

User's Guide

Flatpack2 Power Modules



Rectifiers and Converters

Flatpack2 Power Supply Systems

Information in this document is subject to change without notice and does not represent a commitment on the part of *Eltek*.

No part of this document may be reproduced or transmitted in any form or by any means — electronic or mechanical, including photocopying and recording — for any purpose without the explicit written permission of *Eltek*.

Copyright ©: *Eltek*, 2022



350002.013 Issue 8.2, 2015 October

Published 2015-10-02

Mafe/MEI

Table of Contents

1. Introduction	6
About this Guide.....	6
System Diagrams — Flatpack2 Power Systems.....	6
Flatpack2 PS System ~ Telecom	6
Flatpack2 PS System ~ Hybrid Solar	7
Flatpack2 PS System ~ Industrial.....	8
2. Flatpack2 Rectifier & Converter Modules	9
Key Features.....	9
Typical Applications.....	9
Module Options	10
Heat Management ~ FB or BF Air Flow	10
Rectifiers — Output Voltage Lower than 60VDC.....	11
Flatpack2 Rectifier 24V, 1800W HE	11
Flatpack2 Rectifier 24V, 2000W	11
Flatpack2 Rectifier 24V, 2000W WOR	11
Flatpack2 Rectifier 48V, 1800W	11
Flatpack2 Rectifier 48V, 2000W	11
Flatpack2 Rectifier 48V, 2000W HE	11
Flatpack2 Rectifier 48V, 3000W	12
Flatpack2 Rectifier 48V, 3000W HE	12
Flatpack2 Rectifier 48-60V, 2000W HE.....	12
Flatpack2 Rectifier 48V, 2000W BF	13
Flatpack2 Rectifier 48V, 2000W HE, BF	13
Rectifiers — Output Voltage Higher than 60VDC	14
Flatpack2 Rectifier 110VDC, 2000W HE WOR - (Industrial).....	14
Flatpack2 Rectifier 110-125VDC, 10A HE - (Industrial)	14
Flatpack2 Rectifier 110-120VDC, 20A HE - (Industrial)	14
Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial).....	15
Flatpack2 Rectifier 220VDC, 5A HE - (Industrial)	15
Flatpack2 Rectifier 220VDC, 10A HE - (Industrial)	15
Flatpack2 Rectifier 380VDC, 2500W HE - (Data Centres).....	16
DC/DC Converters	16
Flatpack2 DC/DC Converter 1350W, 18-75VDC, 24VDC.....	16
Flatpack2 DC/DC Converter 1350W, 18-75VDC, 48VDC.....	16
DC/DC Solar Chargers.....	17
Flatpack2 Solar Charger 24/1500 HE Solar	17
Flatpack2 Solar Charger 48/1500 HE Solar	17
Flatpack2 Solar Charger 48/3200 HE Solar	17
3. Installation of Flatpack2 Modules	18
Safety Precautions	18
Mounting and Removing Modules.....	18
Removing Blind Panels	18
Keying Scheme ~ Modules and Power Shelves	19
Connections	20
CAN Bus Addressing (plug-and-play)	20
Correct Rectifier Position in Power Shelves	20
Firmware Upgrade of the Rectifier Modules	21
4. Operation	22
Front Panel Interface	22
LED Indicators	22
5. Technical Specifications	23
Specifications Flatpack2 Rectifier 24V, 1800W HE.....	23

Specifications Flatpack2 Rectifier 24V, 2000W	24
Specifications Flatpack2 Rectifier 24V, 2000W WOR.....	25
Specifications Flatpack2 Rectifier 48V, 1800W	26
Specifications Flatpack2 Rectifier 48V, 2000W	27
Specifications Flatpack2 Rectifier 48V, 2000W HE.....	28
Specifications Flatpack2 Rectifier 48V, 3000W	29
Specifications Flatpack2 Rectifier 48V, 3000W HE.....	30
Specifications Flatpack2 Rectifier 48-60V, 2000W HE	31
Specifications Flatpack2 Rectifier 48V, 2000W HE, BF	32
Specifications Flatpack2 Rectifier 110VDC, 2000W HE WOR - (Industrial)	33
Specifications Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial)	34
Specifications Flatpack2 Rectifier 380VDC, 2500W HE - (Data Centres)	35
Specifications Flatpack2 DC/DC Converter 1350W, 18-75VDC, 24VDC and 48VDC ..	36
Specifications Flatpack2 Solar Charger 24/1500 HE Solar	37
Specifications Flatpack2 Solar Charger 48/1500 HE Solar	38
Specifications Flatpack2 Solar Charger 48/3200 HE Solar	39

1.Introduction

The *Flatpack2* rectifier module is a powerful and cost-effective power supply used in Eltek's *Flatpack2* power systems.

About this Guide

This booklet provides users of *Flatpack2* power systems with the required information to install and operate the *Flatpack2* rectifier modules. The booklet also presents the modules' technical specifications, such as input voltage range, output power, operating temperature range, etc.

Read also the generic and site specific documentation that was delivered with your *Flatpack2* power system.

For detailed functionality description, browse and search through [Online Help](#) in Internet, or embedded in the PowerSuite application.

System Diagrams — Flatpack2 Power Systems

The *Flatpack2* modules are the building blocks of *Flatpack2 PS* systems, used for power supply of telecom and industrial equipment, in grid-fed sites or hybrid solar sites.

Flatpack2 PS System ~ Telecom

The example in Figure 1 represents a typical *Flatpack2 PS* system for power supply of telecom equipment. The system is fed from an external AC mains supply, and consists of rectifiers in power shelves, a controller and DC distribution unit. Battery banks, LVD contactors, etc. are typically also a part of the system. The system controller monitors the whole system, and serves as the local user interface. You can configure the system from a standard web browser, or installing the *PowerSuite* application in a computer.

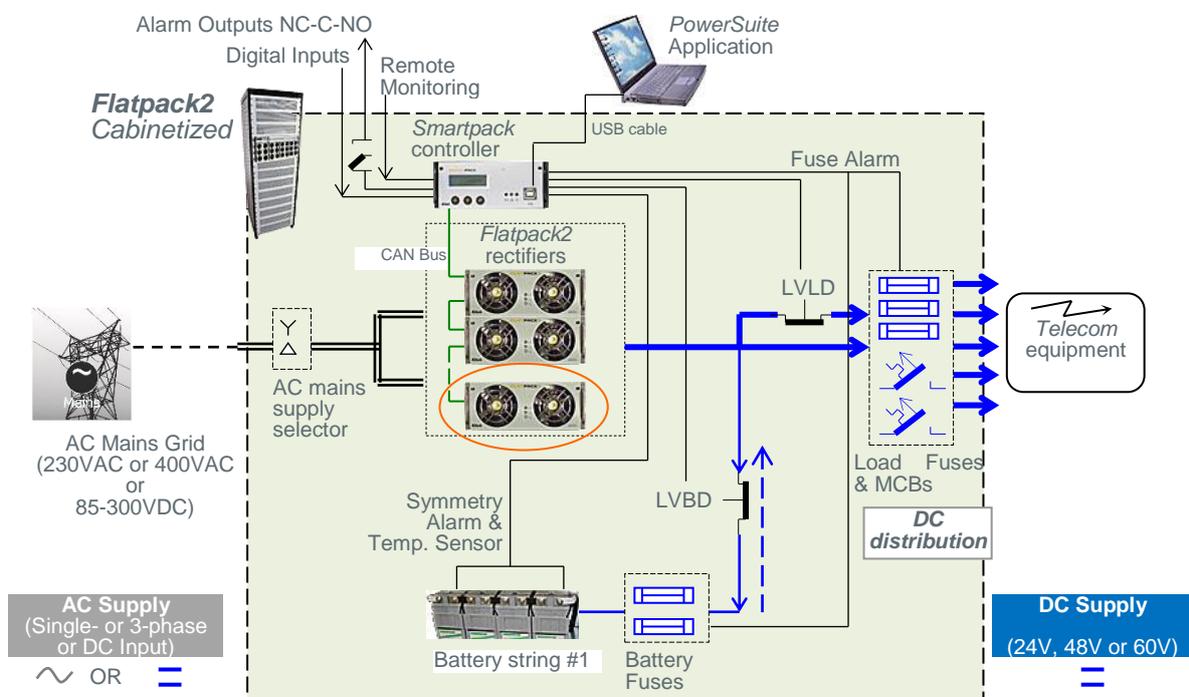


Figure 1 Typical Flatpack2 PS system for DC power supply of telecom equipment

Flatpack2 PS System ~ Hybrid Solar

The example in Figure 2 represents a typical hybrid, solar *Flatpack2* PS system for power supply of telecom and industrial equipment.

The system is fed from strings of solar panels (DC feed), and uses a diesel generator as AC feed backup at night and during cloudy days, thus ensuring extra battery charging. Extra AC feed backup can also be supplied by wind turbines or from the Mains grid.

The hybrid, solar system consists of paralleled solar chargers and rectifiers in power shelves, *Smartpack2*-based system controllers and DC distribution unit. Battery banks, LVD contactors, etc. are typically also a part of the system.

The *Smartpack2 Master* controller serves as the local user interface, while the *Smartpack2 Basic* controller monitors the system's internal wiring. The *I/O Monitor2 CAN* node provides the system with input monitoring and output controlling signals.

You can configure the system from a standard web browser, using the controller's web-based interface (CWUI), or installing the *PowerSuite* application in a computer.

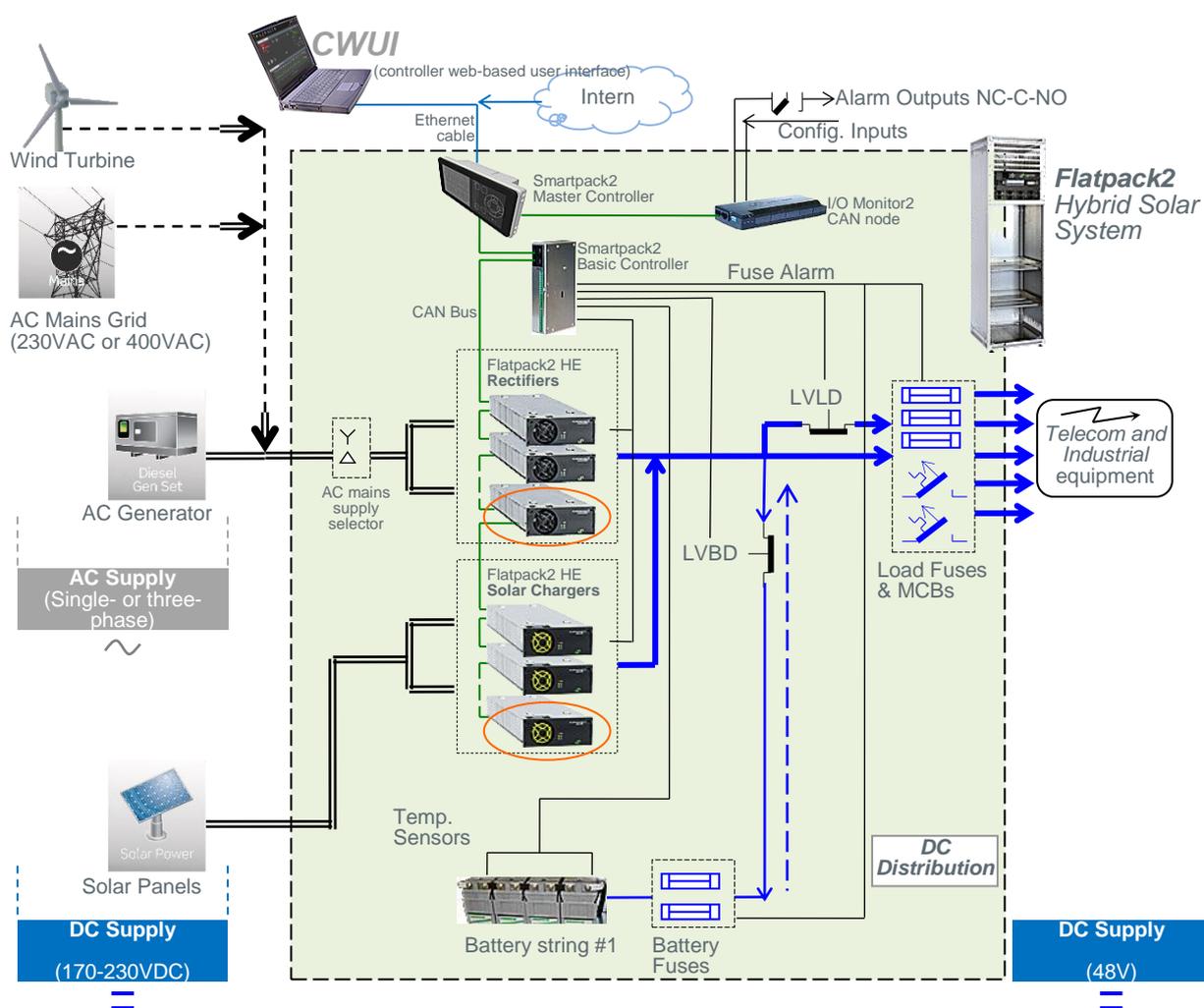


Figure 2 Typical hybrid, solar Flatpack2 PS system for DC power supply of telecom or industrial equipment

Flatpack2 PS System ~ Industrial

The example in Figure 3 represents a typical *Flatpack2* PS system for power supply of industrial equipment, in all areas of the industry, power generation and distribution.

The system is fed from an external AC mains supply, and consists of rectifiers in power shelves, a system controller and DC distribution unit. Battery banks, LVD contactors, etc. are typically also a part of the system.

The system controller monitors the whole system, and serves as the local user interface. You can configure the system from computer, installing the *MMT* application.

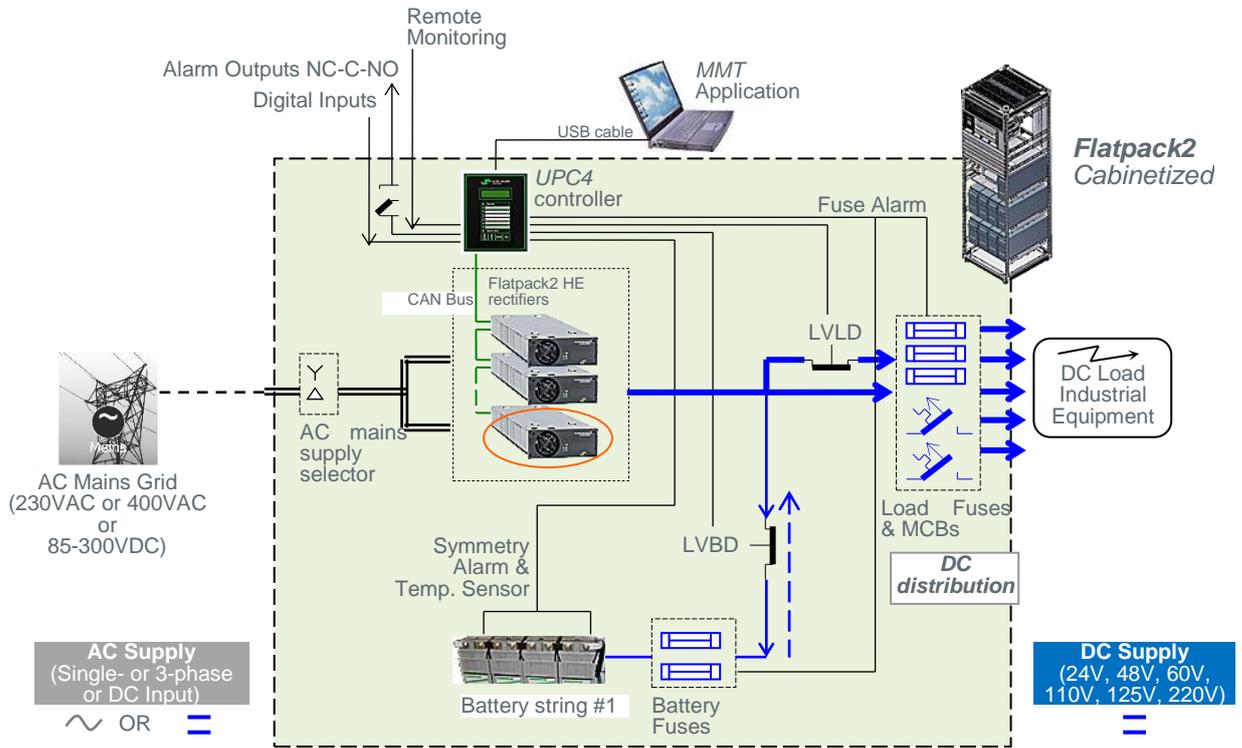


Figure 3 Typical Flatpack2 PS system for DC power supply of industrial equipment

2.Flatpack2 Rectifier & Converter Modules

The *Flatpack2* module is a hot-pluggable, digitally controlled switch mode power supply. The module is designed for battery charging and supplying of high quality power to telecom, industrial, solar hybrid equipment and similar applications.

The module works in stand-alone mode or in parallel with other modules, then communicating via CAN bus with the system's main controller and other connected modules. *Flatpack2* power systems are implemented by mounting the rectifiers in 23" or 19" power shelves (4 modules across).

A wide range of features are implemented in the *Flatpack2* module, as mentioned below.

Key Features

- ✓ **Highest efficiency in minimum space**
Resonant topology makes the module efficiency industry leading, and contributes to the module's ultra compact dimensions.
Specially, the Flatpack2 HE module stands out with 96.5% efficiency.
- ✓ **Digital controllers**
Primary and secondary controls are digitalized, enabling excellent monitoring and control characteristics. Also, the number of components has been reduced by 40% compared to previous module generation - for highly reliable, long life, trouble free power systems.
- ✓ **Heat management**
Front-to-back and back-to-front air flow modules, with chassis-integrated heat sinks, gives the module the most suitable working environment and no limitations in the scalability of the desired system solution.
- ✓ **CAN bus networked**
The *Flatpack2* module is connected in a CAN bus network for communication with the controller and other modules.
- ✓ **Unique connection**
A true plug-and-play connection system: reducing time-to-install related cost.
- ✓ **Global approvals**
Flatpack2 is CE marked, UL recognized and NEBS certified for worldwide installation

Flatpack2 HE module



Flatpack2 rectifier



Typical Applications

Wireless, fiber and fixed line communication

Today's communications demand state-of-the-art, cost efficient and compact power systems. *Flatpack2* modules deliver industry leading power density and superb reliability at lowest lifetime cost.

Broadband and network access

Increasing network speed demands flexible and expandable power solutions. The *Flatpack2* module is your key building block for future needs.

Industrial and Solar Hybrid sites

Also appropriate for power supply facilities with or without battery in all areas of industry, power generation and power distribution. The solar charger option is suitable for any telecom site with autonomous (solar only) or hybrid solar power.

Module Options

The *Flatpack2* modules are available in various options, offering different performance and characteristics. Modules used in industrial applications are always keyed  at factory. Read also chapter “Keying Scheme ~ Modules and Power Shelves”, page 19.

Flatpack2 Module Options ~ Overview			
AC/DC Rectifiers — Output Voltage Lower than 60VDC			
241115.205	Flatpack2 Rectifier 24V, 1800W HE		Page 11
241115.200	Flatpack2 Rectifier 24V, 2000W		Page 11
241115.250	Flatpack2 Rectifier 24V, 2000W WOR		Page 11
241115.001	Flatpack2 Rectifier 48V, 1800W		Page 11
241115.100	Flatpack2 Rectifier 48V, 2000W		Page 11
241115.105	Flatpack2 Rectifier 48V, 2000W HE		Page 11
241119.903	Flatpack2 Rectifier 48V, 3000W		Page 12
241119.105	Flatpack2 Rectifier 48V, 3000W HE		Page 12
241115.705	Flatpack2 Rectifier 48-60V, 2000W HE		Page 12
241115.110	Flatpack2 Rectifier 48V, 2000W, BF		Page 13
241115.115	Flatpack2 Rectifier 48V, 2000W HE, BF		Page 13
AC/DC Rectifiers — Output Voltage Higher than 60VDC			
241115.805	Flatpack2 Rectifier 110VDC, 2000W HE WOR - (Industrial)		Page 14
241115.805B	Flatpack2 Rectifier 110-125VDC, 10A HE - (Industrial)		Page 14
241119.805	Flatpack2 Rectifier 110-125VDC, 20A HE - (Industrial)		Page 14
241115.815	Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial)		Page 15
241115.815B	Flatpack2 Rectifier 220VDC, 5A HE - (Industrial)		Page 15
241119.815	Flatpack2 Rectifier 220VDC, 10A HE - (Industrial)		Page 15
241119.825	Flatpack2 Rectifier 380VDC, 2500W HE - (Data Centres)		Page 16
DC/DC Converters			
241115.600	Flatpack2 DC/DC Converter 1350W, 18-75VDC, 24VDC		Page 16
241115.602	Flatpack2 DC/DC Converter 1350W, 18-75VDC, 48VDC		Page 16
DC/DC Solar Chargers			
241115.660	Flatpack2 Solar Charger 24V, 1500W HE – (Solar)		Page 17
241115.650	Flatpack2 Solar Charger 48V, 1500W HE – (Solar)		Page 17
241119.650	Flatpack2 DC/DC Converter 3200 HE – (Solar)		Page 17



CAUTION:

Never install *Flatpack2* modules in power shelves with **different output voltage than the module's**. The module's output voltage and the power system's output voltage must always be the same.

A **keyed power shelf** will only allow modules that are keyed () for this specific shelf, to be plugged in the shelf.

Heat Management ~ FB or BF Air Flow

The *Flatpack2* module options are always to be installed in power systems designed for Front-to-Back Air Flow heat management, except for modules specified for Back-to-Front Air Flow, e.g. parts 241115.110 and 241115.115, refer to page 13.



CAUTION:

Do **not install** modules with **Back-to-Front heat management** in power systems designed for Front-to-Back heat management, or vice versa; otherwise the product guaranty becomes invalidated.

Rectifiers — Output Voltage Lower than 60VDC



Flatpack2 Rectifier 24V, 1800W HE

Part number 241115.205. For description, refer to chapter "Flatpack2 Rectifier 48V, 2000W HE", page 11. For technical data, read chapter "Specifications Flatpack2 Rectifier 24V, 1800W HE", page 23.

Flatpack2 Rectifier 24V, 2000W

Part number 241115.200. Refer to chapter "Specifications Flatpack2 Rectifier 24V, 2000W", page 24.

Flatpack2 Rectifier 24V, 2000W WOR

Part number 241115.250. This rectifier's Wide Output voltage Range is optimized for charging any type of batteries.

Refer to chapter "Specifications Flatpack2 Rectifier 24V, 2000W WOR" on page 25.

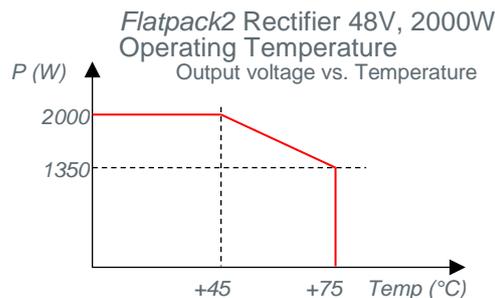


Flatpack2 Rectifier 48V, 1800W

Part number 241115.001. Refer to chapter "Specifications Flatpack2 Rectifier 48V, 1800W" on page 26

Flatpack2 Rectifier 48V, 2000W

Part number 241115.100. Refer to chapter "Specifications Flatpack2 Rectifier 48V, 2000W" on page 27



Flatpack2 Rectifier 48V, 2000W HE

Part number 241115.105. The combination of innovative design, efficiency and reliability makes the Flatpack2 HE rectifier stand out. With an efficiency of up to 96.5%, the losses have been reduced by 50% compared to the current industry standard.

Also, the Flatpack2 HE rectifier has an extremely high efficiency at low load, which historically has been a drawback with most modern soft switching technologies.

Refer to chapter "Specifications Flatpack2 Rectifier 48V, 2000W HE" on page 28.

Flatpack2 Rectifier 48V, 3000W



Part number 241119.903. Flatpack2 power systems using these modules are implemented by mounting the rectifiers in dedicated High Current racks (4AC-HC-3kW Power Shelves, Part 222058).

Refer to chapter "Specifications Flatpack2 Rectifier 48V, 3000W" on page 29.



CAUTION: Do not install 3kW rectifiers in power systems implemented with 2kW power racks (4AC Power Shelves or 2AC Power Shelves); otherwise the product guaranty becomes invalidated.

We recommend to use the more effective Flatpack2 48V, 3kW rectifier, part 241119.903 instead of 241119.100.

Flatpack2 Rectifier 48V, 3000W HE



Part number 241119.105. Flatpack2 power systems using these modules are implemented by mounting the rectifiers in dedicated High Current racks (4AC-HC-3kW Power Shelves, Part 222058) or in High Current & Voltage racks (4AC-HC-HVDC Power Shelves, Part 268035).

Refer to chapters "Flatpack2 Rectifier 48V, 2000W HE", page 11, for the High Efficiency feature, and to "Specifications Flatpack2 Rectifier 48V, 3000W HE", page 30.



CAUTION: Do not install 3kW rectifiers in power systems implemented with 2kW power racks (4AC Power Shelves or 2AC Power Shelves); otherwise the product guaranty becomes invalidated.

Flatpack2 Rectifier 48-60V, 2000W HE



Part number 241115.705. In addition to the High Efficiency feature — refer to chapter "Flatpack2 Rectifier 48V, 2000W HE", page 11 — the rectifier's Wide DC Output Range (WOR) enables support for battery banks of both NiCd and Pb. From the controller, you can configure from 38 to 40 cells in NiCd battery banks, and 24 or 30 cells in Pb battery banks.

The module will detect and auto-adjust its voltage mode at start up.

For technical data, read chapter "Specifications Flatpack2 Rectifier 48-60V, 2000W HE" page 31.

Flatpack2 Rectifier 48V, 2000W BF

This module, part number 241115.110, is always to be installed in power systems designed for Back-to-Front Air Flow heat management.



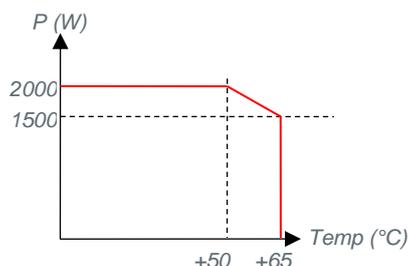
CAUTION:
Do **not** install modules with **Front-to-Back heat management** in power systems designed for Back-to-Front heat management, or vice versa; otherwise the product guaranty becomes invalidated.

The technical specifications for "Flatpack2 Rectifier 48V, 2000W BF" are the same as for "Flatpack2 Rectifier 48V, 2000W", except for their heat management and operating temperatures, which are:

Fan direction icon:
counterclockwise



- "Flatpack2 Rectifier 48V, 2000W"
Heat management: Front-to-Back Air Flow
Operating Temperature: (see page 27)
- "Flatpack2 Rectifier 48V, 2000W BF"
Heat management: Back-to-Front Air Flow
Operating Temperature:
—40 C to +65°C (—40°F to +149°F)



Flatpack2 Rectifier 48V, 2000W BF
Operating Temperature
Output voltage vs. Temperature

For other specifications, refer to chapter "Specifications Flatpack2 Rectifier 48V, 2000W" on page 27

Flatpack2 Rectifier 48V, 2000W HE, BF

This module, part number 241115.115, is always to be installed in power systems designed for Back-to-Front Air Flow heat management.



CAUTION:
Do **not** install rectifiers with **Front-to-Back heat management** in power systems designed for Back-to-Front heat management, or vice versa; otherwise the product guaranty becomes invalidated.

Fan direction icon:
counterclockwise



Refer to chapter "Specifications Flatpack2 Rectifier 48V, 2000W HE, BF" on page 32.

Rectifiers — Output Voltage Higher than 60VDC

Flatpack2 Rectifier 110VDC, 2000W HE WOR - (Industrial)



Part number 241115.805. High efficiency rectifier for power supply facilities with or without battery in all areas of industry, power generation and power distribution.

With efficiency up to 94.4%, the losses have been reduced by 50% compared to the current industry standard.

The HE rectifier also has an extremely high efficiency at low load, which historically has been a drawback with most modern soft switching technologies.

The wide DC output range (WOR) can be used in both 110VDC and 125VDC systems, and is suitable for charging both NiCd and lead acid battery banks. For NiCd battery banks the any number cells from 84 to 105 are fully supported.

The rectifiers are to be mounted in dedicated High Current & Voltage racks (4AC-HC-HVDC Power Shelves, Part 268035).

For technical data, read chapter "Specifications Flatpack2 Rectifier 110VDC, 2000W HE WOR - (Industrial)", page 33.

Flatpack2 Rectifier 110-125VDC, 10A HE - (Industrial)

Part number 241115.805B. This module is similar to the 241115.805, except that it implements a 10A constant current limitation. See "Figure 4", page 14.

For description, refer to chapter "Flatpack2 Rectifier 110VDC, 2000W HE WOR - (Industrial)", page 14.

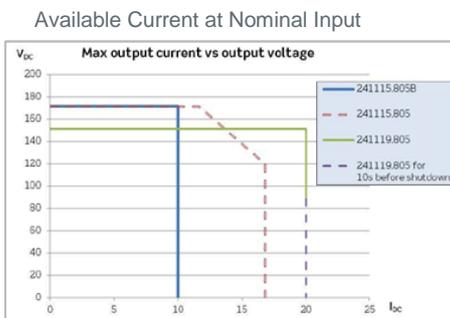


Figure 4 Output I/V diagram for 24111x.805

Flatpack2 Rectifier 110-120VDC, 20A HE - (Industrial)

Part number 241119.805. This module is similar to the 241115.805, except that it implements a 20A constant current limitation. See "Figure 4", page 14.

For description, refer to chapter "Flatpack2 Rectifier 110VDC, 2000W HE WOR - (Industrial)", page 14.



Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial)

Part number 241115.815. High efficiency rectifier for power supply facilities with or without battery in all areas of industry, power generation and power distribution.

With efficiency up to 95.3%, the losses have been reduced by 50% compared to the current industry standard.

The HE rectifier also has an extremely high efficiency at low load, which historically has been a drawback with most modern soft switching technologies.

The wide DC output range (WOR) is suitable for charging both NiCd and lead acid battery banks. For NiCd battery banks the any number cells from 170 to 180 are fully supported.

The rectifiers are to be mounted in dedicated High Current & Voltage racks (4AC-HC-HVDC Power Shelves, Part 268035).

For technical data, read chapter "*Specifications Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial)*", page 34.

Flatpack2 Rectifier 220VDC, 5A HE - (Industrial)

Part number 241115.815B. This module is similar to the 241115.815, except that it implements a 5A constant current limitation.

For description, refer to chapter "*Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial)*", page 15. For technical data, read chapter "*Specifications Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial)*", page 34.

Flatpack2 Rectifier 220VDC, 10A HE - (Industrial)

Part number 241119.815. This module is similar to the 241115.815, except that it implements a 10A constant current limitation.

For description, refer to chapter "*Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial)*", page 15. For technical data, read chapter "*Specifications Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial)*", page 34.

Flatpack2 Rectifier 380VDC, 2500W HE - (Data Centres)

Part number 241119.825. High efficiency rectifier for High Voltage power supply facilities in data centres, central offices, HVDC UPS, etc.



This module enables implementing large systems of up to 2.4MW, e.g. stacking 48 rectifier cabinets controlled by a single *Smartpack2* control system.

For technical data, read chapter "Specifications Flatpack2 Rectifier 380VDC, 2500W HE - (Data Centres)", page 35.

DC/DC Converters

Flatpack2 DC/DC Converter 1350W, 18-75VDC, 24VDC

Part number 241115.600. This flexible, wide input (18-75VDC) DC/DC converter may be integrated in telecom and industrial applications to supply 24VDC loads.

Large 2kW-1MW *Flatpack2* power systems can also be implemented using the DC/DC converters together with *Flatpack2* AC/DC rectifiers to supply galvanic isolated multi-voltage loads. The system's galvanic isolated CAN buses enable monitoring and controlling the converters and rectifiers from the same main controller.



For technical data, read chapter "Specifications *Flatpack2* DC/DC Converter 1350W, 18-75VDC, 24VDC and 48VDC", page 36.

Flatpack2 DC/DC Converter 1350W, 18-75VDC, 48VDC

Part number 241115.602. This flexible, wide input (18-75VDC) DC/DC converter may be integrated in telecom and industrial applications to supply 48VDC loads, otherwise is similar to "*Flatpack2* DC/DC Converter 1350W, 18-75VDC, 24VDC".

For technical data, read chapter "Specifications *Flatpack2* DC/DC Converter 1350W, 18-75VDC, 24VDC and 48VDC", page 36.

DC/DC Solar Chargers

Flatpack2 Solar Charger 24/1500 HE Solar

Part number 241115.660. This galvanic isolated solar charger may be integrated in green telecom applications to supply 24VDC loads, otherwise is similar to "Flatpack2 Solar Charger 48/1500 HE Solar", page 17.

For technical data, read chapter "Specifications Flatpack2 Solar Charger 24/1500 HE Solar", page 37.

Flatpack2 Solar Charger 48/1500 HE Solar

Part number 241115.650. With the Maximum Peak Power Tracking (MPPT) algorithm ensuring close to 100% panel utilization and efficiency up to 96.5%, the galvanic isolated solar charger sets new standards for renewable power in totally green telecom sites.

The charger uses a digitalized advanced control algorithm that finds the solar panel voltage that generates the maximum power independent of sun availability. The charging is continuous according to performance profile for panels. In addition to finding the profiles peak power a full scan is performed at a fixed interval to stay on peak even with panel failures and major shadings. This gives close to 100% panel utilization.

The *Flatpack2* HE SOLAR charger is suitable for any telecom site with autonomous (solar only) or hybrid solar power.

It can be used in parallel with any other *Flatpack2* rectifiers (front-to-back air flow systems only) fed by generator or unreliable mains, on hybrid sites.

Solar chargers must be mounted in dedicated solar power shelves with correct DC input feeding, see Figure 2, page 7.

Refer to chapter "Specifications Flatpack2 Solar Charger 48/1500 HE Solar" on page 38.

Flatpack2 Solar Charger 48/3200 HE Solar

Part number 241119.650. With the Maximum Peak Power Tracking (MPPT) algorithm ensuring close to 100% panel utilization and efficiency upto 97%, the galvanic isolated solar charger sets new standards for renewable power in totally green telecom sites.

It can be used in parallel with any other Flatpack2 rectifier fed by generator or unreliable mains, on hybrid sites.

Refer to chapter "Specifications Flatpack2 Solar Charger 48V 3200W HE - (Solar)" on page 39.



3. Installation of Flatpack2 Modules

Safety Precautions

Get acquainted with the safety precautions on page 2, before installing or handling the equipment.



CAUTION: Double Pole / Neutral Fusing. There is a Mains fuse in each line.

Mounting and Removing Modules

The Flatpack2 modules incorporate handles that serve both to lock the modules into position and to pull them out of their housings.



CAUTION: The modules may be warm, but **do not hand-carry** them by their handles. **Open the handles before inserting** them into the power shelves (hot-pluggable).

Mount **blind panels** in unused module locations.



Electric Shock

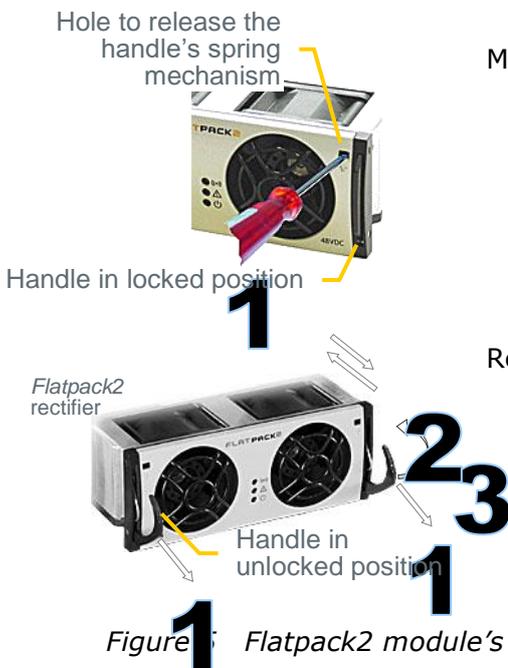


Figure 1 Flatpack2 module's locking mechanism

Mounting the Flatpack2 module (hot-pluggable)

1. **Open the handles**
(insert a screwdriver into the holes to release the spring mechanism)
2. **Insert the module** fully into the power shelf
3. **Lock the handles**
(push the handles up into their housings (locked position), so that the module is securely locked)

Removing the Flatpack2 module

1. **Open the handles**
(insert a screwdriver into the holes to release the spring mechanism)
2. **Remove the module**
(use both handles to pull the module loose from the connector; support from underneath)



CAUTION: Do not relocate **already hot-plugged modules** to other positions in the power shelf. New Flatpack2 modules must be hot-plugged in the power shelf, one at a time, starting with position 1, 2, 3 and so on. This is usually performed before shipment of the system. Read your system's quick start guide for more information.

WARNING: To replace installed modules with new ones, remove the installed modules and wait for the controller to notify communication error with the extracted modules. Push the new modules firmly inwards — one module at a time, allowing a 2s delay — to plug them in the power shelf. Start with the shelf position with lowest ID number. Lock their handles.

Removing Blind Panels

Release the panel's upper left and right corners by inserting a small screwdriver into the panel's upper left gap, and carefully press down and out to release the locking tabs. Repeat on the upper right gap. Refer to the Flatpack2 system's quick start guide for more information.

Keying Scheme ~ Modules and Power Shelves

Eltek rectifier and converter modules are available in a vast range of output voltages, and all the rectifiers may be physically inserted in the same rectifier power shelf and all converters in the same converter power shelf.

A **keying scheme** is designed to achieve that a specific module is only plugged into a suitable power shelf, thus avoiding damaging the module and the power system.

The keying scheme is based in **inserting one or several keys** (or small pieces of plastic) in the slots (position 1-6) located both on the module's chassis and on the power shelf's chassis.

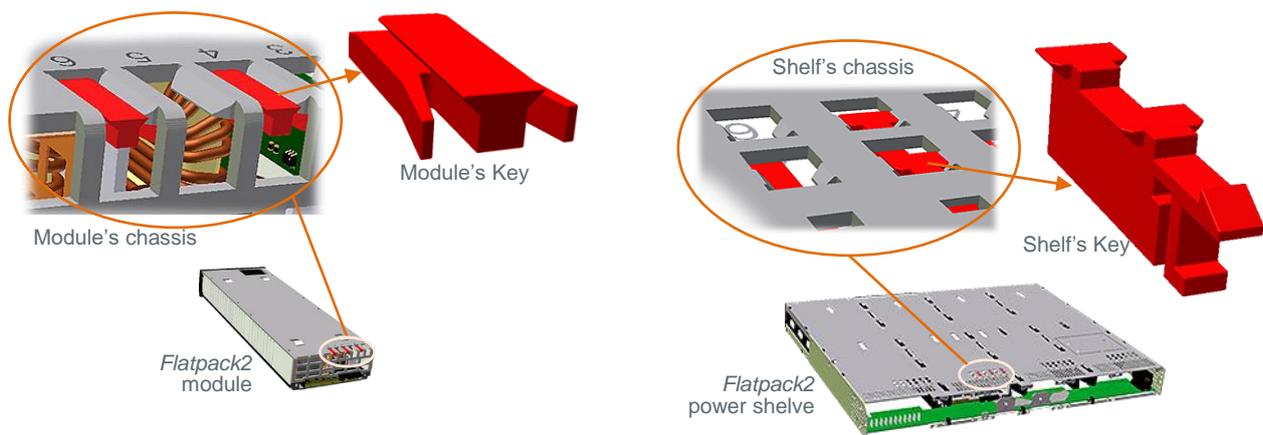


Figure 6 Keying scheme for Flatpack2 modules and power shelves (keys are black)

When a module and a power shelf have a key inserted in the same position, the module will not plug into the shelf.

A slot with inserted key may be indicated with "1", and an empty slot with "0".

For example, a power shelf suitable for 24V *Flatpack2* solar chargers will be shipped from factory keyed as <110 001>. Then, only modules keyed as <001 110> can be plugged into the shelf, e.g. the *Flatpack2 24/1500 HE Solar Chargers*.

In general, modules and power shelves for industrial applications are always keyed at factory. When required, *Eltek* will also ship keyed modules and power shelves for telecom applications.

NOTICE:

A **keyed power shelf** will ONLY allow modules keyed for the specific shelf to be plugged in the shelf.
A **non-keyed power shelf** will allow both keyed and non-keyed modules to be plugged in the shelf.



CAUTION:

Never install *Flatpack2* modules in power shelves with **different output voltage than the module's**. The module's output voltage and the power system's output voltage must always be the same.

Connections

All connections are implemented by inserting the *Flatpack2* module fully into the power shelf, thus plugging the module to the shelf's back wiring card (hot-pluggable).

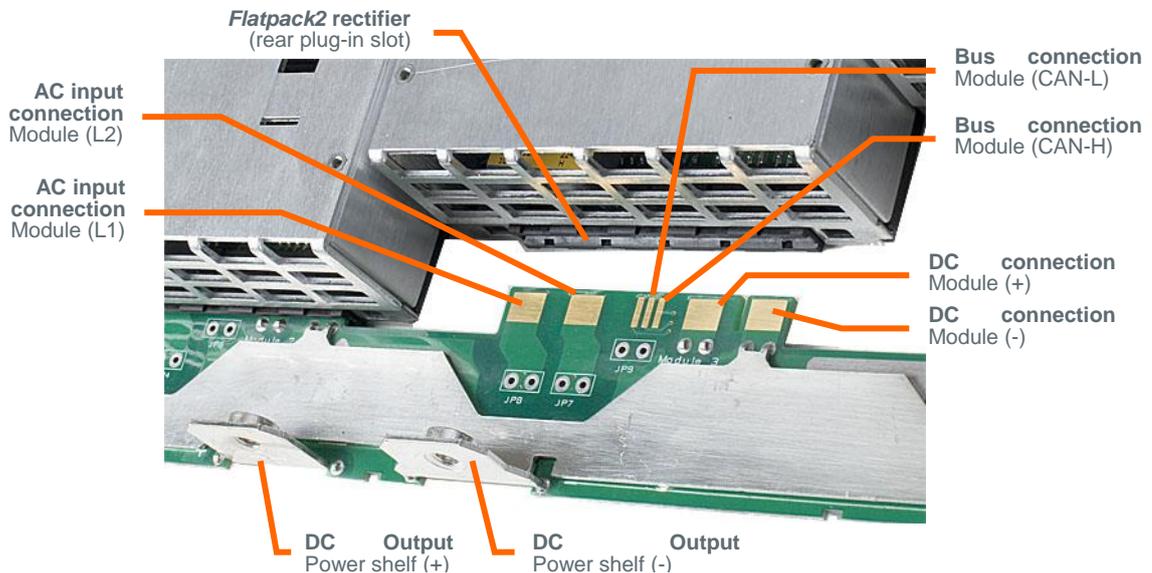


Figure 7 *Flatpack2* module's rear plug-in connections to power shelf's back wiring card

For details about other power shelf signals, type of power shelf, etc., please read the system's generic and specific documentation, or contact your dealer or Eltek representative.

Notice:

The AC Input Connections are not polarity sensitive, even when the system uses DC input feed instead of AC input feed. Solar chargers do not have AC input connection. Solar chargers are designed to be used in Eltek designed system. Ventilation, spacings/clearance around the chargers have been factored.

CAN Bus Addressing (plug-and-play)

When a *Flatpack2* module is hot-plugged in the power shelf the first time, the system's main controller automatically assigns the module with the next available ID number (CAN bus address). The module will retain its ID (and serial number), even after removing and reinserting it in the power shelf.

The modules' IDs are assigned from 1 and upwards. When a module is plugged in, the system's main controller automatically increases the number of communicating modules in the CAN network.

Correct Rectifier Position in Power Shelves

Flatpack2 power systems are usually shipped from factory with the rectifier modules already installed in the correct position in the power shelves, with respect to their CAN bus address or ID number.

This relationship is very important for the correct monitoring of the mains three phases, as the system's main controller always uses rectifier ID 01, 02 and 03 to monitor mains phase L1, L2 and L3 respectively. If these rectifiers malfunction, rectifier ID 04, 05 and 06 will automatically take over.

For example: accidentally inserting a rectifier with ID 02 in a power shelf position internally connected to mains phase L1, will cause the controller to monitor L1 “thinking” it monitors L2.

Firmware Upgrade of the Rectifier Modules

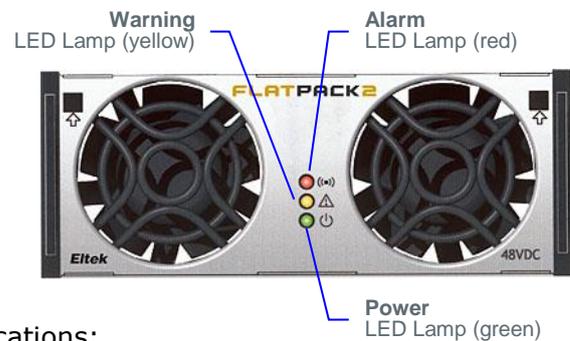
Please, contact Eltek Service Dep. if you need to upgrade the modules’ firmware.

4. Operation

The *Flatpack2* Rectifier Module is designed for parallel operation in a system. The front panel LEDs provides information about the module status and CAN bus activity.

Front Panel Interface

Figure 8 Example of a *Flatpack2* module's front panel



The *Flatpack2* module has the following LED indications:

- "Power" (green) indicates that the power supply is OFF, ON and communicating
- "Alarm" (red) indicates an alarm situation
- "Warning" (yellow) indicates an abnormal situation

LED Indicators

The following events will activate the *Flatpack2* module's front LEDs:

LED	Status	Description
Power (green)	ON	Module is powered
	Flashing	System controller accessing information on the module
	OFF	Mains are unavailable
Warning (yellow)	ON	<ul style="list-style-type: none"> ▪ Module is in Derating Mode (reduced output power) due to high internal temperature, or low input voltage, or fan failure ▪ The remote Battery Current Limit is activated ▪ AC input voltage is out of range ▪ Module in stand-alone mode (or loss of communication with the system's main controller)
		Flashing
	OFF	No abnormal situation is present
Alarm (red)	ON	<ul style="list-style-type: none"> ▪ Module is in Shut-down Mode due to low mains, or high internal temperature, or high output voltage ▪ Internal module failure (malfunction) ▪ Fan failure (single or double fan malfunction) ▪ Low output voltage ▪ CAN bus failure
		OFF

No regular maintenance is required for the *Flatpack2* modules.

Refer also to chapter "Technical Specifications", page 23.

5. Technical Specifications

Specifications Flatpack2 Rectifier 24V, 1800W HE

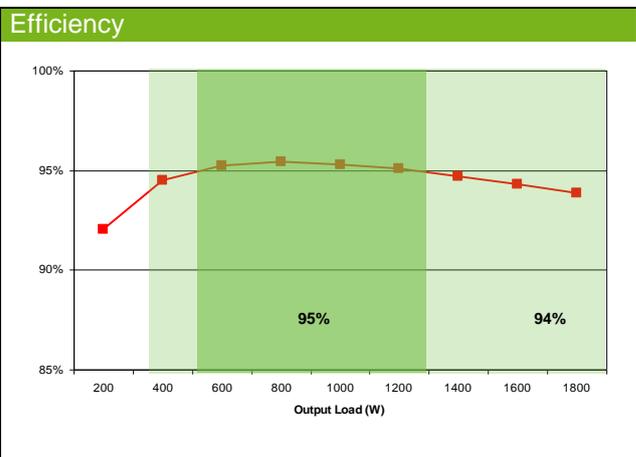
AC Input	
Voltage	85-300 VAC (Nominal 176 – 275 VAC)
Frequency	45 to 66Hz
Maximum Current	11.25 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Mains fuse in both lines ○ Disconnect above 300 VAC

DC Output	
Voltage	26.7 VDC (adj. range: 21.7-28.8 VDC)
Output Power	1800 W at nominal input
Maximum Current	75 Amps at 24 VDC and nominal input
Current Sharing	±5% of maximum current from 10 to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 21 VDC at 1000W load
Ripple and Noise	<ul style="list-style-type: none"> ○ < 250 mV peak to peak, 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Short circuit proof ○ High temperature protection

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2 ETSI EN 300 132-2 Telcordia NEBS GR63 CORE Zone 4 RoHS compliant

Specifications are subject to change without notice 241115.105.DS3 – v6

Other Specifications	
Efficiency	>95% at 30-70% load
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth 0.5 KVDC – output earth
Alarms:	<ul style="list-style-type: none"> ○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm at 21.5V ○ CAN bus failure
Warnings:	<ul style="list-style-type: none"> ○ Low temperature shutdown ○ Rectifier in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at overvoltage ○ Loss of CAN communication with control unit, stand alone mode
Visual indications	<ul style="list-style-type: none"> ○ Green LED: ON, no faults ○ Red LED: rectifier failure ○ Yellow LED : rectifier warning
Operating temp	-40 to +75°C (-40 to +167°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	Fan (front to back airflow)
Fan Speed	Temperature and current regulated
MTBF	> 300, 000 hours Telcordia SR-332 Issue 1, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	< 40dBA at nominal input and full load (T _{ambient} < 25°C) < 58dBA at nominal input and full load (T _{ambient} > 40°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.950 kg (4.3lbs)



241115.205.DS3 – v2

Specifications Flatpack2 Rectifier 24V, 2000W

AC Input	
Voltage	85-290 VAC (Nominal 176 – 275 VAC)
Frequency	44 to 66Hz
Maximum Current	13.0 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Mains fuse in both lines ○ Disconnect above 290 VAC

DC Output	
Voltage	26.7 VDC (adj. range: 21.0-29.0 VDC)
Output Power	<ul style="list-style-type: none"> ○ 2000 W at nominal input ○ 1800 W at nominal input above 28.0 VDC
Maximum Current	84.0 Amps at 24 VDC and nominal input
Current Sharing	±5% of maximum current from 10% to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 21 VDC at 1000W load
Ripple and Noise	< 100 mV peak to peak, 30 MHz bandwidth < 0.96 mV rms psophometric
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Blocking diode ○ Short circuit proof ○ High temperature protection

Other Specifications	
Efficiency	Typical 89%
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth 0.5 KVDC – output earth
Alarms:	<ul style="list-style-type: none"> ○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure, one or two fans. ○ Low voltage alarm at 21.0V ○ CAN bus failure
Warnings:	<ul style="list-style-type: none"> ○ Low temperature shutdown ○ Rectifier in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at overvoltage ○ Loss of CAN communication with control unit, stand alone mode
Operating temp	-40 to +75°C (-40 to +167°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	2 fans (front to back airflow)
Fan Speed	Temperature and load regulated
MTBF	> 240, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	< 65dBA at nominal input and 70% load (T _{ambient} < 30°C)
Humidity	<ul style="list-style-type: none"> ○ Operating: 5% to 95% RH non-condensing ○ Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.9 kg (3.97 lbs)

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 (telecommunication network) EN 61000-6-4 (emission, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-1 (immunity, light industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2 ETSI EN 300 132-2 Telcordia NEBS GR63 CORE Zone 4 RoHS compliant

Specifications are subject to change without notice

241115.200.DS3 v2

Specifications Flatpack2 Rectifier 24V, 2000W WOR

AC Input	
Voltage	85-300 VAC (Nominal 185 – 275 VAC)
Frequency	44 to 66Hz
Maximum Current	12.5 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
Input Protection	Varistors for transient protection Mains fuse in both lines Disconnect above 300 VAC

DC Output	
Voltage	Adjustable range: 21.5-36.0VDC Default voltage: 26.7 VDC
Output Power	2000 W at nominal input
Maximum Current	70.0 Amps at 29 VDC and nominal input
Current Sharing	±5% of maximum current from 10% to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 21.5 VDC at 1500W load
Ripple and Noise	< 100 mV peak to peak, 30 MHz bandwidth < 0.96 mV rms psophometric
Output Protection	Overvoltage shutdown Fuse on output Short circuit proof High temperature protection

Other Specifications	
Efficiency	Typical 91%
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth 0.5 KVDC – output earth
Alarms:	Low mains shutdown High temperature shutdown Rectifier Failure Overvoltage shutdown on output Fan failure, one or two fans. Low voltage alarm at 21.0V CAN bus failure
Warnings:	Low temperature shutdown Rectifier in power derate mode Remote battery current limit activated Input voltage out of range, flashing at overvoltage Loss of CAN communication with control unit, stand alone mode
Visual indications	Green LED: ON, no faults Red LED: rectifier failure Yellow LED : rectifier warning
Operating temp	-40 to +75°C (-40 to +167°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	2 fans (front to back airflow)
Fan Speed	Temperature and load regulated
MTBF	> 200, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	< 65dBA at nominal input and 70% load (T _{ambient} < 30°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.9 kg (3.97 lbs)

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 (telecommunication network) EN 61000-6-4 (emission, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-1 (immunity, light industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2 ETSI EN 300 132-2 Telcordia NEBS GR63 CORE Zone 4 RoHS compliant

Specifications are subject to change without notice

241115.250.DS3 v3

Specifications Flatpack2 Rectifier 48V, 1800W

AC Input	
Voltage	85-300 VAC (Nominal 185 – 275 VAC)
Frequency	45 to 66Hz
Maximum Current	10.7 Arms maximum at nominal input and full load
Power Factor	> 0.99 at 20% load or more
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Mains fuse in both lines ○ Disconnect above 300 VAC

DC Output	
Voltage	53.5 VDC (adj. range: 43.5-57.6 VDC)
Output Power	1800 W at nominal input
Maximum Current	37.5 Amps at 48 VDC and nominal input
Current Sharing	±5% of maximum current from 10% to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 43.5 VDC at 1500W load
Ripple and Noise	<ul style="list-style-type: none"> ○ < 100 mV peak to peak, ○ 30 MHz bandwidth ○ < 0.96 mV rms psophometric
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Blocking diode ○ Short circuit proof ○ High temperature protection

Other Specifications	
Efficiency	Typical 92%, min. 91% at 40-90% load
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth 0.5 KVDC – output earth
Alarms:	<ul style="list-style-type: none"> ○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure, one or two fans. ○ Low voltage alarm at 43.5V ○ CAN bus failure
Warnings:	<ul style="list-style-type: none"> ○ Rectifier in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at overvoltage ○ Loss of CAN communication with control unit, stand alone mode
Visual indications	<ul style="list-style-type: none"> ○ Green LED: ON, no faults ○ Red LED: rectifier failure ○ Yellow LED : rectifier warning
Operating temp	-40 to +70°C (-40 to +158°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	2 fans (front to back airflow)
Fan Speed	Temperature and load regulated
MTBF	> 405, 000 hours Telcordia SR-332 Issue I, method III (a) (Tambient : 25°C)
Acoustic Noise	< 50dBA at nominal input and 70% load (Tambient < 30°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.8 kg (3.97 lbs)

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 (telecommunication network) EN 61000-6-4 (emission, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-1 (immunity, light industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2 ETSI EN 300 132-2 Telcordia NEBS GR63 CORE Zone 4 RoHS compliant

Specifications are subject to change without notice

241115.001.DS3 v8

Specifications Flatpack2 Rectifier 48V, 2000W

AC Input	
AC Voltage	85-300 VAC (Nominal 185 – 275 VAC)
Frequency	45 to 66Hz
Maximum Current	12.5 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
DC Voltage	120-275VDC (Rated 140 – 250VDC)
Input Protection	Varistors for transient protection Mains fuse in both lines Disconnect above 300 VAC

DC Output	
Voltage	53.5VDC (adj. range: 43.5-57.6VDC)
Output Power	2000 W at nominal input
Maximum Current	41.7 Amps at 48 VDC and nominal input
Current Sharing	±5% of maximum current from 10% to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 43.5 VDC at 1500W load
Ripple and Noise	< 100 mV peak to peak, 30 MHz bandwidth < 0.96 mV rms psophometric
Output Protection	Overshoot shutdown Blocking diode Short circuit proof High temperature protection

Other Specifications	
Efficiency	Typical 92%, min. 91% at 40-90% load
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth 0.5 KVDC – output earth
Alarms:	Low mains shutdown High temperature shutdown Rectifier Failure Overshoot shutdown on output Fan failure, one or two fans. Low voltage alarm at 43.5V CAN bus failure
Warnings:	Low temperature shutdown Rectifier in power derate mode Remote battery current limit activated Input voltage out of range, flashing at overshoot Loss of CAN communication with control unit, stand alone mode
Visual indications	Green LED: ON, no faults Red LED: rectifier failure Yellow LED : rectifier warning
Operating temp	-40 to +75°C (-40 to +158°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	2 fans (front to back airflow)
Fan Speed	Temperature and current regulated
MTBF	> 350, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	< 55dBA at nominal input and full load (T _{ambient} < 30°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.9 kg (4.19lbs)

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 (telecommunication network) EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2 (-1, -2, -3) ETSI EN 300 132-2 Telcordia NEBS GR63 CORE Zone 4 RoHS compliant

Specifications are subject to change without notice

241115.100.DS3 – v6

Specifications Flatpack2 Rectifier 48V, 2000W HE

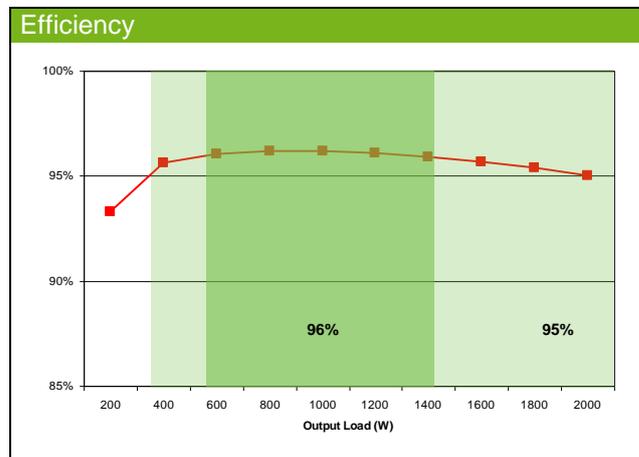
AC Input	
Voltage	85-300 VAC (Nominal 185 – 275 VAC)
Frequency	45 to 66Hz
Maximum Current	11.6 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Mains fuse in both lines ○ Disconnect above 300 VAC

DC Output	
Voltage	53.5 VDC (adj. range: 43.5-57.6 VDC)
Output Power	2000 W at nominal input
Maximum Current	41.7 Amps at 48 VDC and nominal input
Current Sharing	±5% of maximum current from 10 to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 43.5 VDC at 1500W load
Ripple and Noise	<ul style="list-style-type: none"> ○ < 100 mV peak to peak, ○ 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Short circuit proof ○ High temperature protection

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2 ETSI EN 300 132-2 Telcordia NEBS GR63 CORE Zone 4 RoHS compliant

Specifications are subject to change without notice 241115.105.DS3 – v6

Other Specifications	
Efficiency	>96% at 30-70% load
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth 0.5 KVDC – output earth
Alarms:	<ul style="list-style-type: none"> ○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm at 43.5V ○ CAN bus failure
Warnings:	<ul style="list-style-type: none"> ○ Low temperature shutdown ○ Rectifier in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at overvoltage ○ Loss of CAN communication with control unit, stand alone mode
Visual indications	<ul style="list-style-type: none"> ○ Green LED: ON, no faults ○ Red LED: rectifier failure ○ Yellow LED : rectifier warning
Operating temp	-40 to +75°C (-40 to +167°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	Fan (front to back airflow)
Fan Speed	Temperature and current regulated
MTBF	> 350, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	<ul style="list-style-type: none"> < 20dBA at nominal input and full load (T_{ambient} ≤ 25°C) < 56dBA at nominal input and full load (T_{ambient} > 40°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.950 kg (4.3lbs)



241115.105.DS3 – v6

Specifications Flatpack2 Rectifier 48V, 3000W HE

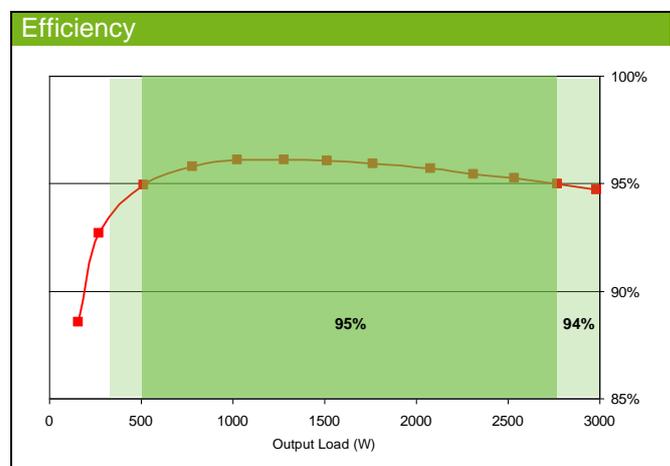
AC Input	
Voltage	85-300 VAC (Nominal 176 – 277 VAC)
Frequency	45 to 66Hz
Maximum Current	19.2 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Mains fuse in both lines ○ Disconnect above 300 VAC

DC Output	
Voltage	53.5 VDC (adj. range: 43.2-57.6 VDC)
Output Power	3000 W within nominal input, linear derating linear to 1380W at 85 VAC
Maximum Current	62.5 Amps at 48 VDC and nominal input
Current Sharing	±5% of maximum current from 10 to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 43.5 VDC at 1500W load
Ripple and Noise	<ul style="list-style-type: none"> ○ < 150 mV peak to peak, ○ 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Fuse ○ Short circuit proof ○ High temperature protection

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.3 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2 ETSI EN 300 132-2 Telcordia NEBS GR63 CORE Zone 4 RoHS compliant

Specifications are subject to change without notice 241115.105.DS3 – v6

Other Specifications	
Efficiency	>95.5% at 25-75% load
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth 0.5 KVDC – output earth
Alarms:	<ul style="list-style-type: none"> ○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm ○ CAN bus failure
Warnings:	<ul style="list-style-type: none"> ○ Low temperature shutdown ○ Rectifier in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at overvoltage ○ Loss of CAN communication with control unit, stand alone mode
Visual indications	<ul style="list-style-type: none"> ○ Green LED: ON, no faults ○ Red LED: rectifier failure ○ Yellow LED : rectifier warning
Operating temp	-40 to +75°C (-40 to +167°F), derating output power linear to 2100W at +75°C
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	Fan (front to back airflow)
Fan Speed	Temperature and output current regulated
MTBF	> 300, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	<ul style="list-style-type: none"> < 40dBA at nominal input and full load (T_{ambient} < 25°C) < 58dBA at nominal input and full load (T_{ambient} > 40°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.950 kg (4.3lbs)



241119.105.DS3 – v2

Specifications Flatpack2 Rectifier 48-60V, 2000W HE

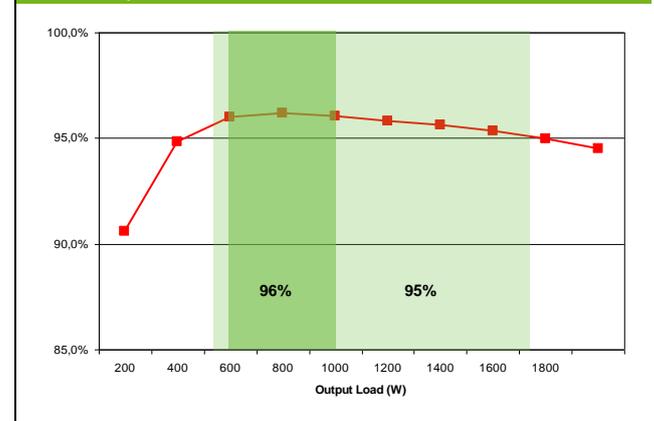
AC Input	
Voltage	85-300 VAC (Nominal 185 – 275 VAC)
Frequency	45 to 66Hz
Maximum Current	11.6 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
THD	< 5 % at nominal input and full load
Input Protection	Varistors for transient protection Mains fuse in both lines Disconnect above 300 VAC

DC Output	
Voltage	Default: 53.5 VDC (48V mode) 67 VDC in (60V mode)
Pb batteries (48V or 60V)	Float/Boost charge: 2.0 – 2.4VDC/cell Standby/Test: 1.75 – 2.0VDC/cell
NiCd batteries (48V)	Float charge: 1.40 – 1.45 VDC/cell Boost charge: 1.45 – 1.70 VDC/cell Standby/Test: 1.05 – 1.2 VDC/cell
No of cells configurable in controller	NiCd: 38 - 40 Pb: 24 or 30
Output Power	<ul style="list-style-type: none"> ○ 2000W at nominal input, derating linear below 185VAC to 850W at 85VAC ○ Constant Power: 48V – 72V ○ Constant Current: 0 – 48V
Maximum Current	41.6 Amps at 48 VDC and nominal input
Current Sharing	±5% of maximum current from 10 to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±4.0% for 10-50% or 50-10% load variation, regulation time < 200ms
Hold up time	> 20ms; output voltage > 53.5 VDC at 1500W load
Ripple and Noise	<ul style="list-style-type: none"> ○ < 150 mV peak to peak, 30 MHz bandwidth ○ < 2 mVrms psophometric
Output Protection	Overvoltage shutdown Hot plug-in Output fuse Short circuit proof High temperature protection

Applicable Standards	
Electrical safety	IEC 60950-1 / UL 60950-1 / CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry)
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2 ETSI EN 300 132-2 RoHS compliant

Other Specifications	
Efficiency	>95% at 30-70% load
Isolation	3.0 KVAC – input - output 1.5 KVAC – input earth 1.0 KVDC – output earth
Alarms:	Low mains shutdown High temperature shutdown Rectifier Failure Overvoltage shutdown on output Fan failure Low voltage alarm CAN bus failure Low temperature shutdown
Warnings:	Rectifier in power derate mode Remote battery current limit activated Input voltage out of range, flashing at overvoltage Loss of CAN communication with control unit, stand alone mode
Visual indications	Green LED: ON, no faults Red LED: rectifier failure Yellow LED : rectifier warning
Operating temp	-40 to +75°C (-40 to +167°F), derating above +45°C (+113°F) to 1350W at +75°C (+167°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	Fan (front to back airflow)
Fan Speed	Temperature and load regulated
MTBF	> 350, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	< 52dBA at nominal input and full load (T _{ambient} ≤ 30°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.950 kg (4.3lbs)

Efficiency



241115.705.DS3 – v2

Specifications are subject to change without notice

When required, find the latest version of the datasheet on www.elftek.com

Specifications Flatpack2 Rectifier 48V, 2000W HE, BF

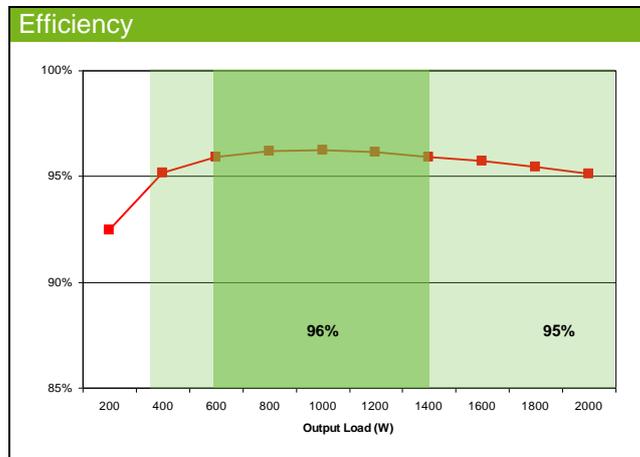
AC Input	
Voltage	85-300 VAC (Nominal 185 – 275 VAC)
Frequency	45 to 66Hz
Maximum Current	11.6 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Mains fuse in both lines ○ Disconnect above 300 VAC

DC Output	
Voltage	53.5 VDC (adj. range: 43.5-57.6 VDC)
Output Power	2000 W at nominal input, derating linear below 185 VAC to 850W at 85 VAC
Maximum Current	41.7 Amps at 48 VDC and nominal input
Current Sharing	±5% of maximum current from 10 to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 43.5 VDC at 1500W load
Ripple and Noise	<ul style="list-style-type: none"> ○ < 250 mV peak to peak, 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Short circuit proof ○ High temperature protection

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2 ETSI EN 300 132-2 Telcordia NEBS GR63 CORE Zone 4 RoHS compliant

Specifications are subject to change without notice 241115.105.DS3 – v6

Other Specifications	
Efficiency	>96% at 35-60% load
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth 0.5 KVDC – output earth
Alarms:	<ul style="list-style-type: none"> ○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm at 43.5V ○ CAN bus failure
Warnings:	<ul style="list-style-type: none"> ○ Low temperature shutdown ○ Rectifier in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at overvoltage ○ Loss of CAN communication with control unit, stand alone mode
Visual indications	<ul style="list-style-type: none"> ○ Green LED: ON, no faults ○ Red LED: rectifier failure ○ Yellow LED : rectifier warning
Operating temp	-40 to +80°C (-40 to +167°F), derating linear above +60°C (+142°F) to 1350W at +80°C (+167°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	Fan (back to front airflow)
Fan Speed	Temperature and current regulated
MTBF	> 350, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	< 45dBA at nominal input and full load (T _{ambient} ≤ 30°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.950 kg (4.3lbs)



241115.115.DS3 – v1

Specifications Flatpack2 Rectifier 110VDC, 2000W HE WOR - (Industrial)

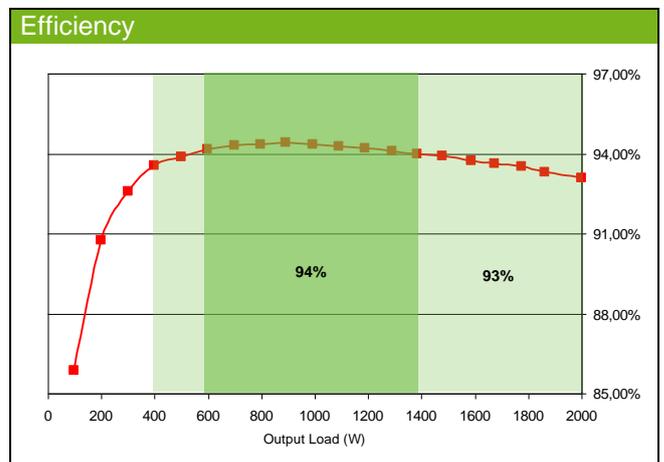
AC Input	
Voltage	85-300 VAC (Nominal 185 – 275 VAC)
Frequency	45 to 66Hz
Maximum Current	11.9 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
THD	< 5 % at nominal input and full load
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Mains fuse in both lines ○ Disconnect above 300 VAC

DC Output (floating)	
Voltage Adjustable	Default: 122.56 VDC (without controller) Range: 89.2-171.6 VDC
NiCd batteries	Float charge: 1.40 – 1.45 VDC/cell Boost charge: 1.45 – 1.70 VDC/cell Standby/Test: 1.05 – 1.2 VDC/cell No of cells configurable in controller Min: 85 / Max: 104
Output Power	2000 W at nominal input, derating linear below 185VAC to 850W at 85VAC Constant Power > 120V > Constant Current
Maximum Current	16.8 Amps at 120 VDC and nominal input
Current Sharing	±5% of maximum current from 10 to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-80% or 80-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 89 VDC at 1500W load
Ripple and Noise	< 500 mV peak to peak, 30 MHz bandwidth
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Hot plug-in ○ OR-ing diode ○ Short circuit proof ○ High temperature protection

Applicable Standards	
Electrical safety	IEC 60950-1 / UL 60950-1 / CSA 22.2
EMC	ETSI EN 300 386 V.1.4.1 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry) EN 61000-6-5 (immunity, power station and substation)
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2 ETSI EN 300 132-2 RoHS compliant

241115.105.DS3 – v6

Other Specifications	
Efficiency	>94% at 30-70% load
Isolation	3.0 KVAC – input to output 1.5 KVAC – input to earth 1.5 KVDC – output to earth 3.0 KVAC – CAN to primary 3.0 KVAC – CAN to secondary
Alarms:	<ul style="list-style-type: none"> ○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm ○ CAN bus failure
Warnings:	<ul style="list-style-type: none"> ○ Low temperature shutdown ○ Rectifier in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at overvoltage ○ Loss of CAN communication with control unit, stand alone mode
Visual indications	<ul style="list-style-type: none"> ○ Green LED: ON, no faults ○ Red LED: rectifier failure ○ Yellow LED : rectifier warning
Operating temp	-40 to +75°C (-40 to +167°F), derating above +55°C (+131°F) to 1350W at +75°C (+167°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	Fan (front to back airflow)
Fan Speed	Temperature and load regulated
MTBF	> 391, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	< 40dBA at nominal input and full load (T _{ambient} ≤ 25°C) < 58dBA at nominal input and full load (T _{ambient} > 40°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.950 kg (4.3lbs)



241115.805.DS3 – v2

Specifications are subject to change without notice

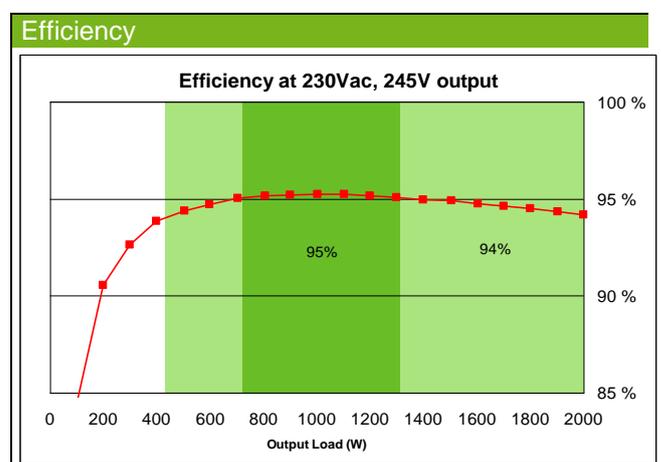
Specifications Flatpack2 Rectifier 220VDC, 2000W HE WOR - (Industrial)

AC Input	
Voltage	85-300 VAC (Nominal 185 – 275 VAC)
Frequency	45 to 66Hz
Maximum Current	11.9 A _{rms} maximum at nominal input and full load
Power Factor	> 0.99 at 50% load or more
THD	< 5 % at nominal input and full load
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Mains fuse in both lines ○ Disconnect above 300 VAC

DC Output (floating)	
Voltage Adjustable	Default: 245.3 VDC (without controller) Range: 178.5-297 VDC
NiCd batteries	Float charge: 1.40 – 1.45 VDC/cell Boost charge: 1.45 – 1.70 VDC/cell Standby/Test: 1.05 – 1.2 VDC/cell No of cells configurable in controller Min: 170 / Max: 180
Output Power	2000 W at nominal input, derating linear below 185VAC to 850W at 85VAC Constant Power > 220V > Constant Current
Maximum Current	9.16 Amps at 220 VDC and nominal input
Current Sharing	±5% of maximum current from 10 to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-80% or 80-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 178 VDC at 1500W load
Ripple and Noise	< 1000 mV peak to peak, 30 MHz bandwidth
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Hot plug-in ○ OR-ing diode ○ Short circuit proof ○ High temperature protection

Other Specifications	
Efficiency	>95% at 35-65% load
Isolation	3.0 KVAC – input to output 1.5 KVAC – input to earth 1.5 KVDC – output to earth 3.0 KVAC – CAN to primary 3.0 KVAC – CAN to secondary
Alarms:	<ul style="list-style-type: none"> ○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm ○ CAN bus failure
Warnings:	<ul style="list-style-type: none"> ○ Low temperature shutdown ○ Rectifier in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at overvoltage ○ Loss of CAN communication with control unit, stand alone mode
Visual indications	<ul style="list-style-type: none"> ○ Green LED: ON, no faults ○ Red LED: rectifier failure ○ Yellow LED : rectifier warning
Operating temp	-40 to +75°C (-40 to +167°F), derating above +55°C (+131°F) to 1350W at +75°C (+167°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	Fan (front to back airflow)
Fan Speed	Temperature and load regulated
MTBF	> 459, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	< 40dBA at nominal input and full load (T _{ambient} ≤ 25°C) < 58dBA at nominal input and full load (T _{ambient} > 40°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.950 kg (4.3lbs)

Applicable Standards	
Electrical safety	IEC 60950-1 /UL 60950-1 / CSA 22.2
EMC	ETSI EN 300 386 V.1.4.1 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry) EN 61000-6-5 (immunity, power station and substation)
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2 ETSI EN 300 132-2 RoHS compliant



241115.105.DS3 – v6

241115.815.DS3 – v2

Specifications are subject to change without notice

Specifications Flatpack2 Rectifier 380VDC, 2500W HE - (Data Centres)

TECHNICAL SPECIFICATIONS	
Model	Flatpack2 380V 2500W HE
Part number	241119.825
INPUT DATA	
Voltage (nominal)	185 - 250 V _{AC} ¹⁾
Voltage (range)	85 - 276 V _{AC} ¹⁾
Frequency	45 - 66 Hz
Current (maximum) @ nominal input, full load	19.2 A _{RMS}
Power Factor	> 0.99 at 50% load or more
Protection	Fuse Disconnect above 276 V _{AC} ¹⁾
OUTPUT DATA	
Voltage (default)	381 V _{DC}
Voltage (adjustable range)	300 - 400 V _{DC}
Power (maximum)	2500 W
Power @ 85 VAC	1110 W
Current (maximum) @ nominal input, full load	7.5 A (@ 336 V _{DC}) / 6.6 A @ 381 V _{DC}
Current sharing (10 - 100% load)	±5% of maximum current from 10 to 100% load
Static Voltage regulation (10 - 100% load)	±0.5%
Dynamic Voltage regulation	±5.0% for 10-50% or 50-10% load variation, regulation time < 25 ms
Hold up time	> 20 ms; output voltage > 300 V _{DC} at 1500 W load
Ripple	< 1000 mV peak to peak, 30 MHz bandwidth
Protection	Overvoltage shutdown Hot plug-in - Inrush current limiting ORing diode Short circuit proof High temperature protection
OTHER SPECIFICATIONS	
Efficiency @ nominal input (peak / range)	95.8% / >95.5% @ 35 - 70% load
Isolation	3.0 kV _{AC} - input to output 1.5 kV _{AC} - input to earth 1.5 kV _{DC} - output to earth 3.0 kV _{AC} - CAN to primary 3.0 kV _{AC} - CAN to secondary
Alarms: Red LED 'on'	Low mains shutdown, High and low temperature shutdown, Rectifier Failure, Overvoltage shutdown on output, Fan failure, Low voltage alarm, CAN bus failure
Warnings: Yellow LED 'on'	Rectifier in power derate mode, Remote battery current limit activated, Input voltage out of range, flashing at overvoltage
Normal (module running): Green LED 'on'	
Acoustic noise, at nominal input and full load	< 40dBA @ T _{ambient} < 25 °C / < 58dBA @ T _{ambient} > 40 °C
MTBF (Telcordia SR-332 Issue I method III (a))	>400 000 (@ T _{ambient} : 25 °C)
Operating temperature	-40 to +75°C (-40 to +167°F), humidity 5 - 95% RH non-condensing Output power de-rates linear from 2500W @ 45°C (113°F) to 1650W @ 75°C(167°F)
Storage temperature	-40 to +85°C (-40 to +185°F), humidity 0 - 99% RH non-condensing
Dimensions[WxHxD] / Weight	109 x 41.5 x 327 mm (4.25 x 1.69 x 13") / < 1.95 kg (4.3 lbs)
DESIGN STANDARDS	
Electrical safety	UL 60950-1, EN 60950-1
EMC	ETSI EN 300 386 V.1.4.1 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry)
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2
1) 277 V _{AC} nominal (shut-off at 305 V _{AC}) target for next revision.	

Specifications *Flatpack2* DC/DC Converter 1350W, 18-75VDC, 24VDC and 48VDC

Model	1350W 18-75/24V	1350W 18-75/48V
Part number	241115.600	241115.602
INPUT DATA		
Voltage range	20 - 75 V _{DC} (shutdown < 16.5V _{DC})	
Current (maximum)	70 A _{DC} (85 A _{DC} during boost)	
Protection	Fuse and reversed polarity protection	
OUTPUT DATA		
Voltage (default)	26 V _{DC}	53 V _{DC}
Voltage (adjustable range)	24 - 28 V _{DC}	48 - 58.5 V _{DC}
Power (maximum) @ V _{IN} > 26 V _{DC} / V _{IN} = 18 V _{DC} Power boost 15s / 10min recovery (V _{IN} > 25V _{DC})	1350 W / 910 W 2000W	
Current (maximum)	56 A	28 A
Current boost 15s / 10min recovery (V _{IN} > 25V _{DC})	84 A	42 A
Static Voltage regulation (0 - 100% load)	±1%	±0.5%
Dynamic Voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 30ms	
Ripple, 20MHz bandwidth	< 200 mV _{pp}	
Protection	Short circuit proof , OR-ing diode, High temperature protection, Hot plug-in inrush current limiting, Over voltage Shutdown	
OTHER SPECIFICATIONS		
Efficiency	Up to 91.7 %	Up to 93.8 %
Isolation	1.2 kV _{DC} - input to chassis 1.9 kV _{DC} - input to output 1.0 kV _{DC} - output to chassis	1.9 kV _{DC} - CAN to chassis 1.9 kV _{DC} - CAN to input 1.9 kV _{DC} - CAN to output
Alarms: Red LED 'on'	Low and high input voltage shutdown, High and low temperature shutdown, Converter Failure, Overvoltage shutdown on output, Fan failure, Low output voltage alarm	
Warnings: Yellow LED 'on'	Converter in power derate mode, Remote output current limit activated, Input voltage out of range, flashing at overvoltage, Loss of CAN communication with controller	
Normal (module running): Green LED 'on'		
MTBF (Telcordia SR-332 Issue I method III (a))	>315 000 (@ T _{ambient} : 25 °C)	>315 000 (@ T _{ambient} : 25 °C)
Operating temperature	-40 to +75°C (-40 to +185°F), humidity 5 - 95% RH non-condensing	
Temperature de-rating above 55°C (131 °F)	1350W to 1250W @ 65°C (149°F) and 800W @ 75°C (167°F)	
Storage temperature	-40 to +85°C (-40 to +185°F), humidity 0 - 99% RH non-condensing	
Dimensions[WxHxD] / Weight	109 x 41.5 x 327mm (4.25 x 1.69 x 13") / < 1.95 kg (4.3 lbs)	
DESIGN STANDARDS		
Electrical safety	UL 60950-1, EN 60950-1	
EMC	EN 61000-6-1 / -2 / -3 / -4 ETSI EN 300 386 V.1.4.1	
Environment	ETSI EN 300 019: 2-1 (Class 1.2), 2-2 (Class 2.3) & 2-3 (Class 3.2) RoHS (2011/65/EU) and WEEE (2002/96/EC) compliant	

Doc 241115.60x.DS3 - rev1

Specifications are subject to change without notice

When required, find the latest version of the datasheet on www.eltek.com

Specifications Flatpack2 Solar Charger 24/1500 HE Solar

INPUT DATA

Voltage	Nominal: 170 – 230 VDC Tolerances: 85-265 VDC
Start-up voltage	150VDC
Maximum Current	9.5 A _{rms} maximum at nominal input and full load 10 A _{rms} maximum at 85VDC and full load
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Fuse in both lines ○ Reverse polarity

OUTPUT DATA

Voltage	<ul style="list-style-type: none"> ○ Default: 26.75 VDC ○ Float/Boost: 21.75 – 28 VDC For input voltages > 230VDC output stand by/test voltage is limited
Maximum Output Power	<ul style="list-style-type: none"> ○ 1500 W, derating below 170V input ○ 800W at 85V input
Maximum Current	62.5 Amps at 24 VDC
Current Sharing	Passive, to optimize the power available from each string of solar panels
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Ripple and Noise	<ul style="list-style-type: none"> ○ < 250 mV peak to peak, < 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Short circuit proof ○ High temperature protection ○ Fuse

OTHER SPECIFICATIONS

Efficiency	>95% at 30-70% load and 200VDC input	
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth	0.5 KVDC – output earth
Alarms	<ul style="list-style-type: none"> ○ High or low temperature shutdown ○ Charger Failure ○ Overvoltage shutdown on output 	<ul style="list-style-type: none"> ○ Fan failure ○ Low voltage alarm at 21.5V ○ CAN bus failure
Warnings	<ul style="list-style-type: none"> ○ Low input voltage ○ Charger in power derate mode ○ Remote battery current limit activated 	<ul style="list-style-type: none"> ○ Input voltage out of range ○ Loss of CAN communication with control unit, stand alone mode
Visual indications	<ul style="list-style-type: none"> ○ Green LED: ON, no faults ○ Red LED: charger failure 	<ul style="list-style-type: none"> ○ Yellow LED : charger warning
Operating temp.	-40 to +75°C (-40 to +167°F), derating linear above +55°C (+131°F) to 1200W at +75°C (+167°F)	
Storage temp.	-40 to +85°C (-40 to +185°F)	
Cooling	Fan (front to back airflow)	
Fan Speed	Temperature and current regulated	
MTBF	> 406, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)	
Acoustic Noise	< 20dBA at nominal input and full load (T _{ambient} ≤ 25°C) < 56dBA at nominal input and full load (T _{ambient} > 40°C)	
Humidity	Operating: 5% to 95% RH non-condensing	Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (W x H x D) (4.25 x 1.69 x 13")	
Weight	1.950 kg (4.3lbs)	

APPLICABLE STANDARDS

Electrical safety	IEC 60950-1 UL 60950-1	CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 EN 61000-6-1 (immunity, light industry)	EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry)
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2	ETSI EN 300 132-2 RoHS compliant

ORDERING INFORMATION

Part No.	Description
241115.660	Flatpack2 28/1500 HE SOLAR

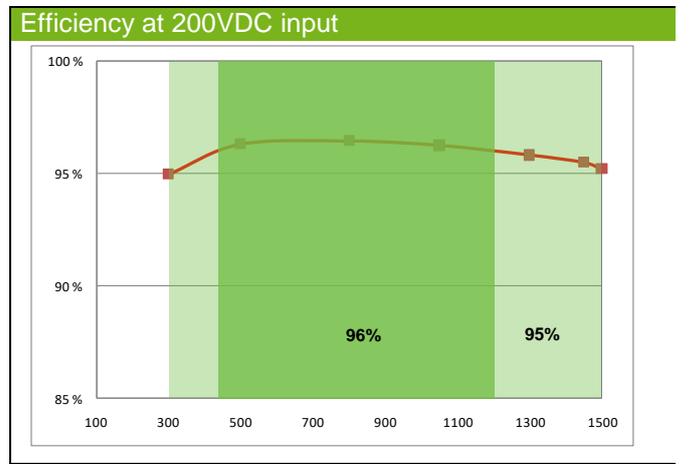
Specifications Flatpack2 Solar Charger 48/1500 HE Solar

Input	
Voltage	Nominal: 170 – 230 VDC Tolerances: 85-265 VDC
Start-up voltage	150VDC
Maximum Current	9.5 A _{rms} maximum at nominal input and full load 10 A _{rms} maximum at 85VDC and full load
Input Protection	<ul style="list-style-type: none"> ○ Varistors for transient protection ○ Fuse in both lines ○ Reverse polarity

Output	
Voltage	<ul style="list-style-type: none"> ○ Default: 53.5 VDC ○ Float/Boost: 48 – 57.6 VDC ○ Stand by/Test: 43.5-48 VDC <p>For input voltages > 230VDC output stand by/test voltage is limited</p>
Maximum Output Power	<ul style="list-style-type: none"> ○ 1500 W, derating below 170V input ○ 800W at 85V input
Maximum Current	31.3 Amps at 48 VDC
Current Sharing	Passive, to optimize the power available from each string of solar panels
Static voltage regulation*	±0.5% from 10% to 100% load
Dynamic voltage regulation*	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Ripple and Noise*	<ul style="list-style-type: none"> ○ < 250 mV peak to peak, ○ 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	<ul style="list-style-type: none"> ○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Short circuit proof ○ High temperature protection
* Based on power supplied not limited by solar panels	

Other Specifications	
Efficiency	>96% at 30-80% load and 200VDC input
Isolation	3.0 KVAC – input and output 1.5 KVAC – input earth 0.5 KVDC – output earth
Alarms:	<ul style="list-style-type: none"> ○ High temperature shutdown ○ Charger Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm at 43.5V ○ CAN bus failure
Warnings:	<ul style="list-style-type: none"> ○ Low input voltage ○ Low temperature shutdown ○ Charger in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at overvoltage ○ Loss of CAN communication with control unit, stand alone mode
Visual indications	<ul style="list-style-type: none"> ○ Green LED: ON, no faults ○ Red LED: charger failure ○ Yellow LED : charger warning
Operating temp	-40 to +75°C (-40 to +167°F), derating linear above +55°C (+131°F) to 1200W at +75°C (+167°F)
Storage temp	-40 to +85°C (-40 to +185°F)
Cooling	Fan (front to back airflow)
Fan Speed	Temperature and current regulated
MTBF	> 350, 000 hours Telcordia SR-332 Issue I, method III (a) (T _{ambient} : 25°C)
Acoustic Noise	<ul style="list-style-type: none"> < 20dBA at nominal input and full load (T_{ambient} ≤ 25°C) < 56dBA at nominal input and full load (T_{ambient} > 40°C)
Humidity	Operating: 5% to 95% RH non-condensing Storage: 0% to 99% RH non-condensing
Dimensions	109 x 41.5 x 327mm (wxhxd) (4.25 x 1.69 x 13")
Weight	1.950 kg (4.3lbs)

Applicable Standards	
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry)
Environment	ETSI EN 300 019-2-1 Class 1.2 ETSI EN 300 019-2-2 Class 2.3 ETSI EN 300 019-2-3 Class 3.2 ETSI EN 300 132-2 RoHS compliant



When required, find the latest version of the datasheet on www.eltek.com

Specifications are subject to change without notice

241115.105.DS3 – v6

241115.650.DS3 – v2

Specifications Flatpack2 Solar Charger 48/3200 HE Solar

Model	Flatpack 2 48/3200 HE SOLAR
Part number	241119.650
INPUT DATA	
Voltage (MPPT range) ¹⁾	100 - 380 V _{DC}
Voltage (operating range)	85 - 420 V _{DC}
Voltage (start-up)	150 V _{DC}
Maximum current	21.5 A _{DC}
Maximum DC Power	3200W
Max MPPT Short circuit current	25A
Protection	Fuse, varistor for transient protection, reversed polarity, shutdown when V _{IN} is too low, earth fault check during start-up
OUTPUT DATA	
Voltage (default)	53.5 V _{DC}
Voltage (adjustable range)	42 ²⁾ - 57.6 V _{DC}
Rated Power	3200 W
Max power, V _{IN} ≥ 170 V _{DC}	3299 W
Max power, de-rated @V _{IN} = 85 V _{DC}	1500 W
Rated output current @ V _{OUT} = 53.5 V _{DC}	59.1 A
Max current, @V _{OUT} = 48 V _{DC}	66.7 A
Current sharing	Passive to optimize power available from each string of solar panels
Static voltage regulation (10-100% load)	±0.5% from 10 - 100% load and supplied power not limited by PV panels
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Ripple	< 250 mV _{PP} , 30 MHz bandwidth
Protection	Fuse, Overvoltage shutdown, short circuit proof, high temperature, hot plug-in inrush current limiting
OTHER SPECIFICATIONS	
Peak Efficiency	97 %
Isolation	4.2 kV _{DC} – input and output, 2.5 kV _{DC} – input earth, 0.5 kV _{DC} – output earth
Alarms (Red LED)	High and low temperature shutdown, Converter Failure, Overvoltage shutdown on output, Fan failure, Low voltage alarm, CAN bus failure
Warnings (Yellow LED)	Low input voltage, Converter in power derate mode, Remote current limit activated, Input voltage out of range, flashing at overvoltage
Normal (Green LED)	Input and output ok
MTBF (Telcordia SR-332 Iss.3 Method II Case L1)	1 440 000 (@ T _{ambient} : 25°C)
Operating temperature (5 - 95% RH non-cond.)	-40 - 75°C [-40 - 167°F]
Max output power de-rates above temp / to	45°C [+113°F] / 2400 W
Storage temperature	-40 to +85°C (-40 to +185°F), humidity 0 - 99% RH non-condensing
Operational altitude	0~4000m
Dimensions[WxHxD] / Weight	109 x 41.0 x 327mm [4.25 x 1.61 x 13"] / < 2 kg [4.4lbs]
IP Rating	IPX0
Country of Manufacture	China
DESIGN STANDARDS	
Electrical safety	IEC/EN 62109-1:2010/-2:2011, EN 62368-1:2020+A11:2020, IEC 62368-1:2018 UL 62368-1:2019, IEC 60950-1:2013
EMC	EN 61000-6-1:2016, -6-2:2016, -6-3:2007 + A1:2011, -6-4:2007 + A1:2011, IEC 61000-6-5:2015, EN 300 386:v2.1.1, FCC CFR 47 Part 15:2013
Environment	ETSI EN 300 019: 2-1 (Class 1.2) & 2-2 (Class 2.3) 2011/65/EU (RoHS) & 2012/19/EU (WEEE) Normal operating conditions as per IEC 62040-5-3:2016 clause 4.2. Other operating conditions as per IEC 62040-5-3:2016 clause 4.3, must be advised
<small>1) At nominal output voltages. MPPT will operate down to 100V, but the maximum input current limitation will de-rate maximum output power 2) Stand-by / test operation (V_{OUT} < 48 V_{DC}) limited for V_{IN} > 250 V_{DC} 3) Enclosure does not need to be additionally grounded. Protective earthing/bonding is achieved when used in Eltek system components.</small>	