



ANALYTIC SYSTEMS

Power Conversion Solutions

INSTALLATION & OPERATION MANUAL

IPSi300W Series PURE-SINE INVERTER



An ISO9001 Registered Company Battery Chargers • Inverters • Power Supplies • Voltage Converters

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www.analyticsystems.com

INVERTER

IMPORTANT SAFETY INSTRUCTIONS

1. SAVE THESE INSTRUCTIONS — This manual contains important safety and operating instructions for the Inverter.
2. Do not expose the Inverter to rain or snow.
3. Use of an attachment not recommended or sold by the Inverter manufacturer may result in a risk of fire, electric shock, or injury to persons.
4. Do not disassemble the Inverter; take it to a qualified serviceman when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
5. To reduce risk of electric shock, disconnect the Inverter from the input power before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
6. Never place the Inverter directly above a battery; gases from the battery will corrode and damage the Inverter.
7. Never allow battery acid to drip onto the Inverter.

GROUNDING AND AC POWER CORD CONNECTION INSTRUCTIONS — Inverters should be grounded to reduce risk of electric shock. This Inverter is equipped with a chassis grounding stud, and electric receptacles capable of accepting an equipment-grounding conductor and a grounding plug.

Medical Equipment Notice

Analytic Systems does not recommend the use of their products in life support applications where failure or malfunction of this product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness. Analytic Systems does not recommend the use of any of its products in direct patient care. Examples of devices considered to be life support devices are neonatal oxygen analyzers, nerve stimulators (whether used for anesthesia, pain relief, or other purposes), auto-transfusion devices, blood pumps, defibrillators, arrhythmia detectors and alarms, pacemakers, hemodialysis systems, peritoneal dialysis systems, neonatal ventilator incubators, ventilators for both adults and infants, anesthesia ventilators, and infusion pumps as well as any other devices designated as "critical" by the U.S. FDA



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Introduction

The IPSi300W series of *Intelligent Pure Sinewave* Inverters are designed specifically for running computers and other sensitive AC loads in rugged, mobile, off-grid environments. This unit produces up to 300 watts of pure sine wave AC power, identical to a conventional AC outlet.

This IPSi300W series Inverter is run by a sophisticated Digital Signal Processor (DSP) for optimal control and the maximum operating efficiency. The heavy-duty Toroidal Power Transformer steps up the low voltage AC produced by the Power MOSFET transistors to either 110 or 220 VAC at 50 or 60 Hz and filters the AC output to reduce or eliminate electrical noise that can interfere with sensitive communications equipment.

This model is sealed to the IP66 standard. The innovative design employs watertight connectors and a custom CNC machine billeted chassis to protect the unit from dust ingress and water ingress.

Built with the Off-line UPS option, this unit has an additional AC Input connection on the front panel and can function as a backup power supply. In the event of an AC power failure, the inverter will automatically switch to using its DC power source to power the load until such time that AC power is restored.

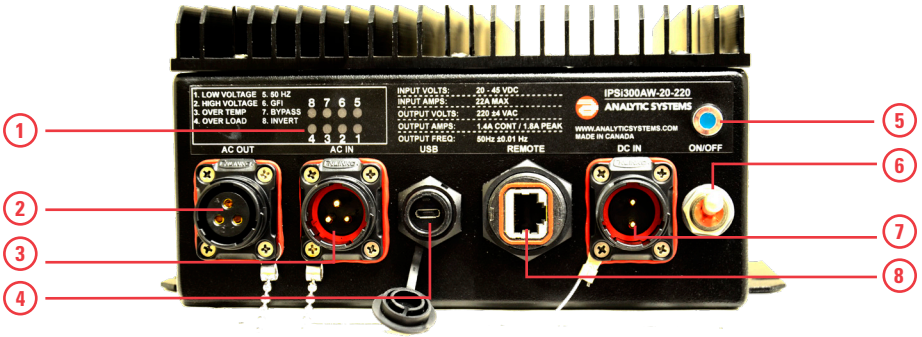
Using the free-to-download InverterWizard software, you can customize the Inverter's capabilities, selecting output frequency and voltage as well as setting the unit's low voltage shutdown parameters from any PC through a standard USB interface.

FEATURES

- Fully regulated Pure Sine Wave output at 110 VAC or 220 VAC / 50 Hz, identical to commercial AC.
- Digitally controlled for precision frequency (± 0.01 Hz) at 50 Hz or 60Hz.
- Modern MOSFET technology and sophisticated Digital Signal Processor control for efficient and reliable operation.
- AC-powered output LED for positive indication of proper operation.
- Transformer-type output to protect computers and other sensitive equipment from surges and spikes.
- Low voltage warning and shutdown circuitry to protect the load.
- Over voltage warning, over temperature warning, and shutdown circuitry to protect the Inverter.
- Short circuit protection and ground fault detection.
- Front panel LED indicators and a loud buzzer to bring alarms and faults to attention.



Main Parts



Front Panel

1. **Indicator LEDs**
2. **AC Output:** CNLINKO YM-20-J03SX-01-001c/w cover
3. **AC Input:** CNLINKO YM-20-C03SX-01-001 c/w cover
4. **USB:** IP68-rated microUSB port c/w cover
5. **AC Power Output LED**
6. **On/Off Switch**
7. **DC Input:** CNLINKO YM-20-C02SX-01-001 c/w cover
(-20V & -40V models: CNLINKO YM-20-C04SX-01-001 c/w cover)
8. **Remote Connector:** RJ45-8P8C c/w cover

Box Contents

The box you have received should contain the following:

- One IPSi300W Inverter
- One MicroUSB to USB cable
- This User Guide (A PDF copy can be downloaded from www.analyticsystems.com)
- One Warranty Card

If anything is missing or damaged please contact your dealer or Analytic Systems for a replacement.



Operation

Before operating, this unit should be properly connected to a load and source of DC power as shown in the Installation section.

To turn the unit ON, move the On/Off switch to the ON position to energize the circuitry. The AC Output LED will glow green to indicate the presence of AC power at the output terminal. Then either the 50 Hz or 60Hz LED will glow green to indicate the unit's output frequency. The unit is factory preset for 50Hz output. The output frequency can be changed using the InverterWizard software.

To turn the unit OFF, move the On/Off switch to the OFF position. It is safe to disconnect the power source of and load, once all the LEDs on the unit have turned off.

Indicators

The front panel of the IPSi300W features eight LED indicators to display the unit's operational state. For more information about the alarm conditions, see *Troubleshooting*.

The functions of the LED indicators are detailed below:

1. **Low Voltage:** This LED blinks red when the input voltage is near the lower limit for proper operation. It glows red when the input voltage is too low for proper operation. The Bypass LED will also glow red and the AC Output Power LED will turn off.
2. **High Voltage:** This LED blinks red when the input voltage is near the upper limit for proper operation. It glows red when the input voltage is too high for proper operation. The Bypass LED will also glow red and the Invert LED will turn off.
3. **Over Temp:** This LED blinks red if the internal temperature of the Inverter is approaching the safe limit. As it approaches this limit the Inverter will derate its maximum power rating to try to maintain a safe operating temperature. It glows red if the Inverter becomes too hot to operate. The Bypass LED will also glow red and the AC Output Power LED will turn off.
4. **Over Load:** This LED blinks red if the output current being drawn on the Inverter reaches the continuous rating. It glows red if the current drawn on the Inverter reaches the maximum rating.
5. **50 Hz:** This LED glows green if the Inverter's output frequency is set for 50 Hz operation. This setting can be changed using the InverterWizard program.
6. **60 Hz:** This LED glows green if the Inverter's output frequency is set for 60 Hz operation. This setting can be changed using the InverterWizard program.



- 7. **Bypass:** This LED glows green if the Inverter is in Bypass mode. In this mode, the Inverter can be connected an AC Power input and act as a backup power source in event of AC power failure. This is only available on units with the Off-Line UPS option. This LED glows red if the Inverter is experiencing an alarm condition as described above.
- 8. **GFI:** This LED glows red if the Inverter detects a ground fault. The Ground Fault Safety Circuit can be disabled if it is interfering with an application. For more information see *Ground Fault Safety Circuit*.

Installation

Mounting

Mount the unit in a WELL VENTILATED area. Allow at least one inch (2.54 cm) of clearance all around the unit for adequate cooling.

CAUTION: Do not mount the unit anywhere explosive gases may accumulate. A slight arc may occur when the power leads are connected, and in the unlikely event of a failure, sparks may be generated inside the unit.

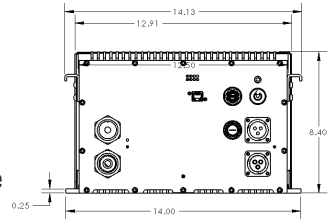
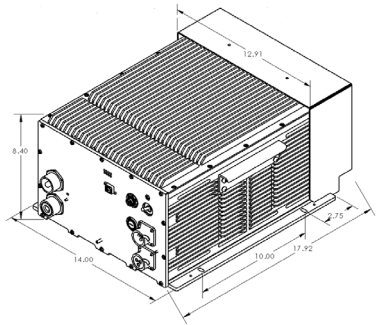
Grounding

The chassis of the Inverter is connected to AC Ground and AC Neutral to meet regulatory requirements and to reduce the possibility of it generating any radio frequency interference. The case must be bonded appropriately to the grounding system of the vehicle or marine vessel.

On a vehicle, bond the Inverter case to the vehicle's frame. On a marine vessel, bond the case to the vessel's hull. A grounding stud is provided on the front panel for this purpose. To ensure proper grounding, check the connection with an ohmmeter. The chassis is isolated from the DC input, so the DC power can be on a different ground from the AC output.

Disconnecting

If you need to disconnect the Inverter for service or storage, move the power switch to the OFF position and disconnect the DC input. Then while disconnected, move the power switch to the ON position turn and leave it in that position least one minute to discharge the storage capacitors. Return the switch to the OFF position.

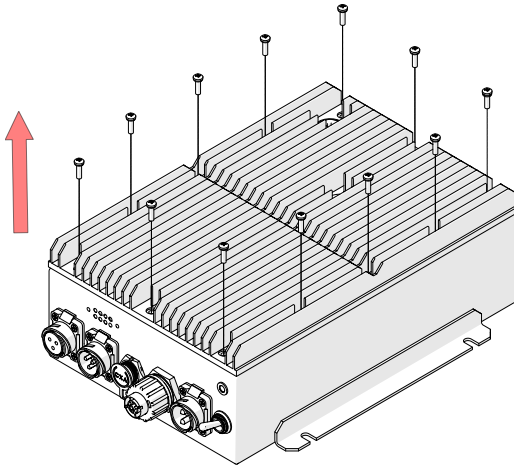




Fuse Replacement

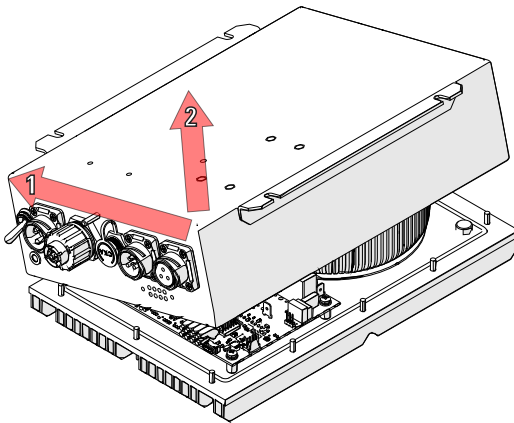
This unit is equipped with an ATC blade fuse as a safety feature. The 12V input model is equipped with two ATC blade fuses. If initial start-up blows the fuse(s), the input power is likely connected in the wrong polarity. Operation can be restored by reconnecting the input power in the correct polarity and replacing the fuse(s)

If the fuse blows while the unit is normal operation, likely the cause is an internal component failure and replacing the fuse will not restore normal operation.



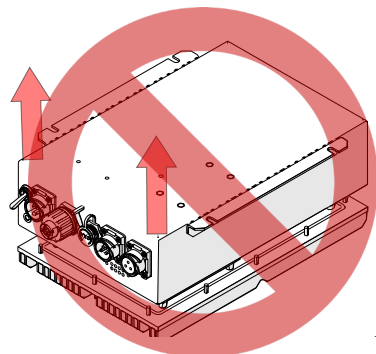
1. Remove the 12 screws and washers holding the heatsink to the cover panel.

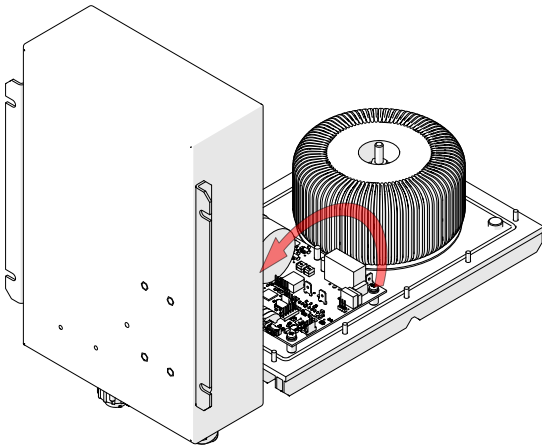
Then the two pieces together, turn the unit over, resting it on the heatsink.



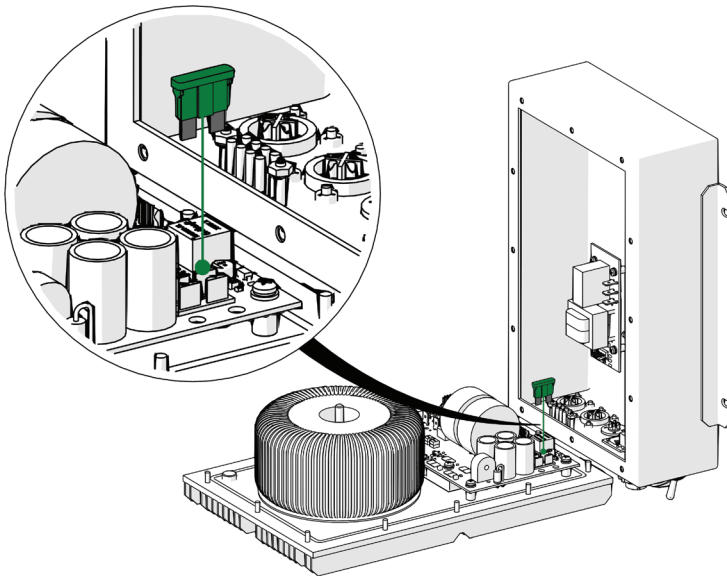
2. Lift the cover off the heatsink in the motions shown in the image. The cover may need to be gently angled to prevent it from catching on any internal components.

CAUTION: Do not pull directly up, this can damage the main PCB.





3. Flip the cover as shown and rest it on its front connectors to access the main PCB. Be careful not to pull on the wiring.



4. Pull the blown fuse from the fuse holder and insert a new one. A pair of pliers can be used to easier access. If the 12V model, there are two fuses to remove and replace. A pair of pliers can be used to easier access.

5. Return the cover to its original position and then re-insert and tighten the 12 screws and washers in a star pattern.



DC Connections

DC Input Power Connection

Prepare a circuit breaker-protected or fuse-protected DC power source to connect to the IPSi300W. Making sure the power switch is in the OFF position, connect the power source to the DC Input terminals using an appropriate sized wire (AWG 12) for the maximum input current (22A) with a matching connector.

If the unit accepts a 12V input, a YM-20-C04SX-01-001 input connector is provided for the DC Input Connection.	
Pin	Wire Color
1	Positive
2	Negative

If the unit accepts a 20V or 40V input, a YM-20-C04SX-01-001 connector is provided for the DC input connection.	
Pin	Wire Color
1	Positive
2	Positive
3	Negative
4	Negative

AC Connections

AC Output Power Connection

One YM-20-J03SX-01-001 output connector is provided for the AC Output Connection. Connect to the loads with the matching cable connector.

CAUTION: *Do not apply AC voltage to the output connection.*

This will cause damage to the Inverter and will not be covered under warranty.

AC Output and Input Wiring Pinout

The wiring pinout is the same for both the AC Input and AC Output:

Pin A - AC Hot

Pin B - AC Neutral

Pin C - AC Ground (Chassis)

AC Input Power Connection

This unit is equipped Offline UPS capability, for more information see Offline UPS.

Prepare a circuit breaker-protected or fuse-protected AC power source to connect to the IPSi300W. Making sure the power switch is in the OFF position, connect the power source to the AC Input terminals using an appropriate sized wire (AWG 10) for the maximum input current (22A) with a matching connector.

One YM-20-C03SX-01-001 input connector is provided for the AC Input Connection.



Ground Fault Safety Circuit

A ground fault is caused when current passes from an energized component to the normally grounded unit chassis. This is usually due to a breakdown in wire insulation and increases the risk of electric shock.

This Inverter is equipped with a Ground Fault Safety Circuit (GFSC) and a Ground Fault Indicator (GFI) LED. The GFSC is a safety feature that can detect ground faults and shut off the Inverter.

If current in excess of CSA/UL safety limits is detected passing through the AC ground line, this trips a hardware-based safety switch and the unit's output is shut off. Immediately after, the internal microcontroller detects the output shutting off and shuts off the input, effectively turning the unit OFF. The GFI LED on the front panel will then glow red to indicate the fault to the user. To restart the Inverter, the power switch must be cycled OFF and then back ON again.

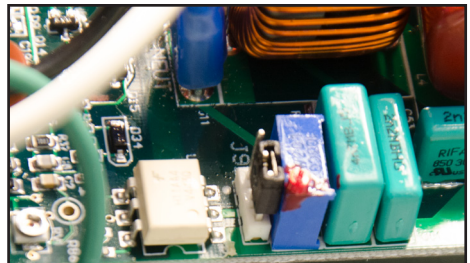
Analytic Systems does not recommend disabling the GFSC. However, it can be disabled if the feature is interfering with operation of the Inverter for a specific application.

To disable the Ground Fault Safety Circuit:

1. Disconnect the unit from the input DC as shown under the *Installation* section.
2. Remove the cover panel from the unit as shown in the *Fuse Replacement* section
3. Locate the 3-pin connector **J92**. While the Jumper is in place over the first and second pins the GFSC is active.
4. Move the Jumper to the second and third pins. While the Jumper is in this position the GFSC is disabled.
5. Reattach the cover panel to the unit as shown in the *Fuse Replacement* section.
6. Reconnect the unit to the input DC power as shown in the *Installation* section



GFSC Active



GFSC Disabled



Offline UPS (Optional)

The Offline UPS (Uninterrupted Power Source) Option allows the Inverter to work as a backup power source in the event of external AC power failure.

To set up the Offline UPS

1. Connect the external AC power source to the AC Input Connection.
2. Connect the batteries to the DC Output Connection.
3. Connect the load to the AC Output Connection. The Bypass LED will glow green indicating the load is connected to external AC power.

In the event that external power fails, the Inverter will sense the malfunction, power up, and take over supplying AC power to the load. It will continue to work until either time the external AC power is restored or the batteries become discharged.

The external AC voltage thresholds for the Inverter to take over supplying AC Power or to stop supplying AC power are all factory-preset to typical values. However, you can use the InverterWizard software to adjust these values to fit your specific needs.

Tip: Choose batteries with enough capacity to ensure that the Inverter can power the load for the required amount of time in the event of AC power failure. For example, a 2000W Inverter running from 24 VDC input will draw ~100 amps, so for 2 hours of runtime the minimum required battery capacity is 280 amps hours of capacity at 24 volts.



Remote Port (Optional)

This port is intended to be used with an Analytic Systems Digital Remote Control, but it can also be used for as a Remote On/Off switch, Isolated RS232 Communications terminal and Dry Contact Output Fail indicator. The remote port uses a standard RJ45 style connector with proprietary connections. Do not connect this port to a computer. The wire colors described below correspond to colors found in any standard T-568B network cable.

CAUTION: *Do not connect this port to a computer*

This will cause serious damage to the Inverter and the computer. This will not be covered under warranty.

Pin Number	Wire Color	Function
1	White/Orange Stripe	Remote ON/OFF
2	Orange	Digital Ground
3	White/Green Stripe	+12V Out
4	Blue	RX RS232
5	White/Blue Stripe	TX RS232
6	Green	Gnd RS232
7	White/Brown	Dry Contact Relay
8	Brown	Dry Contact Relay

Remote On/Off

Pins 1 (White/Orange) and 2 (Orange) are used to turn the Inverter ON or OFF. Connect them together through a switch or relay to turn the Inverter OFF and disconnect them to turn the Inverter ON. The main power switch must be ON for this connection to function.

Isolated RS232 Communications

Pins 4 (Blue), 5 (White/Blue) and 6 (Green) are an isolated RS232 port that can be used for communication to/from the Inverter. Information on the standard data structure or custom programming is available from the factory. Pin 4 is RX, Pin 5 is TX and Pin 6 is Return.

Dry Contact Output Fail Relay

Pins 7 and 8 (White/Brown and Brown) connect to the contacts of an Output Fail relay controlled by the processor. The contacts will be CLOSED if the Inverter is operating normally and OPEN if the Inverter has failed.



InverterWizard Program

The Inverter is delivered preset for the input voltage, output voltage and frequency shown on the label. If these parameters are satisfactory, the Inverter can be put directly into service.

The normal shutdown parameters are set for the lowest battery voltage the Inverter will support are: 12 Volts for a -12 model, 24 Volts for a -20 model and 48 Volts for a -40 model.

If the Inverter is powered by alternate input voltage such as 32 or 36 volts for a -20 model or 72 volt rail (64 volt nominal) for a -40 model, then the low voltage shutdown parameters will need to be adjusted. You can do so using the free-to-download InverterWizard software from www.analyticsystems.com

Connect the Inverter to your PC using the microUSB interface on the front panel. From InverterWizard, you can:

- Adjust the low voltage shutdown parameters (to match battery voltage)
- Adjust the output frequency (50 or 60 Hz)
- Adjust the output voltage (+/- 10 percent range at 1 VAC intervals)
- Update the inverter’s firmware
- Graph the input voltage, input current, output voltage and output current

Special Services & Options

A	Line AC Detect & Autoswitch UPS
C	COTS MIL461F, MIL810G (MIL Connectors) (VIBRATION PROTECTION) (WIDE TEMP {-40 TO +55°C}) (IN-HOUSE TESTED AND REPORT FOR EACH UNIT- AVAILABLE AS ADD ON TO M OPTION)
E	European ROHS compliant (LEAD FREE MANUFACTURED)
I	MIL461F (IN-HOUSE TESTED AND REPORT FOR EACH UNIT- AVAILABLE AS ADD-ON TO M OPTION)
J	MIL810G (IN-HOUSE TESTED AND REPORT FOR EACH UNIT- AVAILABLE AS ADD-ON TO M OPTION)
M	Military Rugged Package (MIL Connectors) (VIBRATION PROTECTION) (WIDE TEMP {-40 TO +55°C})
U	Safety Special Inspection (CSA/UL)
X	Heavy Duty Ruggedization (VIBRATION PROTECTION) (WIDE TEMP {-40 TO +55°C})
Z	No Conformal Coating

View/download an expanded description of our Special Services & Options online <https://www.analyticsystems.com/download>



Troubleshooting

This unit provides LED indicators and a buzzer to help diagnose any problems. The unit will sound the buzzer to alert you prior to shutting itself down. You should immediately check the LED indicators to determine the cause of the shutdown.

LED Indicator	Meaning
LOW VOLTAGE	The input voltage is too low for normal operation.
Fix:	<p>Check the rating of the input voltage. Check that the cables and connections are not corroded or damaged.</p> <p>If using InverterWizard, make sure the Low Input threshold is set properly for the battery voltage you are using, for example:</p> <ul style="list-style-type: none">• ~21V for a 24V battery• ~28V for a 32V battery• ~31V for a 36V battery
HIGH VOLTAGE	The input voltage is too high for normal operation.
Fix:	<p>Check the rating of the input voltage.</p> <p>The Inverter can be damaged if the input voltage exceeds the maximum rating. Over-voltage damage is not covered under warranty.</p>
OVER TEMP	The internal temperature is too hot for normal operation.
Fix:	<p>Check that the cooling fans are functioning. If the fans are still running, remount the Inverter for improved ventilation.</p> <p>If the fans are NOT running, the Inverter must be returned to the manufacturer for repair.</p>
OVER LOAD	The load is drawing too much current from the Inverter.
Fix:	Reduce the load by disconnecting some devices connected to the Inverter's AC output.



Specifications

Input	-12	-20	-40
Nominal (VDC)	12 VDC	24, 32 or 36 VDC	48 or 72 (Rail) VDC
Actual (VDC)	10.5-16 VDC	20 - 45 VDC	30-40 VDC
Input Amps (max)	48A	20A	10A
Input Fuse (External)	2x 25A	25A	15A

Output	-110	-220
Voltage	110 ± 2 VAC	220 ± 4 VAC
Output Amps (max)	2.5A (cont) / 3.33A (peak)	1.36A (cont) / 1.82A (peak)
Output Frequency	50.00 ± 0.01 Hz or 60.00 ± 0.001 (user selectable)	
Output Distortion	<5% at 300 Watts into resistive load	
Regulation (Line & Load)	< ± 2.0%	
Duty Cycle Continuous	100% for 24 hours per day	

Mechanical	
Length	11.6 inches (29.5 cm)
Width	8.7 inches (22.1 cm)
Height	3.8 inches (9.7 cm)
Clearance	1 inch (2.5 cm) all around
Material	Marine Grade Aluminum
Finish	Black Powder Epoxy
Fastenings	18-8 Stainless Steel
Weight	13.6 lbs / 6.2 kg
Packaging	Sealed to IP66

Connections	Remote Connector – RJ45-8P8C c/w cover DC Input – CNLINKO YM-20-C04SX-01-001 c/w cover (CNLINKO YM-20-C02SX-01-001 for the -12 model) AC Output – CNLINKO YM-20-J03SX-01-001c/w cover AC Input – CNLINKO YM-20-C03SX-01-001 c/w cover
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Environmental	
Efficiency	> 80% @ maximum output
Temp Range	-25 to +40°C @ maximum output
Humidity	0-95% Relative Humidity (Non-condensing) with standard conformal coating
Isolation	1500 VDC Input-Output, Input-Case; 500VDC Output-Case Input
Warranty	2 Years

* Specifications subjects to change without notice.



Limited Warranty

1. The equipment manufactured by Analytic Systems Ware (1993) Ltd. (the "Warrantor") is warranted to be free from defects in workmanship and materials under normal use and service.
2. This warranty is in effect for 2 years from the date of purchase by the end user.
3. Analytic Systems will determine eligibility for warranty from the date of purchase shown on the warranty card when returned within 30 days, or
 - a. The date of shipment by Analytic Systems, or
 - b. The date of manufacture coded in the serial number, or
 - c. From a copy of the original purchase receipt showing the date of purchase by the user.
4. In case any part of the equipment proves to be defective, the Purchaser should do the following:
 - a. Prepare a written statement of the nature of the defect to the best of the Purchasers knowledge, and include the date of purchase, the place of purchase, and the Purchasers name, address and telephone number.
 - b. Call Analytic Systems at 800-668-3884 or 604-946-9981 and request a return material authorization number (RMA).
 - c. Return the defective part or unit along with the statement at the Purchasers expense to the Warrantor; Analytic Systems Ware (1993) Ltd., 8128 River Way, Delta, B.C., V4G 1K5, Canada.
5. If upon the Warrantor's examination the defect proves to be the result of defective material or workmanship, the equipment will be repaired or replaced at the Warrantor's option without charge, and returned to the Purchaser at the Warrantor's expense by the most economical means. Requests for a different method of return or special handling will incur additional charges and are the responsibility of the Purchaser.
6. Analytic Systems reserves the right to void the warranty if:
 - a. Labels, identification marks or serial numbers are removed or altered in any way.
 - b. Our invoice is unpaid.
 - c. The defect is the result of misuse, neglect, improper installation, environmental conditions, non-authorized repair, alteration or accident.
7. No refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so.
8. Only the Warrantor shall perform warranty service. Any attempt to remedy the defect by anyone else shall render this warranty void.
9. There shall be no warranty for defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion except for equipment specifically stated to be waterproof.
10. No other express warranty is hereby given and there are no warranties that extend beyond those described herein. This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purposes for which such goods are used, or fitness for a particular purpose, or any other obligations on the part of the Warrantor or its employees and representatives.
11. There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any person or persons, or damage to property, or loss of income or profit, or any other consequential or resulting damage which may be claimed to have been incurred through the use or sale of the equipment, including any possible failure of malfunction of the equipment, or part thereof.
12. The Warrantor assumes no liability for incidental or consequential damages of any kind.




DESIGNED AND MANUFACTURED BY



ANALYTIC SYSTEMS
Power Conversion Solutions

Battery Chargers • Inverters • Power Supplies • Voltage Converters

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