SAGEON® MICRO SERIES
24V | 440 to 1400W RECTIFIERS

10-1003

THREE YEAR WARRANTY

The SAGEON® Micro 24V Series Rectifier is a switched-mode rectifier (rectifier) module designed to provide up to 60A of output current into a 24VDC nominal system. This rectifier is available in 440W, 900W, 1200W and 1400W models and has been designed to be used in conjunction with a battery to provide an uninterruptible DC power system. The low noise and high reliability make it ideally suited to telecommunications applications. From 1 to 63 rectifiers can be configured as a system using one control and supervisory unit (SAGEON® Plant Controller). The system can be monitored and controlled remotely using SageView® software.

INPUT

	Rated Output	440W	900W	1200W	1400W**
	Part #	100-7665-2412	100-7665-2425	100-7665-2434	100-7667-2450
AC Line Voltage					
Single phase:		Phase to Phase or Phase to Neutral			
Rated voltage range[1] (VAC):		120 - 240		208 - 240	
Minimum operating voltage (VAC):		85			
Maximum operating voltage (VAC):		285			
Output power de-rating[2]: (linearly increasing as input voltage increases)		none 440W always available	660W at 85VAC to 900W at 120VAC	895W at 85VAC to 1200W at 120VAC	560W at 85VAC to 1400W at 185VAC
AC Line Current					
Line current at 120VAC (A RMS nom):		3.6	8.5	9.0	9.1
Line current at 208VAC (A RMS nom):		2.1	4.8	5.3	7.9
Line current at 230VAC (A RMS nom):		1.9	4.3	4.8	7.1
Line current at 240VAC (A RMS nom):		1.9	4.1	4.6	6.9
Line current limiting (A RMS max):		6.0	10.0	13.0	10.0

** 1400W Rectifier requires high capacity backplane PCB and will not function in a 450, 900, or 1200W power module and vice versa.

Frequency: 50/60Hz ± 10%
Power Factor: > 0.98 for > 50% output power; > 0.99 for 100% output power. Reduced power factor above 275VAC

Harmonic Distortion: Current THD < 5%, typically at full load when operated with mains voltage THD < 2%

Efficiency: Better than 88% from 50 - 100% output power

Inrush Current: < 9A RMS

Soft Start: Ramp-up time 8 seconds to full load

Protection: AC input fuse on both lines. Overvoltage shutdown at approx. 305VAC. Undervoltage shutdown at approximately 70VAC. Fully protected up to 440VAC (for accidental phase-to-phase connection or neutral loss).

Voltage Withstand Test: 1500VAC input to chassis for 1 minute; (2200VDC 100% tested on production units for 2 seconds)

Conversion Frequency: >110kHz

Operating characteristics of the SAGEON Micro 24V Series Rectifier are at 77°F (25°C) ambient, 230VAC unless otherwise stated.

1 The rectifier operates from 85VAC to 285VAC. Nominal AC feed as per the rated voltage range. Rated output current guaranteed over the rated voltage range and rated temperature, altitude, frequency ranges; output is self-limiting.

2 The rectifier provides additional output power (higher output current and/or higher ouput voltage per the output specifications, but additional output power may be reduced under low AC feec voltage conditions as noted.

MECHANICAL

Size:

Width:	8.5in (216mm)
Height:	1.7in (43mm) (1RU)
Depth:	10in (255 mm)
Mass:	5.1lbs (2.3kg)

Mounting Hardware:
All mounting hardware is integrated into the SAGEON® Micro Power Module.

Insertion and Removal:
Rectifiers are hot-swapable and do not require any tools for insertion and removal. Rectifiers slide into the front of the SAGEON® Micro Power Module and secure into place via a self-locking latch. Rectifiers are removed by lifting the latch with a finger and sliding the rectifier forward.

CONNECTIONS

Input, Output, and Communications:
All connections are made through a single pair of multi-pin connectors. One connector is integrated into the rear of the rectifier module; a matching connector is located on the power module; mating of connectors occurs when the rectifier is installed into the power module.

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OUTPUT

Voltage:

Float:	24.0 - 29.0V
Equalize:	25.0 - 29.5V

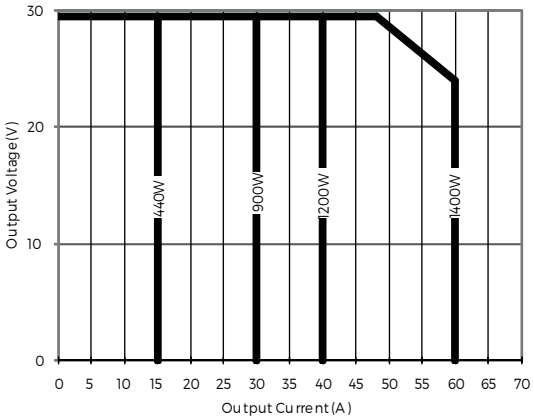
Current Limit:

Range:	20% -120% of Rated Output

Power Limit:
Current limit is automatically reduced in direct proportion to input voltage and in inverse proportion to output voltage.

Minimum Output Current* (A) - Vin 240V				
Rated Output	12A	25A	34A	50A
Power Limit	440W	900W	1200W	1400W
Part #	100-7665-2412	100-7665-2425	100-7665-2434	100-7667-2450
Output (VDC)	Output (Amps RMS) @ 240VAC			
24.0	15.0	30.0	40.0	60.0
27.0	15.0	30.0	40.0	53.8
28.0	15.0	30.0	40.0	50.8
29.5	15.0	30.0	40.0	48.1

* With input voltage at minimum of Rated Voltage Tolerance.



Static Regulation:

Line: Better than ± 0.05%

Load: Terminal voltage drops by 0.21V ± 0.02V from zero to full load (for passive current sharing) for stand alone units, or regulates to better than ±0.05% for SAGEON® Controller controlled units.

Dynamic Regulation:
± 2% for 10% to 90% to 10% step load change
± 1% of final value within 1ms of step change
± 0.2% for a 25% step change in AC input voltage

Noise:
< 0.96mV RMS Psophometrically weighted
< 32dBrnC
< 10mV RMS (10kHz - 100MHz)
< 100mV peak to peak (10kHz - 100MHz)

Load Sharing:
Better than ± 5% of full scale with active current sharing from the SAGEON® Controller.

Protection:
Fusing - protects against reverse polarity connection and protects DC bus if internal components fail.

Hot pluggable - no surge 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. Supplementary thermal overload production is provided.

Voltage Withstand Test:
1000 VAC output to chassis for one minute
(1500VDC 100% testing on production units for 2 seconds)

ENVIRONMENTAL

Cooling:
Forced convection cooling using two 40 mm fans mounted internally with variable speed temperature control. Rectifier draws cool air from the front and exhausts warmed air to the back. Fan stops if AC power fails or rectifier inhibited remotely.

Temperature:

Operating range	-40˚F (-40˚C) to 158˚F (70˚C)
Full power range	-40˚F (-40˚C) to 131˚F (55˚C) 50% power at 158˚F (70˚C)
Storage & Transport	-40˚F (-40˚C) to 158˚F (70˚C)

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

Humidity:
0 to 100% RH condensing including dripping water and icing conditions

Altitude:
Operational to 13,100 ft. (4,000m) (Consult factory above 13,000ft.). Derate maximum ambient temperature by 9˚F (5˚C) per 3,300 ft. (1,000m) above sea level

Acoustic Noise:	< 55dB (A weighted)
Vibration:	
Operational:	2-9Hz,displacement, 9-200Hz, 5m/s^2, Continuous, any direction
Transport:	2-9Hz, 3.5mm displacement, 9-200Hz,10m/s^2 acceleration, 200-500Hz,15m/s^2 acceleration One hour, any direction

Shock:	
Operational:	40m/s² half sine, 11ms duration, any direction
Transport: (packaged)	180m/s² half sine, 6ms duration, any direction
Drop Test: (packaged)	39.4 in (1m) drop all faces

REMOTE CONTROLS (SAGEON® CONTROLLER)

Programmable Parameters - Battery Menu:

- Float Voltage
- Equalize Voltage

Programmable Parameters - Rectifier Menu:

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

Equalize Mode:
The rectifier will automatically enter and exit equalize mode at user specified conditions, or can be manually initiated. Under any fault condition the rectifier will default to the float value.

External Digital Voltage Control (EDVC):
The rectifier float and equalize voltages are digitally controlled over a limited range to achieve active current sharing between parallel connected rectifiers, for temperature compensation, voltage drop in the DC bus to control battery discharge tests, and to limit the maximum battery recharging current. Rectifiers are fully protected against loss of communications and will maintain output.

Rectifier Inhibit:
Rectifiers can be inhibited by a signal from a remote SageView terminal, transmitted via the SAGEON® Controller.

Test Function:
When the test function is activated on the SAGEON® Controller the rectifier LEDs are flashed.

ALARMS AND MONITORING

Front Panel LED Condition Table:

Green	Yellow	Red	Condition
0	0	0	Primary power off
F*	0	0	Primary power bad
1	0	0	Normal
1	F *	0	Alarm
1	1	0	Equalize
0	F *	1	Shutdown

F* indicates flashing LED

Primary Power Off:
Indicates no AC power.

Primary Power Bad:
Indicates that the input AC is too low or too high, or that the primary circuit is faulty.

Normal:
Status is normal

Alarm:

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 is higher than internal regulation value)
Lo *	Load current low (less than 1A)
Ma *	Operating parameters out of allowable range (or eeprom fault)
Sd	Unit is shut down by remote command - user shutdown
Mr	Internal reference voltage fault
Mc (no response)	Rectifier communication fault
Vs	High voltage shut down. Latched alarm. Incorrect user setting or rectifier/system fault.
Off	Unit is shut down due to AC out of range or rectifier primary circuit fault
Ts	Temperature sensor fault
Dc	DC-DC feedback fault. Latched alarm.
Ff	Fan failure or inadequate air flow

* Indicates flashing of alarm led on rectifier.

Equalize:
Rectifier is in equalize mode

Shutdown:
Rectifier is shut down by remote control, or there is an internal fault in the rectifier.

Rectifier Status Monitoring:
SAGEON® Controller and SageView ® monitor status of the rectifier:

- Output current
- Heatsink temperature
- Software version

Current:
Monitored on SAGEON® Controller and SageView ® with 1A resolution; Accuracy ± 1% at full load.

Voltage:
System voltage normally displayed on SAGEON® Controller alpha-numeric LCD display; Accuracy ± 0.5%.

Rectifier Address:
The rectifier address is factory set via dip switches on the rear of the power module.

Rectifier Alarm Monitoring:
The Alarm table shows alarm conditions that are monitored by the rectifier and are displayed on both SAGEON® Controller and SageView ®. The mnemonics listed here appear on SageView, but full alarm description appears on SAGEON® Controller.

COMPLIANCES

Safety:
Designed to IEC60950:1999; UL60950:2000

EMC Emissions and Immunity:
ETSI EN 300 386 V1.3.2 (2002-12)

Environmental:
ETSI EN 300 019

EMC TEST LEVELS

Emissions:

Category	Tested to	
Harmonics	IEC 61000-3-2	Class A
Flicker	EC 61000-3-3	Class B
Conducted RF	AC Terminals: CISPR 22; DC Terminals: CISPR 22	Class B / Class A
Radiated RF	CISPR 22	Class B

Immunity:

Category	Tested to	
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: 2kV on load and 1kV on comms 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) (6kV/3kA Common Mode [CM] on AC lines) (6kV/3kA Differential Mode [DM] on AC lines) (Level 3: 2kV CM, 1kV DM on DC lines) IEC 61000-4-12 (Ring Wave) (6kV/500A, 100kHz CM & DM on AC lines) (Level 3: 2kV CM, 1kV DM on DC lines)	 Criterion B Criterion B Criterion B Criterion A Criterion B
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: 100% dip for 10ms) (Level: 30% dip for 500ms) (Level: 60% dip for 1000ms) (Level: 100% dropout for 5s)	 Criterion A Criterion A Criterion B Criterion B

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