# Base Load Power Hub (BLPH)

## DC UPS - INSTALLATION, OPERATING AND MAINTENANCE MANUAL (INCLUDING SITE ERECTION INSTRUCTIONS AND PROCEDURES)

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# Base Load Power Hub (BLPH)

## DC UPS - TAG: UP-200F1

## INSTALLATION, OPERATING AND MAINTENANCE MANUAL

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AEG

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# PROTECT RCS

## Operation manual

## Installation, Operation and Maintenance manual

Battery charger

SPRe - TPRe
Building Blocks

BN 092495/01/03 – 03/03/2019

EN

 AEG Power Solutions is a world specialist in AC and DC power conversion.

 The company designs and manufactures rectifiers, inverters and power electronics systems associated with all types of batteries.

 The applications range from Oil & Gas, Petrochemicals, Transport, Power, Manufacturing and Telecommunications Industries through to Military applications.

 AEG Power Solutions makes available to its customers its theoretical and practical training centre at various locations.

CE

This equipment has been designed to meet the requirements of the European Directives applicable to the product concerned, i.e. Directive on Electromagnetic compatibility (EMC) N° 2014/30/EU of 18-04-2014. To comply the units are equipped with the necessary input filters where applicable. Together with the compliance to Low Voltage Directive N° 2014/35/EU of 18-04-2014, the systems have the CE mark.
The delivered equipment is conform with these Directives as long as the user does not change its electrical and mechanical characteristics.

*This equipment is designed to be used in an industrial environment.*

*WARNING :*
*THIS PRODUCT IS FOR RESTRICTED DISTRIBUTION TO INFORMED INSTALLERS OR USERS. INSTALLATION RESTRICTIONS OR ADDITIONAL MEASURES MAY BE NECESSARY TO AVOID DISTURBANCES.*

*The units equipped with an EMI suppression filter have high leakage currents to the chassis. Always connect the earth connection first before any other connection. Danger to the operator can occur if the units are not firmly connected to earth.*

*The units contain DC capacitors on the output of the DC line. Allow 5 minutes for the discharge of the capacitor bank when the system is completely powered down and in any case, always check the absence of voltage on the system terminals and at capacitors terminals prior to maintenance operations.*

*This equipment has been designed to be connected to class II power supplies with over voltages not exceeding 2500 V peak. All precautions should be taken to stay within these limits.*

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# 1 INTRODUCTION

This manual is designed to familiarize the user with the operating principles, use and maintenance of the PROTECT RCS range of rectifiers fitted in floor mounted cabinets. The Protect RCS range comprises the SPRe and TPRe. SPR means Single Phase Rectifier, TPR means Three Phase Rectifier and "e" means "evolution" brought by the GCAU control card.

To use the system properly, the user should first read this manual carefully.

AEG is not be responsible for damage due to improper use, neglect, alterations, or use of other than original parts without our written consent.

Equipment access areas:
- Operator: door closed.
- Maintenance personnel: door open.

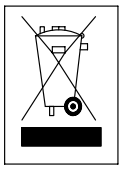
**IMPORTANT RECOMMENDATIONS:**

**ANY OPERATION ON THE EQUIPMENT SHOULD BE CARRIED OUT BY QUALIFIED PERSONNEL, AWARE OF SPECIFIC ELECTRICAL HAZARDS AND PRECAUTIONS TO BE TAKEN.**

**LETHAL VOLTAGES EXIST PERMANENTLY ACROSS THE BATTERY TERMINALS.**

**DO NOT MAKE ASSUMPTIONS AS TO THE PRESENCE OR ABSENCE OF A VOLTAGE: CHECK USING A VOLTMETER OR AN ELECTRICAL SAFETY TESTER.**

**WEEE INFORMATION**



**The disposal of this product is covered by a selective processing of some components. For this provision of services, please contact our Customer Service.**
**Refer to standards 2002/95/EC (LSDEEE or RoHS) and 2002/96/EC (WEEE)**

**For general information about operating principles of the charger: please refer first to Chapter 7 "Functional description".**

**CUSTOMER DRAWINGS:**

**This manual, covering standard equipment, comes with a customer drawing package specific to your equipment.**
**These documents will be needed for any on-site action by our Customer Service Department.**

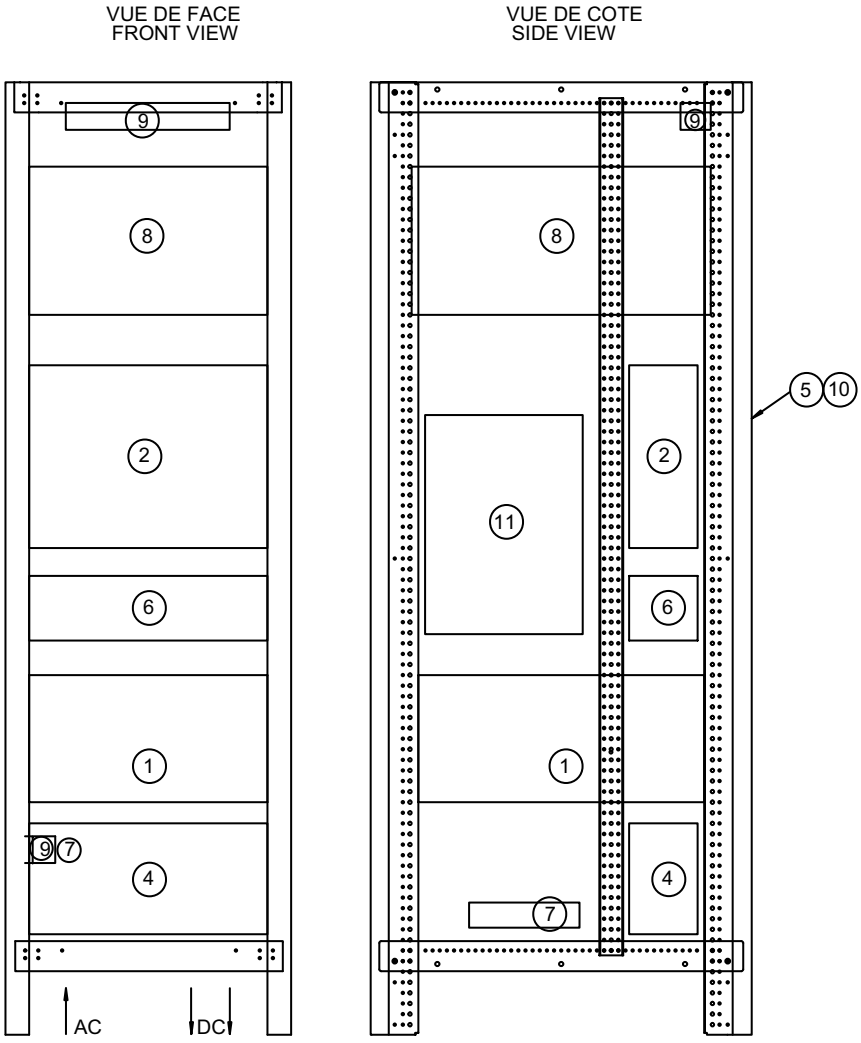
# 2 PRESENTATION OF THE SYSTEM

The aim of the building block system is to identify the different functions of the system and to integrate them into the cabinet at fixed positions.
This ergonomics facilitates access and maintenance of the system while optimizing security.

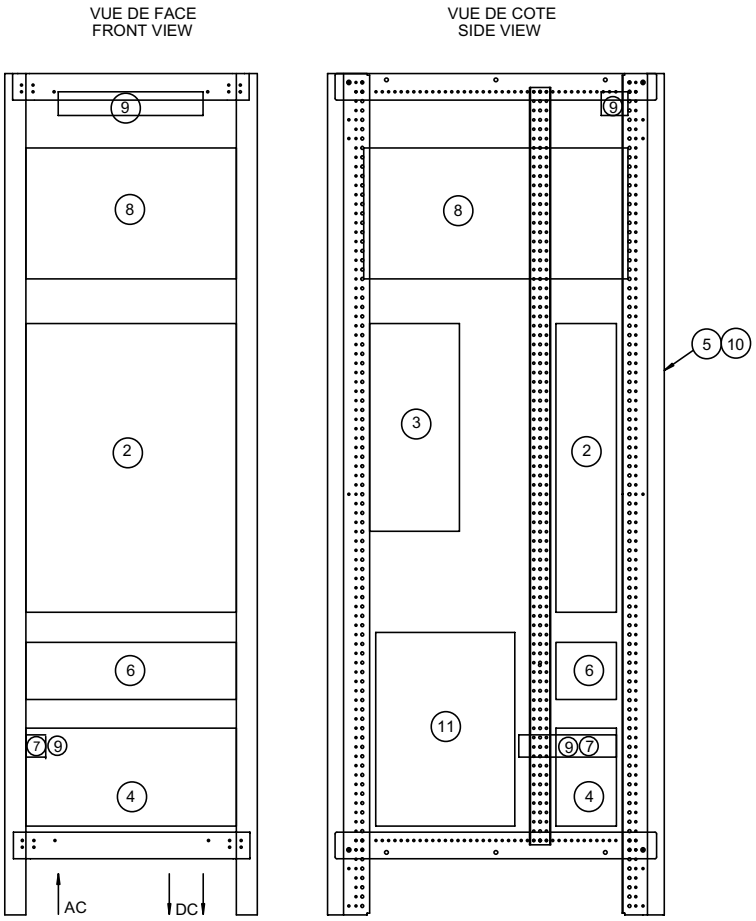
Depending on the delivered configuration, the system can be equipped with the following building-blocks (refer to the specific drawings):

**1.** Battery building block
**2.** Distribution building block
**3.** Diode dropper building block
**4.** Inputs/outputs building block
**5.** Display building block (Man/machine interface front panel)
**6.** Load protections building block
**7.** Heating resistor building block
**8.** Rectifier building block
**9.** AC mains socket and light building block
**10.** Structure building block
**11.** Transformer building block

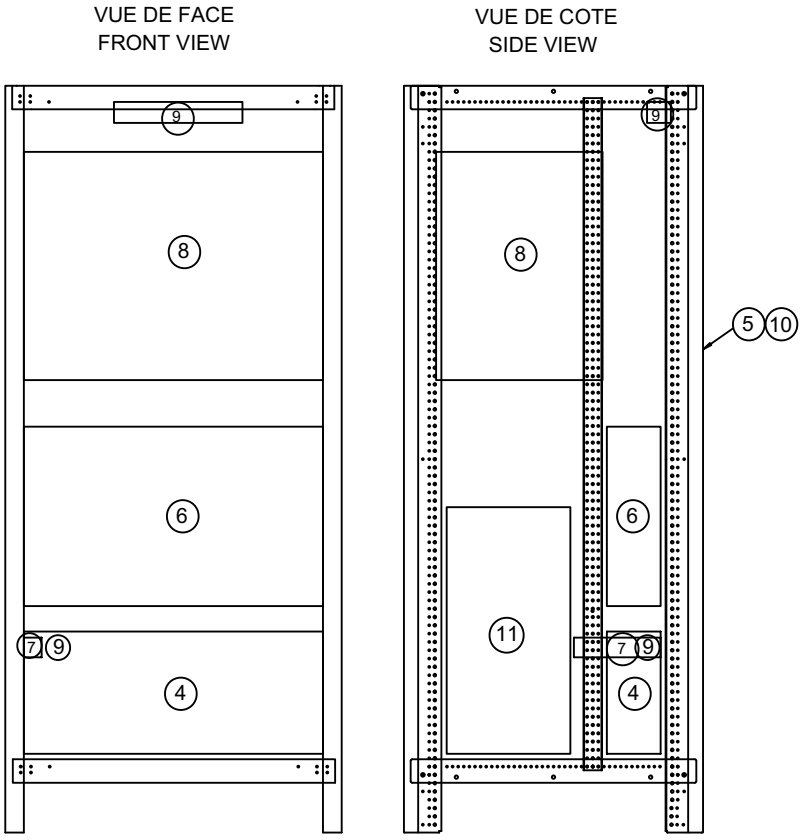
The door of the cabinet is equipped with the man-machine interface (MMI) allowing the operation and monitoring of the system.




***Position of the blocks for rectifier range up to 200 A with integrated battery***




***Position of the blocks for rectifier range up to 200 A without integrated battery***




***Position of the blocks for rectifier range > 200 A***

The PROTECT RCS range offers the following standard and extended ratings:

**SPRe**

| Battery Voltage (V DC) | 24 | 48/60 | 110/125 |
|---|---|---|---|
| **Output Current (A)** | 25 | 25 | 25 |
| | 50 | 50 | 50 |
| | 75 | 75 | |
| | 100 | 100 | |

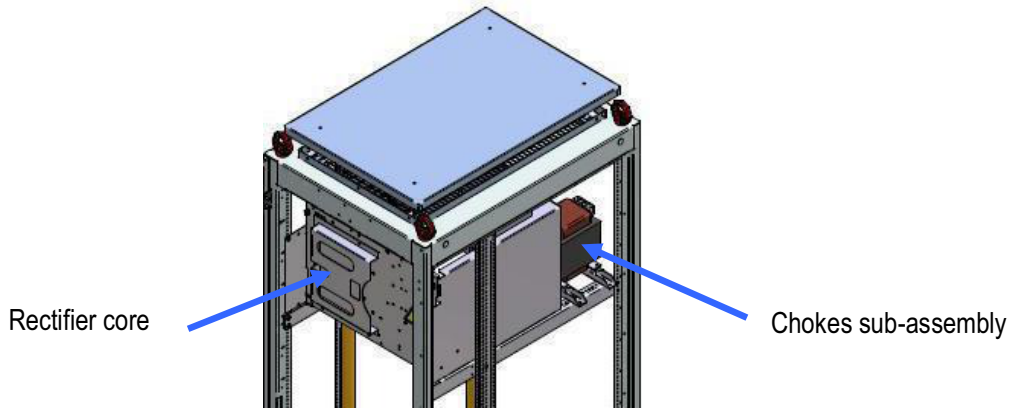
**TPRe**

| Battery Voltage (V DC) | 24 | 48/60 | 110/125 | 220 |
|---|---|---|---|---|
| **Output Current (A)** | 25 | 25 | 25 | 25 |
| | 50 | 50 | 50 | 50 |
| | 75 | 75 | 75 | 75 |
| | 100 | 100 | 100 | 100 |
| | 150 | 150 | 150 | 150 |
| | 200 | 200 | 200 | 200 |
| | 300 | 300 | 300 | 300 |
| | 400 | 400 | 400 | 400 |
| | 500 | 500 | 500 | 500 |
| | | 600 | 600 | |
| | | 700 | 700 | |
| | | 800 | 800 | |
| | | 1000 | 1000 | |
| | | 1200 | 1200 | |

***Other ratings available on request.***

# 2.1 RECTIFIER RACK

The rectifier rack is located in the upper part of the cabinet.




The bars set is the same for all systems (three-phase or single-phase) up to 100 A.
It can be modified via the filter function.

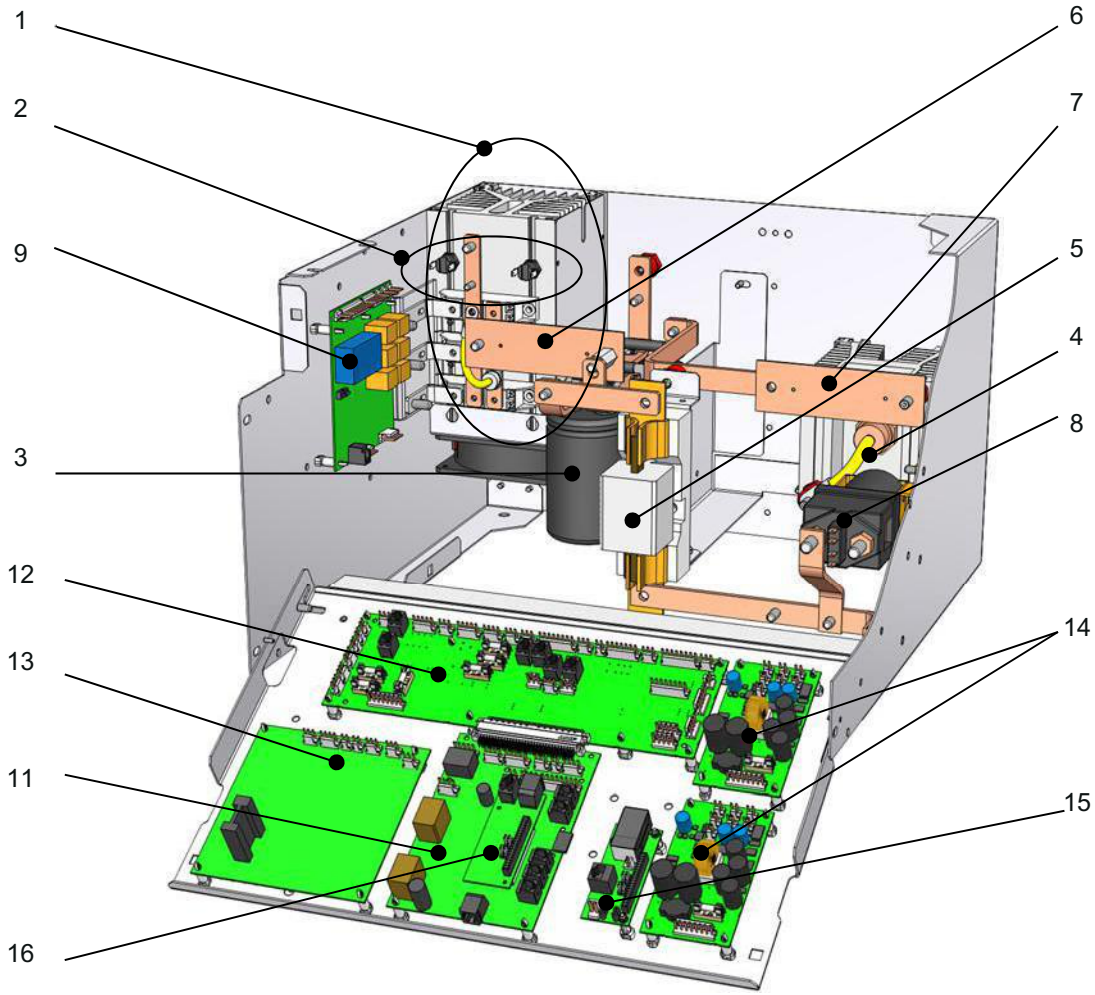
The rack can be equipped with additional options.

The aim of the rectifier building block is to gather the following elements in a volume easily transportable, testable, and repairable (refer to the following drawings) :

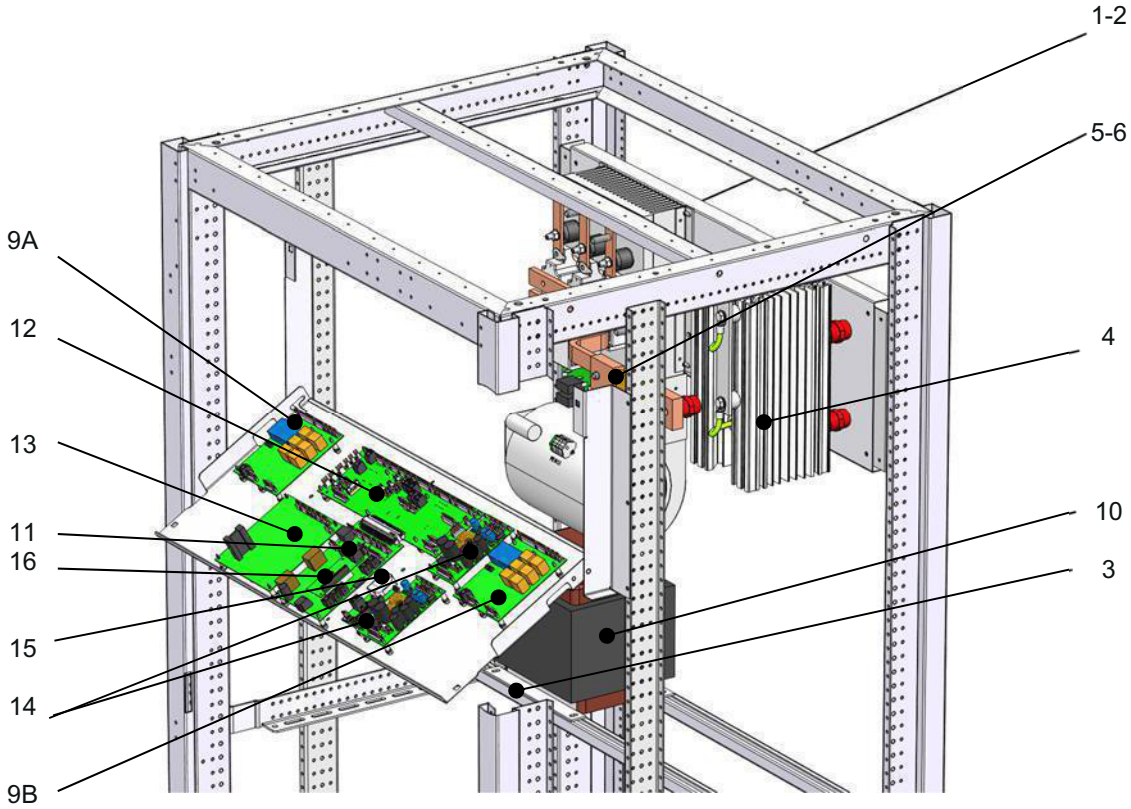
- **1**. Rectifier bridge sub-assembly,
- **2**. Thermoswitches,
- **3**. Capacitor for DC filtering,
- **4**. Blocking diode,
- **5**. Rectifier output fuse,
- **6**. Rectifier shunt,
- **7**. Battery shunt (option),
- **8**. End of discharge contactor (option),
- **9**. TPC three-phase interface board,
- **10**. A choke is installed behind the rack for DC filtering. Some products references depending on the design version may not be equipped with a separate choke. The filter choke is then integrated inside the transformer.

The rack pivoting panel receives the following elements while providing optimum protection of the assembly:

- **11**. GCAU control and alarm board,
- **12**. Interface board,
- **13**. C15-100 battery monitoring board (option),
- **14**. Converter board (depending on the equipment),
- **15**. TCP/IP communication board (option),
- **16**. EIA485 / RS232 A71 interface board (option).



***Rectifier range up to 200 A***




*Note: 9B present only for 12-pulse rectifiers.*

***Rectifier range > 200 A***

# 3 INSTALLATION

The system is delivered as shown hereafter.




*IP21 cabinet example* *IP42 cabinet example*

The equipment is fixed onto the pallet. Its fittings such as the front and rear panel plates are not fitted and stowed inside the cabinet.
Before setting up the cabinet, install the rear panel plate.
Remember to install the front panel plate after making the connections. This panel can be non-perforated.

# 3.1 HANDLING

The equipment must be handled with care, always in a vertical position. Labels on the outside of the package show the top and bottom.



**CAUTION:**
**The transport of the system can be performed as follows:**
- **on pallet,**
- **by crane (in presence of lifting eye bolts),**
- **by forklift truck.**

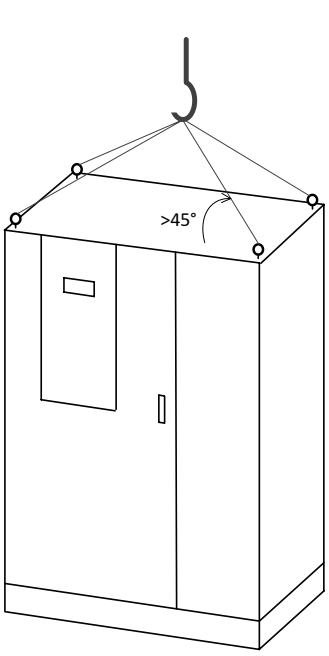
The SPRe/TPRe rectifiers and the batteries are delivered on pallets for easy handling using a pallet truck.
For the transport of cabinets, always watch for the center of gravity.
Check that the eye bolts are screwed fully home. The length of the slings calculated so that a minimum angle is given between the cable and the top edge of the cabinet. The total weight shall be equally balanced between all the slings. The minimum capacity of each sling must be ≥ 0.5 times the weight of the cabinet. One sling must be used for each eyelet.
The lifting capacity of the handling equipment used must always be greater than the weight of the cabinets (specified on the packages).
In case of vermin proof plate on the floor, the cabinet must be installed using slings.



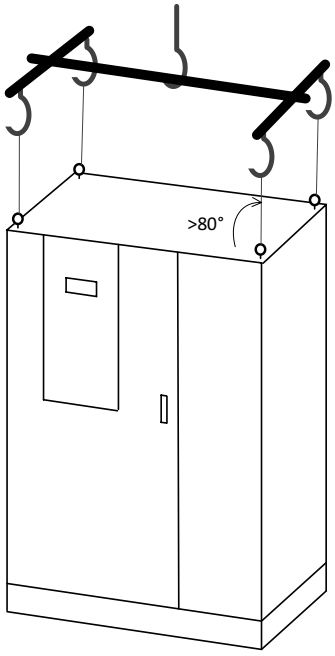


**CAUTION:**
**- Only transport the cabinets in an upright position!**
**- Never tilt or cant, always observe the centre of gravity!**
**- Always keep the battery cells in a vertical position.**
**- Never lift a battery cell by its connections.**
**- Do not put or drop objects on the battery.**
**- Do not stay or walk under suspended loads.**
**- Always wear protective clothings and accessories.**

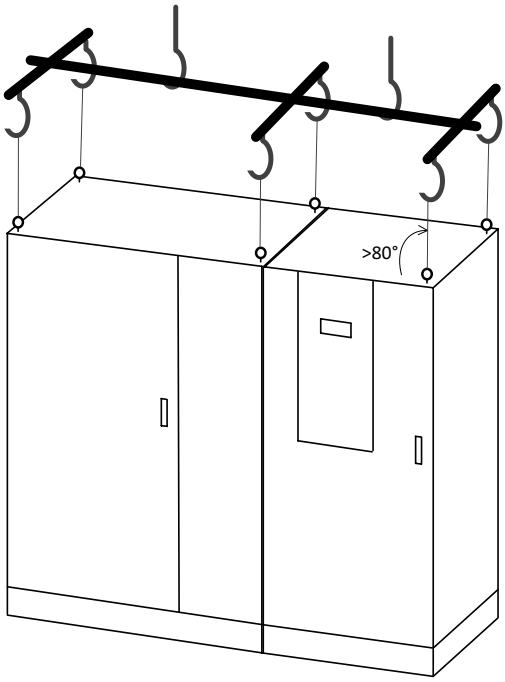
Instuctions for lifting using the eye bolts :




Single cabinets <300kg




Single cabinets ≥300kg

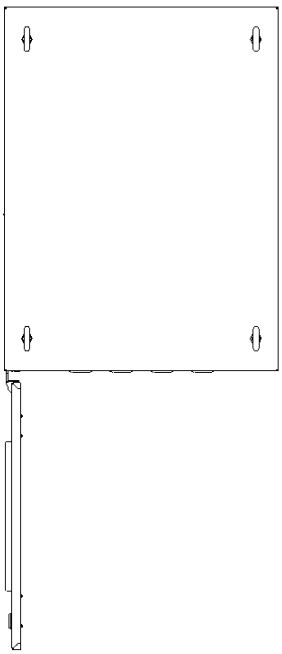



Coupled cabinets

# 3.2 INSTALLING AND SECURING THE RECTIFIER CHARGER

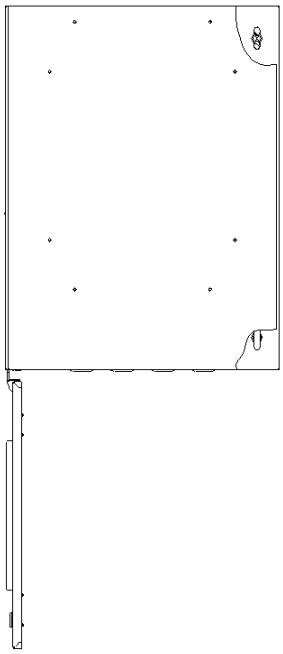
Select an installation site with the following characteristics:

- Ambient temperature and relative humidity as specified in section 3.4.
- Ambient air free from dust and corrosive gases.
- Floor sufficiently flat.
- Floor sufficiently strong to carry the weight of the equipment.
- Sufficient space at the front to open the door (see picture below).
- So that the cabinet will not be distorted, some wedges can be used to ensure the mechanical interface between the floor and cabinet fixations. This ensures a correct tightening torque.
- For the distances between hole centre, the location and the diameter of the fixing holes, refer to the customer drawings.



*IP21 cabinet with open door top view*

The maximum door opening is 180°.
The minimum door opening in order to carry out the maintenance tasks is 120°.



*IP42 cabinet with open door top view*



**CAUTION:**
**Securing the cabinets to the floor is required if the equipment has integrated batteries and is recommended otherwise.**



**CAUTION:**
**Do not touch the metal section near the heating resistor.**
**Do not touch neither the rectifier bridge nor blocking diode heatsinks.**

**A. Installing a single cabinet**

- For the distances between hole centers, the location and the diameter of the fixing holes, refer to the customer drawings.
- Mark the cabinet position on the floor.
- Perform the drillings (four holes).
- Position the cabinet.
- Fix the cabinet to the floor.

**B. Installing a single cabinet with a gland plate**

Refer to the instructions indicated in paragraph A.
In this case, the gland plate is used as drilling gauge and must be positionned between the floor and the cabinet, the removable gland plate windows shall be placed just below the terminal blocks.

**C. Installing and coupling the cabinets on site**

- Refer to the drawings to know the cabinets positions.
- To install and fix the cabinets to the floor, depending on the delivered configuration refer to the instructions given in paragraph A or B.
- On each cabinet, on the coupling side, unscrew and remove the eye bolts, if present, or the fixing screws of the roof.
- Between each cabinet, install the intermediate roof.
- Mount back the eye bolts or the screws to fix the intermediate roof.

**D. Installing a cabinet with IP2x rear panel**

In some cases, the rear panel can be perforated with IP2x holes (refer to project drawing) and in this case it's necessary to leave 100 mm space at the back of the cabinet. Refer to the instructions given in paragraph A, B or C.

**E. Installing a cabinet with forced cooling**

For systems equipped with fans, depending on the configuration, refer to the instructions given in paragraph A, B or C.

# 3.3 INSTALLING THE BATTERY

The ground or floor must be strong enough to carry the weight of the batteries and/or stands or cabinets in which they are mounted.

# 3.4 ENVIRONMENTAL REQUIREMENTS (EXCLUDING THE BATTERY)

**Storage in standard carboard packing box**

| | |
|---|---|
| Temperature: | - 25°C to +70°C |
| Relative humidity: | 15% to 90% in the original package. |
| Maximum storage period: | 3 months. |

**Storage in seaworthy packing**

| | |
|---|---|
| Temperature: | - 25°C to +70°C |
| Relative humidity: | 15% to 90% in the original package. |
| Maximum storage period: | 12 months. |

***For a storage period exceeding the values recommended above, contact the factory in order to know the required environmental conditions and the maximum storage duration.***

**Operating**

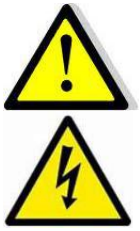
| | |
|---|---|
| Temperature: | 0°C to +40°C<br>Above 40°C and up to 55°C, the output current must be de-rated (1.25% per °C). |
| Relative humidity: | 20% to 95 % (non-condensing). |

**Altitude**

≤ 1000 m

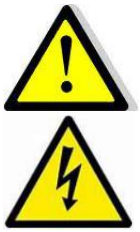
Above 1000 m and up to 4000 m, the output current must be de-rated (7% per 1000 m).

# 4 CONNECTIONS (*REFER TO THE CUSTOMER DRAWING PACKAGE*)



**ANY OPERATION ON THE EQUIPMENT SHALL BE CARRIED OUT BY QUALIFIED PERSONNEL AWARE OF SPECIFIC ELECTRICAL HAZARDS AND PRECAUTIONS TO BE TAKEN. NEVER ASSUME THE ABSENCE OF VOLTAGE, ALWAYS CHECK WITH A VOLTMETER BEFORE ANY OPERATION ON A SYSTEM.**

Always make the connections with power off and the circuit-opening devices in the **"open"** position:
- Mains and load protective devices open.
- Battery protective device or disconnecting switch open.
- Power switch to "OFF" *(option)*.



**If an external protection or cut-off device is mounted between the charger output and the battery shunt, it is necessary to provide an auxiliary contact "position open" of this device to open the battery current measurement to avoid damaging the control system.**
**The external battery shunt must be inserted on the negative polatity of the battery, never on the positive polarity as this will damage the charger control board.**
**Please contact AEG Power Solutions Customer Service Department.**

## 4.1 MAINS INPUT CONNECTION



**DANGER, IF THE RECTIFIER IS EQUIPPED WITH AN OPTIONAL INPUT FILTER:**
**MAINS INPUT: HIGH LEAKAGE CURRENT.**
**EARTH CONNECTION IS MANDATORY BEFORE CONNECTING THE MAINS SUPPLY.**

It is mandatory to install a mains input protection in the mains switchboard, upstream the charger.

Recommended rating: 2 x charger nominal input current.
- The nominal input current is specified on the electrical characteristics page of the customer drawing package.
- As standard, the inrush current is less than 20 times the input current.

Connect the mains input to the terminal block located in the connection area.

**In case of TPRe, the units are not phase rotation sensitive.**

Remember to connect the earth bar to the site reference earth.

# 4.2 BATTERY CONNECTION







**IMPORTANT RECOMMENDATIONS**

**REFER TO THE BATTERY MANUAL.**
**Refer to the battery manufacturer's instructions for the storage conditions.**
**Never short-circuit a battery.**

**Allow no flame nor sparks in the battery room. Never smoke in the battery room.**
**Never disconnect a battery being charged.**

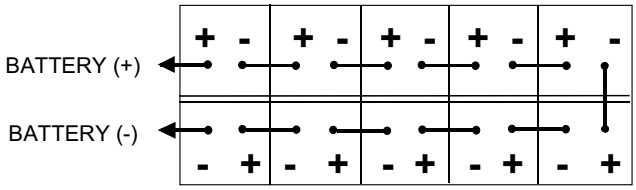
**To handle the electrolyte, use gloves and safety goggles.**
**The electrolyte contained in a battery is dangerous to the skin and clothes.**
**Before doing work on a battery, make sure that there is an accessible supply of water nearby. If electrolyte is splashed, wash immediately with water and refer to battery safety data sheets.**

**Use tools with insulated handles.**

**Remove the shipping plugs from "open" Ni-Cd batteries. Always use maintenance accessories (especially electrolyte handling tools) suited to the batteries.**

### Reminder

Battery cells must be connected in series, i.e. the (+) pole of each cell must be connected to the (-) pole of the next cell.




*Series connection of battery cells*

### Battery on stand

. Position the battery cells and connect them in series.
. Check that no cell is missing.
. Check that the connections are tight.
. Connect the battery (-) to the (-) BATT terminal of the charger (via the fuse box if applicable).
**Do not connect the positive cable until start-up time.**

### Battery in cabinet

**Case 1: Battery delivered separated from the charger system :**

. Connect the battery cells in series using the connecting cables supplied with the equipment, starting from the lowest tray.
. Position the battery trays so that:
- the tray with the largest number of cells is located at the lowest position inside the cabinet,
- the tray with the smallest number of cells is located at the highest position inside the cabinet.
. After connecting in series all the cells of each tray, connect the trays in series.
. Check that the connections are tight.
. Connect the battery (-) to the (-) BATT terminal of the charger (via the fuse box if applicable).
**Do not connect the positive cable until start-up time.**

**Case 2: Battery delivered already installed in the cabinet :**
In this case, before start-up, perform the following operations:

. Remove the straps (or clamps).
. Check that the connections are tight.
. Connect the battery (-) to the (-) BATT terminal of the charger (via the fuse box if applicable).
**Do not connect the positive cable until start-up time.**

**IN ANY CASE, a battery short-circuit and overcurrent protection must be connected between the battery and the charger if the charger is not equipped with such a protective device.**

# 4.3 CONNECTING THE OPTIONS

Refer to the customer drawing package.

# 4.4 CONNECTING THE REMOTE ALARM OUTPUTS

Refer to the customer drawing package.

# 4.5 CONNECTING THE LOAD

Connect the load (+) to the load (+) terminal of the equipment.
Connect the load (-) to the load (-) terminal of the equipment.

# 5 START-UP (*REFER TO THE CUSTOMER DRAWING PACKAGE*)

# 5.1 PRELIMINARY CHECKS

All circuit-opening devices must be in the "open" position.
Check that the mains line protective device rating has the appropriate rating *(see section 4.1)*.
Check that the mains voltage and frequency are compatible with the equipment (see equipment nameplate).
Check that the mains, battery and load connections are tight.
Check the polarities and that the battery cells are correctly connected in series.

# 5.2 SWITCHING ON

- **Leave the positive side of the battery open,** either through protective or opening device *(e.g. fuse F13: case 1 below)* or through the battery cable not connected to the (+) BATT terminal of the charger *(case 2 below)*.

- Close the negative side of the battery (-) (fuse, protective device, etc … ).
- Close the mains protective devices. Turn on the mains input and the rectifier.

The rectifier starts and the display shows:

| |
|---|
| ≂ v x.y.z |

*V x.y.z = software version of the display controller*

After a few seconds, the display shows:

| |
|---|
| AEG PS-GCAU |
| Vxx.yy/aa.bb |

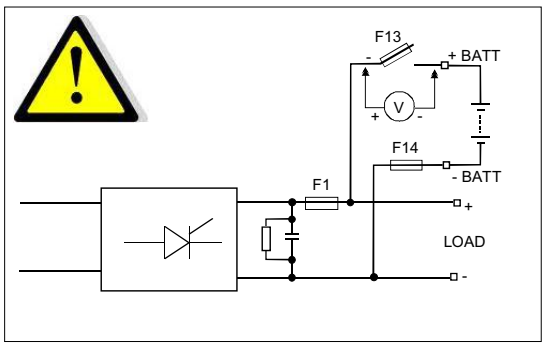
*Vxx.yy and aa.bb are the software versions of the two micro controllers of the GCAU board*

After a few seconds, the display shows the floating voltage and the rectifier current (at no-load).

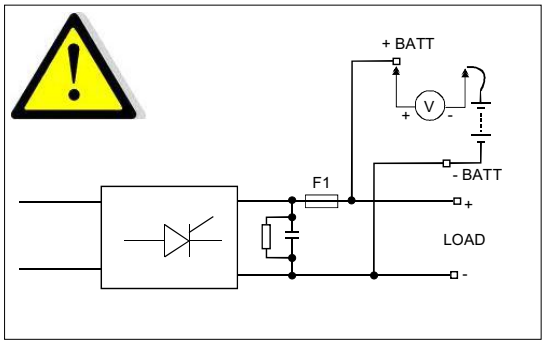
| | |
|---|---|
| DC:xx.xV | 0.5A |
| Alarms: | |

*NOTA: The current value can be around 0.5 A.*

To check that the battery polarities are correct, take a voltage reading using a DC voltmeter as shown below:




*- Case 1 -*
*Configuration with battery fuse F13*




*- Case 2 -*
*Configuration without opening device*

The voltage reading must not exceed 30% of the nominal voltage (refer to the customer drawings).

**. If the voltage is outside of this tolerance, check the battery cables for correct polarity.**

. If the voltage is correct, close fuse F13 or connect the battery (+) cable to the rectifier terminal. The rectifier will charge the battery. During this operation, arcing may develop across the actuated device.

- Check that the displayed current increases (current to the battery).

| |
|---|
| DC:xx.xV |
| 3.0A |



**Dangerous voltages exist across the battery and/or load terminals. Take the necessary safety precautions.**



**We recommend to change "user" and "supervisor" passwords to prevent bad handlings. Refer to paragraph 6.7.3.**

# 5.3 START-UP PROCEDURE OF SPRE/TPRE PARALLELED SYSTEMS

In the case of SPRe/TPRe units with battery (each one) connected in parallel for redundancy, respect the following instructions :

- **Check that the output protective device of each unit is open.**
- Start-up the rectifier-battery assembly n°1 according to the previous paragraph 5.2.
- Start-up the rectifier-battery assembly n°2 according to the previous paragraph 5.2

Then close the output protective device of each unit.

## 5.4 BATTERY COMMISSIONING CHARGE

For open lead-acid and Nickel-Cadmium batteries, at initial start-up, a commissioning charge can be performed according to the battery manufacturer's instructions (refer to the battery manual).
Open load circuit.
From the command menu, set the rectifier to the commissioning charge (refer to paragraph 6.6.2).
The initial start-up current and time are factory set. Refer to the "System setup" menu (refer to paragraph 6.7.3.2) to see the adjustment value.

NOTE: If the A3 board (C15-100 rectifier monitoring board) is fitted, the overvoltage control of the card shall be disabled. With analog A3 board, remember to enable the overvoltage control once the commissioning charge is completed. This overvoltage control is enables automatically with digital A3 board.

**At the end of the commissioning charge:**
- **from the "Alarm" menu, reset the "HIGH DC VOLTAGE" alarm. This alarm can be triggered when returning from commissioning charge to floating charge.**

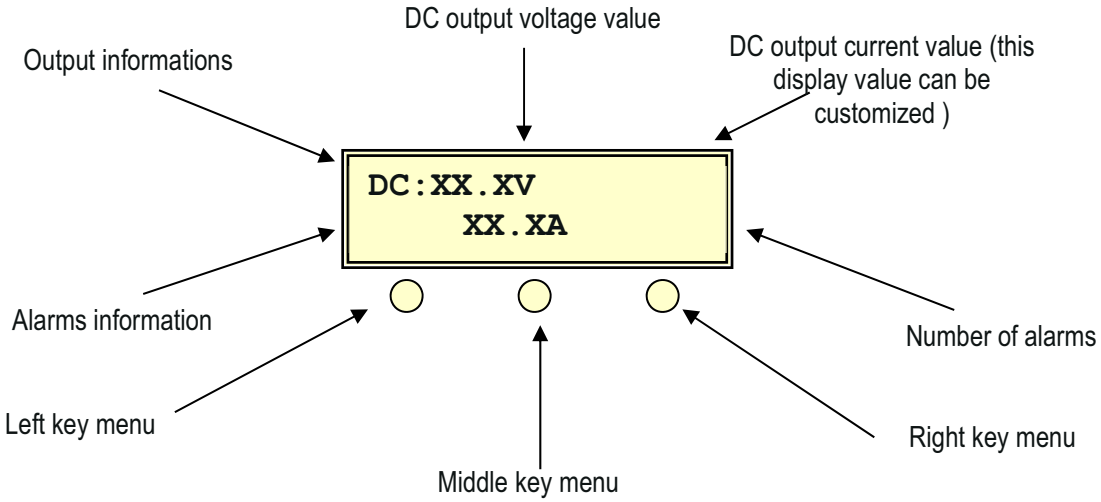
# 6 OPERATING INSTRUCTIONS

The following section explains the basic operator menu structure of your system. It allows you to access all necessary functions in order to operate your system.
The menus, indications and controls available depend on the system configuration.

The keyboard assembly has two LEDs indicators:
- green LED: "System OK" (indicates proper operation).
- red LED: "Fault" (a fault is present).

The green LED is always on in case no alarms are present.
In case an alarm is present, the red LED comes on and flashes.
If the alarm is acknowledged, the red LED is on permanently provided the alarm is still active.
If no alarms are active after an acknowledgement, the red LED will be switched off and the green LED comes on again.

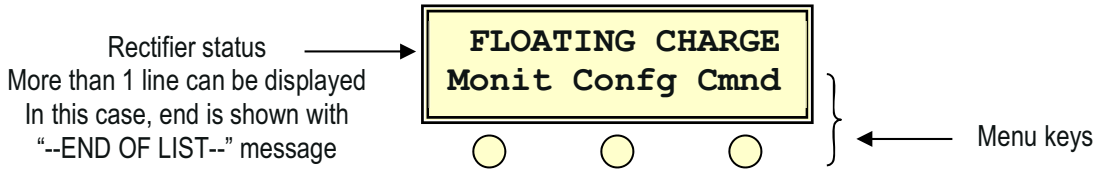
## 6.1 DEFAULT MENU




The top line ("DC") will display the charger voltage and the load current with battery shunt or the total charger current (battery + load) when the battery shunt is not active.

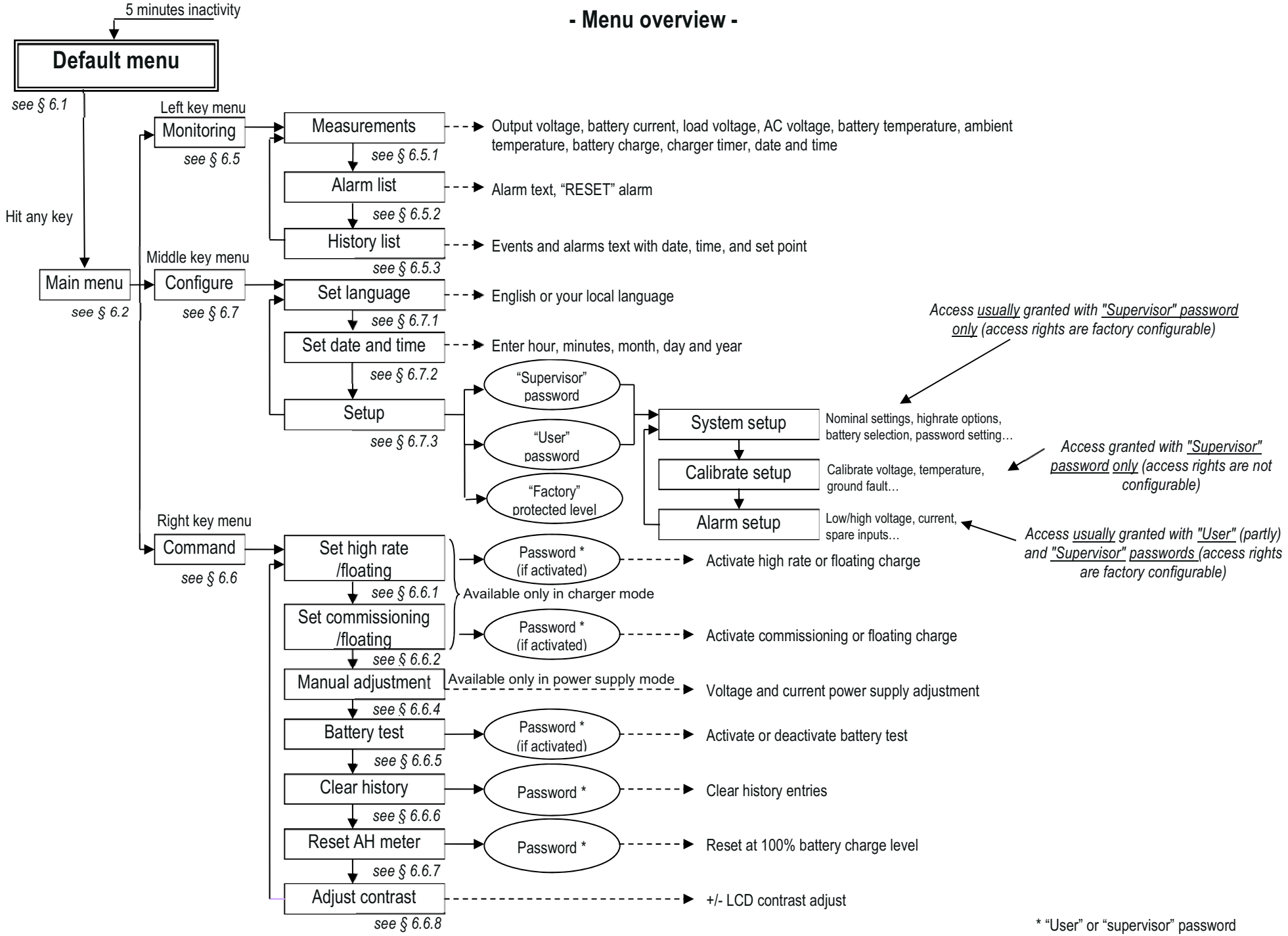
**Hit any key to go to main menu**

## 6.2 MAIN MENU




The different rectifier statuses are:
- FLOATING CHARGE
- HIGHRATE CHARGE
- COMMISSIONING
- CHARGER OFF (see Chapter 11 "ELEMENTARY TROUBLESHOOTING for more explanations)
- BATTERY TEST.

# - Menu overview -

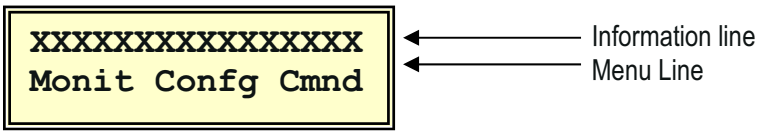



Note: According to your equipment configuration, some menus may be inactivated.

# 6.3 HUMAN INTERFACE STRUCTURE

The human interface is based on consistency in operation. Consistency means that the functions are grouped logically within the menu structure and will provide ease of use for the operator.

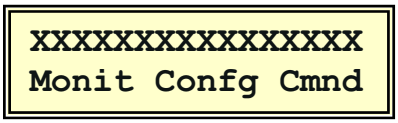
The LCD Display has 2 lines by 16 characters. The top line is always used to indicate information while the bottom line is used for the menu structure indication.




There are three major menu groups under which all functions are located.

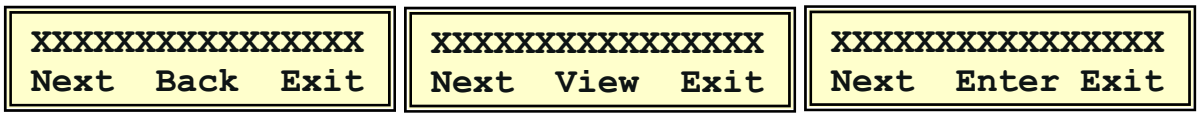
These groups are defined as:

- **Monitoring** Displaying analog measurements and alarms
- **Configuration** Configuring the system
- **Commands** Manually activated functions (High rate, Battery test etc.)




The menu indication uses five basic menu functions with the following functions:

- **Next** One step forward in the menu
- **Back** One step back in the menu
- **View** Display a selection
- **Enter** Acknowledge an entry
- **Exit** Always return to default menu



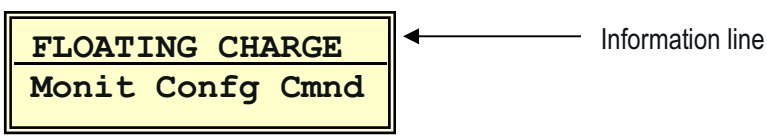

The following sections will clearly explain how you can access the various functions.

# 6.4 STATUS INDICATION DISPLAY

As explained in the previous chapter the top line of the display will indicate information about the status of the system. If more than one message is active, the messages are displayed in sequence. Each message is displayed for 1 second before the next message is displayed.

The following messages are displayed:

- Alarm texts of the active alarms
- Charge status messages
- Events




The messages are dynamic meaning they are updated continuously. If the alarm texts are latched you must go into the alarm menu to clear the text from the display. Refer to section 6.5.2 for details.

# 6.5 MONITORING FUNCTION

### 6.5.1 How to Display the Measurements

You will find the measurements menus under the Monitoring function. The Monitoring function will display all relative meter indications on the top line of the LCD.

Follow the instructions below.

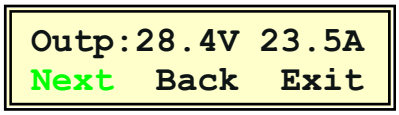
From the main menu select **'Monit'**.




Select **'View'**.




The top line ("Outp") will display the battery voltage and the total charger current (battery + load).
Display resolution is 1 decimal for V and A <100 and no decimal for values > 100.




The **'Next'** key can be used to scroll through all available measurements.

In order of appearance the following measurements can be displayed:

- Load voltage and current*
- Battery current (charge and discharge)*
- Battery voltage and total charger current
- AC input voltage*
- Battery temperature*
- Ambient temperature*
- AH Meter*
- Remaining charge time* (if in High rate or Commissioning charge)
- Date and Time
- Customized measurements (depends on system configuration)

* Menu can be disabled on customer demand.

Note about the ambient temperature in VO battery mode:
The ambient temperature read on the LCD display is particular in case of a VO battery is used. The first value indicates the instantaneous ambient temperature and the second value, between brackets, indicates the integrated ambient temperature. The integrated value is an average temperature calculation on several hours. This function works to absorb fast thermal changes.

### 6.5.2 How to Display the Alarm List

You will find the Alarm list indication under the Monitoring function. This Alarm List indication will display all active alarms on the top line of the LCD.

Follow the instructions below.




From the main menu select **'Monit'**.

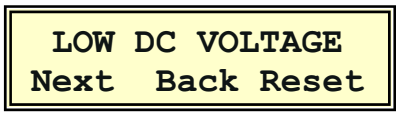



Select **'Next'.**




The display indication XX shows you how many alarms are in the alarm list. The list shows Active alarms and Non-acknowledged (Reset) alarms based on the alarm configuration. If a "LCD Latch" function is selected for an alarm, it will remain in the alarm list even if the alarm condition has disappeared. In this case, a manual alarm reset will clear it from the alarm list.

Select **'View'**.




The alarm is shown in clear text on the top line. Pressing **'Next'** will show you the next alarm in the list and pressing **'Back'** will show you the previous alarm in the list.

If an alarm has not been acknowledged the text **'Reset'** will flash. If the alarm is acknowledged and the alarm option "LCD latch" was activated (see Alarm Setup for details), the alarm will be removed from the list provided the condition of the alarm has been cleared.

If an alarm is associated with a signalling relay with latching, the display of this alarm is imperatively "latch" set. The acknowledgment of the alarm using the display causes the acknowledgment of the associated relay too.

### 6.5.3 How to Read the Alarm and Event Memory List (History List)

The control board GCAU in your system is equipped with an Alarm and Event list. The GCAU board stores the alarm and events, in order of appearance, in a non-volatile memory (permanent storage). Events in this context means indicating if the system has been switched to High rate, Float or Commissioning, Entering the setup mode, Clearing the history etc.
The memory is based on a FIFO mechanism (**F**irst **I**n **F**irst **O**ut), which means that if the memory is full the oldest event or alarm will be removed from the list.
The alarm and events are time/date stamped using an RTC (Real Time Clock).

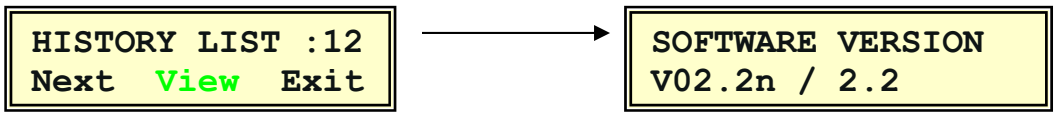
Follow the instructions below.




From the main menu select **'Monit'.**

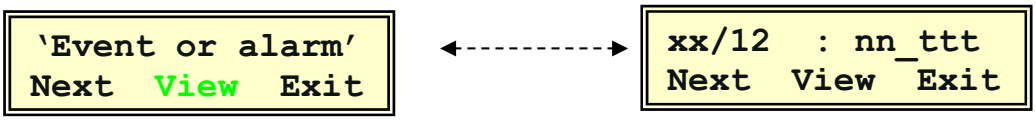



Select **'Next'** until the top line shows below text.



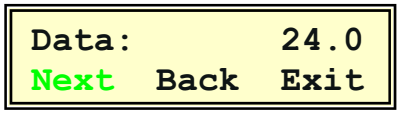

Select '**View**' *Example*

The "history list" screen indicates the quantity of Alarm and Event in the list.
Viewing the "history list" will display first the internal software versions of the GCAU board for reference. This message is displayed for two seconds. After two seconds the display will show:



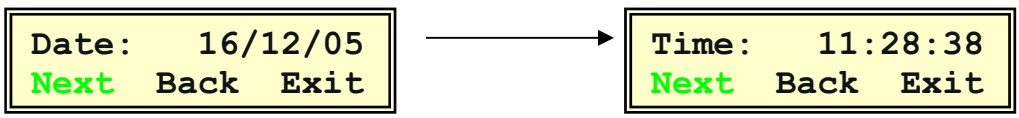

Top line shows "event or alarm" text.
A non permanent screen will indicate during 1 s the place (xx) of the "alarm and event" in the history list, its internal code (xx) and its internal acronym (ttt).

Select **'View'**




Top line shows set point (alarm level) if valid (analog alarms only)

Pressing **'Next'** will show the date and time of the Alarm/Event:




Date format is dd/mm/yy (if temperatures unit is °C) or mm/dd/yy (if temperatures unit is °F).

# 6.6 COMMAND FUNCTION

According to the factory set configuration, your system can have several specific command functions. All these commands are accessible through the Command function **'Cmnd'**.

The different command functions are:
- Manual High rate Charge
- Manual Commissioning Charge
- Manual floating Charge
- Manual Adjustment of Voltage and/or Current
- Battery Test Function
- Clear History List
- Set Display Contrast
- Reset Ah meter.

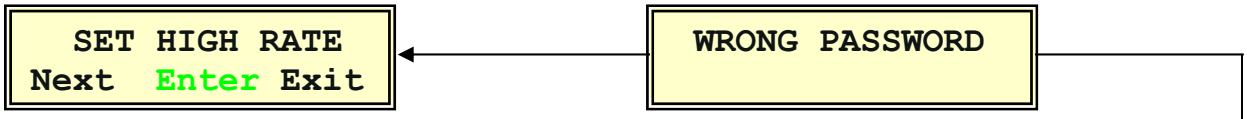
### 6.6.1 How to Activate Manual High rate Charge

The Manual High rate charge is a command function and is located under the Command (**'Cmnd'**) key. To prevent accidental activation, this command can be password protected if required. Follow the instructions below.

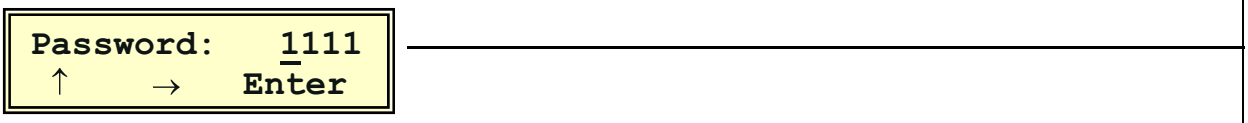



Starting from the main menu, select **'Cmnd'**.

Press **'Next'** until the following indication is displayed:

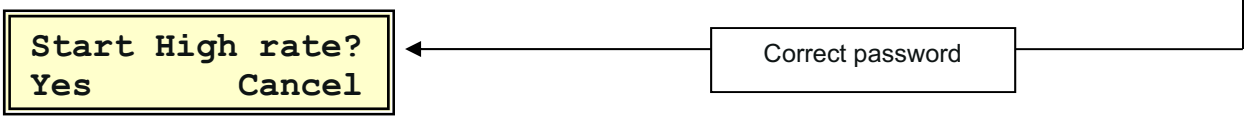



Press '**Enter**'




With the right pointing arrow '→' the digit position can be selected and with the arrow up '↑' an alphanumeric character between 0 and 9 or between A and Z can be set. When all four characters are set, press **'Enter'**.
If the password is correct, the display switches to the High rate on/off selection.
Incorrect passwords will cause a jump of two positions back in the menu tree and a message **'WRONG PASSWORD'** is displayed.

If no password is activated the High rate selection menu will be shown directly.




The high rate charge can be switched on by pressing the "Yes" key.

To stop the high rate charge, the user can manually put the rectifier in floating charge mode via the command menu (see the 6.6.3 paragraph) or wait for the timer times out. In this last case, the rectifier switches automatically in floating charge mode.
The remaining high rate charge time can be read on the LCD display via the measurements menu.
See paragraph 6.5.1.

### 6.6.2 How to Activate Manual Commissioning Charge

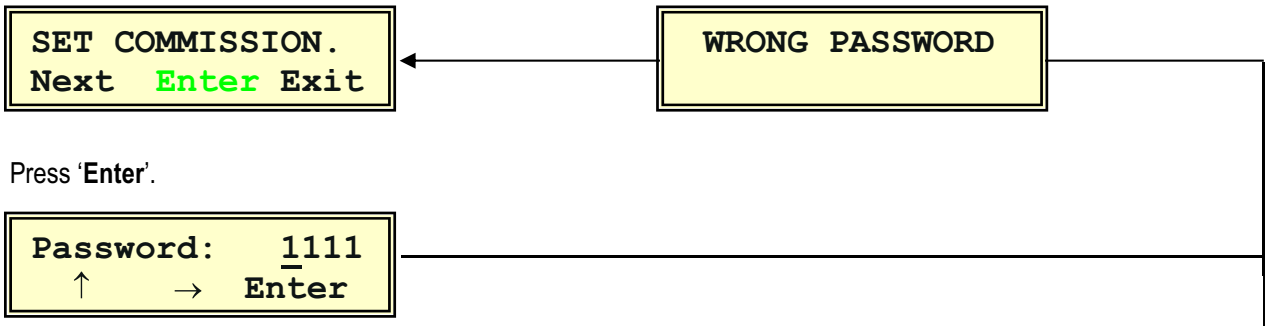
The Manual Commissioning charge is a command function and is located under the Command (**'Cmnd'**) key. To prevent accidental activation, this command can be password protected if required.

Follow the instructions below.




Starting from the main menu, select **'Cmnd'**.

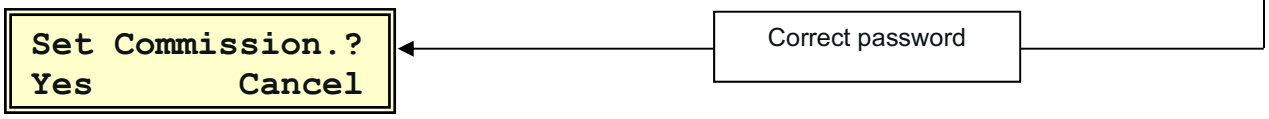
Press **'Next'** until the following indication is displayed:




Press '**Enter**'.

With the right pointing arrow '→' the digit position can be selected and with the arrow up '↑' an alphanumeric character between 0 and 9 or between A and Z can be set. When all four characters are set, press **'Enter'**.
If the password is correct the display switches to the Commissioning on/off selection.
Incorrect passwords will cause a jump of one position back in the menu tree and a message **'WRONG PASSWORD'** is displayed.

If no password is activated the Commissioning selection menu will be shown directly.




With **'Yes'**, the Commissioning charge can be switched on.

To stop the commissioning charge, the user can manually put the rectifier in floating charge mode via the command menu (see paragraph 6.6.3) or wait for the timer times out. In this last case, the rectifier switches automatically in floating charge mode.

The remaining commissioning charge time can be read on the LCD display via the measurements menu. See paragraph 6.5.1.

### 6.6.3 How to activate Manual Floating Charge

When you are in high rate or commissioning charge mode, you can manually switch the rectifier in the floating charge mode. Follow the instructions below.




or

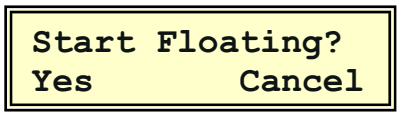



Starting from the main menu, select **'Cmnd'**.

Press **'Next'** until the following indication is displayed:




Press **'Enter'**.




Floating charge can be switched on by hitting the **'Yes'** key.

### 6.6.4 Manual Voltage and Current adjustment (OPTION)

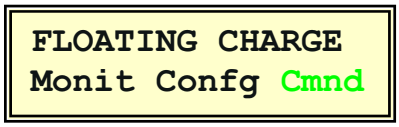
If required, your system can be programmed as a power supply. It allows you to adjust the output voltage and output current over a wide range. Both functions can be activated independently.
When only the output current adjustment is activated, the output voltage is the voltage of the current charge (floating, highrate, commissioning).

***Warning:***
*Do not activate this option when the charger is used for normal battery charging. Consult the nearest agent of your system if you want to use this option. Activating this option without the necessary system knowledge can damage the connected battery.*

The rectifier operates as a power supply only. It delivers the adjusted voltage and, if activated, the manually adjusted current. If the manual current adjustment is not activated the current limit is as specified on the nameplate of your system.
The voltage adjustment is configured to operate within a window.

#### *6.6.4.1 How to Adjust the Voltage and Current (Manual Adjustment)*

The procedure below explains how to adjust the voltage and current if the manual Voltage and/or Current option is activated.




Current adjustment only activated

or



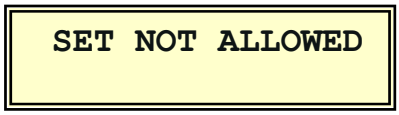

Voltage adjustment activated
(current adjustment activated or no).

Starting from the main menu, select **'Cmnd'**.



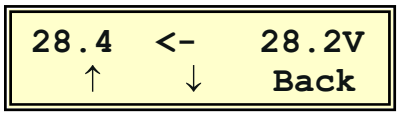

Press **'Next'** until the text 'ADJUSTMENT' is displayed and press **'Enter'**.

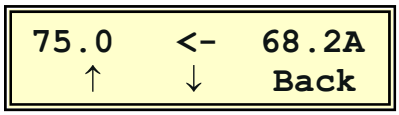



From this menu, the Voltage or Current adjustment can be selected. If one of these options is not active and the function is selected, a message **'SET. NOT ALLOWED'** is displayed for two seconds.

If you need to set the voltage, press **'Volts'**. If you need to set the current press **'Amps'**.




Left: display of setpoint value (change with up or down arrow key).
Right: display of actual value (measurement).
When you press the arrow up '↑' the voltage or current increases. The arrow down '↓' will decrease the voltage or current.
The values are saved in the system memory ensuring the values are permanently stored. Adjustment Resolution is 1 decimal V or A <100 and no decimal for values >100.

### 6.6.5 Battery capacity test Function (OPTION)

The Battery Test feature can be used to test the battery performance. The test can be initiated manually or automatically.

Three programmable parameters define the battery test:

- Discharge Current
- End Voltage
- Tolerance percentage.

***Warning:***
*Contact the nearest agent of your equipment for details of the above settings.*

Wrong settings can cause mis-interpreted battery performance or loss of DC power.

#### *6.6.5.1 How to Activate the Battery Test*

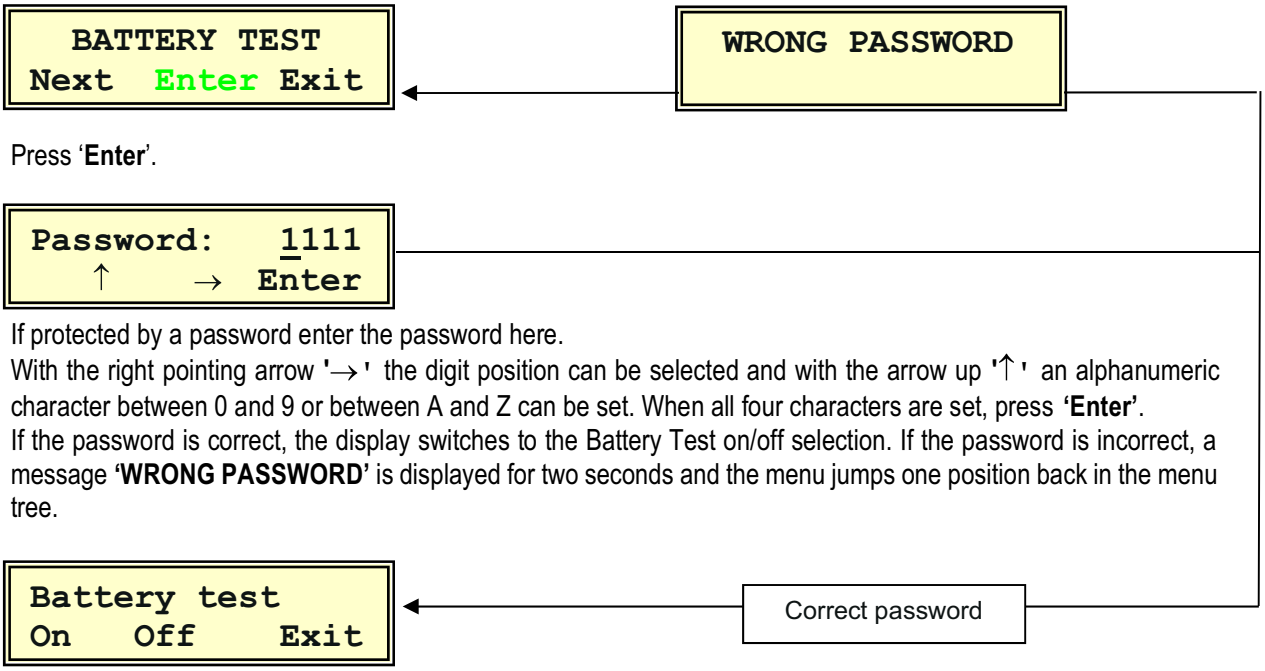
Before activating this test, make sure you are familiar with the Battery Test Operation as further-described in paragraph 8.6.13 BATTERY CAPACITY TEST.

Follow the instructions below.




Starting from the main menu, select **'Cmnd'**.

Select '**Next**' until the following menu is displayed.




Press '**Enter**'.

If protected by a password enter the password here.
With the right pointing arrow '→' the digit position can be selected and with the arrow up '↑' an alphanumeric character between 0 and 9 or between A and Z can be set. When all four characters are set, press **'Enter'**.
If the password is correct, the display switches to the Battery Test on/off selection. If the password is incorrect, a message **'WRONG PASSWORD'** is displayed for two seconds and the menu jumps one position back in the menu tree.

Activate or de-activate the Battery Test by selecting **'On'** or **'Off'**.
The display will show if the battery test is on or off.

### 6.6.6 How to Clear the Event and Alarm History List

If required, the event and alarm history list of your system can be cleared from the front panel. A password on Supervisor or User level is mandatory to clear the list.

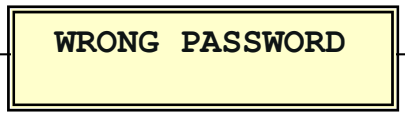
Follow the instructions below.



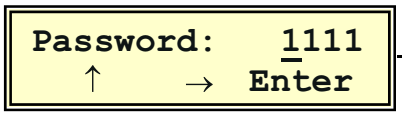

Starting from the main menu, select **'Cmnd'**.

Select '**Next**' until the following menu is displayed.



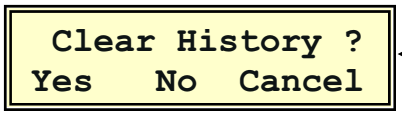

Press '**Enter**'.

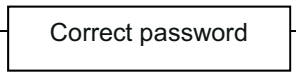



A Supervisor or User level password is required to continue.

With the right pointing arrow '→' the digit position can be selected and with the arrow up '↑' an alphanumeric character between 0 and 9 or between A and Z can be set. If all four characters are set, press **'Enter'**.

When the password is correct, the display switches to the Clear History Yes/No selection. If the password is incorrect, a message **'WRONG PASSWORD'** is displayed for two seconds and the menu jumps one position back in the menu tree.



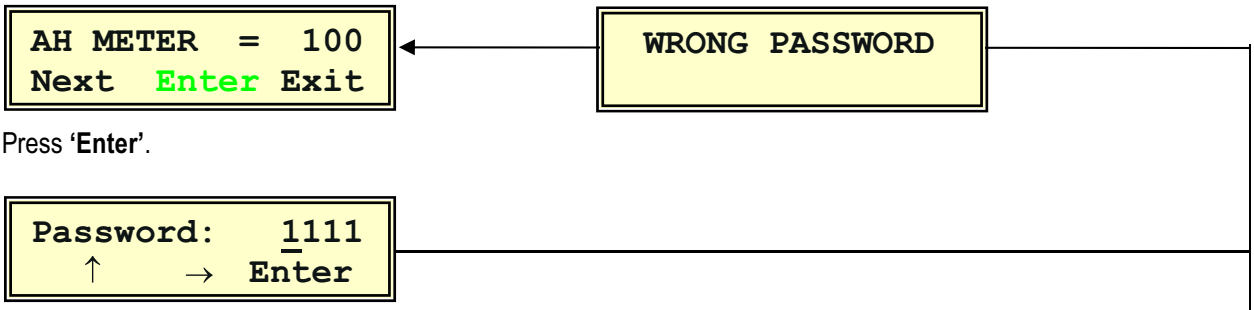

Clear the History list by pressing the **'Yes'** key. Pressing **'No'** will cause a jump two menus back.

### 6.6.7 How to reset Ah Meter



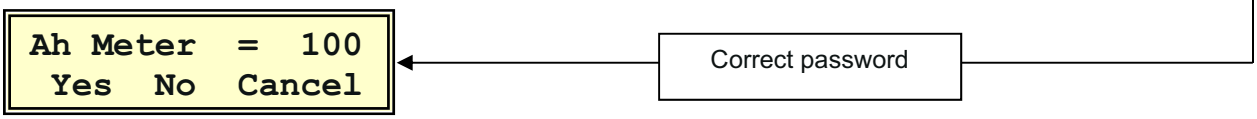

Starting from the main menu, select **'Cmnd'**.

Select '**Next**' until the following menu is displayed.




Press **'Enter'**.

A Supervisor or User level password is required to continue.
With the right pointing arrow '→' the digit position can be selected and with the arrow up '↑' an alphanumeric character between 0 and 9 or between A and Z can be set. If all four characters are set, press **'Enter'**.
When the password is correct, the display switches to the **'Ah Meter = 100'** Yes/No selection. If the password is incorrect a message **'WRONG PASSWORD'** is displayed for two seconds and the menu jumps one position back in the menu tree.




Reset Ah meter by pressing the **'Yes'** key initiates the battery Ah counter to 100% and causes a jump to the default menu. Pressing **'No'** or **'Cancel'** will cause a jump to **'AH METER = 100'** menu.
This manipulation must be always done before a manual battery test.

### 6.6.8 How to Adjust the Display Contrast

The display contrast can be adjusted in two ways:

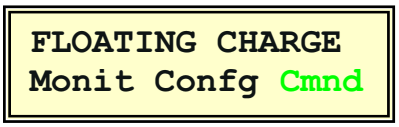
- From the default menu directly
- Using the Command function.

#### *6.6.8.1 Adjusting the Contrast from the Default Menu*

When the contrast is too low to read the display, the contrast can be adjusted directly from the default menu. If the leftmost button from the default menu is held, the contrast will be decreased. If the rightmost button from the default menu is held, the contrast will be increased. If you are not sure whether the default menu is displayed, do not touch any button for 5 minutes. This will automatically activate the default menu.

#### *6.6.8.2 Adjusting the Contrast using the Command Function*

To adjust the display contrast using the Command function, follow the instructions below:

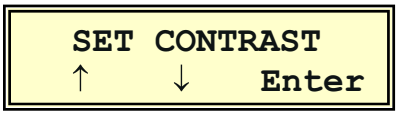



Starting from the main menu select '**Cmnd**'.

Select '**Next**' until the following menu is displayed.




Press '**Enter**'.



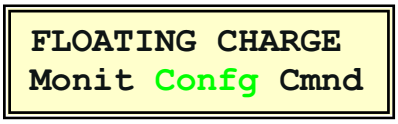

Use the arrow keys to adjust the contrast.

# 6.7 CONFIGURATION FUNCTIONS

### 6.7.1 How to Change the Language

Two languages are available in your GCAU board: the standard language (English) and a second one: the one you specified when you ordered your equipment.

To change the language, follow the instructions below:

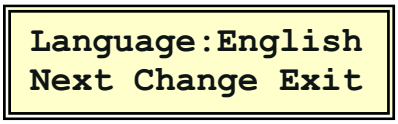



Starting from the main menu select '**Confg**'.

Select '**Next**' until the following menu is displayed.

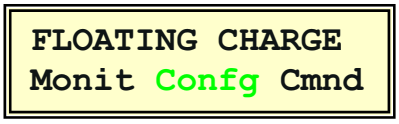



Press '**Enter**'.




Press '**Next**' until the desired language is shown.
Pressing the '**Change**' key will update the selected language.

### 6.7.2 How to set Date and Time

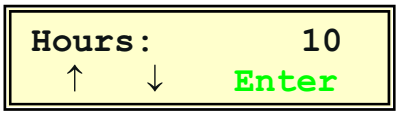



Starting from the main menu, select **'Confg'**.

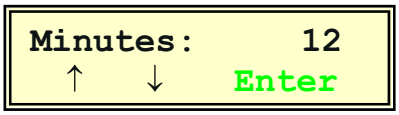
Select **'Next'** until the following menu is displayed.



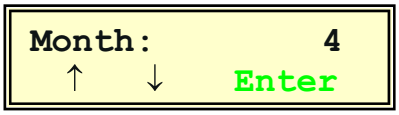

Select **'Enter'**.



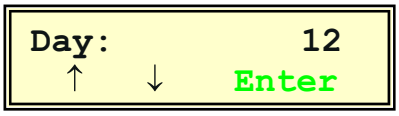

Use the up/down arrows to select the set point of hours. Hit **'Enter'** key to go to next menu.



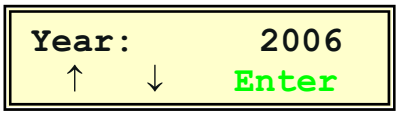

Use the up/down arrows to select the set point of minutes. Hit **'Enter'** key to go to next menu.




Use the up/down arrows to select the set point of month. Hit **'Enter'** key to go to next menu.




Use the up/down arrows to select your the set point of day. Hit **'Enter'** key to go to next menu.




Use the up/down arrows to select the set point of year. Hit **'Enter'** key to come back to the **'SET DATE & TIME'** menu.

### 6.7.3 Setup



**The setup menu is accessible with a “user” or “supervisor” password and it allows the modification of your system configuration. The default “user” password is 1111. For supervisor access password please contact factory. Any modification of your system configuration is your responsibility. You risk damages on your battery or equipment if the modification is done by a non specialized staff.**

According to the factory setting configuration, the access to the "alarms" and "system" setup menus can differ. The following paragraphs describe the menus access usual setup for a standard equipment. When a menu is not accessible to the user, it is not displayed. When there is no menu accessible to the user, the message "SET NOT ALLOWED" is displayed.

#### *6.7.3.1 How to change “user” and “supervisor” password*

Enter the Password setting as follows:

```
FLOATING CHARGE
Monit Confg Cmnd
```

Starting from the main menu, select **‘Confg’**.

Select **‘Next’** until the following menu is displayed.

```
SETUP
Next  Enter Exit
```

Select **‘Enter’**.

```
Password:   1111
  ↑    →   Enter
```

With arrow keys, select the “supervisor” password and hit **‘Enter’** key.

```
SYSTEM SETUP
Next  Enter Exit
```

Enter the system setup by hitting **‘Enter’** key.

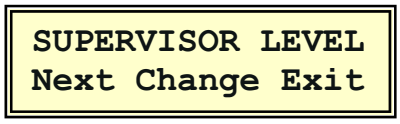
```
BATT.SELECTION
Next Enter Exit
```

Select **‘Next’** until the above menu is displayed.

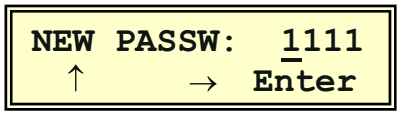
```
PASSWORD SETTING
Next Change Exit
```

Select **‘Change’** to enter the password setting menu.

The first menu is to change the “supervisor” password.




Select ‘Change’.

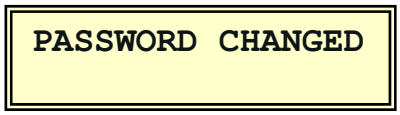



With arrow keys, enter the new “supervisor” password and hit **‘Enter’** key.

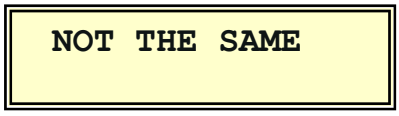



With arrow keys, confirm the new password and hit **‘Enter’** key.

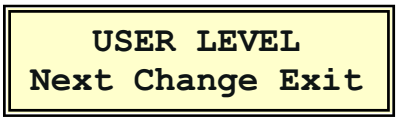
We can distinguish 2 scenarios:




or




In the second case, you must start again.




For the user level, apply the same procedure.

#### *6.7.3.2 System setup*

With the “supervisor” password, you have access to the following setup:

- Battery selection: to select battery type, number of cells etc…
- Nominal settings: to select mains, floating or high rate voltages, limit currents etc…
- Meter selection: to select °C or °F.
- High rate options: to allow manual high rate charge, activate the password protection etc…
- Commissioning options: to allow manual, activate password, select commissioning parameters.
- Manual adjustment: to switch the rectifier in the power supply mode.
- VO application: to specify VO battery parameters.
- Battery test options: to select battery test parameters.
- LVD function: to select Low Voltage Disconnect parameters.
- Diode regulator: to select output diode regulator parameters (option).
- Temperature compensation: to implement the battery voltage temperature compensation (option).
- Communication options: to select serial communication parameters.
- Charge protections: to set battery charge limits.
- “User” and “supervisor” passwords setting: to change “user” or “supervisor” passwords.
- Battery symmetry

#### *6.7.3.3 Alarms and events setup*

The alarms setup menus are available with the “user” password and enable to set up the thresholds and the time-delay of the accessible alarms.
The "supervisor" password enables to set up all parameters of the accessible alarms and events.

Alarms list:

- High mains voltage alarm parameters.
- Low mains voltage alarm parameters.
- Charge fault alarm parameters.
- High battery voltage alarm parameters.
- Low battery voltage alarm parameters.
- High DC voltage alarm parameters.
- Low DC voltage alarm parameters.
- Ground fault + alarm parameters.
- Ground fault – alarm parameters.
- Spare 1 digital input alarm parameters.
- Spare 2 digital input alarm parameters.
- Spare 3 digital input alarm parameters.
- Spare 4 digital input alarm parameters.
- Spare 5 digital input alarm parameters.
- Spare 6 digital input alarm parameters.
- Spare 7 digital input alarm parameters.
- Spare 8 digital input alarm parameters.
- Charger current limit alarm parameters.
- Battery current limit alarm parameters.
- High charger current alarm parameters.
- High battery current alarm parameters.
- High temperature alarm parameters.
- Temperature sensor error alarm parameters.
- Internal communication error alarm parameters.
- Battery test failed alarm parameters.
- Battery test abort alarm parameters.
- High battery temperature alarm parameters.
- Long charge time alarm parameters.
- No power supply voltage alarm parameters.
- Battery operation alarm parameters.
- Battery symmetry alarm parameters.
- Service alarms parameters (if applicable and activated at factory).

#### *6.7.3.4 Calibration setup*

All these setup menus are available with a “supervisor” password.

- Battery voltage.
- Positive battery current.
- Negative battery current.
- Charger current.
- Earth impedance.
- Load voltage.
- Mains voltage.
- Ambient temperature.
- Battery temperature.
- Battery symmetry

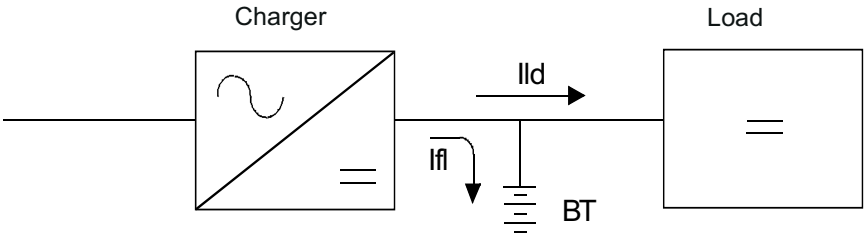
# 7 FUNCTIONAL DESCRIPTION

The SPRe/TPRe rectifiers are thyristor-controlled rectifiers suitable for charging nickel-cadmium or lead-acid batteries while supplying DC loads. The rectifier can be also used without batteries as direct power supplies.

# 7.1 OPERATING SEQUENCES

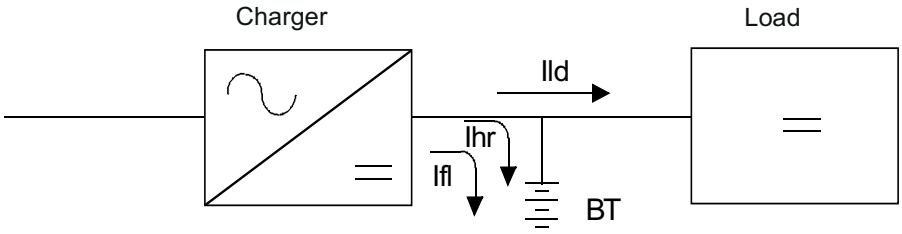
Rectifier with associated battery

Mains power ON – battery on floating



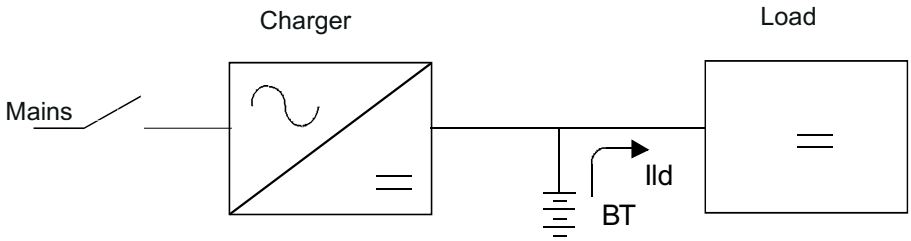

The charger supplies the load (Ild) and delivers a "floating" charge current (Ifl) to battery BT.

Mains power ON – battery recharging




The charger recharges battery BT at a high rate (Ihr) and supplies the load (Ild). The charger automatically switches to "floating" charge (Ifl) when the battery is fully charged.
Thereafter the battery is kept in floating (Ifl).

Mains power OFF




The battery immediately substitutes for the charger in supplying the load (Ild).

# 7.2 CHARGE MODES

The following battery charge modes are available (depending on the equipment):

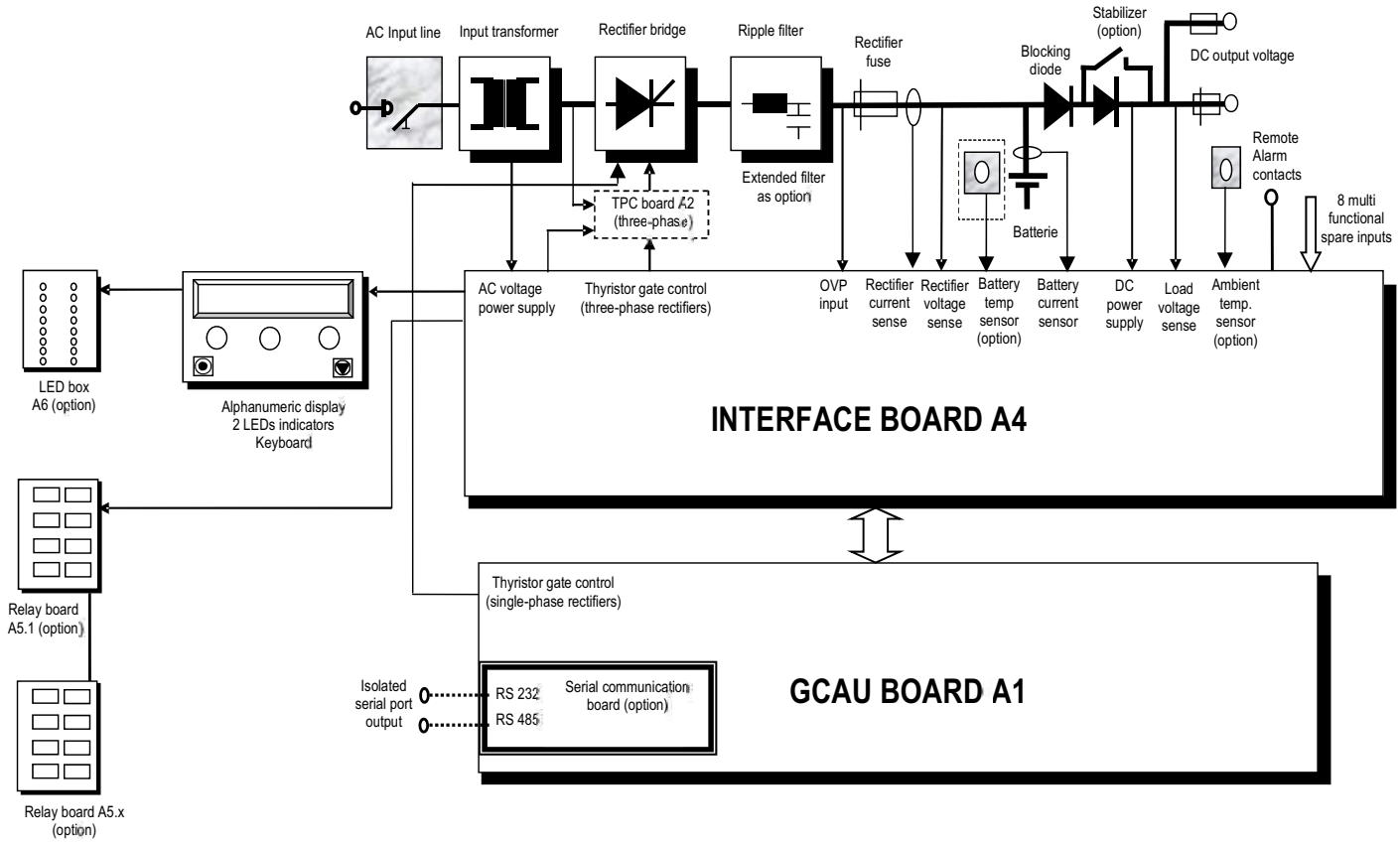
**Floating charge**
Floating charge compensates for the self-discharge of the battery and, in normal operation, maintains the battery in a fully charged condition.

**High rate charge (or equalizing charge)**
High rate charge restores the battery to full capacity.
Depending on the equipment, it can be activated:
- manually from the keyboard,
- automatically by the system which monitors the state of charge of the battery (mains off or rectifier in current-limiting mode or on Ah drop),
- periodically by the system at fixed intervals (1 month, 6 months, 1 year: depending on factory setting).

The high rate charge time is factory-set to a value in the range from 0 to 99 hours.
During high rate charge, the remaining charge time can be displayed.

**Commissioning charge** (or boost charge) ***(option)***
This mode can be used for initial battery charging and is manually activated from the front display.

# 7.3 PRINCIPLE OF OPERATION



The mains voltage is applied to the primary winding of the power transformer via the standard mains input switch or other optional circuit-opening devices. The rectifier is then in service, provided no fault has been detected and/or stored by the monitoring systems.
The power converter rectifies the transformer secondary voltage.
The single-phase power converter consists of a mixed diode/thyristor bridge; the three-phase power converter consists of a full thyristor bridge.
The rectifier current is smoothed by an inductor and the voltage is filtered by capacitors.
The rectifier current is sensed across a rectifier shunt. A blocking diode is connected to the rectifier output and is used to isolate a faulty unit while the rectifiers are in the parallel configuration.

The GCAU control board is supplied via the interface board A4, either by an auxiliary secondary winding of the transformer or from the battery. The GCAU board controls the power converter from internal references (which depend on the battery type and the current charge mode) to regulate the rectifier output voltage and/or current. There is a protective fuse inserted in the positive output polarity of the rectifier.

The battery current is sensed across a battery shunt *(option)*.
A temperature sensor senses the battery temperature and compensates the rectifier output voltage according to the temperature *(option)*.

# 7.4 "GCAU" GENERIC CONTROL AND ALARM UNIT (A1)

This board has two dedicated microcontrollers, memories for the microcontroller and all necessary analog interface circuits to measure and control. The board is mounted inside the cabinet, on the pivot panel.

The board consists of two major functional blocks:

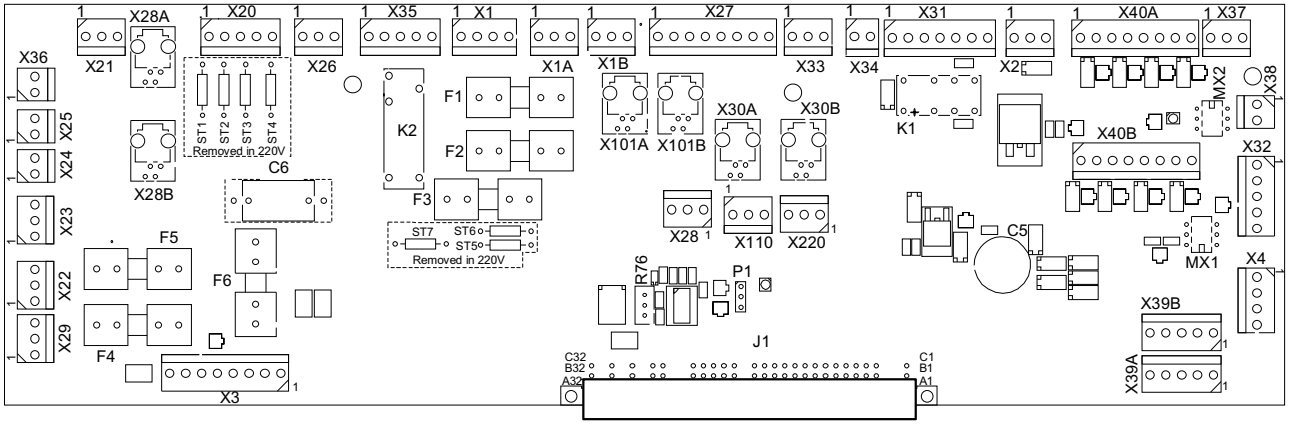
- an **analog** block providing the following main functions:
  . analog signal (current and voltage) matching,
  . synchronisation (in case of single phase),
  . power converter thyristor gate firing by electrically isolated pulses (for single-phase only),
  . electronic circuits power supply ,
  . analog control signal 0-10V.

- a **digital** block with two micro controllers providing the following main functions:
  . analog input (voltage, current and temperature) measurement,
  . digital input/output monitoring,
  . system operating and monitoring sequences controlled by a program stored in memory,
  . setpoint (reference) generation for the analog regulators,
  . full digital control algorithm (separate micro controller),
  . serial communication for remote monitoring/programming,
  . serial communication for display unit,
  . on- board Flash memory and EEPROM.

The fuses for GCAU and TPC boards protection are integrated on the interface board A4.

# 7.5 INTERFACE BOARD A4

The board A4 is an interface between the GCAU control board and the system, which includes voltage adaptation and protection via fuses for GCAU and options.




J1 : Control board GCAU A1 connection.

X1 : Connection to auxiliary secondary winding of the transformer T1 (fuses F1-F2-F3).
X2 : End of discharge contactor connection (option).
X3 : C15-100 board connection (option that uses Spare 8 input).
X4 : Connection of the earth to enable the insulation fault measurement (option).

X20 : Connection of the DC voltage measurement inputs.
X21 : Connection of the load voltage measurement for display on analog meter (option).
X22 : Connection of the display for load voltage measurement (option).
X23 : Connection of the display for charger voltage measurement (option).
X24 : Connection of the display for battery current measurement (option).
X25 : Connection of the display for charger current measurement (option).
X26 : Outputs protected by fuses for power supply of options.
X27 : Connection of the thermostats and the rectifier bridge fan (option).
X28 : Choice of the insulation fault measurement point (battery or load).
X28.A : Connection of the display-keyboard assembly.
X28.B : Connection of the relay boards (option).
X29 : Connection to buzzer (option).
X30A : Connection of the battery temperature probe (option).
X30B : Connection of the ambient temperature probe (option).
X31 : Connection of the battery shunt (for dual systems).
X32 : Connection to charger 2. Simultaneous Highrate / Sequential Highrate (for dual systems).
X33 : Connection to rectifier shunt.
X34 : Connection to standard battery shunt.
X35 : “Volt-free” contact output of the common alarm relay.
X36 : Output of the GCAU auxiliary 12 V.
X37 : Spare input for V measurement.
X38 : Output for watchdog option.
X39A : Connection of the auxiliary power supply board 1.
X39B : Connection of the auxiliary power supply board 2.
X40A : Digital inputs - spares 1 to 4.
X40B : Digital inputs - spares 5 to 8.
X101A : Connection to the TPC1 (three-phase charger).
X101B : Connection to the TPC2 (three-phase 12 pulses charger).
X110 : GCAU power supply configuration for V batt max. up to 200 VDC.
X220 : GCAU power supply configuration for V batt max. higher than 200 VDC.

ST1 to ST7 : Voltage adaptation.
P1 : Activation of the integrated high ripple detection (option that uses Spare7 input).
F1-F2-F3 : Protection of auxiliary secondary winding of transformer T1 (in single-phase configurations, only F1 and F2 are applicable).
F4 : Protection of load voltmeter.
F5 : Protection of charger voltmeter and auxiliary power supplies connected to X39A and X39B.
F6 : Protection of the end of discharge contactor output.

Fuses characteristics : 3.15 A 300 VDC 5 x 20 – time-delayed.

# 7.6 "TPC" THREE- PHASE CONTROL BOARD (A2)

The TPC board is used in case of a three-phase system and is mounted close to the bridge assembly.
The board is controlled via a link cable connected to the GCAU board.
The TPC has all necessary electronics to synchronise to the secondary transformer voltage and to control the thyristors.
The board is phase insensitive meaning it will operate with all possible phase rotations.

# 7.7 DISPLAY BOARD (A300) AND KEYBOARD ASSEMBLY (A310)

The display board is mounted on the front of the system and is controlled by the GCAU board, via the interface board A4. It is a plug-in device and is connected through two RJ 4-4 connectors with a 4-wire cable. All data and necessary power supply voltages are transferred over this cable. The display is a 9mm character height two line by sixteen-character alpha numeric LCD with LED backlight.
The Keyboard is connected to the display unit which decodes the three operating buttons and controls the two indicator LEDs.
The display board is equipped with an USB type B port, which offers an insulated communication port for maintenance purpose.

# 8 OPTIONS

**The equipment has these options fitted only if they have been specified in the initial order. Refer to the customer drawings.**

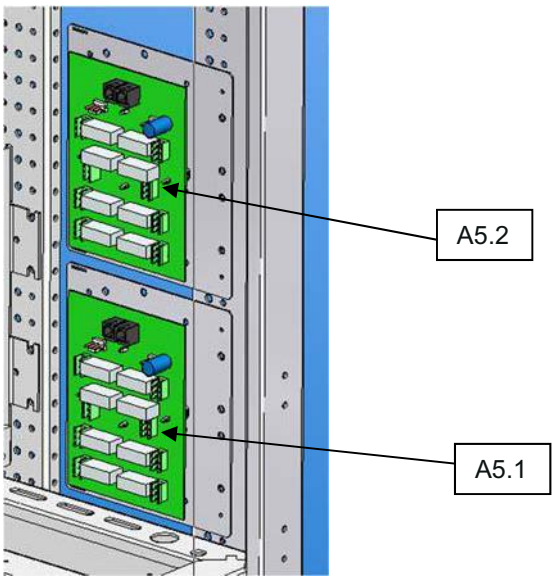
# 8.1 ALARM/SIGNALLING/MEASUREMENT OPTIONS

### 8.1.1 LED box (A6)

The front door of the rectifier can be equipped with 16 electroluminescent diodes and related texts.
The LEDs indicate alarm or events as configured in the GCAU board.
The lighting of the LEDs can be tested through a long press (5 seconds) on the middle key (in default menu) of the display/keyboard.

### 8.1.2 Relay boards (A5)

Relay boards A5 provide remote signalling of individual alarms. Each board has eight relays.
A maximum of 8 relay boards can be connected to the GCAU board. Note that only one board can be powered from the GCAU, via the interface board A4. All other relay boards must be powered separately.
The A5-1 board has two additional spare input alarms.




### 8.1.3 Temperature alarm

**SPRe-TPRe up to 50 A (rectifier bridge natural cooling)**
A thermoswitch TH2 is mounted on the rectifier bridge for a "high temperature" alarm signalling. A second thermoswitch TH1, mounted on the rectifier bridge, causes the electronically shutdown of the rectifier by inhibiting the thyristor gate signals.

**SPRe-TPRe from 75 A (rectifier bridge forced cooling)**
The thermoswitches TH1 and TH2 are included in the base of the equipment.

*NOTE: Refer to the drawings for the temperature detection values.*

### 8.1.4 Supplementary meter functions

As standard, load voltage and current, date and time are displayed in the measurements menu.

Your equipment can have supplementary meter functions:
"AC Meter", "Ibatt meter", "Ah meter", "Ambient Temp" and "Battery Temp".
These options can be activated or deactivated on customer demand.

**"AC Meter"**
This option allows reading the mains input voltage in the measurements menu.

**"Ibatt Meter"**
If the system is equipped with the battery shunt option and "Ibatt Meter" is activated, the battery charge and discharge currents can be displayed. The "-" sign preceding the displayed value indicates a discharge condition. In this case, the load current will correspond to the rectifier current minus the battery current.

**"Ah Meter"**
The ampere-hour meter measures the battery charge and discharge Ahs. This value is displayed as a percentage of the initial battery capacity.
The ampere-hour meter reads 100% in the following cases:
- the counting reaches 100%,
- the system has been operating in the floating mode for at least 100 hours.

***NOTE:***
During battery recharging, only 80% of Ahs are taken into account (battery average efficiency when recharging). (Note: Efficiency factor is programmable).

***"Ambient Temp" and "Battery Temp"***
When these options are activated and temperature sensors are installed, you can read the battery and ambient temperatures on measurements menu. Temperature unit can be set in °C or °F on customer demand.

### 8.1.5 Analog meters

The digital measurements can be associated with needle analog meters (on the front panel). These meters provide a direct reading of voltage and current.
These options are available for:
- Mains input voltage and current (with phase selector switch for three-phase system).
- Charger voltage and current.
- Battery voltage and current.
- Load voltage and current.

### 8.1.6 Spare inputs

The GCAU board has 8 multifunctional digital inputs, some can be used for option signalling purpose (e.g.: low electrolyte level, battery symmetry fault detection ...). Depending on the option configuration, some spare inputs are free and they can be used as user alarms centralization. Inputs are not isolated: they are provided to be exclusively connected to the 0 V (negative polarity) typically via a dry contact of relay or switch. A free displayed text can be associated to each input.

### 8.1.7 Audible alarm

To alert the operator of a malfunction, the common alarm (when activated) generates an audible signal. Associated with the audible alarm is a switch used to stop the buzzer. When the common alarm is acknowledged, the switch can be turned to its original position. The switch is located on the front door of the rectifier.

### 8.1.8 Ground fault detection

***1 - Case of a single SPRe/TPRe rectifier***

The option is integrated into the GCAU board.
The ground fault detection circuit monitors the impedance of the connection between ground and the positive and negative polarities of the DC output.
An alarm is delivered on detection of a leakage current ≈ 10 mA between ground and one of the output polarities.

***2 - Case of two SPRe/TPRe rectifiers connected in parallel***

In case of two redundant systems with individual battery banks the ground fault detection is realized by GCAU control board in the similar way as for single systems

In case of two redundant systems with common battery bank the option is realized with a separate board installed on the DC output common bus.
This board provides dual insulation fault detection between the positive and negative polarities with reference to ground.
The alarm (Ground + or Ground -) is delivered either:

- directly on free-voltage loops, or
- to the GCAU board using (on each rectifier) : 1 spare input (Ground fault)
  or 2 spare inputs (Ground + fault, Ground – fault).

### 8.1.9 Electrolyte level alarm

The electrolyte level in the battery cells can be checked using an external probe.
On the outside surface of a pilot cell, a capacitive probe is positioned between the minimum and maximum electrolyte level marks on the cell.
If the electrolyte level in the cell drops below the minimum level, the probe sends a signal to control board A1 through a digital spare input and the corresponding alarm is displayed.
The probe comes with a bracket and straps for securing it to the battery cell.

### 8.1.10 Battery symmetry fault detection circuit

***1 - Case of a single SPRe/TPRe rectifier***

The option is integrated into the GCAU board.
The battery symmetry alarm is generated when a battery cell is shorted, has an open circuit or when asymmetrical cell voltage is detected.

The detection is independent of the charge state of the battery (float charge, high rate charge or commissioning charge).
In order to detect one of the above fault conditions, a battery centre tap input is present.
Cell numbers can be odd or even since the adjustment allows compensation for odd cell numbers.

The alarm is displayed on the front panel LCD.

***2 - Case of two SPRe/TPRe rectifiers connected in parallel***

In case of two redundant systems with individual battery banks the battery symmetry fault is realized by GCAU control board in the similar way as for single systems.

In case of two redundant systems with common battery bank the option is realized either with GCAU card in a similar way as single systems or with a separate board A10 installed on the DC output common bus.

In case of multiple battery banks, each bank needs to be monitored with a separate board A10, the alarm is transmitted to the GCAU card A1 through digital inputs.

***3 - Wires and system protection for battery symmetry fault detection option***

F100 box protects the cables and the system against short circuits. In the event of a short circuit between the battery middle point and one of the DC polarity of the battery, the F100 fuse will open the circuit. The F100 box must be located as close as possible to the battery middle point connection.

# 8.2 COMMUNICATION OPTIONS

Depending on configuration the Protect RCS rectifier charger can be equipped with the following communication options.

### 8.2.1 RS232 interface connection

This option is a piggy-back board (A71) connected to the extension bus of the GCAU control board. It allows to communicate locally or remotely with a PC computer.
This RS232 interface connection is used in the configuration when only one charger has to be connected to a PC computer.

A 2 m cable with SUB-D connector is supplied with this option.

The communication port is fully isolated from the charger output and/or internal control.

### 8.2.2 RS485 interface connection

This option includes is a piggy-back board (A71) connected to the extension bus of the GCAU control board and additional EIA485 interface & connecting board (A72). It allows to connect several rectifier systems on one common communication bus (centralized supervision of the rectifers) to communicate locally or remotely with a computer.

The rectifiers are acting as slaves and the central computer as the master. By giving the different rectifiers different slave numbers, it is possible to control each individual rectifier.

A 2,5 m cable with RJ (6/6) is supplied with this option to connect A71 and A72 boards.

The communication port is fully isolated from the charger output and/or internal control.

### 8.2.3 IEC 61850 Server interface

The IEC 61850 Server interface option is also available for PROTECT RCS range.

Rectifier Alarms / Status and Analog measurements are cyclically polled from the rectifier supervision control board GCAU A1 by the gateway and translated to IEC 61850 protocol available at the RJ45 Ethernet port.

The detail description is available in the separate IEC 61850 Server interface manual document.

### 8.2.4 MODBUS communication

The Protect RCS rectifiers support the Modbus (Jbus) protocol (RTU or ASCII based), an user SCADA system with MODBUS protocol can be used for supervision.
The connection to the charger(s) can be RS232 (one equipment monitored) or RS485 (more than one charger or equipments on the bus), the same hardware equipment is supplied than the one with WINSPARC supervision software.
The complete MODBUS mapping of the various parameters are available.
The Communication speed is 2400, 4800, 9600, 19200 or 38400 Bauds.

For more details please refer to separate Modbus manual document.

### 8.2.5 TCP/IP Communication

This option includes a NCS board connected to A71 (RS232 board) and allowing TCP/IP communication with the GCAU control board.
The board provides the following protocols: HTTP (Web navigator), SNMP, connection to Winsparc via a network, Modbus TCP.

For more details please refer to separate NCS manual document.

### 8.2.6 WINSPARC GCAU supervision software

The software WINSPARC (WINDOWS based) is an application designed as local and remote supervision on the entire GCAU configuration in order to control, monitor and configure the system.
This software interacts with the GCAU control board locally through a serial port RS232, RS485 or TCP/IP interfaces described above. As minimum requirements the system has to be equipped with RS232 option. For details please refer to the options described above.

For details please contact AEG Power Solutions representative.

The WINSPARC GCAU software allows visualizing the system data on the PC screen such alarms, measurements, charge modes, history log. Remote commands can be sent also to the system.

The two access levels are available:

- User: this first level is used for monitoring only. The system measurements, statuses and alarms are available for user.

- Super User: this second level allows to send command and also to modify some parameters of the system. This level requires additional training. Please contact AEG Power Solutions Service Department for more details.

# 8.3 CONTROL/COMMAND OPTIONS

### 8.3.1 Manual voltage and/or current adjustments

**Option reserved for systems without batteries**

When the rectifier is configured in this operation mode, the rectifier output voltage and current are set by the operator, the charger operates as an adjustable power supply.

Rectifier output voltage and current adjustment is made through the "Manual adjustment" menu (refer to § 6.6.4).
The voltage can be set between an upper limit (max) and a lower limit (min) set in the system set-up *(factory setting)*.
The current can be set between 0 and the maximum current of the rectifier.

### 8.3.2 Remote rectifier shutdown

The remote rectifier shut down option is a function used to switch the rectifier off via a normally closed (NC) contact. The charger does not restart automatically when the remote contact is back to the initial “ON” position, the operator needs to acknowledge the alarm “rectifier shutdown” locally for safety purposes.
The option uses one spare input .

### 8.3.3 Remote alarm reset

The remote alarm reset/acknowledgement command option is a function used to reset the alarms remotely. The option uses one spare input.

### 8.3.4 Remote high rate charge

This option is used to put the rectifier in high rate charge via a normally open (NO) contact from remote control panel. The option uses one spare input .

### 8.3.5 Remote fan control room & remote forced floating charge

This combined remote option allows to control the ventilation of the battery room for air renewal. The signal to ventilation fan is sent via one contact of the alarm card once the rectifier is in the high rate charge mode.

The remote forced floating charger option prevents also the manual and automatic high rate charge mode of the rectifier to be initiated. It is used when high rate charge is not allowed if the load is connected or in case of fan failure in the battery room. This funtion is activated by an external dry contact and uses one spare input.

# 8.4 AC INPUT OPTIONS

### 8.4.1 EMI filter

The rectifier is equipped as standard with an input EMI filter that smoothes mains interference in accordance with the EN 61000-6-4 standard (EN 55011 class A). To avoid undesirable disturbances, the rectifier cabinet must be properly earthed and the doors must be closed.

### 8.4.2 Supplementary protective devices

The protective devices (fuses or circuit breakers) can be provided for the mains input protection.
For alarm purposes, auxiliary contacts of protective devices are available as additional option.

### 8.4.3 Input contactor

An input contactor replaces the standard input switch to isolate the AC input from the mains.
An ON/OFF switch is available on the front of the rectifier.

## 8.5 LOAD OPTIONS

### 8.5.1 Supplementary protective devices

The protective devices (fuses or circuit breakers) can be provided for the load lines protection.
For alarm purposes, auxiliary contacts of protective devices are available as additional option.

### 8.5.2 Additional DC filtering

Additional DC filtering (additional capacitor or/and chokes) provides low voltage ripple on DC output without battery.
When the battery is connected, the ripple current of the battery is minimized by the additional filter.
1 % filter or 0.1% filter are available.

### 8.5.3 Load switch

A switch isolates the load from the DC bus.

### 8.5.4 Diode stabilizer

A diode stabilizer is used if the DC output voltage is too high for the load. The GCAU board has a specific function built in which controls the diode stabilizer through the relay board.
The number of diodes depends on the required voltage drop.
For a small load voltage range, the diode stabilizer must be turned on in steps. The switching in or out of a step is controlled by a contactor energized by the relay board.

### 8.5.5 High DC voltage mechanical trip

As standard, the rectifier is electronically shut down by inhibiting the thyristor gate drive signals.

The high DC voltage mechanical trip option is used when the output DC load of a rectifier system must be protected against too high DC voltages generated by an uncontrolled fault condition of the rectifier. The high DC voltage alarm is used to disconnect the rectifier from the AC input by a contactor.
To control the contactor of the AC input, a 8 relay board A5-1 is used. The relay contact of the dedicated alarm will de-energize the input contactor.

The function is "latching" meaning a manual reset (using the display keyboard) must be initiated before the system can operate again.

# 8.6 BATTERY OPTIONS

### 8.6.1 Supplementary internal protective devices

The protective devices (fuses or circuit breakers) can be provided inside the rectifier for the battery protection.
For alarm purposes, auxiliary contacts of protective devices are available as additional option.

### 8.6.2 External battery protection devices

A battery protection box can be fitted with the equipment, according to the customer requirements.

### 8.6.3 Battery switch

A switch isolates the battery from the DC bus.

### 8.6.4 Battery temperature compensation

The SPRe and TPRe rectifiers can sense the battery ambient temperature. The sensor is located in a metal lug and can be mounted to the wall, on the battery rack or inside the battery cabinet by a screw. The connection from sensor to board is a 4 wire telephone cable. The sensor is used to compensate the floating voltage or the high rate voltage if necessary.
The temperature coefficient with reference to the battery ambient temperature can be defined by software in the system set-up *(factory setting)*.

Note: The SPRe and TPRe rectifiers can sense both ambient and battery temperature for special applications (as VO battery charging).

### 8.6.5 Battery current limit/display

Battery branch is equipped with a shunt or a hall effect current transducer. Battery current is displayed and battery charging current can be limited to a configured value (*factory setting)*.

### 8.6.6 Low-Voltage Disconnect *(end-of-discharge contactor)*

To protect the battery from over-discharging and the load from too low a DC voltage, the battery is disconnected from the load at a set voltage level. This level is just below the one corresponding to the end of the battery backup time. The battery is disconnected by a contactor in the battery line.
When the mains voltage returns, the rectifier supplies the load, the low voltage alarm is automatically reset, and the battery is reconnected.

### 8.6.7 Reverse battery protection

This option protects the rectifier against reversed connection of battery and must be associated with a battery protection against short-circuit. The protection is realized either by a diode connected with the cathode on the positive side and the anode on the negative side, or by a tripping coil on the battery breaker if applicable.

### 8.6.8 VO battery charging (recombination batteries)

**This option is reserved to systems equipped with VO (sealed Ni-Cd) batteries, and is used with:**

- C15-100 rectifier monitoring board and input contactor,
- Battery and ambient temperature sensors,
- Battery current limit,
- 1% filter,
- Relay board.

The batteries are charged at constant voltage at two levels and limited current. Voltage levels are depending on the battery temperature (temperature coefficient is -2,5 mV/°C/cell, factory setting).
The battery recharge is controlled following the difference between the battery temperature and the ambient temperature.

Battery temperature increase (from ambient) and charging time are monitored.
C15-100 independent board monitors permanently battery parameters (voltage, current and temperature). 1% filters insure low ripple voltage and current to the battery and DC output.

### 8.6.9 C15-100 analog monitoring board

This option is composed of a board that monitors the battery charge parameters independently of the charger GCAU control board. This option allows the system to comply with standard C15-100 that recommends the conditions of implementation and use of batteries.

This board shuts down the rectifier when any of the followings fault are detected :
- high battery voltage (temperature-compensated value)
- high battery charging current
- battery temperature higher than +60°C (this fault is inhibited on mains power return if the rectifier is in the floating mode).

The fault must be reset locally by pressing push-button S2 (only if the fault has disappeared).

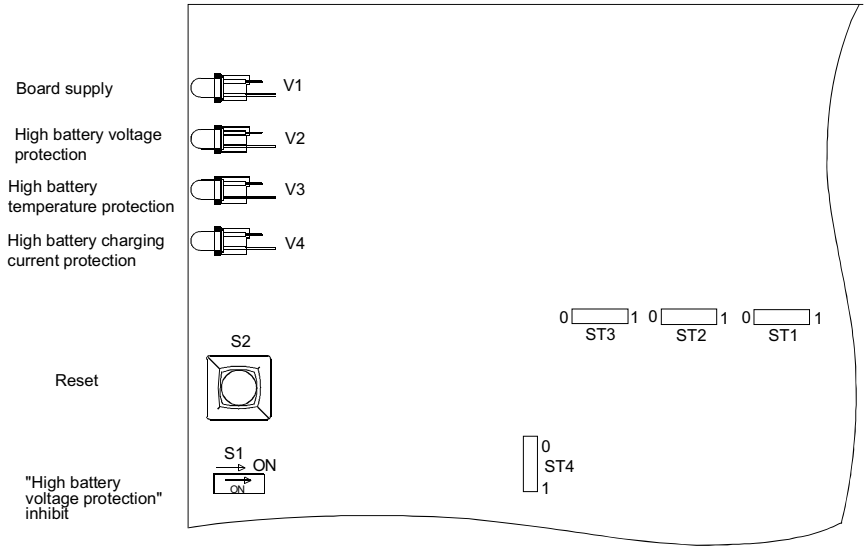
Standard settings :

| | ST3 | ST2 | ST1 |
|---|---|---|---|
| 220V | 0 | 0 | 0 |
| 110V | 0 | 0 | 1 |
| 48V | 0 | 1 | 1 |
| 24V | 1 | 1 | 1 |

| ST4 | Slope adjustment |
|---|---|
| 0 | Inhibition |
| 1 | Compensation : 0.17%/°C |

NOTE: During commissioning charge, set S1 on the position ON ("high battery voltage" detection inhibited).

Components location
C15-100 board



### 8.6.10 C15-100 digital monitoring board

This option is composed of a board that monitors the battery charge parameters independently of the charger GCAU control board. This option allows the system to comply with standard NFC15-100 and NFC58-311 that recommends the conditions of implementation and use of batteries.

This board shuts down the rectifier when any of the followings fault are detected :

- high battery voltage (temperature-compensated value)
- high battery charging current
- battery temperature higher than +60°C (if the card is on dual charge rate mode, this fault is inhibited on mains power return if the rectifier is in the floating mode).

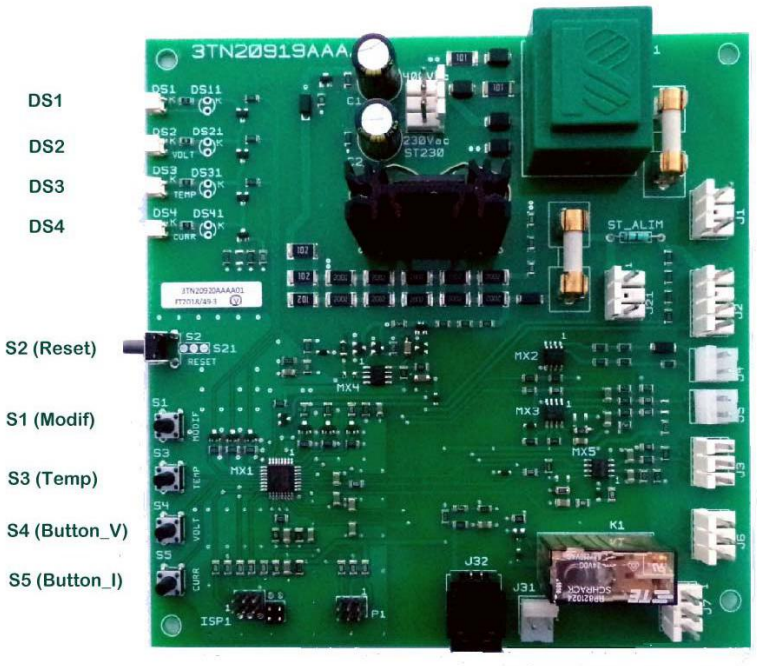
The relay and alarm signal, once tripped are latched.
They must be manually reset by pressing the Reset button S2.
This operation can be done only if the measurements are below the threshold limit.

In monitoring mode :

- The LED DS2 is ON if the voltage is above threshold.
- The LED DS2 is blinking if the voltage is below the threshold but the relay/alarm tripped on voltage condition.
- The LED DS4 is ON if the current is above threshold.
- The LED DS4 is blinking if the current is below the threshold but the relay/alarm tripped on battery current condition.
- The LED DS3 is ON if the temperature is above threshold.
- The LED DS3 is blinking if the temperature(s) is/are below the threshold but the relay/alarm tripped on battery temperature condition.

When operators needs to set charger in battery commissioning elevated voltage, the Commissioning mode shall be activated.
When Commissioning is active, the control of overvoltage is disabled.
In “Monitoring” mode (ex: after a power on), make a long push on button S4 (Button_V) until LEDs start blinking. Confirm by a short pulse on button S1 (Button_Modif). Blinking of LED’s stops.

Components location
C15-100 board



### 8.6.11 Cable drop compensation

The rectifiers can be programmed (cable drop parameter) to compensate for cable drop between the system and the battery without the need of remote sensing.

**If battery current limit/display option is present:**

The output voltage will be increased as a function of the battery recharge current.

**If battery current limit/display option is not present:**

The output voltage will be increased as a function of the load current.

This option is mainly used when load cables are connected directly to the battery.

Voltage measurements on the display:

"Outp" (measurement menu): compensated voltage (value from calculation).

"DC" (default menu) and Load (measurement menu): actual voltage

Note: the cable drop parameter is the reverse function of "droop" factor used for passive load sharing.

### 8.6.12 High rate charge interlock *(Forced float charge)*

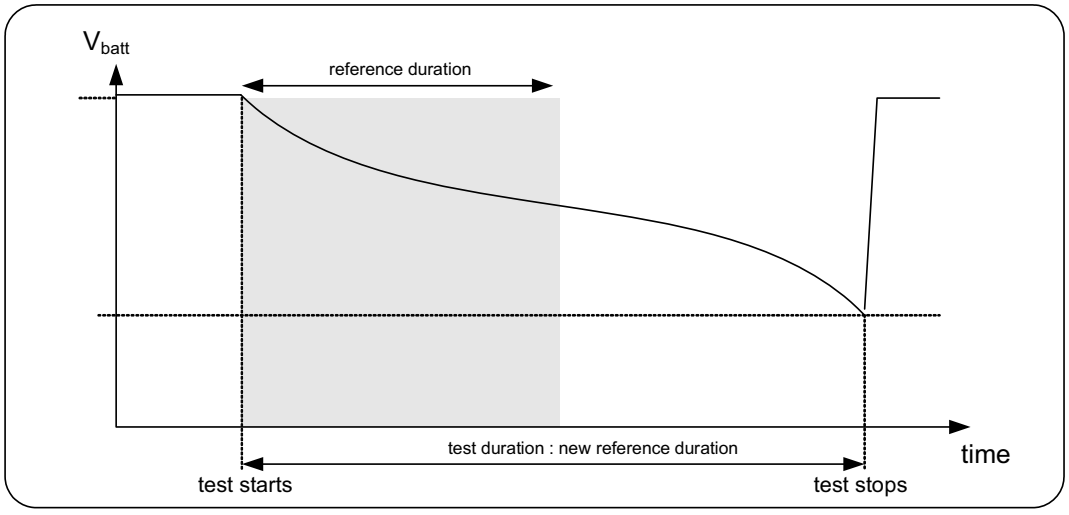
This option is used when high rate charge is not allowed if the load is connected for voltage level reasons. In this case, an auxiliary contact of the DC load protective device is wired to the spare input configured for forced floating.

### 8.6.13 Battery capacity test

Battery current display option is necessary for this option.

In order to check the battery performance, a battery test can be activated. The battery test discharges the battery until a predefined voltage. It discharges the battery with a constant current. To achieve this, the charger output voltage is slowly decreased until the battery discharge current reaches the desired level. Both charger and battery will deliver current. This ensures you do not loose system performance in case a battery is in a bad condition or has an open cell.

The battery test can only be performed on a 100% charged battery and should discharge the battery up to 60%.




The Battery test can be activated by the operator/serial command or can be initiated periodically.

If initiated periodically but the conditions to start the battery test is not met (see below), the battery test will be postponed 24 hours and a new try is given. After three retries the test will be terminated until the next periodic cycle. During the three retries the periodic counter is stopped and started again after the battery test is initiated.

If the battery test is manually initiated and periodic battery test is active as well, the periodic timer is reset upon selecting manual battery test to prevent sequential battery tests.

The time needed to reach the End Voltage level is compared to the time of the previous battery test. This previous time is multiplied with a tolerance factor to compensate for battery performance. If the time is shorter than this reference time, an alarm **"BATT.TEST FAILED"** is generated. If the time is longer than the predefined time, or within the defined percentage, a text **"BATT.TEST PASSED"** is generated. This is not an alarm situation but only a message. It will disappear from the screen as soon as another function is selected from the front panel. In both cases this event is written to the history list. If the time is longer than the predefined time, this new time is updated and will be used as the reference for the next battery test.

The first time the battery test is performed the reference time is 0. This ensures that the first battery test logs a time greater than the reference time.

***Note:***
*If required, you can manually set the reference time to 0. Go to the Battery Test Setup in the System Setup and select the discharge current. If you change this setting, the reference time will be set to 0 once you leave the setup. (If you do not want to change the value, just go up and down with the setting until you have the previous setting. This will have the same effect).*

The Battery test is not allowed under the following conditions:
- AC Failure
- Standing load < discharge current
- Battery capacity < 100%
- Battery current is negative (Discharge)
- System in High rate or commissioning charge

If you try to activate the battery test manually from the front panel and any of the above conditions is detected, the top line will show the message **"TEST NOT ALLOWED"** for two seconds.
If an AC failure occurs during the battery test, the test will be cancelled and the system will return to normal operation when the mains return.

The Battery test is aborted under the following conditions:
- AC Failure
- Manual Stop (From display, serial port or external digital input).
- Discharge current is lower than the required current for 5 minutes.

In any of these cases, the battery test will be aborted and an alarm **"BATT.TEST ABORT"** is generated. This alarm can be acknowledged (reset).

# 8.7 CABINET OPTIONS

### 8.7.1 IP ratings

The cabinet standard IP rating is IP21*. IP43 is available as option and higher are available on special request (IP5x*, IP6x*).
* (according to standard EN 60529)

### 8.7.2 Eye bolts

For transporting the system, the cabinet can be equipped with four eye bolts and nuts (provided separately or mounted on the cabinet).

### 8.7.3 Cabinet heater

The cabinets are fitted with heating resistors supplied via a circuit breaker.
The heater circuit must be supplied with an auxiliary mains of 110 VAC to 230 VAC during storage, before system energization and during periods when the rectifier is not operating.

### 8.7.4 Interior lighting and AC socket outlet

The cabinet can be fitted with a light turning on automatically when the door is opened.
An AC socket outlet is mounted on the terminal block. It delivers a voltage corresponding to the auxiliary supply voltage.

# 9 PARALLEL OPERATION

The Protect RCS rectifier charger can operate also as parallel system. The following configuration are available:

**System**:
Redundant - for a charger and/or battery redundancy.
Parallel - to increase the power or to increase the battery capacity.

**Battery** :
No battery supply mode.
Individual each charger manages its own battery.
Common two chargers, a single battery.

Depending on the configuration the different options can be used in the system. Please refer to the customer drawings for the details.

# 9.1 REDUNDANT SYSTEM CONFIGURATION

The purpose of a redundant system is to obtain maximum availability of the load supply, including any fault of a source (charger and/or battery) or a component (output capacitor, diode regulator etc.). The redundant configuration facilitates also the on-site maintenance operation.

In a redundant system, the aim is to limit the “common mode failures” between the 2 chargers: avoid anything that could lead to the spread of a fault, of a process or a component failure, of a power source failure (charger, battery etc.) to another, in order to ensure permanent supply of the load.

The “decoupling” method chosen in the Protect RCS is the most reliable one.

# 9.2 PARALLEL SYSTEM CONFIGURATION

The paralleling of the systems in not redundant configuration is used to increase of the power of the chargers.

The paralleling of the systems is used also for increasing the battery capacity when the direct paralleling of the battery strings is not authorised (e.g.: VO battery). In this case, the management of each battery string is independent. This topology system ensures optimum management of each battery string in terms of availability (recharging), monitoring and ageing.

# 9.3 OPTIONS FOR PARALLEL SYSTEM CONFIGURATIONS

The options described below are used depending on the system configuration

### 9.3.1 Sequential High Rate (parallel)

The option is a function of the GCAU control board that allows the start-up of two chargers in high rate mode in a sequential way (one after the other).

With this function, two chargers can be switch to High Rate Mode sequentially and will switch back sequentially to Floating Charge Mode whenever one of the two charge modes is selected on one charger.

### 9.3.2 Passive Load sharing *("droop" factor) function*

The option is a function of the GCAU control bard. It is used when two rectifiers are connected in the parallel configuration and load sharing is required.

The load sharing is passive and is based upon changing the slope ("droop" factor parameter) of the rectifier output voltage according to its output current. The droop factor reduces the output voltage if the system current rises.

The on-site installation must as far as possible minimize connection or installation dissymmetry (thermal conditions, lengths and wire sections, protections etc.) of the chargers towards the batteries and the load.

### 9.3.3 Simultaneous High Rate (shared)

This option is a function of the GCAU control board that allows the start-up of two chargers in high rate mode in a simultaneous way.

With this function, two chargers can be switched to High Rate Mode simultaneously and will switch back simultaneously to Floating Charge Mode whenever one of the two charge modes is selected on one charger.

Both chargers are able to stop and start the High Rate Mode charge cycle of the other one.

# 10 MAINTENANCE

AEG Power Solutions can provide a Global Service capability through regional Service Centres.



**Electronic boards are sensitive to E.S.D. (electrostatic discharge).**
**When not installed in the equipment, they are delivered in antistatic bags.**
**Before handling a board, the operator must take care to be at the same potential as the equipment to be worked on and take all customary precautions.**





**ANY OPERATION ON THE EQUIPMENT SHOULD BE CARRIED OUT BY QUALIFIED PERSONNEL AWARE OF SPECIFIC ELECTRICAL HAZARDS AND PRECAUTIONS TO BE TAKEN. NEVER ASSUME THE ABSENCE OF VOLTAGE, ALWAYS CHECK WITH A VOLTMETER BEFORE ANY OPERATION ON A SYSTEM.**

**THE DC OUTPUT IS EQUIPPED WITH FILTERING CAPACITORS, DANGEROUS VOLTAGES CAN REMAIN EVEN IF THE CHARGER IS STOPPED AND THE BATTERY DISCONNECTED. ALWAYS CHECK THE ABSENCE OF VOLTAGE ON THE DC CIRCUITS BEFORE TO START ANY WORKS ON THE SYSTEM.**

**DANGEROUS VOLTAGES CAN REMAIN ON THE SYSTEM EVEN IF IT IS SWITCHED OFF AND INSULATED FROM MAINS AS LONG AS BATTERY IS CONNECTED.**

# 10.1 PREVENTIVE MAINTENANCE VISIT

It is recommended to perform a maintenance visit every year.

### 10.1.1 Rectifier maintenance

Remove dust.

Carry out an inspection including the following:

1 - Disconnect the mains input line and the battery.

2 - Examine the components and the wiring. Pay special attention to signs of overheating and melted insulation. Check all connections. Check for loose wires.

3 - Check that the cooling air flow is not impeded, clean the fans, the air inlets and outlets in case of presence of dust.

4 - For rectifiers with air inlet filters (on the door and/or on the roof), check the filters for cleanliness.

5 - Check the operation of the rectifier and the voltage levels *(see customer drawings)*.

6 - The GCAU board is equipped with a lithium battery for the Real Time Clock (RTC). This component has a life time of about 10 years. Its replacement must be done by specialized personnel.

**IMPORTANT**
**This component, mounted on a support, must be recycled in compliance with the European Directive n° 91/157/EEC of 18.03.91. You can also apply to AEG Power Solutions by shipping back the used board (prepaid shipment).**

### 10.1.2 Battery maintenance

For the recommended battery maintenance procedures, refer to the battery manufacturer's manual.
At the end of their service life, the batteries must be recycled in compliance with the European Directive n° 91/157/EEC of 18.03.91 and WEEE directive. You can also apply to the battery manufacturer as indicated in the battery manual.

# 10.2 FAN MAINTENANCE

**Rectifier bridge and cabinet fans:**
It is recommended to replace the fans every five years. This operation must be done by specialized personnel.
A "FAN REPLACEMENT" message can be displayed if the alarm is activated on the system.

# 10.3 CAPACITORS MAINTENANCE

It is recommended to replace the DC capacitors every seven years. This operation must be done by specialized personnel.
A "CAPA REPLACEMENT" message can be displayed if the alarm is activated on the system.

# 11 ELEMENTARY TROUBLESHOOTING

When an alarm is activated, the green light is out and the red light flashes on the charger display. The "ALARM" message can be displayed by hitting any key to go to main menu.

Note the descriptions of the alarms present (see Chapter 6 - OPERATING INSTRUCTIONS).

If pressing RESET (in the alarm menu) does not turn off the red light, refer to the following troubleshooting table for the corrective action to be taken.

NOTE:
This elementary troubleshooting guide assumes that the usual protective options are fitted.
Your equipment may be different and some of alarms can be deactivated. Refer to the customer drawings.

| ALARM or EVENT | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| The display is white | Contrast problem | Do not touch any button for 5 minutes. This will automatically activate the default menu. Held the rightmost button, the contrast will be increased. |
| "HIGH MAINS VOLTS" | Mains voltage out of limits.<br>Programmable threshold: default value or customer demand value. | . Check the mains voltage.<br>The voltage must as per the specified value on the customer drawing package. |
| "LOW MAINS VOLTS" | . Rectifier off.<br>. Mains protection opened.<br>. TPRe : fuses F1 to F3 on the interface board A4 blown<br>. SPRe: fuses F1-F2 on the interface board A4 blown.<br>Programmable threshold: default value or customer demand value. | . Switch on the rectifier.<br>. Check the fuse(s). Replace if necessary. Check the input breaker/switch.<br>. Check the fuses. Replace the defective fuses |
| "CHARGER FAULT" | . Low floating voltage with the rectifier not in current-limiting mode.<br>. Fuse F1 blown. | . Check the F1 fuse<br>Call the Customer Service Department.<br>. Check the mains voltage and the proper operation of the fans. |
| "HIGH BATT.VOLTS" | The rectifier output voltage is higher than the maximum allowable value.<br>Programmable threshold: default value or customer demand value. | . Call the Customer Service Department. |

| ALARM or EVENT | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| “LOW BATT.VOLTS” | Battery in discharge resulting from:<br>. rectifier off.<br>. mains absence or low mains voltage.<br>. missing phase (TPRe).<br>Programmable threshold: default value or customer demand value. | <br>. Switch on the rectifier.<br>. Check the mains. |
| "HIGH DC VOLTAGE" | The rectifier output voltage is higher than the maximum allowable value.<br>Programmable threshold: default value or customer demand value. | . Call the Customer Service Department. |
| "LOW DC VOLTAGE" | Low load voltage resulting from:<br>. rectifier off.<br>. mains absence or low mains voltage.<br>. missing phase (TPRe).<br>Programmable threshold: default value or customer demand value. | <br>. Switch on the rectifier.<br>. Check the mains. |
| “GROUND FAULT +” | Low resistance between positive output and cabinet ground.<br>Programmable threshold: default value or customer demand value. | . Check for the insulation fault. |
| “GROUND FAULT –“ | Low resistance between negative output and cabinet ground.<br>Programmable threshold: default value or customer demand value. | . Check for the insulation fault. |
| "HIGH TEMPERATURE" | High temperature on the bridge. Detection by thermo switch mounted on the heat sink. | . Check the fan(s).<br>. Check if no obstacles are blocking the airflow.<br>. Check the ambient temperature.<br>. Check the thermo switch. |
| “TEMP SENSE ERROR” | . Short or open circuit temperature sensor.<br>. GCAU board fault (ADC) | . Check the sensor connection.<br>. Call the Customer Service Department. |
| “HIGH BATT. TEMP.” | High battery temperature.<br>Programmable threshold: default value or customer demand value. | . Check the battery cabinet temperature. |

| ALARM or EVENT | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| "CHARGER CURR.LIM" | Charger current limit indicator.<br>It appears when the rectifier cannot supply the necessary power for the load. In this case, the rectifier operates in current-limiting mode. | . Check that load isn't higher than your customer drawings specifications |
| "BATTERY CURR.LIM" | Battery current limit indicator.<br>It appears after battery discharge. When the mains power supply comes back, the battery is in current-limiting mode. | . This alarm is a warning. It should not stay more than the usual time charge.<br>. Otherwise, call the Customer Service Department. |
| "HIGH CHARGR CURR" | High charger current. | . Call the customer service department |
| "HIGH BATT. CURR" | High battery current.<br>Programmable threshold: default value or customer demand value. | . If battery current limit option is activated, this alarm should not appear.<br>. Call the customer service department. |
| "BATT.TEST FAILED" | Appears after a battery test.<br>. Battery blackout.<br>. Battery in end of life. | . Call the customer service department |
| "BATT.TEST ABORT" | Appears during a battery test.<br>. Discharge battery current is not sufficient<br>. Battery charge was not initialized before the test.<br>. Battery test appears during high rate or commissioning charge. | . Stop high rate or commissioning charge manually<br>. Initialize battery charge at 100% (in command menus "reset AH meter").<br>. Restart the battery test manually. |
| "BATT. OPERATION" | Battery in discharge resulting from:<br>. rectifier off.<br>. mains absence or low mains voltage. | . Switch on the rectifier.<br>. Check the mains. |

| ALARM or EVENT | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| "INTERNAL CHECK" | Communication error between the microcontrollers or internal system error (e.g.: DC overvoltage protection, synchro pulse missed, TPC board error … etc.) | Call the customer service department. |
| "LONG CHARGE TIME" | High rate charge time too long. | Call the customer service department. |
| "NO PS VOLTAGE" | No more DC power supply to the board: rectifier output voltage out of order | . Check the fuse F1.<br>. Call the customer service department. |
| "CHARGER OFF"<br>It can be due to a normal system operation. | . Alarm activation.<br>. Serial information input.<br>. Manual shutdown.<br>. Initialising delay. | . Put the rectifier in floating charge mode.<br>. Call the customer service department to identify bad system configuration. |
| "BATT SYMM FAULT" | Battery cell is shorted, or has an open circuit or when asymmetrical cell voltage is detected.<br>Fuses on measurement wires protection damaged. | Check the battery and replace the defective cells.<br><br>Correct the fault leading to breakage and change the fuse if necessary. |
| "OUT OF WARRANTY"<br>This alarm is not systematically programmed | The rectifier warranty period has finished.<br>This alarm is not systematically programmed | Call the customer service department.*<br>This alarm can be acknowledged by the user. |
| "MAINT. REQUIRED"<br>This alarm is not systematically programmed | The rectifier required maintenance.<br><br>This alarm is protected and cannot be acknowledged by the user. | Call the customer service department.* |
| "FAN REPLACEMENT"<br>This alarm is not systematically programmed | The fans has to be replaced.<br>This alarm is protected and cannot be acknowledged by the user. | Call the customer service department* |
| "CAPA REPLACEMENT"<br>This alarm is not systematically programmed | The DC filtering capacitors have to be replaced.<br>This alarm is protected and cannot be acknowledged by the user | Call the customer service department.* |
| "BATT. LIFE CHECK"<br>This alarm is not systematically programmed | The connected batteries have to be checked.<br>This alarm is protected and cannot be acknowledged by the user. | Call the customer service department.* |

**** The Customer Service Department phone number is displayed with the alarm message, if activated on the charger.***

*Data in this document is subject to change without notice and becomes contractual only after confirmation. Photos are not contractual.*

Operation manual
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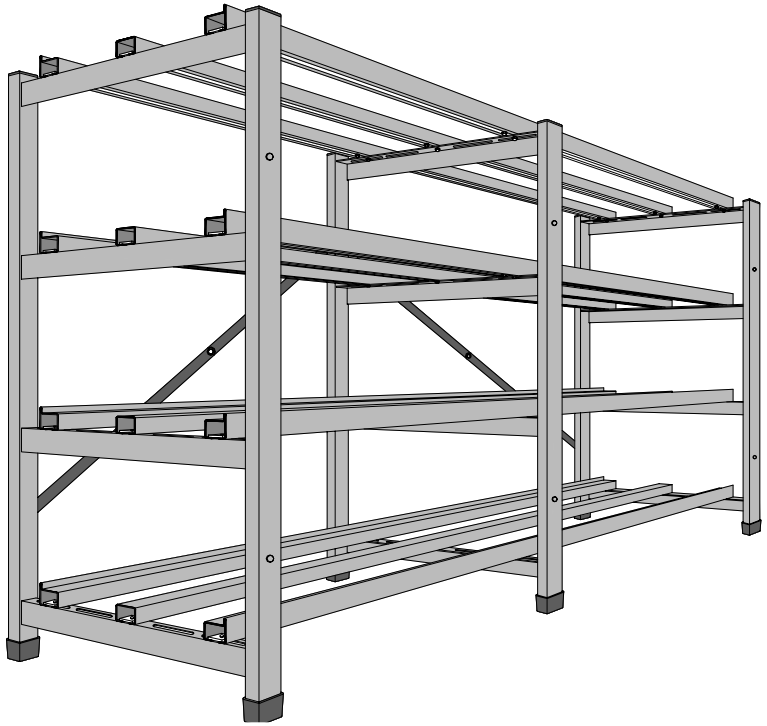
# Base Load Power Hub (BLPH)

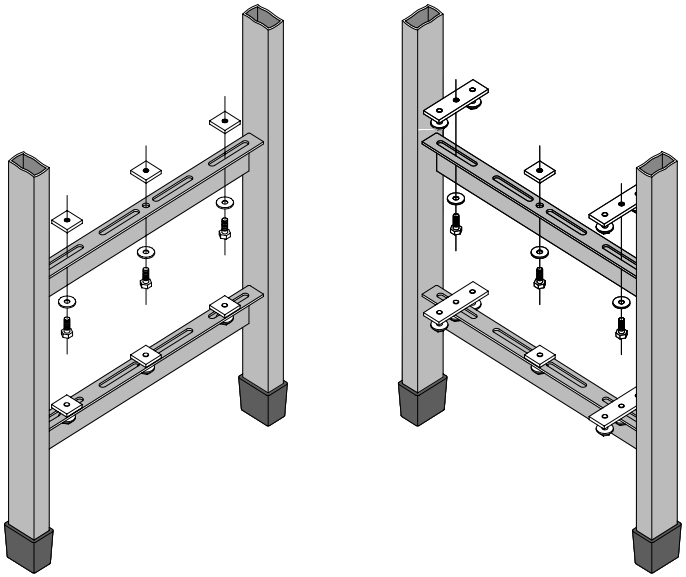
## DC UPS BATTERY RACK - TAG: BA-200F1
## MOUNTING AND INSTALLATION INSTRUCTIONS

*This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy*

# Assembly instructions - Montageanleitung - Instructions de montage - Instruzione di montaggio - Instucciones de montaje

## Applicable to BA-200F1 battery rack





### Racks for VRLA Batteries

GB

The procedure for assembly can be clear seen in the illustrations.

- Pre-assemble the supports, note left and right side parts in this case.
- In the case of racks that consist of several elements, connecting plates are to be employed at the jointing points.

**NOTE**

*Before you start with the assembly of the rack, check the packages delivered to ensure you have received the correct number and items.*

*In case of damage to the coating, this must be repaired immediately.*

### Gestelle für VRLA Batterien

D

Aus den Abbildungen ist die Vorgehensweise der Montage ersichtlich.

- Seitenteile vormontieren, dabei auf linke und rechte Seitenteile achten.
- Bei Gestellen, die aus mehreren Elementen bestehen, sind an den Stoßstellen Klemmleisten zu verwenden

**NOTIZ**

*Bevor Sie mit dem Aufbau des Gestells beginnen, überprüfen Sie die angelieferten Packstücke auf Vollständigkeit.*

*Im Falle einer Beschädigung der Beschichtung muss diese sofort repariert werden.*

### Chantier pour montage de batteries sans entretien

F

Les dessins illustrent les différentes étapes du montage.

- Procéder au montage préalable des échelles tenant compte de leur disposition gauche et droite.
- Pour les chantiers composés de plusieurs éléments, on utilisera à leur point de réunion les plaques de raccordement.

**NOTE**

*Avant le montage du chantier, vérifier l'intégralité du matériel livré.*

*Un endommagement de la plastification doit être réparé immédiatement.*

### Scaffali per batterie ermetiche

I

Dalle illustrazioni si possono desumere le modalitá di procedura per il monaggio.

- Preassemblare gli elementi laterali. Tenere conto della disposizione degli elementi laterali destri e sinistri.
- In occasione del montaggio di telai che sono composti da piú elementi, presso i giunti devono essere utilizzate le piastre di connessione.

**NOTA**

*Prima di iniziare a montare l´intelaiatura, controllare che la confezione di imballaggio contenga tutti i pezzi.*

*In caso di danneggiamento del rivestimento, quest´ultimo deve essere immediatamente riparato.*

### Estanteria para baterias hermeticas

E

De las ilustraciones se deduce la manera de proceder en el montaje.

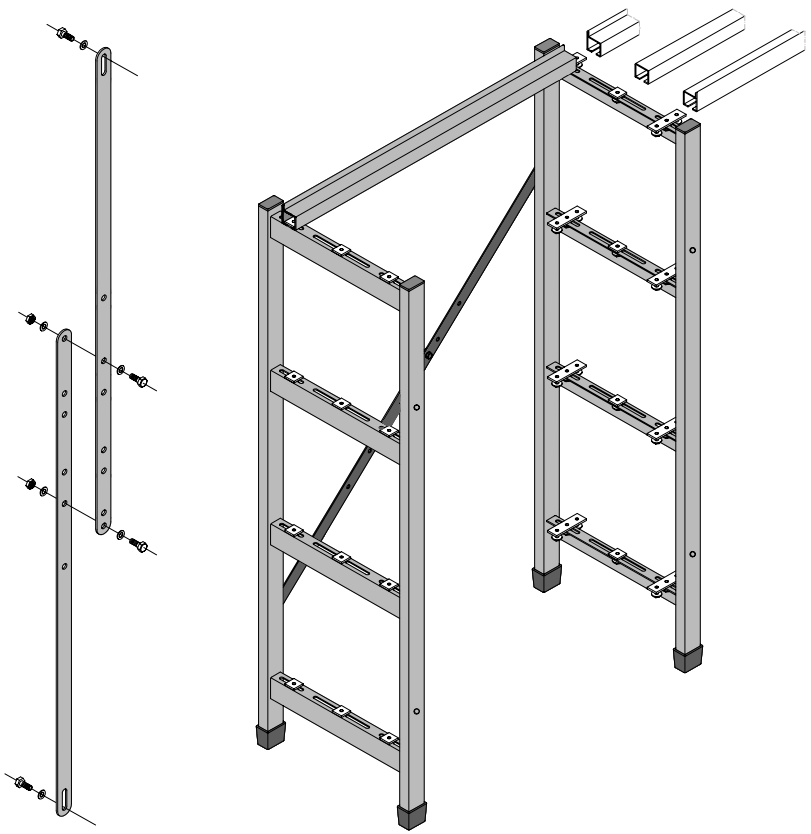
- Montar previamente las partes laterales, prestando atención a la vez a la parte lateral de la izquierda y de la derecha.
- En caso de marcos que se compongan de varios elementos hay que utilizar regleta de bornes en las junturas.

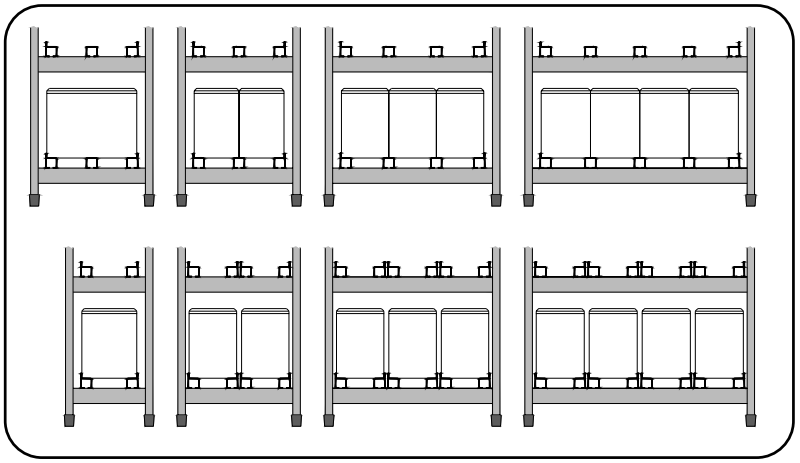
**NOTA**

*Antes de empezar con el montaje del marco examine las piezas del paquete para ver si están completas.*

*En caso de que haya algún daño en el recubrimiento, éste tiene que ser reparado enseguida*

# Assembly instructions - Montageanleitung - Instructions de montage - Instruzione di montaggio - Instucciones de montaje





## GB

- Place supports and fix with rail.
- Pre-assemble diagonal bracings according to drawing or length of the rails, and attach to the supports. Do not tighten up bolts.
- Insert rails between anchor / clamping plates and align support rails. Tighten bolts lightly only.
- Align racks. In case of irregularities in the floor, employ level-equalizing disks. Tighten all bolts.

**NOTE**

*All bolts must be tightened to a torque of 8 Nm [11 ft·lb]. Do not over tighten.*

*For additional information, please refer to* AlphaSYS® *drawings and assembly instructions.*

## D

- Ständer hinstellen und mit einer Auflageschiene fixieren.
- Diagonalverstrebungen entsprechend der Zeichnung bzw. Länge der Auflageschienen vormontieren und am Ständer anbringen. Schrauben nicht festziehen.
- Auflageschiene zwischen Klemmplatten bzw. Klemmleisten einführen und ausrichten. Schrauben nur leicht anziehen.
- Gestell ausrichten. Bei Unebenheiten im Boden Ausgleichsscheiben verwenden. Alle Schrauben anziehen.

**NOTIZ**

*Alle Schrauben sind mit einem Drehmoment von 8Nm anzuziehen.*

*Für zusätzliche Informationen sehen Sie bitte* AlphaSYS®*-Zeichnungen und Montageanleitung.*

## F

- Placer le support et le fixer à l'aide d'un longeron.
- Prémonter les renforts selon le dessin ou en fonction des longerons. Les visser à l'échelle. Ne pas serrer les vis.
- Introduire et centrer les longerons entre les plaques de serrage et de raccordement. Serrer les vis légèrement.
- Centrer le chantier. Si le sol présente des inégalités, on utilisera les épaisseurs. Serrer maintenant toutes les vis.

**NOTE**

*Serrer toutes les vis avec un couple de serrage de 8 Nm.*

*Pour toute information supplémentaire, veuillez vous reporter aux dessins* AlphaSYS® *et au manuel d'utilisation.*

## I

- Piazzare i montanti e fissarli per mezzo di un longherone.
- Preassemblare le diagonali in corrispondenza della lunghezza dei longheroni e poi applicarle ai montanti. Non serrare ancora le viti.
- Introdurre i longheroni tra le piastre di fissaggio e le piastre di connessione ed allinearle. Serrare leggermente le viti.
- Allineare lo scaffale. Se il pavimento presenta dislivelli, utilizzare i dischi spessore. Serrare tutte le viti.

**NOTA**

*Tutte le viti devono essere serrate con un momento di coppia di 8 Nm.*

*Per ulteriori informazioni, consultare i disegni e le istruzioni per il montaggio* AlphaSYS®.

## E

- Colocar el soporte y fijarlo con una guía de asiento.
- Montar previamente los puntales diagonales de acorde con el dibujo o, respectivamente, con el largo de las guías de asiento e instalarlo en el soporte. No fijar los tornillos.
- Introducir y ajustar las guías de asiento entre las placas de bornes o, respectivamente, las regletas de bornes.
- Ajustar el marco. En caso de desigualdades en el suelo emplear guías compensadoras. Apretar todos los tornillos.

**NOTA**

*Todos los tornillos tienen que ser apretados con un momento de giro de 8 nanómetros.*

*Para más informaciones mire los dibujos de* AlphaSYS® *y las instrucciones de montaje.*