RT4F-110V/25A RECTIFIER

The RT4F-110V/25A is a hot-pluggable switched mode rectifier (SMR) module designed to provide up to 25A of output current into a 110V nominal system. Examples of such systems are 60 cells lead acid (136V float, 140V equalize) and 92 cells Nicad (129V float, 147V equalize).

This rectifier has been designed to be used in conjunction with a battery to provide an uninterruptable or standby DC power system. Batteries are charged with constant power for most rapid recharging. 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 (MiniCSU-2). The system can be monitored and controlled remotely using WinCSU software and modem communications. 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-2, making rectifier replacement a completely hands-off operation, other than plugging it in. Illustrated is 5 units in a magazine.

Operating characteristics of the RT4F-110V/25A SMR at 25°C ambient, 230VAC unless otherwise stated.

Input

Voltage[1]:

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

Current:

21A RMS max at 150VAC;
14A RMS at 220 VAC;

Frequency:

50 / 60Hz ± 10%;

Power Factor:

> 0.98 at 40% - 100% load;

Harmonic Distortion:

Current THD < 8% typically at full load when operated with mains voltage THD < 1%;

Efficiency:

Better than 90% at > 50% load at 230VAC;

Inrush Current:

< 8A peak at maximum rated mains voltage;

Soft Start:

Ramp-up time 8 seconds to full load;

Protection:

HRC input fuse with fuse option for both lines;
Overvoltage shutdown at approx. 300VAC;
Undervoltage shutdown at approx. 85VAC;
Input soft start – can be connected to live AC bus;
Will withstand 400VAC (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);

Conversion Frequency:

140kHz for input stage;
180kHz for output stage;

[1] The unit can operate from 90V to 290V, but has the RATED voltage range and tolerance as specified. Specifications apply to 230VAC.

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Output

Voltage:

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

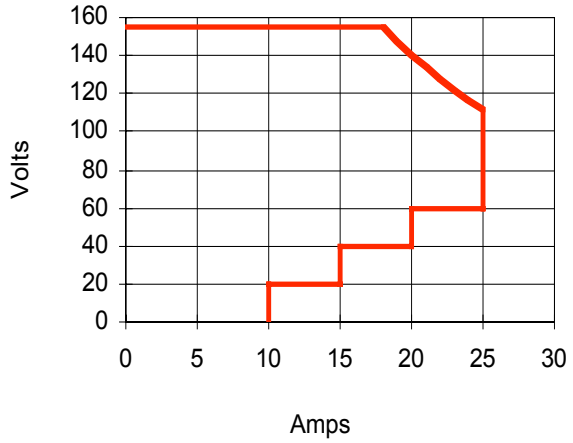
Current Limit:

Range	4 - 25A

Power Limit:

Current limit is automatically reduced in inverse proportion to output voltage at 112V to limit output power to 2800 watts;

Max. current limit : 25.0A at 112V
22.0A at 127V
20.0A at 140V
18.0A at 155V



Static Regulation:
Line: better than ± 0.02%;

Load: terminal voltage drops by 0.65V ± 0.03V from zero to full load (for passive current sharing) for stand alone units, or regulates to better than ±0.05% for MiniCSU controlled units;

Dynamic Regulation:

± 5% for 10% to 90% to 10% step load change;
± 1% of final value within 20ms of step change;
± 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 ± 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;
(2200VDC 100% testing on production units);

Remote Controls (from MiniCSU)

Programmable parameters - Battery menu:

- Float Voltage
- Equalise Voltage

Programmable parameters - SMR menu:

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

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.

External Digital Voltage Control (EDVC):

The SMR Float and Equalise voltages are digitally controlled over a limited range to achieve active current sharing between parallel connected SMRs, for temperature compensation, voltage drop in the DC bus, and to limit the maximum battery recharging current.

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Remote Controls (continued):

Rectifier Inhibit:

Rectifiers can be inhibited by a signal from a remote WinCSU terminal, transmitted via the MiniCSU;

Test Function:

When the test function is activated on the MiniCSU the rectifier LEDs are flashed.

Alarms and Monitoring

Front Panel LED condition table:

Green	Yellow	Red	Condition
0	0	0	Primary power bad
1	0	0	Normal
1	F*	0	Alarm
1	1	0	Equalise
0	F*	1	Shutdown
0	0	1	µP fault

Note: F indicates flashing LED.*

Primary power bad: Indicates that the input AC is off, too low or too high, or that 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, or there is an internal fault in the SMR, such as control loop out of limit or temperature sensor faulty;
µP fault: Internal micro-controller is faulty.

SMR status monitoring:

MiniCSU and WinCSU monitor status of the SMR:

- Output current;
- Heatsink temperature;
- Software version;

Current:

Monitored on MiniCSU and WinCSU with 0.1A resolution; Analog measurement accuracy ± 1% at full load; Optional bar-graph display on rectifier;

Voltage:

System voltage normally displayed on MiniCSU alpha-numeric LCD display. Accuracy ± 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 MiniCSU and WinCSU. The mnemonics listed here appear on WinCSU, but full alarm description appears on MiniCSU.

Alarm table:

Vh *	Output voltage too high
Vl *	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
Nd *	No demand (output terminal voltage higher than internal regulation value)
Lo *	Load current low (less than 0.9A)
Ma *	Operating parameters out of allowable range (or eeprom fault)
Sd	Unit is shut down by remote command - user shutdown
Mr	Internal voltage reference faulty
Mc	SMR communication fault. (Generated within MiniCSU)
Vs	High voltage shut down (output), latched alarm. User setting or fault
Unit Off	Unit is shut down due to AC out of range or SMR primary circuit fault. (normal operation or fault)
Ts	Temperature sensor fault
Dc	DC-DC feedback fault, latched alarm
Ff	Fan failure

*Note: * indicates flashing of alarm led on SMR.*

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Compliances

Safety: Meets IEC60950 (1999);

EMC Emissions and Immunity: CISPR22 class A

Environmental: TBD

EMC Test Levels

Emissions:

Category:		
Harmonics	IEC 61000-3-2	*Class A*
Conducted RF	AC Terminals: CISPR 22 DC Terminals: CISPR 22	*Class A*
Radiated RF	CISPR 22	*Class A*

Immunity:

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

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Environmental

Cooling:

Forced convection cooling using 80mm fan with variable speed temperature control, finger guard and filter. Fan stops if AC power fails or rectifier inhibited remotely. The fan is mounted externally to the rectifier in the magazine.

Temperature:

Operating range:	-25°C to +70°C
Full power range:	-25°C to +50°C
Derated operation:	55% power at +70°C (approx. -70W/°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:	2-9Hz, 1.5mm displacement, all major axes.
	9-200Hz, 0.5g, all major axes
Transport:	5-20Hz, 0.01g/Hz^2 acceleration, 20-200Hz –3dB/oct all major axes.

Shock:

Packaged: 18g 6ms half sine, all major axes

Drop test:

Packaged: 1m drop all faces

Mechanical

Size:

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

Acoustic Noise:

< 55dB (A Weighted)

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 8U of rack height.
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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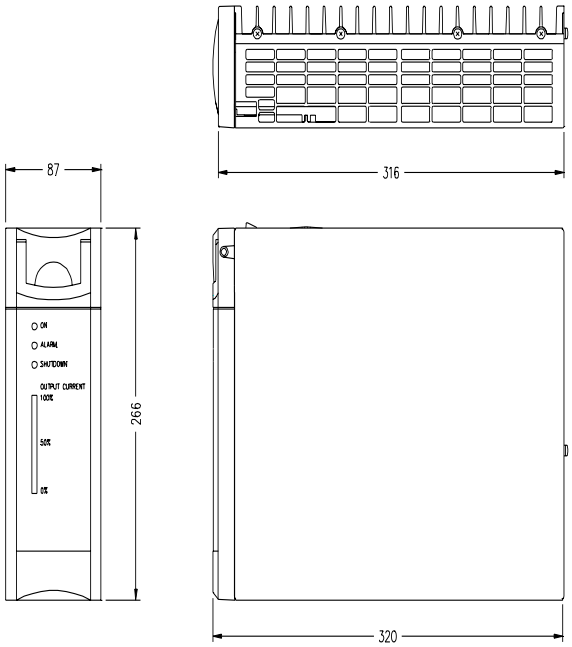
RT4F-110V Rectifier dimensions:



RT4 Subrack dimensions: