ELTEK
A Delta Group Company

User's Guide

Flatpack2 Power Modules

Rectifiers and Converters

Flatpack2 Power Supply Systems

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SAFETY and ENVIRONMENTAL PRECAUTIONS

The **product warranty** becomes invalid if the following safety precautions are not followed during handling, installation, commissioning and general use/operation of *Eltek* power supply systems.

General Precautions

Device Hazard

G1 **CAUTION:** Even though the product incorporates protection circuitry and other safeguards, it can be **damaged, perform poorly or have a reduced lifetime** if it is exposed to **incorrect treatment** during transport, installation or service. Always handle the equipment using proper lifting techniques, do not roll, climb or drill hole in the cabinets or enclosures.

Electric Shock

G2 **WARNING: Opening the equipment may cause terminal injury — even if the mains AC supply is disconnected. Hazardous voltages may be present inside, as large capacitors may still be charged.**

Environmental Precautions

Ventilated Hot Surface

E1 **CAUTION:** To avoid damage the equipment, **keep objects clear of system ventilation inlets, outlets and system fans**, if any, ensuring the **airflow** through the units is **not obstructed**, and that the fans rotate freely. Use caution with power modules, as they can reach **extreme temperatures** under load and normal operation.

Current Surge Protection

E2 **WARNING: The installer/user is responsible for ensuring that the power system is not damaged by current surges, over-voltages, etc. caused by external transients, lightning, electrostatic discharge, etc. To avoid damage and obtain the expected system reliability, it is mandatory to always install SPDs in Eltek's power supply systems. Follow the instructions given in "Guidelines for Lightning and Surge Protection", doc. 2024623**.

Humidity & Dust Protection

E3 **WARNING: The electronics in the power supply system are designed for indoor, clean environment. When installed in outdoor enclosures — using heat sinks or closed loop heat management systems — it is important to maintain the equipment closed and tight during operation, to avoid external air entering the enclosure. Also, when using open loop heat management systems, it is important to replace the filters on a regular basis. Indoor installations in dusty or humid areas require appropriate air filtering of the room, or filtering of the air entering the power system. Follow the instructions given in "Generic Guidelines Environmental Protection.", doc. 2038879**

Precautions during Installation

Qualified Personnel

I1 **CAUTION: Read the user documentation carefully** before installing and using the equipment, as installation and operation is to be performed as described in it. Always tighten screws and bolts with the **torque values recommended** in the documentation. For safety reasons, the **commissioning and configuration of the equipment is only to be performed** by *Eltek*'s personnel or by authorized and qualified persons.

EMC, NEC/CEC Regard

I2 **CAUTION:** This product is tested and verified according to international safety, environmental and EMC standards. Any **non-*Eltek* equipment** installed into this product after delivery might influence the performance and **could infringe the original approvals**. The **installer is responsible** for ensuring that the environmental properties of this product/ system do not deteriorate during installation, and that it is performed in accordance with applying regulations.

Installations in USA and Canada must comply with NEC/CEC requirements.

Device Hazard

I3 **CAUTION:** Before you start the electrical installation, you must **always disconnect** all external supply fuses, as well as internal battery and load fuses/ breakers, if any.

Electric Shock

I4 **WARNING: For safety reasons (high leakage current / high touch current) you must always connect the AC earth wire (PE) to the terminals, before you connect the AC input cable(s).**

The batteries, if any, represent a major energy hazard. To avoid short-circuit of battery poles, you must always remove metallic objects — uninsulated tools, rings, watches, etc. — from the vicinity of the batteries.

Electric Shock

I5 **WARNING: 60V power systems, and higher voltage systems, are only to be installed in Restricted Access Locations (RAL). Access must be limited by use of tool, i.e. lock and key.**

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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.

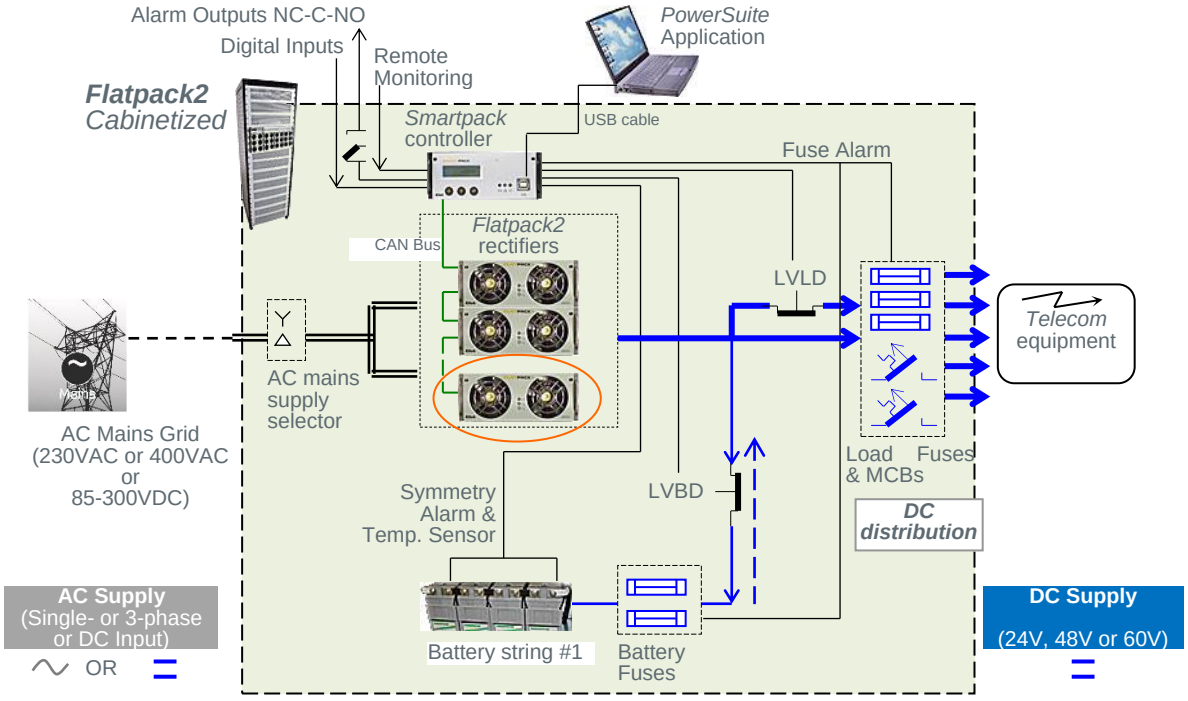

Figure 1 Typical Flatpack2 PS *system for DC power supply of telecom equipment*

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.

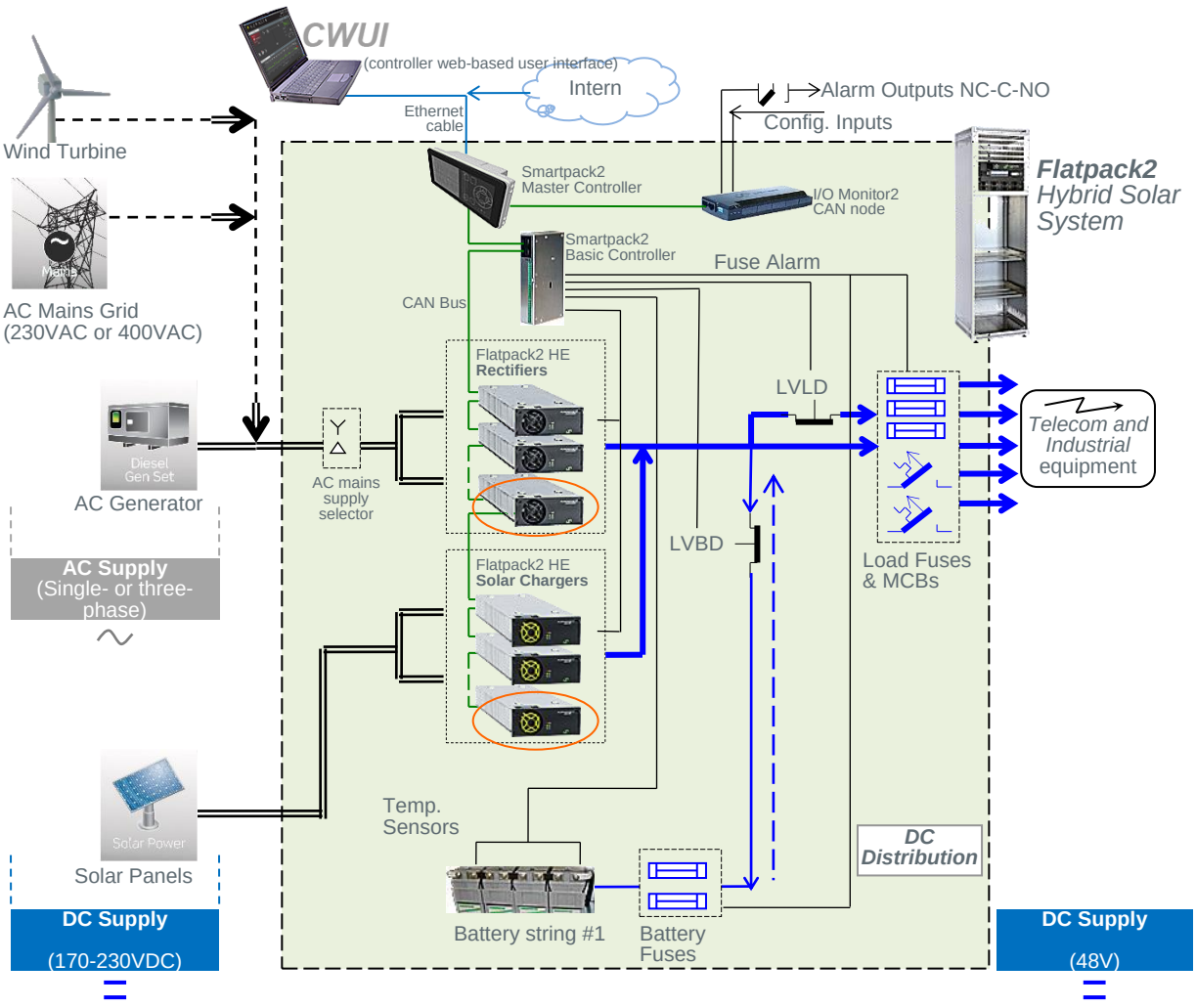

Figure 2 Typical hybrid, solar Flatpack2 PS *system for DC power supply of telecom or industrial equipment*

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.

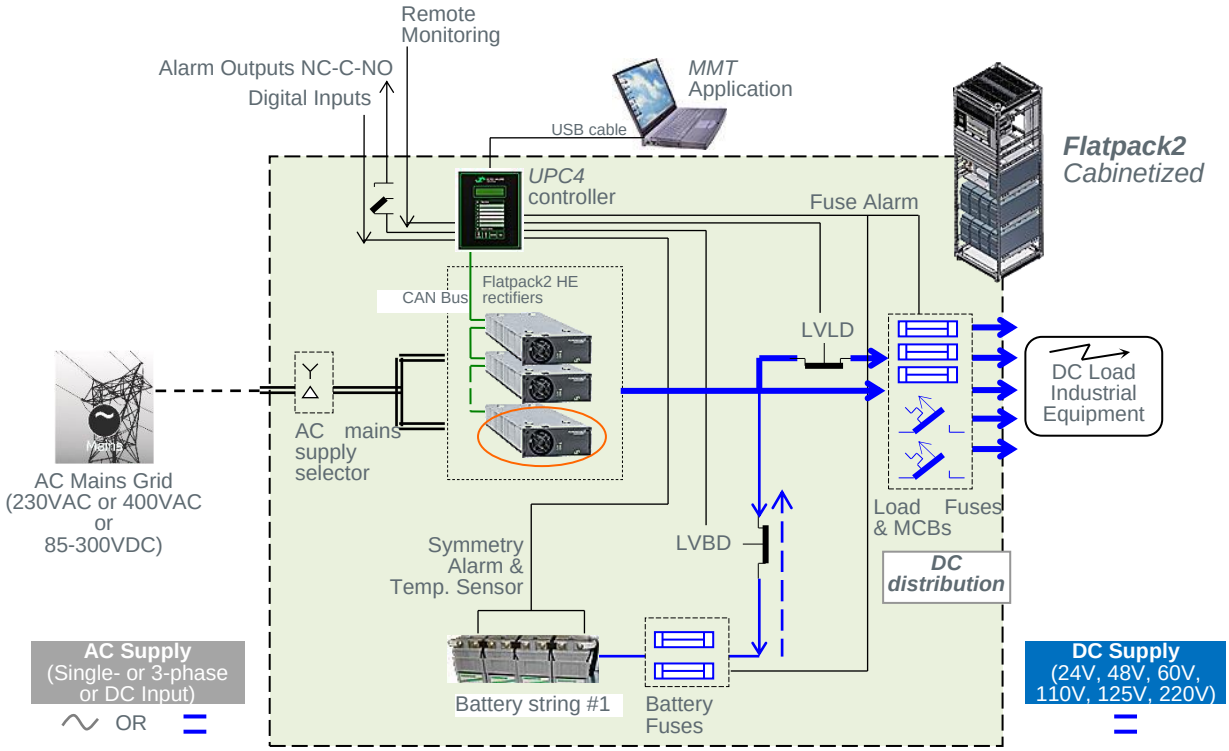

Figure 3 Typical Flatpack2 PS *system for DC power supply of industrial equipment*

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

Flatpack2 HE module

- ✓ **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.

Flatpack2 rectifier

- ✓ **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

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
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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
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241115.602	Flatpack2 DC/DC Converter 1350W, 18-75VDC, 48VDC		Page 16
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241115.660	Flatpack2 Solar Charger 24V, 1500W HE – (Solar)		Page 17
241115.650	Flatpack2 Solar Charger 48V, 1500W HE – (Solar)		Page 17

Device Hazard

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.

Device Hazard

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.

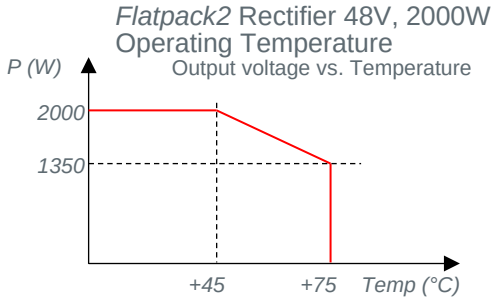
Flatpack2 Rectifier 48V, 1800W

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 stands 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.

Device Hazard

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.

Device Hazard

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.

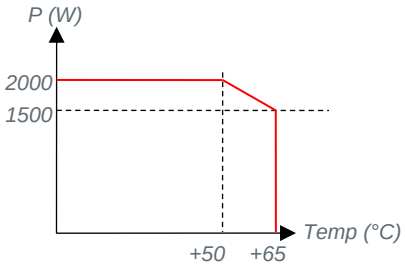
Device Hazard

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:

- "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.

Device Hazard

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.

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.

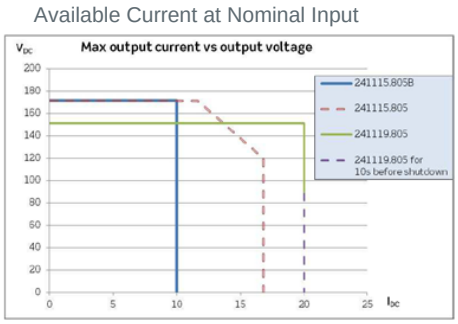


Figure 4 Output I/V diagram for 24111x.805

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 24V, 1500W 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 48V, 1500W HE – (Solar)", page 17.

For technical data, read chapter "Specifications Flatpack2 Solar Charger 24V, 1500W HE – (Solar)", page 37.

Flatpack2 Solar Charger 48V, 1500W 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 48V, 1500W HE – (Solar)" on page 38.

3. Installation of *Flatpack2 Modules*

Safety Precautions

Get acquantied with the satety 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

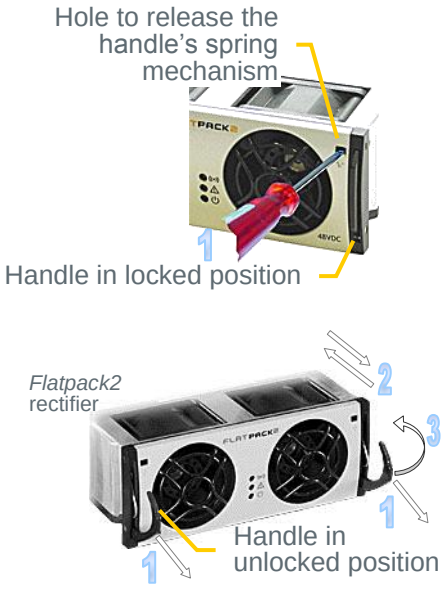
The Flatpack2 modules incorporate handles that serve both to lock the modules into position and to pull them out of their housings.

Device Hazard

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



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)

Figure 5 Flatpack2 module's locking mechanism

Device Hazard

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 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.

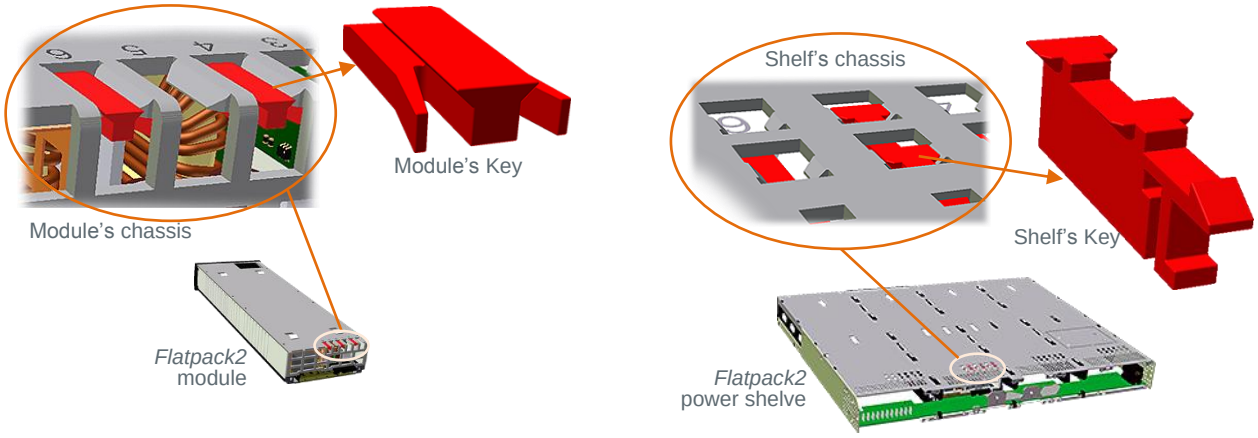


Figure 6 Keying scheme for Flatpack2 modules and power shelves (keys are black)

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.

Device Hazard

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 self's back wiring card (hot-pluggable).

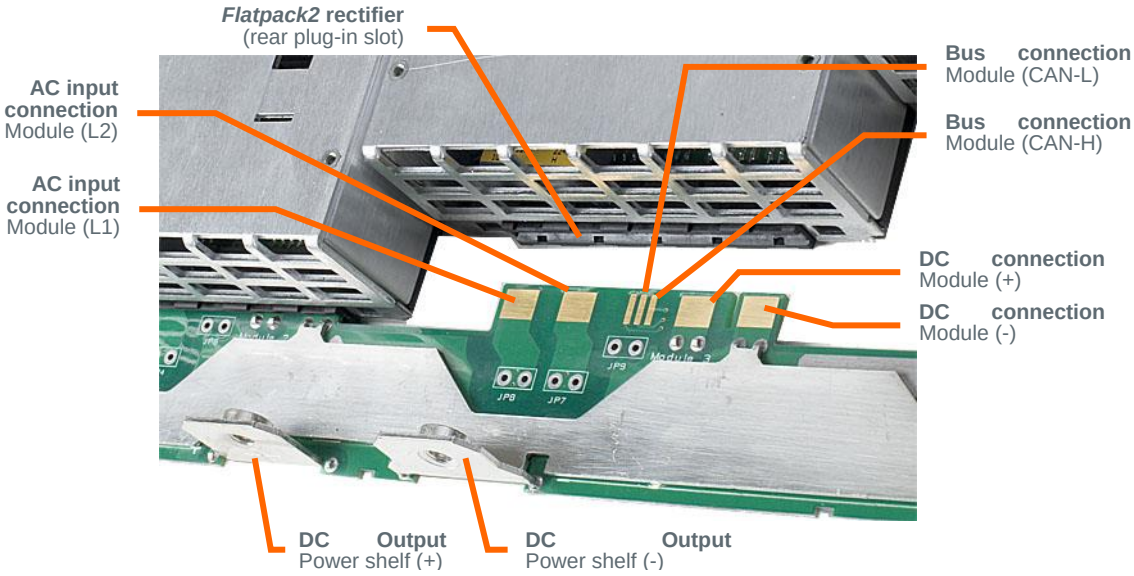


Figure 7 Flatpack2 module's rear plug-in connections to power shelf's back wiring card

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.

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

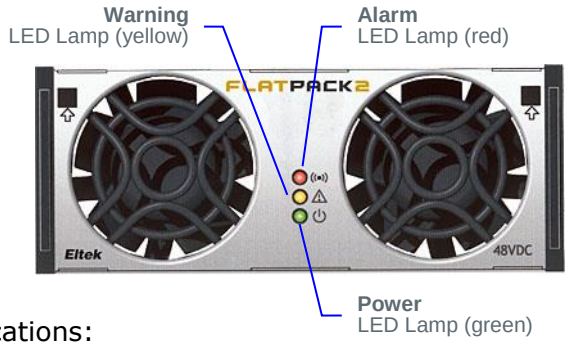


Figure 8 Example of a Flatpack2 module's front panel

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	▪ 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	Module is in Over-voltage Protection Mode (AC input)
	OFF	No abnormal situation is present
Alarm (red)	ON	▪ 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 alarm situation is present

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	○ Varistors for transient protection ○ Mains fuse in both lines ○ Disconnect above 300 VAC

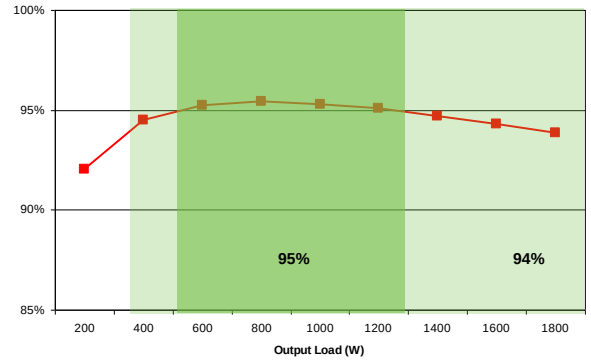
DC Output	
Voltage	26.7 VDC (adj. range: 21.7-28.8 VDC)
Output Power	1800 W at nominal input
Maximum Current	75 Amps at 24 VDC and nominal input
Current Sharing	±5% of maximum current from 10 to 100% load
Static voltage regulation	±0.5% from 10% to 100% load
Dynamic voltage regulation	±5.0% for 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time	> 20ms; output voltage > 21 VDC at 1000W load
Ripple and Noise	○ < 250 mV peak to peak, ○ 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	○ 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

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:	○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm at 21.5V ○ CAN bus failure
Warnings:	○ Low temperature shutdown ○ Rectifier in power derate mode ○ Remote battery current limit activated ○ Input voltage out of range, flashing at 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	Fan (front to back airflow)
Fan Speed	Temperature and current regulated
MTBF	> 300, 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)

Efficiency



241115.205.DS3 – v2

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

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	○ 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	○ 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	○ 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:	○ 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
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	○ 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

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

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

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

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	○ 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	○ < 100 mV peak to peak, ○ 30 MHz bandwidth ○ < 0.96 mV rms psophometric
Output Protection	○ 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:	○ 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:	○ 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 +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

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

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	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:	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:	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 +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) (Tambient : 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

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

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	○ 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	○ < 100 mV peak to peak, ○ 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Short circuit proof ○ High temperature protection

Applicable Standards

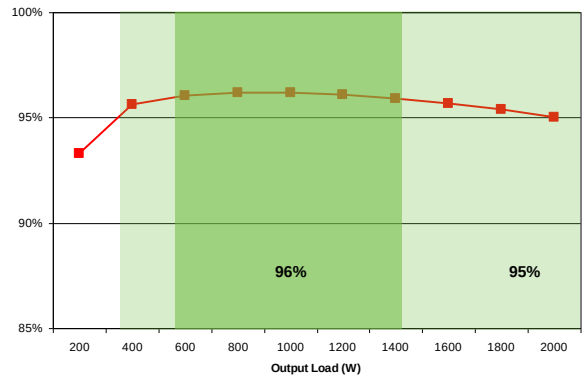
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.2 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 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

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:	○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ 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 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	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	< 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)

Efficiency



241115.105.DS3 – v9

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

Specifications Flatpack2 Rectifier 48V, 3000W

Model	48/3000
Part number	241119.903
INPUT DATA	
Voltage (nominal)	185 - 275 V_{AC}
Voltage (operating range)	85 - 300 V_{AC}
Frequency	45 - 66 Hz
Current (maximum)	19 A_{RMS}
Power Factor	> 0.99 at 50-100% load
Protection	Fuse in L & N, Shutdown above 305 V_{AC}
OUTPUT DATA	
Voltage (default)	53.5 V_{DC}
Voltage (adjustable range)	43.5 - 57.6 V_{DC}
Power @ 230 V_{AC} (maximum)	3000 W
Power @ 85 V_{AC} (maximum)	1380 W
Current (maximum)	62.5 A (@ 48 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 10-90% or 90-10% load variation, regulation time < 50ms
Hold up time, 1500 W / 3000 W output power	>20ms / >10ms ; output voltage > 43 V_{DC}
Ripple	< 150 mV peak to peak, 30 MHz bandwidth
Protection	Fuse, Short circuit proof, High temperature protection, Overvoltage shutdown, Hot plug-in inrush current limiting
OTHER SPECIFICATIONS	
Efficiency @ nominal input	> 95%
Isolation	3.0 kV_{AC} - input to output, 1.5 kV_{AC} - input to earth, 500 V_{DC} - output to earth
Alarms: Red LED 'on'	Low mains shutdown, High and low temperature shutdown, Fan failure, Rectifie Overvoltage shutdown on output, Low output voltage alarm, CAN bus failure
Warnings: Yellow LED 'on'	Rectifier in power de-rate mode, Remote battery current limit activated, Input of range, flashing at overvoltage
Normal: Green LED 'on'	
Cooling	Fan (front to back airflow, temperature and output current regulated speed)
Acoustic noise, full load @ $T_{ambient}$ = 25°C full load @ $T_{ambient}$ = 40°C	< 40 dBA < 58 dBA
MTBF (Telcordia SR-332 Issue I method III (a))	>300 000 (@ $T_{ambient}$: 25 °C)
Operating temperature	-40 to +75°C (-40 to +167°F), humidity 5 - 95% RH non-condensing
Temperature de-rating above 45°C (110°F)	3000W to 2100W @ 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") / 1.85 kg (4.1 lbs)
DESIGN STANDARDS	
Electrical safety	UL 60950-1, EN 60950-1
EMC	EN 61000-6-1 / -2 / -3 / -4, EN 61000-3-2 ETSI EN 300 386 V.1.4.1, FCC Part 15 Subpart 109
Environment	ETSI EN 300 019: 2-1 (Class 1.2), 2-2 (Class 2.3) & 2-3 (Class 3.2) ETSI EN 300 132-2 RoHS (2011/65/EU) and WEEE (2002/96/EC) compliant

Specifications are subject to change without notice 241119.903.DS3 – v4

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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	○ 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	○ < 150 mV peak to peak, ○ 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Fuse ○ Short circuit proof ○ High temperature protection

Applicable Standards

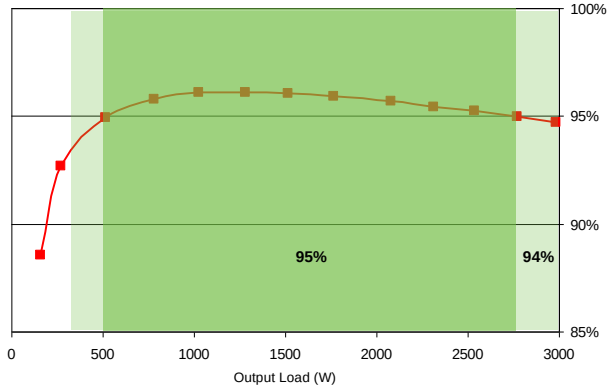
Electrical safety	IEC 60950-1 UL 60950-1 CSA 22.2
EMC	ETSI EN 300 386 V.1.3.3 EN 61000-6-1 (immunity, light industry) EN 61000-6-2 (immunity, industry) EN 61000-6-3 (emission, light industry) EN 61000-6-4 (emission, industry) Telcordia NEBS GR1089 CORE
Mains Harmonics	EN 61000-3-2
Environment	ETSI EN 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

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:	○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm ○ 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), 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	< 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)

Efficiency



241119.105.DS3 – v2

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

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	○ 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	○ < 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

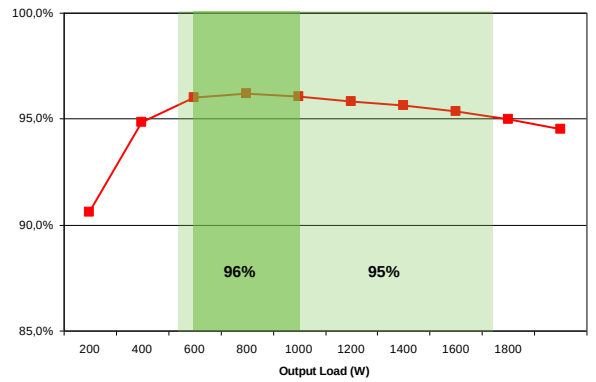
Applicable Standards

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

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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	○ 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	○ < 250 mV peak to peak, 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Short circuit proof ○ High temperature protection

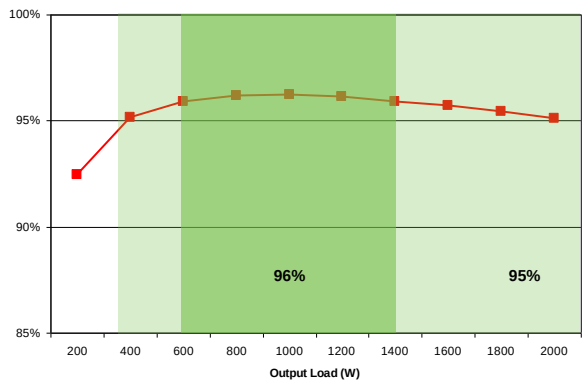
Applicable Standards

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

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:	○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ 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 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 +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)

Efficiency



Specifications are subject to change without notice

241115.115.DS3 – v1

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

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	○ 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	○ Overvoltage shutdown ○ Hot plug-in ○ OR-ing diode ○ Short circuit proof ○ High temperature protection

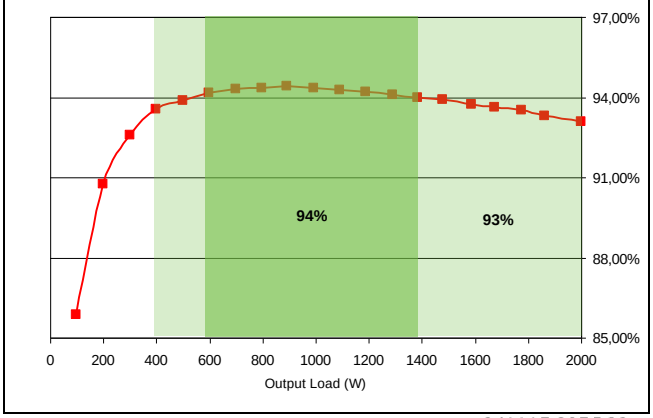
Applicable Standards

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

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:	○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm ○ 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), 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)

Efficiency



241115.805.DS3 – v2

Specifications are subject to change without notice

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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	○ 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	○ Overvoltage shutdown ○ Hot plug-in ○ OR-ing diode ○ Short circuit proof ○ High temperature protection

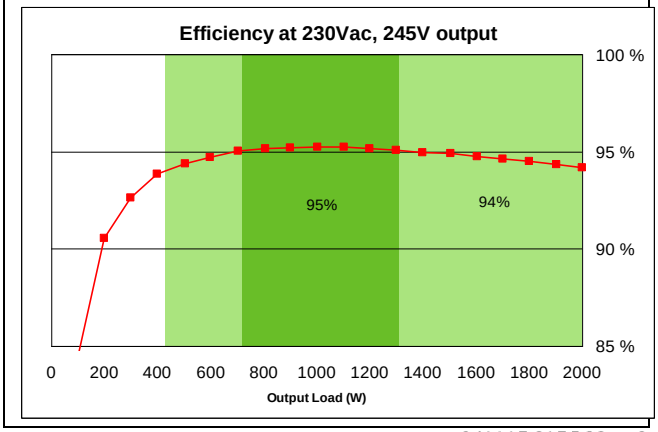
Applicable Standards

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

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:	○ Low mains shutdown ○ High temperature shutdown ○ Rectifier Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm ○ 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), 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)

Efficiency



241115.815.DS3 – v2

Specifications are subject to change without notice

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

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 (adjusable 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
Rippel	< 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 (@ Tambient : 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.

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

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 polartity protection	
OUTPUT DATA		
Voltage (default)	26 V_{DC}	53 V_{DC}
Voltage (adjusable 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) Current boost 15s / 10min recovery (V_{IN} > 25V_{DC})	56 A 84 A	28 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	
Rippel, 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	

Specifications are subject to change without notice

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

Specifications Flatpack2 Solar Charger 24V, 1500W 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	○ Varistors for transient protection ○ Fuse in both lines ○ Reverse polarity

OUTPUT DATA

Voltage	○ Default: 26.75 VDC	○ Float/Boost: 21.75 – 28 VDC For input voltages > 230VDC output stand by/test voltage is limited
Maximum Output Power	○ 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	○ < 250 mV peak to peak, ○ 30 MHz bandwidth	○ < 2 mV rms psophometric
Output Protection	○ 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	○ High or low temperature shutdown ○ Charger Failure ○ Overvoltage shutdown on output	○ Fan failure ○ Low voltage alarm at 21.5V ○ CAN bus failure
Warnings	○ Low input voltage ○ Charger in power derate mode ○ Remote battery current limit activated	○ Input voltage out of range ○ Loss of CAN communication with ○ control unit, stand alone mode
Visual indications	○ 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	> 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

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

Specifications Flatpack2 Solar Charger 48V, 1500W 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	○ Varistors for transient protection ○ Fuse in both lines ○ Reverse polarity

Output

Voltage	○ Default: 53.5 VDC ○ Float/Boost: 48 – 57.6 VDC ○ Stand by/Test: 43.5-48 VDC For input voltages > 230VDC output stand by/test voltage is limited
Maximum Output Power	○ 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*	○ < 250 mV peak to peak, ○ 30 MHz bandwidth ○ < 2 mV rms psophometric
Output Protection	○ Overvoltage shutdown ○ Hot plug-in - Inrush current limiting ○ Short circuit proof ○ High temperature protection

* Based on power supplied not limited by solar panels

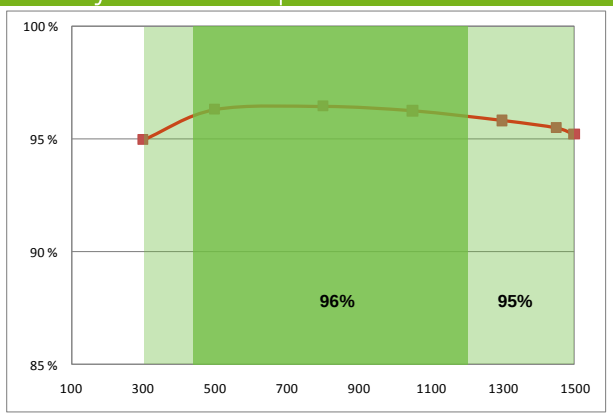
Other Specifications

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:	○ High temperature shutdown ○ Charger Failure ○ Overvoltage shutdown on output ○ Fan failure ○ Low voltage alarm at 43.5V ○ CAN bus failure
Warnings:	○ 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	○ 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	< 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

Efficiency at 200VDC input



Specifications are subject to change without notice

241115.650.DS3 – v2

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www.eltek.com

Headquarters:
Eltek
Gråterudv. 8, Pb 2340 Strømsø, 3003 Drammen, Norway
Phone: +47 32 20 32 00 Fax: +47 32 20 32 10