



RT4B-110V/12A RECTIFIER

The RT4B-110V/12A is a switched mode rectifier (SMR) module designed to provide up to 12A of output current into a 110V nominal system. It can be used with or without a cooling fan. With a fan it runs cooler and the life is extended, and it occupies less total space. It is backward compatible with all existing magazines and older 110V systems, and has been optimised for performance, cost and reliability, offering substantial advantages compared to older products.

This rectifier has been designed to be used in conjunction with a battery to provide an uninterruptable or standby DC power system. The low noise, high reliability and natural cooling make it ideally suited to industrial applications including switch tripping and emergency lighting. Up to five rectifiers can fit in a single magazine and up to fifteen rectifiers can be configured as a system using one control and supervisory unit (CSU). The system can be monitored and controlled remotely using WinCSU software (see CSU specification for more details). The rectifier has been designed with a “plug-and-play” philosophy; when a rectifier

module is plugged into a live system the relevant system parameters are automatically downloaded from the MiniCSU, making rectifier replacement a completely hands-off operation, other than plugging it in. The unit is fully hot-pluggable.



Operating characteristics of the RT4B-110V/12A SMR at 25°C ambient, 220VAC unless otherwise stated.

Input

Voltage:

Single phase: Active, Neutral and Earth;
Rated voltage range: 208 – 240VAC;
Rated voltage tolerance: 150 – 275VAC;
Extended low voltage range: 90 – 150VAC;
(With power limit increasing from 50% to 100%)
Extended high voltage range: 275 – 290VAC;
Must start voltage: 90VAC;
Fully protected up to: 400VAC;

Current:

11A RMS max at 150VAC;
8A RMS at 220VAC;

Frequency:

45 - 66Hz;

Power Factor:

> 0.98 at 40% - 100% load;

Harmonic Distortion:

Current THD < 6% at full load when operated with
mains voltage THD < 1%;

Efficiency:

Better than 90% at > 50% load;

Inrush Current:

< 8A peak at nominal mains voltage;

Soft Start:

Ramp-up time 8 seconds to full load;

Protection:

HRC input fuse (with option to fuse both lines);
Overvoltage shutdown at approx. 300VAC;
Undervoltage shutdown at approx. 85VAC;
Input soft start – can be connected to live AC bus;
Indefinite survival at 400VAC and typically at least
5 minutes survival at 420VAC (for accidental phase
to phase connection or neutral loss);

Voltage Withstand Test:

1500VAC input to chassis for 1 minute;
(2200VDC 100% testing on production units);





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Output

Voltage:

Float: 110 - 140V
 Equalise: 110 - 155V

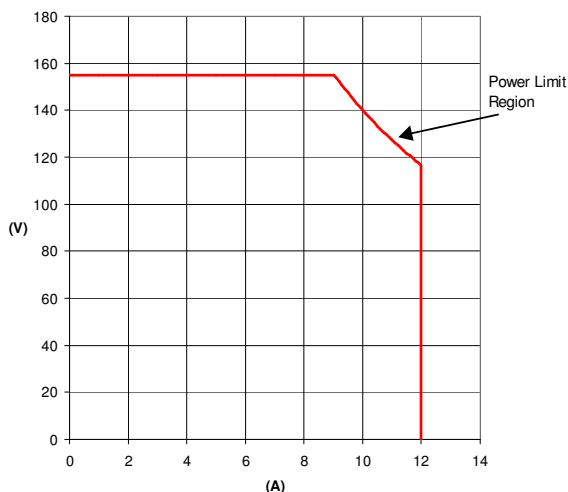
Current Limit:

Range 5 - 12A

Power Limit:

Current limit is automatically reduced in inverse proportion to output voltage above 120VDC to limit output power to 1400 watts;

Max. current limit : 12.0A at 120V
 11.0A at 127V
 10.0A at 140V
 9.0A at 155V



Static Regulation:

Line: better than $\pm 0.02\%$;

Load: terminal voltage drops by $0.66V \pm 0.05V$ from zero to full load (for passive current sharing) for stand alone units, or regulates to better than $\pm 0.05\%$ for MiniCSU controlled units;

Dynamic Regulation:

$\pm 5\%$ for 10% to 90% to 10% step load change;
 $\pm 1\%$ of final value within 20ms of step change;
 $\pm 0.1\%$ for a 25% step change in AC input voltage;

Noise:

< 50mV RMS (100Hz – 10kHz);
 < 50mV RMS (10kHz - 100MHz);
 < 500mV peak to peak (10kHz - 100MHz);

Load Sharing:

Better than $\pm 5\%$ of full scale with active current sharing from MiniCSU;

Protection:

Fuse at output of SMR protects against reverse polarity connection and protects DC bus when internal components fail;

Relay in output circuit prevents surges when connection is made to a live DC bus;

Overvoltage - only faulty unit shuts down;

Overcurrent - can sustain short circuit at output terminals indefinitely.

Over-temperature - gradual reduction of power limit if heatsink temperature exceeds pre-set limit;

Voltage Withstand Test:

1500VAC output to chassis for 1 minute;
 100% production testing: 2200VDC for 2 seconds;

Remote Controls

Equalise mode:

The SMR will automatically enter and exit equalise mode at user specified conditions, or can be manually initiated. Under any fault condition the SMR will default to the float value.

Rectifier Inhibit:

Rectifiers can be inhibited by a signal from a remote WinCSU terminal, transmitted via the CSU.

External Digital Voltage Control (EDVC):

The CSU uses the optically isolated communications lines to digitally control rectifier Float and Equalise voltages over a limited voltage range in order to adjust battery voltage for temperature and voltage drop in DC bus, limit the maximum battery recharging current and to achieve active current sharing;





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SMR parameters programmed by CSU

In the SMR menu on the CSU:

- Current Limit
- High Voltage Shut-Down (HVSD)
- High Voltage Alarm
- Low Voltage Alarm
- Latched Fault Reset

In the Battery menu on CSU:

- Float Voltage
- Equalise Voltage

Test Function: (when activated on CSU)

Test function causes all rectifier LEDs to flash.

Alarms and Monitoring

Front Panel LED indication table:

Green	Yellow	Red	Condition
Off	Off	Off	Primary power bad
ON	Off	Off	Normal
ON	Flash	Off	Alarm
ON	ON	Off	Equalise
Off	Flash	ON	Shutdown
Off	Off	ON	Microcontroller fault

Primary power bad: Indicates the input AC is too low or too high, or the primary circuit is faulty;

Normal: Status is normal;

Alarm: See Alarm table;

Equalise: SMR is in equalise mode;

Shutdown: SMR is shut down by remote control, due to environmental conditions or there is an internal control circuit fault;

SMR status monitoring:

CSU and WinCSU monitor status of the SMR:

- Output current;
- Heatsink temperature;
- SMR alarms;

Current:

Monitored on CSU and WinCSU with 1A resolution; Analogue measurement accuracy $\pm 1\%$ at full load; Optional bar-graph display on rectifier;

Voltage:

System voltage normally displayed on CSU alphanumeric display. Accuracy $\pm 0.5\%$

SMR address:

The SMR address is automatically set by a resistor on the magazine.

SMR alarm monitoring:

The Alarm table shows alarm conditions that are monitored by the SMR and are displayed on both CSU and WinCSU. The mnemonics listed here appear on WinCSU, but full alarm description appears on CSU.

Vh	Output voltage too high
VI	Output voltage too low
Il	Unit is in current limit
Po	Unit is in power limit
Th	Heatsink temperature high and thermal limit is active
Ff	Fan failure (only if fan is connected)
Lo	Load current low (less than 0.9A)
Ma	Operating parameters out of range (or EEPROM fault)
No Response	SMR communication fault. (Generated within CSU)
Sd *	Unit is shut down by remote command - user shutdown
Mr *	Internal voltage reference faulty
Vs *	High voltage shut down (output), latched alarm. User setting or fault
Unit Off *	Unit is shut down due to AC out of range (normal operation) or SMR primary circuit fault.
Ts *	Temperature sensor fault
Dc *	DC-DC converter feedback fault, latched alarm

Note: * indicates unit shut-down





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Compliances

Safety: IEC60950:1999; EN60950; AS/NZS 60950:2000; (European group difference)

EMC Emissions and Immunity: ETSI EN 300 386 V1.2.1 (2000-03)

Environmental: ETSI EN 300 019

EMC Test Levels

Emissions: (* indicates that the standard is equivalent to first standard named in the section)

Category:	Designed to comply with:	
Harmonics	IEC 61000-3-2; EN61000-3-2*; AS/NZS 61000-3-2*:	<i>Class A</i>
Conducted RF	AC Terminals: CISPR 22; EN55022*; AS/NZS 3548*: DC Terminals: CISPR 14; EN55014*; AS/NZS 1044*.	<i>Class A</i>
Radiated RF	CISPR 22; EN55022*; AS/NZS 3548*:	<i>Class A</i>

Immunity:

Category:	Designed to comply with:	
Electrostatic Discharge (ESD)	IEC 61000-4-2; EN61000-4-2*: (Level 4: Air 15kV, Contact 8kV)	<i>Criterion A</i>
Radiated RF	IEC 61000-4-3; EN61000-4-3*: (Level 4: 10V/m, 1kHz 80% AM)	<i>Criterion A</i>
Electrical Fast Transient (EFT)	IEC 61000-4-4; EN61000-4-4*: (Level 4: 4kV on AC lines) (Level 3: 1kV on load lines)	<i>Criterion A</i> <i>Criterion A</i>
Surge Protection	ANSI C62.41-1991 category B3 - AC lines (Combination Wave 6kV/3kA; Ring Wave 6kV/500A) IEC 61000-4-5; EN61000-4-5* (Impulse) (Level X: 6kV/3kA Common Mode [CM] on AC lines) (Level X: 6kV/3kA Differential Mode [DM] on AC lines) IEC 61000-4-12; EN61000-4-12* (Ring Wave) (Level X: 6kV/500A, 100kHz CM & DM on AC lines)	<i>Criterion B</i> <i>Criterion B</i> <i>Criterion A</i>
Conducted RF	IEC 61000-4-6; EN61000-4-6*: (Level 3: 10V on AC, load and comms lines)	<i>Criterion A</i>
Voltage Dip, Interruptions	IEC 61000-4-11; EN61000-4-11*: (Level: 30% dip for 10ms) (Level: 60% dip for 100ms) (Level: 100% dropout for 5s)	<i>Criterion A</i> <i>Criterion B</i> <i>Criterion B</i>





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Environmental

Class (according to ETSI EN 300 019):

Storage: Not Temperature Controlled Storage Locations (Class 1.2)
Transportation: Public Transportation (Class 2.3)
Operation: Stationary Use at Non-Temperature-Controlled Locations (Class 3.3).

Temperature:

Operating range: -25°C to +70°C
Full power range: -25°C to +50°C
Derated operation: 55% power at +70°C
(approx. -36W/°C over 50°C)
Storage and Transportation: -40°C to +70°C

The rectifier senses its internal heat-sink temperature and, if necessary, adjusts power limit in order to protect itself against over-heating;

Humidity:

0 to 100% RH condensing

Altitude:

Derate maximum ambient temperature by 4°C per 1000m above sea level, to 3000m (consult factory above 3km).

Vibration:

Operational: 1.5mm displacement 2-9Hz,
5m/s² acceleration 9-200Hz,
Transportation: 3.5mm displacement 2-9Hz,
(packaged) 10m/s² acceleration 9-200Hz,
15m/s² acceleration 200-500Hz,

Shocks:

Operational: 11ms, 10g half sine
Transportation: 6ms, 40g half sine (packaged)

Drop:

1.2m (packaged)

Cooling:

There are two possibilities: Natural convection, or forced convection cooling using 80mm fan with variable speed temperature control, finger guard and filter. On rectifier startup, if a fan is connected it will be detected and the fan alarm software routines activated. Fan stops if AC power fails or rectifier inhibited remotely. The fan is mounted externally to the rectifier in the magazine.

Mechanical

Size:

Width: 87mm
Height: 266 mm (6U)
Depth: 320 mm
Mass: < 6kg

Acoustic Noise:

< 55dB (A Weighted), fan connected

Magazine size:

The RT4Mag-5way-110V magazine allows 5 rectifiers to fit side by side in a standard 19 inch rack and one row of rectifiers in every 10U of rack height with the natural cooling option, or 8U with fan cooling option.
The magazine fits a rack 400 mm or greater in depth.

Connections

Input, Output, Fan, and Communications:

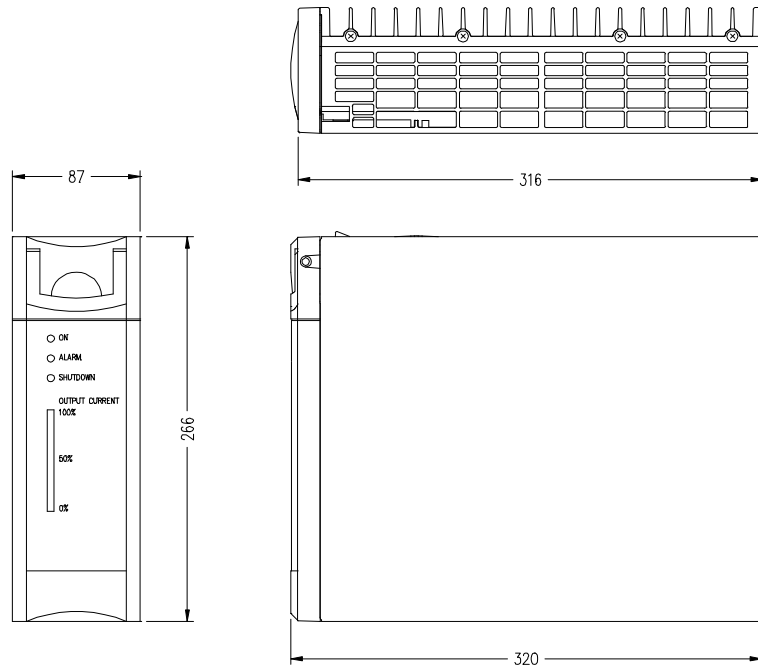
A multi-purpose connector is mounted on the back of the rectifier module; a matching connector is located at the back of the magazine; mating of connectors occurs when unit is plugged into the magazine; the rectifier is mechanically latched to ensure reliable mating.





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Dimensions - rectifier



Front view of 5-way RT4B magazine with air vents and system controller

