



**Ablerex Grid-Connected Solar Converter**  
**EnerSolis Series**

**ES 52000HC**

**ES 60000HC**

**User Manual**

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# 1.Preamble

Thank you for purchasing Ablerex EnerSolis ES 52000HC / ES 60000HC series grid-connected solar converter products.

Ablerex is a professional electricity equipment manufacturer having many years of experience in research, development and production. We hope this equipment can provide you with a solar power system without operational failure for many years. However, solar converters combined with grid power are a very complicated electrical system. Therefore, if there is any solar converter or grid failure or anomaly, please call Ablerex or the local retailers. We will quickly act to help you solve the problems.

Please read this user manual carefully to help the installation personnel promptly and correctly install the converter.

## 2.Safety Descriptions



**Caution! Only professional electricians are allowed to open the converters and conduct work. Prior to conducting any work, AC and DC power sources must be turned off and completely break off from the converters.**

- ES 52000HC / ES 60000HC series manuals include installation and operations guides. Please finish reading the guides before commencing installation and maintenance.
- Only professional electricians are allowed to open the converters.
- Do not open the solar converter when under operation.

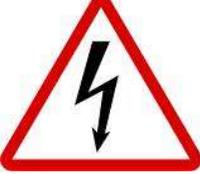


**High voltage capacitors are installed with so lethal and dangerous high voltage is period of time after the converters have off.**



## ■ Warnings

Descriptions of the Warning Labels:

Symbol	Description
	<b>Caution, electrical hazard!</b>
	<b>Caution, danger!</b>
 10 min	<b>Caution, electrical hazard</b> <b>Residual energy is in discharge!</b>
	<b>Please refer to the user manual!</b>

## ■Repair and Maintenance

Only professionally trained electricians are allowed to repair converters.

## ■Solar Panel

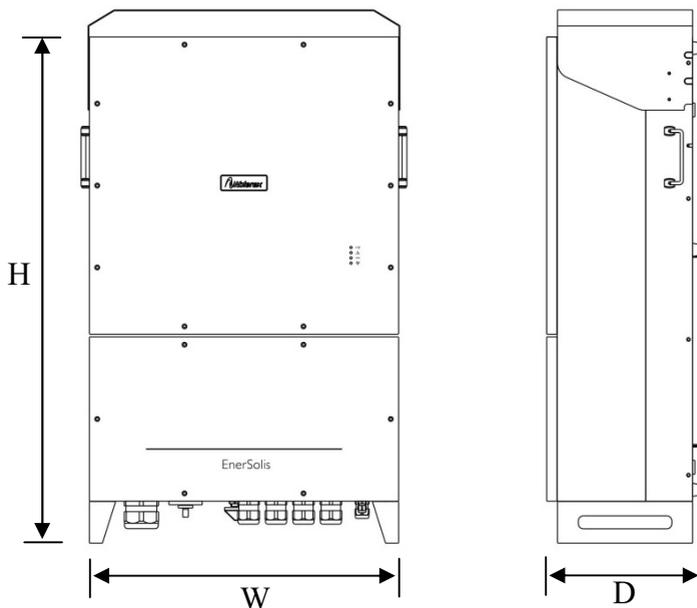
When installing and configuring the solar panels, please confirm that the solar panel rated voltage parameter provided by the manufacturer complies with the specifications in actual use. Please check and confirm that, under strong sunlight and an outdoor temperature of  $-25^{\circ}\text{C}$  ( $-13^{\circ}\text{F}$ ), the solar panel open-circuit voltage is lower than the maximum threshold of 1,000Vdc for the ES 52000HC / ES 60000HC series. Solar panel specifications take temperature into account. When using under an outdoor temperature of  $-25^{\circ}\text{C}$  ( $-13^{\circ}\text{F}$ ), the open-circuit voltage needs to be considered. If the voltage exceeds 1,000Vdc, the converters will become permanently damaged.

## ■Grid Connection

Solar converter installation must be carried out by retailers having professional electrical certification. Grid connections must be approved by a local power company before installation and operations. Please contact the local retailer for installation details.

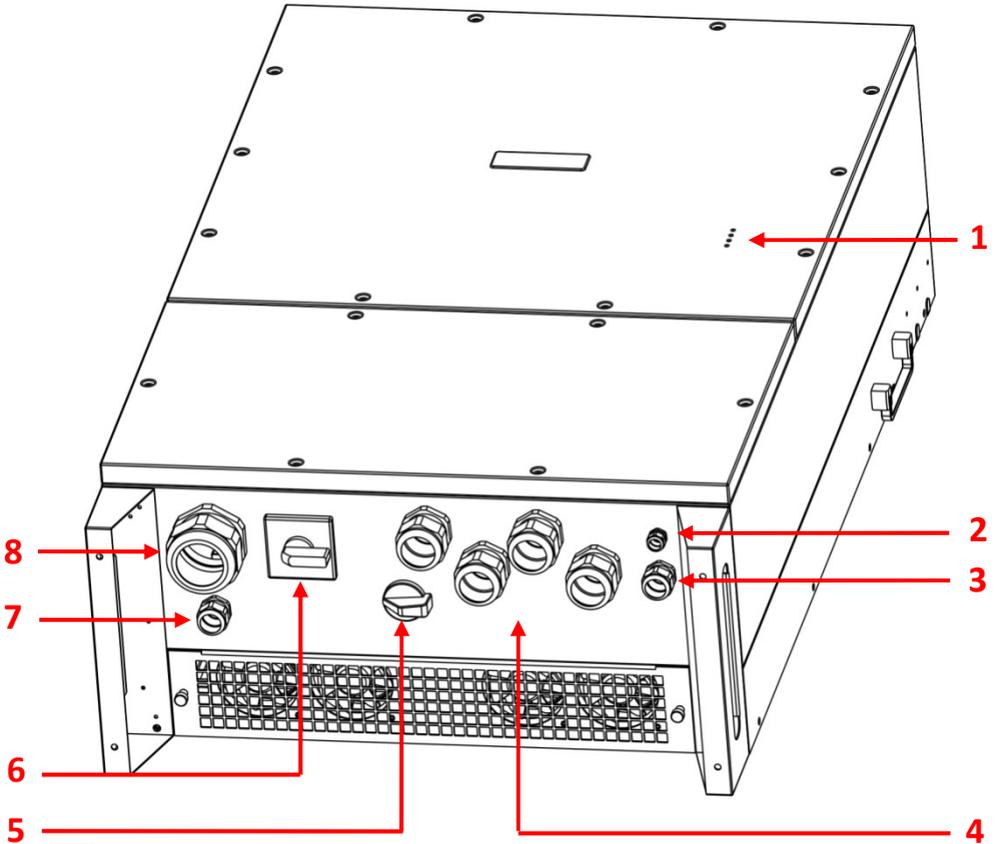
# 3.Introduction

## 3.1 Exterior dimensions



Product model number Dimension (mm)	ES 52000HC series ES 60000HC series
W	595
H	970
D	303

### 3.2 Equipment Interface



1. LED indicator: Displays converter operating status
2. Equipment ground: Connects to the ground of the solar panel
3. Standard communication interface: RS485
4. DC input: Connects to the solar panel serial input (8-bit serial in)
5. DC input switch: Controls the turning off of the converter's DC input power
6. AC output switch: Controls the AC output power switch of the inverter
7. Equipment ground: Connects to the system protective earth (PE) of the grid AC terminal

8. AC output: Transmits AC power generated from the inverter to the mains

### 3.3 Installation

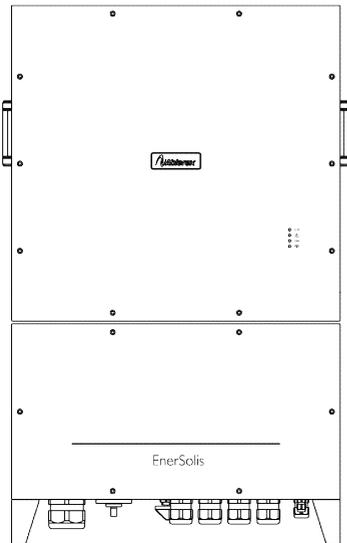
**Warning: Before installing the solar converter, please read 2. Safety Descriptions in advance.**

### 3.4 Unpacking

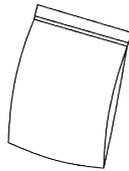
Upon receiving the solar converter, please inspect the converter. Although the manufacturer has designed robust packaging for the product, damages may still occur during transportation. If the converter is damaged, please contact the retailer. (Packaging is recyclable and reusable)

Inspect the contents including the following:

機器本體 x 1



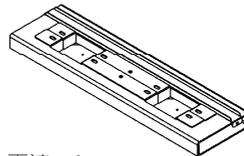
配件包 x 1



內含：

- 快速安裝手冊 x 1份
- 背掛定位紙 x 1張
- 直流配件包 x 1包  
(直流孔塞2款 共8顆+配線環型端子 1包)
- 交流配件包 x 1包  
(交流孔塞3款 共3顆+配線環型端子 1包)
- 通訊配件包 x 1包  
(通訊孔塞 1顆+單孔塞 1個)
- 配件螺絲 x 1包

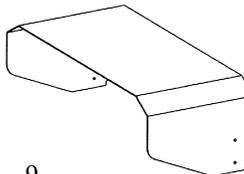
配件盒 x 1



內含：

- 背掛架 x 2支
- 輔助架 x 1支

雨遮 x 1



Converter x1
Accessories kit x1
Contains:
<ul style="list-style-type: none"> <li>• Quick installation manual x1</li> </ul>
<ul style="list-style-type: none"> <li>• Back-mount positioning sheet x1</li> </ul>
<ul style="list-style-type: none"> <li>• DC accessories kit x1 (DC plugs in 2 types and a total of 8 plugs + 1 circular wire terminal)</li> </ul>
<ul style="list-style-type: none"> <li>• AC accessories kit x1 (AC plugs in 3 types and a total of 3 plugs + 1 circular wire terminal)</li> </ul>
<ul style="list-style-type: none"> <li>• Communication accessories kit x1 (Communication plug 1 + 1 single hole plug)</li> </ul>
<ul style="list-style-type: none"> <li>• Accessory screw x1</li> </ul>
Accessory box x1
Contains:
<ul style="list-style-type: none"> <li>• Back-mount support x2</li> </ul>
<ul style="list-style-type: none"> <li>• Auxiliary support x2</li> </ul>
Rain shield x1

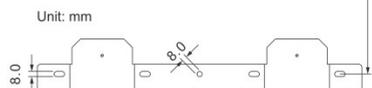
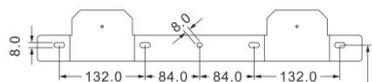
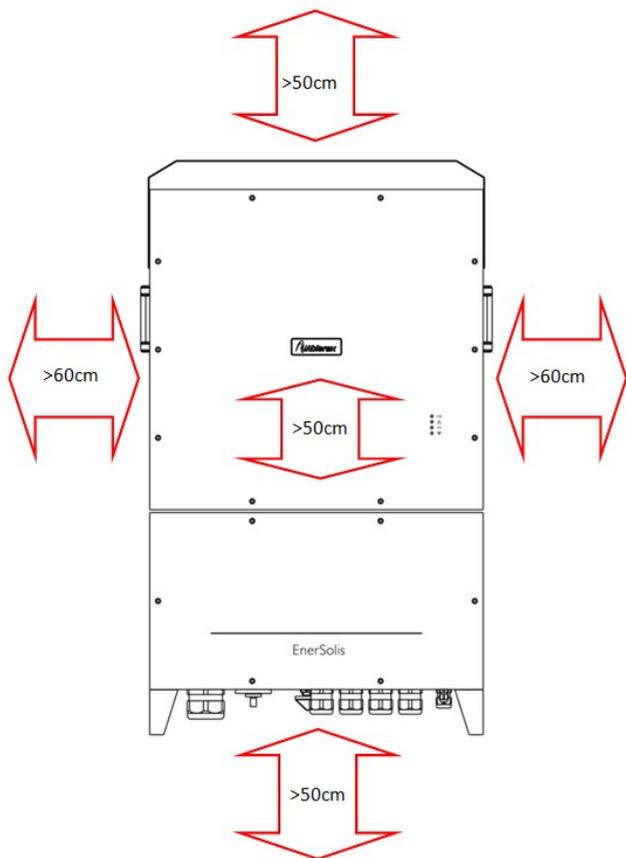
### 3.5 Installation location requirements

The converter weighs 75 **kg**, so please consider the weight of the converter when choosing an installation location and method.

An appropriate installation location will optimize converter performance, reduce the chances of malfunction, and prolong converter lifespan. Please follow the guidelines below to choose an appropriate location to install the converter:

1. ES 52000HC / ES 60000HC series designs comply with IP65 protection level, so they are allowed to be installed in outdoor and humid environments.
2. The converters should be installed in a well-vented place with no exposure to direct sunlight and rain, and where no snow piles above the converter. The ambient temperature must be within the range indicated in the converter specifications to avoid overheating and execution of derating, which would cause a decrease in power generation efficiency, or tripping triggered by the self-protection mechanism of overheating.
3. The converters must be mounted on a wall vertically, so when installing, the location conditions must be checked for wall-mounting. Please do not install the converter in a tilted or flat position. It is recommended to install the converter in a safe and open site, and at an eye-level height for the ease of observation, service and maintenance inspection, and repair.
4. It must be assured that there is sufficient space to allow the heat generated from the converter operations to dissipate. Therefore,

sufficient space must be reserved for heat dissipation and installation, as shown in the figure below.



Unit: mm

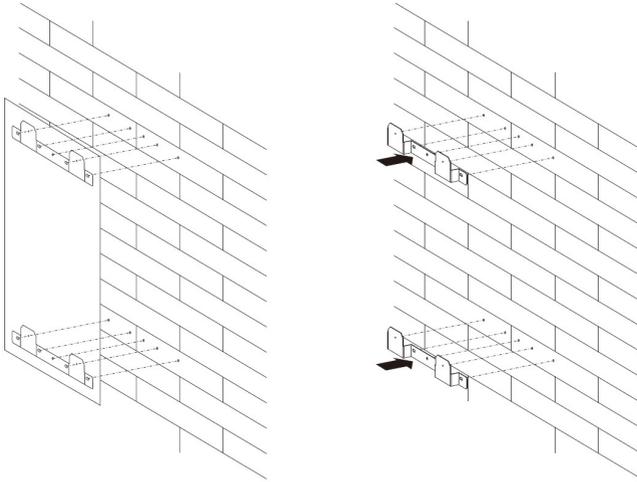
Please clear out space around the converter for installation and leave room for holes to back-mount the converter.

### 3.6 Wall-mount Installation Procedures

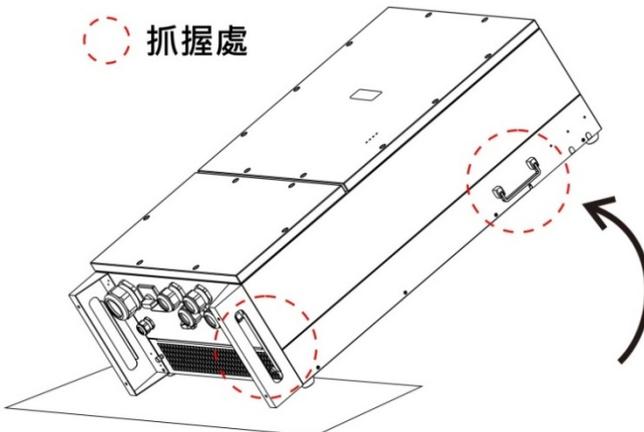
Step 1: Place the back panel positioning sheet on the wall for mounting.

Drill holes according to dimensions of the back panel securing holes, and secure the back panel on the wall.

Step 2: Mount the solar converter on the back panel, and confirm that the solar converter is in firm connection with the back panel.

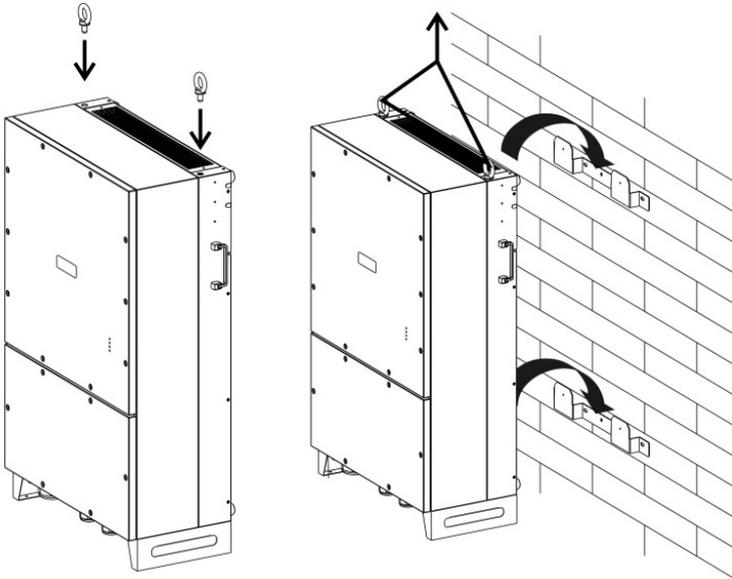


Step 3: Use the handles to lift the solar converter into an upright position.

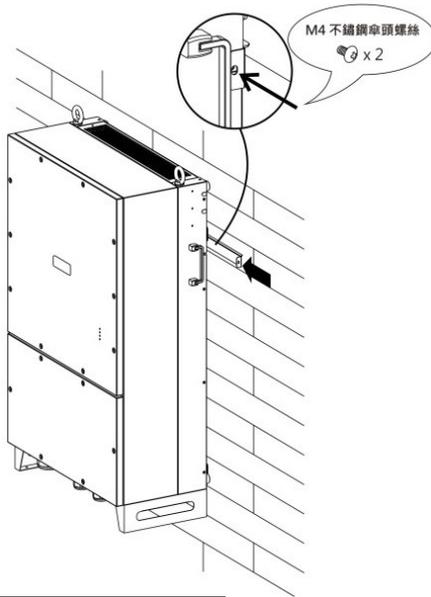


抓握處	Handles
-----	---------

Step 4: Screw in 2 slinger rings above the converter, and hang the solar converter on the back panel.

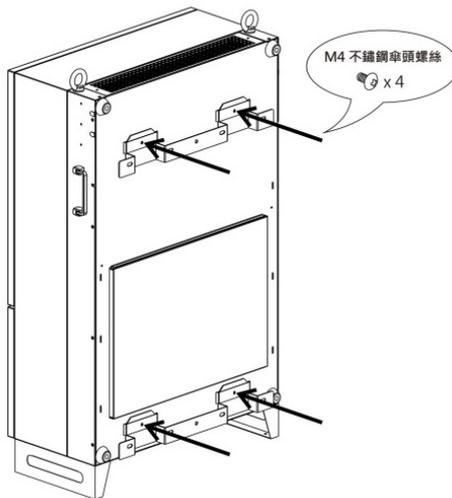


Step 5: Use 2 M5 stainless steel truss head screws to fix the securing plates on the left and right sides.



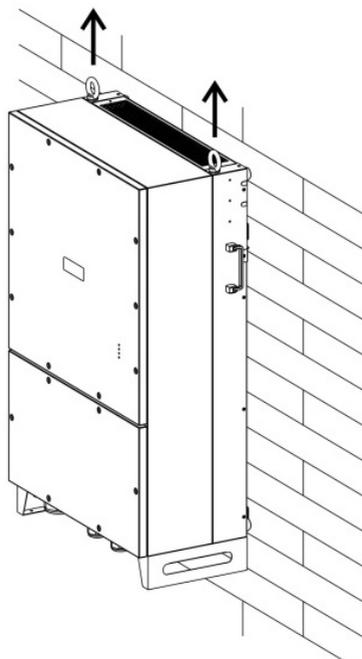
M4 stainless steel truss head screw

If the solar converter is installed with an independent stand, 4 M4 stainless steel truss head screws can be used at the back panel for securing.

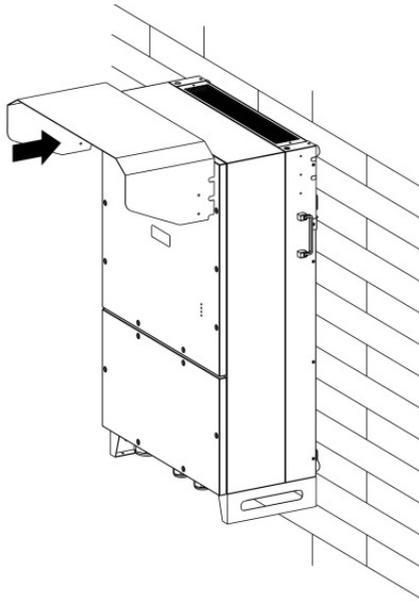


M4 stainless steel truss head screw

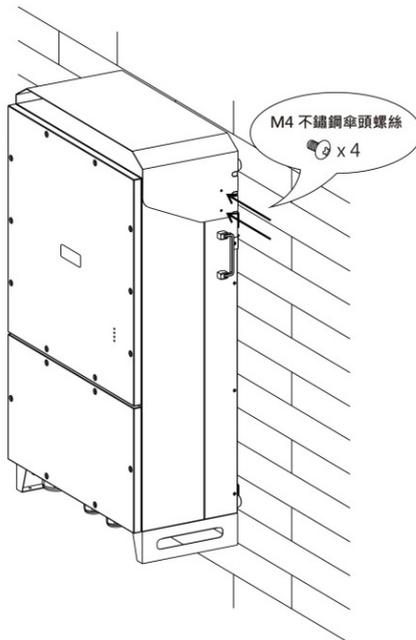
Step 6: Wall-mounting is completed. Remove the 2 slinger rings.



Step 7: Place the rain shield above the venting outlet of the converter.



Step 8: Use 4 M4 stainless steel truss head screws to secure the rain shield on the left and right sides.



### 3.7 Electricity Installation



**Caution! Electrical hazard! Solar panels release voltage under the sun!**

■ Confirm the AC circuit breaker is installed between the converter and the grid.

Note: Please use **Ue:690Vac / Ie:100A** circuit breakers.

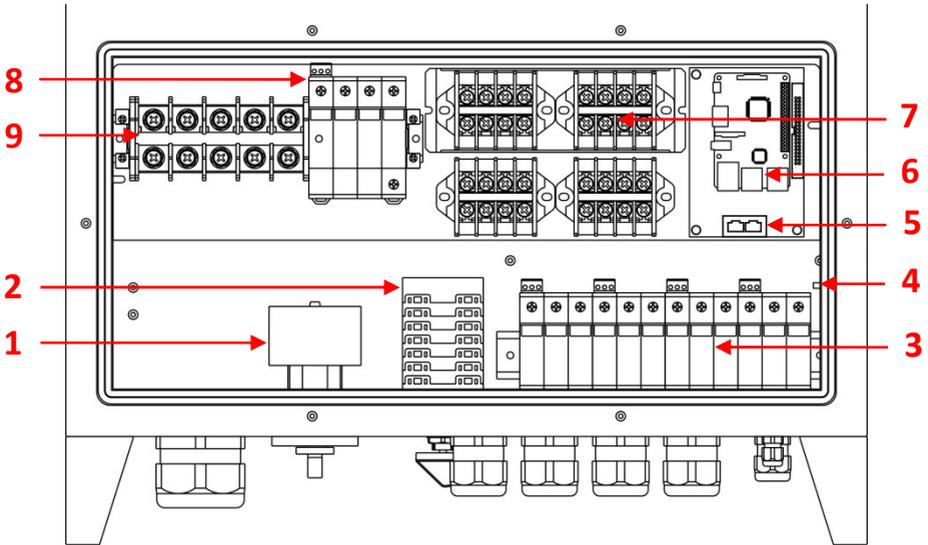
■ Confirm the DC circuit breaker is installed between the converter and the solar panel array.

Note: Please use **Ue: 1000Vdc/Ie:32A** circuit breakers.

■ When installing the converter, the AC circuit breaker and DC circuit breaker must be disconnected.

■ During installation, it must be confirmed that the power sources of the AC circuit breaker and DC circuit breaker are not interconnected.

### 3.7.1 Wiring Area Function Descriptions



1. AC switch
2. DC switch
3. DC surge protection device (for -S, -SI models)
4. Equipment grounding copper pillar
5. RS485 communications interface
6. Smart cloud module (for -I, -SI models)
7. DC input terminal
8. AC surge protection device (for -S, -SI models)
9. AC output and grounding terminal

### 3.7.2 Equipment Grounding Installation Procedures

Step 1: Prior to installing the converter grounding, switch the DC input switch to **0**, and switch the grid-connecting circuit breaker to open circuit.

Step 2: Please select the 5.5 - 8.0mm<sup>2</sup> ground wires, loosen the equipment's protective earth (PE) thread locknut, push the wires through the water-proof plug, enter the wires in the copper pillar screw hole on the right-hand side of the converter, and secure the wires. 3.0 Nm torque must be applied on M5 screws for proper tightening, as shown in Figures 1 and 2.

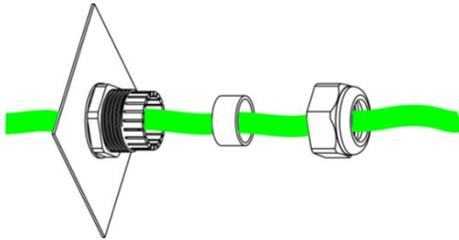


Figure 1

Step 3: Tighten the equipment's PE thread locknut; 3 Nm torque must be applied for proper tightening. The installation is thus completed, as shown in Figure 7.

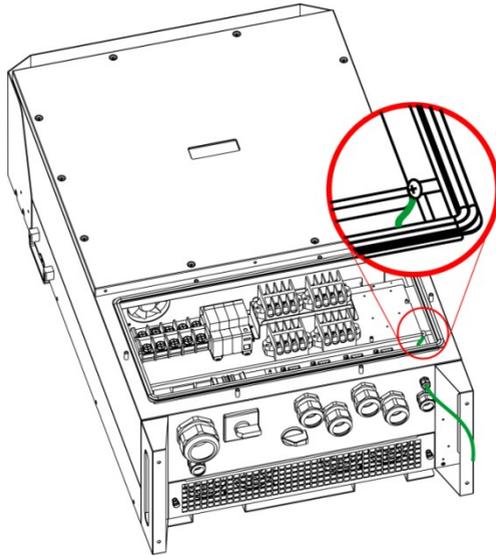


Figure 2

### 3.7.3 AC Output Switch Status Indication

Prior to operating the AC output switch, please confirm the status indication as described below.

Rotate AC switch 90° to the **ON** closed position (Position **I**).

Rotate AC switch 180° to the **OFF** open position (Position **O**).

This is shown in Figure 3:

## Output Switch

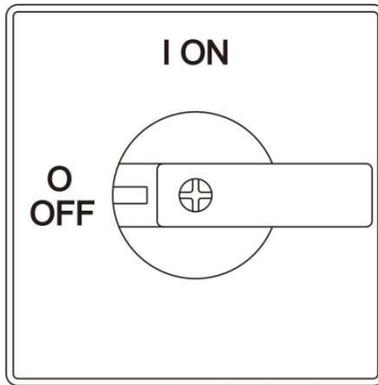


Figure 3

### 3.7.4 AC Output Installation Procedures



#### Note:

**Prior to connecting to the grid, please install an AC circuit breaker between the converter and the grid.**

AC output installation procedures are the following:

Step 1: Confirm the grid voltage and grid frequency are within the specifications of the converter.

Step 2: Prior to wiring the AC output of the converter, switch the DC input switch to **0**, switch the grid connection circuit breaker to open circuit, and install an AC varistor at the AC terminal. The grid connection circuit breaker can only be closed after the converter has been electrically installed.

Step 3: Loosen the thread locknuts of the AC output and the system PE, select the suitable water-proof plugs (4-hole\_R, S, T, N and single-hole PE) from the AC accessories based on the recommended wire diameters, push the wires through the water-proof plugs as shown in Figures 4 and 5 (do not damage the water-proof plug structure to avoid humidity seeping into the converter's interior), and wire the AC output according to the terminal indications of Figure 6. When wiring the AC terminal, 8.0 Nm torque must be applied for proper tightening.

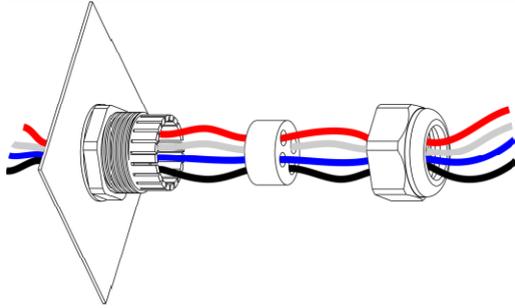


Figure 4

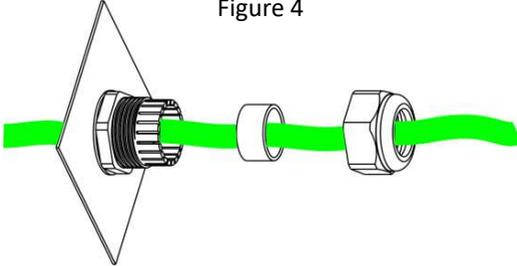


Figure 5

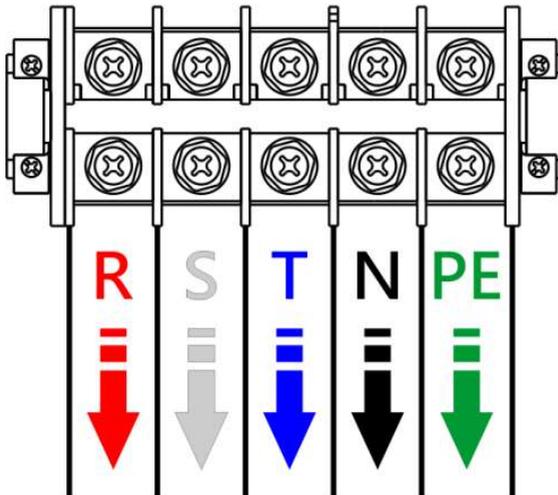


Figure 6

Step 4: Tighten the AC output and the system PE thread locknut;16 Nm and 3.5 Nm torques must be applied for proper tightening. The installation is thus completed, as shown in Figure 7.

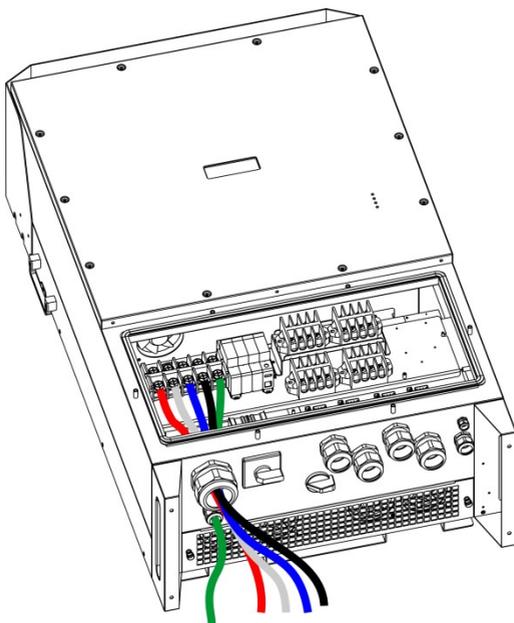


Figure 7



## Warning:

**Prior to operating the solar converter, please ensure that the equipment's PE is connected to the correct location to avoid electrical hazard.**

To prevent humidity from seeping into the converter interior and cause malfunction, select the suitable water-proof plugs from the accessories according to the selected wire diameter, and firmly install the AC thread locknuts.

**AC Wire Diameter Recommendation**

Model	Area (mm <sup>2</sup> )	AWG	Suitable wire outer diameter (mm)	Water-proof hole plug dimension
ES 52000HC series ES 60000HC series	38	2	15~17	Large hole
	50	1/0	13~15	Medium hole
	60	2/0	11~13	Small hole

### 3.7.5 DC Input Switch Status Indication

Prior to operating the DC input switch, please confirm the status indication as described below.

Rotate the DC switch 90° to the **ON** closed position (Position **I**).

Rotate the DC switch 180° to the **OFF** open position (Position **O**).

This is shown in Figure 8.

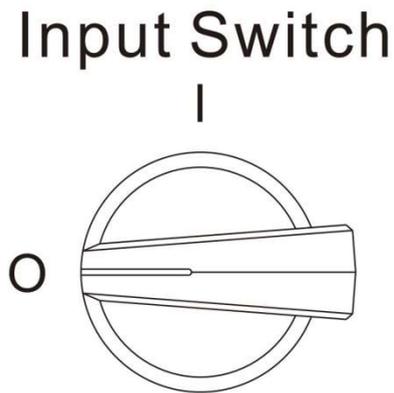


Figure 8

## 3.7.6 DC Input Installation Procedures

### Solar Module Requirements

ES 52000HC / ES 60000HC series are designed for the input of 8 sets of solar module arrays. The quantity of solar modules for installation and the connection method must be consistent with converter specifications. The following three requirements must be met:

1. To avoid damaging the converter, please make sure that, under any circumstances, the maximum open circuit voltage (Voc) of the solar panel array can never exceed 1,000 Vdc. If the voltage exceeds 1,000 Vdc, the converters will be permanently damaged.
2. The polarity of the solar panel array cannot be installed in reverse, and the reverse short-circuit current cannot exceed 20A.
3. Each set of MPPT should be accompanied with 2 sets of solar module arrays in parallel connection.
4. To ensure the solar panel array is able to generate maximum energy, under any circumstances, the V<sub>MPPT</sub> (maximum power point track voltage) must be maintained between 600 Vdc - 725 Vdc.

### Solar Module Wiring



#### **Note:**

**Prior to connecting to the solar module, please install an independent DC circuit breaker between the converter and the solar module.**

The connection method of the converter and the solar panel is indicated in the following steps:

Step 1: Switch the DC input switch to 0, and switch the grid connection

circuit breaker to open circuit.

Step 2: Ensure the polarity of the solar module connection is correct and the voltage has not exceeded the maximum input voltage allowed by the converter.

Step 3: Loosen the DC+ and DC- thread locknuts at the DC input, as shown in Figure 9.

Step 4: Wire the solar module to the DC input with two sets of wiring or four sets of wiring according to the arrangement. Based on the recommended wire diameters, push the wires through the suitable water-proof plugs (4-hole or 2-hole). Do not damage the water-proof plug structure to avoid humidity seeping into the converter interior, as shown in Figures 10 and 11.

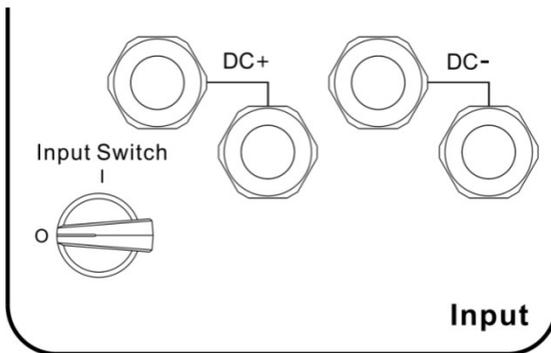


Figure 9

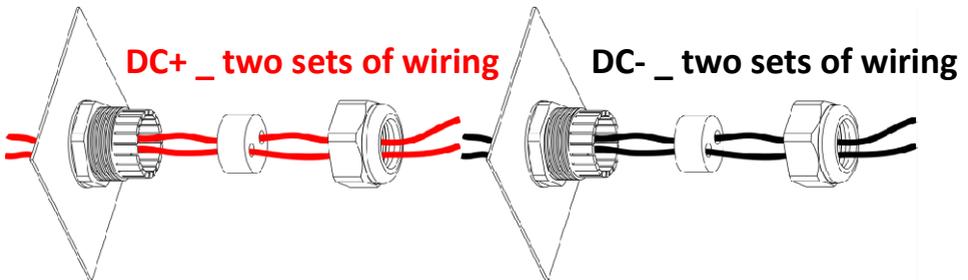


Figure 10

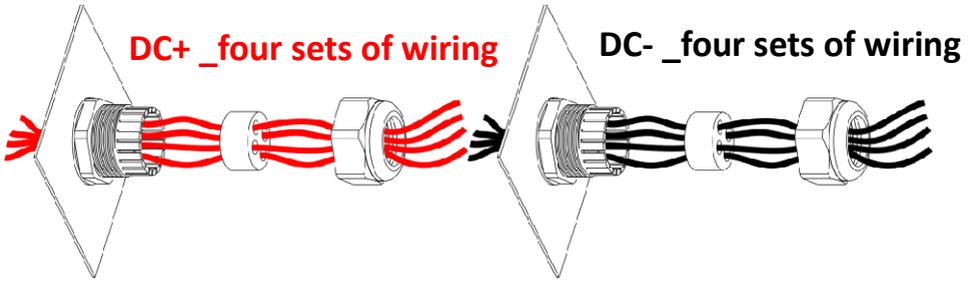


Figure 11

Step 5: Based on the solar module output polarity, the positive terminals are placed at A+, B+, C+, D+, and the negative terminals are placed at A-, B-, C-, D-. When wiring DC terminals, a 2.0Nm torque must be applied for tightening.

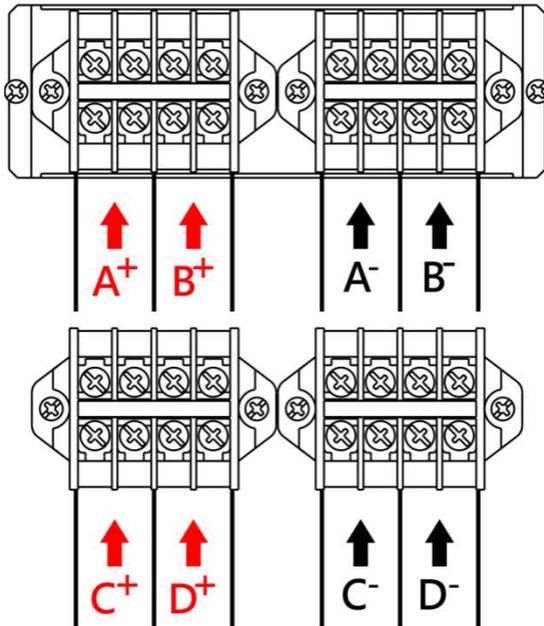


Figure 12

**DC Wire Diameter Recommendation**

Model	Area (mm <sup>2</sup> )	AWG	Suitable water-proof plug outer diameter (mm)
ES 52000HC ES 60000HC	5~6	10	6.4~9.0

Step 6: Complete the wiring of the DC input with two sets of wiring (Figure 13) or four sets of wiring (Figure 14), and tighten the thread locknut of the DC input; 5 Nm torque must be applied for proper tightening. The installation is thus completed.

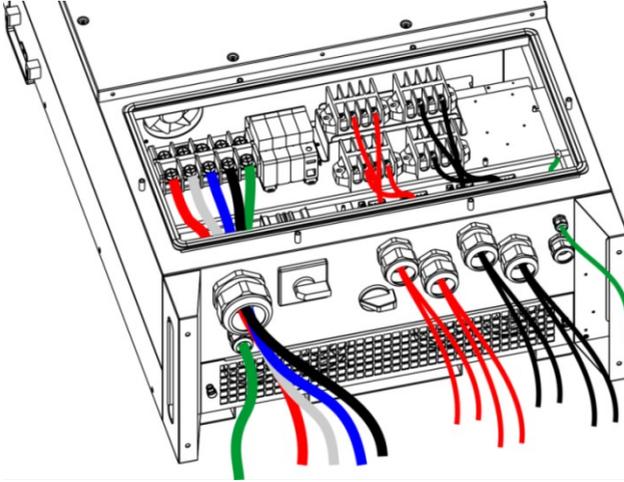


Figure 13

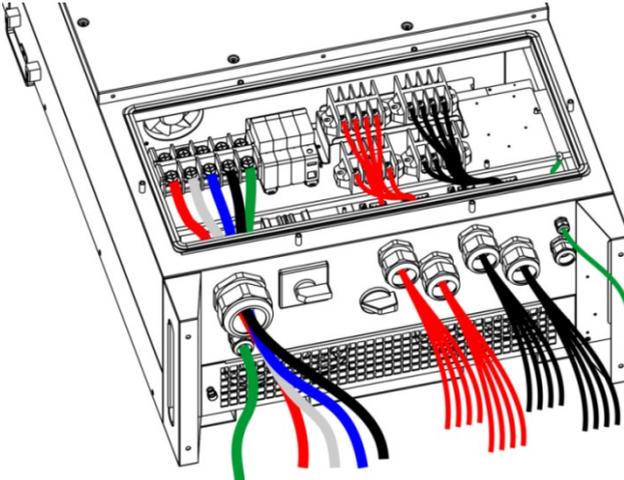


Figure 14

## 4.LED Indicator Description

LED light		
1		Red LED flashing: Solar converter has failure/malfunction
2		Yellow LED flashing: Electrical conditions are incompatible with solar converter specifications
3		Green LED lit: Converter under normal operation Green LED flashing: Converter is disconnected from grid
4		Blue LED lit: Bluetooth connection in progress

## 5.Converter Operation

Prior to operating the converter, please confirm the converter has been installed according to the above chapters.

This converter offers DC and AC dual power supply.

### Operation Procedures

Step 1: Switch the DC switch below the converter and the DC switch of the DC circuit breaker that connects the solar panel and converter to the ON (closed) position. When the solar panel voltage is higher than 250Vdc, all LEDs will light up and the converter will start operation.

Step 2: Switch the grid connection circuit breaker to the ON (closed) position. When the grid specifications meet the requirements of

the converter, after about 30 second, the yellow LED will turn off, and the converter will start the on-grid power generation procedure. If the grid specifications do not meet the requirements of the converter, the yellow LED will start flashing.

Step 3: During on-grid power generation, the converter will automatically execute the procedure, and the green LED will be flashing.

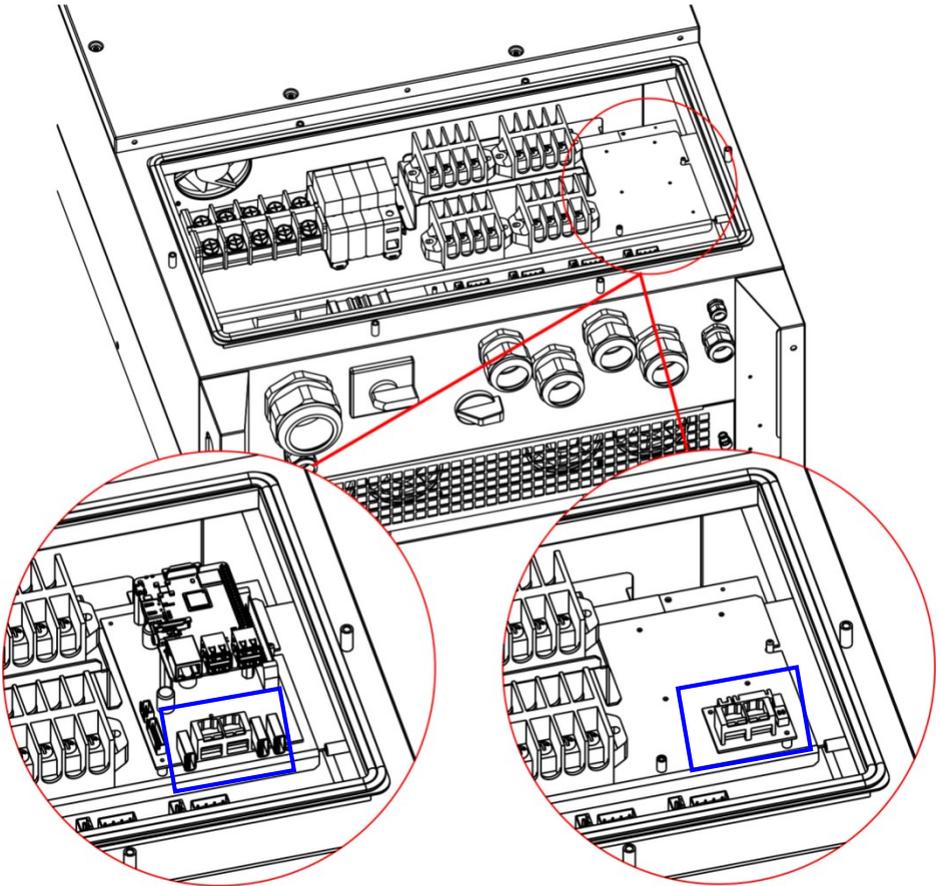
Step 4: If errors occur during the operation of the converter (such as output current too high), the red LED will start flashing. Please contact Ablrex or the local retailer for assistance and troubleshooting in such case.

Step 5: When the converter completes the on-grid power generation procedure, the green LED will light up permanently, and the converter under normal operation.

# 6.Communication Interface

The user can connect to the converter by using RS-485 communication interface with PC software or via Bluetooth. With the exclusive app, the user can monitor the converter status.

## 6.1 RS-485 Terminal



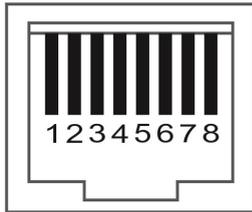
RS-485 Terminal  
(for -I, -SI models)

RS-485 Terminal  
(for standard and -S models)

## 6.1.1 RS-485 Communication Interface Definition

RS-485 communication interface settings are as follows:

Baud Rate	9600 bps
Data Length	8 bits
Stop Bit	1
Parity	None



## 6.1.2 RS-485 Pin Definitions:

PIN 3 = 485 GND

PIN 7 = 485 A/Data+

PIN 8 = 485 B/Data-

With the smart cloud module, converter message contents can be read remotely. Please refer to the smart cloud module user manual for detailed descriptions.

## 6.2 Bluetooth

Ablerex has developed an exclusive app for Bluetooth-enabled product series, so that the converter status can be configured via the app. As there are many different makes and models of connecting devices (smartphones, tablets etc.), to maintain the stability of Bluetooth connections, the operating system of the connecting devices must comply with the following specifications, as to ensure connection quality:

Operating system	Recommended version
iOS	8 or higher
Android	5.0 or higher

After the Bluetooth device connects with the converter, the blue LED of the converter will light up permanently.

## 6.3 Solar Converter Configuration Software (App) User Manual (Android version used as example in this chapter)

### 6.3.1 Installation Method

- a. In Google Play or App Store, search “Ablerex”, and select “Converter Configuration Software”.



Copyright declaration: Google Play is a trademark belonging to Google Inc.

App Store is a trademark belonging to Apple Inc.

- b. Enter the installation options page, which shows the introduction of “Converter Configuration Software”, and select “Install”.



- c. Once successfully installed, select “Open” to access the “Converter Configuration Software”.

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工具 類似內容

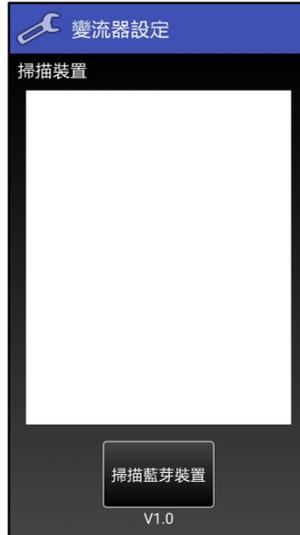
**變流器設定軟體**

[閱讀完整內容](#)

## 6.3.2 Program Features

### 6.3.2.1 Connection Method

- a. Prior to using the “Converter Configuration Software”, please turn on Bluetooth, and then select “Scan for Bluetooth devices”.



- b. Converter Bluetooth device code description:

PV 0 0 0 1 ID 0 0 1

機器序號末四碼      機器ID  
(初始設定為1)

Last four digits of the product serial number
---

Product ID (the default configuration is 1)
--

- c. For initial configuration, please refer to the last four digits of the serial number label on the front of side of the converter as the device identification code. Once the converter is

confirmed, select the device.



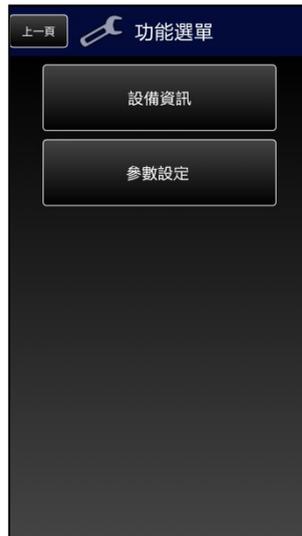
- d. After the Bluetooth device connects with the converter, the blue LED of the converter will light up permanently, which means the app is displaying the real-time data of the converter.



- e. Select  on the upper right-hand corner to access the function menu.
- f. Select “Back” on the upper left-hand corner to return to the “Scan for Bluetooth devices” page.

### 6.3.2.2 Function menu

In the “Real-time data” page, select  at the upper right-hand corner to activate the function menu, which will enable you to access “Equipment information” and “Parameter settings”. Select “Back” to return to the “Real-time data” page.



- a. After the “Equipment information”, “Read” must be selected first in order to display the equipment information. Select “Back” to return to the “Function menu” page.



- b. After entering “Parameter settings”, “Read” must be selected first. The parameters can only be set or changed after the reading of the parameters is finished. Selecting “Write” will write the settings on the screen into the converter. Select “Back” to return to the “Function menu” page.

**Note 1:**

Please configure the converter ID according to the requirements of the communication equipment to be installed. If the ID is incorrect or repeated, the communication equipment will not be able to connect properly.

**Note 2:**

Each setting value for over-voltage protection, low voltage protection, over-frequency protection, and low frequency protection should be configured according to the local power system requirements. If the setting values are incorrect, they

may be incompatible with the local power system requirements, or the converter may not operate properly.



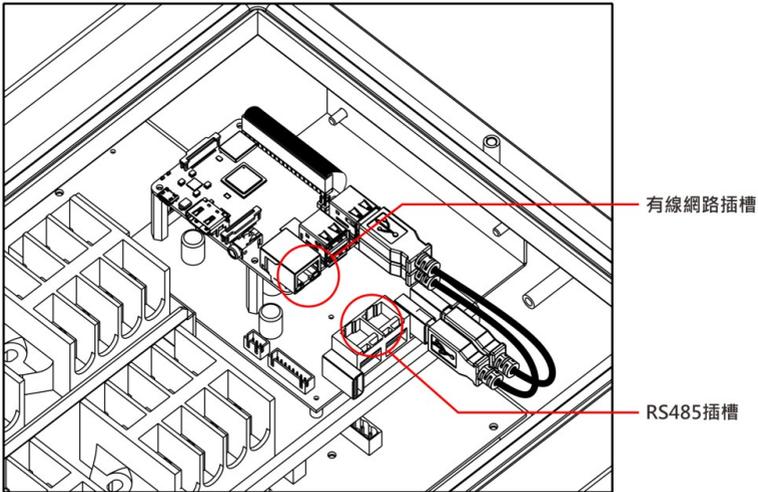
The image shows a screenshot of a parameter setting menu. At the top, there is a dark blue header with a white wrench icon and the text "參數設定" (Parameter Setting). To the left of the header is a button labeled "上一頁" (Previous Page). Below the header, the menu lists several parameters with their current values displayed in a dark blue box:

- ID: 1
- 過電壓保護(V) (Overvoltage Protection (V)): 242
- 低電壓保護(V) (Undervoltage Protection (V)): 187
- 過頻率保護(Hz) (Overfrequency Protection (Hz)): 63
- 低頻率保護(Hz) (Underfrequency Protection (Hz)): 57

At the bottom of the screen, there are two buttons: "讀取" (Read) on the left and "寫入" (Write) on the right.

## 6.4 Smart Cloud Module User Manual (for -I, -SI models)

The -I and -SI models of ES 52000HC / ES 60000HC have built-in smart cloud modules, which upload the converter operation conditions to the cloud server via wireless network. Smart cloud module interface includes: RS485 port, Ethernet port, location of the interface are shown in the figure below:



Ethernet port
RS484 port

### 6.4.1 Installation Method

Cloud module network installation and connection method:

Wired network: Plug the network cable to the “Ethernet port”

If there are multiple converters that require connected monitoring, please connect the RS485 communication cable of the other converters (communication cable must be less than 10m long) to

the RS485 port of the cloud module (please refer to 6.1 Communication Interface).

## 6.4.2 Cloud Module Configuration Software (App) User Manual (Android version used as example in this chapter)

### 6.4.3 Installation Method

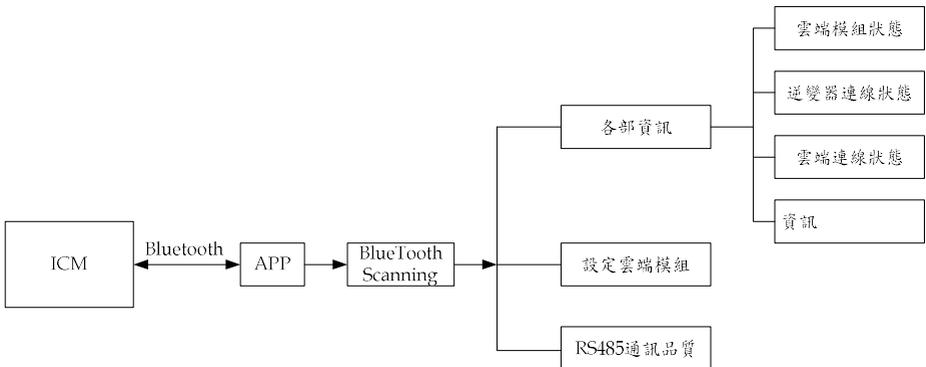
This app supports Android/iOS, please go to Google Play/App Store to download “ICM Cloud Module Configuration Software” for installation.

Copyright declaration: Google Play is a trademark belonging to  
Google Inc.

App Store is a trademark belonging to Apple Inc.

Note:

1. Configuration of the smart cloud module connection must be conducted via Bluetooth.
2. Operating system needs to be Android 5.0 /iOS 8.0 or higher for the app to be found on Google Play/App store.



Information of Each Module
Cloud module status
Inverter connection status
Cloud connection status
Information
Cloud module configuration
RS485 Communication Quality



#### 6.4.4 Cloud Module Connection Settings

- a. After executing the app, you must enter the password. Upon confirmation, you will enter the page for pairing the cloud module and Bluetooth device. If there are two or more cloud modules on site, pair the devices according to the serial number on the “Ablerex ICM” label placed on the front panel of the converter.



- b. After Bluetooth pairing is successful, you will enter the home page, as shown below. If installing for the first time, it is recommended to execute the “Installation Wizard” for step-by-step installation guidance. To execute the wizard, select the icon  on the upper right-hand corner, enter the Function menu, and then select “Configure cloud module”. If the converter has been configured previously and requires reconfiguration for a new site or settings reset, please execute

steps for initialization first (enter the “Function menu” and execute “Information and Settings Initialization”) to avoid the cloud server from receiving incorrect information. After completion of the execution, enter “Configure cloud module” for other configurations.

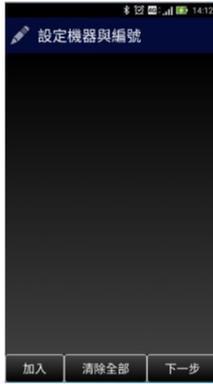


#### 6.4.5 Converter and Code Configuration

- a. Configure based on the number of converters on site and their ID information.

Remarks:

1. The configured ID must be the same as the ID on the converter, otherwise connection will fail.
2. On-site converter IDs cannot be repeated.



- b. Click “Add”, and ID and RS485 port configurations will be prompted.

ID: Configure the IDs based on the converters on site.

For example, if there are 5 converters on site, their IDs might be 1 to 5.

RS485 Port: Select RS485-1.

After completing the configuration, please click “OK” to confirm.



- c. The diagram below will be displayed after completing configuration. If changes or deletions are required, “Remove” on the right-hand side can be used for changes, or choose “Delete all” for reconfiguration. Once the changes are completed, please click “Next” to configure other settings.



## 6.4.6 Wired Network Configuration

The IP can be manually input (this information needs to be provided by the ISP) or automatically retrieved to configure the wired network.



## 6.4.7 Dial-Up Account Number and Password Configuration

If connecting via dial-up, please enter the account number and password in the fields, and select “Confirm” to proceed onto the next step. If NOT connecting via dial-up, please select “Next” directly.



## 6.4.8 Synchronization

After clicking "Write cloud module", the system will automatically synchronize the Bluetooth device's time with the cloud module. Upon configuration, the cloud module will restart, and the app will go to the device scanning page. This means configuration is completed.



## 6.4.9 Information of Each Module

When entering the home page of the app, the following contents will be displayed:

- a. Cloud module status:
  1. Collector time: Current collector time information.
  2. Collector warning message: When the cloud module is at a normal status, "Normal" is displayed. When the cloud module is anomalous, the error message is displayed.



b. Converter connection status:

The connection status of the cloud module and the converter via RS485. For example, if the cloud module monitors a total of 5 converters and the connection is successful, the status will be shown as in the diagram below.



c. Cloud connection status

The cloud module is able to connect to the cloud server via wired network. If “Not connected” is displayed, the cloud module is unable to connect to the cloud server via the above methods. Please confirm that the current network connection is normal.



“Connected” is displayed when connected to the cloud server. If “Network unstable” is displayed, it means that the signal from the local telecommunication provider is weak in strength or the wired network is unstable.



If “Parameter incorrect” is displayed, it means that the cloud server cannot find the cloud module’s MAC Address. Please

confirm whether there is an input error.



### 6.4.10 Information

Information contents are:

1. Collector version: This is the program version for the cloud module, which will be updated automatically via the network when a new version is released.
2. Bluetooth MAC Address: MAC Address must be correctly filled in the cloud page, so that the user is able to monitor the converter condition on site via the cloud.



Cloud URL:

<http://solar.ablerex.com.tw/SolarSystem/LoginPage.aspx>

### 6.4.11 RS485 Communication Quality

Select  on the upper right-hand corner to enter the “Function menu” page, and then select “RS485 Communication Quality” to check each converter’s connection status and confirm whether there is any anomaly in communication quality.



## 7. Service and Maintenance

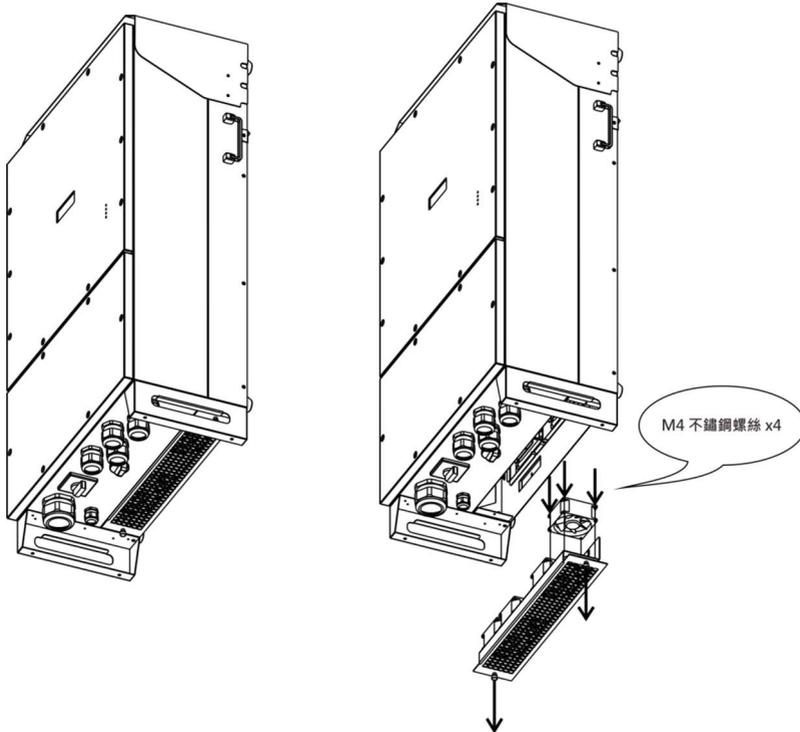
	<p><b>Note:</b> Only professional technicians are allowed to service the converters. Prior to conducting this work, AC and DC power sources must completely break off from the converters to avoid electrical hazards.</p>
---	--

To ensure the normal operation of the converter, please inspect the converter every six months. The inspection includes:

1. Confirm that there are no objects piled on top of the converter
2. Professional technicians need to clean the dust off the converter body and the radiating fins
3. Check all wiring and terminals to confirm that they are not loose or eroded
4. Check if the power supply cable is damaged
5. Confirm that the venting outlet is not blocked by objects and clean the dust
6. Professional technicians need to remove the fan frame, and clean away dust or objects
7. Check if the surge protection device is damaged

## 7.1 Fan Replacement

- Step 1: When the water-proof fan is displaying error messages, switch the DC input switch to 0, switch the AC output switch to 0, and switch the AC circuit breaker to open circuit.
- Step 2: Open the fan stand directly below the converter, unscrew the 4 M4 stainless steel screws, and remove the faulted fan.
- Step 3: Replace with fan of the same brand, place the lower cover back, and lock to the converter.



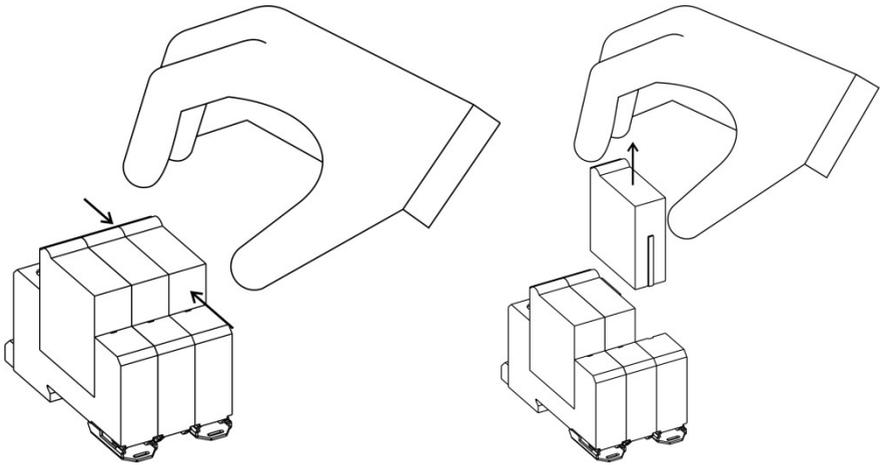
M4 stainless steel screw x4

## 7.2 DC Terminal Surge Protection Device (SPD) Replacement (-S, -SI models)

Step 1: When the surge protection device (SPD) is displaying error messages, switch the DC input switch to 0, switch the AC output switch to 0, and switch the AC circuit breaker to open circuit.

Step 2: Open the bottom cover of the converter and remove the faulted SPD.

Step 3: Replace with SPD of the same brand, place the lower cover back, and lock to the converter.



Maximum continuous operating voltage $U_{cpv}$	1060Vdc
Rated operating voltage $U_{oc}$	$\leq 1000Vdc$
Maximum discharge current $I_{max}$	40kA

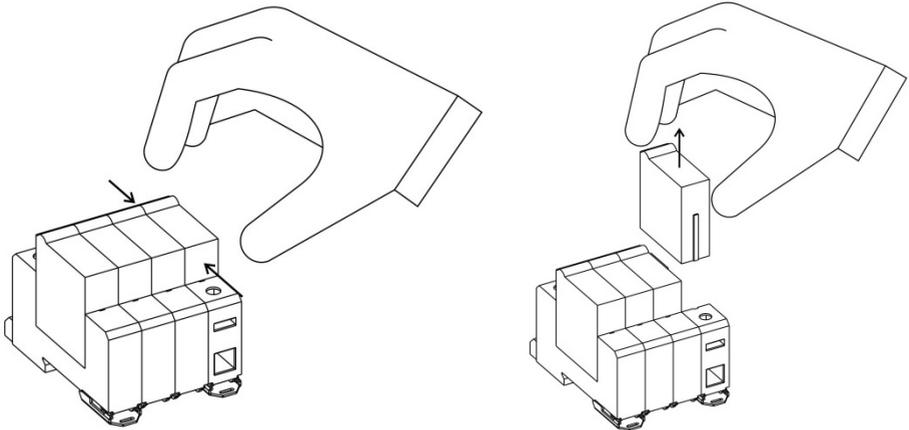
Rated discharge current In	20kA
Operating temperature range	-40°C ~ +85°C
Fault display	Window showing red means fail

### 7.3 AC Terminal Surge Protection Device (SPD) Replacement (for -S, -SI models)

Step 1: When the surge protection device (SPD) is displaying error messages, switch the DC input switch to 0, switch the AC output switch to 0, and switch the AC circuit breaker to open circuit.

Step 2: Open the bottom cover of the converter and remove the faulted SPD.

Step 3: Replace with SPD of the same brand specifications, place the lower cover back, and lock to the converter.



Maximum continuous operating voltage $U_{cpv}$	440Vac
Rated operating voltage $U_{oc}$	$\leq 220Vac$ or $\leq 277Vac$
Maximum discharge current $I_{max}$	40kA

Rated discharge current In	20kA
Operating temperature range	-40°C ~ +85°C
Fault display	Window showing red means fail

## 8. Converter Failure Determination and Troubleshooting

Based on the LED lighting signals of the converter, preliminary cause of failure can be determined.

LED light	Description	Troubleshooting instructions
	Red LED flashing: Solar converter has failure/malfunction	Please contact Ablerex or the local retailer for assistance.
	Yellow LED flashing: Electrical conditions are incompatible with solar converter specifications	Please confirm that the solar panel or grid conditions are compatible with converter specifications.
	Green LED flashing: Converter is disconnected from grid	Please confirm whether there is insufficient sunlight or the solar panel is covered.

Also, the converter can be connected via Bluetooth. The message of the code displayed relating to converter operational status, generation status or converter failures can be obtained via the exclusive app. The user is then able to troubleshoot according to the displayed message. Tables 2 and 3 are the converter-provided message descriptions.

**Table 2 Converter Failure and Grid System Error Code Descriptions**

Code	Cause	Description	Troubleshooting instructions
Er00	DC_BUS charging error	During the converter DC turn-on procedure, DC_BUS has failed to reach the preset value	<ol style="list-style-type: none"> <li>1. Disconnect the solar panel array and the AC grid from the converter.</li> <li>2. Wait for all LEDs to be completely off, and then re-connect the solar panel array and the AC grid to the converter.</li> <li>3. If the error continues to occur, please contact the supplier.</li> </ol>
Er07	DC_BUS voltage too high	DC_BUS operating voltage higher than the preset value	
Er08	DC_BUS voltage too low	DC_BUS operating voltage lower than the preset value	
Er17	Main control board memory error	Controller configuration value error	
Er22	Output relay error	Relay error during the converter AC turn-on procedure	
Er24	Output current detection error	Output current error during the converter DC turn-on procedure	
Er25	Maximum power point tracker A input overcurrent	Maximum power point tracker input current over the rated value	
Er26	Maximum power point tracker B input overcurrent		
Er45	Maximum power point tracker C input overcurrent		
Er46	Maximum power point tracker D input overcurrent		
Er48	Converter driver error	Converter IGBT error	<p>Disconnect the solar panel array and the AC grid from the converter. Please contact the supplier.</p>
Er49	Converter driver overcurrent	Converter output current over the rated value	
Er50	Converter driver voltage insufficient	Converter IGBT error or current error	
Er51	Maximum power point track A&B driver error	Maximum power point track IGBT error	<p>Disconnect the solar panel array and the AC grid from the converter. Please contact the supplier.</p>
Er52	Maximum power point tracker C&D driver error		
Er53	Maximum power point tracker A&B driving voltage insufficient	Maximum power point tracker IGBT error or current error	
Er54	Maximum power point tracker C&D driving voltage insufficient		

Er09	Converter AC output overcurrent	Converter AC output current over the rated value	<ol style="list-style-type: none"> <li>1. Switch the grid connection circuit breaker to the "OFF" position, and inspect the grid system structure.</li> <li>2. If the grid system is normal and the error continues to occur, please contact the supplier.</li> </ol>
Er11	Converter overload	Converter AC output power over the rated value	<ol style="list-style-type: none"> <li>1. Switch the grid connection circuit breaker to the "OFF" position, and inspect the grid system structure.</li> <li>2. If the grid system is normal and the error continues to occur, please contact the supplier.</li> </ol>
Er13	Combined hardware protection	Converter combined error	
Er14	Converter phase locking error	Failure to synchronize with grid phase during the converter AC turn-on procedure	
Er29	Converter AC output DC ratio too high	AC output DC ratio above the rated value	
Er18	Radiating fin overheated	Radiating fin overtemperature	<ol style="list-style-type: none"> <li>1. Lower the ambient temperature of the converter or relocate the converter to a well-vented location.</li> <li>2. If the error continues to occur, please contact the supplier.</li> </ol>
Er02	Auxiliary MCU error	Auxiliary MCU error	If the error continues to occur, please contact the supplier.
Er12	DC BUS charging failed	DC BUS charging failed	
Er43	Output DC ADC failure	Output current sensor failure	
Er37	Fan failure	Fan rotation error	<ol style="list-style-type: none"> <li>1. Check if there is any foreign object in the fan.</li> <li>2. If the error continues to occur, please contact the supplier.</li> </ol>
Er55	Exterior fan (model 1) error	Fan rotation error	
Er56	Exterior fan (model 2) error	Fan rotation error	
Er57	Internal cable routing signal error	Loose cable routing	Disconnect the solar panel array and the AC grid from the converter. Please contact the supplier.

**Table 3 Grid System Error Troubleshooting and Identification**

Code	Cause	Description	Troubleshooting instructions
AL00	Grid voltage too high	Grid voltage does not meet converter specifications	<ol style="list-style-type: none"> <li>1. Disconnect the solar panel array and the AC grid from the converter.</li> <li>2. Confirm the wiring and structure of the grid system.</li> <li>3. Confirm that the grid voltage and frequency are within converter specifications.</li> <li>4. Re-connect the solar panel array and the AC grid to the converter. If the error continues to occur, please contact the supplier.</li> </ol>
AL01	Grid voltage too low		
AL02	Grid voltage frequency too high	Grid voltage frequency does not meet converter specifications	
AL03	Grid voltage frequency too low		
AL04	Maximum power point tracker A_input voltage too high	Maximum power point tracker input voltage does not meet converter specifications	<ol style="list-style-type: none"> <li>1. Disconnect the solar panel array and the AC grid from the converter.</li> <li>2. Confirm the open circuit voltage of the solar panel array.</li> <li>3. If the open circuit voltage of the solar panel array is within converter specifications and the error continues to occur, please contact the supplier.</li> </ol>
AL06	Maximum power point tracker B_input voltage too high		
AL33	Maximum power point tracker C_input voltage too high		
AL35	Maximum power point tracker D_input voltage too high		
AL05	Maximum power point tracker A_input voltage too low	Maximum power point tracker input	<ol style="list-style-type: none"> <li>1. Disconnect the solar panel array and the AC grid from the converter.</li> <li>2. Confirm the open circuit voltage of the solar panel array.</li> <li>3. Confirm that the wiring from the solar panel array to the converter is not loose or missing.</li> <li>4. If the open circuit voltage of the solar panel array is within converter specifications and the error continues to occur, please contact the supplier.</li> </ol>
AL07	Maximum power point tracker B_input voltage too low		
AL34	Maximum power point tracker C_input voltage too low		
AL36	Maximum power point tracker D_input voltage too low		
AL08	Islanding	No grid or grid error	<ol style="list-style-type: none"> <li>1. Disconnect the solar panel array and the AC grid from the converter.</li> <li>2. Confirm that the AC wiring is correct.</li> <li>3. Confirm that the grid has no anomaly.</li> <li>4. If the grid is normal and the wiring is correct but the error continues to occur, please contact the supplier.</li> </ol>
AL13	Grid voltage phase error		
AL10	Leakage current too high	Ground leakage current too high	<ol style="list-style-type: none"> <li>1. Disconnect the solar panel array and the AC grid from the converter.</li> <li>2. Confirm the wiring and structure of the grid system.</li> <li>3. Re-connect the solar panel array and the</li> </ol>

			AC grid to the converter. If the error continues to occur, please contact the supplier.
AL11	Insulation resistance error	Converter DC input insulation resistance too low and fails to meet specifications	<ol style="list-style-type: none"> <li>1. Disconnect the solar panel array from the converter, and disconnect the converter from the grid.</li> <li>2. Confirm that the converter DC input terminal and the solar panel array are normal (e.g., no short circuits, no damaged wire insulation).</li> <li>3. Re-connect the solar panel array and the AC grid to the converter. If the error continues to occur, please contact the supplier.</li> </ol>
AL25	Overtemperature warning	Converter overtemperature so derating mechanism is triggered	<ol style="list-style-type: none"> <li>1. Lower the ambient temperature of the converter or relocate the converter to a well-vented location.</li> <li>2. If the error continues to occur, please contact the supplier.</li> </ol>
AL31	DC varistor failure_standard model	DC varistor function failure	Based on the code, replace the DC or AC varistor.
AL32	AC varistor failure_standard model	AC varistor function failure	
AL37	DC varistor failure_model 1	DC varistor function failure	
AL38	AC varistor failure_model 1	AC varistor function failure	
AL40	DC varistor failure_model 2	DC varistor function failure	
AL41	AC varistor failure_model 2	AC varistor function failure	
AL42	Input mode setting incorrect	Converter input setting incompatible with solar panel	Inverter DC input is configured to "Synchronization", and the "A" array input voltage of maximum power point tracker is too low. Please confirm whether "A" array of the solar panel array is functioning normally.
AL43	AC switch open circuit	AC switch open circuit	Grid connection needs closed switch

## 9.Specification

Model		ES 52000HC*	ES 60000HC**
Converter Technology	Switching mode	Sine wave output current source mode, high frequency pulse width modulation	
	Electrical isolation	No output electrical isolation design	
<b>DC input</b>			
Rated operating voltage		600Vdc	725Vdc
Maximum input voltage		1000 Vdc	
Activation voltage		250 Vdc	
Maximum input current		26 Amp x4	
Maximum power point track range		200 ~ 1000 Vdc	
Maximum power point tracker quantity		4	
Module matching capacity		1.2 times	
<b>AC output</b>			
Rated output power		52 kVA / 52kW	60 kVA / 60kW
Rated output voltage		220/380Vac	277/480Vac
Output wiring method		3-phase 4-wire	3-phase 4-wire
Rated output current		78.8Amp x3	72.2Amp x3
Maximum output current		80Amp x3	80Amp x3
Rated operating frequency		60Hz	
Power factor		0.8 leading - 0.8 lagging	
Current distortion		Compliant with IEEE519	
<b>Efficiency</b>			
Maximum converting efficiency		98.40%	98.50%
European efficiency		98.0%	98.0%
<b>Working environment</b>			
Ambient temperature		-25°C - +60°C	
Relative humidity		0 - 100% (No condensation)	
Height		0-2,000 m / 0-6,600 ft	
<b>Structure</b>			
Dimensions (W x D x H)		595 x 303 x 970 mm (Including stand)	
Weight		75 kg	
Water-proof and dust-proof		IP65, outdoor model	
Heat dissipation method		Smart cooling	

Communications		
Standard		RS-485, Bluetooth
Display		LED, APP
Protection		
DC	Standard	DC switch, reverse protection, insulation resistance check
AC	Standard	AC switch, overcurrent protection, leakage current inspection
	Islanding detection	Passive method: Voltage phase shift detection Active method: Virtual work control
Certification		
Safety		CNS 15426-1, -2
Grid connection		CNS 15382:2017
Electromagnetic interference		CNS 14674-2, CNS 14674-4
Harmonics		IEEE-519
Outer casing protection level		CNS 14165 IP65
Salt spray testing		IEC 60068-2-52(severity 5)
Earthquake testing		GR-63 Core Earthquake Test Zone 3

\* ES 52000HC series model description:

Model	Description
ES 52000HC	Standard
ES 52000HC-S	Built-in surge protection device (SPD)
ES 52000HC-I	Built-in smart cloud module
ES 52000HC-SI	Built-in surge protection device (SPD) and smart cloud module

\*\* ES 60000HC series model description:

Model	Description
ES 60000HC	Standard
ES 60000HC-S	Built-in surge protection device (SPD)
ES 60000HC-I	Built-in smart cloud module
ES 60000HC-SI	Built-in surge protection device (SPD) and smart cloud module

## 10.Contact Information

**Ablerex Electronics Co., Ltd.**

**1F., No. 3, Ln. 7, Baogao Rd., Xindian Dist., New Taipei, Taiwan**

TEL: +886-2-2917-6857

FAX: +886-2-2913-1705

E-mail: [ablerex@ablerex.com.tw](mailto:ablerex@ablerex.com.tw)