M1012 SERIES

DOUBLE-CONVERSION ONLINE UPS



19" RACKMOUNT, 1U HIGH, MILITARY GRADE,

UNIVERSAL INPUT RANGE, PURE SINE-WAVE OUTPUT,

UP TO 1.25kW/1.5kVA.

STACKABLE TO 7.5kW SINGLE-PHASE or 3.75kW 3-PHASE

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Highlights

- Input / Output isolation
- Pure sine-wave output
- Remote control and telemetry
- Internal EMI filters
- Battery Management System
- Battery hot-swappable
- Safe $LiFePO_4$ battery chemistry
- Stackable for future proofing
  - 1-phase: up to 7.5kW
  - 3-phase: up to 3.75kW
- High efficiency design
- Protected against:
  - Short-circuit / Overload
  - Output over-voltage
  - Over temperature

Electrical Specifications

Input

Voltage range[1]: 85 to 265 V_{RMS}
Frequency: 47-63 Hz / 400 Hz
High Power Factor[2]: > 0.98
Operates through transients IAW MIL-STD-704A-F

Output (Preset in factory)

Voltage: Up to 230V_{AC} /400V_{DC}
Frequency: Up to 800 Hz
Real Power: Up to 1250 W
Apparent power: Up to 1500 VA
Reactive power: Up to 830VAr

Isolation

Input to Output: 1000 V_{DC}
Input to Case: 1000 V_{DC}
Output to Case: 1000 V_{DC}

Output Voltage Regulation

Less than ±3% (no load to full load, –20°C to +50°C).

Output Waveform

Pure sinewave synthesized from a crystal oscillator, with THD_V <1.5% into a linear load.

EMC

Designed to meet[3] MIL-STD-461F CE101, CE102, CS101, CS114, CS115, CS116, RE102, RS103

Backup

Backup (full load, 0°C to +50°C): > 10 minutes
Charge time from depleted to full capacity (0°C to +40°C): < 6 hours
Battery life expectancy: at least 1000 cycles.

Cooling

Self-cooled by two internal fans.
Thermally controlled fan speed, to reduce noise & increase reliability.
Can operate with reduced performance in case of fan failure.
Fan assemblies are user replaceable.

[1] Power capability is derated to 1000W below 102V_{RMS}. DC input optional with special variant. consult factory.
[2] Measured at 115V/60Hz with full resistive load
[3] Compliance achieved with shielded cables

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Protections [4]

Input

- **Under Voltage Lock-Out**
  Input stage shuts down when input voltage falls below 80 V_{RMS}
- **Surge Suppressor**
  Protection against fast transients
- **Catastrophic Failure Protection**
  20A circuit breaker on input line, to protect the user's system in case of internal failure.

Output

- **Overvoltage Protection**
  Output shuts down if output voltage exceeds a preset value due to internal failure.
- **Current Limiting**
  Current waveform is clamped (~21Apk@115V_{RMS}), and the output current shape will be a sinewave with a "flat top", approaching a square wave at short circuit.
- **Short Circuit Protection**
  At high overload/short-circuit, the output hiccups several times. If the high loading/short persists, the output will be shut down.

General

- **Over Temperature Protection**
  - **UPS** shuts down individual modules if their internal temperature exceeds a preset threshold. UPS resumes operation automatically upon cooldown.
  - **Charger/discharger** disconnects the battery if its temperature exceeds a preset threshold. In this case, the UPS continues operation *without backup*. Charger/discharger resumes normal operation automatically upon battery cool down.
- **Battery Management System**
  - **Overcharge:** Electronically disconnects the battery if overcharge state is detected.
  - **LVD:** Electronic Low Voltage Disconnect if battery voltage drops below preset threshold.
  - **Over Temperature:** Electronically disconnects the battery if the internal temperature exceeds a preset threshold.

[4] Thresholds and protections can be modified / removed – please consult factory.

Environmental Conditions

Designed to meet MIL-STD-810G

Temperature
Methods 501.5 & 502.5
Operating: -20 °C to +50 °C (ambient)
Charging: 0 °C to +40 °C (ambient)
Storage: –30 °C to +60 °C (ambient)

Altitude
Method 500.5
Procedures I – up to 40,000 ft. (non-operational)
Procedure II – up to 30,000 ft. (operational)

Humidity
Method 507.5
Up to 95% RH

Salt Fog
Method 509.5

Vibration
Method 514.6
Category 24 (IAW Figure 514.6E-1)
General minimum integrity exposure
1 hour per axis.

Fungus
Method 508.6

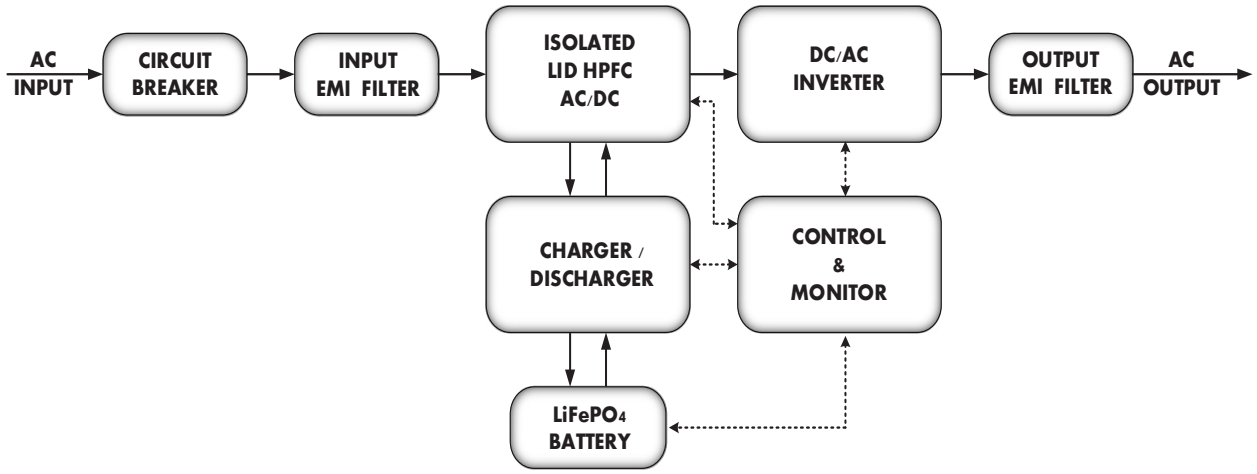
Shock
Method 516.6
20g, 11ms terminal peak saw-tooth

Sand & Dust
Method 510.5
Procedures I & II

Acceptance Test Procedure (ATP) & Environmental Stress Screening (ESS)

All units go through standard ATP and 24 hours burn-in.
In addition, ESS (random vibration and thermal cycling) tests can be performed on each unit – please contact factory for further details.

Simplified Block Diagram



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Front Panel Layout



Switches

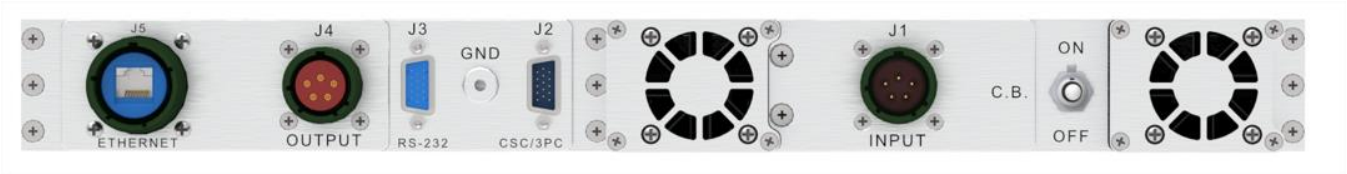
Name	Description
PWR (Toggle switch)	Turns UPS ON or OFF
Multifunction (Momentary push button)	• Silences active audible alarm • Turns output voltage OFF (Charge-only mode) • Prepares the UPS for battery hot-swap (disconnects battery pack)

Indications

Name	Description
INPUT OK	Input voltage in range
OUTPUT OK	Output voltage in range of nominal value
BATT IN USE	Battery discharging (UPS provides backup)
LOW BATT	Battery discharged to below 20% of full capacity.
OVER TEMP	Internal temperature exceeds a preset threshold. Indication resets when internal temperature drops back to normal
FAN A/B FAIL	FAN A / FAN B does not operate normally.
FAIL	General failure.

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Back Panel Layout



Switches

Name	Description
AC INPUT ON/OFF	250V / 20A circuit breaker. Connects the UPS to the input voltage line and provides overload and short circuit protection against internal failures.

Connectors

Designation	Name	Description
J1	INPUT	Input voltage connection. Single-phase, 85-265V_{rms}, 47-63Hz / 400Hz
J2	RS-232	Remote communication, telemetry and control over RS-232 protocol. Remote controlled standby mode (via dry contact).
J3	CSC/3PC	The UPS can be configured to operate in parallel with other UPSs in current share mode, or in a 3-phase connection, by connecting an appropriate cable to this connector.
J4	OUTPUT	Output voltage connection. Single-phase, 115/230Vrms, 50/60/400Hz/Other (depending on model)
J5	ETHERNET	Remote communication, telemetry and control, over Ethernet protocol.

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Pin Assignment

J1 – INPUT connector

Connector type: D38999/20WD5PN or eq.

Mates with: D38999/26WD5SN or eq.

Pin No.	Function
A	GND
B	Neutral
C	Neutral
D	Line
E	Line

J2 – RS-232 connector

Connector type: M24308/23-39F or eq.

Mates with: M24308/4-3F or eq.

Pin No.	Function
1	N/C (for future use)
2	N/C (for future use)
3	N/C (for future use)
4	RMT_OUT_SHDN
5	RMT_SHDN
6	Rx
7	N/C (for future use)
8	N/C (for future use)

Pin No.	Function
9	N/C (for future use)
10	N/C (for future use)
11	Tx
12	5V_SIG
13	SIGNAL RTN
14	N/C (for future use)
15	RMT_SHDN_RTN

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J3 – CSC/3PC connector

Connector type: DD15M3000C-15 or eq.

Mates with: DD15S1000C-15 or eq.

Pin No.	Function
1	AC_OFF_OUT
2	SET_SLV
3	PH_SLV_CFG
4	CRNT_SHR_OUT
5	CRNT_SHR_OUT_REF
6	AC_OFF_IN
7	SYNC_IN
8	CRNT_SHR_IN

Pin No.	Function
9	SET_PH0
10	SET_PH1
11	SYNC_OUT
12	CRNT_SHR_IN_REF
13	SIGNAL_RTN
14	SLV_D_P
15	SLV_D_N

J4 – OUTPUT connector

Connector type: D38999/20WD5SN or eq.

Mates with: D38999/26WD5PN or eq.

Pin No.	Function
A	GND
B	Neutral
C	Neutral
D	Line
E	Line

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Functions

Pure Sine-Wave Output Voltage

The UPS employs a double-conversion online topology. In this topology, the output voltage is ALWAYS generated inside the UPS, whether the input power is available or not.
This means that the load does not suffer from common problems of grid or generator connected loads, such as surges, sags, brown-outs, spikes, frequency transients and high harmonic content.
This also means that the transfer from grid to battery backup, and vice versa, is seamless.

Backup

The UPS contains a plug-in, hot-swappable, $LiFePO_4$ Battery Pack (MPS P/N M1012-3801), that provides, when fully charged, at least ten minutes of backup operation at full load when ambient temperature is between 0°C to +50°C, in case of input power loss. Operation at lower temperature down to -20°C is possible with reduced load.

Current Share

This connector is used to connect a stack of up to six (6) UPS devices in parallel, in order to enable load current sharing. (Modification can be made to enable stacking of more than six UPSs. Please contact the factory for more details).
See parallel connection scheme in the M1012 User Manual.

3-Phase Configuration

This connector is used to connect three units, in order to enable 3-phase connection, to support 3-phase loads of up to 1.25kW/1.5kVA per phase.
See 3-phase connection scheme in the M1012 user manual.

Load Gauge

The UPS provides a ten-level load gauge, visible on the front panel and through the telemetry communication channels.

Battery Fuel Gauge

The UPS provides a ten-level battery fuel gauge, visible on the front panel and through the telemetry communication channels.

Alarm

The UPS provides alarms for various events, that can be viewed on the front panel and audibly heard. The alarms can also be viewed through the telemetry communication channels.

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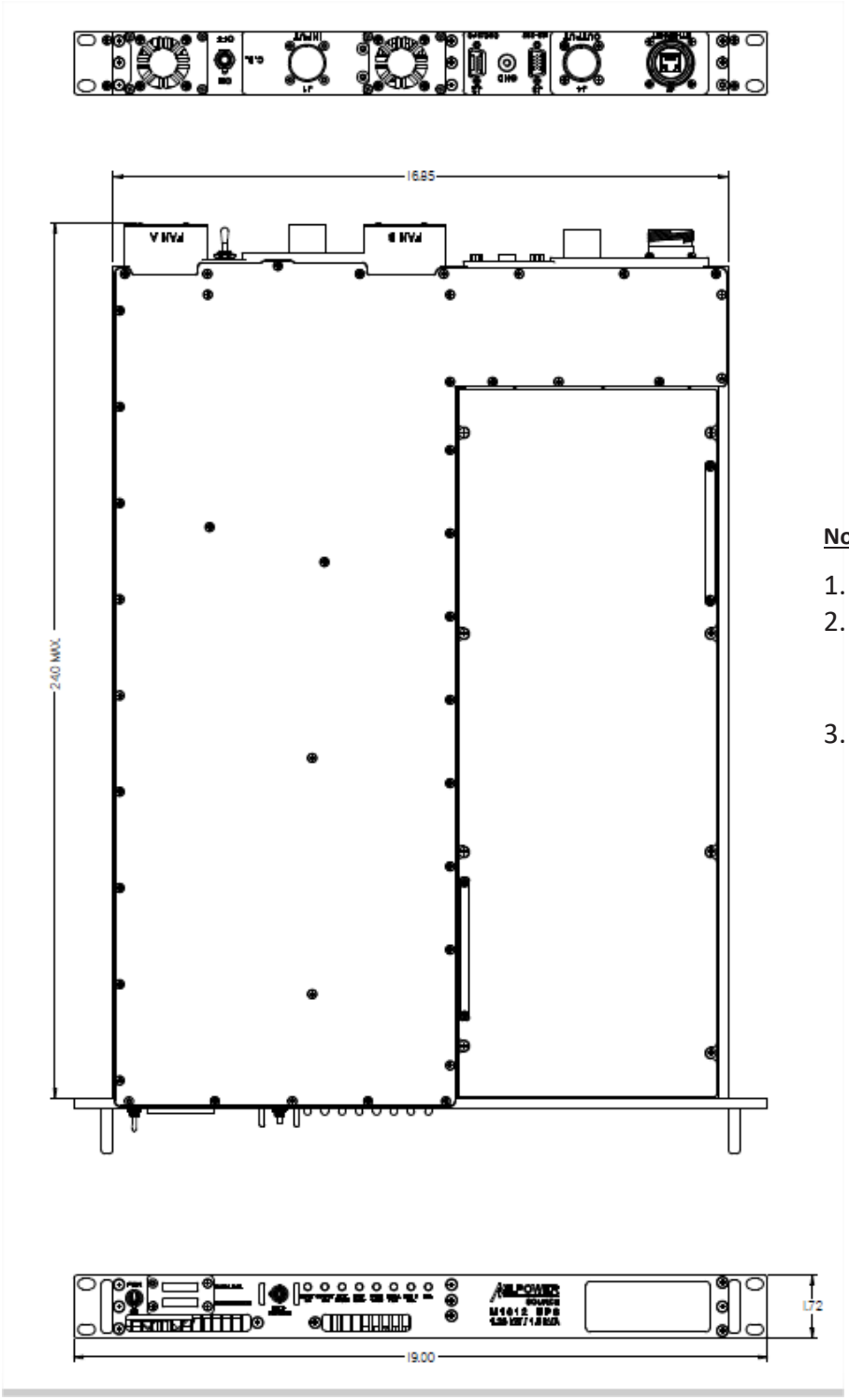
Cooling

The UPS uses two internal fans to cool itself during operation.
The fans speed is determined by the internal temperature.

A fan failure is a rare event. The fan's expected life is 40,000 hours @ 60°C ambient, or 70,000 hours @ 40°C ambient. However, if this failure occurs, please replace the fan as soon as possible. A spare part can be purchased from us for this purpose (MPS P/N M1012-3901).
Please refer to M1012 User Manual for maintenance instructions.

In case of a fan failure, the appropriate FAN FAIL LED will light up on the front panel, and an indication will appear through the remote communication channel. The UPS will not shut down due to the fan failure itself, but it may shut down due to internal over temperature, that can occur at high power levels and within the normal ambient temperature range.

Outline Drawing



Notes

1. Dimensions are in inches
2. Tolerance is:
   .XX ±0.01 in
   .XXX ±0.005 in
3. Weight: Approx. 36 lbs.

Note: Specifications are subject to change without prior notice by the manufacturer

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