

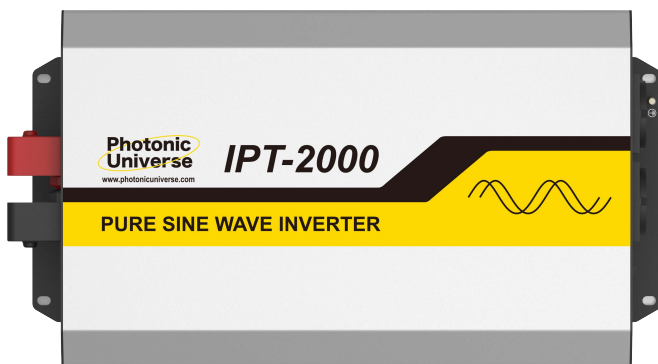


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# Pure Sine Wave Inverter

*IPT series*

## INSTRUCTION MANUAL





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## Important Safety Instructions

### Please reserve this manual for future review.

This manual contains instructions on the safety, installation, and operation of the IPT series high-frequency pure sine wave inverter.

### 1. Explanation of symbols

Please read the explanations accompanying the following symbols carefully. They provide important safety information and guidance for correct operation.



#### DANGER

Indicates a high-level hazard that, if not avoided, will result in death or serious injury.



#### WARNING

Indicates a medium-level hazard that, if not avoided, could result in death or serious injury.



#### CAUTION

Indicates a low-level hazard that, if not avoided, could result in minor or moderate injury.

#### NOTICE

Indicates an important reminder during operation which, if ignored, may result in an equipment malfunction or an alarm condition.

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#### Tip

Indicates recommendation or useful reference.

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Read through the user manual before any operations.

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### 2. Requirements for professional and technical personnel

- Professionally trained.
- Familiar with relevant safety regulations and recommendations for the electrical systems.
- Have read and understood this manual and the relevant safety precautions.

### 3. Safety precautions before installation



#### DANGER

- Keep the inverter out of the reach of children.
- When installing the inverter, assess whether there is a risk of electric arc formation in the installation area.

#### NOTICE

- When you receive the inverter, check whether there are any signs of damage on the inverter. If any damage is found, do not install the inverter and contact the supplier.
- When installing or relocating the inverter, follow the instructions provided in the manual.
- The inverter is designed for off-grid operation only. Connection to the grid is strictly prohibited, as it may cause permanent damage to the inverter.
- This inverter is intended for stand-alone operation only and must not be connected in parallel or in series with other units, as this may cause permanent damage to the inverter.
- The inverter must be connected to an appropriate battery to operate.

### 4. Safety precautions for mechanical installation



#### DANGER

Before installation, ensure the inverter is completely disconnected from all power sources.

#### NOTICE

Ensure that sufficient space and ventilation is provided for heat dissipation before installation. The installation surface and any nearby objects must be non-combustible, otherwise appropriate protection must be used (such as a fireproof board as the mounting surface). Do not install the inverter in harsh environments such as humid, greasy, flammable, explosive, or dusty areas.

### 5. Safety precautions for electrical connection



#### DANGER

Do not install the inverter near a flooded lead-acid battery, as sparks at the battery terminals may ignite the gas released during operation.



#### WARNING

Ensure that all wiring connections are secure to prevent heat accumulation caused by loose connections.

#### NOTICE

- The AC output terminal is intended for load connection only. Do not connect it to any other power source or to the utility grid, as this may cause permanent damage to the inverter. Always turn off the inverter before connecting or disconnecting loads.
- Do not connect battery chargers or similar equipment directly to the inverter input terminal, as this may cause permanent damage to the inverter.
- The protective grounding terminal must be connected to earth. The cross-section of the wire should not be less than 4mm<sup>2</sup>.
- A fast-acting fuse or breaker should be used between battery and inverter. The fuse or breaker's rated current should be twice the inverter rated input current.
- The DC input voltage must comply with the values specified in the user manual. Input voltages that are too high or too low will affect normal operation and may cause damage to the inverter.
- It is recommended that the cable length between the battery and the inverter is less than 3 meters. If the length exceeds 3 meters, use a cable with a larger cross-sectional area.
- It is strictly forbidden to connect a load with a surge power (VA) exceeding the overload power rating of the inverter to the AC output port as this may cause permanent damage to the inverter.

## 6. Safety precautions for inverter operation



#### DANGER

The inverter AC output is high voltage. Do not touch the wiring connections to avoid electric shock.



#### WARNING

- When the inverter is operating, the enclosure may become very hot. Do not touch the enclosure during operation.

## 7. Dangerous operations which would cause an electric arc, fire, or explosion

- Touching uninsulated or unterminated wire ends that may be live.
- Touching busbars, terminals, or internal inverter components that may be live.
- Loose power cable connections.
- Screws or other items inadvertently falling into the inverter.
- Improper operations by untrained or unauthorised personnel.



### DANGER

If an incident occurs, it must be handled by professional and technical personnel. Improper handling may result in more serious consequences.

## 8. Safety precautions for stopping the inverter

- Internal conductive components may remain live for up to five minutes after the inverter stops operating.
- The inverter may only be restarted after faults affecting safety performance have been removed.
- There are no user-serviceable components inside the inverter. Do not disassemble or attempt to repair the inverter.



### DANGER

Do not touch or open the enclosure within ten minutes after the inverter is powered off and disconnected from the battery.

## 9. Safety precautions for inverter maintenance

- It is recommended to verify the inverter using appropriate safety test equipment to ensure that no residual voltage or current is present.
- Improper operation of the inverter may cause personal injury or equipment damage.
- It is recommended to wear an antistatic wrist strap or avoid unnecessary impact on the circuit board.

# 1 Product Introduction

## 1.1 Overview

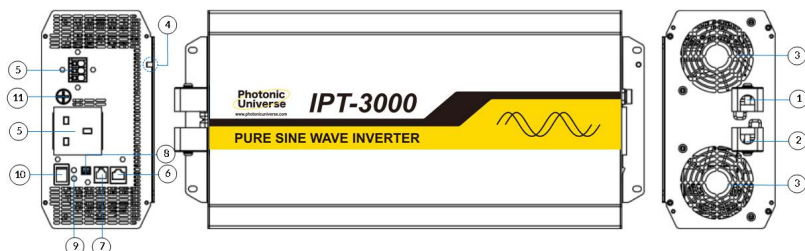
The IPT series is a high-frequency sine wave inverter featuring a fully digital intelligent design and a dual closed-loop voltage and current control algorithm. With high conversion efficiency, low Total Harmonic Distortion (THD), and high operational reliability, the IPT series is suitable for use in DC-AC off-grid systems such as vehicle systems, security monitoring systems, emergency lighting systems, household power systems, field power systems, and other applications requiring high power quality.

### Features

- Pure sine wave output.
- Input to output electrical isolation.
- Output power factor up to 1.
- Input protection: low-voltage, over-voltage, reverse polarity, anti-surge.
- Output protection: overload, short circuit, overheating.
- RS485 communication port for remote monitoring. <sup>(1)</sup>
- External switch design to extend inverter control functions and reduce power consumption.

(1) For inverters with 12V/24V input voltage, the RS485/RJ11 port does not provide communication isolation. Communication isolation is provided only for inverters with 48 V input voltage.

## 1.2 Appearance



| No. | Description                                  | No. | Description                                                                                          |
|-----|----------------------------------------------|-----|------------------------------------------------------------------------------------------------------|
| 1   | DC input terminal <sup>(1)</sup>             | 7   | Reserved external switch port RJ11 (for future use)                                                  |
| 2   | DC input terminal <sup>(1)</sup>             | 8   | 2-pin remote switch port (for IPT-RMS remote switch, dry contacts of MT80 meter, external relay etc) |
| 3   | Cooling fan <sup>(2)</sup>                   | 9   | LED Indicators <sup>(4)</sup>                                                                        |
| 4   | Grounding terminal                           | 10  | ON/OFF switch                                                                                        |
| 5   | AC output terminals/sockets <sup>(1)</sup>   | 11  | AC fuse terminal <sup>(5)</sup>                                                                      |
| 6   | RS485 communication port RJ45 <sup>(3)</sup> |     |                                                                                                      |

(1) The DC input terminals and the AC output terminals/sockets may vary depending on the product model. Please refer to the actual product.

(2) Cooling fan control algorithm:

- Conditions to start the cooling fan

|                                                                                                                                                                                          |                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <p>The heat sink temperature is higher than 45°C; or</p> <p>The internal inverter temperature is higher than 45°C; or</p> <p>The output power is higher than 50% of the rated power.</p> | All IPT models |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|

- Conditions to stop the cooling fan

|                                                                                                                                                                          |                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| The heat sink temperature is lower than 40°C; and<br>The internal inverter temperature is lower than 40°C; and<br>The output power is lower than 30% of the rated power. | IPT-500 and smaller models |
| The heat sink temperature is lower than 40°C; and<br>The internal inverter temperature is lower than 40°C; and<br>The output power is lower than 40% of the rated power. | IPT-1000 and larger models |

(3) The RS485 communication port supports connections from a remote meter, Bluetooth dongle, Wi-Fi dongle, or PC for parameter setting and remote monitoring.

(4) Indicators include the power indicator and fault indicator. The indicator and buzzer status under different working conditions are shown in the table below:

| Power indicator                         | Fault indicator                       | Buzzer       | Status                    |
|-----------------------------------------|---------------------------------------|--------------|---------------------------|
| Green ON                                | Red OFF                               | No beeps     | Output voltage normal     |
| Green slowly flashing (every 4 seconds) | Red OFF                               | Buzzer beeps | Input under voltage       |
| Green fast flashing (every second)      | Red OFF                               | Buzzer beeps | Input over voltage        |
| Green OFF                               | Solid red                             | Buzzer beeps | Internal over-temperature |
| Green OFF                               | Red fast flashing (every second)      | Buzzer beeps | Output short-circuit      |
| Green ON                                | Red slowly flashing (every 4 seconds) | Buzzer beeps | Overload                  |

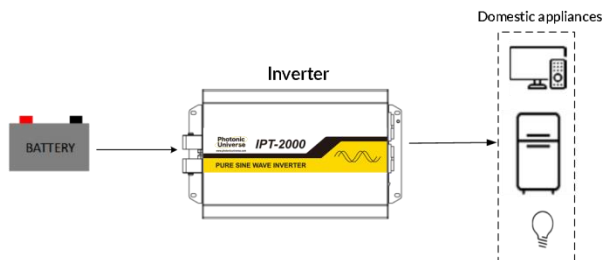
(5) The primary purpose of fast-acting fuse terminal 11 is to protect the AC socket. The load connected to the product via the fast-acting fuse terminal must not exceed the rated current of 10 A or 20 A, as marked.

**Note:** Not all IPT products are equipped with a fast-acting fuse terminal. Please refer to the actual product configuration.

### 1.3 Connection diagram

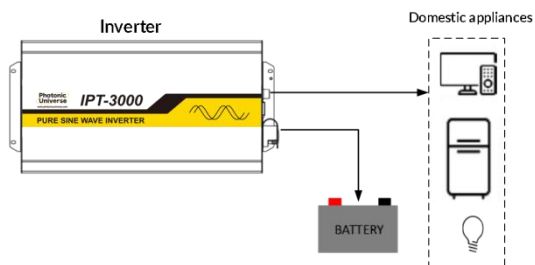
- The DC input and AC sockets are located on different sides

For some models, the DC input terminals and AC sockets are located on different sides of the inverter, such as IPT-350, IPT-500, IPT-1000, IPT-1500, IPT-2000. The system connection example is illustrated below.



- The DC input and AC sockets are located on the same side

For other models, the DC input terminals and AC sockets are located on the same side of the inverter, such as IPT-3000. The system connection example is illustrated below.



#### NOTICE

It is recommended to connect the inverter DC input terminals directly to the battery terminals. Do not connect them to the terminals of charging devices with variable voltage output, as charging voltage spikes of these devices may trigger the over-voltage protection of the inverter.

## 2 Installation

### 2.1 Precautions

- Read all installation instructions in this manual carefully before beginning the installation.
- Exercise caution when installing batteries. When installing flooded lead-acid batteries, wear appropriate eye protection and rinse immediately with clean water if battery acid comes into contact with the skin or eyes.
- Keep the battery away from metal objects, as they may cause a short circuit.
- Loose power connectors and corroded wires may generate excessive heat, melt wire insulation, burn surrounding materials, or cause a fire. Ensure tight connections and secure cables with cable clamps to prevent movement in mobile applications.
- The DC input voltage must strictly comply with the values specified in the user manual. Too high or too low DC input voltage may affect operation and damage the inverter.
- Recommended cross-section for battery-to-inverter cables:  $1\text{mm}^2$  for every 3A of current.
- Mount the inverter indoors. Avoid exposure to the elements, and do not allow water to enter or come in contact with the inverter under any circumstances.
- After turning off the power switch and disconnecting the inverter, do not touch live terminal components immediately. It is recommended to perform related operations only after waiting at least 10 minutes.
- Do not install the inverter in harsh environments such as humid, salt-spray, corrosive, greasy, flammable, explosive, or dusty areas.
- The AC output is high voltage. Do not touch the wiring connections to avoid electric shock.
- To prevent injury, do not touch the fan during operation.

### 2.2 Wire size and circuit breaker

Ensure that the wiring and installation methods, as well as the selected cables and accessories (fuses, fuse holders, circuit breakers, switches) conform to all applicable local requirements and industry standards. In particular, it is important to comply with the minimum cable cross-section sizes and to provide adequate circuit protection.

### 2.2.1 Battery connection

| Inverter model | Minimum wire size         | Ring terminal | Circuit breaker / fuse |
|----------------|---------------------------|---------------|------------------------|
| IPT-350        | 6mm <sup>2</sup> /10AWG   | M6            | 50A                    |
| IPT-350-24     | 4mm <sup>2</sup> /12AWG   | M6            | 30A                    |
| IPT-500        | 10mm <sup>2</sup> /8AWG   | M6            | 60A                    |
| IPT-500-24     | 6mm <sup>2</sup> /10AWG   | M6            | 30A                    |
| IPT-1000       | 25mm <sup>2</sup> /3AWG   | M6            | 125A                   |
| IPT-1000-24    | 16mm <sup>2</sup> /5AWG   | M6            | 60A                    |
| IPT-1000-48    | 6mm <sup>2</sup> /10AWG   | M6            | 40A                    |
| IPT-1500       | 50mm <sup>2</sup> /0AWG   | M6            | 200A                   |
| IPT-1500-24    | 25mm <sup>2</sup> /3AWG   | M6            | 100A                   |
| IPT-1500-48    | 10mm <sup>2</sup> /8AWG   | M6            | 60A                    |
| IPT-2000       | 70mm <sup>2</sup> /2/0AWG | M10           | 250A                   |
| IPT-2000-24    | 35mm <sup>2</sup> /2AWG   | M6            | 125A                   |
| IPT-2000-48    | 16mm <sup>2</sup> /5AWG   | M6            | 60A                    |
| IPT-3000       | 95mm <sup>2</sup> /3/0AWG | M10           | 400A                   |
| IPT-3000-24    | 50mm <sup>2</sup> /0AWG   | M6            | 200A                   |
| IPT-3000-48    | 25mm <sup>2</sup> /3AWG   | M6            | 100A                   |
| IPT-4000-48    | 35mm <sup>2</sup> /2AWG   | M6            | 125A                   |
| IPT-5000-48    | 35mm <sup>2</sup> /2AWG   | M6            | 150A                   |

#### NOTICE

The cable size in the above table is for reference only. Always comply with applicable local regulations and industry standards. If there is a long distance between the inverter and the battery, thicker cables should be used to reduce voltage drop and improve performance.

## 2.2.2 AC output connection

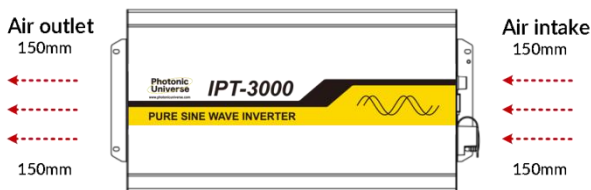
| Inverter model | Minimum wire size         | Circuit breaker / fuse |
|----------------|---------------------------|------------------------|
| IPT-350        | 1mm <sup>2</sup> /18AWG   | 6A                     |
| IPT-350-24     | 1mm <sup>2</sup> /18AWG   | 6A                     |
| IPT-500        | 1mm <sup>2</sup> /18AWG   | 6A                     |
| IPT-500-24     | 1mm <sup>2</sup> /18AWG   | 6A                     |
| IPT-1000       | 1.5mm <sup>2</sup> /16AWG | 10A                    |
| IPT-1000-24    | 1.5mm <sup>2</sup> /16AWG | 10A                    |
| IPT-1000-48    | 1.5mm <sup>2</sup> /16AWG | 10A                    |
| IPT-1500       | 1.5mm <sup>2</sup> /16AWG | 10A                    |
| IPT-1500-24    | 1.5mm <sup>2</sup> /16AWG | 10A                    |
| IPT-1500-48    | 1.5mm <sup>2</sup> /16AWG | 10A                    |
| IPT-2000       | 2.5mm <sup>2</sup> /14AWG | 16A                    |
| IPT-2000-24    | 2.5mm <sup>2</sup> /14AWG | 16A                    |
| IPT-2000-48    | 2.5mm <sup>2</sup> /14AWG | 16A                    |
| IPT-3000       | 4mm <sup>2</sup> /12AWG   | 20A                    |
| IPT-3000-24    | 4mm <sup>2</sup> /12AWG   | 20A                    |
| IPT-3000-48    | 4mm <sup>2</sup> /12AWG   | 20A                    |
| IPT-4000-48    | 4mm <sup>2</sup> /12AWG   | 25A                    |
| IPT-5000-48    | 4mm <sup>2</sup> /12AWG   | 32A                    |

## 2.3 Mounting and wiring

### 2.3.1 Mounting

It is important to ensure the installation location allows for sufficient heat dissipation.

The inverter shall be installed on a non-combustible surface in a place with sufficient airflow through the inverter heat sink and a minimum clearance of 150mm from the upper and lower edges of the inverter to ensure proper thermal convection.



#### WARNING

Do not install the product in an enclosed cabinet, as this will impair heat dissipation. If installation in an enclosed cabinet is unavoidable, ensure effective ventilation and avoid full-load operation, as over-temperature protection may be activated.

### 2.3.2 Wiring

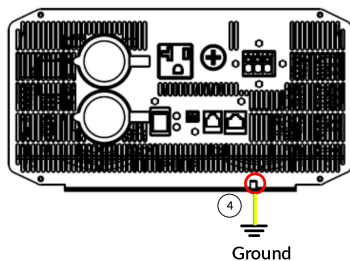
#### NOTICE

- Turn off the inverter switch before wiring.
- Do not close the circuit breaker or fast-acting fuse during the wiring and ensure that the poles' leads are connected correctly.

#### Wiring sequence

##### 1. Ground connection

The wire size for the ground connection must be thicker or equal to that for the AC output. Refer to Section 2.2 for detailed wire size.



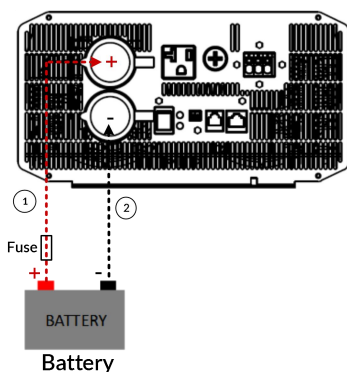
## 2. Battery connection

### NOTICE

A fast-acting fuse or circuit breaker must be installed on the battery side, in accordance with the following requirements:

- The fast-acting fuse voltage shall be 1.5 to 2 times the inverter's rated voltage.
- The fast-acting fuse current shall be 1.5 to 2.5 times the inverter's rated current.
- The distance between the fast-acting fuse or breaker and the battery shall not exceed 150mm.

These requirements do not override applicable safety regulations or cable protection requirements. The fuse or circuit breaker rating shall not exceed the maximum permissible current of the connected cable. Where a smaller protective device is required to protect the cable, the lower rating shall be used.



### 3. AC loads connection

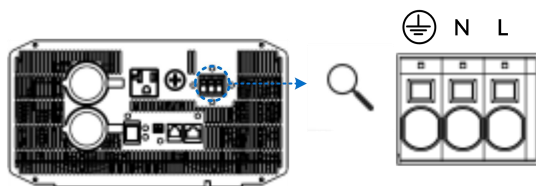
#### NOTICE

The AC loads shall be selected based on the continuous output power of the inverter. The surge power of the AC loads must be lower than the inverter surge capacity; otherwise, damage to the inverter may occur.

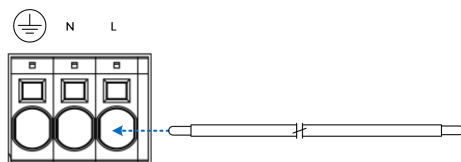
#### DANGER

Never work on the AC connections when the inverter is under power or connected to a battery.

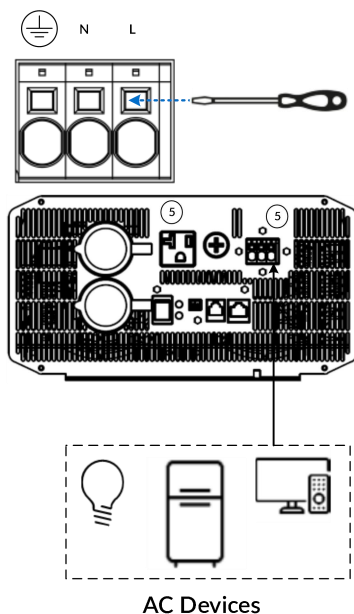
**Definition of the AC output port:** It varies depending on the product model; please refer to the actual product.



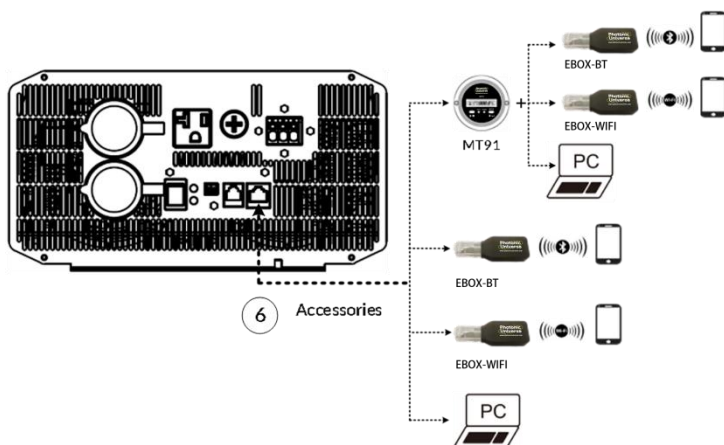
- It is recommended to use multi-stranded wires with a cross-sectional area of no more than  $6\text{mm}^2$ .
- When selecting multi-stranded wire, tin the conductor with solder before inserting it directly into the corresponding port.



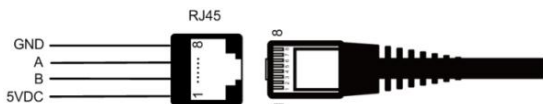
- Turn off the inverter before removing the wiring. To remove the wire, insert a suitable insulated tool into the small hole (on the top of the port) to release the terminal, and remove the wire.



#### 4. Connection of optional accessories for the RS485 communication port (RJ45)



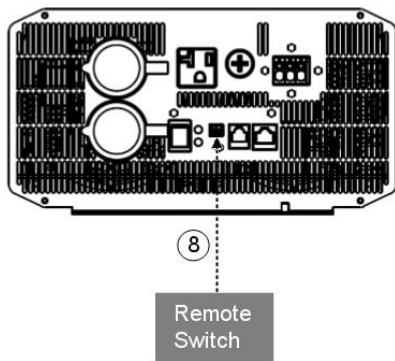
## Pin definitions for the RS485 communication port (RJ45)



| Pin | Name    | Details  | Pin | Name    | Details   |
|-----|---------|----------|-----|---------|-----------|
| 1   | +5VDC   | 5V/200mA | 5   | RS485-A | RS485-A   |
| 2   | +5VDC   |          | 6   | RS485-A |           |
| 3   | RS485-B | RS485-B  | 7   | GND     | Power GND |
| 4   | RS485-B |          | 8   | GND     |           |

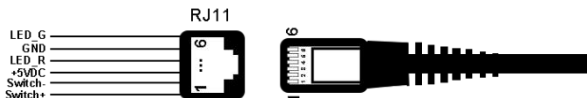
## 5. Remote switch port (2-pin)

This port is used for connecting a remote switch IPT-RMS (optional), dry contacts from the MT80 remote meter, an external relay, or other remote switch devices.



## 6. Reserved external switch port (RJ11)

This port is reserved for future use for compatible switches with RJ11 connection. Pin definitions:



| Pin | Name    | Details | Pin | Name  | Details         |
|-----|---------|---------|-----|-------|-----------------|
| 1   | Switch+ | Switch+ | 4   | LED_R | Red light drive |

|   |         |          |   |       |                   |
|---|---------|----------|---|-------|-------------------|
| 2 | Switch- | Switch-  | 5 | GND   | Power GND         |
| 3 | +5VDC   | 5V/200mA | 6 | LED_G | Green light drive |

### 2.3.3 Power on the inverter

**Step 1:** Close the breaker at the inverter input terminal or connect the fast-acting fuse at the battery terminal. An enclosed circuit breaker or a switch is recommended, as directly connecting the battery via the terminals or a fuse may cause sparks.



#### DANGER

Do not connect the fuse or live DC cables to any terminals in close proximity to a flooded lead-acid battery, as sparks at the connection point may ignite the gas released during operation.

**Step 2:** Turn on the inverter switch, and the green indicator will turn on, indicating normal AC output.

**Step 3:** Close the breaker between the AC load terminal / socket and your AC loads, turn on your loads and check that the system is working properly.

**Step 4:** If the FAULT indicator flashes red and the buzzer sounds after the inverter is powered on, immediately turn off the load and the inverter. Clear the faults according to Chapter 5 of the user manual. After the faults have been cleared, restart the inverter by following the above steps.

#### NOTICE

When supplying power for different loads, it is recommended to first turn on the load with a larger inrush current, and then turn on the loads with smaller inrush currents after the output has stabilised.

### 3 Parameter Setting

IPT inverter parameters such as power saving mode, baud rate, output voltage class, and output frequency class can be set using a remote meter, phone app, or PC software. This chapter describes the parameter settings on the remote meter MT91 (optional) as an example.

#### 3.1 Power Saving Mode

Users can enable the power saving mode and set the PSI (= "Power Saving In", the power threshold for entering power saving mode) and the PSO (= "Power Saving Out", the power threshold for exiting power saving mode) values using the remote meter. The minimum power step is 1VA.

When the actual load power is lower than the PSI value, the system will automatically switch to the power saving mode. In this mode, the device output is turned on for 1s and turned off for 5s.

When the actual load power exceeds the PSO value, the inverter will automatically exit the power saving mode and resume normal operation.

To enable power saving mode (PSE = "Power Saving Enable" parameter):

**Step 1:** In the real-time interface of the remote meter, press and hold the  button to enter the parameter setting interface.

**Step 2:** Press the  or  button to select the PSE parameter.

**Step 3:** Press and hold the  button until the PSE parameter (default: OFF) flashes.

**Step 4:** Press the  or  button to set the PSE state.

- Select ON to enable the power saving mode.
- Select OFF to disable the power saving mode.

**Step 5:** Press and hold the  button to confirm.

To set the power value for exiting the power saving mode (PSO):

**Step 1:** In the parameter setting interface, press the  or  button to select the PSO

parameter.

**Step 2:** Press and hold the  button until the PSO value flashes.

**Step 3:** Press the  or  button to set the PSO value.

- Press the  button to increase the PSO value by 1.
- Press the  button to decrease the PSO value by 1.
- Press and hold the  button to increase the PSO value by 10. After increasing the value ten times, the PSO value will increase by 100 each time.

**Step 4:** Press and hold the  button to confirm.

**To set the power value for entering the power saving mode (PSI):**

**Step 1:** In the parameters setting interface, press the  or  button to select the PSI parameter.

**Step 2:** Press and hold the  button until the PSI value flashes.

**Step 3:** Press the  or  button to set the PSI value.

- Press the  button to increase the PSI value by 1.
- Press the  button to decrease the PSI value by 1.
- Press and hold the  button to increase the PSI value by 10. After increasing the value ten times, the PSI value will increase by 100 each time.

**Step 4:** Press and hold the  button to confirm.

## 3.2 Other parameters

Users can set the baud rate, low voltage disconnect, low voltage reconnect, etc. using the remote meter.

### Operation:

**Step 1:** In the real-time interface, press and hold  for 2s to enter the parameter setting interface.

**Step 2:** Press  or  to select the parameter to be configured.

**Step 3:** Press and hold  for 2s to enter the configuration interface of the selected parameter.

**Step 4:** Press  or  to set the parameter value.

**Step 5:** Press and hold  for 2s to confirm the setting.

**Step 6:** Press  +  to exit the current interface.

### User-defined parameters:

| Display                                                                                | Parameter                                     | Default value                          | User-defined range                                                                                      |
|----------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------|
|  BLT   | LCD backlight time                            | 30s                                    | 30s/ 60s/100s(ON solid)                                                                                 |
|  PSE  | Power Saving Enable                           | OFF                                    | ON/OFF                                                                                                  |
|  PSI | Power Saving In                               | 20VA                                   | 20VA - (20% * rated power)                                                                              |
|  P50 | Power Saving Out                              | 40VA                                   | (20VA + PSI) - (50% * rated power)                                                                      |
|  BRS | Baud Rate Select <sup>(1)</sup>               | 115200                                 | 9600/115200                                                                                             |
|  LVD | Low voltage disconnect voltage <sup>(2)</sup> | 12V: 10.8V<br>24V: 21.6V<br>48V: 43.2V | 12V: 10.5V-14.2V; step size: 0.1V<br>24V: 21V-30.2V; step size: 0.1V<br>48V: 42V-62.4V; step size: 0.1V |

|                                                                                      |                                           |                                    |                                                                                                         |
|--------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------|
|  LVR | Low voltage<br>reconnect voltage<br>(2)   | 12V: 12.5V<br>24V: 25V<br>48V: 50V | 12V: 11.5V-15.2V; step size: 0.1V<br>24V: 22V-31.2V; step size: 0.1V<br>48V: 43V-63.4V; step size: 0.1V |
|  OVR | Over voltage<br>reconnect voltage<br>(2)  | 12V: 14.5V<br>24V: 29V<br>48V: 58V | 12V: 11.5V-15.2V; step size: 0.1V<br>24V: 22V-31.2V; step size: 0.1V<br>48V: 43V-63.4V; step size: 0.1V |
|  OVD | Over voltage<br>disconnect<br>voltage (2) | 12V: 16V<br>24V: 32V<br>48V: 64V   | 12V: 12.5V-16.2V; step size: 0.1V<br>24V: 23V-32.2V; step size: 0.1V<br>48V: 44V-64.4V; step size: 0.1V |

(1) Due to the character limit of the LCD displayed data, when the baud rate is set to 115200, the value displayed on the LCD is 1152.

(2) For the parameters marked with (2), please set them by the input voltage rules in Chapter 4; otherwise, the parameter settings will not be successful.

## 4 Protections

### 4.1 Input voltage protection

The following rules must be followed when modifying the battery input voltage parameters:

- A. Over voltage limit voltage (16.2/32.2/64.4V)  $\geq$  Over voltage disconnect voltage  $\geq$  Over voltage reconnect voltage +1V.
- B. Over voltage reconnect voltage  $\geq$  Low voltage reconnect voltage.
- C. Low voltage reconnect voltage  $\geq$  Low voltage disconnect voltage + 1V.
- D. Low voltage disconnect voltage  $\geq$  Low voltage limit voltage (10.5/21/42V).

The inverter status is as follows when input voltage protection occurs:

| Input voltage protection         | Inverter status                                                                                                        |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Over voltage protection          | The output is switched OFF immediately.<br>The green indicator flashes rapidly (once every second).<br>Buzzer beeps.   |
| Over voltage recovery protection | The green indicator is ON solid.<br>The output voltage is normal.                                                      |
| Low voltage protection           | The output is switched OFF immediately.<br>The green indicator flashes slowly (once every 4 seconds).<br>Buzzer beeps. |
| Low voltage recovery protection  | The green indicator is ON solid.<br>The output voltage is normal.                                                      |

#### NOTICE

Although the inverter is equipped with input over-voltage protection, the input voltage must not exceed 20V for the 12V system, 40V for the 24V system, and 80V for the 48V system. Otherwise, the inverter may be damaged.

## 4.2 Overload protection

|                                                                                                                                                                                                                        |                                  |                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------|
| IPT-350<br>IPT-350-24<br>IPT-500<br>IPT-500-24<br>IPT-1000<br>IPT-1000<br>IPT-1000-48<br>IPT-1500<br>IPT-1500-24<br>IPT-1500-48<br>IPT-2000<br>IPT-2000-24<br>IPT-2000-48<br>IPT-3000-24 <sup>(i)</sup><br>IPT-3000-48 | Output power = 1.2 * Rated power | The output is switched OFF after 1 minute.<br>Buzzer beeps.<br>Red indicator slowly flashes.   |
|                                                                                                                                                                                                                        | Output power = 1.5 * Rated power | The output is switched OFF after 30 seconds.<br>Buzzer beeps.<br>Red indicator slowly flashes. |
|                                                                                                                                                                                                                        | Output power = 1.8 * Rated power | The output is switched OFF after 10 seconds.<br>Buzzer beeps.<br>Red indicator slowly flashes. |
|                                                                                                                                                                                                                        | Output power = 2 * Rated power   | The output is switched OFF after 5 seconds.<br>Buzzer beeps.<br>Red indicator slowly flashes.  |

### NOTICE

When the overload protection occurs on the above models, the AC output will automatically attempt to recover three times (after 5s, 10s, and 15s respectively). If all three recovery attempts fail, the inverter must be restarted to recover the AC output.

(i) When the overload protection is triggered on IPT-3000-24, the AC output is shut down and cannot be recovered automatically.

|                         |                                         |                                                                                                |
|-------------------------|-----------------------------------------|------------------------------------------------------------------------------------------------|
| IPT-3000<br>IPT-4000-48 | Output power = $1.5 \times$ Rated power | The output is switched OFF after 10 seconds.<br>Buzzer beeps.<br>Red indicator slowly flashes. |
|                         | Output power = $1.7 \times$ Rated power | The output is switched OFF after 5 seconds.<br>Buzzer beeps.<br>Red indicator slowly flashes.  |
| IPT-5000-48             | Output power = $1.2 \times$ Rated power | The output is switched OFF after 1 minute.<br>Buzzer beeps.<br>Red indicator slowly flashes.   |
|                         | Output power = $1.4 \times$ Rated power | The output is switched OFF after 10 seconds.<br>Buzzer beeps.<br>Red indicator slowly flashes. |
|                         | Output power > $1.4 \times$ Rated power | The output is switched OFF after 5 seconds.<br>Buzzer beeps.<br>Red indicator slowly flashes.  |

#### NOTICE

When the overload protection occurs on the above models, the AC output will not recover automatically. The AC output can be restored after clearing the overload fault and restarting the inverter.

### 4.3 Output short circuit protection

| Faults                                                                                  | Instructions                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The output is switched OFF immediately.<br>Buzzer beeps.<br>Red indicator fast flashes. | When the short circuit protection is triggered, the AC output will automatically attempt to recover three times (after 5s, 10s, and 15s respectively). If all three recovery attempts fail, the inverter must be restarted to recover the AC output. |

#### 4.4 Inverter over temperature protection

| Faults                     | Instructions                                                                                                          |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Red indicator is ON solid. | The inverter stops working when the temperature of the heat sink or the internal modules exceeds a set value.         |
| Red indicator is OFF.      | The inverter resumes operation when the temperature of the heat sink or the internal modules falls below a set value. |

## 5 Troubleshooting



### DANGER

High voltage is present inside the inverter. Do not try to repair or maintain the inverter by yourself, as this may cause an electric shock.

| No. | Faults                                                                                             | Possible reasons                  | Troubleshooting                                                                                                                                                              |
|-----|----------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Green indicator flashes slowly (once every 4 seconds)<br>Red indicator turns OFF<br>Buzzer beeps   | The DC input voltage is too low.  | Check whether the DC input voltage is lower than 10.8/21.6/43.2V using a multimeter.<br><br>The inverter resumes operation if the input voltage returns to the normal range. |
| 2   | Green indicator flashes fast (once every second)<br>Red indicator turns OFF<br>Buzzer beeps        | The DC input voltage is too high. | Check whether the DC input voltage is higher than 16/32/64V using a multimeter.<br><br>The inverter resumes operation if the input voltage returns to the normal range.      |
| 3   | Green indicator is ON solid<br>Red indicator slowly flashes (once every 4 seconds)<br>Buzzer beeps | Overload                          | Turn the inverter off. Check whether the AC load's power is within the inverter's rated power. Clear the overload fault, and restart the inverter.                           |
| 4   | Green indicator turns OFF<br>Red indicator flashes fast (once every second)<br>Buzzer beeps        | Load short-circuit                | Turn the inverter off. Check the load connection carefully. Clear the short circuit fault and restart the inverter.                                                          |
| 5   | Green indicator turns OFF<br>Red indicator is ON solid.<br>Buzzer beeps                            | Inverter over-temperature         | Improve ventilation and reduce the ambient temperature. Once the temperature has dropped, restart the inverter. If the fault cannot be cleared after performing the above    |

|  |  |  |                                                      |
|--|--|--|------------------------------------------------------|
|  |  |  | operations, reduce the load connected to the output. |
|--|--|--|------------------------------------------------------|

## 6 Maintenance

The following inspections and maintenance tasks are recommended at least twice a year for best performance.

- Make sure there are no obstructions to the airflow around the inverter. Remove any dirt and debris if any are found.
- Check all the wires for signs of damage from sun exposure, frictional wear, dryness, insects, or rats, etc. Replace any damaged wires.
- Check the display and LED indicators of the inverter to ensure they are working as expected. Pay attention to any fault or error indication.
- Tighten all the terminals. Inspect for loose, broken, or burnt connections at the terminals.
- Remove dirt, insects, and corrosion on and around the inverter.
- Check and confirm that any fuses or lightning arresters installed with the inverter are in good working condition.



### DANGER

Electric shock hazard! Ensure that all power is turned off and that the inverter is physically disconnected on both the DC and AC sides. Ensure that all capacitors have been fully discharged by turning the disconnected inverter's power switch ON and keeping it in this state for at least 10 seconds, before turning it OFF and performing the above operations.

## 7 Specifications

Please pay attention to the following footnotes (1), (2) and (3) in the specifications table:

- (1) The "Surge current at power on" parameter for this product is reduced due to the anti-surge function. If you have a customised inverter without this function, the actual surge current shall prevail.
- (2) This refers to the rated output efficiency when the load power equals the "continuous output power" under the rated DC input voltage.
- (3) This refers to the maximum output efficiency when the inverter is connected to different loads under the rated DC input voltage.

| Parameter                                | IPT-350                                              | IPT-350-24          | IPT-500                                 | IPT-500-24          |
|------------------------------------------|------------------------------------------------------|---------------------|-----------------------------------------|---------------------|
| Continuous Output Power                  | 350W at 35°C at the rated input voltage              |                     | 500W at 35°C at the rated input voltage |                     |
| Surge Power                              | 700W for 5s                                          |                     | 1,000W for 5s                           |                     |
| Power-on Surge Current <sup>(1)</sup>    | < 30A                                                |                     | < 50A                                   |                     |
| Output Voltage                           | 220VAC (±3%); 230VAC (-6% - +3%); 240VAC (-9% - +3%) |                     |                                         |                     |
| Output Frequency                         | 50/60Hz ± 0.2%                                       |                     |                                         |                     |
| Output Wave                              | Pure Sine Wave                                       |                     |                                         |                     |
| Output Distortion THD                    | ≤ 3% (Resistive load)                                |                     |                                         |                     |
| Load Power Factor                        | 0.2 - 1 (Load power ≤ Continuous output power)       |                     |                                         |                     |
| Rated Input Voltage                      | 12V                                                  | 24V                 | 12V                                     | 24V                 |
| Input Voltage Range                      | 10.8 - 16.0V                                         | 21.6 - 32V          | 10.8 - 16.0V                            | 21.6 - 32V          |
| Rated Output Efficiency <sup>(2)</sup>   | > 89.0%                                              | > 90.0%             | > 89.5%                                 | > 91.5%             |
| Maximum Output Efficiency <sup>(3)</sup> | > 90.0% (70% loads)                                  | > 91.5% (70% loads) | > 91.0% (40% loads)                     | > 92.0% (40% loads) |
| Standby Current                          | < 0.15A                                              | < 0.10A             | < 0.15A                                 | < 0.10A             |

|                        |                      |        |                      |        |
|------------------------|----------------------|--------|----------------------|--------|
| No-Load Current        | < 0.9A               | < 0.4A | < 0.9A               | < 0.6A |
| RS485 Port             | 5VDC/200mA           |        |                      |        |
| Mechanical Parameters  |                      |        |                      |        |
| Input Terminals        | M6                   |        | M6                   |        |
| Dimensions (L × W × H) | 229mm × 160mm × 73mm |        | 286mm × 160mm × 73mm |        |
| Mounting Size (L × W)  | 205mm × 75mm         |        | 262mm × 75mm         |        |
| Mounting Hole Size     | Φ5mm                 |        |                      |        |
| Net Weight             | 1.5kg                |        | 2.3kg                |        |

| Parameter                                | IPT-1000                                                | IPT-1000-24         | IPT-1000-48                   |
|------------------------------------------|---------------------------------------------------------|---------------------|-------------------------------|
| Continuous Output Power                  | 1,000W at 35°C at the rated input voltage               |                     |                               |
| Surge Power                              | 2,000W for 5s                                           |                     |                               |
| Power-on Surge Current <sup>(1)</sup>    | < 100A                                                  |                     | < 35A                         |
| Output Voltage                           | 220VAC (±3%); 230VAC (-6% - +3%);<br>240VAC (-9% - +3%) |                     | 220VAC/230VAC/<br>240VAC(±3%) |
| Output Frequency                         | 50/60Hz ± 0.2%                                          |                     |                               |
| Output Wave                              | Pure Sine Wave                                          |                     |                               |
| Output Distortion THD                    | ≤ 3% (Resistive load)                                   |                     |                               |
| Load Power Factor                        | 0.2 - 1 (Load power ≤ Continuous output power)          |                     |                               |
| Rated Input Voltage                      | 12V                                                     | 24V                 | 48V                           |
| Input Voltage Range                      | 10.8 - 16.0V                                            | 21.6 - 32.0V        | 43.2 - 64.0V                  |
| Rated Output Efficiency <sup>(2)</sup>   | > 89.0%                                                 | > 90.0%             | > 92.0%                       |
| Maximum Output Efficiency <sup>(3)</sup> | > 93.0% (40% loads)                                     | > 93.0% (30% loads) | > 93.0% (40% loads)           |
| Standby Current                          | < 0.2A                                                  | < 0.15A             | < 0.1A                        |
| No-Load Current                          | < 1.1A                                                  | < 0.9A              | < 0.4A                        |
| RS485 Port                               | 5VDC/200mA                                              |                     |                               |
| Mechanical Parameters                    |                                                         |                     |                               |
| Input Terminals                          | M6                                                      |                     |                               |
| Dimensions (L × W × H)                   | 371mm × 228mm × 118mm                                   |                     | 332mm × 228mm × 118mm         |
| Mounting Size (L × W)                    | 345mm × 145mm                                           |                     | 306mm × 145mm                 |
| Mounting Hole Size                       | Φ6mm                                                    |                     |                               |
| Net Weight                               | 4.8kg                                                   |                     | 4.5kg                         |

| Parameter                                | IPT-1500                                              | IPT-1500-24         | IPT-1500-48         |
|------------------------------------------|-------------------------------------------------------|---------------------|---------------------|
| Continuous Output Power                  | 1,500W at 35°C at the rated input voltage             |                     |                     |
| Surge Power                              | 3,000W for 5s                                         |                     |                     |
| Power-on Surge Current <sup>(1)</sup>    | < 100A                                                | < 100A              | < 50A               |
| Output Voltage                           | 220VAC (± 3%); 230VAC (-6% - +3%); 240VAC (-9% - +3%) |                     |                     |
| Output Frequency                         | 50/60Hz ± 0.2%                                        |                     |                     |
| Output Wave                              | Pure Sine Wave                                        |                     |                     |
| Output Distortion THD                    | ≤ 3% (Resistive load)                                 |                     |                     |
| Load Power Factor                        | 0.2 - 1 (Load power ≤ Continuous output power)        |                     |                     |
| Rated Input Voltage                      | 12V                                                   | 24V                 | 48V                 |
| Input Voltage Range                      | 10.8 - 16.0V                                          | 21.6 - 32.0V        | 43.2 - 64.0V        |
| Rated Output Efficiency <sup>(2)</sup>   | > 89.0%                                               | > 90.0%             | > 92.5%             |
| Maximum Output Efficiency <sup>(3)</sup> | > 93.0% (30% loads)                                   | > 93.5% (30% loads) | > 94.0% (30% loads) |
| Standby Current                          | < 0.2A                                                | < 0.15A             | < 0.1A              |
| No-Load Current                          | < 1.2A                                                | < 0.9A              | < 0.5A              |
| RS485 Port                               | 5VDC/200mA                                            |                     |                     |
| Mechanical Parameters                    |                                                       |                     |                     |
| Input Terminals                          | M6                                                    |                     |                     |
| Dimensions (L × W × H)                   | 387mm × 228mm × 118mm                                 |                     |                     |
| Mounting Size (L × W)                    | 361mm × 145mm                                         |                     |                     |
| Mounting Hole Size                       | Φ6mm                                                  |                     |                     |
| Net Weight                               | 6.0kg                                                 | 5.5kg               | 5.2kg               |

| Parameter                                | IPT-2000                                             | IPT-2000-24           | IPT-2000-48         |
|------------------------------------------|------------------------------------------------------|-----------------------|---------------------|
| Continuous Output Power                  | 2,000W at 35°C at the rated input voltage            |                       |                     |
| Surge Power                              | 4,000W for 5s                                        |                       |                     |
| Power-on Surge Current <sup>(1)</sup>    | < 100A                                               | < 100A                | < 50A               |
| Output Voltage                           | 220VAC (±3%); 230VAC (-6% - +3%); 240VAC (-9% - +3%) |                       |                     |
| Output Frequency                         | 50/60Hz ± 0.2%                                       |                       |                     |
| Output Wave                              | Pure Sine Wave                                       |                       |                     |
| Output Distortion THD                    | ≤ 3% (Resistive load)                                |                       |                     |
| Load Power Factor                        | 0.2 - 1 (Load power ≤ Continuous output power)       |                       |                     |
| Rated Input Voltage                      | 12V                                                  | 24V                   | 48V                 |
| Input Voltage Range                      | 10.8 - 16.0V                                         | 21.6 - 32.0V          | 43.2 - 64.0V        |
| Rated Output Efficiency <sup>(2)</sup>   | > 88.0%                                              | > 90.0%               | > 92.5%             |
| Maximum Output Efficiency <sup>(3)</sup> | > 94.0% (30% loads)                                  | > 93.0% (30% loads)   | > 94.5% (30% loads) |
| Standby Current                          | < 0.2A                                               | < 0.15A               | < 0.1A              |
| No-Load Current                          | < 1.2A                                               | < 1.0A                | < 0.5A              |
| RS485 Port                               | 5VDC/200mA                                           |                       |                     |
| Mechanical Parameters                    |                                                      |                       |                     |
| Input Terminals                          | M10                                                  | M6                    |                     |
| Dimensions (L × W × H)                   | 420mm × 228mm × 118mm                                | 421mm × 228mm × 118mm |                     |
| Mounting Size (L × W)                    | 395mm × 145mm                                        |                       |                     |
| Mounting Hole Size                       | Φ6mm                                                 |                       |                     |
| Net Weight                               | 7.0kg                                                | 5.8kg                 |                     |

| Parameter                                | IPT-3000                                         | IPT-3000-24           | IPT-3000-48         |
|------------------------------------------|--------------------------------------------------|-----------------------|---------------------|
| Continuous Output Power                  | 3,000W at 35°C at the rated input voltage        |                       |                     |
| Surge Power                              | 6,000W for 5s                                    |                       |                     |
| Power-on Surge Current <sup>(1)</sup>    | < 100A                                           | < 100A                | < 65A               |
| Output Voltage                           | 220VAC (±3%); 230VAC (-6%~+3%); 240VAC (-9%~+3%) |                       |                     |
| Output Frequency                         | 50/60Hz ± 0.2%                                   |                       |                     |
| Output Wave                              | Pure Sine Wave                                   |                       |                     |
| Output Distortion THD                    | ≤ 3% (Resistive load)                            |                       |                     |
| Load Power Factor                        | 0.2 ~ 1 (Load power ≤ Continuous output power)   |                       |                     |
| Rated Input Voltage                      | 12V                                              | 24V                   | 48V                 |
| Input Voltage Range                      | 10.8 ~ 16.0V                                     | 21.6 ~ 32.0V          | 43.2 ~ 64.0V        |
| Rated Output Efficiency <sup>(2)</sup>   | > 87.0%                                          | > 90.0%               | > 92.5%             |
| Maximum Output Efficiency <sup>(3)</sup> | > 94.0% (30% loads)                              | > 94.0% (30% loads)   | > 94.5% (30% loads) |
| Standby Current                          | < 0.2A                                           | < 0.15A               | < 0.1A              |
| No-Load Current                          | < 1.6A                                           | < 1.0A                | < 0.5A              |
| RS485 Port                               | 5VDC/200mA                                       |                       |                     |
| Mechanical Parameters                    |                                                  |                       |                     |
| Input Terminals                          | M10                                              | M6                    |                     |
| Dimensions (L × W × H)                   | 557mm × 228mm × 118mm                            | 521mm × 270mm × 143mm |                     |
| Mounting Size (L × W)                    | 532mm × 145mm                                    | 495mm × 145mm         |                     |
| Mounting Hole Size                       | Φ6mm                                             |                       |                     |
| Net Weight                               | 9.5kg                                            | 8.5kg                 |                     |

| Parameter                                | IPT-4000-48                                      | IPT-5000-48                               |
|------------------------------------------|--------------------------------------------------|-------------------------------------------|
| Continuous Output Power                  | 4,000W at 35°C at the rated input voltage        | 5,000W at 35°C at the rated input voltage |
| Surge Power                              | 8,000W for 5s                                    |                                           |
| Power-on Surge Current <sup>(1)</sup>    | < 65A                                            |                                           |
| Output Voltage                           | 220VAC (±3%); 230VAC (-6%~+3%); 240VAC (-9%~+3%) |                                           |
| Output Frequency                         | 50/60Hz ± 0.2%                                   |                                           |
| Output Wave                              | Pure Sine Wave                                   |                                           |
| Output Distortion THD                    | ≤ 3% (Resistive load)                            |                                           |
| Load Power Factor                        | 0.2 – 1 (Load power ≤ Continuous output power)   |                                           |
| Rated Input Voltage                      | 48V                                              |                                           |
| Input Voltage Range                      | 43.2 – 64.0V                                     |                                           |
| Rated Output Efficiency <sup>(2)</sup>   | > 91.0%                                          |                                           |
| Maximum Output Efficiency <sup>(3)</sup> | > 94.0% (30% loads)                              |                                           |
| Standby Current                          | < 0.1A                                           |                                           |
| No-Load Current                          | < 0.6A                                           | < 0.8A                                    |
| RS485 Port                               | 5VDC/200mA                                       |                                           |
| Mechanical Parameters                    |                                                  |                                           |
| Input Terminals                          | M6                                               |                                           |
| Dimensions (L × W × H)                   | 516mm × 228mm × 118mm                            | 531mm × 228mm × 118mm                     |
| Mounting Size (L × W)                    | 490mm × 145mm                                    | 505mm × 145mm                             |
| Mounting Hole Size                       | Φ6mm                                             |                                           |
| Net Weight                               | 7.8kg                                            | 8.5kg                                     |

| Environmental Parameters (for all models) |                                                                                   |
|-------------------------------------------|-----------------------------------------------------------------------------------|
| Working Temperature                       | -20°C to +60°C<br>(derating curve is applied from approx. +35°C)                  |
| Storage Temperature                       | -35°C to +70°C                                                                    |
| Relative Humidity                         | ≤ 95% (N.C.)                                                                      |
| Enclosure                                 | IP20                                                                              |
| Altitude                                  | < 5,000m (> 1,000m require derating)                                              |
| Compliance                                |                                                                                   |
| Safety                                    | EN/IEC62109-1, UL458 (Products with 12V/24V input voltage),<br>CSA C22.2 No.107.1 |
| EMC (Electromagnetic compatibility)       | EN61000-6-2/EN61000-6-4,<br>FCC 47 CFR Part 15, Subpart A                         |
| RoHS                                      | IEC62321-3-1                                                                      |

## Appendix 1 Disclaimers

**The warranty does not apply under the following conditions:**

- Damage resulting from improper use or installation in an inappropriate environment (humid, salt spray, corrosive, greasy, flammable, explosive, dust-accumulative, or other harsh environments).
- Current, voltage or power exceeding the inverter's specified limits.
- Damage caused by the operating temperature exceeding the rated range.
- Arc, fire, explosion, and other accidents resulting from failure to follow the inverter warning labels or the instructions in this manual.
- Disassembling and/or repairing the inverter without authorisation.
- Damage caused by force majeure.
- Damage occurring during transportation or handling.
- When using precision instruments or equipment sensitive to power input (such as medical equipment), end users and installers must read this manual carefully and ensure that the inverter's output parameters (output power, output voltage, power factor, THD etc) are suitable. The manufacturer is not responsible for damage to such instruments or equipment caused by these factors or resulting from improper use.

**Specifications and other details in this manual may be subject to change without prior notice.**

User manual version: v3.0





***Photonic Universe Ltd***

***E-mail: [info@photonicuniverse.com](mailto:info@photonicuniverse.com)***

***Web: [www.photonicuniverse.com](http://www.photonicuniverse.com)***

***Tel.: +44 (0) 203 150 11 11***

***Fax: +44 (0) 203 150 12 12***