DENRYO

DIASINE

Sine Wave Power Inverter
GD300 Series
User's Manual

Ver.1.00E

Table of Contents

1. Safety Instructions

This document contains the important safety and operating information for GD300 Inverter. To get most out of the Pure Sine Wave Inverter, carefully read, follow this guide, and save these instructions. Pay attention to the Safety Instructions and the CAUTION and WARNING statements found throughout the manual and on the product.

WARNING	This sign indicates the following contents includes the important information. The wrong order of handling may lead to the risk of death or seriously injured.

CAUTION	This sign indicates the following contents includes the important information. The wrong order of handling may cause damage to the products and the surrounding stuff.

MEMO	This sign indicates the following contents includes the important information of the manuals of functions which contains the safety instructions or the proper operation of the product.

Precautions During Installation

- To avoid the risk of electric shock and fire, ensure adherence to proper electrical wiring regulations. Do not disassemble the GD300 Inverter.
- Do not expose the GD300 Inverter to rain, snow, dust or to the places with high humidity.
- Do not install the GD300 Inverter in the environments with high temperature, near a fire, or under sun exposure directly.
- During the operation of GD300 Inverter, the temperature of the products may become higher. Be careful while moving or removing the products.
- To avoid covering or obstructing the ventilation openings, do not to place any objects closer than 15 cm near the Inverter.
- To avoid overheating, do not place any stuff on the product.
- To connect with more than one battery, do use the same products of batteries from the same manufacturer. Connecting different products of batteries at the same time is dangerous.
- Batteries generate explosive gases during normal battery operation. Never smoke or allow a spark or flame in vicinity of battery.
- This equipment contains components which can produce arcs or sparks. To prevent fire or explosion, do not install in compartments containing batteries or flammable materials.

CAUTION	Since the battery deteriorates over time, a maintenance on a yearly basis is recommended. Replace the deteriorated battery to prevent the hazard of fire.


Do Not Disassemble


Keep Dry


Danger High Temperature


No Open Flame

Do Not Stack


Keep Air Ventilation

2. General Information

GD300 Inverter is a pure sine wave inverter that converts DC voltage to AC since wave voltage. The output waveform is as same as the sine wave of commercial power supply, of which the total harmonic distortion is less than 3%. High efficiency circuit and switching control achieved 90% efficiency at rated load. Without a built-in fan, the GD300 Inverter cools down by natural convection and has reduced the size of the products as well as kept quiet during operation. Moreover, the GD300 Inverter is equipped with abundant protective functions. Even the input polarity is reversed whereas the internal circuit does not be damaged. With the capability of operating under the wide input voltage range, temperature range and to turn on or off remotely, the GD300 Inverter could be used in various environments and applications.

Features

- Protecting the input reverse polarity by its internal circuit
- Fan-less quiet operation (natural convection)
- The wide range of operating temperature（-20～60℃）
- Switching output voltage/frequency easily by button
- Pure sine wave output (total harmonic distortion less than 3%)
- Light weight and thin design
- High efficiency (90% efficiency at rated load)
- Built-in remote-control function
- Easy understanding LED indicators
- Abundant protective circuit: Input voltage warning, shut down/Input reverse polarity/ Output voltage/Output short circuit/Overload/Overtemperature
- Buzzer ON/OFF, LED brightness switchable
- Wide input voltage range
- Input system voltage of 12V/24V/48V 3 lineup
- Input terminal cover for dust prevention
- Optional communication function (T. B. D.)

Safety and EMC Certified

Safety standards :EN60950-1:2006/A2:2013

Immunity standards :EN55024:2010

Emission standards :EN55032:2012, FCC class A Part15

FCC Requirements

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

3. GD300 Inverter Features

3-1 Specification

MODEL		GD300NA-112	GD300NA-124	GD300NA-148
Input	Battery Voltage	12V	24V	48V
	Voltage Range*'	10.5～17Vdc	21～34Vdc	42～68Vdc
	Current Range	20～32 A	10～16 A	5～8 A
	No-load Current	0.7 A	0.4 A	0.2 A
	Standby Mode Consumption	8mA	7mA	5mA
	Efficiency at Rated Load	90%	90%	90%
Output	Rated Power	300VA		
	Peak Power(3min.)	360VA, refer to 3-2 de-rating curve		
	Surge Power(3sec.)	420VA		
	AC Voltage	100 default, 110/115/120Vac, switchable		
	Frequency	50±0.1Hz default, 50/60Hz, switchable		
	Waveform	Sine Wave, <3%THD		
	Voltage Tolerance	±3.0％		
	LED indicators	Operating status, Battery voltage level, Output power level, Protection function, Operation setting		
Function	Remote-control	Output remote ON/OFF control terminal		
	Option terminal	six-position four-conductor (6P4C) modular jack		
Protection	Input	UVP*², OVP*³, input reverse polarity		
	Output	OLP*⁴, SCP*⁵, output voltage error		
	Others	OTP*⁶, detect by internal temperature sensors		
Environment	Operating Temperature	-20～+40℃ at rated load, +60℃ at 70% load, refer to 3-2 de-rating curve		
	Operating Humidity	20～90%RH non-condensing		
	Storage Temperature/ Humidity	-30～+70℃, 10～95％RH		
	Vibration	10～500Hz, 3G 10min./ 1cycle, 60mins. XYZ axes		
Safety & EMC	Safety Standards	Certified EN60950-1:2006+A11+A1+A12+A2		
	Withstand Voltage	Battery I/P-AC O/P: 3.0kVac AC O/P–Ground: 1.5kVac Battery I/P– Ground：1.5kVac		
	Isolation Resistance	Battery I/P– AC O/P: >1000MΩ/500Vdc/25℃/70% RH ACO/P –Ground: >1000MΩ/500Vdc/25℃/70% RH Battery I/P – Ground: >1000MΩ/500Vdc/25℃/70% RH		
	EMC Immunity	EN55024:2010		
	EMC Emission	EN55032:2012, FCC class A		
Others	Dimension	234.0×146.5×44.0mm (L×W×H)		
	Weight	1.0kg		

All parameters NOT specially mentioned are measured at 112:12Vdc, 124:24Vdc, 148:48Vdc input, 300VA rated load, power factor=1.0, 25°C of ambient temperature and under the default setting.

*' Tolerance of voltage: 112±0.5V,　124：±1V and 148：±2V.

*² UVP: Under Voltage Protection.

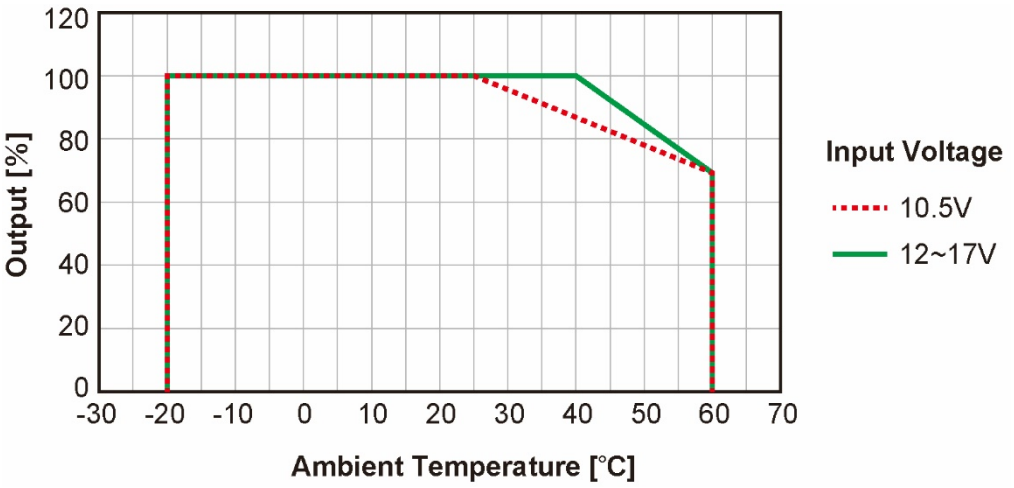
*³ OVP: Over Voltage Protection.

*⁴ OLP: Over Load Protection.

*⁵ SCP: Short Circuit Protection.

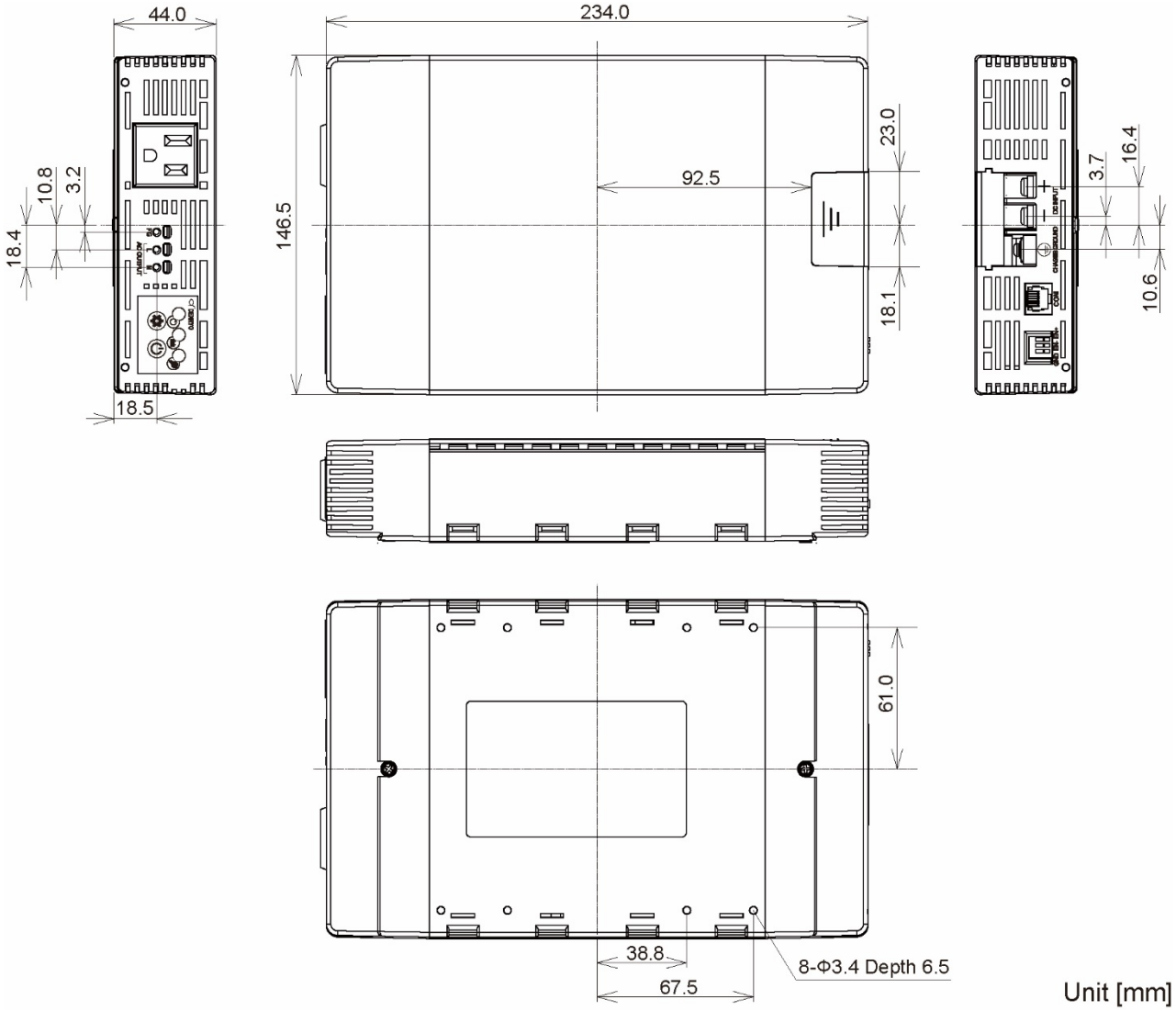
*⁶ OTP: Over Temperature Protection.

3-2 De-rating Curve

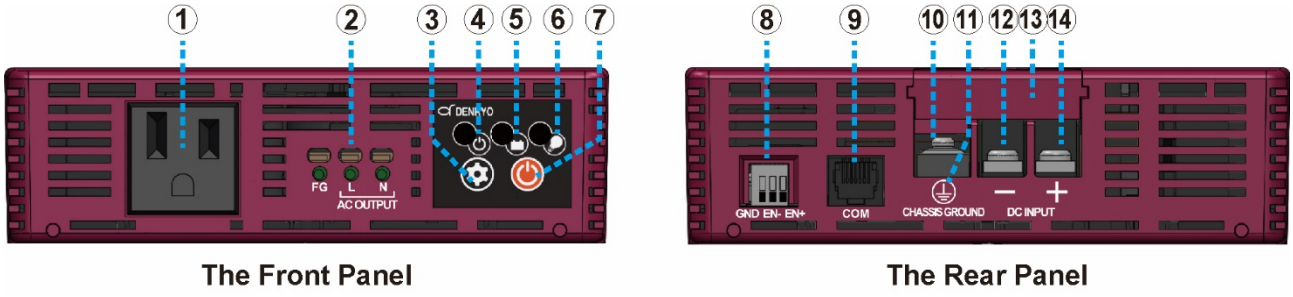


According to the system and environment that products are used in, the Inverter is still under the protection of OLP or OTP even in the range of de-rating curve. Since this feature of the Inverter, please design the system with more allowance. Refer to the graph above, the input voltage will be double under 24V model and 4 times more under 48V model.

3-3 Dimension



3-4 Control Panel



The Front Panel

The Rear Panel

①	AC Outlet	②	AC Output Terminal	③	Setting Button	④	Power LED
⑤	Battery LED	⑥	Load LED	⑦	Power Button	⑧	Remote Connector
⑨	Optional Terminal	⑩	Grounding Terminal	⑪	Reversed Connection Warning LED	⑫	Battery Input (-)
⑬	Terminal Cover	⑭	Battery Input(+)				

4. Installation and Wiring Connections

4-1 Installation Guide

Recommended installation location: Locate the GD300 Inverter on a flat place or rack with sufficient strength. Avoid mounting in a dusty environment or a location with high temperature. Avoid using the Inverter in a high temperature environment. For ventilation, do not mount any objects within 15 cm around the inverter.

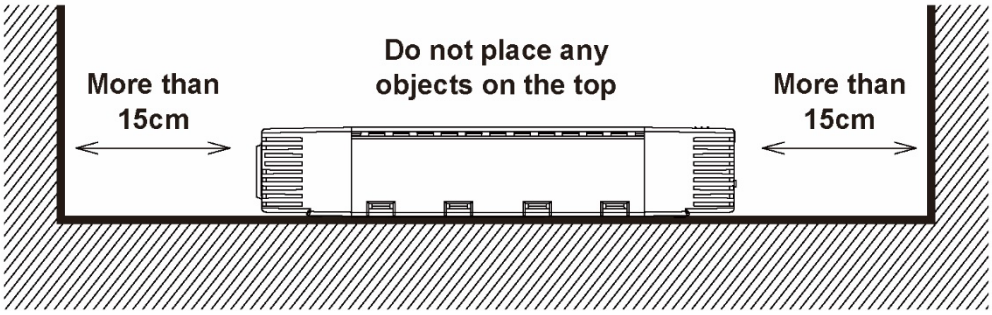


Figure 4.1 The example of installation

Recommended installation Regulation: Refer to 3-3 Dimension, there are 8 holes, Φ3.4mm, and depth 6.5mm, in the bottom of the Inverter, which could be utilized when installing the Inverter. It is recommended to install the Inverter horizontally with the ground.

CAUTION	Burns Hazard. During operation, the temperature of GD300 Inverter will get higher. Be careful not to touch it.

4-2 Wiring Connections

To make Battery wiring connections:

Remove the cover of the terminal on the rear side of GD300 Inverter, and wire it to the battery input terminal. When removing the cover, slide while pushing the terminal cover toward the bottom. Mount a fuse in the plus side wiring. Please refer to Table 4.1. to select the fuses based on the system. Please use suitable wiring cable for power supply terminal. The screw size of battery input terminal is M4; the width of the terminal is 9 mm. The cable size recommended to be used at rated load is 8 AWG; the torque recommended for installation is 1.5 N · m. Using too thin cable may lead to overheating or ignition of cable. The length of Battery wiring connection should be as short as possible that within 1.5 m is recommended. Before continuing Battery wiring connection, check the power LED in front of GD300 is lighting orange. Check the voltage of Battery if not lighting. Further, if the polarity of Battery is reversed, the reverse connection warning LED near the grounding terminal in the rear of the GD300 Inverter lights red. Please correct the polarity and check if the reverse connection warning LED is off.

Table 4.1 Fuse recommended

Model	Current
112	Under 40A
124	Under 20A
148	Under 10A

WARNING	Explosion Hazard The short of Battery is very dangerous. Make the wire connection of input terminal of GD300 Inverter before connecting the Battery.

To make the grounding wire connection:

Connect from the grounding terminal in the rear of GD300 Inverter to the system is being used. The screw size of the grounding terminal is M5; the width is 14mm. Please use solderless terminals, like R5.5-5S, and fasten it with a screw. The cable size of 10AWG and torque 2.0 N・m is recommended.

To make load wire connection:

Connect the load from the AC outlet in the front of the GD300 Inverter or the AC output terminal. Choose to use the cable with proper withstand voltage of AC output terminal when connecting the AC output terminal. The VVF1.6 cable is recommended to be used here. It is connected by inserting the cable, which is peeled off the cover, into the hole which is marked as AC OUTPUT on the front panel. The length to peel off is around 15-20 mm and make the part which the cover has been peeled off could not be seen from outside. Make sure that the wire connected to line (L) and neutral (N) is not short-circuited after connection. When removing the cable, insert a flathead screwdriver in the oval hole above the cable insertion hole, and pull the cable while pressing the flathead screwdriver to remove it.

CAUTION	Terminal damage. Pressing the flathead screwdriver obliquely and strongly, the terminal may be damaged.

WARNING	Shock Hazard Make sure the core wire does not expose to the outside. Moreover, when connecting the AC terminal, be sure to connect it without output voltage.

DO NOT short the line and the neutral. Make sure the connection of the line and the neutral is correct in your system when using both the outlet and the terminal of the Inverter.

Precautions about load:

Inverter is able to operate at most of loads under AC environment. However, even continuously suppling 300VA, there is a possibility that Inverter may not operate properly at some loads.

(1) An extremely large current, around 6~10 times more than at rated load, is required for Inverter to startup at inductive load or the motor. The Inverter may not be able to startup normally in the case. Please check the amount of peak current at load before choose Inverter.

(2) To ensure the complete startup of the Inverter, when connecting with a capacitive load or a rectifier such as switching power supply, do not activate the load while the Inverter startup. Alternatively, start up the Inverter with a smaller load and increase load afterward. If connecting with more than two loads, please activate one load at once after the Inverter started up.

To make Remote Connecter wire connection:

By the function of remote connecter in the rear of GD300 Inverter, it is able to turn the output ON/OFF without pressing power button. Please refer to 5-4 Remote Terminal. The recommended size of cable for remote connecter is 20~28AWG.

To make Optional Terminal wire connection:

The optional terminals in the rear of GD 300 Inverter uses a six-position four-conductor (6P4C) modular jack to adapt to various application. Check DENRYO Official Website for more details.

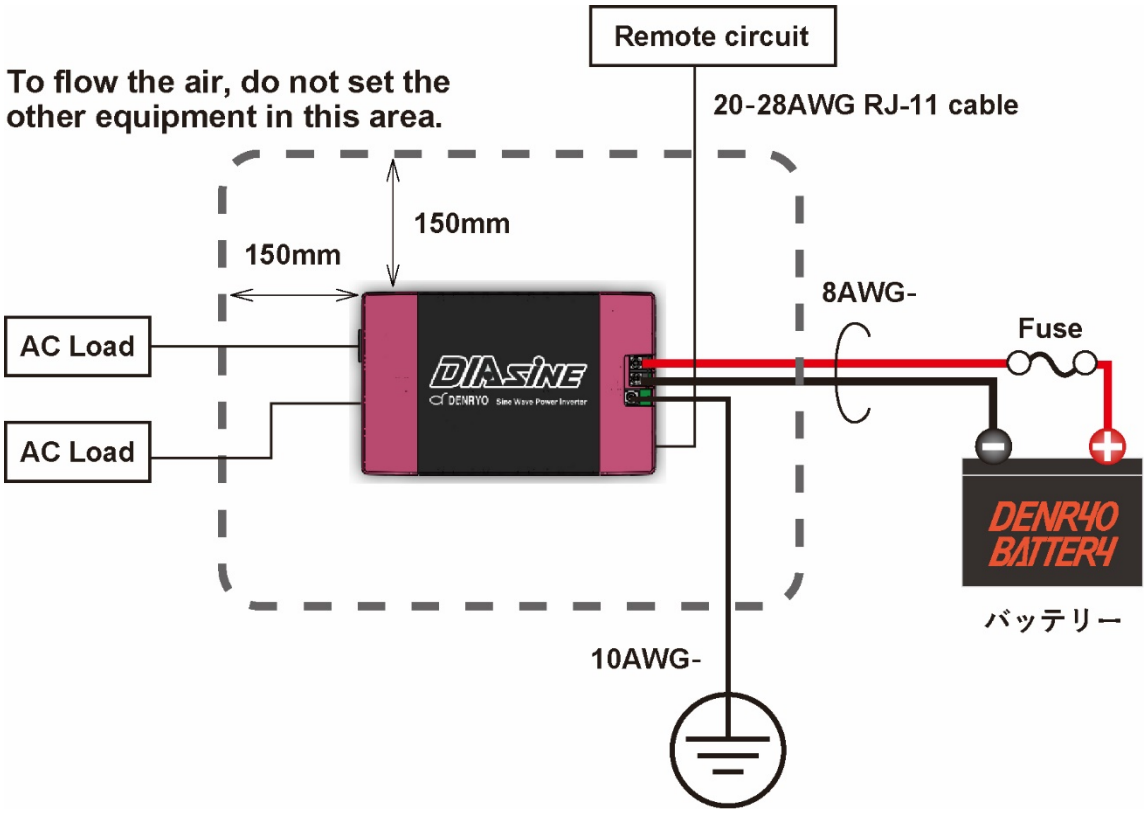


Figure 4.2 System Wiring Diagram

4-3 Setting Confirmation

The default setting is output voltage 100Vac, output frequency 50Hz, buzzer ON, and normal mode of the LED brightness. Pressing the setting button on the front panel to change the settings, refer to Chapter 5-1 Change Settings. Settings remain even the Battery went out its power.

4-4 How to Start Up

Keep pressing the power button on the front side of the Inverter for around 1 second. Make sure the Inverter is not under the protection mode by checking the LED indicators and turn on the load. The introduction of LED indicators during operation please refer to Chapter 6 LED Indicators.

5. Functions

5-1 Change Settings

1. Connect with battery and set the GD300 Inverter to the standby status the power LED is lighting in orange and other LEDs are off. Do not connect anything to AC outlet and AC output terminal.
2. Pressing the setting button in the standby status, the current setting will display around three seconds. To change the setting, press and hold the setting button. Hold down the button for about two seconds, and a buzzer sound* comes from the Inverter while only the power LED indicator lights. Release the setting button and proceed to the next step.
   *The Inverter does not sound once the buzzer is setting OFF.
3. Check the output frequency setting refer to Table 5.1. Press the setting button to select the color of power LED until it matches the color of output frequency you choose. Hold the setting button.
4. Check the battery LED in the center of the Inverter is lighting. Refer to Table 5.1, press the setting button to select the color of battery LED until it matches the color of output voltage you choose. Hold the setting button.
5. Check only the load LED on the right side of the Inverter is lighting. Refer to Table 5.1, press the setting button to select the color of load LED until it matches the buzzer setting ON/OFF and the LED brightness you choose. Press and hold the power button for more than 2 seconds to complete the settings and back to the standby status. If pressing and holding the setting button before holding down the power button, the setting mode begins again from the output frequency.
6. Press the setting button. Check the Inverter is the same as the setting you chose.

Figure 5.1 The LED and settings button

Table 5.1 The LED color of settings

LED / LED Color		Power LED	Battery LED	Load LED
Green	●	50Hz	100Vac	Buzzer ON, bright LED
Yellow	●	60Hz	110Vac	Buzzer ON, dark LED
Blue	●	-	115Vac	Buzzer OFF, bright LED
Purple	●	-	120Vac	Buzzer ON, dark LED

5-2 The Indicators of setting during operation

It is possible to check the current settings during operation by pressing the setting button, refer to Table 5.1. Settings are not able to be changed during operation.

5-3 The Protective Function

To prevent error operation, GD300 Inverter is equipped with the following functions.

A. Reversed battery polarity protection: The reverse warning LED near the grounding terminal in the rear of GD300 Inverter lights red when the battery polarity is reversed. Please unconnected the wire and connect with the correct polarity.

Reversed Connection Warning LED

B. Battery low voltage protection: When the battery voltage falls below the value of low voltage warning, the buzzer sounds three times consecutively around every 5 seconds. When the battery voltage falls below the shut off value of low voltage, the Inverter automatically shuts off the output, the buzzer sounds five times consecutively around every 5 seconds, and battery LED blinks red. When the battery voltage reaches or exceeds the low voltage recovery value, it automatically resumes output. The buzzer does not sound when the buzzer is setting OFF.

C. Battery overvoltage protection: If the battery voltage is higher than the overvoltage warning value, the buzzer sounds three times consecutively around every 5 seconds. When the battery voltage is higher than the shut off value of overvoltage, the inverter automatically shuts off the output, the buzzer sounds five times consecutively around every 5 seconds, and the battery LED lights red. When the battery voltage falls below the overvoltage recovery value, it automatically resumes output. The buzzer does not sound when the buzzer is setting OFF.

⚠ CAUTION	Damage Hazard Please use a battery matching the input voltage range with the Inverter. If using a 12V battery with a 24V model that the voltage of the battery is lower than the input voltage range, the Inverter will not operate. Conversely, if using a 48V battery with a 24V model that the voltage of the battery is higher than the input voltage range, the Inverter may be damaged.

D. Overtemperature protection: When the internal temperature of the Inverter becomes higher than the overtemperature warning value, the buzzer sounds three times consecutively around every 5 seconds. When the internal temperature rises further, the overtemperature protection works and automatically shuts off the output, the buzzer sounds five times consecutively around every 5 seconds, and the power LED lights red. When the internal temperature falls below the value, the Inverter automatically resumes output.

E. Output voltage error protection: When the AC output voltage is too high or too low, the inverter shuts off the output, the buzzer sounds five times consecutively around every 5 seconds, and the load LED lights red. To cancel the protected status, please restart the Inverter.

F. Output short circuit protection: When the output terminal of the Inverter is short-circuited or the load suddenly increases, the Inverter cuts off the output, the buzzer sounds five times continuously every 5 seconds, and the load LED lights red. To cancel the protected status, please restart the Inverter.

G. Overload protection: When the output is within the range of 300 to 360 VA, continues for about 3 minutes or more, and the output continues for about 3 seconds at 360 VA or more, the overload protection is activated to cut off the output and the buzzer. The buzzer sounds five times consecutively every 5 seconds, and the load LED lights red. To cancel the overload protected status, please restart the Inverter.

MEMO	The protected status can be canceled by turning the output ON/OFF by remote connector. Please cancel the protected status after checking the cause of protected status has been removed.

Refer to Table 5.2 for the input voltage setting value of protective function in each model activates and resumes. Also, refer to 6-2 LED indicator of protective function status for LED indicators during protective function activates.

Table 5.2 The input voltage setting value of protective function

	Low voltage			Overvoltage		
Model	Warning	Shut off	Resume	Warning	Shut off	Resume
112	11.5Vdc	10.5Vdc	12.5Vdc	16.5Vdc	17.0Vdc	16.5Vdc
124	23.0Vdc	21.0Vdc	25.0Vdc	33.0Vdc	34.0Vdc	33.0Vdc
148	46.0Vdc	42.0Vdc	50.0Vdc	66.0Vdc	68.0Vdc	66.0Vdc

When the warning and protective function activated, the buzzer could be set OFF by pressing the setting button. If the buzzer has been set OFF by the setting button, the buzzer will sound again once other warning or protective function activated again. Moreover, even the warning status is cancelled, the buzzer will sound again once the Inverter activated the warning status again.

Example 1. The low voltage warning activated and the buzzer was beeping. The buzzer has been set OFF by setting button. The buzzer beeps again when the Inverter shuts off because of low voltage protection.

Example 2. The overtemperature warning activated and the buzzer was beeping. The buzzer has been set OFF by setting button. After the temperature dropped and the warning was released, the buzzer beeps again once the temperature warning activates again.

If you want to set OFF the buzzer anytime, please change the settings to stop the buzzer, refer to Chapter 5-1.

5-4 Remote Connector

As the figure 5.4 method 1, inverter output can be turned ON by inputting the battery voltage to the ENABLE+ (EN+) terminal of the remote connector. The Inverter activates the standby status when input disappears. As the figure 5.4 method 2, inverter output can be turned on by connecting the ENABLE- (EN-) terminal and the GND terminal. When the EN- terminal and GND terminal are disconnected, the Inverter activates the standby status. The power LED lights blue when the Inverter output is turned on by the remote connector. The Inverter can be controlled either by method 1 or method 2.

When the Inverter was turned on by EN+ terminal or EN- terminal input, pressing the power button will turn the Inverter into standby status. Even if pressing the power button in this state, output cannot be turned on unless the EN + terminal or EN - terminal input disappears once.

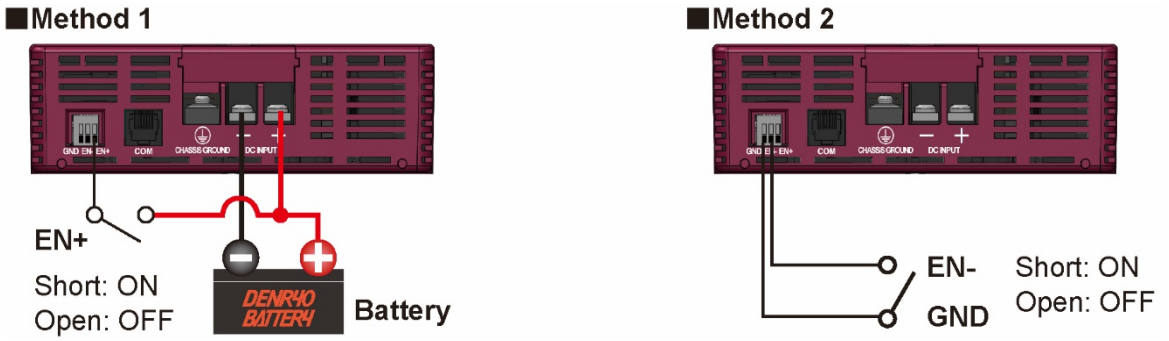


Figure 5.4 The wiring of remote connector

5-5 Optional Terminal

The GD300 Inverter is able to achieve various application by using the optional terminals on the rear of the Inverter. Check DENRYO Official Website for more details.

6. LED Indicators

MEMO	The blinking frequency of each LED indicator is once in two seconds, repeat lighting and off.

6-1 The LED Indicator in Normal Status

Power LED: Power LED indicates the ON/OFF status of output or the overtemperature warning status. Refer to Table 6.1 for the indicators of LED colors and the status.

Table 6.1 Power LED Indicators

LED / LED Colors	Power LED
Orange	Standby
Green	Power ON
Blue	Power On Remote is operating
Blinking yellow	Overtemperature warning

Battery LED: Battery LED indicates the voltage value of battery during operation. Refer to Table 6.2 for the indicators of LED colors and voltage value of battery. The voltage value of 124 and 148 models is double and 4times more than the value listing below.

Table 6.2 Battery LED Indicators

LED / LED Colors	Battery LED
Blinking yellow	Input voltage 10.5-11.5Vdc
Yellow	Input voltage 11.5-12.0Vdc
Green	Input voltage 12.0-14.0Vdc
Blue	Input voltage 14.0-16.5Vdc
Purple	Input voltage 16.5-17.0Vdc

Load LED: Load LED indicates the percentage of output power during operation. Refer to Table 6.3 for the indicators of LED colors and the percentage of output power.

Table 6.3 Load LED Indicators

LED / LED Colors	Load LED
Blue	0-40% output power
Green	40-70% output power
Yellow	70-100% output power
Blinking yellow	Over than100% output power

6-2 The LED Indicators when Protective Function Activates

When the GD300 Inverter activates the protective function, LED indicates the status of the protective function and cut off outputting. Refer to Table 6.4 for the LED indicators and the status of protective functions.

Table 6.4 The Indicators of protective functions

Lighting LED		Indicators		Protective Function
Power LED		Red	●	Overtemperature
Battery LED		Red	●	Input overvoltage
		Blinking red	●●●●●	Input low voltage
Load LED		Red	●	Overload/Load terminal short-circuited
		Blinking red	●●●●●	AC output error
All LEDs		Red/ Blinking red	●/●●●●●	Internal error*

* Please consult with the dealer if an internal error occurs.

7. Troubleshooting Guide

Fault Condition	Possible Cause	Solution
No AC output voltage	Input voltage error Battery LED lights red/ blinks red	Check the value of DC input voltage and adjust the range of input voltage.
	Overtemperature protection Power LED lights red	Check the status of the ventilation is blocked or the air temperature is too high. Please reduce the load capacity or lower the outside air temperature.
	Overload protection Load LED lights red	Check the status of the load capacity, including the instantaneous value, exceeds the rated value of load or not.
	Short-circuit protection Load LED lights red	Check the status of the load wiring connection is short-circuited or not.
	AC output terminal wiring problem	Check the status of the wiring to the AC output terminal is appropriate or broken.
	Internal error All LEDs light red/blink red	It is possible that internal parts of the Inverter may be damaged. Please consult with the dealer.
Short operation time of the Inverter	Battery problem	Please change the battery.
	Lack of battery capacity	Please check the battery specifications and increase the battery capacity.
Output voltage, frequency error	Wrong setting	Refer to Chapter 5-1 Change Settings, and change the settings.
Power LED does not light up even connecting with battery	Reversed connection of battery polarity Reverse connection warning LED lights red	Correct the connection to the correct polarity
	The internal fuse cuts off	Parts of the internal Inverter may be damaged. Please consult with the dealer.
Remote connector does not work	Wiring problem	Check if the status of wire connection of the remote connector is correct.

If the fault condition cannot be solved, please consult with the dealer.

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