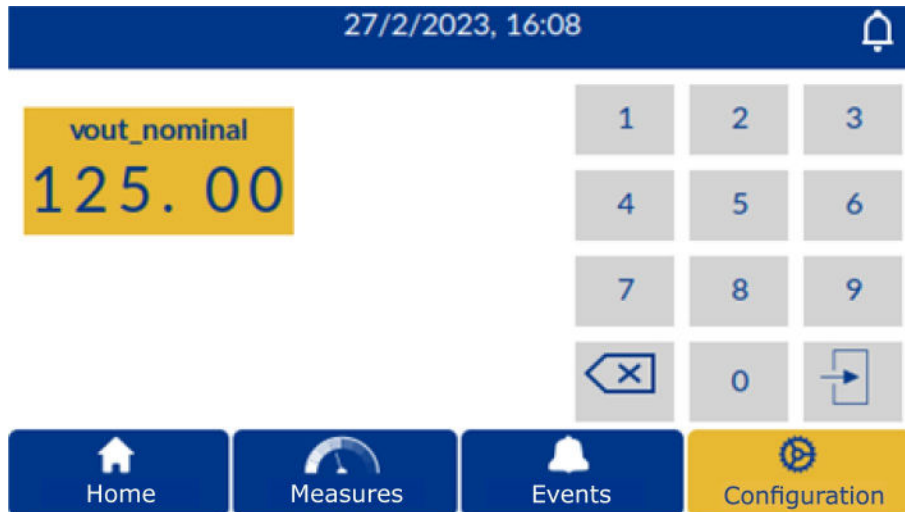


Figure 33 - Display - Identification screen (example)

11.2 Web Server

To access the web server of the communications module (DAS), you must access the configured IP address, which will coincide with the IP address shown at the top left of the display, followed by the port, in this case the number 7878. When accessing via the browser, the screen of the Figure 35 will be displayed. Where the following four main tabs are distinguished.

- General view.
- History.
- Configuration.
- Equipment.

Before being able to view the pages of the web server, the user must log in.

11.2.1 Login

After accessing the web server, the user must log in and the screen shown at Figure 34 will appear. The username and password shall be as follows:

Username: admin

Password: admin



Figure 34 - Web - User identification

11.2.2 General view

As shown on Figure 35, the page displays the system overview, where we can find the same information as in the touch screen overview.

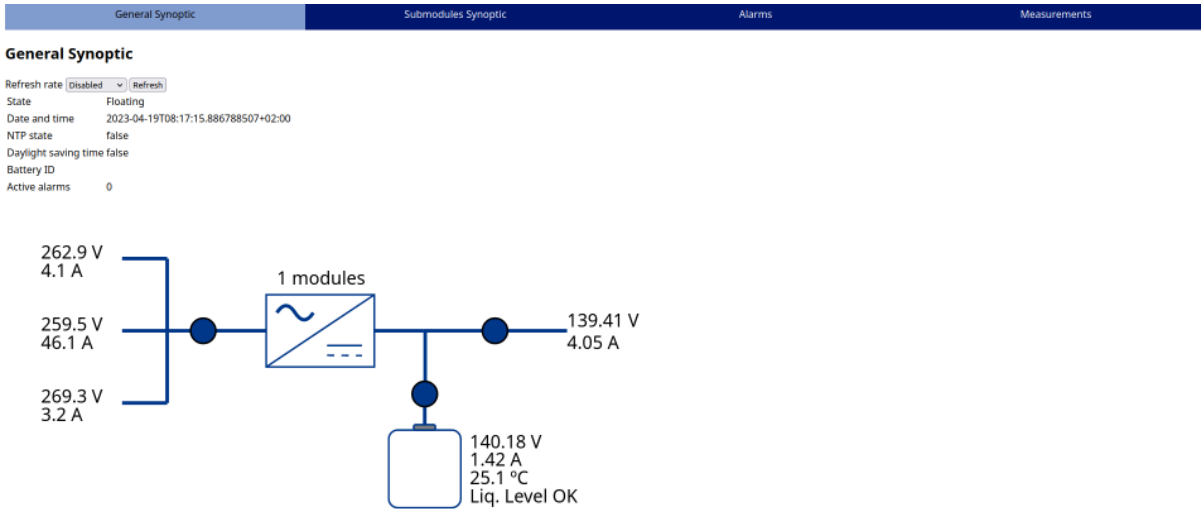


Figure 35 - Web - Overview

The function and characteristics of the sub-sections shown in the website overview are detailed below.

- General synoptic (Figure 35): Displays the real-time status of the entire system.
- Synoptic sub-modules (Figure 36): Displays the real-time status and variables of each sub-module connected to the system.
- Alarms (Figure 37): Displays the current status of the equipment alarms. Green when OK and red when the alarm is active.
- Measurements (Figure 38): It shows the list of the variables measured by both the control module and the different power modules connected to the system.

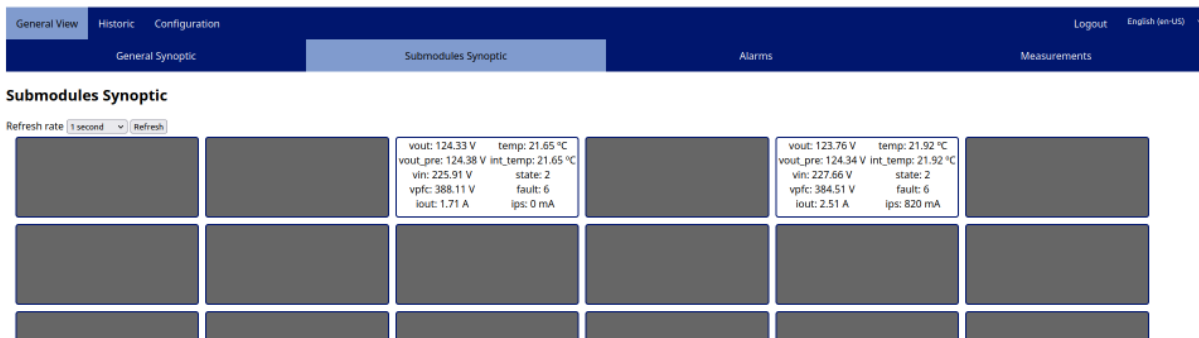


Figure 36 - Web - Overview - Synoptic sub-modules

Alarms

Refresh rate: 1 second | Refresh

- Battery**
 - No battery
 - Battery temperature high
 - Battery temperature low
 - Battery undervoltage
 - Battery overvoltage
 - Unknown localization alarm-battery_max_overvoltage
 - Charge overcurrent
 - Discharge overcurrent
 - Battery test failure
- Internal**
 - Internal temperature high
 - Internal temperature low
 - Charger failure
- Input**
 - Input overvoltage
 - No input voltage
 - No input voltage in control
 - No input voltage in modules
 - Overvoltage protection
- Output**
 - Output undervoltage
 - Output overvoltage
 - Output switch disconnected
- Modules**
 - Module in ROM state
 - Module with default address

Figure 37 - Web - Overview - Alarms

Measurements

Refresh rate: 1 second | Refresh

Control module

vbatt	354 mV
vout	0 mV
lout	17 mA
lbatt	-21 mA
internal_temp	35.878 °C
tbatt	25.084 °C
vin_r	240.112 V
vin_s	238.764 V
vin_t	238.723 V
n_modules	2
state	0
desired_vout	125 V
target_vout	125 V
iin_r	305 mA
iin_s	-33639 mA
iin_t	396 mA

Submodule 3

vout	100 mV
vout_pre	0 mV
vin	50 mV
vpfc	320.3 V
lout	40 mA
temp	22.32 °C
int_temp	22.32 °C
state	0
fault	6
ips	20 mA

Figure 38 - Web - Overview - Measurements

11.2.3 History

Accessing the History section, Figure 39 is displayed. The events tab shows the different events registered in the equipment.

Events

Refresh rate: 1 second | Refresh

timestamp	event_id	event_type	event_text
2000-01-01T00:13:25.8	undefined	undefined	Event "Stop state reached"
2000-01-01T00:13:24.2	undefined	undefined	Event "a module has changed its state": 5 fault under voltage
2000-01-01T00:12:58.2	undefined	undefined	Event "a module has changed its state": 5 regulated
2000-01-01T00:12:58.2	undefined	undefined	Event "a module has changed its state": 5 idle
2000-01-01T00:12:58.0	undefined	undefined	Event "a module has been connected": Connected 5 0x15 FD5-3K 1.1.0 c75f67f-dirty
2000-01-01T00:12:57.11	undefined	undefined	Event "Device in AC only state"
2000-01-01T00:12:55.2	undefined	undefined	Event "a module has changed its state": 3 regulated

Figure 39 - Web - Historical - Events

11.2.4 Configuration

In the configuration section, Figure 40 is displayed. Three sub-sections can be accessed from this page. The function and characteristics of the sub-sections shown in the website overview are detailed below.

- Equipment parameters (Figure 40): Displays configurable system parameters for charger operation.
- Forced parameters (Figure 41): Displays the possible actions to be forced by the user through the website.
- Updating the software (Figure 42): It allows software updates to be made, both of the control module and of the different power modules.

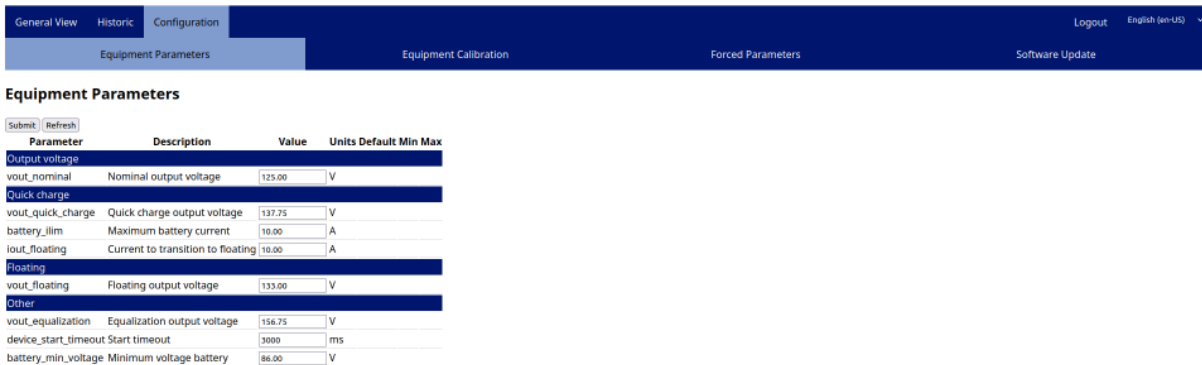


Figure 40 - Web - Configuration - Equipment Parameters

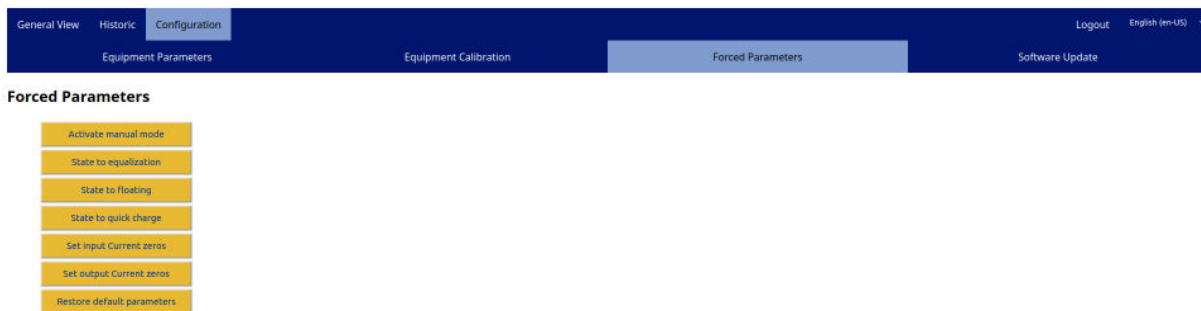


Figure 41 - Web - Configuration - Forced Parameters



Figure 42 - Web - Configuration - Software Update

This page allows you to upload software update files and apply them to both the control module and any updated power module.

To update a module:

1. Press the "Navigate..." button of the module to be updated (control or power).
2. Click on the corresponding "Upload binary" button and wait about 5 seconds for the file to upload correctly.

3. If you are updating a power module, select the module number to be updated from the drop-down menu.
4. Click on the "InstallControl" or "InstallPower" button, depending on which file you have uploaded and which module you want to update.
5. In case of the power module, it shall be observed that the chosen module stops generating output voltage until it is updated. The update takes a few minutes to complete. Once finished, the module should restart on its own.
6. In the case of the control module, it will be observed in the events how, if the update has gone well, in about two minutes a new "Start" event appears, due to the successful update and reset of the module.

11.2.5 Auto refresh

On pages where system variables are monitored, you will see a box like the following:

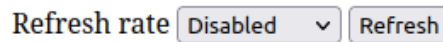


Figure 43 - Data refresh rate detail

Pressing the "Refresh" button will update the data in real time that may be available on the website. By clicking on the drop-down menu and selecting one of the options that appear, this data refresh will be done automatically with the chosen period of time.



Premium

Powering Your Challenge

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