



## True Sinewave Power Inverter

21060-03

## Owner's Manual



For safe and optimum performance, the Power Inverter must be used properly. Carefully read and follow all instructions and guidelines in this manual and give special attention to the **CAUTION** and **WARNING** statements.

### PLEASE KEEP THIS MANUAL FOR FUTURE REFERENCE

#### Disclaimer

While every precaution has been taken to ensure the accuracy of the contents of this guide, **Modul-System** assumes no responsibility for errors or omissions. Note as well that specifications and product functionality may change without notice.

#### Important

Please be sure to read and save the entire manual before using your **Modul-System Power Inverter**. Misuse may result in damage to the unit and/or cause harm or serious injury. Read the manual in its entirety before using the unit and save the manual for future reference.

#### True Sinewave Series:

21060-03 12V 600W 230VAC True Sinewave Inverter (Schuko - CEE 7/4)

P/N: MSIN600W Rev 1.1

#### Service Contact Information

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Phone: +46 31 746 87 00

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## 1. INTRODUCTION

Thank you for purchasing the Modul-System Power Inverter. With our state of the art, easy to use design, this product will offer you reliable service for providing AC power for your vehicle, trailer or container. The Modul-System Power Inverter can run many AC-powered appliances when you need AC power anywhere. This manual will explain how to use this unit safely and effectively. Please read and follow these instructions and precautions carefully.

### IMPORTANT SAFETY INFORMATION

This section contains important safety information for the Modul-System Power Inverter. Each time, before using the Modul-System Power Inverter, READ ALL instructions and cautionary markings on or provided with the inverter, and all appropriate sections of this guide. The Modul-System Power Inverter contains no user-serviceable parts. See Warranty section for how to handle product issues.

#### **WARNING: Fire and/or chemical burn hazard**

- Do not cover or obstruct any air vent openings and/or install in a zero-clearance compartment.

#### **WARNING: Failure to follow these instructions can result in death or serious injury**

- When working with electrical equipment or lead acid batteries, have someone nearby in case of an emergency.
- Study and follow all the battery manufacturer's specific precautions when installing, using and servicing the battery connected to the inverter.
- Wear eye protection and gloves.
- Avoid touching your eyes while using this unit.
- Keep fresh water and soap on hand in the event battery acid comes in contact with eyes. If this occurs, cleanse right away with soap and water for a minimum of 15 minutes and seek medical attention.
- Batteries produce explosive gases. **DO NOT** smoke or have an open spark or fire near the system.
- Keep unit away from moist or damp areas.
- Avoid dropping any metal tool or object on the battery. Doing so could create a spark or short circuit which goes through the battery or another electrical tool that may create an explosion.

#### **WARNING: Shock Hazard. Keep away from children!**

- Avoid moisture. Never expose unit to snow, water etc.
- Unit provides household AC, treat AC output sockets the same as regular wall AC sockets at home.

#### **WARNING: Explosion hazard!**

- DO NOT** use the Modul-System Power Inverter in the vicinity of flammable fumes or gases (such as propane tanks or large engines).
- AVOID** covering the ventilation openings. Always operate unit in an open area.

### EMC INFORMATION

This equipment has been tested and found to comply with the limits for CE EMC standard. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### LIMITATIONS ON USE

Do not use in connection with life support systems or other medical equipment or devices.

## 2. PRODUCT DESCRIPTION

The Modul-System Power Inverter package includes the items list below.

- Power Inverter base unit
- Owner's manual
- Cable boots
- Spare label

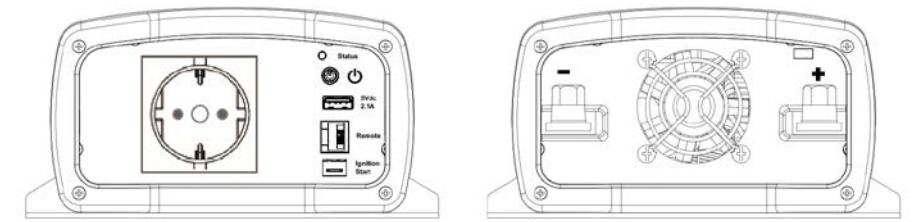
## 3. INSTALLATION

**WARNING:** Modul-System recommends that all wiring be done by a certified technician or electrician to ensure adherence to the applicable electrical safety wiring regulations and installation codes. Failure to follow these instructions can damage the unit and could also result in personal injury or loss of life.

**CAUTION:** Before beginning your power inverter Installation, please consider the following:

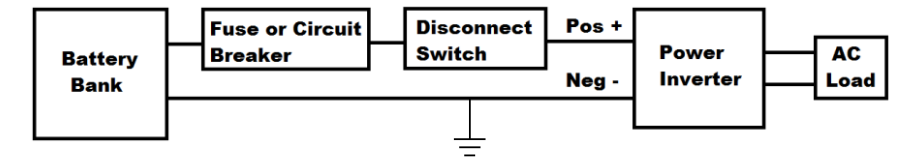
- The Power Inverter base unit should be used or stored in an indoor area away from direct sunlight, heat, moisture or conductive contaminants.
- When placing the unit, allow a minimum of 80 mm of space around the unit for optimal ventilation.

## Understanding the unit features



### Installation Preparation

Typical wiring block diagram of the Power Inverter:



#### Battery Bank:

- The use of deep cycle batteries is highly recommended for power inverter applications.
- For battery size, you need to identify how long you wish to operate the load(s). Modul-System does recommend that you purchase as much battery capacity as possible, with a minimum of 60AH. See more on "Estimated Run time and Load" in Section 4.
- Please use 12V Battery Bank system for the 21060-03 Power Inverter. Using 24V or higher voltage Battery Bank Systems will damage the inverter and may cause fire.

#### Fuse or Circuit Breaker:

- DC-rated fuse or DC-rated circuit breaker connected along the DC positive line is required.
- Select a fuse or circuit breaker with 60A minimum rating.
- Based on the size of the battery bank chosen on the 12V system above, determine the overall short circuit current rating of the battery bank from the battery manufacturer. The fuse or circuit breaker chosen has to be able to withstand the short circuit current that may be generated by the battery bank.

#### Disconnect Switch:

- Select a Disconnect Switch with the same or higher rating of the selected fuse or circuit breaker from the above.
- The Disconnect Switch is used to disconnect the DC power between the power inverter and the battery bank during service, maintenance or trouble shooting.

### Installing the Power Inverter System

#### **WARNING: Electrical Shock Hazard**

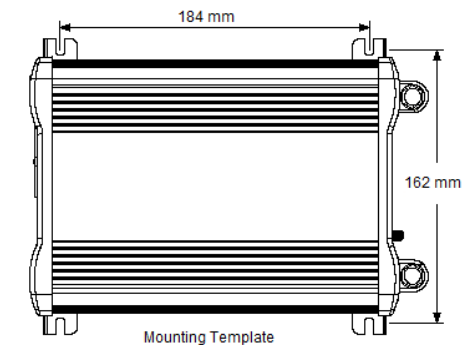
The unit green 'On/Off' switch does not disconnect the DC power from the battery. Use the DC Disconnect Switch or disconnect the DC input cables connection to disconnect the DC power from the battery before working on any circuits connected to the unit. Failure to follow these instructions can result in death or serious injury.

#### **CAUTION: Unit Damage**

Reversing the battery connection to the DC Input terminals will damage the unit and it cannot be repaired. Damage caused by reverse polarity connection is not covered by the warranty.

#### Connect unit for Permanent use (cable not provided)

- Unit is for indoor use only, choose an appropriate mounting location.
- Orientation: Unit can be mounted in any direction.
- Use mounting template below to mark the positions of the mounting screws. Drill the 4 mounting holes and place the inverter in position and fasten the inverter to the mounting surface.



- Use of low resistance cable is required for all the DC connections between the inverter and the battery bank.
- Use minimum 16mm<sup>2</sup> cable with maximum cable length of 3 meters for the Inverter system.
- Connect one end of the negative DC input cable to the Power Inverter DC negative (black) M5 terminal.
- Connect the other end of the negative DC input cable to the battery negative terminal or suitable chassis earth point.
- Make sure the Disconnect Switch is in the OFF position.
- Connect one end of the positive DC input cable to the Inverter DC positive (red) M5 terminal.

- Connect the other end of the positive DC input cable to one of the terminals of the Disconnect Switch.
- Connect a DC input cable between the other terminal of the Disconnect Switch and one side of the terminal of the fuse holder.
- Connect a DC input cable between the other terminal of the fuse holder and the battery positive terminal.
- Install the selected fuse to the fuse holder.
- Turn Disconnect Switch to ON position.

#### Remote Switch (optional) Connection:

- The unit comes with a Remote port and an optional Modul-System 'Remote Switch' accessory (21000-03) can be used to turn unit On and OFF remotely. To install the 'Remote Switch', just connect the switch's RJ12 plug to the RJ12 'Remote' port located at the Front AC panel of the Power inverter. Please note polarity when connecting the plug.
- The Power 'On/Off' push button on the remote shares the same function as the green 'On/Off' button on the main unit.
- With 'Power Save' Function set to OFF (default), the 'Power' indicator will remain solid ON when AC Output Power is available and will be OFF when the unit has shutdown.
- With 'Power Save' Function set to ON, the 'Power' indicator will be flashing when AC Output Power is available and will be OFF when the unit has shutdown.
- **Please note that the Modul-System Power Inverter will not work with the digital wiring and control system Modul-Connect with the 'Power Save' Function set to ON.**

#### Use of the Ignition Start Function on unit:

- An 'Ignition Start' port is located at the Front AC Panel of the unit using a 6.3mm width female spade terminal. This port is used for turning the unit ON and OFF using a +12V signal. An insulated female connector is required to connect to the port.
- Connecting to +12V will turn ON the unit and removing the +12V signal will turn it OFF.
- This +12V connection should be fused at its source with a minimum 2A fuse.

#### Power Inverter Test after installation:

- Press and hold the green 'On/Off' button on the unit to turn ON the unit.
- Check that the 'Status' indicator turns to solid green.
- Plug in a small AC load like a 40W table lamp or small appliance to the AC socket to verify AC is available.
- The unit is successfully installed and functioning properly.

## 4. UNIT OPERATION

### WARNING: RISK OF EQUIPMENT DAMAGE

Do not connect an AC power source like utility power or generator to the AC outlets of the unit.

#### Turn ON and OFF the unit

- Press and hold the green 'On/Off' button for about a second to turn ON the unit and 'Status' indicator will turn on.
- Press again the green 'On/Off' button to turn OFF the unit and the 'Status' indicator will turn off.

#### Understanding the 'Power Save' function

The unit can pre-set with 'Power Save' function ON or OFF. If unit is turned ON with 'Power Save' function pre-set to ON, with >10W AC load connected to the unit, the unit will provide continuous AC Output and with <10W AC Load connected to the unit or with AC Load changing from >10W to < 5W, the AC Output will change from continuous to pulsing AC Output every 5 seconds.

The unit is default set to 'Power Save' OFF. To change the 'Power Save' function from OFF to ON or switch back from ON to OFF, press and hold the green 'On/Off' button for more than 5 second until the 'Status' light quickly flashes three times and the alarm beeps for more than 2 seconds.

#### Understanding the 'Status' indicator

Function	'Status' Indicator	Condition
Power Save Function 'OFF'	Solid Green	Unit is normal and continuous AC Output is available
	Solid Green with alarm beep every 2 seconds	Unit is detected with either DC Over/Under Voltage or Over Temperature warning and continuous AC Output is still available
Power Save Function 'ON'	Flashing Green	Unit is normal and AC Load connected is >10W
	Flashing between Amber and Red	Unit is normal and AC Load connected is <10W or AC Load connected is reduced from >10W to < 5W
	Flashing Green and alarm beep every 2 seconds	Unit is detected with either DC Over/Under Voltage or Over Temperature warning and AC Load connected is > 10W
	Flashing between Amber and Red and alarm beep every 2 seconds	Warning detected with either DC Over/Under Voltage or Over Temperature AC Load connected is <10W or AC Load connected is reduced from >10W to <5W
Power Save Function is either	Solid Red with alarm beep every second	No AC Output as unit had shut down due to either DC Over/Under Voltage or AC Output Overload or Over Temperature occurs. See more details on "Understanding the

'ON' or 'OFF'		<b>Warning and Shutdown Condition" in this manual</b>
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#### Understanding the Warning and Shutdown Condition

- **Over Temperature Warning:** Unit internal temperature is high. Unit requires better ventilation.
- **DC Over Voltage Warning:** DC Input Voltage is high and close to the over-voltage shutdown limit. Checking the battery voltage.
- **DC Under Voltage Warning:** DC Input Voltage is low and is close to the under-voltage shutdown limit. Checking on battery voltage or battery connection is required.
- **Over Temperature Shutdown:** Reduce the AC load and provide more ventilation to the unit. Unit will automatically restart when the internal temperature of the unit cools down.
- **DC Over Voltage Shutdown / DC Under Voltage Shutdown:** Check the battery voltage in the first 30 seconds, AC Output will resume when battery voltage is corrected to be within the unit's operating range. If the battery voltage shutdown condition is ignored, the unit will latch OFF completely after 30 seconds and restart the unit using green 'On/Off' button is required after the battery voltage is corrected.
- **AC Output Overload Shutdown:** Check AC Load connected to the unit. AC Output is short circuited or AC Power draw by the load is beyond the unit's limit. The indicator and alarm will beep for about 30 seconds before it is latched OFF completely. Restarting the unit using the green 'On/Off' button is required after the AC Load condition is corrected.

#### USB Port on unit

With unit on, 2.1A 5V USB is provided on the 5V USB port. This can be used to charge 5V USB Powered devices.

#### Understanding the Fan Operation

The fan on the unit is internal temperature activated. It will automatically turn on when AC output power exceeds the pre-set values (~ 200W) and turn off when AC output power is reduced to 150W. It will also automatically turn on when it senses the internal components have reached to around 80°C and turn off when temperature drops to below 60°C.

#### AC Load on Power Inverter

Although the Power Inverter can provide high surge power (up to two times the rated output power), some appliances may still trigger on the unit protection system during start up or surge period. A higher power inverter is required for those appliances.

#### Estimated Run time on Load

Following run time is an estimate based on using a 12V-120AH battery bank. Actual runtime may vary.

Load	Consumption	Estimate Run time
Cordless Phone	5W	150 hrs
Clock / Radio	8W	100 hrs
Table Lamp	40W / 60W	27 hrs / 18 hrs
Small Freezer (8.8 cu. ft.)	80W	15 hrs
20" LCD TV	100W	11.5 hrs
Flood Light	500W	1 hr
Sump Pump (1/2 hp)	350W	Not applicable (start-up surge too high)

## 5. TROUBLESHOOTING

Problem	Symptom	Solution
No AC output and 'Status' light is OFF	The unit is off	Turn unit ON
	No power to inverter	Check fuse or if the Disconnect switch (if installed) is either blown or turned OFF
'Status' indicator is in green or flashing between amber and red (alarm beeps every 2 seconds)	Unit has detected a warning and is going to shutdown	Verify the warning condition and make adjustment. See "Understanding the 'Status' indicator" in this manual
'Status' indicator is in red (alarm beeps)	Unit has shut down	Check unit condition and make correction. See "Understanding the 'Status' indicator" in this manual

## 6. SPECIFICATIONS

**Note: Specifications are subject to change without notices.**

Specifications	21060-03
<b>Inverter</b>	
AC Output Power	600 Watt
AC Output Current	2.6A
AC Surge Power	1200 Watt
AC Output Voltage	230Vac / 50Hz
AC Output Waveform	True Sinewave (<5% THD)
DC Input Voltage	12.5 VDC
No Load Current (Power Save OFF)	< 0.8 A
No Load Current (Power Save ON)	< 0.2 A
DC Operating Range	10.5 – 15.9 VDC
Under Voltage Alarm	11.0 VDC
Under Voltage Alarm Recovery	11.3 VDC
Under Voltage Shutdown	10.5 VDC
Under Voltage Recovery	12.0 VDC
Over Voltage Shutdown	15.9 VDC

Over Voltage Recovery	15.0 VDC
Power Save OFF	>10W
Power Save OFF to ON	~ 5W
AC Output Socket	EU
<b>Safety and Environmental</b>	
Agency Markings	CE LVD, EMC, (E)
Operating Temp.	0°C to 40°C
Storage Temp.	-20°C to 60°C
Relative Humidity	5 - 90% non-condensing
Operating Altitude	Up to 2000 m above sea level
<b>Weights and Dimensions</b>	
Weights	2.0 kg
Dimensions	237 x 175 x 89 mm

## 7. WARRANTY

### Two Year Limited Warranty

The limited warranty program is the only one that applies to this unit, and it sets forth all the responsibilities of Modul-System. There is no other warranty, other than those described herein. Any implied warranty of merchantability of fitness for a particular purpose on this unit is limited in duration to the duration of this warranty.

This unit is warranted, to the original purchaser only, to be free of defects in materials and workmanship for two years from the date of purchase without additional charge. The warranty does not extend to subsequent purchasers or users.

Manufacturer will not be responsible for any amount of damage in excess of the retail purchase price of the unit under any circumstances. Incidental and consequential damages are specifically excluded from coverage under this warranty.

This warranty does not apply to damage to units from misuse or incorrect installation/connection. Misuse includes wiring or connecting to improper polarity power sources.

#### Return/Repair Policy:

If you are experiencing any problems with your unit, please contact our customer service department at info@modul-system.com or phone +46 31 746 87 00 before returning product. After speaking to a customer service representative, if products are deemed non-working or malfunctioning, the product may be returned to Modul-System within 30 days of original purchase. Any defective unit that is returned to manufacturer within 30 days of the date of purchase will be replaced free of charge.

If such a unit is returned more than 30 days but less than two years from the purchase date, manufacturer will repair the unit or, at its option, replace it, free of charge. If the unit is repaired, new or reconditioned replacement parts may be used, at manufacturer's option. A unit may be replaced with a new or reconditioned unit of the same or comparable design. The repaired or replaced unit will then be warranted under these terms for the remainder of the warranty period. The customer is responsible for the shipping charges on all returned items.

#### Limitations:

This warranty does not cover accessories, such as adapters and batteries, damage or defects result from normal wear and tear (including chips, scratches, abrasions, discoloration or fading due to usage or exposure to sunlight), accidents, damage during shipping to our service facility, alterations, unauthorized use or repair, neglect, misuse, abuse, failure to follow instructions for care and maintenance, fire and flood.

If your problem is not covered by his warranty, contact our Customer Service Department at info@modul-system.com or +46 31 746 87 00 for general information if applicable.



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