



ESAA300-HAE01 series User Manual



NELTA

Smarter.

Greener.

Together.

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1 General

1.1 Using This Manual

This manual contains the instructions to properly install and maintain the DPR3000 rectifier shelves. The manual also describes how to install rectifier shelves into current field power cabinet.

1.2 Change History

Revision	Change contents	Edited by	Approved by	Issue Date
S00	Draft Version	Brent Wang	Shu Su	2016.09.20

1.3 Glossary

List of abbreviations used in the manual:

Glossary	Description
Urg	Urgent
RFA	Rectifier Fail Alarm
HW	Hardware
TB	Battery Temperature Sensor
RM	Rectifier Module
Us	Safety Voltage (Voltage 1)
Ua	Abnormal Voltage (Voltage 2)
Vin	Input Voltage (V)
Po(W)	Output Power (W)
Iout	Output Current (A)
Vout	Output Voltage

Max. Ibatt[A]	Battery charge current limit
Umax off	Rectifier High Voltage Shutdown

1.4 Safety Notice

1.4.1 About legal and safety information

Please read all safety and legal information given here before working with any Delta products. Ignoring these instructions may result in damage to the equipment, health hazards, or loss of life.

These safety instructions are an extension of any national laws governing health and safety at work and the applicable standards, as well as any regulations of the statutory authorities.

Installation shall only be performed by trained persons familiar with the local installation regulations. The local installation regulations must always be followed (covering installation in the building and main AC distribution panels). It is also necessary to follow the instructions provided in the system user manual for installation, commissioning, operation, and maintenance.

1.4.2 Legal statements

1.4.2.1 Statement of compliance

Please see the relevant product fact sheet for information.

1.4.2.2 Limitations

The equipment is mainly intended for telecommunications purposes only. The equipment is not intended for use in applications in which the failure of the equipment could lead to death, person injury, or severe physical or environmental damage.

Delta is not responsible for any danger or damage resulting from incorrect installation, maintenance, operation or usage of the equipment, use beyond its intended purpose, failure to observe state instructions, and/or failure to observe the applicable safety regulations.

Delta is only responsible for components and services provided by Delta. Third party components and/or services, such as batteries, repair and/or maintenance used in and/or conducted for the equipment are not the responsibility of Delta. Furthermore, Delta is not

responsible for any malfunction or danger of, and/or damage to/resulted from the equipment caused by such third party components and/or services.

Unauthorized modifications to the equipment may result in incorrect operation and/or performance. The operator is responsible for the consequences of any modification in the hardware configuration that are made without an agreement with the manufacturer or authorized representative.

Installation, operation and maintenance of the equipment should only be performed by suitably qualified personnel with appropriate training. The operator is responsible for ensuring that personnel working with the equipment are provided with appropriate operation and safety training.

The operator is responsible for ensuring that location of the system is treated as an electrical equipment room. These rooms must have appropriate air-conditioning and restricted access. The operator is also responsible for ensuring that the system rack doors are securely locked and not accessible to unauthorized persons.

If the power supply to the system is not fitted with a disconnecting switch or equivalent device, the operator is responsible for fitting an appropriate disconnection switch conforming to the relevant regulations.

1.4.2.3 Third Party Devices

Delta is not responsible for devices, such as batteries that are not supplied by Delta.

Delta is not responsible for any danger or damage resulting from devices not supplied by Delta.

1.5 Safety Instructions

Warnings, cautions, and notes are used to identify important information. They are classified as follows:



Warning! A warning means that injury or death is possible if the information or instructions are not obeyed.



Caution! A caution means that damage to equipment is possible if the information or instructions are not obeyed



Note! Notes are additional information which may be useful to the operator.

1.5.1 General instructions



Warning! Hazardous voltages are present within the equipment when a source of electrical power is applied.

There is the risk of electrical shock from the main power supply and/or batteries. When working on equipment with power applied, supervision of personnel is required. The supervisor must be capable of providing first aid in the event of electrical shock. Provision of an emergency switch or disconnection strap is not sufficient protection.

There is increased risk of accidents and electrical hazards when working on compact equipment due to the close proximity of components. Operation of compact equipment requires extra attention to safety. Only trained professionals can access the system to open the cover, change cable connecting and replace SPD.



Warning! Protective shields and other safety devices provided with the equipment must be in place when the equipment is operated.

The power system may have dual energy supply. Hazardous voltages may be present at the main power connector and within the equipment for up to 10 seconds after disconnecting the power supply. The operator is responsible for securing the proper precautions for maintenance or service purposes.

During installation and maintenance, protective shields may be temporarily removed. Use suitable insulated tools and appropriate clothing. Handle fuses only with tools provided for this purpose, for example, load-break switch handles.

Adequate insulation from ground potential (earth) must be provided when working on the equipment.



Warning! High temperatures present.

Localized areas of high temperature (<70 °C) may occur within the rectifier/inverter/distribution rack. Take precautions against accidental burns.



Warning! Moving parts

Devices, such as rectifiers and environmental control for cabinets contain fans. These may also continue to rotate for some time after the power has been removed.



Warning! Heavy equipment

The weight of the equipment requires suitable safety considerations. Additional personnel or lifting equipment may be needed. Where required, the weight of equipment is stated on the front of the unit.



Warning! Sharp edges

Equipment may have sharp edges. We recommend you wear gloves.



Caution! Do not restrict air flow. Fit blank panels for empty rectifier slots to ensure correct air circulation inside cabinet.



Caution! The recommend installation location is keep least 1km distance away from the sea.



Note! Delta recommends using wire rated for 90°C or greater for all AC and DC connections.

1.5.2 Specific instructions

Products are not liable for any hazards incurred by not following proper safety procedures. Installation, Operation and maintenance personnel should always follow these safety rules:

1. Please observe all warning labels and notification on the equipment. Additional warnings, cautions, and notes specific to certain equipment and/or conditions are described in the context of relevant instructions.
2. Please read all documentation relevant to the given task.
3. Where devices, such as batteries, that are not supplied by Delta are used, please read and observe all safety notices and instructions supplied by the appropriate manufacturer or supplier.
4. The equipment is designed for installation and use in areas designated as "Restricted Access Location" only. Where the rack will be secured to a concrete or other non-combustible floor.
5. Per Safety Standard an insulated grounding conductor, identical in size and insulation characteristics to the supply conductors, is to be installed as part of the branch circuit that supplies the unit or system. The grounding conductor should be green, with or without yellow stripes.
6. The grounded conductor described up above is to be grounded to the earth at the service equipment or if supplied by a separate derived system, at the supply transformer or motor-generator set.
7. The AC receptacles in the vicinity of the power system are all to be of a grounding type and the grounding conductors serving all receptacles are to be connected to earth ground at the service equipment.
8. Before the system is operational, the AC input frequency and voltage must be verified making sure the AC breaker rating and type are adequate and other environmental conditions as noted in the specifications are met.

9. Protective systems or devices in PRIMARY CIRCUITS shall be in such a number and located so as to detect and to interrupt the over-current flowing in any possible fault current path (for example, line-to-line, line-to-neutral, line to protective earth conductor or line to PROTECTIVE BONDING CONDUCTOR).
10. The system has passed stringent system testing prior to shipment. To avoid electrical shock, the system requires a single ground point permanently connected to earth ground.
11. DC output & battery breakers must be replaced with approved replacement circuit breakers meeting the original design specification.
12. All AC connections must be made per the latest issue of the Local Electrical Standard and must conform to all local codes. The wiring method to accommodate different power systems should comply with Local Electrical Standard; we suggest referring National Electrical Code.
13. Always keep door closed at any time if no maintenance required preventing organism intruding. Make sure door is latched and locked properly before leaving to avoid vandalism or water/dust ingress. Do not open door in rainy or bad climate.
14. Only well-trained people can access and maintain the system. Use specified or approved component for replacement such as air filter, fan, etc. Follow instruction to perform needed maintenance
15. Do not dump the cabinet. Do not roll the cabinets on their sides. Do not store anything on top of the cabinet.
16. Ensure no liquids or wet things contact internal components. Do not smoke or introduce sparks in the vicinity of a battery.
17. Follow the battery manufacturers approved transportation and storage instructions. And follow battery manufacturers approved instructions to set all battery related parameters accordingly.
18. Each individual battery should have at least 0.25 inches of space between it and surrounding surfaces, or per the battery manufacturer's specification to allow for convective cooling.
19. Use only suitable measuring devices. Calibrate measuring devices regularly.
20. This information is for reference only, due to continuous product improvements, design changes without further notice

2 Introduction

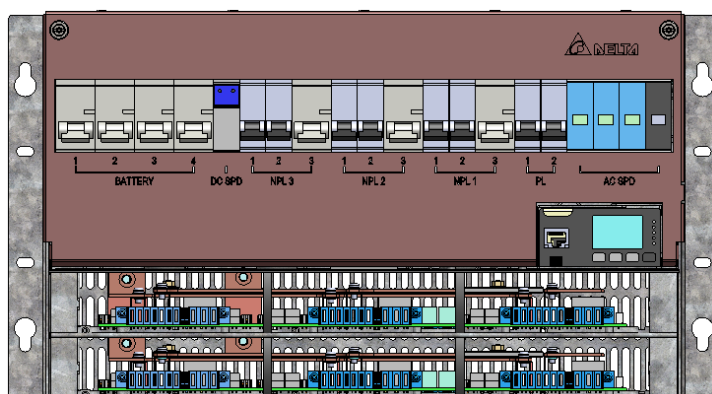
2.1 Overview

ESAA300-HAE series are power systems designed for telecom power or network power. The efficiency of rectifier is up to 96%. The systems monitor status alarms of rectifiers and control output voltage by Controller. All parameters of system are controlled by Controller.

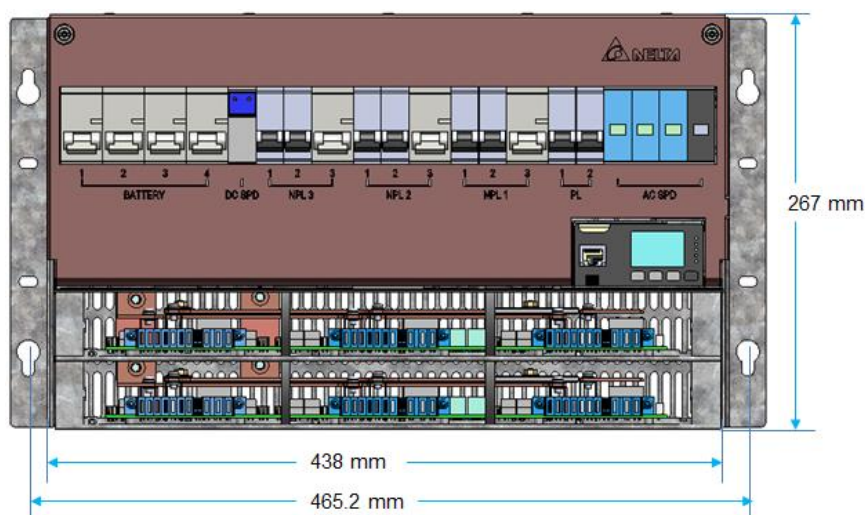
2.2 Functions and Features

- AC Input: 380V_{AC}+N; PE, three phase
- Shelf Capacity: -48VDC/300A Max.
- Rectifier: -48/3000W * 5 Max.
- Control Unit :ORION

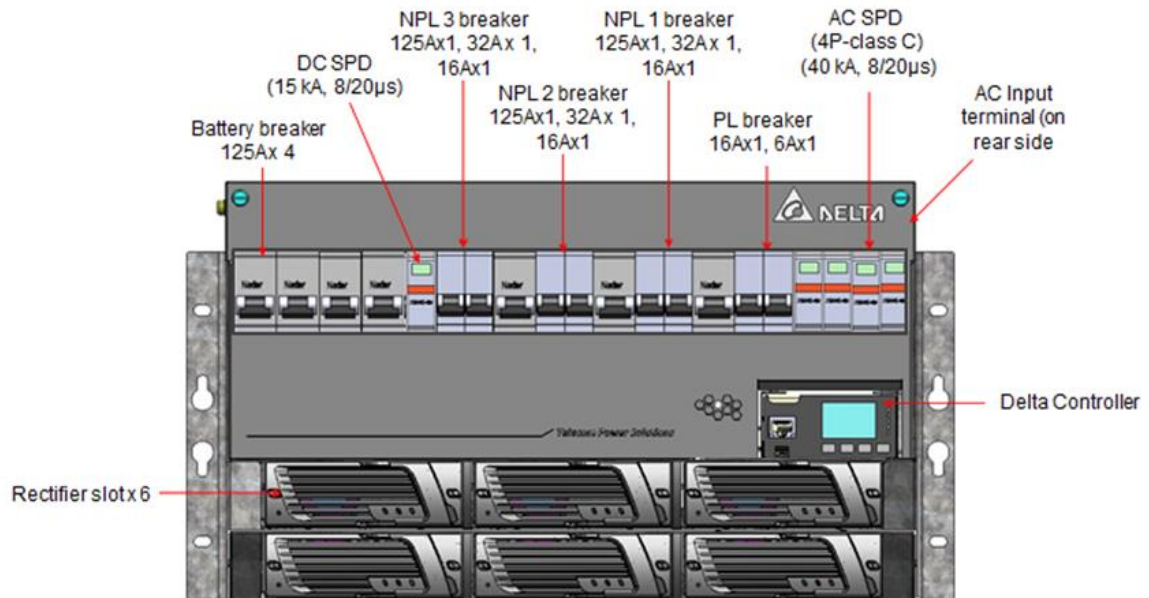
2.3 Exterior



2.3.1 Dimension / Weight



3.2 System Architecture



3.2.1 Cable Requirement

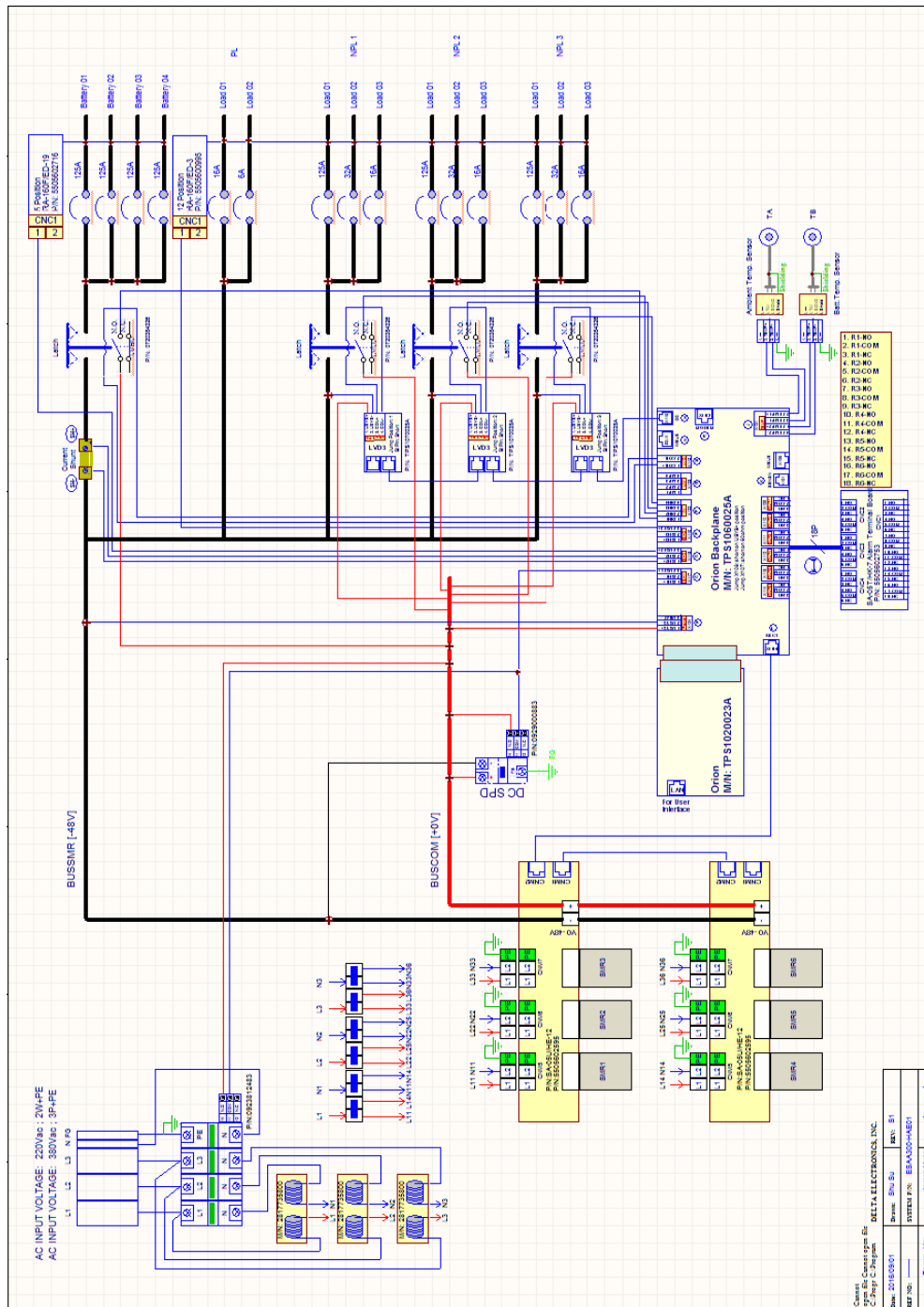
The recommended wire size (AWG#) for each breaker, refer to the 60 °C column for copper wire and with at least 90° C insulation.

Size	60°C 140°F	75°C 167°F	90°C 194°F	Size	60°C 140°F	75°C 167°F	90°C 194°F
AWG	copper			kemil	copper		
18	---	---	14	250	215	255	290
16	---	---	18	300	240	285	320
14	20	20	25	350	260	310	350
12	25	25	30	400	280	335	380
10	30	35	40	500	320	380	430
8	40	50	55	600	355	420	475
6	55	65	75	700	385	460	520
4	70	80	95	750	400	475	535
3	85	100	110	800	410	490	555
2	95	115	135	900	435	520	585
1	110	130	150	1000	455	545	615
1/0	125	150	170	1250	495	590	665
2/0	145	175	195	1500	520	625	705
3/0	165	200	225	1750	545	650	735
4/0	195	230	260	2000	560	665	750

The comparison list for wiring size of AWG and mm

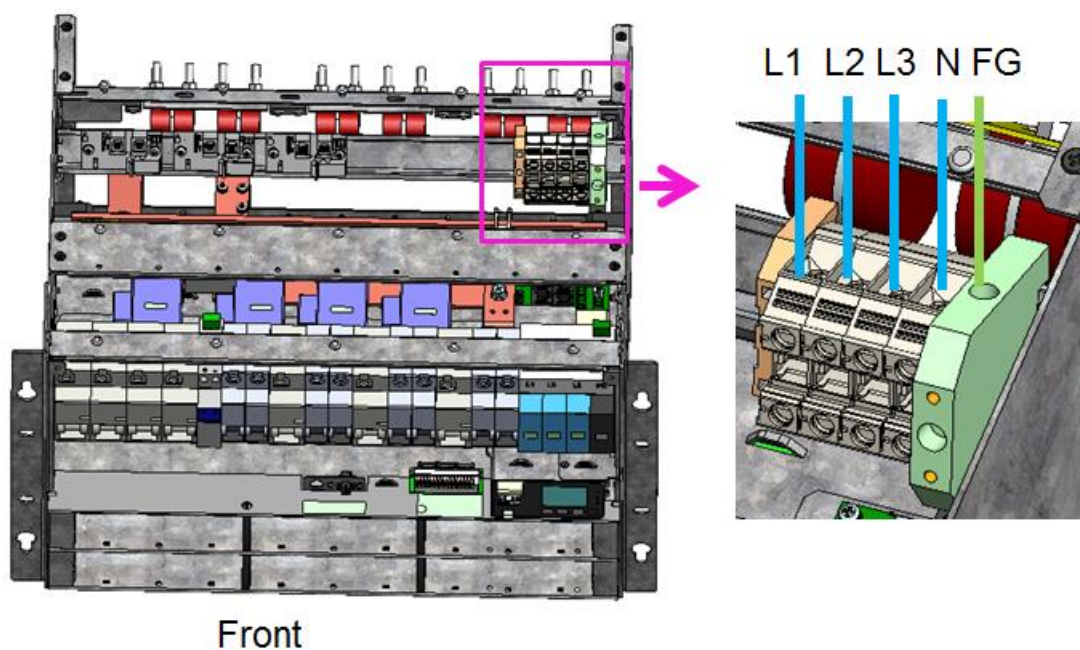
AWG Number	Ø [Inch]	Ø [mm]	Ø [mm ²]	Resistance [Ohm/m]	AWG Number	Ø [Inch]	Ø [mm]	Ø [mm ²]	Resistance [Ohm/m]
4/0 = 0000	0.46	11.7	107	0.000161	12	0.0808	2.05	3.31	0.00521
3/0 = 000	0.41	10.4	85	0.000203	13	0.072	1.83	2.62	0.00657
2/0 = 00	0.365	9.26	67.4	0.000256	14	0.0641	1.63	2.08	0.00829
1/0 = 0	0.325	8.25	53.5	0.000323	15	0.0571	1.45	1.65	0.0104
1	0.289	7.35	42.4	0.000407	16	0.0508	1.29	1.31	0.0132
2	0.258	6.54	33.6	0.000513	17	0.0453	1.15	1.04	0.0166
3	0.229	5.83	26.7	0.000647	18	0.0403	1.02	0.823	0.021
4	0.204	5.19	21.1	0.000815	19	0.0359	0.912	0.653	0.0264
5	0.182	4.62	16.8	0.00103	20	0.032	0.812	0.518	0.0333
6	0.162	4.11	13.3	0.0013	21	0.0285	0.723	0.41	0.042
7	0.144	3.66	10.5	0.00163	22	0.0253	0.644	0.326	0.053
8	0.128	3.26	8.36	0.00206	23	0.0226	0.573	0.258	0.0668
9	0.114	2.91	6.63	0.0026	24	0.0201	0.511	0.205	0.0842
10	0.102	2.59	5.26	0.00328	25	0.0179	0.455	0.162	0.106
11	0.0907	2.3	4.17	0.00413	26	0.0159	0.405	0.129	0.134

3.3 System Schematic

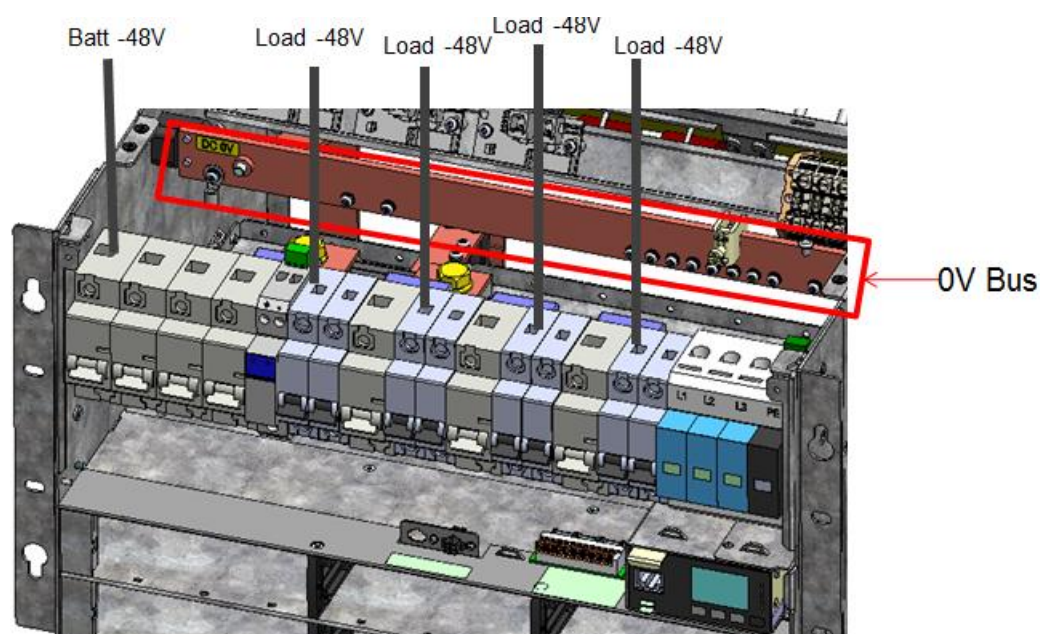


3.4 Installation Process

3.4.1 AC input connector



3.4.2 DC Output Connector



3.4.3 Rectifier

Step 1 Insert the rectifiers mechanically into their slots until the rectifier closed with a "click".



Note! Unused rectifier slots must have a cover plate to prevent recycling of warm air, heated by the installed rectifier losses.



Caution! Do not force the module into the slot. If it does not slide in and connect easily, remove and re-seat the unit.

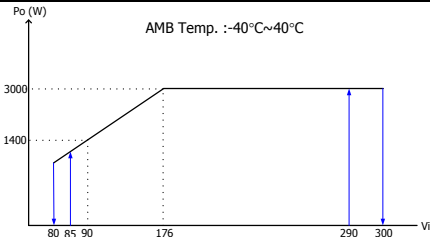
4 Operation

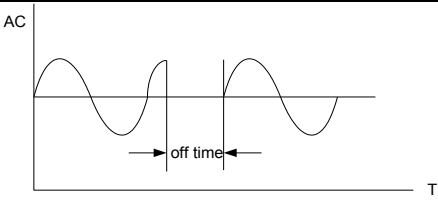
4.1 System Specification

Item	Specification/Function
AC Input	Three Phase 380V _{AC} +N; PE
Input Line	#14 AWG Brown max. #14 AWG Blue Max. #12 AWG Green/Yellow Max.
System Capacity	18000W (3000W rectifier x6 Max.)
Output Line	OVdc: #6 AWG X1 Max. -48Vdc: #6 AWG X1 Max.
Communication	CANBus
Operating Temperature	-40°F~+140°F (-40°C~+50°C)
Storage Temperature	-40°F~+158°F (-40°C ~+70°C)
Humidity	0~95% Relative Humidity, Non-Condensing
Altitude	4000m above mean sea level 2000 m - 3000 m: 1% power de-rating per 100m. At 3000m altitude, the output power can be 90% of the nominal power rating at maximum temperature. 3000 m - 4000 m: 2% power de-rating per 100m. At 4000m altitude, the output power can be 70% of the nominal power rating at maximum temperature.
Acoustic	55 dB @ 1 meter

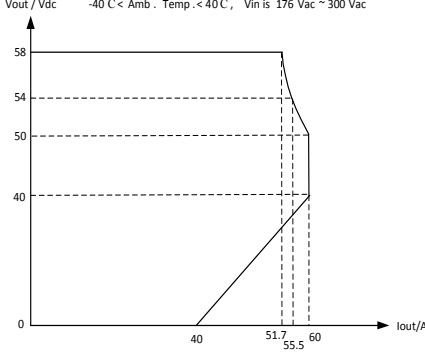
4.2 Rectifier Specification

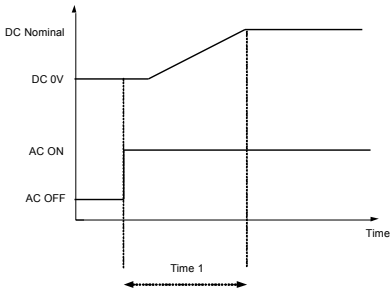
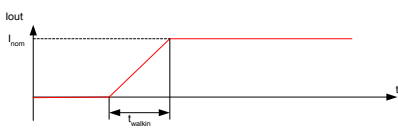
No	Item	Specifications	Remark
3.1.1	Nominal	230Vac / Single Phase	Vinrmsnom
3.1.2	Input characteristics	Voutdcnom: 54Vdc; Tamb< 40°C	- Rectifier is not working but safe when voltage below 80Vac - Rectifier may cause damage when voltage

		 AC input low voltage shut down and restart level is configurable by power system controller. And there is less than $\pm 3\%$ tolerance due to the difference of O/P load condition.	is above 310Vac; System AC voltage protection device shall be equipped in case unstable utility status.
3.1.3	Input current	Max: 18.5 Arms	Vinrms 176 @ 3000W Vinrms 90V @ 1400W
3.1.4	Inrush current	<21.8Apeak	- Compliant with : ETS 300 132-1 - Xcap charging current ignored
3.1.5	Frequency range	45Hz....66Hz	
3.1.6	Input power factor	>0.99	Vinrmsnom , Voutdcnom, and Poutdcmax
3.1.7	Harmonic content	EN 61000-3-2 class A,100Hz..2KHz	
	THD	< 5 % < 8 %	Vinrmsnom , Voutdcnom, @ Ioutdcnom @ 0.5 x Ioutdcnom
3.1.8	Input connector	FCI 51939-211	
3.1.9	Input protection	2 x 20A time lag T on Line and Neutral, type Littelfuse 314 series	
3.1.10	Mains on/off switch	None	
3.1.11	Drop out	Abnormal test for no damage.	- AC is on 50/60Hz and Vinrmsnom - Full load - There shall be 3.5cycles of normal AC power between each dropout
3.1.12		No damage to rectifier when following condition occurs: - Either 50 or 60Hz and Vinrmsnom - Full load - The off time > 70ms	

			
3.1.13	Line dips & interruptions	EN 61000-4-11	
3.1.14	Hold up time	7ms The output voltage may drop to 42V to provide the normal service voltage range for the telecom equipment. The rectifier continues operation (without shut down / soft start sequence). Immediately after disconnection of the AC mains, a low impedance connection between line and neutral will be made to simulate the low impedance line failure case.	
3.1.15	Hold up time of auxiliary supply	> 2 seconds	For the CPU power supply. To provide proper communication and mains failure handling with PSC 3 at mains failure conditions.

No	Item	Specifications	Remark
3.2.1	Nominal voltage	54V (Factory default)	Voutdcnom, half load. Default voltage configurable by power system controller in the range 43 ... 58V.
3.2.2	Output voltage control range	43 58 Vdc	Output voltage is adjustable by power system controller in the range 43 ... 58V
3.2.3	Nominal current	55.56A	at Voutdcnom
3.2.4	Output characteristics		Power limit factory setting: Poutdcmax: 3000W $\pm$ 50W. Power limit is

			configurable by power system controller in the range 275 ... 3000W. Resolution for programming of power system controller 1W
3.2.5	Current limit	Guaranteed for user: 60 A Internal factory setting: 61 A	Current limit factory setting 60A -0/+2.5A Configurable by power system controller in the range 6 ... 60A. Resolution 100mA
3.2.6	Efficiency	Typical >96% at 40% load Typical >94% at 80%~100% load Typical >93% at 20% load	Vinrmsnom, Voutdcnom, Tambnom
3.2.7	Standby power	< 5W	Uinnom, rectifier controlled into standby mode,
3.2.8	Current sharing	$\leq \pm 5\%$ of nominal output current	50% to 100% load
3.2.9	Line regulation	$\leq \pm 50\text{mV}$	Vinrmsnom ... Vinrmsmin respectively Vinrmsnom ... Vinrmsmax
3.2.10	Load regulation - droop	$\leq \pm 250\text{mV}$ $> \pm 150\text{mV}$	Voutdcnom, Vinrmsnom and Tambnom with Ioutdc varied from 27.78A (half load) to 0.1A (light load) or 55.56A (Full load).
3.2.11	Temperature regulation	$\leq 200\text{ ppm}$	Tamb variations Tambnom .. Tambmax respectively Tambnom .. Tambmin Remark: compare at constant O/P power.
3.2.12	Recovery from short circuit	Voltage overshoot < + 2V	For the load transition from short circuit to no-load
3.2.13	Programming voltage	Voltage overshoot < + 0.5V Settling time: < 20ms	programming step from Uoutnom to

	step response	Settling behaviour: 1V/s	maximum output voltage U_{outmax} , a limited overshoot of the output voltage is permitted. This is verified at no load, 0.5 I_{outnom} and I_{outnom} . No overvoltage protection shut down is allowed.
3.2.14	Start up delay	Output start-up time (Time 1): 3...10s Remark: Measured from mains turn-on to V_{out} within $\pm 1\%$ of $V_{outdcnom}$, $I_{outdc}=0$, $V_{inrms}=V_{inrmsnom}$ and T_{ambnom}. 	Additional start up delay is configurable by the power system controller.
3.2.15	Current walk in time	The current walk in time is the rise time of the output current.  $t_{walkin} = 3 \dots 4 \text{ s}$	Measured with nominal load $V_{inrmsnom}$, $V_{outdcnom}$, $I_{outdcnom}$, T_{ambnom}
	Start up	Must provide the start up current for the equipment. Worst case -40°C, need to test for all the ambient condition...	O/p load start up capability ETSI EN300132-2, section 4.7
3.2.17	Output connector	FCI 51939-211	
3.2.18	Output protection	80A fuse	
3.2.19	Output short circuit	In case of short circuit on the DC output, the rectifier reduce the current limit to 40A automatically. In case the short circuit disappear, the rectifier automatically provide full performance also with high capacitive loading.	Condition for short circuit detection: If output current $> 35\text{A}$ AND rectifier output voltage $< 5\text{Vdc}$ for 50ms, short circuit alarm.
3.2.20	Noise	• Audio band • $\leq 24 \text{ dBnc}$ • $\leq 40 \text{ dBnc}$ • Psophometric • $< 2\text{mVrms}$(on system level,8	CCITT, connect battery No battery connection EN 300132-2 (weighted

	noise	SMR in parallel)	filter).
	- Wide band - Peak to peak ripple voltage	≤ 50 mVrms ≤ 20 mVrms ≤ 150 mV	3.4KHz~150KHz wide band noise 150KHz~30MHz wide band noise BW = 0...20MHz,
3.2.21	Acoustic noise	< 55 dB(A), ISO 7779	
3.2.22	Dynamic response - Overshoot - Recovery time	$\leq \pm 5\%$ of $V_{outdcnom}$ <1ms, Recover to $\leq \pm 1\%$ of $V_{outdcnom}$	Load change: 10%~90% Load change: 25%~50% 50%~75% Dynamic switching periods: 10ms (100Hz)
3.2.23	MTBF	300K hours (Calculated) at Ambient 25°C	Telcordia SR-332
3.2.24	Field MTBF	> 1000'000 hours	Field measured in mass production.

4.2.1 LED

Item	Specifications
LED "OK" Color On condition	Green When the rectifier is operating – power cell is ok.
Off condition	When the rectifier is shut down e.g. no AC connection, OVP shut down, OTP shutdown, rectifier faulty, SW download by PSC 3, output fuse broken.
Blinking (20ms on / 1000ms off)	When the rectifier is in standby mode, When the AC input voltage is out of rectifier operating range. When the rectifier is waiting to start up during the start up delay.
LED "NL" - Color - On condition - Off condition	Yellow As soon as the rectifier output current is <5% of nominal output current. Output current is between 5% of nominal load and current limit. When the rectifier is in standby mode (off command from controller).

- Blinking (500ms on / 500ms off)	When the AC input voltage is out of rectifier operating range. When the rectifier is waiting to start up during the start up delay. Rectifier operates in current limit mode.
LED 'COM' - Color - On condition - Off condition - Blink condition (100ms on / 400ms off)	Green Rectifier communicates successfully with PSC 3. No communication with the controller e.g. bus cabling faulty. At start up of the rectifier during configuration process of the interface Identify a specific rectifier module in the system by using PSC 3 (blinking 30s). Reset to default rectifier settings. Bus termination not ok.

4.3 Controller

- Telecom power business leading controller
- Capability to control site equipment
- User friendly local monitoring with integrated display and keypad
- Integrated web server with for system monitoring, control and configuration
- High flexibility for site expansions
- Different access levels with password protection
- Remote site maintenance & SW download
- Enhanced battery management & battery test functions
- Signal processing engine (PLC functionalities)
- Data / Event log
- Energy saving function with efficiency mode and rectifier cycling
- Digital system bus to rectifiers and I/O modules
- Advanced rectifier start up functions



4.3.1 Interface

4.3.1.1 LED

The following LED's are on the front of the controller:

Name	Sign	Color	Indication
UA		Red	DC Low active
NUA		Red	Temp High active
Alarm suppression		Red	Alarms are suppressed
Mains failure		Red	Mains failed
Refer to manual		Yellow	Alarms are suppressed

4.3.1.2 LCD

Display type: 128 x 64 graphical LCD on the front panel

4.3.1.3 Keypad

Total four (4) buttons in the front panel ("EXIT", "↑", "↓", "ENTER) to navigate through the menu.

4.3.1.4 Parameters

Visualizing / change of basic system parameters (voltage, current, alarms)

4.3.1.5 Language

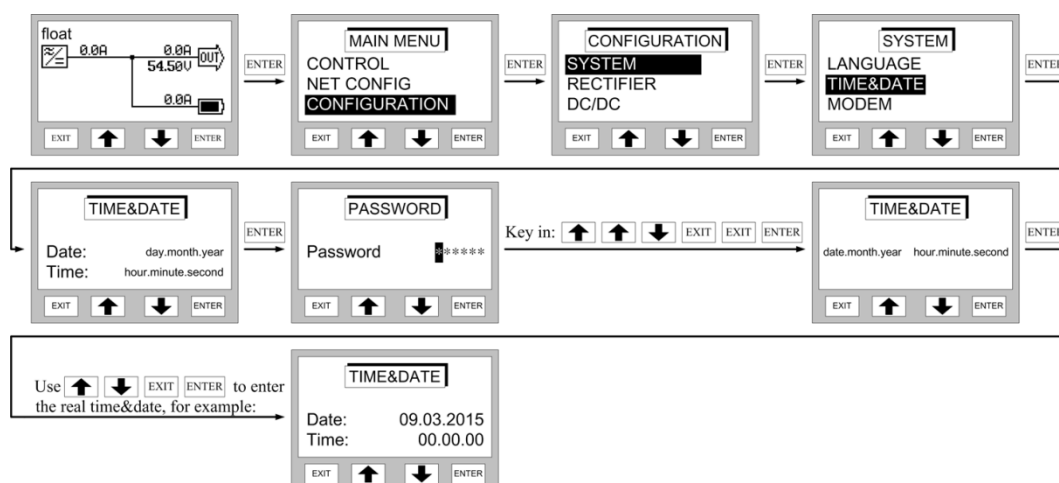
Basic setup language is in English, 2nd language will be optional by downloading.

4.3.2 Function

Total 11 sub-title in the main menu

- DC system status
- AC system status
- Alarm
- LOG
- General
- Configuration
- Battery function
- Rectifier function
- Setup
- Maintenance
- Meter panel

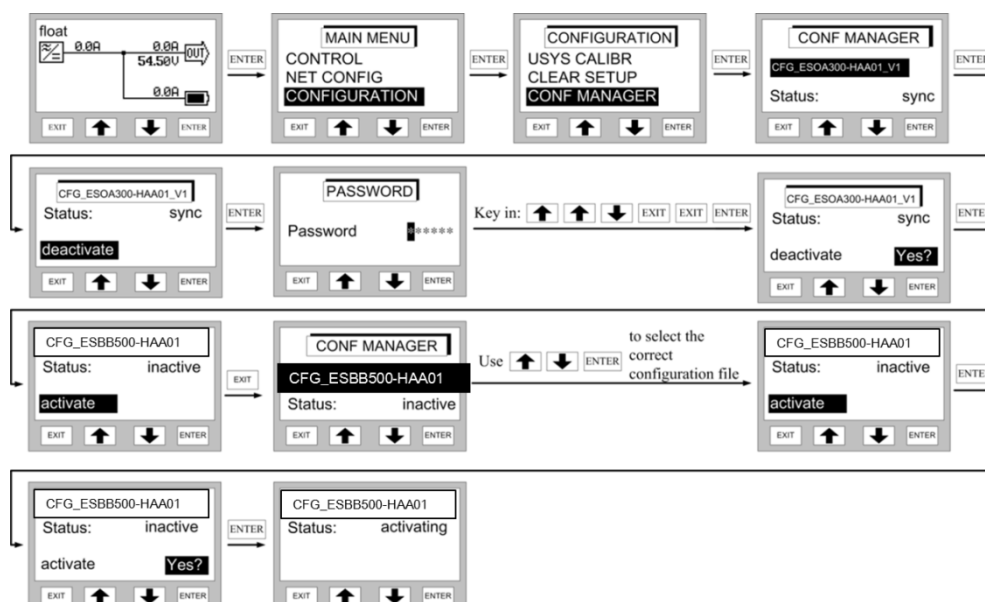
4.3.3 Time and Date setting



4.3.4 Configuration selection

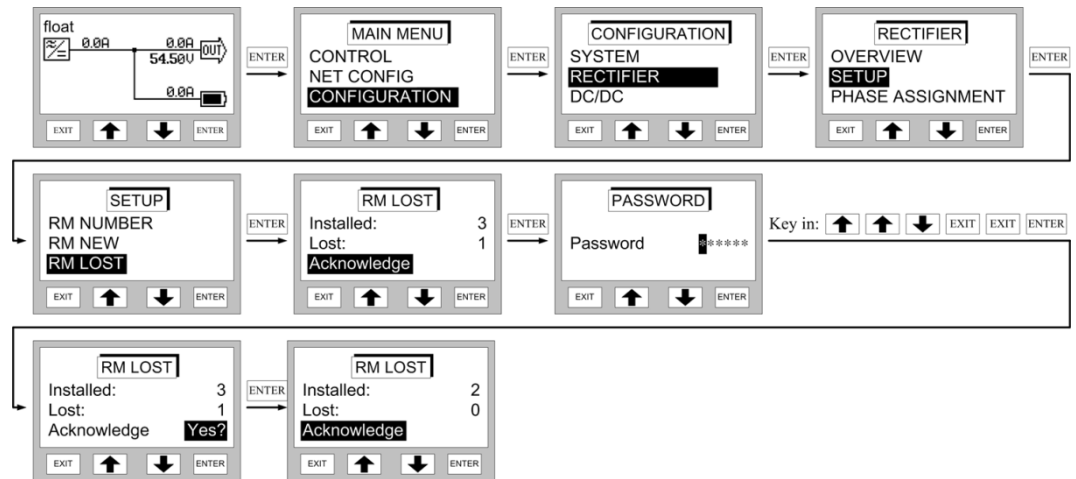
Important:

Please follow actual configuration to activate corresponding configuration file before online operation, or it may cause unpredictable fault.



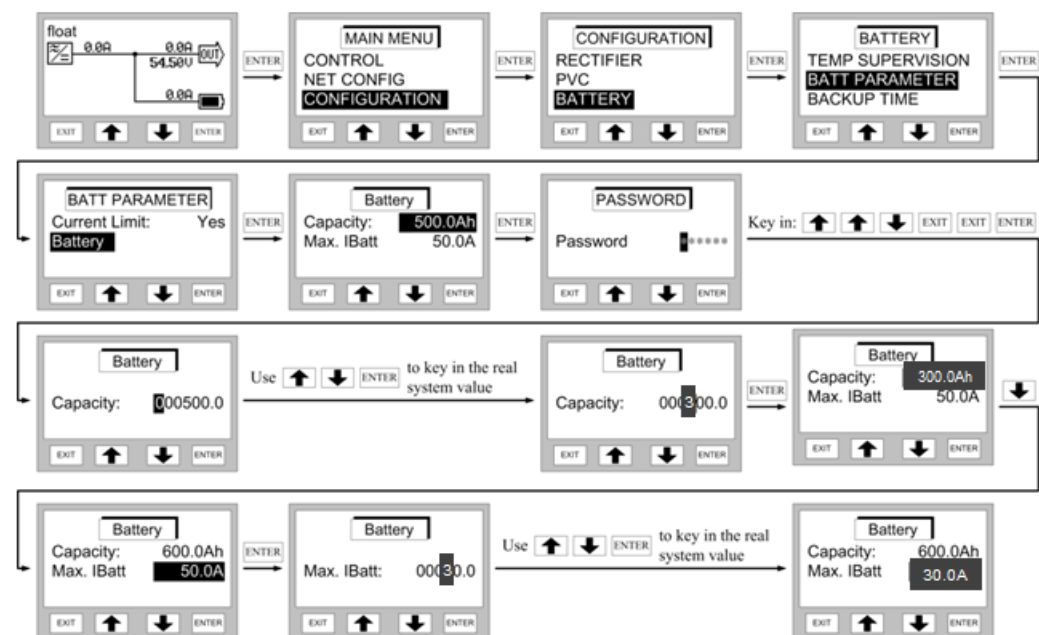
 **Note!** In order to select a properly configuration file and battery parameter, please refer to configuration file and battery setting .

4.3.5 Change Number of Rectifier

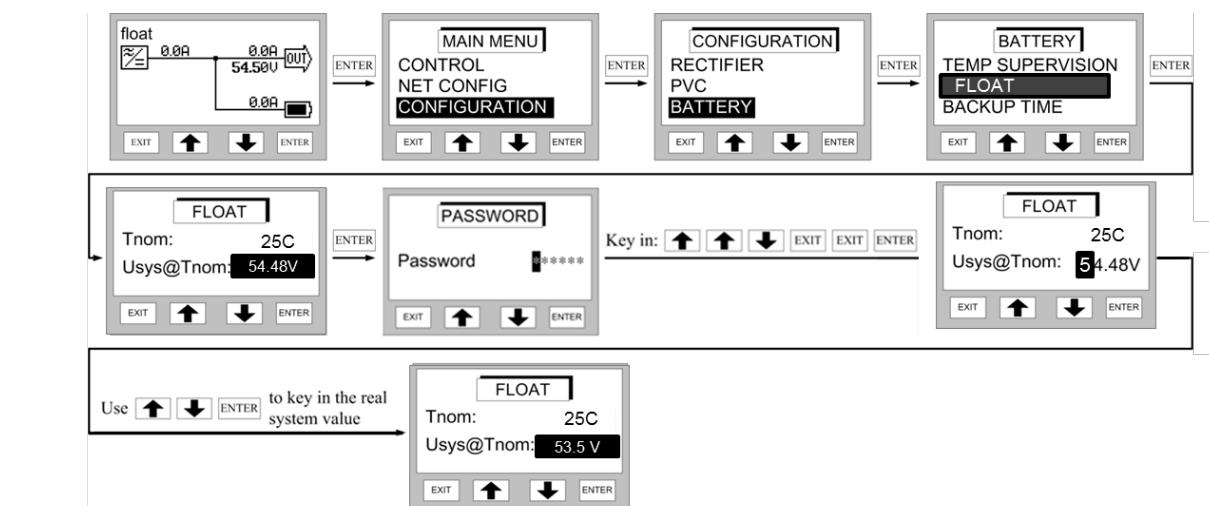


4.3.6 Battery capacity & charge current limited

When number of string was changed, please modify battery capacity to meet real AH



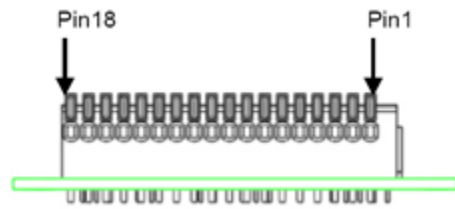
4.3.7 Floating Voltage Change



4.3.8 Alarm

4.3.8.1 Alarm Dry Contact Board

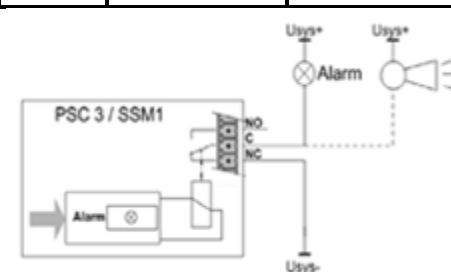
4.3.8.1.1 Outlook



4.3.8.1.2 Alarm Function

If end customer alarm trigger by Open ,please connect to COM and NC

Relay	Description	Label Name	Alarm Event	Remarks
1	OUT 1	AC Main Failure	AC Low	AC Low
			AC High	AC High
			S Mainsfailure	AC off
2	OUT 2	Rectifier failure	S Non Urg RFA	1 Rectifier Failure
			S Urgent RFA	2 or more Rectifier Failure
3	OUT 3	DCL Alarm	DCL alarm	DC voltage low $\leq 46Vdc$
4	OUT 4	High temperature	High temperature	Ambient Temperature High
				Battery Temperature High
5	OUT 5	Breaker Trip	Load CB	Load + Battery breaker trip
			Batt CB	
6	OUT 6	SPD Alarm	SPD Trip	SPD Trip



4.3.8.2 System alarm table

Name	Remark (default Value)	Urgent Alarm	Non-urgent Alarm
AC SPD:			
Batt CB:	Battery breaker trip		✓
LVD Trip	Any LVD Trip	✓	
LVBD1:	Usys < 43V, LVBD trip, Alarm will be asserted Usys > 45V, LVBD turn on, Alarm will asserted		
LVLD1:	Usys < 46V, LVBD trip, Alarm will be asserted Usys > 48V, LVBD turn on, Alarm will asserted		
LVLD2:			
LVLD3:			
Load CB:	Load breaker trip		✓
Name	Remark (default Value)	Urgent Alarm	Non-urgent Alarm
TB High:	TB > 55°C, Alarm will be asserted TB < 50°C, Alarm will asserted		✓
TA High:	TA > 55°C, Alarm will be asserted TA < 50°C, Alarm will asserted		✓
S Battery Current Limit:	0.1C		
S Urgent RFA:	2 or more rectifier fail	✓	
S Non Urg RFA:	1 rectifier fail		✓
S Ua High:	Usys > 57V, Alarm will be asserted Usys < 56V, Alarm will asserted		
DC SPD:			
AC Fail:	AC High, AC Low, S Mains failure	✓	
S Mains failure	AC off or fail		
S HW Failure:			✓
S Ua Low:	Usys < 46V, LVLD trip, Alarm will be asserted Usys > 48V, LVLD turn on, Alarm will asserted		✓
Parameter	Remark (default Value)		
AC High:	AC input > 264Vrms, Alarm will be asserted AC input < 254Vrms, Alarm will asserted		
AC Low:	AC input < 176Vrms, Alarm will be asserted AC input > 186Vrms, Alarm will asserted		

5 Maintenance

5.1 Rectifier

5.1.1 Removing a Rectifier



Step 1 Push the locker to sprint the handle

Step 2 Pull out the rectifier slowly from the shelf, using one hand to support the rear half of the rectifier and remove the rectifier from the shelf



Warning! Do not touch the DC output Bus when pulling out the SMR module.



Note! The rectifiers are equipped with a pair of safety locker.

5.1.2 Replacing a Rectifier

Step 3 Install the rectifier module, holding the handle with one hand and using the other to support the rear half of the rectifier module.

Step 4 Place the rectifier in the shelf and push into the shelf



Caution! Do not force the module into the slot. If it does not slide in and connect easily, remove and re-set the unit.

5.1.3 Adding a Rectifier

Step 1 Insert the rectifiers mechanically into their slots until the rectifier closed with a "click".

5.2 Maintenance Notice

To avoid the power system being damaged or causing electrical hazards, the following are suggested measures during/after maintenance.

1. Only well-trained people should access the system.
2. Use specified or approved component only for replacement.
3. Follow instruction to perform required maintenance

6 Troubleshooting

a) S Mains failure (AC Fail Alarms)

- No AC input to rectifier system – rectifier is OFF
- Battery is in discharge mode

Possible cause:

- 1) Power system AC mains breaker tripped or switch off
- 2) AC outage (voltmeter to measure input voltage at mains breaker)

b) S Ua High (DC output voltage high) Alarms

- DC output voltage exceeds pre-defined Ua max. setting

Possible cause:

- 1) Rectifier output voltage out of tolerance – replace rectifier if needed
- 2) Check correct Ua max. setting on power system

c) S Ua Low (DC output voltage low) Alarms

- DC output voltage falls below pre-defined Ua min. setting

Possible cause:

- 1) Rectifier output voltage out of tolerance – replace rectifier if needed
- 2) AC Mains fail, battery has not enough backup capacity – need to do battery fully charge, even replace damaged battery block if needed
- 3) Check correct Ua min. setting on power system

d) Rectifier fail Alarms (S Non Urg RFA / S Urgent RAF)

Alarm	Definition
S Urgent RFA	Condition Two or more Rectifiers show no output or have shut down. Possible cause 1. CAN cable is disconnect 2. Rectifiers defective or rectifiers' fans failure Solution 1. Check the CAN cable. 2. Restart the controller 3. Replace the Rectifier.
S Non Urg RFA	Condition One Rectifier shows no output or has shut down. Possible cause 1. CAN cable is disconnected 2. Rectifiers defective or rectifier's fan failure Solution 1. Check the CAN cable. 2. Restart the controller. 3. Replace the Rectifier.

e) CB Trip (Battery/NPL1/NPL2/LP Breaker Tripped Alarms)

Possible cause:

- One or more DC breakers have tripped
- Or some battery breakers were not switched on
- Or one or more load breaker were not switched on since that breaker has been connected to equipment.

Action:

- 1) Switch **on** all necessary breakers
- 2) Re-set tripped breaker and check if alarm has normalized.
- 3) If breaker trips again, check whether load exceeds breaker rating
- 4) Replace breaker with higher current rating, if needed

f) Temp High (TE High/TB1 High/TB2 High temperature) Alarms

- Equipment temperature (TE) exceeds pre-defined TE High setting

- Battery temperature (TB1 or TB2) exceeds pre-defined TB High setting

Action:

- 1) Make sure the 'FAN' & 'AUX' breakers have been switched on
- 2) Verify that temperature reading on LCD with other temperature readings whether different or not? If temperature sensor is faulty, replace it if available
- 3) Check whether air filter is dirty or block, if yes, clean or change a new one
- 4) Check whether the installation position of all temperature sensor are properly, if not, follow installation guideline to correct
- 5) If TB1/TB2 still at TB High, please turn OFF equalize charging if it is running at that time.

g) SPD Alarms (AC or DC surge alarm)

- One of more surge (AC or DC) surge is defect

Action:

- 1) Check the AC mains input voltage is normal
- 2) Check grounding connection if well
- 3) Check the connection of alarm detected cable whether well or not?
- 4) Replace module surge arrester as defect

Seller warrants this product, if used in accordance with all applicable instructions, to be free from original defects in material and workmanship within the warranty period. If the product has any failure problem within the warranty period, Seller repair or replace the product at its sole discretion according to the failure situation.

The warranty does not apply to normal wear or to damage resulting from improper installation, operation, usage, maintenance or irresistible force (i.e. war, fire, natural disaster, etc.), and this warranty also expressly excludes all incidental and consequential damages.

Maintenance service for a free is provided for any damage out of the warranty period. If any maintenance is required, please directly contact the supplier or Seller.

A warning icon consisting of a triangle with an exclamation mark inside.

WARNING!

The individual user should take care to determine prior to use whether the environment and the load characteristic are suitable, adequate or safe for the installation and the usage of this product. The User Manual must be carefully followed. Seller makes no representation or warranty as to the suitability or fitness of this product for any specific application.



Our mission is to provide
innovative, clean and
energy-efficient solutions
for a better tomorrow.