ApolloTECK

MANUAL
AUTO
FAULT
RUN

User Manual
-install
-operate

PVBOX

ApolloTECK GmbH

Catalogue

1. Manual Info

1.1 Manual description

1.2 Customer orientation

This manual is designed for APOLLOTECK PVBOX installers, including professional technicians and daily users. The content contains installing procedures, setting the APOLLOTECK PVBOX and systemconnexion operation. Operators should have necessary electrical related knowledge and be familiar with electrical schematic diagrams. Please read the manual before the installation.

1.3 Safety Signs

- Use Signs

	Danger
	This sign indicates the possible occurrence of death orserious injuries due to misoperation.

	Warning
	This sign indicates the possible occurrence of death ormedium or serious injuries due to misoperation.

⚠ Caution

This sign indicates the possible occurrence of minor or medium injuries due to misoperation.

❗ Attention

This sign indicates that users might suffer their property loss due to misoperation

2. Product info

2.1 Overview

- Product appearance

2.2 Function description

PID Explanation: According to the study，the high voltage between the crystal PV modules and grounded metal frames will cause panel efficiency to decrease continuously. There are a lot of factors leading to this decrease. For example, when panels work under high voltage as mentioned above, ionic migration occurs in the packaging materials and the outer layer ; hot carriers appear in the panel; the reallocation of charges weakens the active layer of the panel; the circuit in the region will corrode. These mechanisms that cause attenuation are called PID.

APOLLOTECK PVBOX is designed to stop the panels from losing energy due to PID. APOLLOTECK PVBOX connects to inverter in parallel to create a high voltage between the negative electrode and the earth on the panel. During night, it will release the charge panel saved up in the daytime due the negative bias between negative electrode and the earth, by doing so, we will have the damaged panels repaired.

2.3 Tech data

Alternating current Input	
Alternating input voltage	100Vac～264Vac
Alternating input frequency	50Hz/60Hz
Static state power dissipation	＜0.5W
Operating model power dissipation	3.75W
Operating model Max. power dissipation	＜8.75W
DC output	
Adjustable voltage to ground	400V/500V/600V/700V/800V/900V/1000V
Operating model Max. output current	3.3mA
Max. short circuitcurrent	6.7mA
PV modules and Inverter requirements	
Max. direct current for modules	1500V
Minimum direct current for modules	80V
Minimum direct current for inverter	＞75V
Minimum insulating resistance	200kΩ
Interactive ways for external information	
Data	RS485（standard selective）
Alert	Relay（OP、NC）
Other Info	
Size (length×width×height)	228 mm×250 mm×63mm
weight	1.0kg
Defensive level	IP65
Protective level	Class II
Working temperature range	-20°C～+60°C
Relative humidity	0%～98%
Max. height	3000m
Installation	Fixed against the wall

3. Packing list

3.1 Assembly parts

A	B	C	D
E	F	G	

Objects	Description	quantity
A	APOLLOTECK PVBOX	1
B	User manual	1
C	bolt(ST3.5×25)	2
D	Swell pipe（φ6）	2
E	Splitter	1
F	Splitter	3
G	Communication terminal	1

4. Product info

4.1 Product appearance

- front

4.2   Product function

APOLLOTECK PVBOX and inverter direct current transmit in parallel generating a high voltage between negative electrode and the earth on solar modules, which also supports output voltage and output adjustable voltage. At night, it can release the charge the modules saved up in the daytime to repair those panels damaged by PID. APOLLOTECK PVBOX has module inspector and earth insulating resistance (including panels, inverters, system resistance >200Kn), grid voltage monitoring function.

4.3   The supported type of inverters

APOLLOTECK PVBOX supports route 1, route 2, route 3 MPPT inverters and multiple sets in series between each inverter. If an inverter only has 1 route MPPT, in a case of that , we only need to use APOLLOTECK PVBOX either PV1+, or PV2+ to connect inverter on the front side. If an inverter has 2 routes MPPT, APOLLOTECK PVBOX PV1+ and PV2+ need to be connected to the both front sides on the inverter. If an inverter has 3 routes MPPT, APOLLOTECK PVBOX PV1+,PV2+ and PV3+ need to be connected to the three routes of the inverter, APOLLOTECK PVBOX PV need to be connected to one of the negative electrodes of the inverter.However, we need to make sure two routes or three routes MPPT are connected to each other in the internal circuit . APOLLOTECK PVBOX and inverter connection diagram.
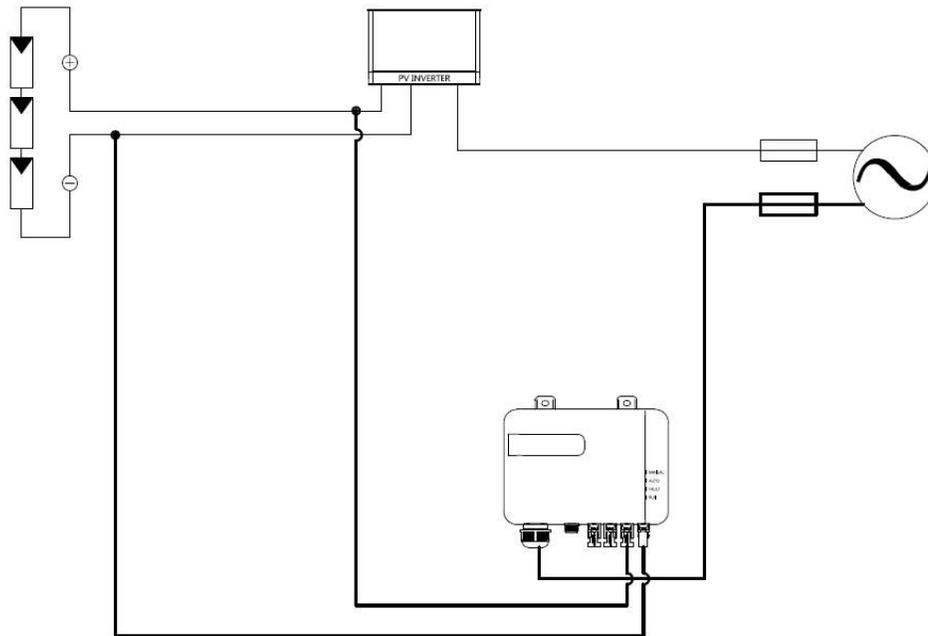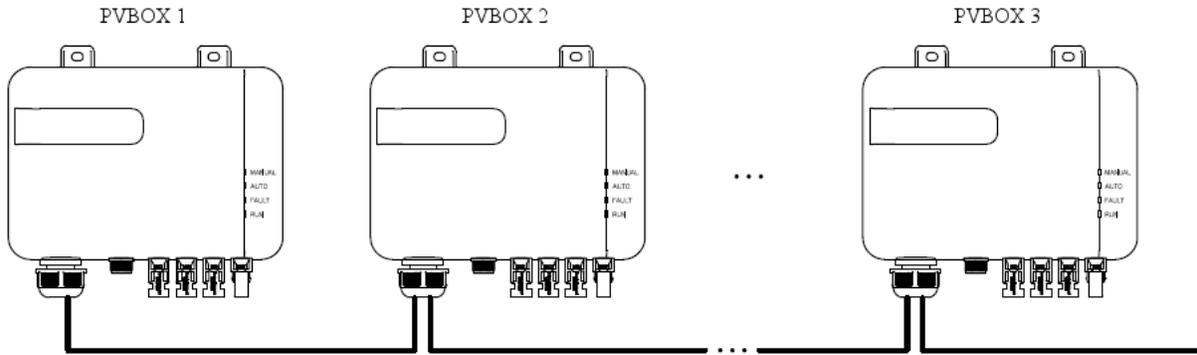

1 route MPPT
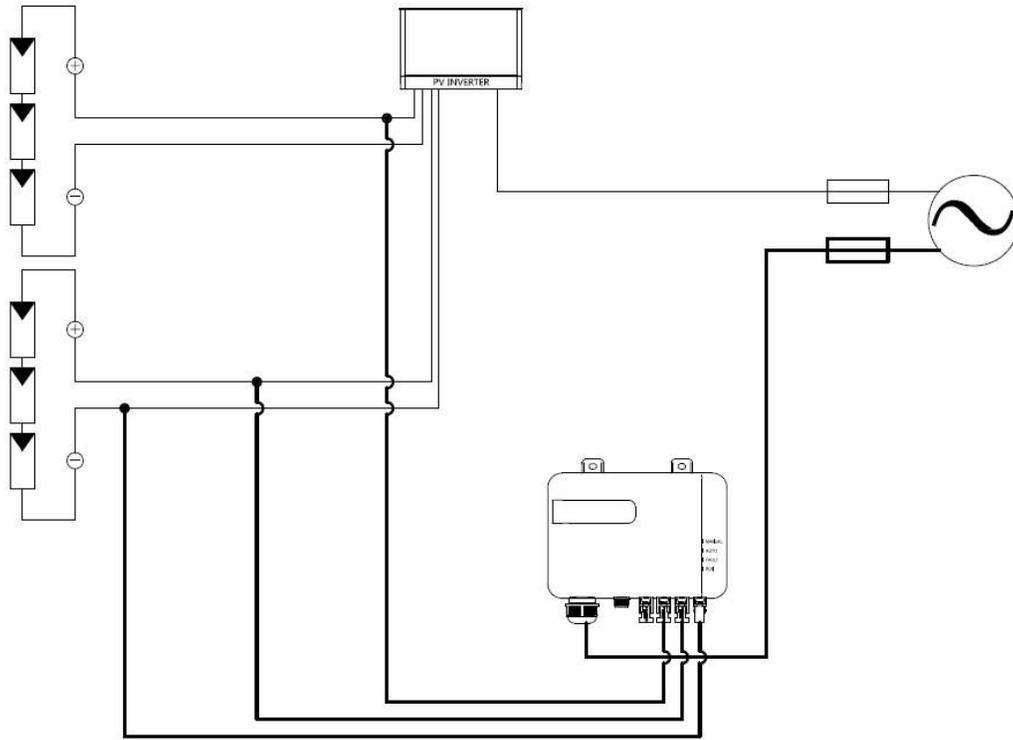
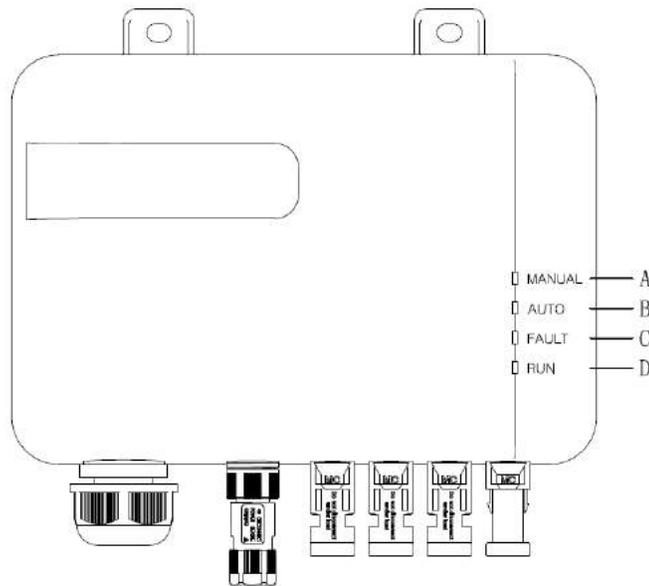**2 route MPPT**
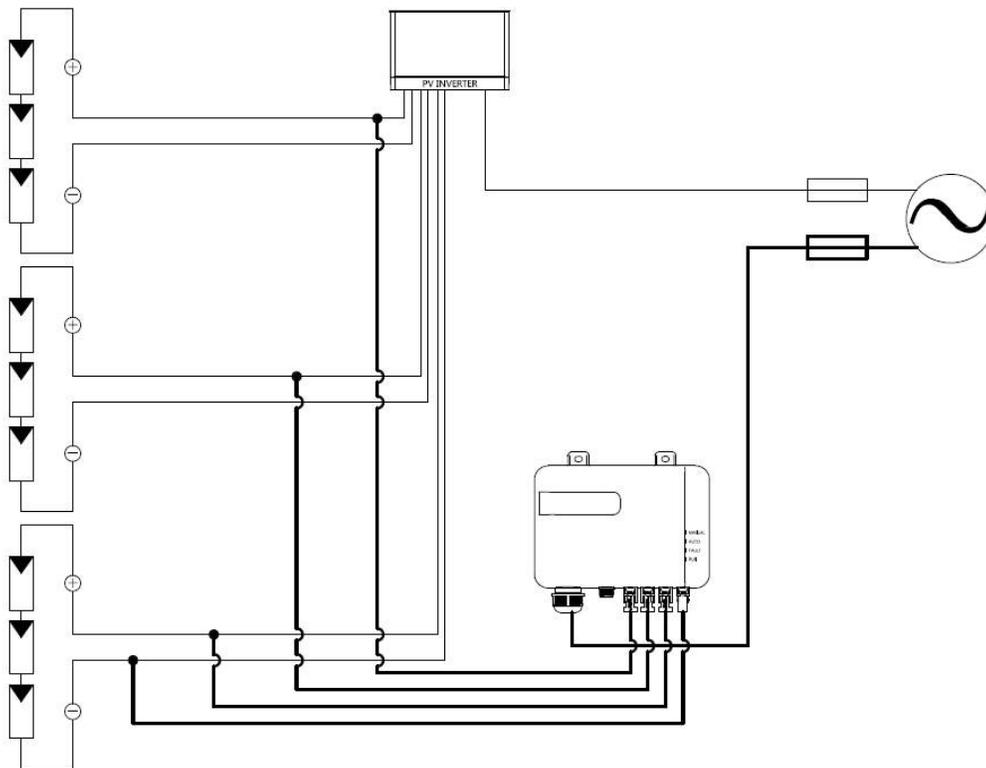
3 route MPPT

For multiple string inverters power stations, APOLLOTECK PVBOX supports multiple sets in series, through one set of alternating power supply ,and connects to up to 16 APOLLOTECK PVBOX.

APOLLOTECK PVBOX

4.4 LED

Item	Description	Details
A	Manual green light	- APOLLOTECK PVBOX works at the manual mode;APOLLOTECK PVBOX transmits voltage to PV+ and PE , PV- and PE , the light is on otherwise it is off.
B	Auto green light	- APOLLOTECK PVBOX works at the auto mode; APOLLOTECK PVBOX transmits voltage to PE+ and PE, PV-and PE, the light is on otherwise it is off.
C	Fault red light	- Under normal conditions, the light is off - When the live line and the neutral line are inversely wired , the light flashes - Under voltage(the voltage the live line and the neutral line is lower than 100V), the light flashes. - Over voltage(the voltage the live line and the neutral line is higher than 200V),, the light flashes； - When the insulation resistance between PV modules and PE is less than 200kΩ, the light is always on.
D	RUN green light	- Refers to APOLLOTECK PVBOX working conditions; - when voltage between PV + and PV- is below 10V, APOLLOTECK PVBOX for "PV + and PE" and "PV- and PE" output voltage, the light is on; - PV + PV- voltage higher than 80V and when, APOLLOTECK PVBOX does not transmit output voltage, the light flashes.

# 5. Operating modes and output voltage setting

Two modes of operation

5.1 two modes of operation

When APOLLOTECK PVBOX is in normal operation, during nighttime voltage repairing occurs, and it does not work during the day. APOLLOTECK PVBOX supports "Manual " and "Auto " two voltage modes.In the manual mode seven output voltages 400V / 500V / 600V / 700V / 800V / 900V / 1000V are available while in the Automatic mode it outputs the highest systems voltage of the day. APOLLOTECK PVBOX factory default setting is "Auto " mode.
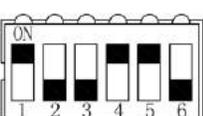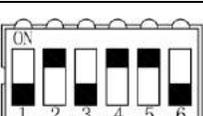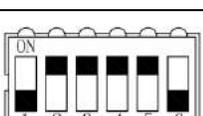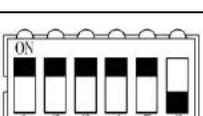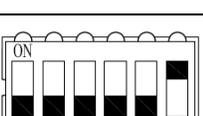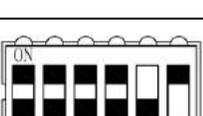
5.2 Setting Mode

APOLLOTECK PVBOX Set "work mode" and "output voltage" through an internal 6 DIP switches. The "Bit 1,2,3,4" to set the output voltage, "bit 5,6" to set the output mode. Detailed settings refer to the following table:
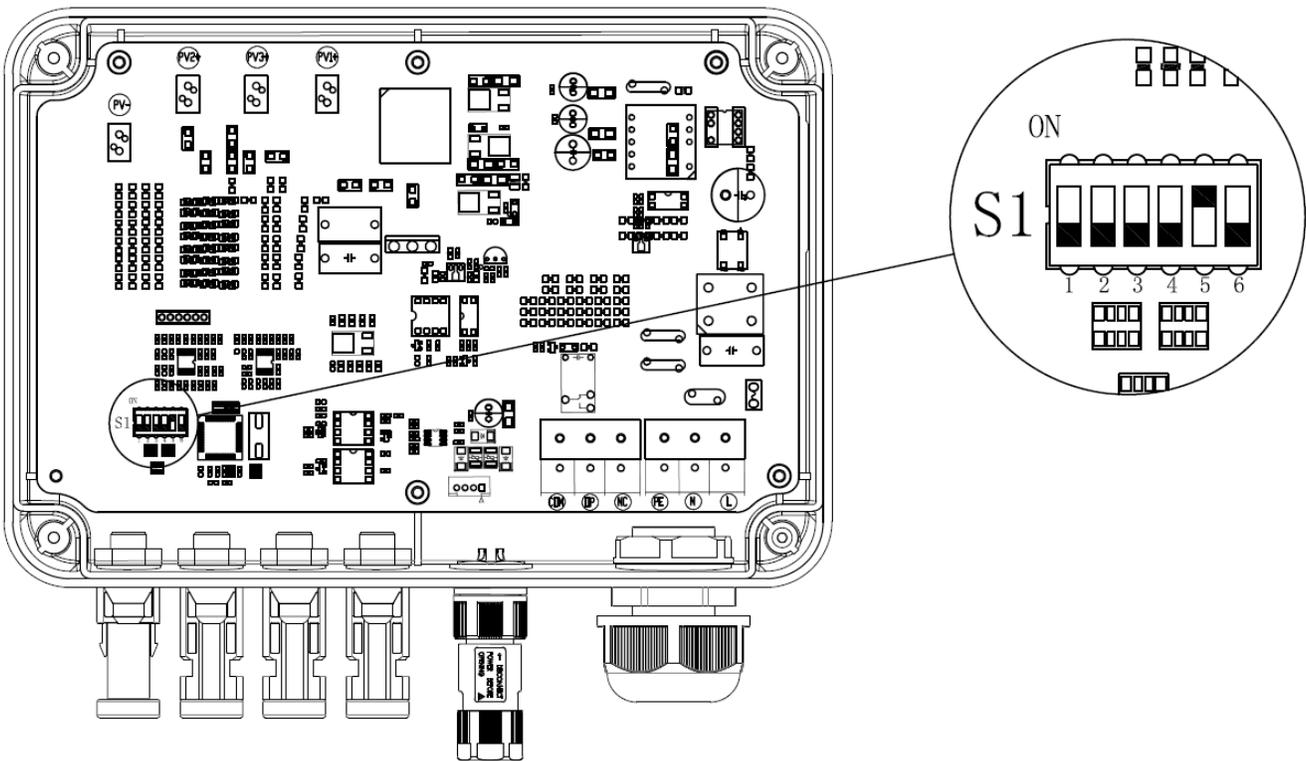
Position diagram of the 6 Bits dial system

•Operation mode and output voltage configuration table

diagram	voltage configuration				mode configuration		output	
	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Mode	Voltage
	OFF	ON	ON	OFF	ON	OFF	fixed	400V
	OFF	OFF	OFF	ON	ON	OFF	fixed	500V
	ON	OFF	OFF	ON	ON	OFF	fixed	600V
	OFF	ON	OFF	ON	ON	OFF	fixed	700V
	ON	ON	OFF	ON	ON	OFF	fixed	800V
	OFF	ON	ON	ON	ON	OFF	fixed	900V
	ON	ON	ON	ON	ON	OFF	fixed	1000V
	OFF	OFF	OFF	OFF	OFF	ON	automatic	Intelligent
	others						fixed	400V
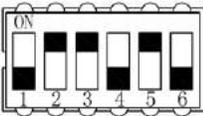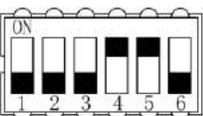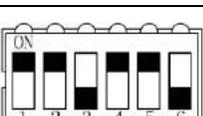
Working in the manual mode: the "bit5" is ON while for the "bit1,2,3,4" the output voltage between the battery plates is selected when PV+ and PV- voltage is below 10V, an output voltage corresponding to the product through. It recommended that the output voltage be set slightly higher than the voltage of the PVmodules during inverter operation. In the automatic mode: the "Bit6" is ON while APOLLOTECK PVBOX system automatically detects the maximum voltage during the day, when the panels between PV+ and PV- voltage is below 10V, the product corresponding output voltage.

Note that the table "others" undefined set to an invalid setting, APOLLOTECK PVBOX according to the manual mode, fixes 400V output.

6. Install

6.1 Notes on safety

> ⚠️ **Danger**
> ──
>
> This sign indicates that users mayhave risk of fatal dangeror serious injuries due to misoperation.

> ## ⓘ Attention
>
> It will reduce the lifespan due to the unfit or irrelevant installation environment
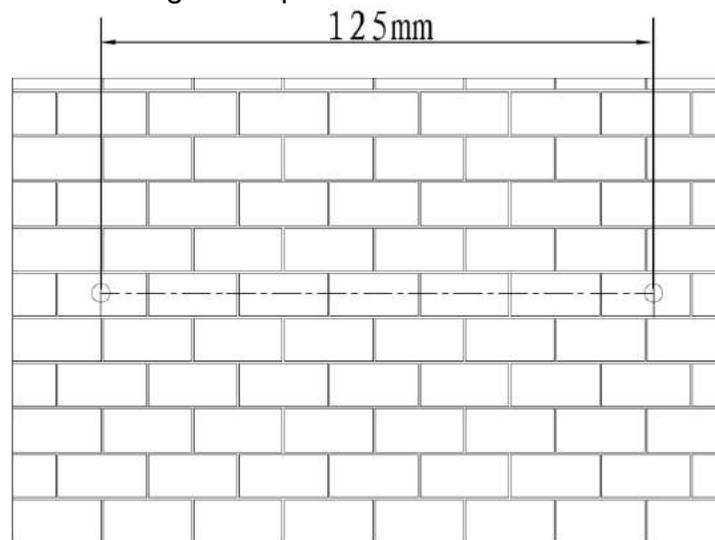>
> in case of the over temperature please do not install in the sunlit area
>
> Do not install placeswhich are exposed to rain and snow.
>
> The location for installation must have a good atmospheric condition

## 6.2 The installation procedure

- Two positions according to the picture are marked on the wall

In two marked positions, two holes are drilled in the wall. Then, with a rubber mallet to two bulge pipes are hammered into the hole. After that, APOLLOTECK PVBOX is fixed through the mounting holes,with two screws,which will be secured bulge pipe. At this point, APOLLOTECK PVBOX is fixed.
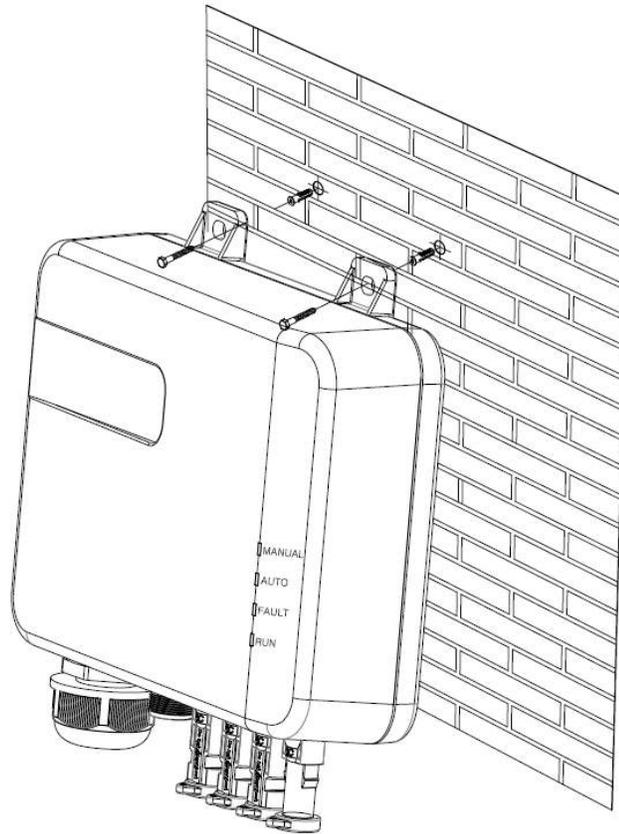
- Attention

Outdoor installation is available

A variety of orientations of installation is available

The temperature of installation environment is between -20°C～+60°C
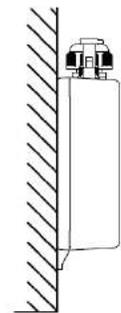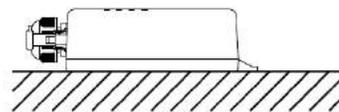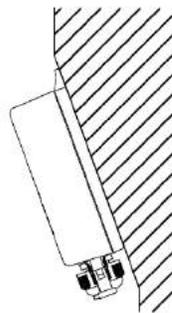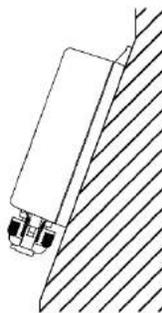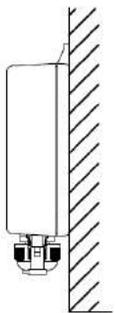
7. Electric connection

7.1 Safety note

Danger

Potential fire disaster or electric shock to people

Please follow the instruction when making connection

High voltage power systems will be connected to PVBOX and installation should follow the instructions

Attention

Electrical connections shall be in accordance with applicable laws and regulations, such as the wire diameter, fuses, PE protective earth connection, please cut all power during wiring process.
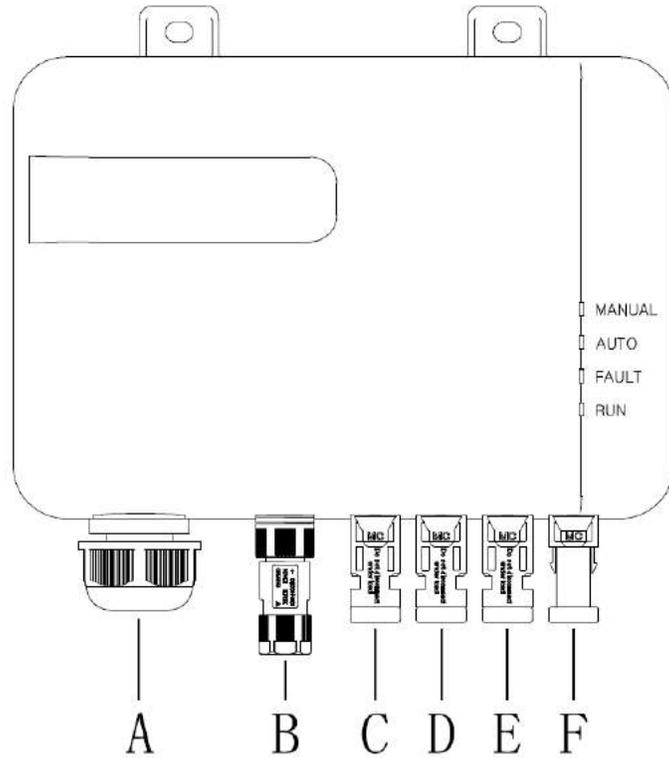
Attention

In order to ensure the safety of personnel and equipment, it is necessary to connect the PV mount to the other conductive h ousing connected and the PVBOX.

7.2　Connecting position preview

- External Interface

location	symbol	Explanation
A	AC1、2	Communication terminal
B	COM	Net communication terminal
C	PV3+	DC 3 positive pole
D	PV2+	DC 2 positive pole
E	PV1+	DC 1 positive pole
F	PV-	DC negative pole

- Internal interface
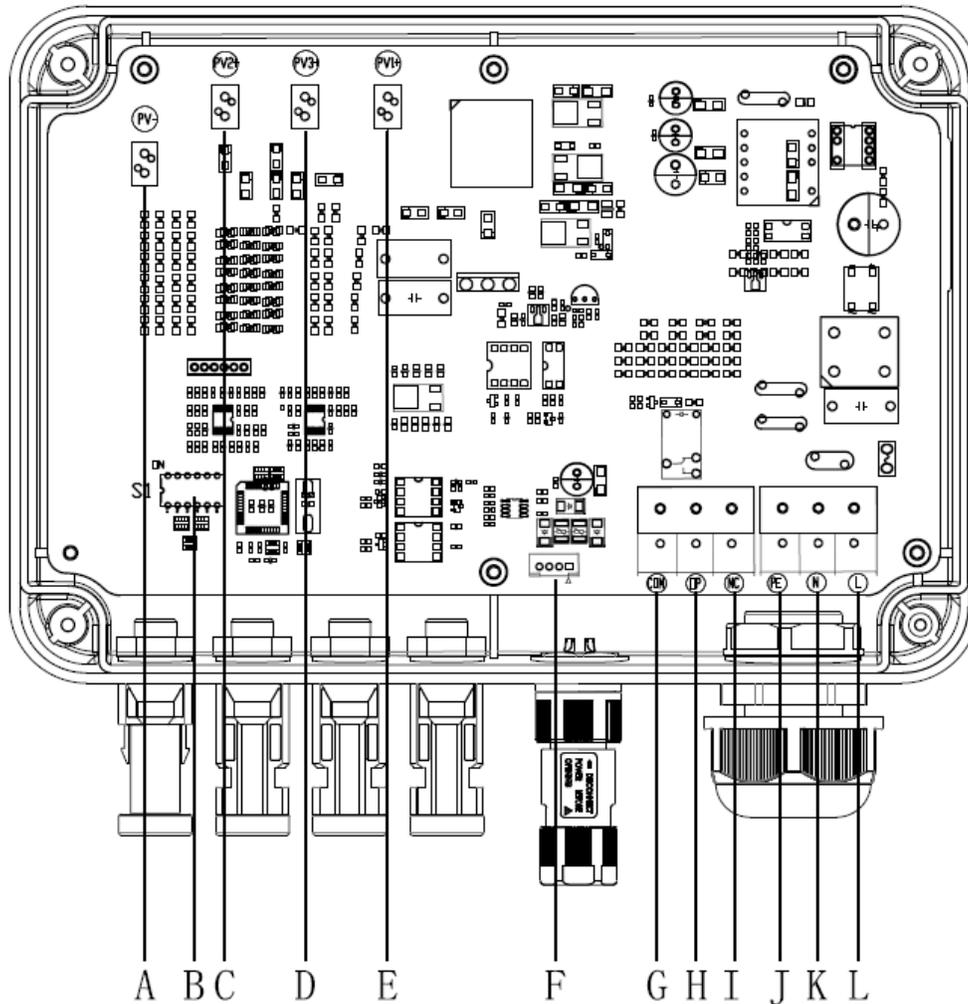
| location	symbol	Explanation
A	PV-	PV- function output PV- Interface
B	S1	6-bit DIP switch to select mode and voltage
C、D、E	PV1+,PV2+,PV3+	PV1 +, PV2 +, PV3 + Function Output PV1 +, PV2 +, PV3 + Interface
F	CN4	RS485 communication interfaces
G、H、I	COM,OP,NC	relay COM, OP, NC terminal
J、K、L	PE,N,L	input power cable PE, N, L terminal

7.3 The AC connection

APOLLOTECK PVBOX by AC mains supply, please lock AC1 connected through the exchange APOLLOTECK PVBOX of L, N, and PE (PE connection system in which the earth, and photovoltaic modules bracket, inverters connected grounding is APOLLOTECK PVBOX reference zero output voltage).
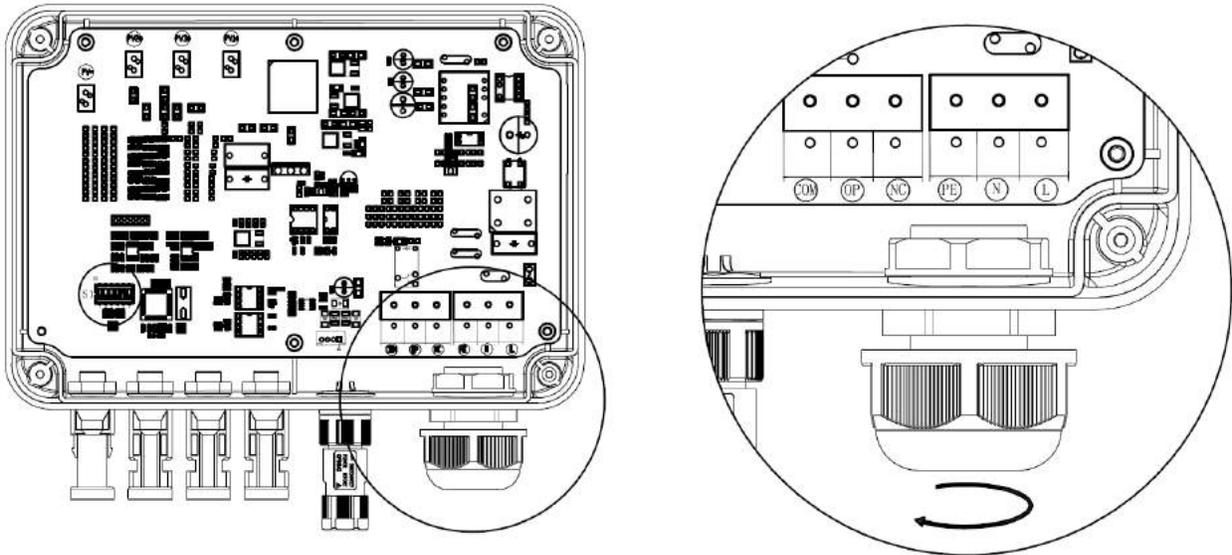
- Require cable
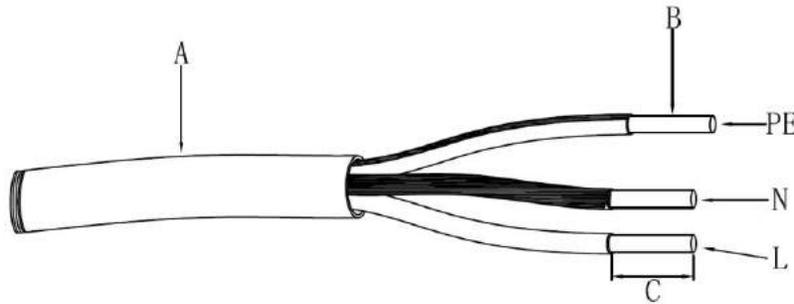
| location	name	explanation
A	Cable diameter	5mm～13mm
B	Wire sectional area	$0.5mm^2～1.5mm^2$
C	The length of insulated wire	About 10mm

- Support 16 in series at most
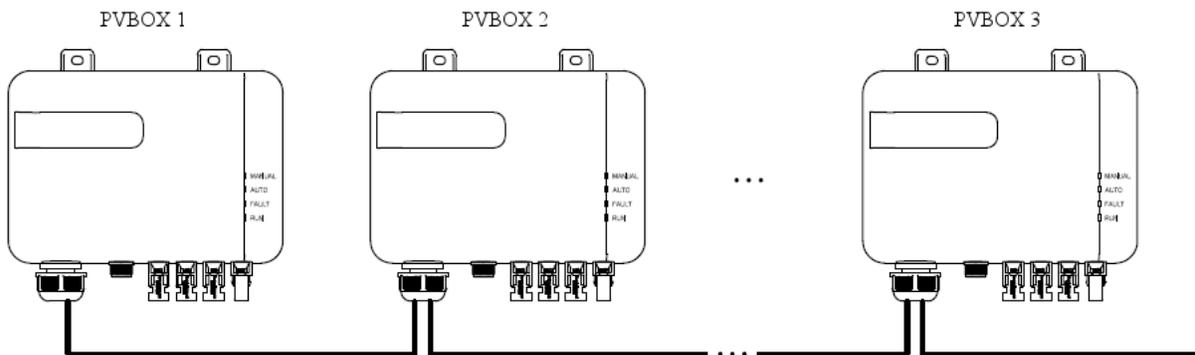
- The detailed installation steps

  1) Unscrew the screw open which is found at the top cover of APOLLOTECK PVBOX.Unscrew the communication terminal as the diagram indicates.

  2) Connect AC1 with APOLLOTECK PVBOX, the three-conductor connection to the double terminal block J, K, L lower, ensure PV Offset Box of L, N AC L phase, N phase are connected, PE and PE earth system is connected;
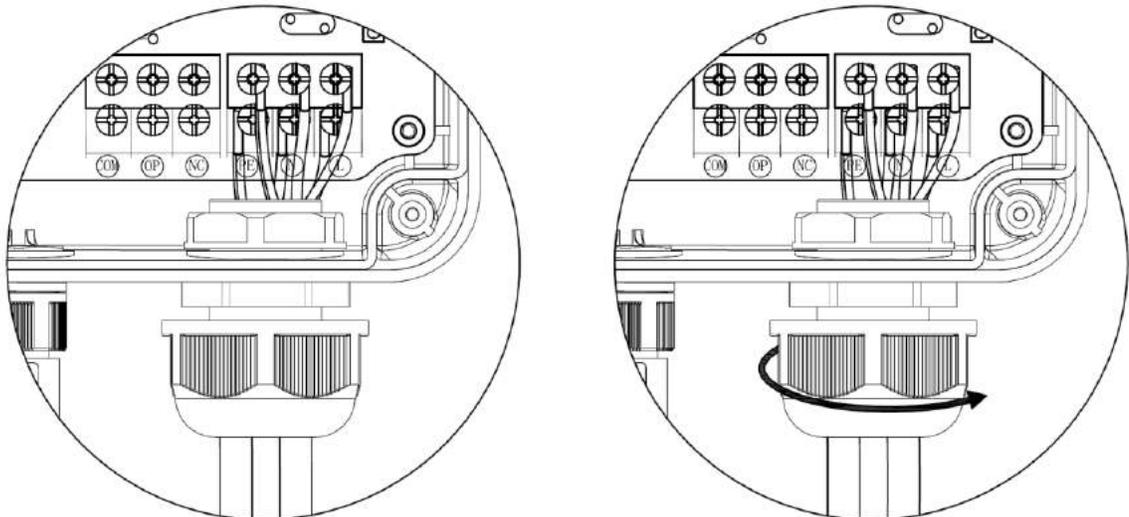

  3) To adjust the PV Offset Box mode, please 6 DIP switch setting "mode" "and" output voltage ";
  4) Tighten the terminal screws Taishan, ensure reliable electrical connection, tighten the AC terminals as shown, close the APOLLOTECK PVBOX cover, AC connection is completed;

5) If several unitsare connected in series with AC, AC2 will lock the other three double-conductor connection terminal blocks J, K, L of the upper layer, namely through J, K, L to the next station PVBOX-powered, while the PE earth connection system to the next station PVBOX terminal lower PE terminal

7.4 DC connection

APOLLOTECK PVBOX output interfaces MC4 solar connectors.If there are additional DC terminals in the inverter APOLLOTECK PVBOX is connected to the terminals just through the wire. If the inverter has no extra DC terminal, we need an additional splitter for DC terminals.
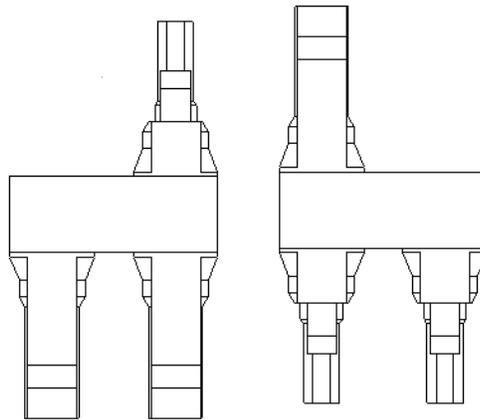
- The 1 route MPPT inverter connexion

PV1 + or PV2 of the APOLLOTECK PVBOX + is connected to the positive terminals of the DC of the inverter, PV- is connected to the inverter DC negative terminal according a schematic diagram (upper).

Concrete connection: if the inverter has extra DC terminals, a set of terminals are connected to solar panels while another set of terminals connected to the APOLLOTECK PVBOX; if there is no extra terminals in the inverter, we need an additional splitter to connect, in the same way.

- Connection to inverters of 2 or 3 MPPT's

PV1 +, PV2 +, and PV3 + of APOLLOTECK PVBOX, respectively connect to the inverter's 2routes' or 3routes' positive DC terminals while, PV- connects of negative terminals, while all the inverter's 2 or 3 MPPT are connected in the negative terminal, with the previous figure as the schematic diagram.

It is to be noted that currently the vast majority of 2-route or 3-route MPPT of the inverters on the market, according to research, are connected internally in the negative terminal. If the inverters' 2-route or 3-route MPPT negative terminal is not connected internally, two or three APOLLOTECK PVBOX are to be equipped, respectively connected to each MPPT.

Concrete connection: if the inverter has extra DC terminals, a group of terminals of MPPT1 are connected to solar panels while the other set of terminals connected with APOLLOTECK PVBOX. A group of terminals of MPPT 2 are connected to solar panels while the other set of terminals connected with APOLLOTECK PVBOX. It is to note that PV- of APOLLOTECK PVBOX needs only connecting to the negative terminals. If the inverter has no extra DC terminal, an additional splitter is needed, then the same connexion applies.

8. Recycling and disposal

To comply with our waste electrical and electronic product recycling regulations provisions, expired electrical equipment must be collected to entities with qualifications of waste electrical and electronic products processing separately. Any device that you no longer use should be returned to your dealer for recycling, or to your local recycling companies with recycling approval.
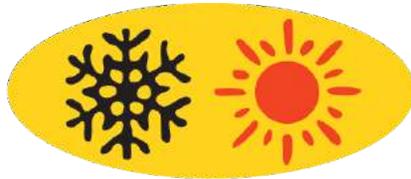Ignoring the regulations could have a serious impact on the environment and your health.

Warning

This device cannot be placed inside the litter bins within residence communities

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