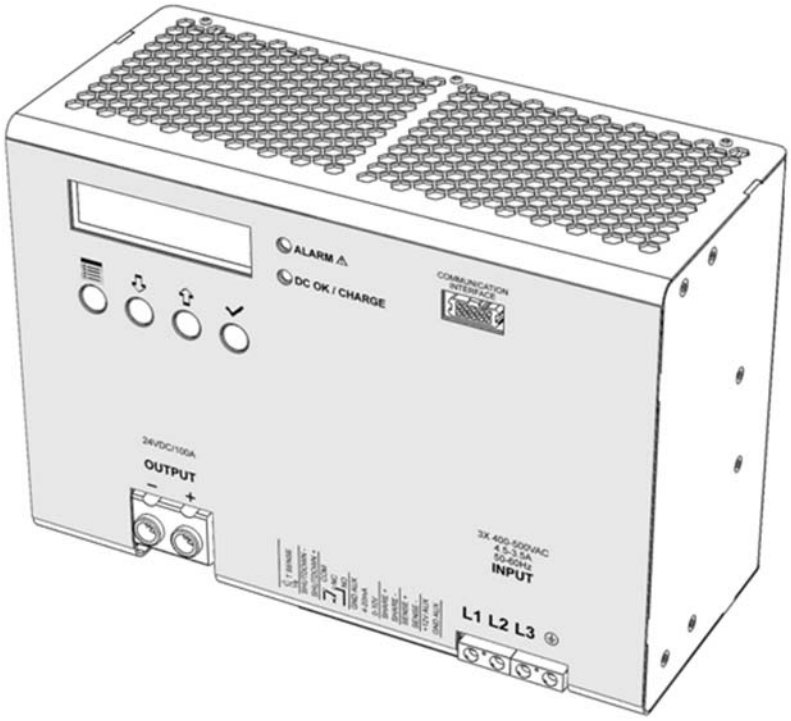

Operating Instructions

CPSB3-2400-xx

High Efficiency Power Supply

Version 1.00

TECHNIK MIT SYSTEM

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TECHNIK MIT SYSTEM

Content

1 Introduction

This manual is part of the Power Supply. It contains important information about the handling and safety. To avoid hazardous situations read the manual before installing the product and using it.

Store the manual at a handy place. If selling, renting or in case of a divestiture pass the manual to the authorize person.

1 General Information

1.1 Symbol Description

The manual contains several safety messages. Each safety message contains a defined signal word and a color. The color and the word are referring to an alert level. There are 4 levels. The safety messages point out hazardous situations and give information to avoid those.

⚠ DANGER	**Indicates a hazardous situation which, if not avoided will result in death or serious injury.**
⚠ WARNING	**Indicates a hazardous situation which, if not avoided could result in death or serious injury.**
⚠ CAUTION	**Indicates a hazardous situation which, if not avoided could result in minor or moderate injury.**
NOTICE	**Is used to address practices not related to personal injury.**

1.2 Copyright

This manual is intended for the operator and his staff. It is forbidden to give the content to a third party, to duplicate, exploit or impart it. The Lütze Transportation GmbH has to allow it explicit in writing.

General data, text, images and drawings are copyrighted and are liable to the industrial property right. Contravention can be prosecuting criminally. The named brands and product names in this document are trademarks or registered trademarks by titleholder.

1.3 Disclaim of Liability

The manual was written under consideration of the applied standards, regulations and the current state of technology.
The content is verified of accuracy. Discrepancies are not excluded. For those discrepancies we disclaim liability. Applicable changes and additional information will be in the next version of the manual.

The Lütze Transportation GmbH does not assume liability for any damages and accidents of following reasons:

- Nonobservance of the manual
- Untrained and unqualified employees
- Non conventional use
- Non approved reconstructions and functional modifications of the product
- Using non original or non admitted parts or equipment

1 Safety

1.1 Content of the Manual

Read and follow the manual before using the product the first time.
This applies to every person which is getting in touch with the product. Trained employees and experts especially qualified persons which had worked with similar products before have to read and understand the manual.

1.2 Intended Use

Use the module only for the described applications in this manual.

1.3 Recepients

The operating manual addresses planers, project manager and programmers. It also addresses the operating employees which are responsible for the initial operation, the operating and for the maintenance of the products and systems. Regarding the employees different qualification levels are differentiated.

1.4 Operating Employees

Risk of injury by deploying insufficient qualified operating employees.
Inappropriate appoint of not qualified or insufficient personal can cause property damages and personal injuries. Tasks which apply special procedures should be done by trained and qualified employees or experts, especially electricians.

Trained Employees
The employee was trained by the employer on the task and possible hazardous situations. The employee does not have any technical knowledge.

Experts
The employee has a technical education, knowledge and/or experience in the required field. The employee is capable to do specific operations on and with the product.

Electrically qualified persons
The employee has a technical education in the required field. The employee is capable to do special operations on and with the product.

The different sections of the manual referingt to the qualification level of the operating employees.

1.5 Responsibility of the Operator

The operator is obligate by the law of occupational safety, if the product is used in a commercial field.

- The operator is responsible to train the employees and to inform himself about the industrial safety regulation.
- The operator is responsible that safety, environment protection regulations and rules for accident prevention are observed.
- The operator has to run a risk assessment at the working environment/place of installation to expose hazards and to alert those.

- The manual has to be stored near the product.
- The manual has to be obeyed.
- The product can just be run in a faultless technical condition.

1.6 Protective Clothing and Equipment

NOTICE

If working with or on the redundant modules, wear special ESD clothing. Because static electrification can destroy parts of the buscoupler which can cause a malfunction of the whole product.

NOTICE

Follow the instructions and regulations of the employer.

1.7 Reconstruction and Modifications of the Product

⚠ WARNING

Reconstructions and modifications of the product can cause property damages or personal injuries. Do not reconstruct or modify the product if the manufacturer does not allow it explicit in writing.

1 Transport and Storing

NOTICE

Protect the product against humidity. Store the product in a dry environment between 0° and 60°C.

NOTICE

Make sure that the Power Supply is safely packaged for transporting, to absorbe possible crushes.

2 Scope of Delivery

- Power Supply

1 Productoverview

1.1 Product Description

The Power Supply series is a high power, high performance, CPU controlled 3-phase input SMPS family. The Power Supply family includes 2 models with different output voltages and current ratings for a rated power of 2400 W (peak overload power of 3600 W:.

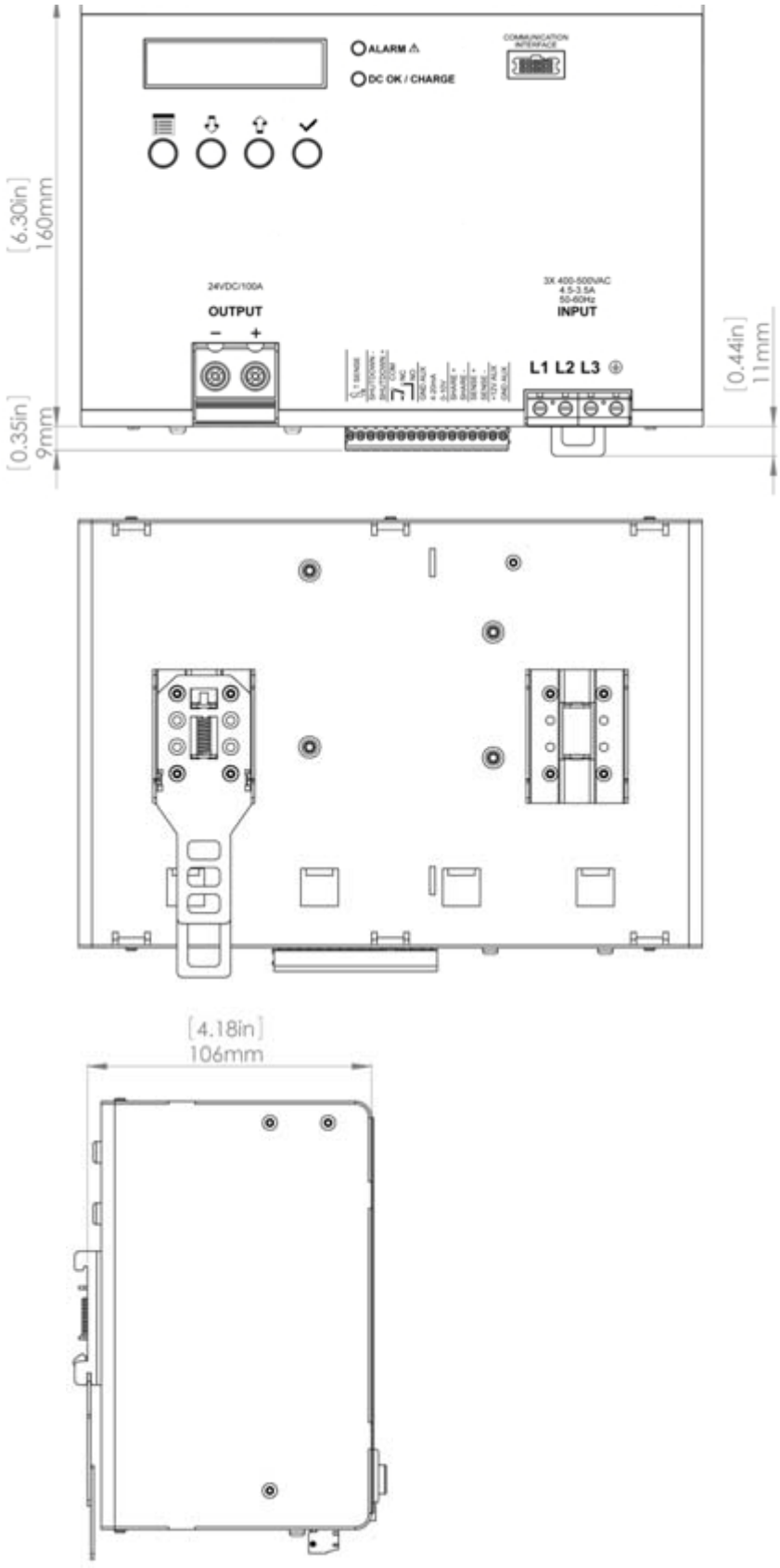
Model	min. Voltage [VDC]	max. Voltage [VDC]	Rated Iout/ Ipeak [A]	Rated/Peak Power [W]
Model 24 V	11.5	29	100/150	2400/3600
Model 48 V	23	56	50/75	2400/3600

These products present many advanced features such as:

- Very high efficiency (>92%)
- Compactness
- PFC input
- Operating also with DC input
- Wide range of output voltage
- Integrated active ORing circuit for all models
- Increased input protection against various mains abnormalities (overvoltage, surge, micro-interruptions, etc.)
- Remote shutdown
- Voltage sense function
- 4-20 mA and 0-10 V output current remote measurement
- User programmable auxiliary dry contact
- Load share (up to 4 units can be paralleled for redundancy or power increase)
- 3 operating modes:
  - ▪Overboost which can deliver up to 150% of the rated current for a maximum of 5 seconds
  - ▪Constant current
  - ▪Lead-acid battery charger (only on “C” and “D” models) with temperature compensation
- Microcontroller based for:
  - ▪Monitoring
  - ▪Operating control and supervision
- User interface
  - ▪Embedded user interface (4 user buttons, 2 LEDs and 1 LCD display):
    - ▪Displays real time status and alarms
    - ▪History of events, time stamped (a Real Time Clock is implemented)

- PC application through USB interface (using an optional interface box CPSB3-2400-xx_CB):
  - Remote configuration of the device
  - Firmware upgrade
  - Same functionalities of the embedded user interface with the ease of the PC benefits

1 Technical Data



Mechanics

Size (WxHxD)	233x158x102 mm
Weight	2.8 kg
Mounting	DIN Rail mounting

Input

Wiring	3 Phasen, PE
Rated input voltage, frequency	3x400…500 VAC , 47…63 Hz or DC
Input voltage range	340…550 VAC / 520…750 VDC
Input current at full load: 400 VAC 500 VAC	4.5A 3.5A
Inrush current	<10 A, active inrush current limiter
Power factor	> 0.92 at full load
External fuse	3x10 A circuit breaker, für DC
Input protection	▪ Active surge protection according to VDE0160 ▪ Input overvoltage (auto restart) ▪ Input undervoltage (auto restart) ▪ Phase loss (reduced output power) ▪ Internal PFC circuit failure (latched shutdown)

Output

Nominal output voltage	24 V 48 V
Output voltage adjust range	11.5 V…29 V 23 V…56 V
Nominal output current	100 A 50 A
Maximum output current	150 A / 5 sec 75 A / 5 sec
Line and load regulation	<1%
Output ripple and noise	< 200 mVpp
Hold up time	>10 ms, independent from line voltage

Output protections	Overload (OL) and short circuit (either constant current or hiccup mode at 150% load, with user settable OL threshold) Overvoltage (active, with latched shutdown)

Environment

Operating temperature	0°C – +45°C (+60°C Derating)

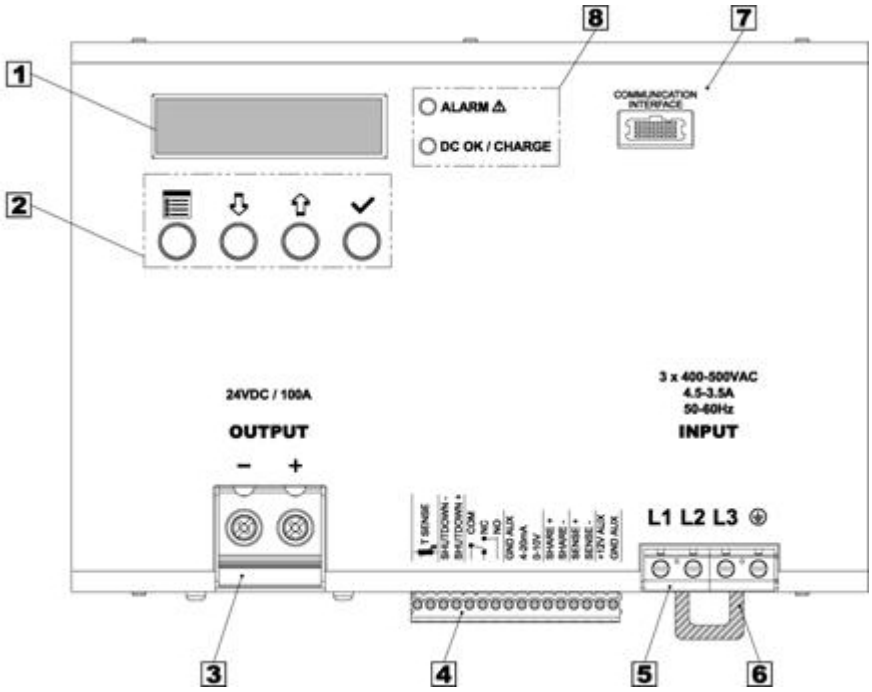
General Data

Efficiency (%)	>92%
Dissipated power	<200 W
Thermal protection	Yes, auto reset
Cooling method	Forced air cooling with variable air flow; temperature and load controlled long life fans
Input/output isolation	3 kVAC / 60s
Input/ground isolation	1.5 kVAC / 60s
Output/ground isolation	0.5 kVAC / 60s
Protection degree	IP20

Safety Standards/Approvals

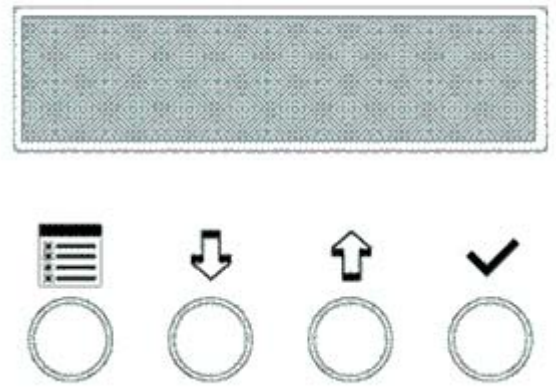
UL	UL508
EMC emissions	EN55011 EN61000-3-2
EMC immunity	EN61000-4-5

1 Produktaufbau



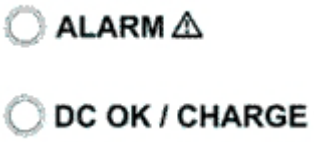
1	Display
2	Control Keys
3	Output Connector
4	Auxiliary Connector
5	Input Connector
6	DIN Rail Fixing Clamp
7	Communication Interface
8	Status LEDs

1.1 Control Keys



	Menu key	Used to enter and exit various pages in the user menu.
	Down key	To scrolls down menus and values.
	Up key	To scroll up menus and values.
	OK key	Confirms selection.

1.2 LEDs



LED	Color	Status	Description
ALARM	red	on	Shows an abnormal condition (either external or internal of the Power Supply)
DC OK / Charge	green	on	shows that the device is operating correctly and the output voltage is regulated
		flashing (1Hz)	Battery charger mode. Turns on when the battery is charged.

1 Montage

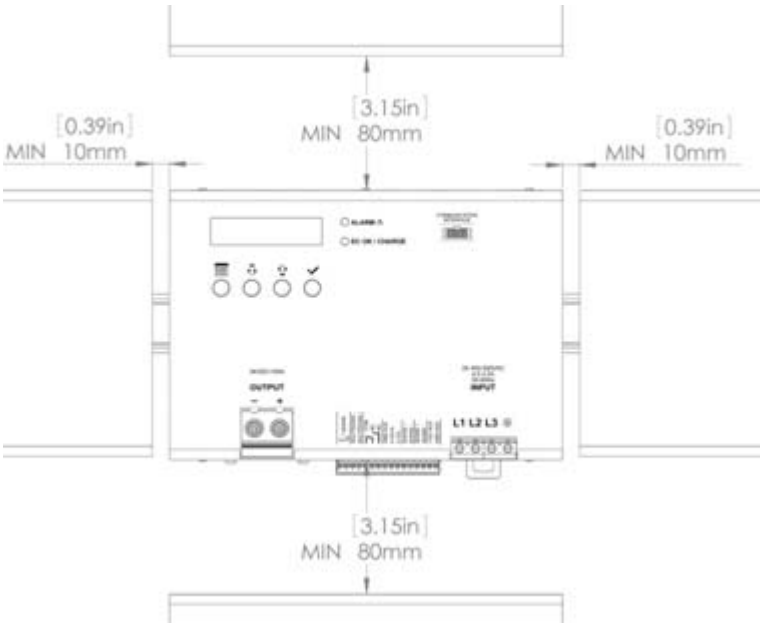
CAUTION

Risk of injury by electric current. Persons can be injured by electric current and the product can be damaged. De-energize the system before mounting.

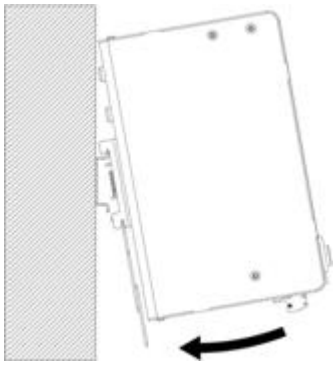
NOTICE

The mounting has to be done by trained employees.

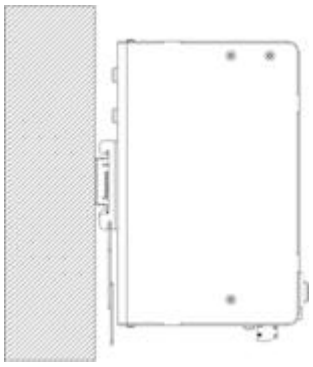
- Mount the device in vertical position, keep at least 80mm (3inch) free spacing on upper and lower side, 10mm (0.4inch) free spacing between adjacent devices.
- Mount the device in the cooler zone of the cabinet. The thermal protection is activated if the surrounding air temperature is >50°C (122 °F) along with continuous full load operation. The device restarts automatically after cooling down.
- Check periodically that the air inlets in the enclosure are free from dust and other debris that can obstruct the air flow.



1. Snap on the module on the upper part of the rail.



2. Push the module on the lower part of the rail.

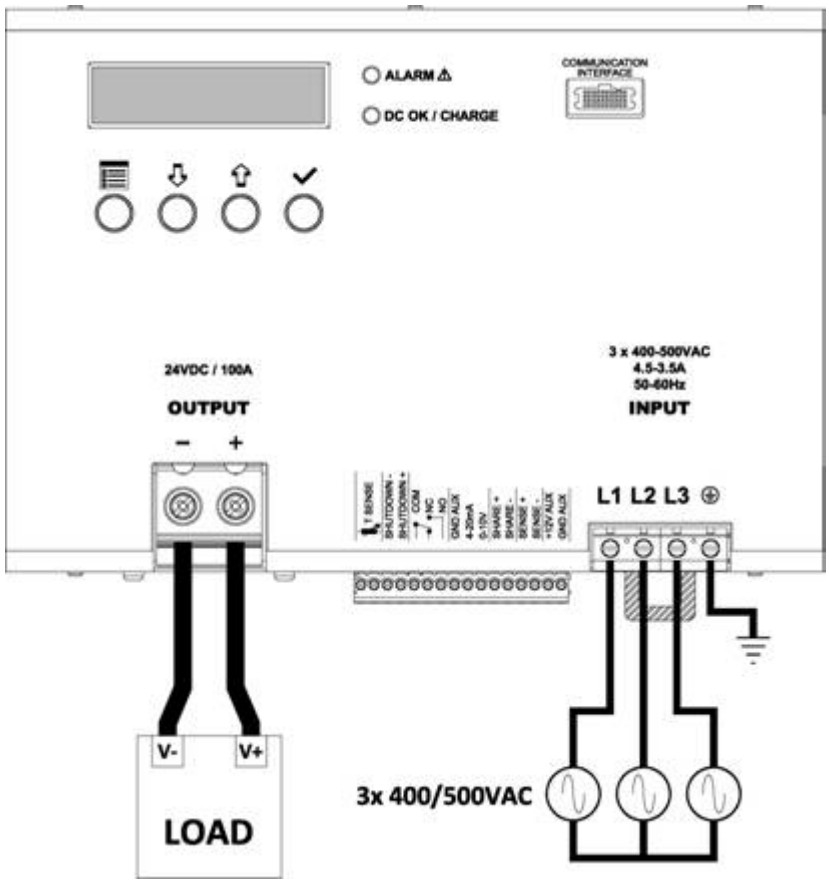


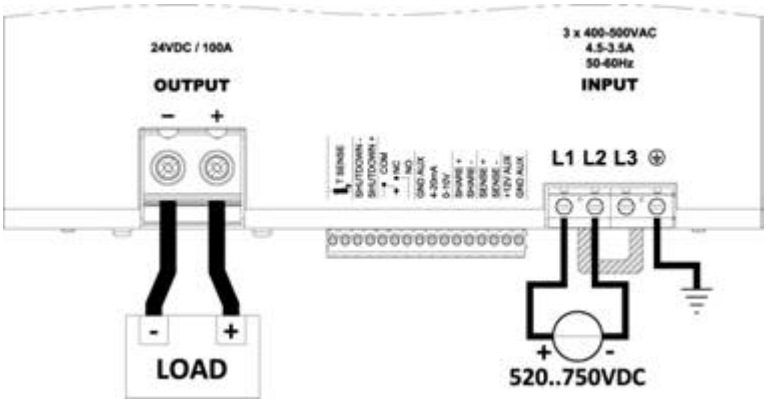
1.1 Wiring

1.1.1 Standard Connection

NOTICE

Check the polarity of the output load before applying mains. The load can be destroyed by wrong wiring.





WARNING **Fire hazard and risk of injury!** The power supply is working with high voltage and high currents. Observe the safety regulations and let just eclectrical qualified employees work with and on the module.

1.1.1.1 Inputs

WARNING **Fire hazard and risk of injury!** Ground the module before connecting the 3 phases L1, L2 and L3. Operating the module only with 2 phases is strictly prohibited. Only in cases of need it is possible to operate the module with 2 phases and half of the nominal voltage.

Wire the inputs regarding following voltage (Vin):

- AC 3x400…500 V (range= AC 340…550 V) or
- DC 520…750 V .
- The input mains terminal block accepts wires up to 4 mm² (11AWG).
- The wire gauge should be at least 1.5 mm² (15 AWG)..
- Use only 60/75 class 1 copper wires.
- Strip the wire insulation for 8 mm.
- Tightening the screws with a torque of 0.5…0.6 Nm

Input protection device
The Power Supply is not equipped with an internal protection fuse. Use external breaking and protection devices as circuit breakers rated 10 A and characteristic C, properly rated for the operating voltage and with a minimum breaking power of 1.5kA. Over-Current protection must be provided on each phase.

For USA and Canada use fuses class CC rated 10 A. In some countries local regulation may apply.

Special ratings and devices should be used for DC input applications. Call factory for information.

1.1.1.2 Outputs

- The input mains terminal block accepts wires up to 35 mm² (AWG 2).
- Use only 60/75 class 1 copper wires.
- Strip the wire insulation for 15 mm.
- Tightening the screws with a torque of 2.5...4.5 Nm.

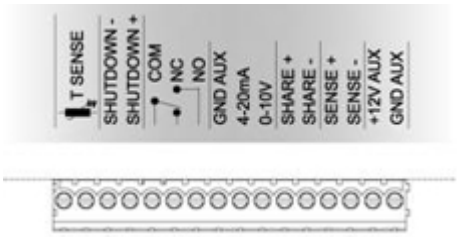
The exact wire gauges for the single modules are listed in the table below:

Product	Nominal Voltage	Minimum Wire Gauge [mm² / AWG]
24 V Model	100 A	25 mm² / AWG 3
48 V Model	50 A	10 mm² / AWG 7

1.1.1.3 Auxiliary Connectors

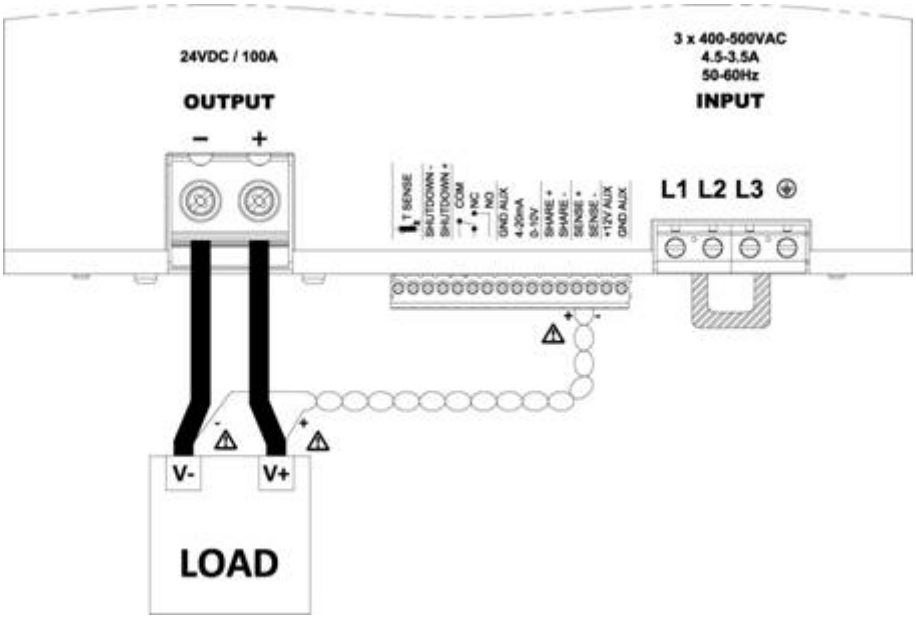
- The auxiliary terminal block accepts wires from 0.5 mm² (20 AWG) to 1.5 mm² (15 AWG).
- Use only 60/75 class 1 copper wires.
- Strip the wire insulation for 5 mm.
- Tightening the screws with a torque of 2.5 Nm.

Mind the correct pin assignment:



1.1.2 Connecting with Remote Voltage Sense

When the load is placed far away from the Power Supply or when tight voltage accuracy is needed by the load, the Power Supply provides a feature to compensate the output cables I*R voltage drop. It can tightly regulate the output voltage directly at the load terminals and not at the Power Supply output terminal, within 10 mV of precision.



NOTICE

Do not invert polaritis! If inverting the polarity of the power supply the output voltage will increase to its maximum and can destroy the load. Check the polarity while connecting the load.

Conenct the Load with the auxiliary connectors SENSE+ and SENSE- via 2 additional wire (any flex wire from 0.5 mm² /20 AWG to 1.5 mm²/15 AWG).

We strongly recommend to twist the 2 wires together in order to improve the noise and interference immunity.

Mind following points:

- The voltage, which is shown on the display, is always the output voltage and not the voltage of the load.
- In case of very long output cables with consistent I*R cable drop the device could no more be able to deliver the rated output current. The rated output power is however maintained.

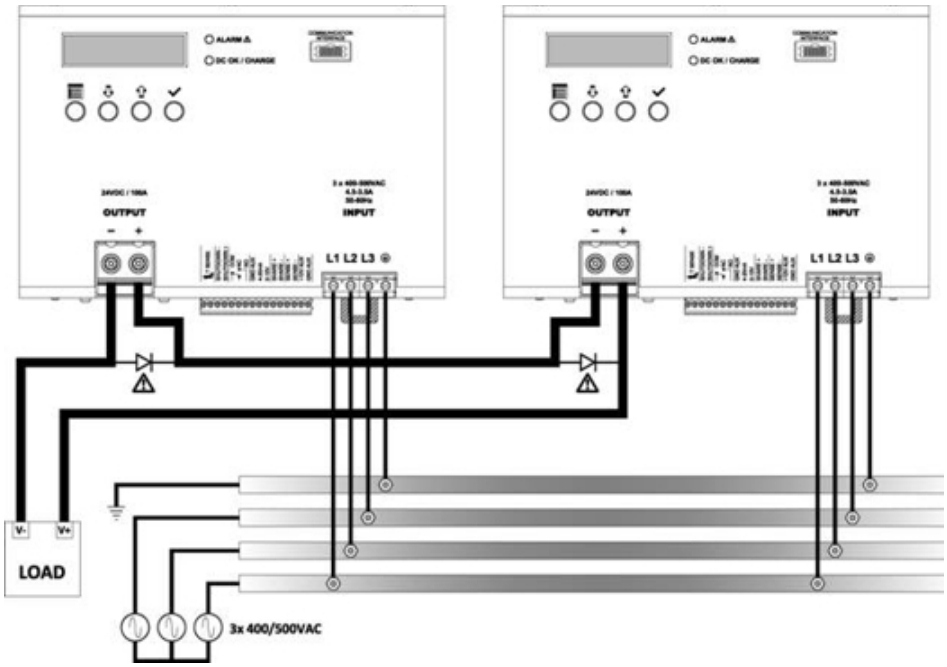
Example:

Vload=24 V, cable drop=0.5 V (per cable)

Voltage on the Power Supply
output=24 V+2*0.5 V=25 V maximum output current=2400 W/25 V=96 A (not 100 A!).

1.1.3 Connecting in Series

It is possible to connect 4 power supplies of the same model (same nominal voltage) with a nominal voltage of 200 V DC in series.



NOTICE

Do not invert polaritis! If inverting the polarity of the power supply the output voltage will increase to its maximum and can destroy the load. Check the polarity while connecting the load.

NOTICE

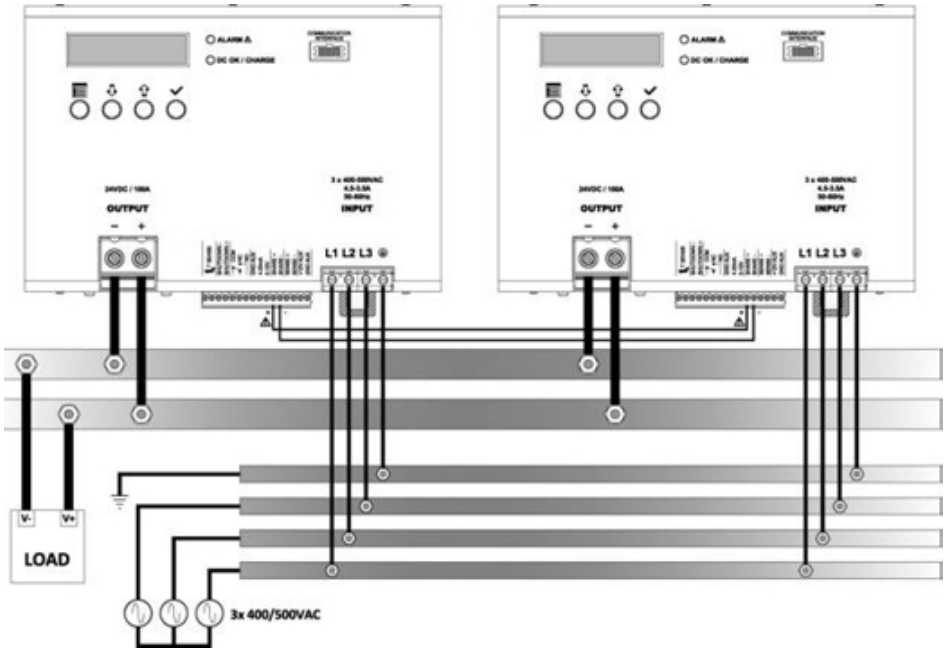
Wrong Connection! Do not connect the auxiliary interface SENSE+/SENSE- and SHARE+/SHARE-. It can destroy the module and/or the connected load.

- Bevor powering the system, make sure that the antiparallel diods are connected to all modules. The voltage rating of EACH diode should cover the TOTAL voltage of the SERIES system. A diode as P600J is suitable for most applications.
- To achieve the best power sharing between the series connected devices it is recommended to regulate the output voltage of each device at the same value with a tolerance of maximum 0.1 V.
- When using several devices in series the operating mode must be set to OVERBOOST, using CONSTANT CURRENT mode can result in instabilities in case of load short circuit. The maximum current setpoint shall be the same on every connected device.

1.1.4 Connecting in Parallel (Power and Redundancy)

Redundancy
It is possible to connect between 2 and 4 modules parallel, to increase the system reliability. If one Power Supply fails the load will be still powered from another Power Supply connected in parallel. The Power Supply integrates an active ORing diode so that several units can be directly connected in parallel without the need for an external ORing module.

Power Increase
This configuration is used to increase the system power capacity by summing the output current of each individual Power Supply connected in parallel to the load. To obtain the system's best performance .



NOTICE

Do not invert polaritis! If inverting the polarity of the power supply the output voltage will increase to its maximum and can destroy the load. Check the polarity while connecting the load.

NOTICE

Wrong Connection! Do not connect the auxiliary interface SENSE+/SENSE- and SHARE+/SHARE-. It can destroy the module and/or the connected load.

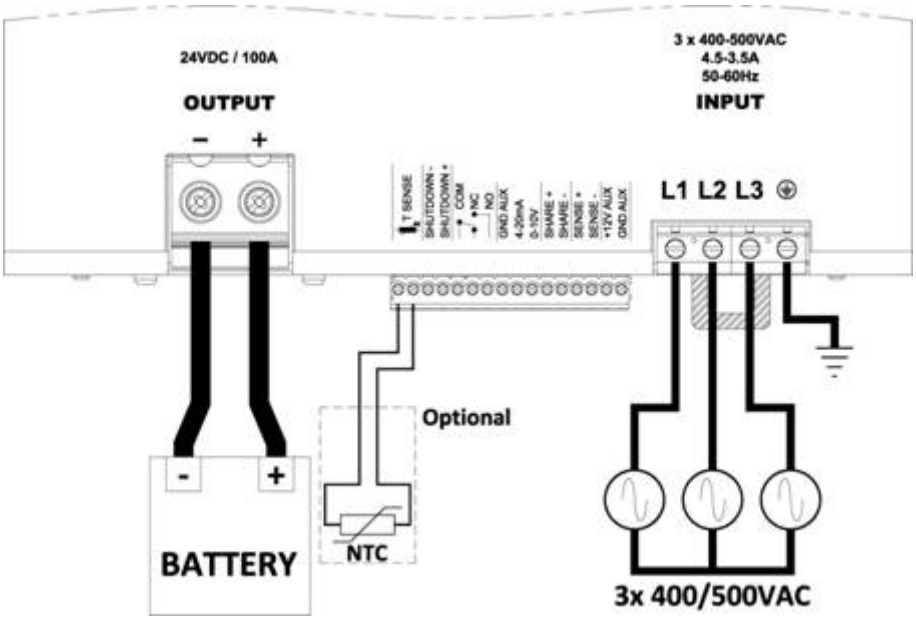
- In this configuration the maximum power sunk by the load must be < Pnom.
- Do not connect more than 4 modules if the circuit is set up for power increase. The connectors SHARE+ and SHARE- has to be daisy chained on each power supply. This allows equal current sharing between all Power Supplies.

- The maximum total output current will be 0.9*Iout*N, where N is the number of connected Power Supplies. The maximum power is thus limited to 0.9*N*Pnom<8.7kW.
- To achieve the best power sharing between the parallel connected devices the output voltage of each device must be adjusted at the same value with a tolerance of maximum 0.2V. The share bus will then slightly vary the output voltage of each Power Supply to achieve the best possible power sharing.

1.1.5 Battery Charger Connection

Both models of the Power Supply have a battery charger function:

- Model 24 V
  Can charge 12 and 24 V batteries with a capacity from 50 Ah to 1000 Ah.
- Model 48 V
  Can charge 48 V batteries with a capacity from 25 Ah to 500 Ah.



WARNING

Fire hazard by inverted polarity! The device is not protected against battery polarity reversal. Check the connected wires before operation.

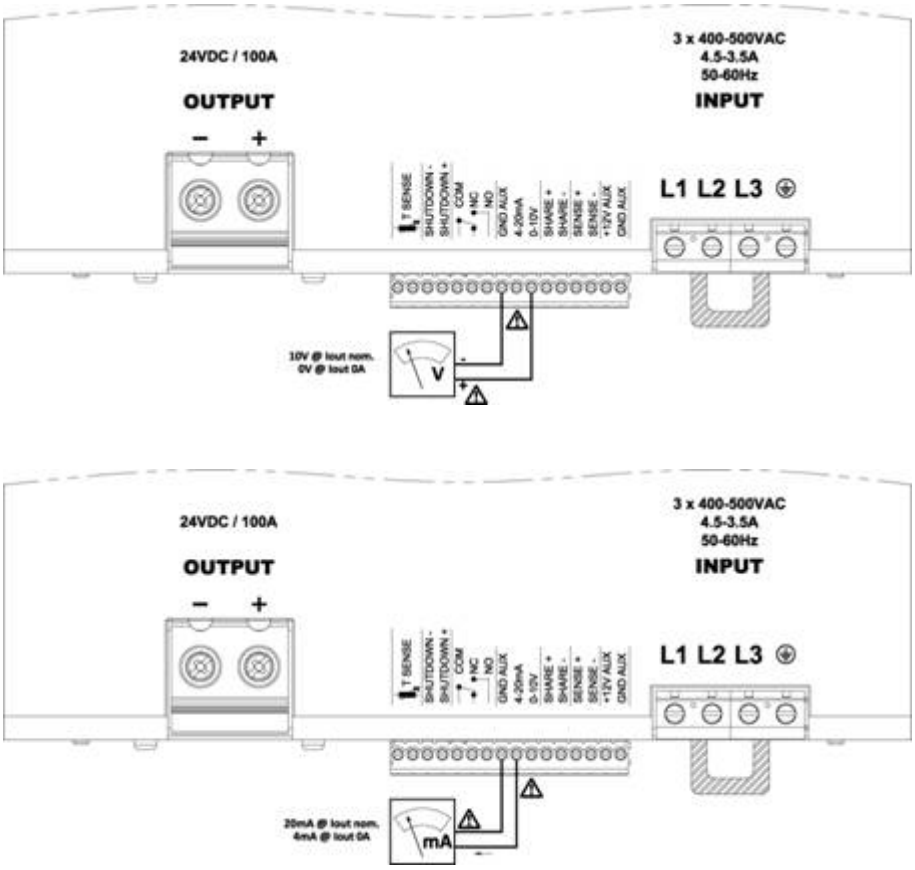
The device has an input for an optional 10kΩ NTC (Murata NPSD0XH103FEB0 or equivalent) used to sense the battery ambient temperature.

When using the temperature sensor the battery can be recharged in a more accurate way since the device regulates its charging voltage according to the battery ambient temperature.

1.1.6 Output Current Remote Measurement

The Power Supply provides 2 different outputs for the remote measurement of the current delivered by the device.

The 2 outputs follow 2 major industry standards levels:



NOTICE

Wrong wiring! Mind the pin assignment when supplying the current measurement.

Ground the device via GND AUX.

0...10 V voltage output
0 V corresponds to 0 A output, 10 V corresponds to the rated output current of the Power Supply.

4…20 mA current output
4 mA corresponds to 0 A output, 20 mA corresponds to the rated output current of the Power Supply.

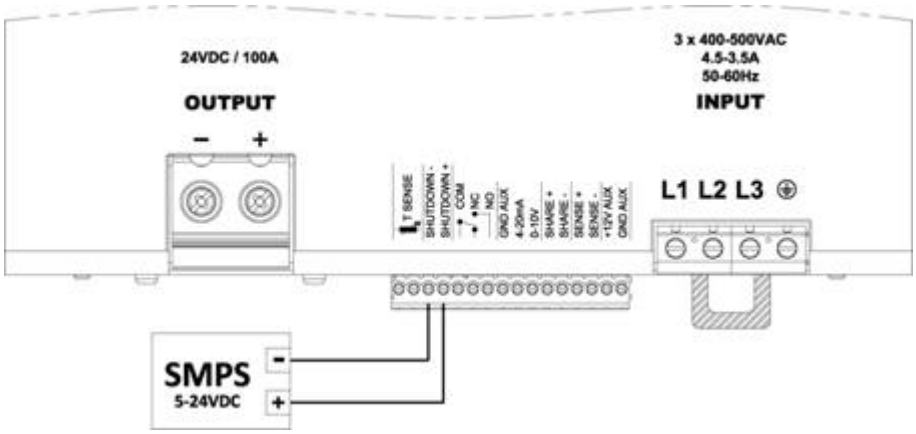
1.1.7 Remote Shutdown Input

The device includes an opto-isolated input used to remotely shutdown or enabling the device output without the need for disconnecting the mains input. This input can be used in 2 ways:

1.1.7.1 Shutdown by an external signal

When applying an external DC voltage from 5 VDC to 24 VDC to the SHUTDOWN inputs the Power Supply output will be turned on or off depending on the programmed shutdown polarity.

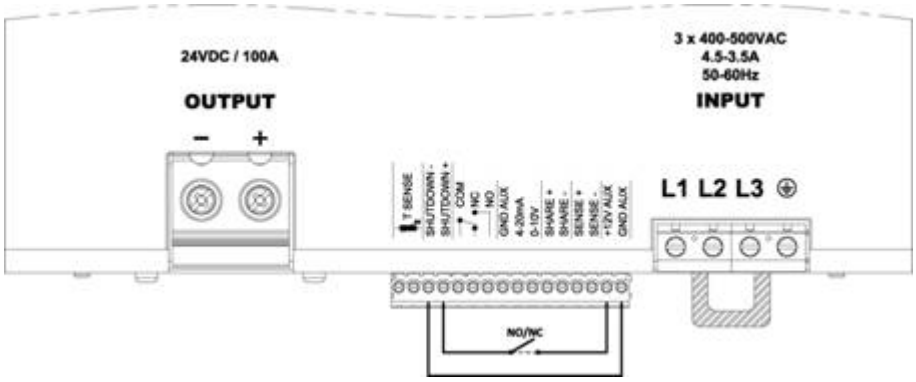
I



- This supply is available on the +12V AUX/ GND AUX terminals of the auxiliary connector. The auxiliary supply is floating (isolated) with respect to the Power Supply output.
- Take care when using the 12V auxiliary output in conjunction with remote output current measurement to avoid ground loops.
- The 12V auxiliary output is short circuit protected by an active circuit.

1.1.7.2 Shutdown via a Switch or Relay Contact

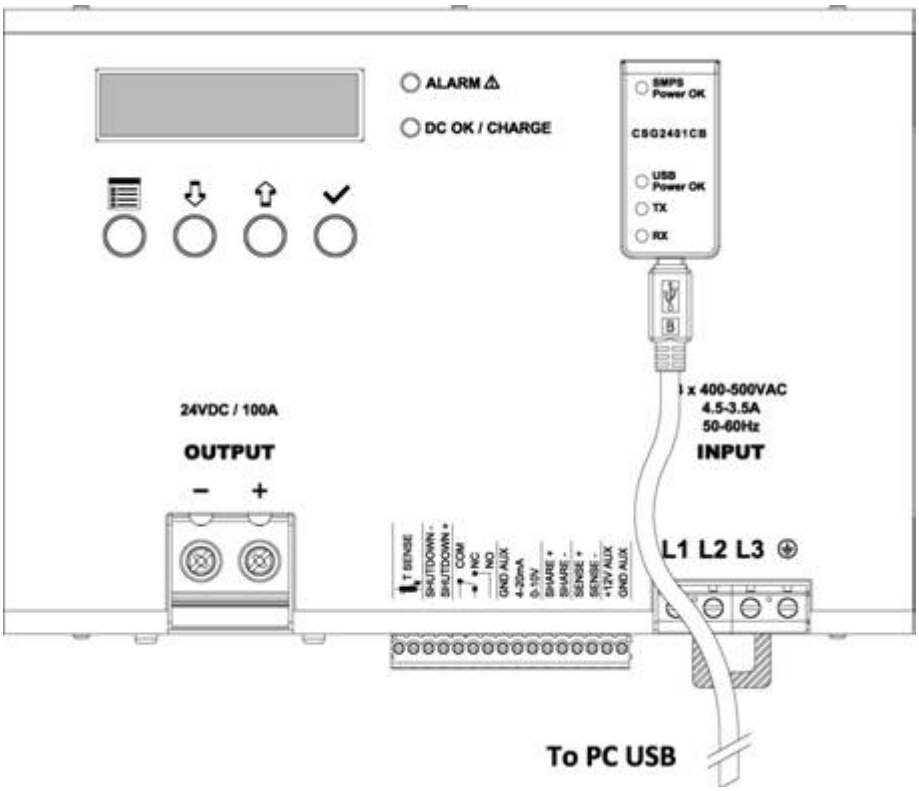
By connecting an external switch or relay contact, the Power Supply output can be switched on or off by only acting on the switch or relay contact.



- The Power Supply provides an SPDT relay with normally open (NO) and normally closed (NC) dry contacts.
- The relay/switch indicates that the output voltage is present and regulated (DCOK).
- When the device is operating in battery charger mode the relay is excited when the battery charging process is terminated, overriding all other functions.

1.1.8 Connection to a PC via the USB Communication Box XCSCOM1

The Power Supply provides a communication interface, via the interface the module can be connected to the computer.



- Connect the USB Box XCSCOM 1 to the communication interface. Through the box the computer can be connected via USB.
- Via the computer application Power Master, the Power Supply can be configured and controlled.

1 Inbetriebnahme

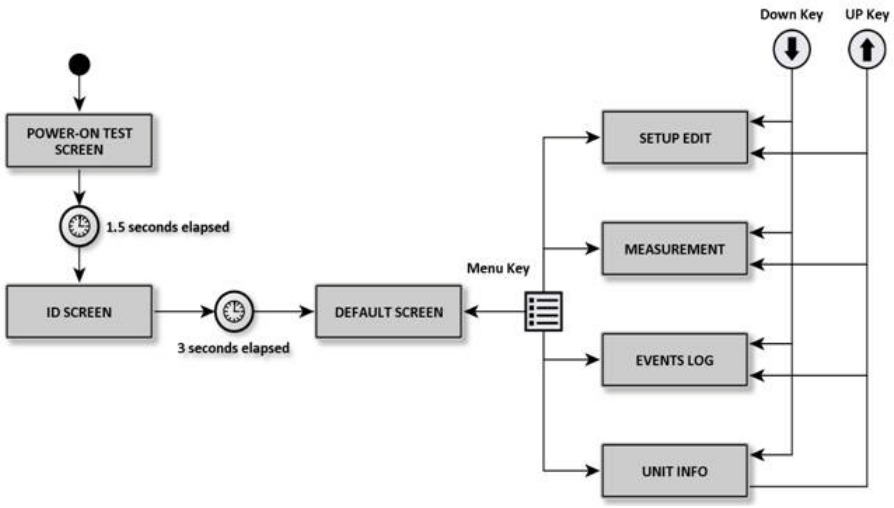
1.1 Display – Menu Settings

1.1.1 Operation

- Activating the Menu
  Push the menu key
- Exit the Menu
  Push the menu key a second time.
- Scroll
  Push the arrows to scroll through the submenus.

1.1.2 Main Menu

- SET-UP
  Configuration of the Power Supply
- MEASUREMENTS
  Monitoring of the voltage, current and the temperature of the Power Supply.
- EVENT LOG
  Various logged events (alarms and errors). All are provided with a time stamp.
- UNIT INFO
  Module specific information.



When the Power Supply is energized a POWER ON TEST is performed and a specific screen is displayed. This test checks the digital controller.

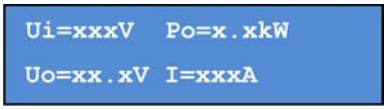
Once the test is concluded an ID SCREEN is shown for 3 seconds.

Consequently the DEFAULT SCREEN is shown.

Line 1 shows the error or alarm type, while line 2 shows the offending value causing it.
When an alarm is present the ALARM L LED is on and the buzzer is active (if enabled).

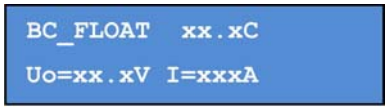
If no error or alarms are present and the mode is set to OVERBOOST or CURRENT-LIMIT the most significant measures are shown:

Uin, Pout
Uout, Iout



If no error or alarms are present and the mode is set to BATTERY-CHARGER the charger status and other useful measures are shown:

Charger status, Temperature
Uout, Iout

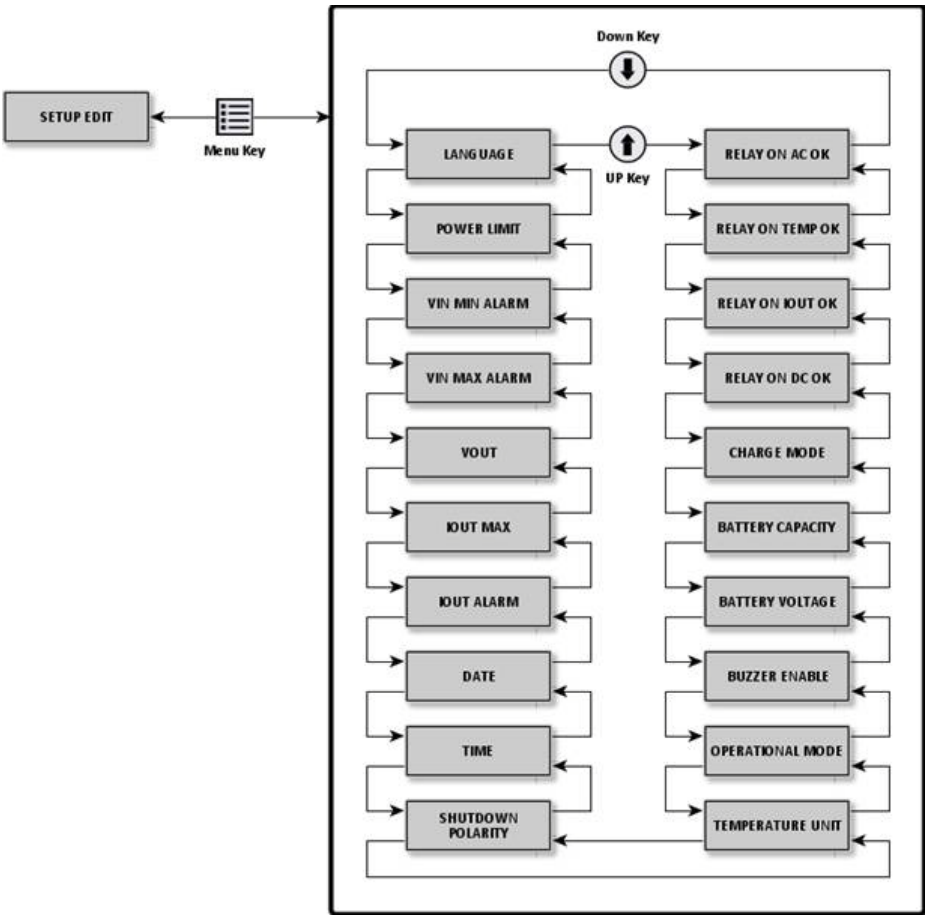


The available charger status are:

- BC_CC: Constant Current charge in process
- BC_CV: Constant Voltage charge in progress
- BC_FLOAT: Float Charge in progress
- BC_OT: Battery environment over-temperature condition (>50°C) – only if provided with optional Temp. sensor
- BC_ERROR: Battery is faulty or not connected
- BC_REVIVE: Charger is trying to revive the battery
- BC_CHECK: Battery is checked by the charger

1.1.2.1 SET UP

From this submenu it is possible to configure the Power SUPPLY. The layout of the submenu is shown below:



- Select Parameters
  Push the OK key.
- Edeting Values
  Push the arrow keys.
- Exit the Edeting Mode
  Push the OK or menu key.

POWER LIMIT
In case of operation in high temperature environment is possible to reduce the maximum power of the device. Possible choices are 1500 W/ 2000 W/ 2400 W.

Default: 2400 W

Setting:
Value:

VIN MIN ALARM
Use the UP/DOWN keys to select the minimum input voltage alarm threshold. Possible range is:

340 V < Vin min alarm < Vin max Alarm.

Default: 340 V

Setting:
Value:

VIN MAX ALARAM
Use the UP/DOWN keys to select the maximum input voltage alarm threshold. Possible range is:

Vin min alarm < Vin max alarm < 520 V

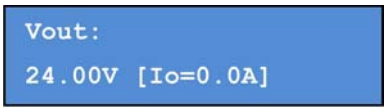
Default: 520 V

Setting:
Value:

VOUT
Use the UP/DOWN keys to set the desired output voltage within the possible values for each model. The range is model specific. The actual output current is displayed in square brackets.

Default: 24.00 V / 48.00 V / 72.00 V / 170.0 V (model specific).

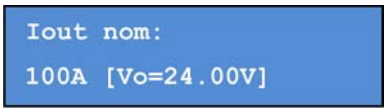
Setting:
Value:



NOMINAL IOUT
Use the UP/DOWN keys to set the desired nominal output current. In case of OVERBOOST mode 150% of this value is supplied for a maximum of 5 consecutive seconds. When the current exceeds this value an overload condition is triggered. The actual output voltage is displayed in square brackets.

Default: 100 A / 50 A / 33 A / 14 A (model specific)

Setting:
Value [actual output voltage]:



IOUT ALARM
Use the UP/DOWN keys to select the desired output current alarm threshold.

Default: 100 A / 50 A / 33 A / 14 A (model specific).

Setting:
Value:

DATE
Use the UP/DOWN keys to modify the date. Press OK or MENU key to advance the cursor to the next editable field, once the editable fields are finished press one more time to save and return to previous menu.

Setting:
Value:

TIME
Use the UP/DOWN keys to modify the time. Press OK or MENU key to advance the cursor to the next editable field, once the editable fields are finished press one more time to save and return to previous menu.

Setting:
Value:

REMOTE SHUTDOWN POLARITY
Use the UP/DOWN keys to modify the remote shut down polarity (LOW or HIGH).

Default: HIGH

Setting:
Value:

TEMPERATURE MEASUREMENT UNIT
Use the UP/DOWN keys to modify the temperature measurement unit (CELSIUS or FAHRENHEIT).

Default: CELSIUS

Setting:
Value:

ENABLE BUZZER
Use the UP/DOWN keys to enable/ disable the buzzer in case of an alarm. During an alarm the buzzer can also be muted by pressing the OK button while in DEFAULT SCREEN for more than 3 seconds.

Default: DISABLED

Setting:
Value:

OPERATING MODE
Use the UP/DOWN key to select the desired operating mode between OVERBOOST / CURRENT LIMIT / BATTERY CHARGER.

Default: OVERBOOST

Setting:
Value:

BATTERY VOLTAGE
This submenu is present only if operating mode is set to BATTERY CHARGER. Use the UP/DOWN key to select the nominal battery voltage. Possible choices are 12 V or 24 V for the “24 V“ model and 48 V for the “48 V“ model.

Default: 12 V / 48 V (model specific)

Setting:
Value:

BATTERY CAPACITY
This submenu is present only if operating mode is set to BATTERY CHARGER. Use the UP/DOWN keys to select the nominal battery capacity. Range is 50 Ah to 1000 Ah for “24 V” model and 25 Ah to 500 Ah for “48 V” model.

Default: 50 Ah / 25 Ah (model specific)

Setting:
Value:

CHARGING MODE
This submenu is present only if operating mode is set to BATTERY CHARGER. Use the UP/DOWN keys to select the desired battery charging mode between NORMAL (0.1C) or FAST (0.2C).

Default: NORMAL

Setting:
Value:

RELAY IOUT OK
Use the UP/DOWN keys to enable/ disable the relay on “Iout OK”, the relay is excited when Iout<Iout_alarm. In BATTERY-CHARGER mode this relay function is disabled.

Default: DISABLED

Setting:
Value:

RELAY TEMP OK
Use the UP/DOWN key to enable/ disable the relay on “Temperature OK”, the relay is excited when the internal transformer temperature is < 110°C (230°F). In BATTERY-CHARGER mode this relay function is disabled.

Default: DISABLED

Setting:
Value:

RELAY AC OK
Use the UP/DOWN key to enable/ disable the relay on “AC input OK” (means the AC voltage is within the user defined window), the relay is excited when the Vin_min_alarm<Vin<Vin_max_alarm. In BATTERY-CHARGER mode this relay function is disabled.

Default: DISABLED

Setting:
Value:

RELAY DC OK
Use the UP/DOWN key to enable/ disable the relay on “DC OK”, the relay is excited when Vout>0.9*Vout_set. In BATTERY-CHARGER mode this relay function is disabled.

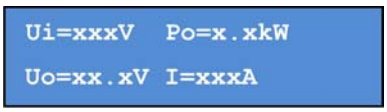
Default: ENABLED

Setting:
Value:

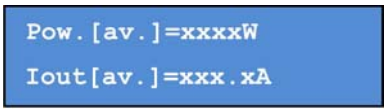
1.1.2.2 MEASUREMENTS

The UP/DOWN keys are used to scroll between pages. MENU key is used to return to the previous menu. The screen is refreshed every 500 ms. The average values are calculated from the beginning of the operation of the unit.

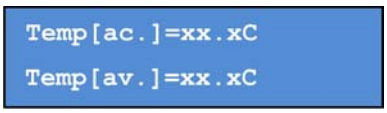
Page 1
Input voltage, output power:
Output voltage, output current:



Page 2
Average output power:
Average output current:

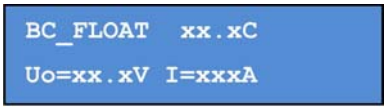


Page 3
Actual internal temperature:
Average internal temperature:



Page 4
Charger status, Battery Ambient Temp.:

Uout, Iout:



1.1.2.3 EVENT LOG

There are 3 categories of information saved by the Power Supply (logged for further monitoring purposes) in a non-volatile memory. The maximum number of stored events is 408. When the storage capacity is reached the oldest event is overwritten.

1. ERRORS: these are critical events (either external or internal to the Power Supply) that impede the correct operation of the unit, leading to its shutdown. They are listed below:

ID	Code	Name	Condition
0	OL	Over Load	Iout > Inom for more then 5 seconds (hiccup)
1	OT	Over Temperature	Transformer Temperature > 125°C (257°F)
2	OOV	Output Over Voltage	Vout > Max Vout Nominal
3	IUV	Input Under Voltage	Vin < 330V
4	IOV	Input Over Voltage	Vin > 530V
5	PUV	PFC Under Voltage	Vpfc < 300V
6	POV	PFC Over Voltage	Vpfc > 450V
7	PSF	Phase Shift Failure	While power converted is ON Vout = 0V & Iout = 0V
8	SC	Short Circuit	While in Constant Current Mode Vout = 0V

2. ALARMS:
   These are events (either external or internal to the Power Supply) that are out of nominal values, but do not impede the operation of the unit. They are listed below:

ID	Code	Name	Condition
20	OLS	Over Load Start	Iout > IoutAlarm
21	OLE	Over Load End	Overload condition ends
22	OTS	Over Temperature Start	Transformer Temperature > 115°C (239°F)
23	OTE	Over Temperature End	Over Temperature condition ends
24	IUVS	Input Under Voltage Start	Vin < VinMinAlarm
25	IUVE	Input Under Voltage End	Input Under Voltage condition ends
26	IOVS	Input Over Voltage Start	Vin > VinMaxAlarm
27	IOVE	Input Over Voltage End	Input Over Voltage condition ends
28	Ph Loss St.	Phase Loss Start	SMSP working on two phases only
29	Ph Loss End	Phase Loss End	Phase Loss condition ends

3. EVENTS:
   These are standard operations (e.g. unit POWER ON or SHUT DOWN) which are logged just for reference of operating conditions. They are listed below:

ID	Code	Name	Condition
40	Rem. ShDown	Remote Shutdown	Remote Shutdown activated
41	Power ON	Power ON	SMSP powered ON
50	BC CC	Battery Charger Constant Current	Battery starts Constant Current phase
51	BC CV	Battery Charger Constant Voltage	Battery start Constant Voltage phase
52	BC Float	Battery Charger Float	Battery charged, float charge phase
53	BC Error	Battery Charger Error	Battery Error, i.e. Vbat too low
54	BC OT	Battery Charger Over Temperature	Battery ambient temperature < 50°C
55	BC Revive	Battery Charger Reviving	Battery charger is trying to revive the battery

1. ERRORS

OVERLOAD
Event: In OVERBOOST mode, Iout > Iout_nom for more then 5 seconds. The device enters a hiccup cycle.

Code, Type, Offending value:

Time stamp:

OVER TEMPERATURE
Event: transformer temperature > 125°C (257°F). The device trips to thermal shutdown

Code, Type, Offending value:

Time stamp:

OUTPUT OVERVOLTAGE
Event: Unit internal error. The output voltage can be no more regulated and it trips to its maximum value. When such error occurs the device goes in a latched shutdown mode. A mains power cycle is needed to recover from such error.

Code, Type, Offending value:

Time stamp:

INPUT UNDER VOLTAGE
Event: Vin < 330 VAC. The Power Supply remains switched off until Vin > 340 VAC

Code, Type, Offending value:

Time stamp:

INPUT OVER VOLTAGE
Event: Vin > 530 VAC. The Power Supply remains switched off until Vin is decreased below 520 VAC

Code, Type, Offending value:

Time stamp:

PFC UNDER VOLTAGE
Event: VPFC < 300 V. The internal PFC bus voltage can be no more regulated. When such error occurs the device goes in a latched shutdown mode. A mains power cycle is needed to attempt a recover from such error. Most of the cases this is an unrecoverable error and the device needs to be serviced.

Code, Type, Offending value:

Time stamp:

PFC OVER VOLTAGE
Event: VPFC > 450 V. The internal PFC bus voltage can be no more regulated. When such error occurs the device goes in a latched shutdown mode. A mains power cycle is needed to attempt a recover from such error. Most of the cases this is an unrecoverable error and the device needs to be serviced.

Code, Type, Offending value:

Time stamp:

DC/DC CONVERTER
Event: Vout = 0 V and Iout = 0 A. The internal DC/DC converter is not working properly. When such error occurs the device goes in a latched shutdown mode. A mains power cycle is needed to recover from such error. Most of the cases this is an unrecoverable error and the device needs to be serviced.

Code, Type:

Time stamp:

SHORT CIRCUIT
Event: While in CONSTANT CURRENT mode the voltage drops below 1 V for more then 0.5 seconds. The device enters a hiccup cycle.

Code, Type:

Time stamp:

OVERLOAD ALARM START
Event: Iout > IoutAlarm

Code, Type, Offending value:

Time stamp:

OVERLOAD ALARM END
Event: Over Load condition alarm ends. Maximum value is the highest Iout measured during the alarm.

Code, Type, Maximum value:

Time stamp:

OVERTEMPERATURE ALARM START
Event: Transformer temperature > 115 °C (239 °F)

Code, Type, Offending value:

Time stamp:

OVERTEMPERATURE ALARM END
Event: Over Temperature alarm condition ends. Maximum value is the highest temperature measured during the alarm.

Code, Type, Maximum value:

Time stamp:

Vin UNDERVOLTAGE ALARM START
Event: Vin < VinMinAlarm

Code, Type, Offending value:

Time stamp:

Vin UNDERVOLTAGE ALARM END
Event: Vin Under Voltage alarm condition ends. Minimum value is the lowest Vin measured during the alarm

Code, Type, Minimum value:

Time stamp:

Vin OVERVOLTAGE ALARM START
Event: Vin> VinMaxAlarm

Code, Type, Offending value:

Time stamp:

Vin OVERVOLTAGE ALARM END
Event: Vin Over Voltage alarm condition ends. Maximum value is the highest Vin measured during the alarm.

Code, Type, Maximum value:

Time stamp:

PHASE LOSS ALARM START
Event: A mains phase is missing for > 10 s. In case of a phase loss alarm the maximum output power is reduced an half.

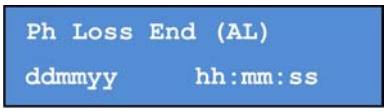
Code, Type:

Time stamp:

PHASE LOSS ALARM END
Event: Phase Loss alarm condition ends.

Code, Type:

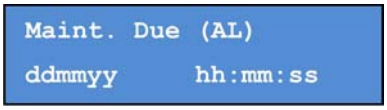
Time stamp:



MAINTENANCE DUE ALARM START
Event: Maintenance is due.

Code, Type:

Time stamp:



MAINTENANCE DUE ALARM END
Event: Maintenance done

Code, Type:

Time stamp:

REMOTE SHUTDOWN EVENT
Event: The device has been remotely shut down through the remote shutdown input

Code, Type:

Time stamp:

POWER ON EVENT
Event: The unit has been energized.

Code, Type:

Time stamp:

BATTERY CHARGER CONSTANT CURRENT EVENT
Event: In BC mode the unit started the constant current phase

Code, Type

Time stamp:

BATTERY CHARGER CONSTANT VOLTAGE EVENT
Event: In BC mode the unit started the constant voltage phase.

Code, Type:

Time stamp:

BATTERY CHARGER FLOAT EVENT
Event: In BC mode the unit started the constant voltage phase

Code, Type:

Time stamp:

BATTERY CHARGER ERROR EVENT
Event: In BC mode the unit started the constant voltage phase.

Code, Type:

Time stamp:

BATTERY CHARGER OVERTEMPERATURE EVENT
Event: In BC mode the unit started the constant voltage phase.

Code, Type:

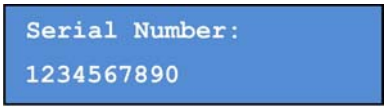
Time stamp:

1.1.2.4 INFORMATION

Factory set generic information (ID, etc.) is available under this menu. The UP/ DOWN keys are used to scroll between the pages.

MODEL
Item:
Model code:

SERIAL NUMBER
Item:
Serial number:



FIRMWARE
Item:
Firmware version:

DATE
Item:
Date:

TIME
Item:
Time:

MAINS EVENT COUNTER
This counter is incremented every time a mains related event happens. Mains related events are:

Input Under Voltage,
Input Over Voltage and
Phase Loss

Item:
Total count:

LOAD EVENT COUNTER
This counter is incremented every time a load related event happens. Load related events are:

Over Load and Short Circuit.

Item:
Total count:

ENVIRONMENTAL EVENT COUNTER
The counter is incremented every time an environment related event happens. Environmental events are:

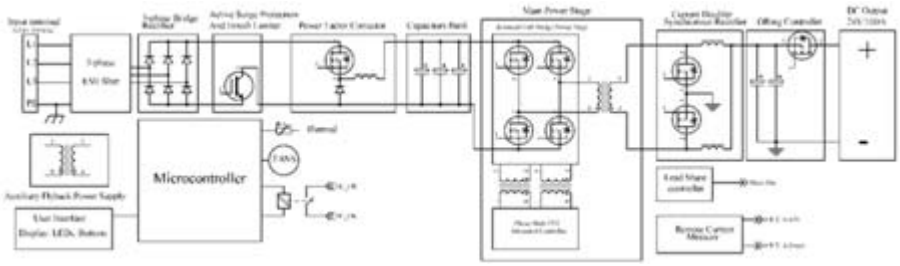
Power Supply Over Temperature and Battery Ambient Over Temperature

Item:
Total count:

1 Operation

1.1 Functional Description

Below a block diagram is shown:



The Power Supply is a 3-phase input SMPS with 2 power stages, supervised by a microcontroller. The first stage is a power factor corrector (PFC) module that improves unit efficiency and reduces the harmonic current from the mains. The second stage is a resonant full bridge converter that provides primary to secondary insulation and high efficiency power conversion.

The product offers additional features that improve the performances and the reliability:

- Integrated active ORing diode
  Allows connecting several devices in parallel for redundancy. When several units are paralleled for increase of the total output power (up to 8.7 kW) this circuit increases the reliability of the system in case of 1 unit failure.
- Load share functionality
  Allows connecting up to 4 devices in parallel to increase the output power up to 8.7 kW. A dedicated bus allows to equally share the total load current between the paralleled devices.
- Remote voltage sensing:
  Allows regulating the output voltage directly at the load terminals compensating the cables and connectors voltage drop when long cables are used.
- Active surge protection:
  This circuit increases the reliability by protecting the device from high voltage transients occasionally present on the 3 phase mains. On top of that this circuit performs also the function of active inrush current limiter reducing the inrush current to very low values.
- Smart thermal management:
  The fans' speed is controlled according to load and internal temperature conditions. This allows maintaining a safe temperature of the critical parts while maximizing the fans operating life and minimizing the fans noise.
- Remote output current measure:
  The user can measure remotely the output current delivered by the SMPS. The information is provided through an opto-isolated output with 2 industry standard ranges: 0…10 V or 4…20 mA for 0 A to rated output current.
- Remote shutdown input:
  It allows to remotely switch the Power Supply on or off without cutting the 3 phase mains. An opto-isolated input can be configured as a remote shutdown/ enable input

- Auxiliary 12 V output:
  The units provide a regulated 12 V/0.1 A output completely insulated from the main output. It can be used to supply light 12 V loads, independently on the Power Supply output voltage/status.
- Battery charger mode :
  This operating mode allows operating the device as a high performance battery charger for lead-acid batteries. 12 V, 24 V or 48 V batteries can be charged up to a capacity of 1000 Ah.

1.2 Operating Modes

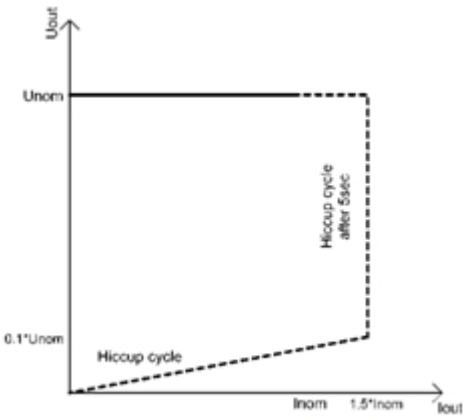
The Power Supply has 3 different operating modes, user selectable:

- Overboost (OB)
- Constant current limit (CC)
- Battery charger (BC- available only on “24V” and “48V” models)

1.2.1 Overboost mode (default)

This mode is suitable for powering loads with high inrush current such as motors or highly capacitive loads. It also helps in blowing fuses of failed loads and separate those from other active loads connected in parallel.

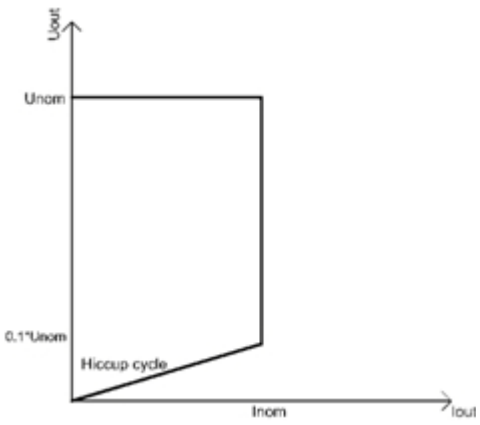
- The power supply provides a temporary power boost up to 150% (3600 W) of its rated power for a maximum of 5 seconds.
  The output U/I behaviour in OB mode is presentedin diagram on the right side:
- As soon as the output current becomes > Inom a timer is started; when the timer elapses (5 s) the output is shut off and kept off for 10 seconds (hiccup cycle – 5 s on/10 s off).
- In case of a “dead short circuit” on the output (Uout<0.1*Unom) the maximum current is still limited at 1.5*Inom, but the output shuts off after about 100 ms entering a hiccup cycle.



1.2.2 Constant Current Limit Mode

This mode can be suitable also for powering systems that have a back-up battery in parallel to the load.

- The Power Supply behaves as a constant voltage source or constant current source depending on the load.
  The output U/I behavior in CC mode is presented in the diagram on the right.
- The output maximum current can be set between 0.1*Inom and Inom. It will never exceed the programmed value independently on the load behavior.
- In case of a “dead short circuit” on the output (Uout<0.1*Unom) Imax is still limited at Inom, but the output shuts off after about 100 ms, entering a hiccup cycle.

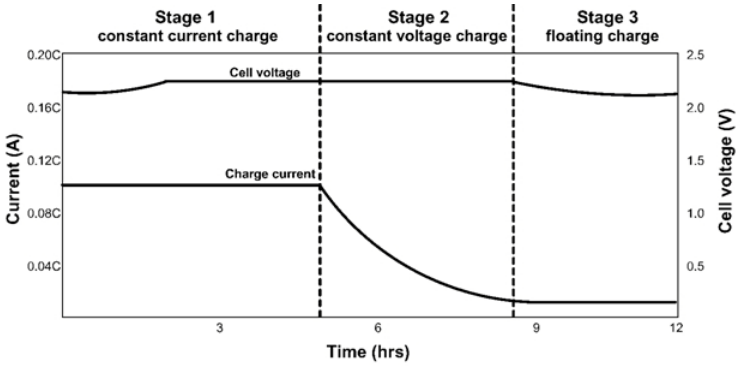


1.2.3 Battery Charger Mode

This operating mode performs lead-acid battery charging. 12 V, 24 V or 48 V batteries from 50 Ah to 1000 Ah can be charged. 2 charging modes are possible:

- Normal Charge
  In normal charge mode the charge current is limited to 0.1C (C = battery nominal capacity expressed in Ah) and the charging time takes approximately 12h.
- Fast Charge
  In fast charge mode the charge current is limited to 0.2 C and the charging time is approximately 8 h.

The charging algorithm is shown in the diagram below:



Stage 1
Constant current charge: during this phase the Power Supply operates as a constant current source limited at 0.1C or 0.2 C. The battery voltage progressively increases until it reaches the constant voltage charge value. Stage 2 starts when this voltage is reached.

Stage 2
During this phase the Power Supply operates as a constant voltage source limited in current at 0.1C or 0.2 C. The output voltage is kept constant at 14.4 V for 12 V batteries, 28.8 V for 24 V batteries or 57.6 V for 48 V batteries. If the external temperature sensor is used the constant voltage charge voltage is varied based on the battery ambient temperature (3 mV/°C). During this phase the current sunk by the battery starts to decrease. Stage 2 ends when the current sunk by the battery becomes lower than 0.03 C or after 8 hrs of constant voltage charge. When Phase 2 is finished the DC-OK LED is ON and the relay is excited, indicating that the charging process is completed..

Stage 3
Floating charge: during this phase thePower Supply operates as a constant voltage source but the output voltage is decreased to 13.5 V for 12 V batteries, 27 V for 24 V batteries or 54 V for 48 V batteries. If the external temperature sensor is used the floating charge voltage is varied based on the battery temperature. This phase is used to compensate the battery self discharge current and to keep the battery at its maximum capacity. The charge ends after Phase 2, Phase 3 can be extended for an indefinite period of time, to keep the battery charged when not used.

Battery voltage is checked before starting a charge cycle. For batteries that were deep discharged: if the battery voltage is < 8.4 V for 12 V batteries, < 16.8 V for 24V batteries or < 33.6 V for 48 V batteries the charger tries to revive the battery. During revive the battery is charged with 0.04C. If after 10 hours the voltage on the battery still too low a battery error is triggered, otherwise a charging cycle is started (Stage 1).

To exit the error state the user must acknowledge the error using the OK button.

1 Maintenance

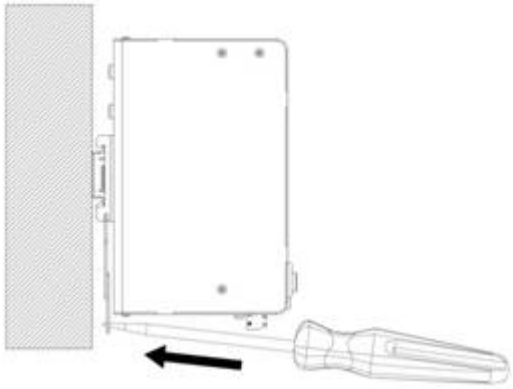
- Optionally a maintenance reminder can be activated by factory. The reminder will be activated after a user definable hours of operation. To acknowledge the reminder the user must keep the button up and the button down pressed for more then 3 second.
- The FAN should be checked periodically (recommended: every 6 month). Dirty fans can be cleaned using compressed air generated by a vacuum cleaner from outside of the unit. Do not use high pressure air flux, it can damage the module.

2 Demounting

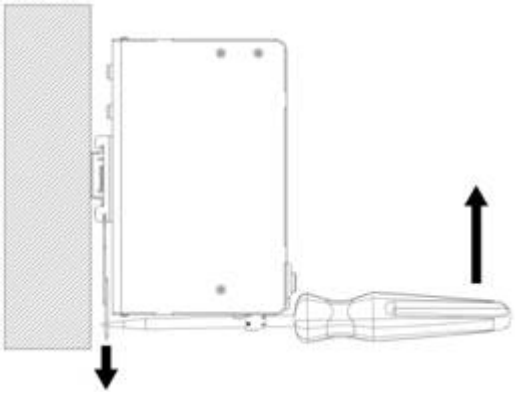
NOTICE

To demount the module a screw driver is necessary.

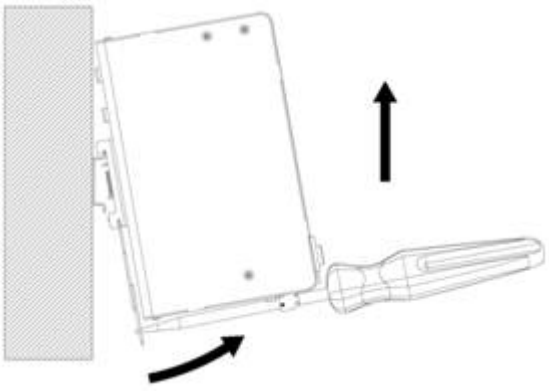
1. Put the screw driver into the loop on the bottom of the module.



2. Pull the loop down.



3. Take the module from the rail.



3 Final Shutdown and Disposal

Mind the valid environmental standard of your country for the final shutdown and disposal.

For the final shutdown the device has to be disassembled. Electric Parts must be disposed after the national electronic scrap regulation. You take the responsibility for the shipped article. You have to dispose the article after the terms of use and legal liability on your own costs and exempt the Friedrich Lütze GmbH from the responsibilities of §10 passage 2 ElektroG (Take-back obligation of the manufacturer) and any third party in this content.

If you have handled the device to a commercial third party without any contractual acceptance of the disposal, you have to take back the device after the final shutdown on your own cost and the legal liability.

The entitlement of indemnity from the Friedrich Lütze GmbH by the customer does not prescribe before two years after the final shut down of the device. The two year deadline of the suspension of statue forlimitations can start with a written message about the terms from you to the Friedrich Lütze GmbH.

4 Service

If you have any further questions regarding the product or our repairing service please contact us:

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5 Revision History

Version	Revision	Date
1.0	Final Review	07/2012

www.luetze.com

TECHNIK MIT SYSTEM