SYSGRATION®

Performance Specifications

Product:	Off-Grid Inverter/Charger
Model:	Inverter III SM120Vac series
Document No.:	

Revision History

Rev.	Date	Description	Prepared By	Approved By
X1	2010/08/31	Draft	Sysgration	

INDEX TOPIC

1.0 Product Scope

This document defines the functional requirements, SM series of products ranging in power levels from 1000W to 3600W. The Inverter/Charger product is an AC line powered uninterruptible power supply that provides AC power with battery backup outlets. The Inverter is an auto frequency ranging, Standby, Power System. This document collectively defines the electrical, mechanical, environmental, and reliability specifications, as well as safety and EMC/EMI requirements. The Inverter automatically maintains continuity of electrical power within tolerances and time frames specified in this product performance specification

2.0 Product Highlights

Model	DC Voltage	Watt Rating	Operating Voltage	Input Connection	Output Connections
SM 1012-120	12Vdc	1000Watts	120Vac	Terminal	Terminal
SM 1024-120	24Vdc	1000Watts	120Vac	Terminal	Terminal
SM 1512-120	12Vdc	1500Watts	120Vac	Terminal	Terminal
SM 1524-120	24Vdc	1500Watts	120Vac	Terminal	Terminal
SM 2412-120	12Vdc	2400Watts	120Vac	Terminal	Terminal
SM 2424-120	24Vdc	2400Watts	120Vac	Terminal	Terminal
SM 3624-120	24Vdc	3600Watts	120Vac	Terminal	Terminal

3.0 Electrical Requirements

3.1 AC Input

Item	1012	1024	1512	1524	2412	2424	3624
Acceptable Input Voltage Range	85 – 135 Vac for 120V						
Cold Start (0 to 100% load)	Yes						
Frequency	50/60Hz Auto select 56 to 64Hz @ 60Hz 46 to 54Hz @ 50Hz						
Low Loss / Recovery	56/57 Hz ± 1Hz @ 60Hz 46/47 Hz ± 1Hz @ 50Hz						
High Loss / Recovery	64/63 Hz ± 1Hz @ 60Hz 54/53 Hz ± 1Hz @ 50Hz						
Protection type	Re-settable Circuit Breaker						
Circuit Breaker	15A	15A	25A	25A	40A	40A	60A
Plug	Terminal						
Surge Energy Rating	> 220 joules						
Let Through	5%, 6 KV Ring wave ANSI C62.41-1991 Cat 3						
Response Time	0 ns normal mode, < 5 ns common mode						
AC Leakage Current	<5mA						

3.2 AC Output, Normal Mode

Model	1012	1024	1512	1524	2412	2424	3624
Power (Watts)	1000W		1500W		2400W		3600W
Output Current (continuous) RMS	10A		15A		24A		36A
Load Power Factor	0.7 ~ 1.0						
Output Voltage - Waveform - Line Mode Voltage - Line Mode Voltage Regulation - Efficiency with fully charged	Same as input Factory Preset Value 85 – 135Vac (±3%) Normal mode>95%						
Transfer and Reset Points:	Brownout Transfer Point – 85V(+/-3%) Brownout Reset point – 90V(+/-3%) Overvoltage Transfer point -135V (+/-3%) Overvoltage Reset point – 133V(+/-3%)						
Transfer Time	8 ms typical, 12 ms max.						
Output Frequency -Nominal output frequency	Same as Input						
Short-Circuit Protection Line Mode	Re-settable Circuit Breaker and Electronically Limited						
Surge Power Capability	Same as circuit breaker						

3.3 AC Output, Battery Mode

Item	1012	1024	1512	1524	2412	2424	3624
Power (Watts)	1000W		1500W		2400W		3600W
Load Power Factor	0.7 ~ 1.0						
Output Voltage - Waveform - Output Voltage Regulation - Peak Voltage	Simulated Sine wave Nominal 120V +/- 5% until LBW, +- 10% Max. 180V peak						
Output Frequency & Regulation	50/60Hz +/- 0.5Hz Cold start frequency : 120V @ 60Hz						
Total harmonic distortion (THD) **- Typical(linear load)** **- Maximum**	< 3.5% < 5%						
Battery Runtime	Depend on batteries and load capacities						
Efficiency (Peak)	> 85%						
Short Circuit Protection	Active Electronic (Current Limit)						
Overload Capability - 1 second Surge current - 10 seconds Surge power (real watts) - 1 minute Surge power (real watts)	15A 130~149% 110~129%		22A 130~149% 110~129%		36A 130~149% 110~129%		**54A** **130~149%** **110~129%**

3.4 Battery (Discharge / Charge)

Model	1012	1512	2412	1024	1524	2424	3624
Nominal DC Voltage	12V			24V			
Input Voltage Rating	10 ~ 15V			20 ~ 30Vdc			
DC Input Max. Current (Discharge)	130A	165A	264A	65A	82.5A	132A	198A
Battery Protection - Battery-low alarm - Discharge prevention DC leakage current	Fuse not user replaceable 11V / 22V start alarm 10V / 20V ±3% <30uA +/-10uA						
Charging Voltage @ 25℃ Float/Equalize (Default value)	13.8V/14.5V			27.6V/29V			
Charging Current Adjustable	**4~40A**	**5~50A**	**8~80A**	**2~20A**	**2.5~25A**	**4~40A**	**6~60A**

3.5 FAN Operation

Fan Operation

Variable speed fan operation is required in invert and charge mode. This is to be implemented in such a way as to ensure high reliability and safe unit and component operating temperatures in an operating ambient temperature up to 50℃.

- Speed to be controlled in a smooth manner as a function of internal temperature and/or current.
- Fan should not start/stop suddenly.
- Fan should run at minimum speed needed to cool unit.
- Fan noise level target < 65dBA @ 1 meter.
- Each speed continue 3 minutes.

The fan logic as below:

Condition	Enter condition	Leave condition	Speed
Heat Sink Temp.	T ≦50℃	T > 65℃	OFF
	65℃≦ T < 85℃	T ≦ 60℃ or T ≧ 85℃	50%
	T > 85℃	T ≦ 70℃	100%
Charge Current	Standby	Charge	OFF
	25 < I < 50%Max	Standby or I ≧ 50% Max.	50%
	I > 50% Max.	I ≦ 40% Max.	100%
Load % (Invert Mode)	Load < 30%	Load ≧ 30%	OFF
	30% ≦ Load < 50%	Load ≦ 20% or Load ≧ 50%	50%
	Load ≧ 50%	Load ≦ 40%	100%

4.0 Mechanical

Model	1012	1024	1512	1524	2412	2424	3624
Enclosure	Powder coated steel						
Case Dimension H x W x L	415 x 225 x 183mm				520 x 225 x 183mm		
Unit Weight	22.5kg	22.5kg	22.5kg	22.5kg	24.5kg	24.5kg	25kg

4.1 Packing

Individual unit packaging box will be carton packaging. The shipping container shall be a commercial grade, brown carton. Packaging shall provide protection for the inverter against damage, breakage or loss during shipment and shall be of a type not destroyed by opening. The packing shall also be capable of withstanding multiple shipments without breaking.

4.1.1 Accessories Matrix

Accessory
User's Manual
Quick Install Guide

4.2 Color

White

5.0 Environmental

5.1 Temperature

Operating Range : -20℃ to +45℃: 0 to 1500 meters above sea level.
-20℃ to +35℃: 1501 to 3000 meters above sea leve l.
Transit and storage : -25℃ to +70 ℃.

5.2 Altitude

Operational Elevation: 0 – 1500 Meters, -20 - +40°C; 1501 – 3000 Meters, -20 - +35°C

5.3 Relative Humidity

0 - 95% non-condensing

5.4 Acoustic

Maximum noise generated under normal operation on utility operation shall be less than 55 dB, "A" weighted (when fan turn off). Maximum noise generated on battery operation shall be less than 70 dB. All measurements shall be taken 1 meter from the nearest surface of the Inverter. The audible alarm shall produce a constant frequency and amplitude tone of 60 to 80 db.

6.0 Controls and Status Indicators

6.1 Controls

The inverter shall contain a user-operated On/Off Standby switch and two piano switches. Activating the Standby side of the switch turns on or off power to the output receptacles. Pressing the piano switch to change the charger voltage/current setting.

6.1.1 Auto-Restart

After battery low cut off, if AC recover. Inverter can auto restart working normal, But if AC does not recover for a long time, or CPU detected battery voltage continues 10s lower than 9.5V+/-0.3V, then CPU will turn off the system power. If AC recovers, Inverter can not start to output.

6.2 Automatic Self Diagnostic Tests

The inverter shall perform automatic self-diagnostic tests at turn on: Flashing all LEDs during self-diagnostic.

6.2.1 Automatic Self Diagnostic Test: Power ON

Whether the utility power has been qualified or not, moving the inverter “on/standby”. Pushing the switch to the “on” position shall initiate the inverter to perform start-up tests. These tests, consisting of an electronics test and a battery test shall occur prior to enabling output power.

6.3 Status & Audio Indicators

The inverter shall provide the operator with both visual and audible status indicators. Visual indicators shall consist eight LED’s provides complete information.

LED and Alarm Indicator for 12V system

	LED 1	LED 2	LED 3	LED 4	Alarm
AC Normal	Off	On/Blink	Off	Off	Off
DC Model	On	Off	Off	Off	Off
Battery Low (DC Mode)	On	Off	Off	On	1 beeps @ 5 sec, last for 3Min.
Low Battery Cut Off (LBCO)	Off	Off	Off	On	1 beep @ shutdown
Battery High (DC Mode)	On	Off	Off	blink	1 beep @ 0.5sec
Overload (DC Mode)110%	On	Off	On	Off	1beeps @ 0.5 sec
Overload (DC Mode)130%	On	Off	On	Off	Constant on
Overload (DC Mode)150%	On	Off	On	Off	Shutdown
Bypass Output (Power Off)	Off	Off	Off	Off	Off

LED and Alarm Indicator for 24V system

	LED 1	LED 2	LED 3	LED 4	Alarm
AC Normal	Off	On/Blink	Off	Off	Off
DC Model	On	Off	Off	Off	Off
Battery Low (DC Mode)	On	Off	Off	On	1 beeps @ 5 sec, last for 3Min.
Low Battery Cut Off (LBCO)	Off	Off	Off	On	1 beep @ shutdown
Battery High (DC Mode)	On	Off	Off	blink	1 beep @ 0.5sec
Overload (DC Mode)110%	On	Off	On	Off	1beeps @ 0.5 sec
Overload (DC Mode)130%	On	Off	On	Off	Constant on
Overload (DC Mode)150%	On	Off	On	Off	Shutdown
Bypass Output (Power Off)	Off	Off	Off	Off	Off

Note: 1. When the inverter switch to DC mode from AC mode or switch to AC mode from DC mode, the alarm will sound 1 beep .

2. When the battery voltage reach LBCO voltage, the alarm will sound 1 beep and the inverter will shut down.

6.4 Battery over charge protection alarm.

Floating voltage : 13.8V / 27.6V.
Over 14.5V/29.0V : Alarm (Red LED blinking & three beeps every five seconds), turn Charger off.
Over 16.0V/32.0V : Alarm (Red LED blinking & three beeps every five seconds), discharge the Battery until shutdown.