AEG

POWER
SOLUTIONS

PROTECT RCS

Installation and operation manual

Rectifier, battery charger and DC/DC converter rack with CoSSMIC Slot controller

MIPe

Modular Industrial Power

19" rack

6kW-150A

BN 133436/01/01 – 13/03/2024

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 when it is integrated inside a system including a closed cabinet. 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, use it in compliance with the connection rules recommended by AEG Power Solutions, and integrate it inside a dedicated enclosure providing the safety requirements to the user.

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 MIPe range of rectifiers, battery chargers and DC/DC converters delivered as 19 inches racks.

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 when integrated inside an enclosure:
- Operator: door closed.
- Maintenance personnel: door open.

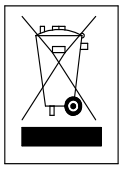
IMPORTANT RECOMMENDATIONS:

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:

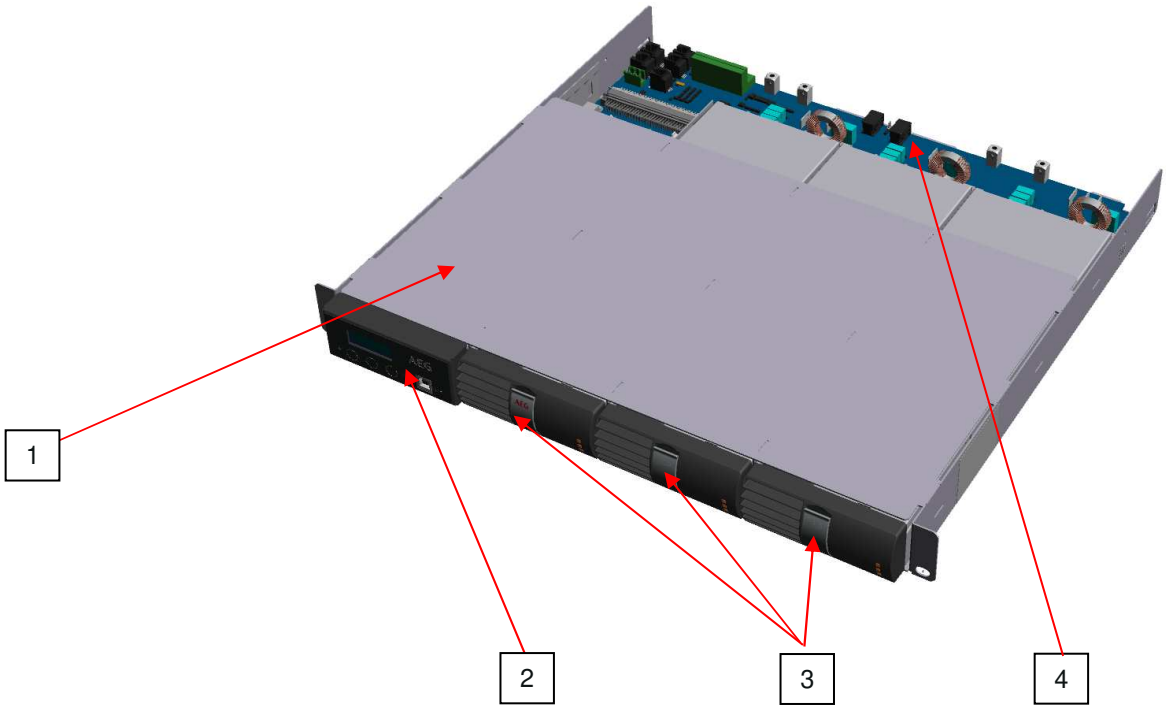
This manual, covering standard equipment, comes with a standard drawing package.
These documents will be needed for any on-site action by our Customer Service Department.

2 PRESENTATION OF THE SYSTEM

The aim of the 19" rack is to provide a compact and ready to use solution for DC power supply or battery charger solutions.

The racks are composed of the following elements:

1. 19'' compatible rack used a mechanical support and receiving the interface mother board, the CoSSMIC Slot controller and up to 3x rectifier or converter modules
2. CoSSMIC Slot controler module
3. MIPe rectifiers or DC/DC converter modules
4. Interface mother board



The 19'' rack offers the following DC output ratings:

6kW rack – 3TN21120AAAA

Output Voltage (V DC)	**24**	**48**	**110**	**220**
Maximum output Current with 3 modules (A)	150	120	48	24

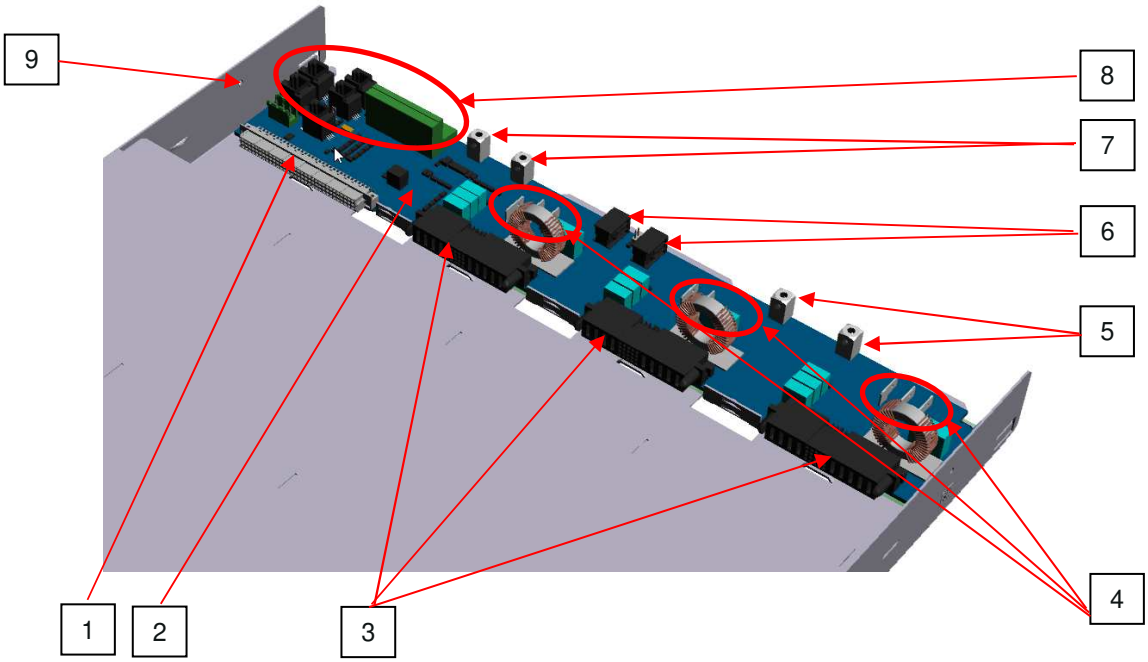
List of associated products:

3TN21124AAAACoSSMIC Slot controller module
3TN21009AAAA PM 24-50 24V 1,5kW MIPe rectifier module
3TN21009ACAA PM24-50 24V 1.5kW MIP Rectifier Module railway application
3TN21010AAAA PM 48-40 48V 2kW MIPe rectifier module
3TN21011AAAA PM 110-16 110V 2kW MIPe rectifier module
3TN21012AAAA PM 220-8 220V 2kW MIPe rectifier module
3TN21009BAAA PMC24 110V-220VDC input / 24V output 0,75kW-1.2kW
3TN21010BAAA PMC48 110V-220VDC input / 48V output 1.2kW-1.9kW
3TN21011BAAA PMC110 110V-220VDC input / 110V output 1.2kW-1.9kW
3TN21012BAAA PMC220 110V-220VDC input / 220V output 1.2kW-1.9kW

2.1 RECTIFIER / CONVERTER POWER RACK

Through its interface mother board, the power rack is designed to receive up to 3x MIPe rectifier or converter modules, and is compatible with the 4 DC nominal voltages 24V, 48V, 110V and 220V.

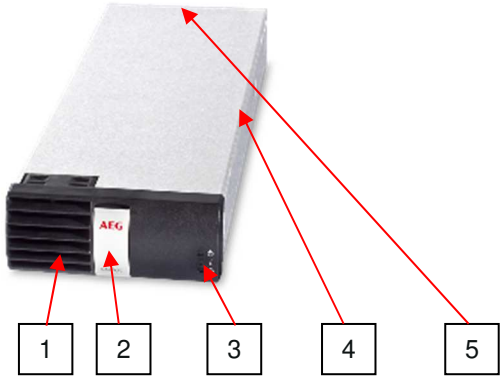
1. CoSSMIC Slot controller connector
2. Interface mother board
3. Rectifier/converter modules connectors (1 to 3)
4. AC or DC input plugs “faston type” for rectifier/converter modules 1 to 3 (Pn, N, Gnd or +, -, Gnd)
5. DC output terminals for modules 2 and 3 (the module outputs are connected in parallel on the board)
6. CAN bus connectors for rectifiers/converters control of the 19” rack intself and for extension racks
7. DC output terminals for module 1
8. Measurements inputs, digital inputs and communication ports connectors
9. Earth connection and cover screw tightening hole.



2.2 RECTIFIER / CONVERTER MODULE

The rectifier and converter modules are not delivered with the 19” power racks and shall be ordered separately. Refer to the module user’s manual for more details.

1. Front face with air inlet
2. Module extraction and locking handle
3. Status and alarm LEDs
4. Module mechanical enclosure
5. Rear connector



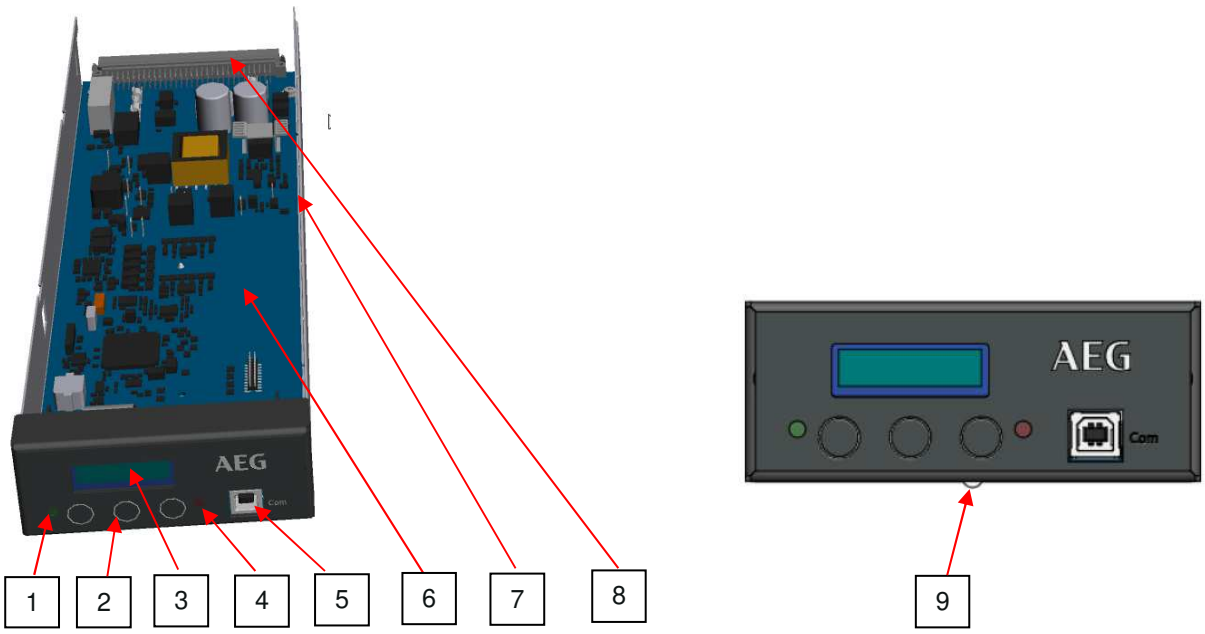
2.3 COSSMIC SLOT CONTROL MODULE

The control module has the following functions :

- Measure the system environment electrical and physical values,
- Store the system settings,
- Run the DC output voltage and current regulation algorithm and control the rectifier/converter modules accordingly,

The control module is composed of the following parts :

1. Green LED for normal working status
2. 3x control buttons for access to the display menus
3. Display 2 line – 16 characters
4. Red LED for alarm indication
5. Local communication port type USB-B
6. CoSSMIC Slot control board
7. CoSSMIC Slot connector to the mother interface board
8. Module enclosure (note that there is no top cover on the module)
9. Spring ball for module locking inside the 19" rack



The CoSSMIC Slot module delivered does not contain any parameter suitable for a battery charger nor converter management. Please contact AEG Power Solutions to be informed of the procedure to have or to generate the parameters suitable for your application, or order separately the parameter settings.

The connection of the CoSSMIC Slot module to the earth is achieved through the rear connector to the mother interface board. Therefor it is mandatory to connect the 19" power rack to the earth for safety and earth fault detection purposes.

WARNING : the mother interface board is not delivered with all the male connectors as standard feature. The user shall purchase himself the missing connectors or buy the AEG optional connector set.

NOTE : the battery charger function is only available when rectifier modules are used. When DC/DC converters are used, the system will work as a DC power supply only without battery management function.

3 INSTALLATION

The racks are delivered with all the different parts assembled on a 19'' compatible mechanical structure.

3.1 HANDLING

The equipment and its associated batteries (if applicable) must be handled with care, the electronic boards that are not protected shall not be touched or sustain mechanical constraints nor shocks.

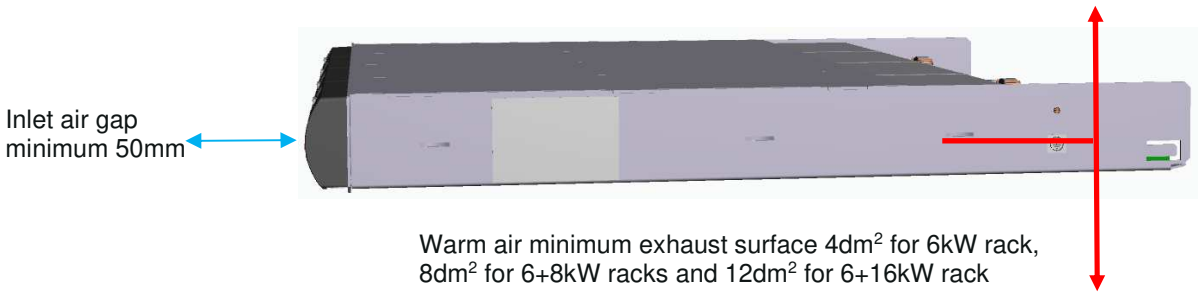
CAUTION:
- The 19" power rack is heavy, always carry the rack making sure that the maximum allowed weight per person is not exceeded!
- Always keep the battery cells in a vertical position.
- Never lift a battery cell by its connections.
- Do not put or drop objects on the battery.
- Do not stay or walk under suspended loads.
- Always wear protective clothings and accessories.

3.2 INSTALLING AND SECURING THE RACK

The racks must be installed inside mechanical enclosures, suitable to receive 19 inches equipments and with a proper cooling capacity.

The racks do not provide any electrical nor mechanical protections, the cabinet shall provide a minimum IP20 protection level in other to protect the operators.

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.
- Cabinet with adapted dimensions and footprint.
- Cabinet providing enough air entry space in front of the modules and allowing exhaust air to escape at the back shall be used, as described below.
- The cabinet cooling capacity shall be sized at 110W per rectifier/converter module. The cabinet internal temperature shall not exceed 65°C @ 40°C external ambient or maximum module air inlet 55°C.



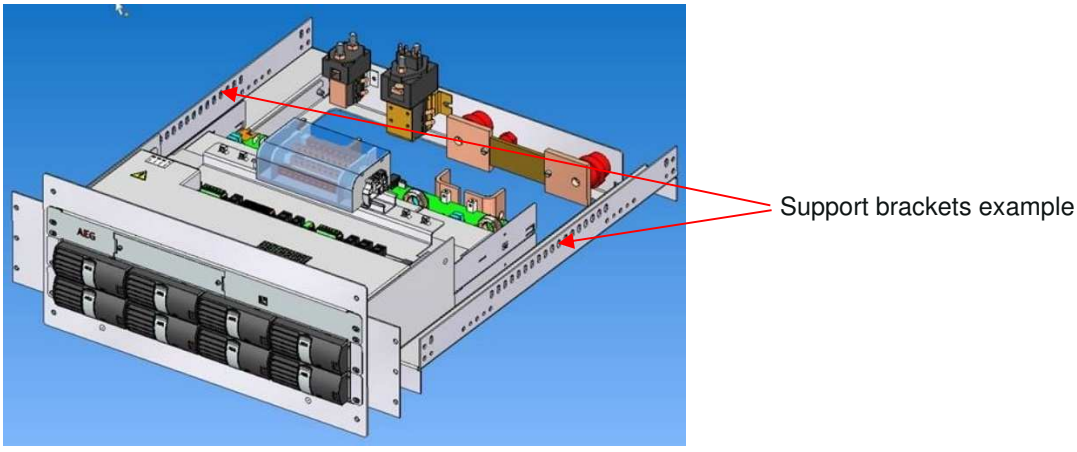
CAUTION:
Do not touch the internal rack mechanical parts, high temperatures might be present.
Make sure that enough space is present above and below the charger rack in order to ensure a proper cooling.

Rack mechanical fixing :

- The front 19" fixing plates do not procure a sufficient mechanical robustness, therefore a mechanical support located in the rack depth is mandatory. This support is not provided with the rack.
- Use screws to fix the front 19'' plate, 4 holes are available to secure the rack.

Mechanical fixing details :

Refer to mechanical drawings.



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:	-10°C to +55°C for rectifier air inlet Above 55°C and up to 75°C, the output current must be de-rated (1.25% per °C).
Relative humidity:	10% to 95 % (non-condensing).

Altitude

≤ 1000 m

Above 1000 m and up to 3000 m, the output current must be de-rated (1% per 100 m).

4 CONNECTIONS

Refer to the drawing package delivered with the rack.

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 use cables with adapted cross section. The cables must be properly tightened inside the cabined in order to avoid mechanical efforts to the connection points in the rack.
The connection of the charger rack to the earth is mandatory for safety and earth fault detection purposes. Refer to the rack dedicated drawing for more information.

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)*.
- Rectifier/converter and CoSSMIC Slot modules removed from the rack.

The 19" Power Rack with CoSSMIC Slot does not contain any DC output shunt for battery recharge current limitation purpose. The rack shall be used in its standard configuration as a DC power supply or battery charger without battery current control. An external shunt must be added and connected to the interface mother board to have the battery current limitation feature.

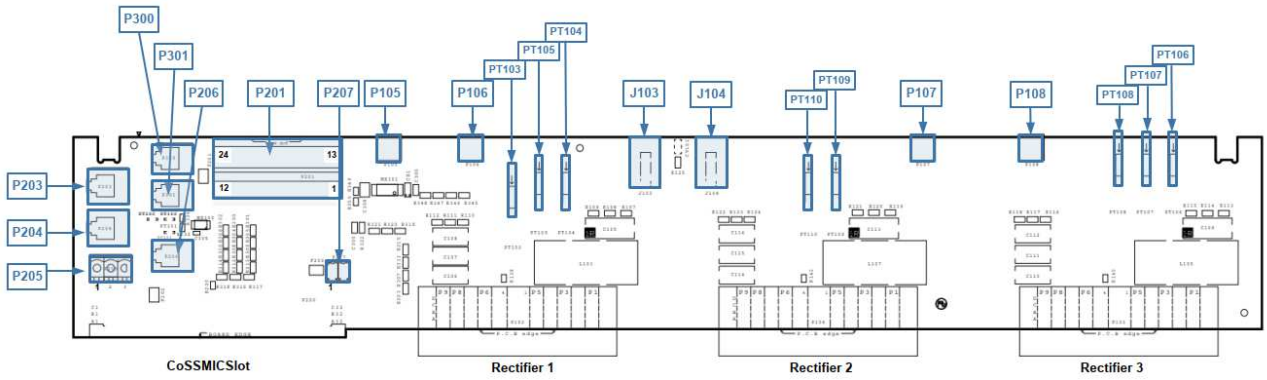
4.1 MAINS INPUT CONNECTION

DANGER, THE RECTIFIER MODULE IS EQUIPPED WITH INPUT FILTERS:
MAINS INPUT: HIGH LEAKAGE CURRENT.
EARTH CONNECTION IS MANDATORY BEFORE CONNECTING THE MAINS SUPPLY.
IF A 3 PHASE MAINS IS SUPPLYING THE RACK, THE NEUTRAL CONNECTION IS MANDATORY

It is mandatory to install a mains input protection in the mains switchboard upstream the charger.
Recommended ratings (gG type fuse or C tripping curve breaker) as follows:

Number of rectifier/converter active modules (redundant module not included)	Recommended protection with 220V-240V single phase mains or 110V/220VDC supply	Recommended protection with 380V-415V three phase + N mains
1	25A	N/A
2	32A	25A
3	40A	25A

Connect the input supply to the faston plugs located on the interface mother board.
Always connect the electrical earth to the power rack earth plugs (faston type) and the site mechanical earth to the mechanical part of the 19" power rack.



PT103 : Earth connection
PT105 : AC Neutral (input of Rectifier 1) or "–" polarity (input of DC/DC converter 1)
PT104 : AC Live (input of Rectifier 1) or "+" polarity (input of DC/DC converter 1)

PT110 : AC Neutral (input of Rectifier 2) or "–" polarity (input of DC/DC converter 2)
PT109 : AC Live (input of Rectifier 2) or "+" polarity (input of DC/DC converter 2)

PT108 : Earth connection
PT107 : AC Neutral (input of Rectifier 3) or "–" polarity (input of DC/DC converter 3)
PT106 : AC Live (input of Rectifier 3) or "+" polarity (input of DC/DC converter 3)

4.2 DC LOAD 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.

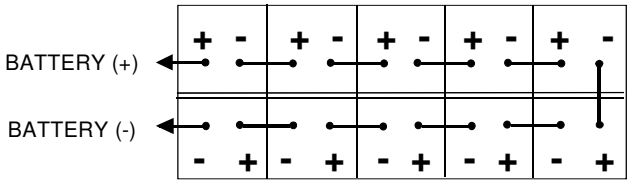
To handle the electrolyte, use gloves and safety goggles.
The electrolyte contained in a battery is dangerous to the skin and clothes.
Before doing work on a battery, make sure that there is an accessible supply of water nearby. If electrolyte is splashed, wash immediately with water and refer to battery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

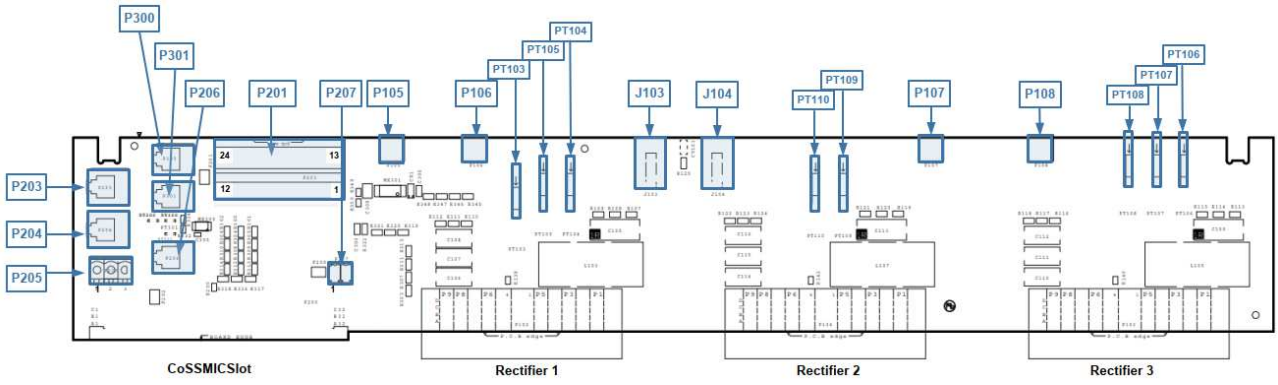
Battery cells must be connected in series, i.e. the (+) pole of each cell must be connected to the (-) pole of the next cell.



Series connection of battery cells

. 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.

The DC load and connection points on the interface mother board are shown hereafter:



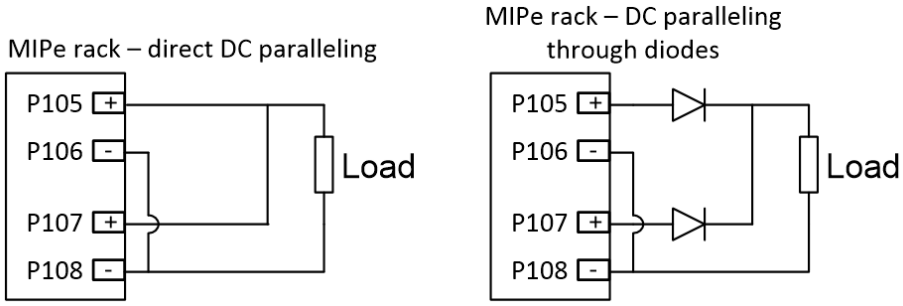
P105 : DC + output of Rectifier 1 or DC/DC converter 1
P106 : DC - output of Rectifier 1 or DC/DC converter 1
P107 : DC + output of Rectifier 2 & Rectifier 3 or DC/DC converter 2 and 3
P108 : DC - output of Rectifier 2 & Rectifier 3 or DC/DC converter 2 and 3

Max. cable cross section 25mm^2 with M5 lug, tightening torque min. 3Nm and max. 4Nm.

For parallel connections of the 3 rectifier or DC/DC converter modules, the terminals P105 and P107 shall be connected together and the terminals P106 and P108 shall be connected together. The IP20 cover option offers the possibility to get paralleling bars between those terminals.

Important notice : the P105/P106 pair is not connected internally to the P107/108. Nevertheless no galvanic insulation is guaranteed between the output of rectifier/converter 1 and those of rectifier/converters 2 and 3.

It is possible to connect a blocking diode in series with each "+" polarity to have backfeed protection.



Important notice : the CoSSMICSlot controller is supplied by the Rectifier 1 or DC/DC converter 1 output.

Refer to the charger rack electrical and mechanical drawings for more details. **It is mandatory to install at least an external battery protection in the battery circuit.**

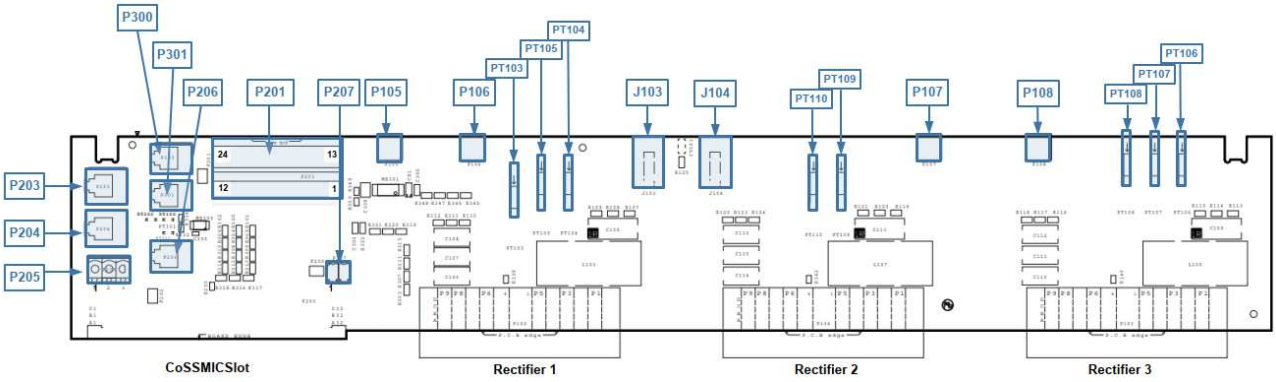
Recommended maximum rating (gG type fuse or C tripping curve breaker):

Type of 19" power rack	Maximum protection rating
6kW – 150A	150A

THE 19" POWER RACK IS NOT DESIGNED TO BE CONNECTED TO OTHER CHARGERS OR DC SOURCES
ALWAYS CHECK THAT THE BATTERY TYPE, TECHNOLOGY AND NUMBER OF CELLS ARE COMPATIBLE WITH THE CHARGER ELECTRICAL FEATURES
IT IS NOT ALLOWED TO MIX DIFFERENT TYPES OF RECTIFIERS OR DC/DC CONVERTERS INSIDE THE RACK

4.3 CONNECTING THE OPTIONS AND ALARM CONTACTS

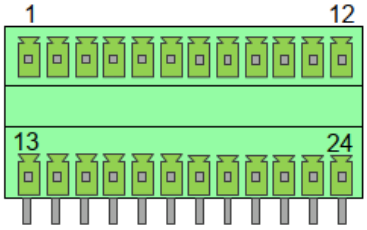
All the options and the associated functions are connected to the interface mother board as shown hereafter :



Option	Connector name on interface mother board	Connector/cable type	Comment
Internal CAN bus	J103 and J104	RJ4P/4C	For extension 19" racks or external device (e.g BMS)
External display A300-A310	P300	RJ4P/4C	
8 relay alarm card(s)	P301	RJ4P/4C	I2C bus is connected in series if 2 relay boards or relay + LED box are used
LED box	On display or relay card	RJ4P/4C	
Temperature probe	P06	RJ4P/4C	
Relay output (dry contacts)	P205	CRV header- pitch 5.08mm - 3 pins 1,5mm2 max	Relay contact 160VDC/0.1A – 250VAC/5A
RS232 communication board RS485 communication board NCS communication board	P203 or P204	RJ6P6C	P203 id UART1 P204 is UART 2
Isolated power supply 5V/3W	P207	CRV header - pitch 3.81mm - 2 pins.	Used for the communication options
5x digital spare inputs for DC signals (DIN) DC output voltage and current measurements Output power contactor control	P201	1,5mm2 max	VDC1/VDC2 : Measurement channels for DC voltage 0..350Vdc. M_IBATT-/M_IBATT+ : Shunt measurement +/-100mV. DIN_0 to DIN_4 : Digital inputs. High impedance or pulled down to 0. DOUT_SPARE : Digital output. Open drain. 50V max. LVD : Digital output. Open drain. 600V max.

P201 connection details :

Pin	Function			
1	VDC1		13	VDC2
2			14	
3	M_IBATT-		15	DIN_0
4	M_IBATT+		16	DIN_1
5	M_HALL1		17	DIN_2
6			18	DIN_3
7			19	DIN_4
8			20	DOUT_SPARE
9	0VD		21	0VD
10	+5VD		22	
11	0VD		23	
12	+12VD		24	LVD



Note : when digital inputs are connected to dry contacts, "0VD" terminal shall be connected to P106 terminal.

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

Important notice : the 19" power rack is delivered with generic parameters that might not be adapted to the solution technical features (mains input, DC output voltage, battery type and charging voltages, type of rectifier or converter module …). This is mandatory to upload the correct parameters prior to initiate the start-up sequence.

5.1 PRELIMINARY CHECKS

All circuit-opening devices must be in the "open" position.
Check that all the rectifier/converter and CoSSMIC Slot modules are removed from the rack.
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 with the battery cable not connected to the (+) BATT terminal of charger *(case 2 below)*.

- Close the negative side of the battery (-) (fuse, protective device, etc …).
- Insert one rectifier module (**and only one**) and plug it completely inside the power rack
- Close the mains protective devices.

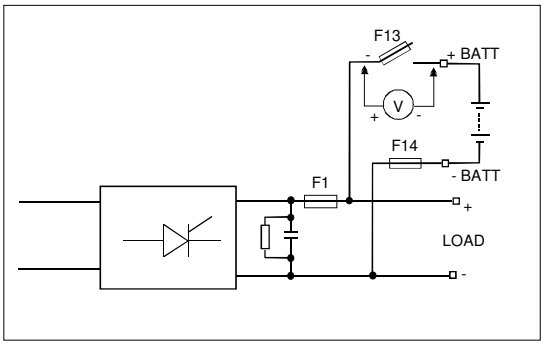
After a few seconds, the display shows the floating voltage and the rectifier current (at no-load).

Load :	xx.xV	xxA
Alarms :		
●	●	●

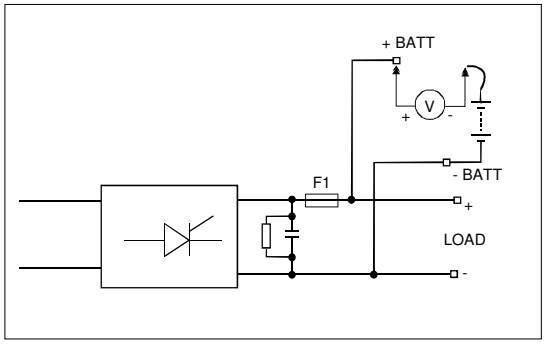
NOTA: The current value can be around 0.5 A.

If the rectifier/converter module does not start and no voltage is present on DC output, check the input supply connection and specially the presence of the neutral wire in case of 3 phase mains.
The DC voltage reading must be as per the system nominal load voltage settings (see project drawing).
Always use the appropriate module type for the application, never mix different module types in the same rack as they deliver different DC voltage levels.

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 :

- Insert all the rectifier modules and plug them completely inside the power rack
- 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).

Rect :	xx.xV	xxA
Alarms :		
●	●	●

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 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 the 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

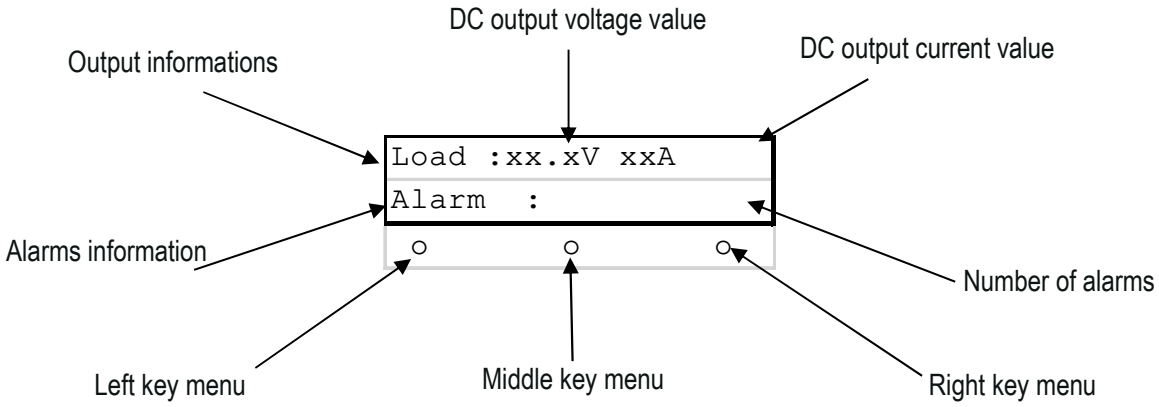
The following section explains the basic operator menu structure of your system. It allows you to access all necessary functions in order to operate your system.
The menus, indications and controls available depend on the system configuration.

The keyboard assembly has two LEDs indicators:
- green LED: CoSSMICSlot controller is powered
- red LED: steady = URGENT alarm / blinking = NON URGENT alarm

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.

The display enters a sleep mode when there is no activity on the buttons (display is OFF). Push the middle key to activate the display and backlight.

6.1 DEFAULT MENU



The top line will display alternatively the rectifier voltage and current, and the load voltage and current.
For display contrast adjustment, press left key to decrease the contast and the right key to increase the contrast.
Press middle key to enter in the main menu.

6.2 MAIN MENU

ALARMS		
EXIT	NEXT	ENTER
●	●	●

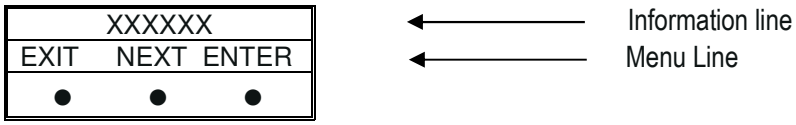
The first menu available is the alarm menu with three possibilities by pressing the corresponding button on the keyboard.

EXIT : go back to the previous menu
NEXT : go to the next menu item
ENTER : select the menu displayed

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.

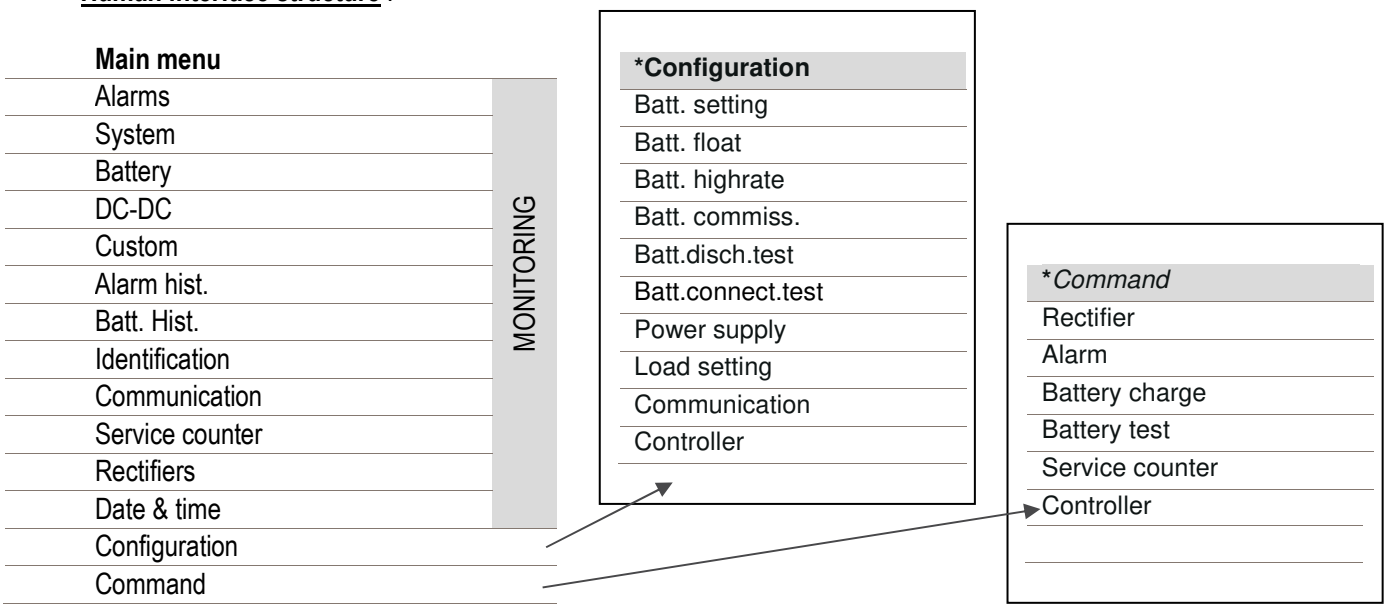
These groups are defined as:

- **Monitoring** Display of the analog measurements and alarms, read only
- **Configuration** Display or change the system configuration
- **Commands** Manually triggered functions (High rate, Battery test etc.)

They are all accessible from the main menu as follows :

Alarms	Access to the content of the alarm list present on the system (read only)
System	Monitoring of the main electrical and physical values of the system (read only)
Battery	Monitoring of the main electrical and physical values of the system (read only)
Custom	Monitoring of custom values (if activated) - (read only)
Alarm hist.	Access to the system alarm history (read only)
Batt. hist.	Access to the battery state history (read only)
Identification	System identification (type, site name, software version, serial number …) - (read only)
Communication	Access to the communication ports parameter (read only)
Service counter	Access to the service counter values (read only)
Rectifiers	Access to the rectifier parameters (read only)
Date & time	Access to date and time set on the system (read only)
Configuration	Access to the configuration menu where configuration parameters can be monitored or changed and in this later case, a password is needed
Command	Access to command menu where some actions can be triggered, password is needed

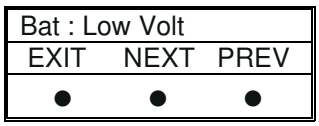
Human interface structure :



6.4 MONITORING FUNCTIONS

6.4.1 Alarm menu

Display of the list of the alarms present on the system.



EXIT : go back to the main menu / NEXT : display of the next alarm in the list / PREV : display the previous alarm in the list

Alarm list present on the system and depending on the configuration :

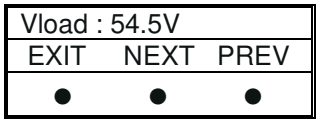
Label	Description
System alarm	
BACKPLANE MEM	The memory on the interface board is not initialized or is corrupted.
CAN1 FAULT	CAN bus 1 is faulty
EARTH FLT P	Earth to DC+ impedance too low
EARTH FLT N	Earth to DC- impedance too low
CNFIG ERR	Error in parameter configuration
CALIB ERR	Error in calibration data
EQUAT ERR	Error in an equation
TCPIP FAIL	TCP/IP option not detected
REL.BRD 1 to REL.BRD 8	A relay board is not detected
DIX BRD 1 to DIX BRD 4	A Digital Input eXtension board is not detected
LEDBOX 1 to LEDBOX 3	A LEDBOX is not detected
AC or DC input alarm	
AC LOW or DC INP. LOW	AC or DC voltage low based on rectifier module mains measurement
AC HIGH or DC INP. HIGH	AC or DC voltage high based on rectifier module mains measurement
AC FAIL or DC INP. FAIL	AC or DC input fail, voltage measurement on system interface board (option)
DC output alarm	
DC EXT SHUTDWN	External shutdown
DC HIGH VOLT	High DC output voltage
DC LOW VOLT	Low DC output voltage
DC HIGH CURR	High DC output current
DC CHARGER FAULT	Common fault of charger
DC I LIMIT	Rectifier / charger in current limitation mode
Rectifier / converter module alarm	
RECT.FAIL <= N DC-DC FLT <=R	Rectifier/converter failed (<= redundancy)
RECT FAIL > N DC-DC FLT >R	Rectifier/converter failed (> redundancy)

Label	Description
Battery alarm	
BATT FUSE1 to 4	Battery protection failed on string 1 to 4
BATT LVD OPEN	Battery LVD contactor open
BATT LVD POS	Battery LVD contactor position inconsistent
BATT VOLT LOW	Battery low voltage
BATT VOLT HIGH	Battery high voltage
BATT V SENSOR	Battery voltage sensor lost
BATT I SENSOR	Battery current sensor lost
BATT T SENSOR	Battery temperature sensor lost
BATT REGUL	Battery regulation error
HIGH RATE FAULT	High rate charge error (too long)
DISCH TEST FAIL	Battery discharge test failed
BATT ILIMIT	Battery in current limit
BATT LOW CAPA	Battery low capacity
BATT ON DISCH	Battery on discharge
BATT HIGH TEMP	Battery high temperature
BATT_SYMM	Battery symmetry error
BATT CONN TEST	Battery connection test failed
DC load alarm	
LOAD LVD	Load LVD contactor open
LOAD LVD POS	Load LVD contactor position inconsistent
LOAD FUSE 1 to 4	Load protection 1 open to 4
LOAD OVER I	Load over current
LOAD V SENSOR	Load voltage sensor lost
LOAD HIGH VOLT	High DC load output voltage
LOAD LOW VOLT	Low DC load output voltage

Note : custom alarms can be added to this list and linked with information coming from digital inputs or auxiliary devices.

6.4.2 System menu

Display of the system electrical and physical measurements.



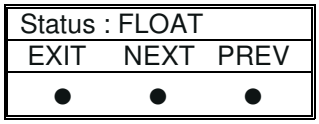
EXIT : go back to the main menu / NEXT : display of the next value / PREV : go back to the previous value

List of the displayed values :

Vload :	Load output voltage (V)
Iload :	Load output current (A)
Pload :	Load output power (W)
Vcharg :	Charger output voltage (V)
I Rect. :	Rectifier output current (Σ of rectifier module output currents) - (A)
Nb rect.fail:	Number of rectifier faulty
Nb rect.op. :	Number of rectifier healthy
Tamb :	Measurement from the temperature probe dedicated to the ambient temperature (°C)
VAC :	Mains input voltage between Ph1 and N whatever the mains type is (3Ph or 1Ph) - (V)
Earth imp:	Impedance measurement of DC polarity to earth (+ or – whatever the lowest is) - (kΩ)

6.4.3 Battery menu

Display of the battery electrical and physical measurements. Note that an external battery current measurement shall be added to have all the features available.



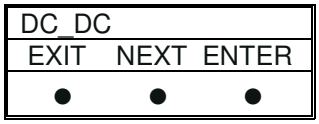
EXIT : go back to the main menu / NEXT : display of the next value / PREV : go back to the previous value

List of the displayed values :

Status:	Battery statuses can be : floating, high rate charge, commissioning charge, discharge, capacity test, connection test
AhMeter :	Battery Amper-hour meter (% of battery nominal capacity)
Vbatt :	Battery voltage (V)
Ibatt :	Battery current, displayed “+” in recharge and “–“ in discharge (A)
Tbatt :	Measurement from the temperature probe dedicated to the battery temperature (°C)

6.4.4 Converter module menu

Display of the converter module group status and information.



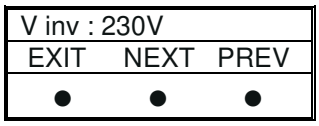
EXIT : go back to the main menu / NEXT : go to the next converter group / ENTER : access to the converter group data.

Converter data for each of them :

Status :	Module working status (ON / FAULTY / STANDBY). Standby mode is used for energy saving when the output current needed is lower than the rectifier total capacity. This mode is activated when required.
Current :	Module output current
Voltage :	Module output voltage

6.4.5 Custom menu

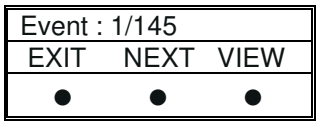
Display of custom electrical and physical measurements (if activated and programmed on the system).



EXIT : go back to the main menu / NEXT : display of the next value / PREV : go back to the previous value

6.4.6 Alarm history menu

Display of up to 1000 alarms recorded by the CoSSMIC control board, with FIFO management process.



The first line shows alternatively the rank of the event and the alarm text.

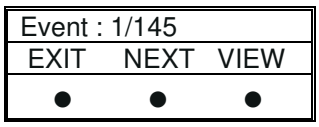
EXIT : go back to the main menu / NEXT : display of the next value / VIEW : get the alarm details

Alarm details recorded, accessible with “VIEW” and “NEXT” buttons :

Mains Fail +	Description of the alarm. “+” means alarm occurence, “-“ means alarm disappearance
21/SEP/2020	Date of the alarm status change
07:55:46	Time of the change

6.4.7 Battery history menu

Display of up to 1000 battery events recorded by the CoSSMIC control board, with FIFO management process. Battery event means a change in the battery status.



The first line shows alternatively the rank of the event and the event text.

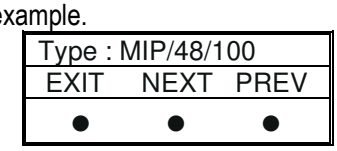
EXIT : go back to the main menu / NEXT : display of the next value / VIEW : get the event details

Event details recorded, accessible with “VIEW” and “NEXT” buttons :

FLOAT	Description of the event.
10/FEB/2020	Date of the event
07:55:46	Time of the event

6.4.8 System identification menu

Display of the system identification parameters, usefull to identify a system during a maintenance operation for example.



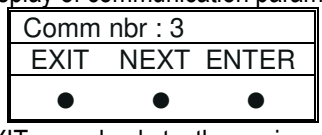
EXIT : go back to the main menu / NEXT : display of the next value / PREV : go back to the previous value

List of the displayed information :

Type:	Type of system (system brand name, nominal output voltage and current)
Sfw vers:	CoSSMIC board software version
Site:	Site name
Sys:	System identification (drawing number, part number)
SN:	Control board serial number

6.4.9 Communication parameters menu

Display of communication parameters, linked with the communication ports of the CoSSMIC Slot interface board.



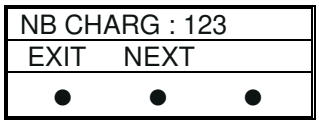
EXIT : go back to the main menu / NEXT : go to the next communication port / ENTER : access to the communication port displayed (access to UART 1 to 2)

Communication parameters details for each port :

COM:9600/8/N/1	Communication baud rate/Nb of bits/Parity/number of stop bits
TYPE : RS485	Communication type declared in the control board
SLAVE :	Slave number
PROT :	Communication protocole (AEG PS / MODBUS ASCII ; RTU ; master)
IP ADDRESS :	IP address (for UART 1 to 2)
NET MASK :	Net mask information (for UART 1 to 2)
GATEWAY :	Gateway information (for UART 1 to 2)

6.4.10 Service counter menu

Display of the service counter figures, stored on a memory of the CoSSMIC board, and recoreded over the time of service of the system. Those information can be used for preventive maintenance and can be associated with alarm triggering events.



EXIT : go back to the main menu / NEXT : display of the next parameter

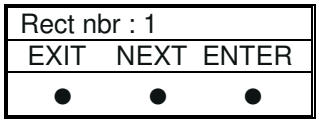
List of the displayed information :

NB CHARG:	Number of battery recharge cycles
SERVICE TIME:	Number of hours since the initial system power-on
BATT. LIFETIME:	Number of hours since battery commissioning

Note : this menu is optional and activated only on special request.

6.4.11 Rectifier module menu

Display of the rectifier module status and information.



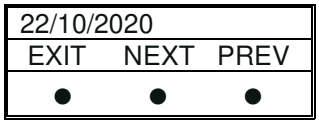
EXIT : go back to the main menu / NEXT : go to the next rectifier number / ENTER : access to the rectifier data through its number declared in the system

Rectifier data for each of them :

Logged :	Status of the communication of the module on the CAN bus (YES/NO)
Status :	Module working status (ON / FAULTY / STANDBY). Standby mode is used for energy saving when the output current needed is lower than the rectifier total capacity. This mode is activated when required.
Serial number :	Module serial number
Current :	Module output current
Temp :	Module internal temperature
Ilimit :	Module is limiting its output current (YES / NO)
Overvolt :	Module on output DC overvoltage shutdown mode (YES / NO)
Overtemp :	Module on overtemperature shutdown mode (YES / NO)
Fault :	Module faulty and not working (YES / NO)
Fan fault :	Module fan faulty, rectifier is stopped to protect against overtemperature (YES / NO)

6.4.12 Date and time menu

Display of the date and time of the internal clock of the control board. Those data are used in history loggin process.



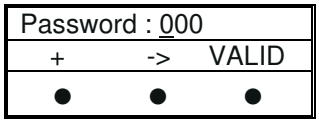
EXIT : go back to the main menu / NEXT : display of the next parameter / PREV : go back to the previous value

List of the displayed information :

22/10/2020	Date in Day/Month/Year format
15h 15min 50sec	Time

6.4.13 Configuration menu

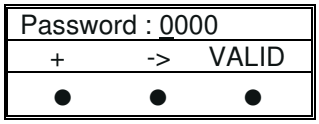
Access to the configuration menu, through password.



+ : increase the highlighted digit number / -> : go to the next digit of password / VALID : acknowledge the password to enter in the menu. In order to go back to the main menu, keep the password to initial “0000” and press “VALID”.

6.4.14 Command menu

Access to the command menu, through password.



+ : increase the highlighted digit number / -> : go to the next digit of password / VALID : acknowledge the password to enter in the menu. In order to go back to the main menu, keep the password to initial “000” and press “VALID”.

6.5 CONFIGURATION FUNCTIONS

The configuration menu is composed of the following menus which allow to change the associated parameters :

Batt. Setting	Access to battery settings for modification
Batt. Float	Access to battery floating parameters for modification
Batt. Highrate	Access to battery high rate parameters for modification
Batt. commiss.	Access to battery commissioning parameters for modification
Batt.disch.test	Access to battery discharge test parameters for modification
Batt.conn.test	Access to battery connection test parameters for modification
Power supply	Access to power supply DC output mode parameters for modification
Load setting	Access to load output parameters for modification
Communication	Access to communication parameters for modification
Controler	Modification of the controler parameters (Display language, date & time, passwords)

If a wrong password is entered, those values will be accessible as read only parameters.

The access to any of those menus is explained hereafter :

Batt. setting		
EXIT	NEXT	ENTER
●	●	●

EXIT : go back to the main menu / NEXT : display of the next value / ENTER : access to the parameters related to the menu item

The Configuration and Command menus are accessible with a password in order to allow the modification of your system configuration. The default password is 0123 for the configuration menu and 0111 for the command menu. Any modification of your system configuration or command action is your responsibility. You risk damages on your battery or equipment if the modification is done by a non specialized staff.

6.5.1 Battery setting menu

Access to the battery settings for modification. Note that an external battery current measurement shall be added to have all the features available.

Mode : AUTO		
-	+	NEXT
●	●	●

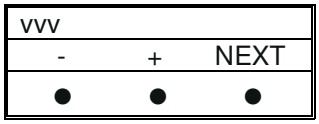
- : go to the previous value / + : go to the next value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

List of the parameters accessible for modification :

Mode :	Battery charging mode : AUTO = normal mode float and automatic high rate FORCED FLOAT = system forced to float, high rate inhibited POWER SUPPLY = system in adjustable DC power supply mode
Capa:	Access to battery nominal capacity (Ah)
Nb cell:	Access to battery number of cells
LVD disc:	Access to the opening voltage level of the low voltage disconnect contactor (V)
LVD rec.:	Access to the closing back voltage level of the low voltage disconnect contactor (V)
LowV:	Access to battery low charging voltage alarm (V)
HighV:	Access to battery high charging voltage alarm (V)

6.5.2 Battery float charge parameter menu

Access to the battery float charge parameters for modification.



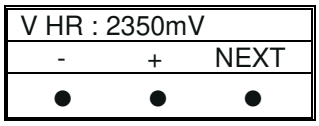
- : decrease the value / + : increase the value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

List of the parameters accessible for modification :

Vfloat :	Battery voltage per cell (mV)
IlimF :	Battery current limit (% of battery capacity)

6.5.3 Battery high rate charge parameter menu

Access to the battery high rate charge parameters for modification.



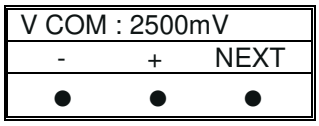
- : decrease the value / + : increase the value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

List of the parameters accessible for modification :

V HR :	Battery voltage per cell (mV)
IlimHR :	Battery current limit (% of battery capacity)
Duration :	High rate charge timeout alarm – (h)
Interval :	High rate charge periodicity (if “0” then the periodic high rate charge is disabled – days)

6.5.4 Battery commissioning charge parameter menu

Access to the battery commissioning charge parameters for modification.



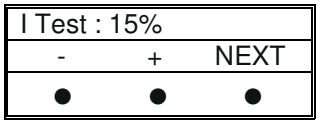
- : decrease the value / + : increase the value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

List of the parameters accessible for modification :

V COM :	Battery voltage per cell (mV)
IlimCOM :	Battery current limit (% of battery capacity)
Duration :	Duration of commissioning charge before going back to floating – (h)

6.5.5 Battery discharge test menu

Access to the battery discharge parameters for modification. This test will assess the actual battery capacity, handling a discharge test using dedicated parameters. It can be either automatically triggered with a pre-defined interval, or triggered manually.



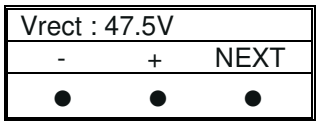
- : decrease the value / + : increase the value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

List of the parameters accessible for modification :

I Test :	Test current applied during the whole test duration (% of battery Ah)
V End :	End test voltage (V) – Must be above the battery end of discharge voltage to avoid load supply failure.
Interval :	Periodicity between 2 tests (if "0" then the periodic test is disabled – days)

6.5.6 Battery connection test menu

Access to the battery connection test parameters for modification. This test will check if the battery is actually connected to the system, handling a short discharge test using dedicated parameters. It can be either automatically triggered with a pre-defined interval, or triggered manually.



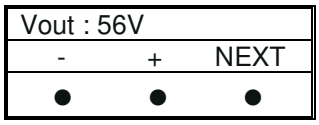
- : decrease the value / + : increase the value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

List of the parameters accessible for modification :

V rect :	Rectifier output voltage set point during the test (V) – Must be above the battery end of discharge voltage to avoid load supply failure.
Interval :	Periodicity between 2 tests (if "0" then the periodic test is disabled – hours)

6.5.7 Power supply menu

Access to the power supply parameters for modification. The values entered have an immediate effect on the system output voltage and maximum current when acknowledged, but can't exceed the system limit values fixed by the control board and calculated from nominal parameters.



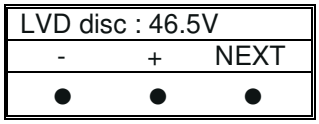
- : decrease the value / + : increase the value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

List of the parameters accessible for modification :

V out :	Output voltage to be delivered by the system (V). Only valid for system with rectifiers and configured in "Power Supply" mode.
I limit :	DC output current limitation that the system will not be allowed to exceed (A). Only valid for system with rectifiers and configured in "Power Supply" mode.
DC/DC out :	DC/DC output voltage. Only valid for system with DC/DC converters.

6.5.8 Load setting menu

Access to the load output settings for modification.



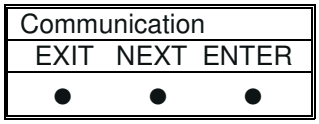
- : decrease the value / + : increase the value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

List of the parameters accessible for modification :

LVD disc :	Access to opening voltage level of the low voltage disconnect contactor (V)
LVD rec :	Access to closing back voltage level of the low voltage disconnect contactor (V)
HV alarm :	Access to load high voltage pre-alarm (V)

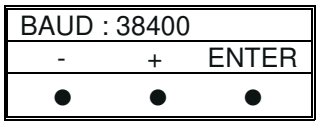
6.5.9 Communication setting menu

Access to the communication ports settings for modification, linked with the communication ports of the CoSSMIC Slot interface board.



EXIT : go back to the main menu / NEXT : go to the next communication port / ENTER : access to the communication port displayed (access to UART 1 to 2)

Communication parameters details for each port :

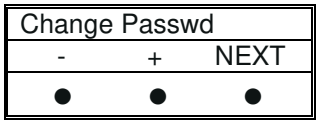


- : decrease the value / + : increase the value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

BAUD : 38400	Communication baud rate
TYPE : RS485	Communication type declared in the control board
SLAVE :	Slave number
PROT :	Communication protocole (AEG PS / MODBUS ASCII / MODBUS RTU / MODBUS master)
IP ADDRESS :	IP address (for UART 1 to 2)
NET MASK :	Net mask information (for UART 1 to 2)
GATEWAY :	Gateway information (for UART 1 to 2)

6.5.10 Controller menu

Access to controler parameters for modification.



- : go to the previous value / + : go to the next value / NEXT : go to the next parameter or in case of parameter change a confirmation message is displayed (OK / CANCEL). NEXT button is also used to leave the configuration menu after scrolling up to the last item.

List of the parameters accessible for modification :

Change Passwd :	Change of the Configuration password (default value 0123) and Command password (default value 0111)
Language :	Selection amongst the available languages available for the display
Date and time :	Access to the modification of date (format Day/Month/Year) and time (format Hour/Min/Sec)

Note : all the other parameters (system setup, alarm and events setup, calibration) are only accessible through AEG Power Solution dedicated software.

6.6 COMMAND FUNCTIONS

The command menu is composed of the following menus which allows to change the associated parameters :

Rectifier	Launch the process to take into account a new configuration of rectifier, rectifier LED test and to trigger a shutdown of the rectfiers.
Alarm	For alarm acknowledgment and to clear the alarm history
Battery charge	Trigger manually the charge mode of the battery and to clear the battery history
Battery test	Trigger manually the battery tests and to clear the test reference parameters
Service counter	Reset manually the values of the service counter (optional)
Controller	Reset manually the CoSSMIC board (after parameter change), launch LED box test, synchronize the parameters between CoSSMIC and backplane EEPROM

The access to any of those menus is explained hereafter :

Rectifier		
EXIT	NEXT	ENTER
●	●	●

EXIT : go back to the main menu / NEXT : go to the next menu item / ENTER : access to the item

The Configuration and Command menus are accessible with a password in order to allow the modification of your system configuration. The default password is 0123 for the configuration menu and 0111 for the command menu. Any modification of your system configuration or command action is your responsibility. You risk damages on your battery or equipment if the modification is done by a non specialized staff.

6.6.1 Rectifier menu

Access to the rectifier module commands.

Recount		
EXIT	NEXT	VALID
●	●	●

EXIT : go back to the main menu / NEXT : go to the next menu item / VALID : trigger the selected action

List of the parameters accessible to trigger an action :

Recount :	Reset of the previous rectifier location and launch of the rectifier module reorganization
Test LED :	Used to lit all the rectifier modules front LEDS for LED test purpose
Shutdown :	Used to shutdown all the rectifier modules.
Restart :	Used to restart all the rectifier modules.

6.6.2 Alarm menu

Access to the alarm commands.

Ack		
EXIT	NEXT	VALID
●	●	●

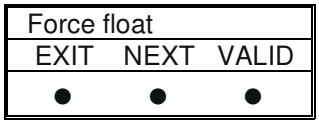
EXIT : go back to the main menu / NEXT : go to the next menu item / VALID : trigger the selected action

List of the parameters accessible to trigger an action :

Ack :	Alarm acknowledgment, will remove all the latched alarms present on the system
Hist.flush:	Used to erase the alarm history

6.6.3 Battery charge menu

Access to the battery charge commands.



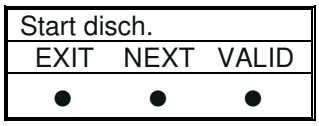
EXIT : go back to the main menu / NEXT : go to the next menu item / VALID : trigger the selected action

List of the parameters accessible to trigger an action :

Force float :	Force the charger to enter in floating charge (used to stop manually high rate, commissioning or battery test).
Start HiRate :	Start the high rate charge
Start Commis. :	Start the commissioning charge
Amph = 100%:	Force the Ah gauge to 100%

6.6.4 Battery test menu

Access to the battery test commands. This functionnality is only available if an external battery current measurement is connected.



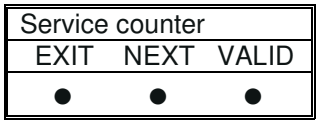
EXIT : go back to the main menu / NEXT : go to the next menu item / VALID : trigger the selected action

List of the actions accessible for triggering :

Start disch. :	Start the battery discharge test, it can be stopped manually using battery charge menu
Reset results :	Restore the initial test reference duration (factory setting), cancel the battery test alarm and erase the battery test history
Start Conn:	Start the battery connection test, it can be stopped manually using battery charge menu

6.6.5 Service counter menu

Access to the service counter values.



EXIT : go back to the main menu / NEXT : go to the next menu item / VALID : trigger the selected action

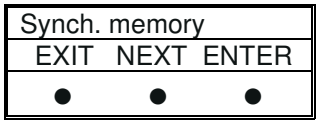
List of the parameters accessible to trigger an action :

NB CHARG:	Reset the number of battery recharge cycles
SERVICE TIME:	Reset the number of hours since the initial system power-on
BATT. LIFETIME:	Reset the number of hours since battery commissioning

Note : this menu is optional and activated only on special request.

6.6.6 Controller menu

Access to the controller parameters commands.



EXIT : go back to the main menu / NEXT : go to the next menu item / ENTER : trigger the action displayed

List of the parameters accessible to trigger an action :

Synch. Memory :	To upload the system parameters of the CoSSMIC to the backplane EEPROM
Reset board :	To reset the CoSSMIC card
Test LED box :	To test all the LEDs of the LED box
Restore USB :	Restore default communication settings on the USB port.

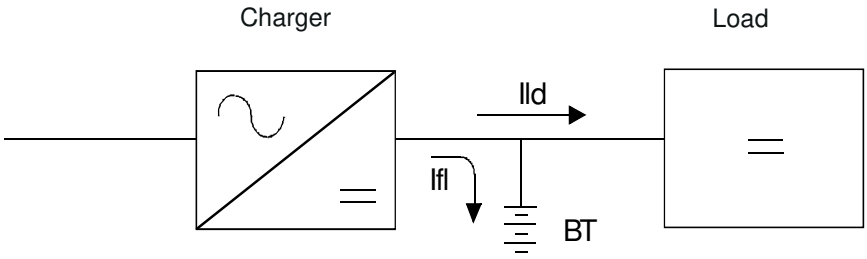
7 FUNCTIONAL DESCRIPTION

The MIPe rectifiers and converters are switch mode modules suitable for charging nickel-cadmium or lead-acid batteries while supplying DC loads. The rectifier/converters can be also used without batteries as direct power supplies.

7.1 OPERATING SEQUENCES

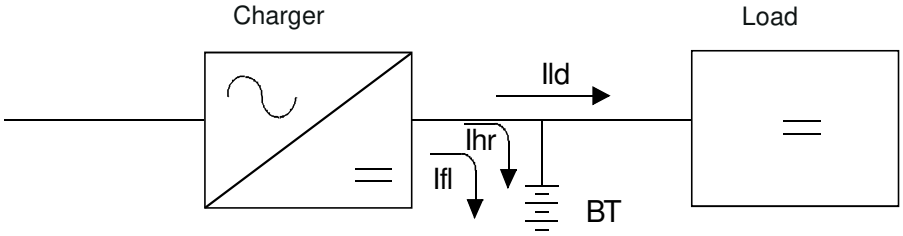
Example on rectifier with associated battery

Mains power ON – battery on floating



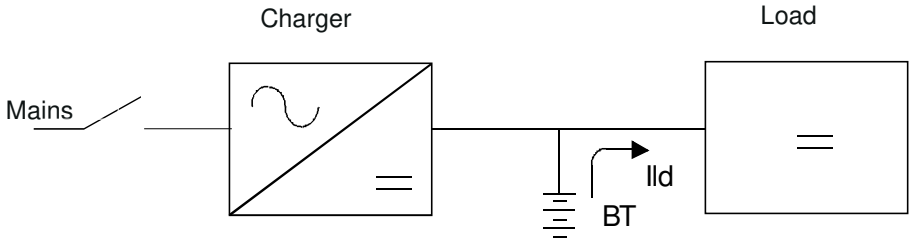
The charger supplies the load (Ild) and delivers a "floating" charge current (Ifl) to battery BT.

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):

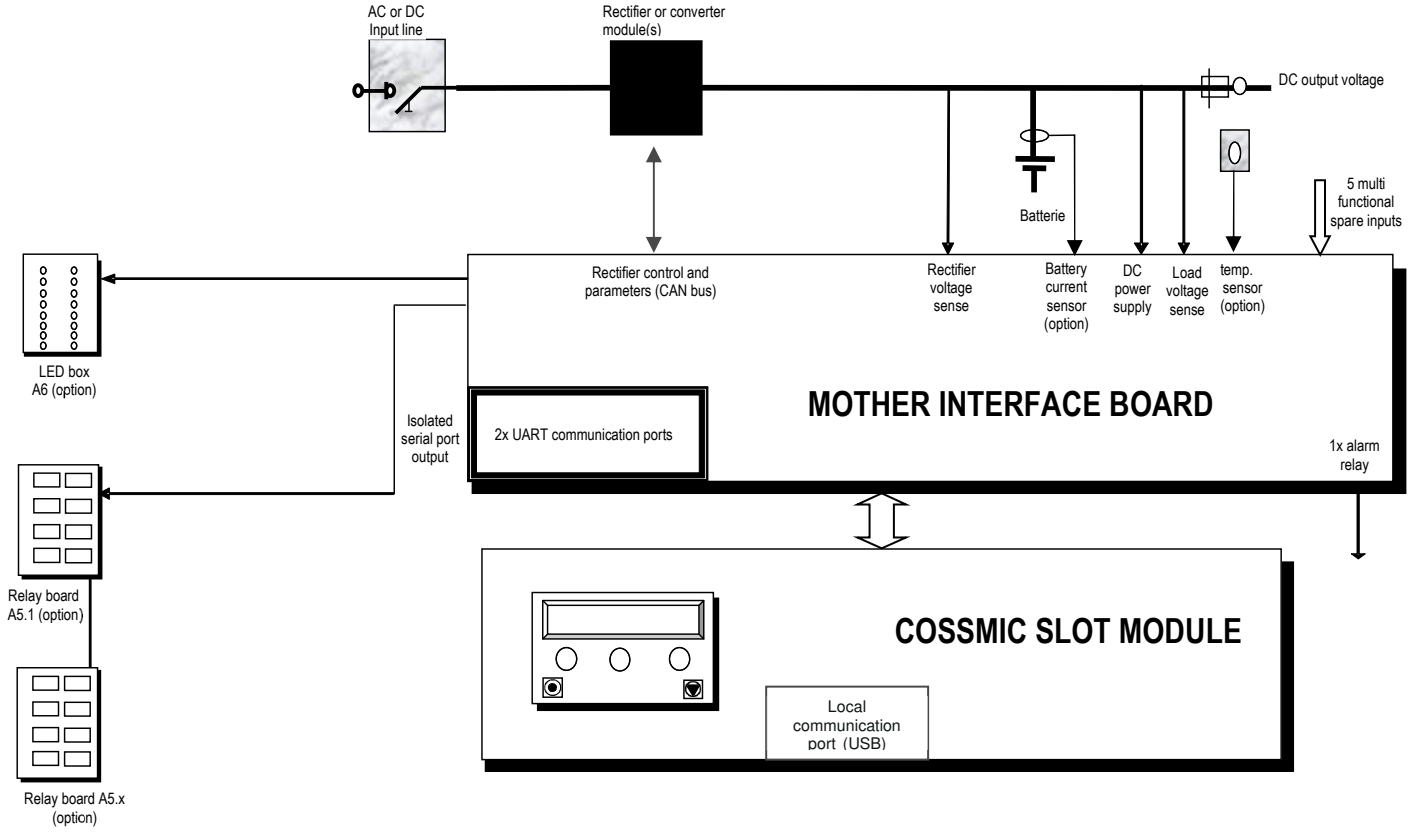
Floating charge
Floating charge compensates for the self-discharge of the battery and, in normal operation, maintains the battery in a fully charged condition.

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 rectifier or converter module input via the upstream circuit-opening devices. The rectifier/converter is then in service, provided no fault has been detected and/or stored by the monitoring systems.
The AC/DC rectifies the mains voltage (or the DC/DC module converts the DC input voltage into a DC output voltage). The rack output current is measured from the individual module measurements.

The CoSSMIC Slot control board is supplied via the interface mother board from the DC output. The CoSSMIC Slot board controls the power converter from internal set points (which depend on the battery type and the current charge mode) to regulate the rectifier output voltage and/or current.

The battery current can be sensed across a battery shunt or hall effect (external and optional).
A temperature sensor senses the battery temperature and compensates the rectifier output voltage according to the temperature *(option)*.

7.4 "COSSMIC SLOT" GENERIC CONTROL AND ALARM UNIT - SLOT (A1)

This board is equipped with a microcontroller, memories for the microcontroller and all necessary analog interface circuits to measure and control. The board is mounted inside the Slot module.

The board consists of two major functional blocks:

- an **analog** block providing the following main functions:
  . analog signal (current and voltage) conditioning,

- a **digital** block with microcontroler providing the following main functions:
  . analog input conversion (voltage, current and temperature),
  . digital inputs monitoring and digital outputs control,
  . system operating and monitoring sequences controlled by a program stored in memory,
  . setpoint (reference) generation for the power converters,
  . full digital control algorithm,
  . several serial communication ports for remote monitoring/programming,
  . serial communication for internal display unit,
  . on- board Flash memory and EEPROM,
  . communication with optional extension boards (relay, LED box, etc..)

The fuses for the Cossmic Slot board protection are integrated inside the CoSSMIC Slot module.

7.5 MOTHER INTERFACE BOARD

The board is an interface between the CoSSMIC Slot control board, the rectifier/converter modules and the system, which includes voltage adaptation and protection via fuses for CoSSMIC Slot and options. The interface mother board implements a wide range input power supply, DC voltage from 18V to 320V.

See connection details on § 4

8 OPTIONS

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

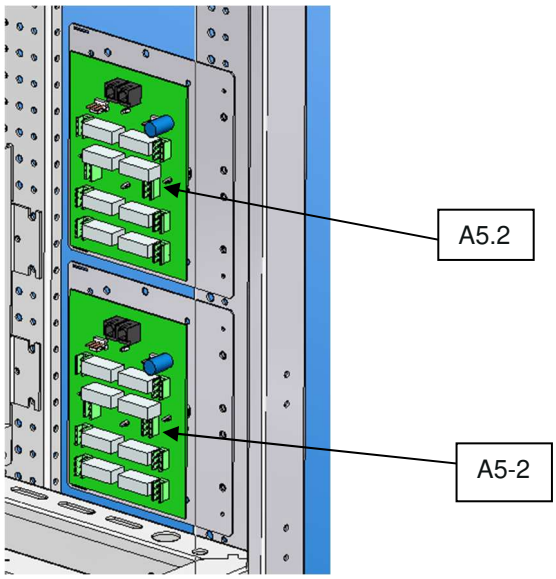
8.1 ALARM/SIGNALLING/MEASUREMENT OPTIONS

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 CoSSMIC Slot board.
The lighting of the LEDs can be tested from the display and using the relevant menu.

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 CoSSMIC Slot board. Note that only one board can be powered from the controller, via the interface board A4. All other relay boards must be powered separately.



8.1.3 Spare inputs

The CoSSMIC Slot board has 5 multifunctional digital inputs, some can be used for option signalling purpose (e.g.: low electrolyte level, circuit breaker auxiliary contact …). 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.

8.1.4 Ground fault detection

1 - Case of a single MIPe rectifier

The option is integrated into the CoSSMIC 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 MIPe rectifiers connected in parallel

In case of two redundant systems with individual battery banks the ground fault detection is realized by CoSSMIC 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 CoSSMIC board using (on each rectifier) : 1 spare input (Ground fault)
  or 2 spare inputs (Ground + fault, Ground – fault).

8.1.5 Battery symmetry fault detection circuit

The battery symmetry is monitores with a separate board A10, the alarm is transmitted to the CoSSMIC Slot card through digital inputs.

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 power rack can be asspociated with the following communication options.
2 communication ports are available on the controller.
Any combination of the following options is possible

8.2.1 RS232 interface connection

The *RS232 board* provides a RS232 interface through a DE9 connector.
The RS232 is insulated from the CoSSMIC Slot controller and tied to the ground.

8.2.2 RS485 interface connection

The *RS485 board* provides an insulated RS485 interface through pluggable screw terminals.
It can be configured in 2 or 4 wires modes.
This option is usually used to communicate with the Modbus protocol.

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 CoSSMIC 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

Slave

Any of the communication port can be configured to communicate in Modbus/Jbus **slave** protocol in RTU or ASCII format.
In this case, it is necessary to set the slave address for the involved communication port.
The physical connection to the charger(s) can be RS232 (one equipment monitored) or RS485 (more than one charger or equipments on the bus.
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.

Master

Any of the communication port can be configured to communicate in Modbus/Jbus **master** protocol in RTU or ASCII format.
This provides the ability to control/monitor several types of equipment (external meters, inverters, etc…)
Contact your AEG reseller for details.

8.2.5 TCP/IP Communication

This option includes a NCS board connected to A71 (RS232 board) and allowing TCP/IP communication with the CoSSMIC Slot control board.
The board provides the following protocols:

- HTTP (Web browser)
- SNMP
- Connection with WinCoSSMIC through a LAN
- Modbus TCP.

For more details please refer to separate NCS-CoSSMIC manual document.

8.2.6 COSSMICSPARC supervision software

The CoSSMICSparc software (WINDOWS based) is an application designed as local and remote supervision on the entire CoSSMIC configuration in order to control, monitor and configure the system.
This software interacts with the CoSSMIC 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 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 4 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 to the system. This level requires additional training. Please contact AEG Power Solutions Service Department for more details

- Administrator: this 3rd level allows change some parameters in the system. This level requires additional training. Please contact AEG Power Solutions Service Department for more details.

- Factory: this 4th level allows to change all the parameters in the system. This level is reserved to AEG Power Systems staff..

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 "Power Supply" in configuration menu.
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.

8.3.6 System settings

The rack is delivered without settings in the control board. Dedicated settings for the project application can be uploaded inside the rack, including battery parameters, alarms settings, communication settings …

8.4 LOAD OPTIONS

8.4.1 Load shedding contactor

To increase the battery backup time, a part of the load identified as “non vital” is disconnected from the battery at a set voltage level. This level is adjusted as per project specification. The load is disconnected by a contactor in the load output line. When the mains voltage returns, the rectifier supplies the load, the low voltage alarm is automatically reset, and the load is reconnected.

8.5 BATTERY OPTIONS

8.5.1 Battery temperature compensation

The MIPe racks 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)*.

8.5.2 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.

8.5.3 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.

8.5.4 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.

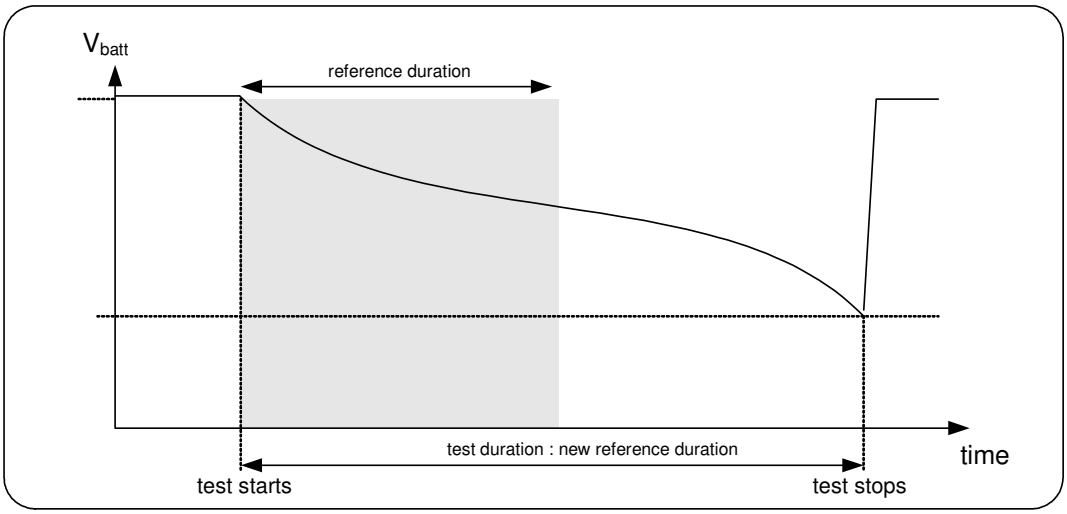
8.5.5 Battery capacity test

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 0in Configuration menu. 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).

8.5.6 Battery connection test

In order to check if the battery is connected to the charger and can deliver a current to the load in case of mains failure, a battery test can be activated. During this test, the control board will control the rectifier modules in order to decrease slowly the charger voltage. When the charger voltage will reach a value between the floating voltage and the battery nominal voltage, the battery will start to deliver a discharge current. The charger will limit this discharge current to a set value and maintain it for some seconds.

If the battery is able to deliver this current during this time, then the test is successful and the charger will recover the floating voltage.

If not a **"BATT.CONN. FAILED"** alarm will be triggered on the system.

The Battery test is not allowed under the following conditions:
- AC Failure
- Battery is recharging (>5% of capacity)
- Battery capacity < 100%
- Load does not sink enough current (<10% of battery capacity)
- 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 **"NOT EXECUTED"** for two seconds.

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.

8.6 RACK OPTIONS

8.6.1 Connector set for mother interface board

In order to connect the wires to the optional functions, connectors need to be added on the interface board. This set supplies all the missing connector in order to make accessible all the connection points. This set does not contain the DC output power connection bus bars included in cover option.

8.6.2 Documentation set hardcopy

A set of paper documentation is delivered with the rack : drawings, operation manual, routine test report.

8.6.3 Rectifier blanking plates

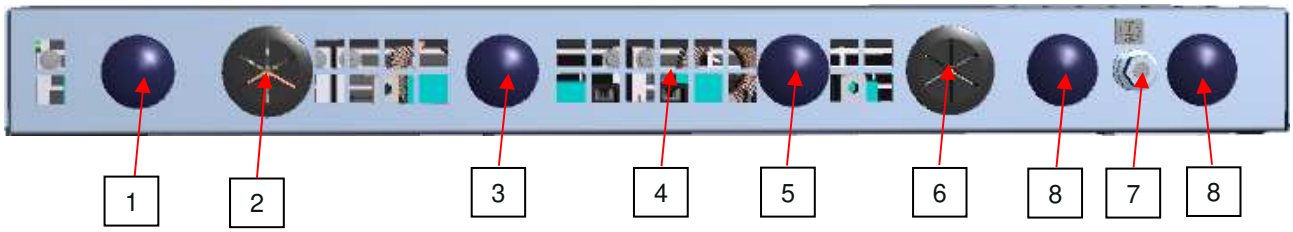
If the power rack is not fully equipped with rectifier modules, blancking plates can be supplied in order to ensure the IP20 protection of the rack.

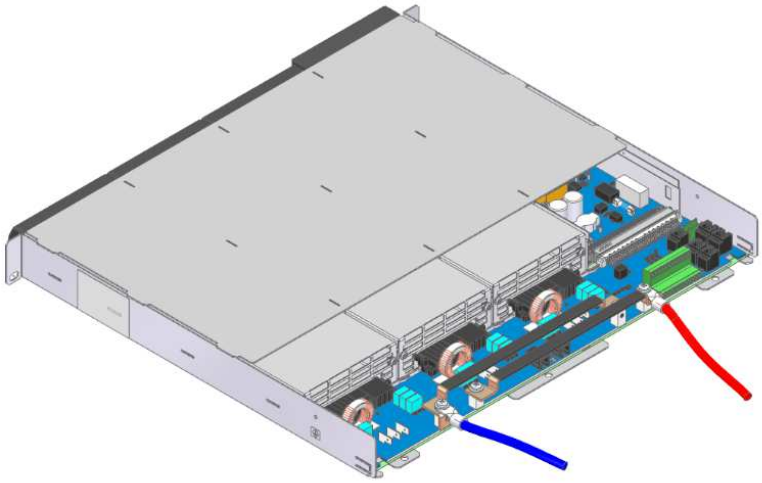
8.6.4 19" rack protection cover

A metal cover is designed to protect the rack rear connection from direct touching, and is equipped with grommets to avoid cable damages to the metal parts.

The cover offers the following features :

1. Cable entry for AC or DC input modules 2 and 3
2. Common rack DC output (-)
3. Cable entry for AC input module 2
4. Air outlet
5. Cable entry for AC or DC input module 1
6. Common rack DC output (+)
7. Earth connection stud (M6)
8. Cable entry for auxiliary and comunication signals to the CoSSMICSlot





2 bus bars connecting the modules DC outputs are delivered with the rack cover option, offering the possibility of an easier connection at site. Max. cable cross section 35mm^2 with M5 lug, tightening torque min. 3Nm and max. 4Nm.

8.6.5 CoSSMIC parameters upload in the rack

Dedicated parameters for the customer's application can be engineered and uploaded in the control board in order to have a ready to use battery charger solution at site. Note that without this option, the rack will be delivered with test parameters, not adapted to the final use of the rack.

9 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.

9.1 PREVENTIVE MAINTENANCE VISIT

It is recommended to perform a maintenance visit every year.

9.1.1 Rectifier / converter 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 systems with air inlet filters (on the door and/or on the roof), check the filters for cleanliness.

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

6 - The Cossmic Slot board is equipped with a super capacitor to backup the Real Time Clock (RTC). This component does not need to be replaced during the whole lifetime of the CoSSMIC Slot.

9.1.2 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.

9.2 FAN MAINTENANCE

Rectifier / converter module and cabinet fans:
It is recommended to replace the fans every five years. This operation must be done by specialized personnel.

10 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 project drawings.

ALARM or EVENT	PROBABLE CAUSE	CORRECTIVE ACTION
The display is white or black	Contrast problem	Do not touch any button for 5 minutes. This will automatically activate the default menu. Held the rightmost button to increase the contrast and leftmost button to decrease the contrast.
AC HIGH	Mains voltage out of limits. Programmable threshold: default value or customer demand value.	. Check the mains voltage. The voltage must as per the specified value on the customer drawing package.
AC LOW AC FAIL	. Rectifier off. . Mains protection opened.	. Switch on the rectifier. . Check the fuse(s). Replace if necessary. Check the input breaker/switch.
RECT.FAIL <= N RECT.FAIL > N RECT FAN FAIL DC-DC FLT <=R DC-DC FLT >R	One or more rectifier/converter modules are faulty or have internal fan fault. The related module front led "alarm" is ON.	. Remove the faulty module and replace it with a new one. . Proceed with a rectifier recount through the command menu (for rectifiers only)

ALARM or EVENT	PROBABLE CAUSE	CORRECTIVE ACTION
BATT VOLT HIGH	The rectifier output voltage is higher than the maximum allowable value. Programmable threshold: default value or customer demand value.	. Call the Customer Service Department.
BATT VOLT LOW	Battery in discharge resulting from: . rectifier off. . mains absence or low mains voltage. . missing rectifier modules	 . Switch on the rectifier. . Check the mains.
DC HIGH VOLT	The rectifier output voltage is higher than the maximum allowable value. Programmable threshold: default value or customer demand value.	. Call the Customer Service Department.
DC LOW VOLT	Low load voltage resulting from: . rectifier off. . mains absence or low mains voltage. . missing rectifier modules	 . Switch on the rectifier. . Check the mains.
EARTH FLT P	Low resistance between positive output and cabinet ground. Programmable threshold: default value or customer demand value.	. Check for the insulation fault.
EARTH FLT N	Low resistance between negative output and cabinet ground. Programmable threshold: default value or customer demand value.	. Check for the insulation fault.
BATT T SENSOR (option)	. Short or open circuit on one of the temperature sensors (option). . Cossmic board fault (ADC)	. Check the sensor connection. . Call the Customer Service Department.
BATT HIGH TEMP (option)	High battery temperature. Programmable threshold: default value or customer demand value.	. Check the battery cabinet temperature.
DC HIGH CURR	Charger current limit indicator. 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
BATT ILIMIT	Battery current limit indicator. 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. . Otherwise, call the Customer Service Department.

ALARM or EVENT	PROBABLE CAUSE	CORRECTIVE ACTION
DISCH TEST FAIL BATT CONN TEST	Appears after a battery test. . Battery blackout. . Battery in end of life. . Battery not connected	. Call the customer service department
BATT ON DISCH	Battery in discharge resulting from: . rectifier off. . mains absence or low mains voltage.	. Switch on the rectifier. . Check the mains.
BACKPLANE MEM CAN1 FAULT	. The memory in the backplane is not initialized or corrupted. . Internal communication error between the microcontrollers and rectifier modules	Call the customer service department.
HIGH RATE FAULT	High rate charge time too long.	Call the customer service department.
SYST EXT SHDN It can be due to a normal system operation.	Rectifier shutdown on external command	. Check the the shutdown order connected to the system . Call the customer service department to identify bad system configuration.
BATT_SYMM (option)	Battery cell is shorted, or has an open circuit or when asymmetrical cell voltage is detected. Fuses on measurement wires protection damaged.	Check the battery and replace the defective cells. Correct the fault leading to breakage and change the fuse if necessary.

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

Installation and operation manual
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