Solar Plug-SGB1

RS485/RS232/TTL To 4G DTU

User Manual

V 1.2

Product Features

- ✧ **Adopting RISC architecture SOC chip, with a maximum frequency of 160MHz, 276KB RAM, 2MB Flash, based on FreeRTOS system**
- ✧ **Supports 4G, LTE-TDD, LTE-FDD for all network connectivity, with optional sub models supporting specific networks**
- ✧ **Support BLE 5.0 for diagnostic or local Bluetooth debugging and data collection functions**
- ✧ **Supports RS485/RS232/TTL (one out of three) to 4G data transmission, with a maximum serial port speed of 460800bps**
- ✧ **Support Solar Of Things photovoltaic energy management platform, web page or APP to monitor energy data**
- ✧ **Power supply: 5~ 36VDC@10W**
- ✧ **Supports multiple interface styles**

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History

V 1.0 2023-04-14 First Edition

V 1.1 2023-08-16 Add interface style, correct incorrect parameters, and supplement functional definitions such as indicator lights and buttons

V 1.2 2024-03-28 Add procedure to insert SIM card

1. PRODUCT OVERVIEW

1.1. Overview

Solar Plug SGB1 is a fully connected 4G DTU that supports China Mobile, China Unicom, China Telecom 4G networks (excluding 2G and 3G). The network supports a maximum downlink rate of 10Mbps and a maximum uplink rate of 5Mbps.

The Solar Plug SGB1 has a protection level of IP65 and is suitable for harsh outdoor environments. It supports sub models and is suitable for use in different countries and regions.

The Solar Plug SGB1 sub model supports different interfaces to adapt to external devices.

Solar Plug SGB1 is equipped with rich network protocols and integrates RS485/RS232/TTL standard data transmission interfaces, without the need for any driver. It is convenient for traditional serial devices to connect and use, and is suitable for Solar of Things photovoltaic energy management. It is suitable for the photovoltaic energy industry.

1.2. Product Parameters

Table1. Solar Plug-SGB1 Product Technical Parameters

Classification	Parameter
System Information	
Processor/Main Frequency	RISC 160MHz
Flash	2MB
RAM	276KB
Operating System	FreeRTOS
4G Interface (- CA sub model)	
Using Regions	China, India, Southeast Asia
Support Frequency Band	LTE-FDD：B1/B3/B5/B8 LTE-TDD：B34/B38/B39/B40/B41
Transmission Power	LTE-FDD: Class 3(Maximum 23dBm±2dB) LTE-TDD: Class 3(Maximum 23dBm+2dB)
Receiving Sensitivity	LTE-FDD B1: -99dBm(10M) LTE-FDD B3: -99dBm(10M) LTE-FDD B5: -99dBm(10M) LTE-FDD B8: -99dBm(10M) LTE-TDD B34: -100dBm(10M) LTE-TDD B38: -99dBm(10M) LTE-TDD B39: -100dBm(10M) LTE-TDD B40: -99dBm(10M) LTE-TDD B41: -100dBm(10M)
LTE	Maximum Support non-CA CAT1 Supports 1.4-20MHz RF bandwidth LTE-FDD: Maximum uplink rate 5Mbps, maximum downlink rate 10Mbps

	LTE-TDD: Maximum uplink rate 4Mbps, maximum downlink rate 6Mbps (configuration 1) LTE-TDD: Maximum uplink rate 2Mbps, maximum downlink rate 8Mbps (configuration 2)
4G Interface (- SA sub model)	
Using Regions	Hong Kong, South Korea, Australia, Asia Pacific
Support Frequency Band	LTE-FDD：B1/B3/B5/B7/B8/B28
Transmission Power	LTE-FDD: Class 3(Maximum 23dBm±2dB)
Receiving Sensitivity	LTE-FDD B1: -99dBm(10M) LTE-FDD B3: -99dBm(10M) LTE-FDD B5: -99dBm(10M) LTE-FDD B7: -97.5dBm(10M) LTE-FDD B8: -98dBm(10M) LTE-FDD B28: -98dBm(10M)
LTE	Maximum Support non-CA CAT1 Supports 1.4-20MHz RF bandwidth LTE-FDD: Maximum uplink rate 5Mbps, maximum downlink rate 10Mbps
4G Interface (- EA sub model)	
Using Regions	Europe, Middle East, Africa, Thailand
Support Frequency Band	LTE-FDD：B1/B3/B7/B8/B20/B28
Transmission Power	LTE-FDD: Class 3(Maximum 23dBm±2dB)
Receiving Sensitivity	LTE-FDD B1: -99dBm(10M) LTE-FDD B3: -99dBm(10M) LTE-FDD B7: -97.5dBm(10M) LTE-FDD B8: -98dBm(10M) LTE-FDD B20: -98dBm(10M) LTE-FDD B28: -98dBm(10M)
LTE	Maximum Support non-CA CAT1 Supports 1.4-20MHz RF bandwidth LTE-FDD: Maximum uplink rate 5Mbps, maximum downlink rate 10Mbps
BLE Interface	
Wireless Standard	BLE5.0
Frequency Range	2.402GHz ~ 2.480GHz
Transmission Power	Max 15dBm
Receiving Sensitivity	-97dBm
Serial Port	
Port Number	1
Interface Standards	Different sub models support one of RS485/RS232/3.3V TTL
Data Bits	7，8
Stop Bits	1，2
Check Bits	None，Even，Odd
Baud Rate	TTL：1200 bps~460800 bps
Flow Control	Without flow control Half duplex （RS485）
Software	
Configuration Method	APP

Firmware Upgrade	Serial port or OTA network upgrade
Basic Parameters	
SIM Card Interface (Internal To The Product)	Nano SIM (1.8V/3V)
Size	-06/-15/-22/-23/-24/-25 Type: 160mm x 72.37mm x 34.48mm -13 Type: 153mm x 72.28mm x 34.48mm -09/-10/-12/-26 Type: 172.5mm x 47.76mm x 34.53mm -20/-27 Type: 171.5mm x 47.76mm x 34.53mm
Working Temperature	-40 ~ 85°
Storage Environment	-45 ~ 105°C， 5 ~ 95% RH (without condensation)
Protection Level	IP65
Input Voltage	5~36VDC@10W Recommended use 5V@2A perhaps 9V@1A Adapters above specifications
Average current	~30mA@12V
Peak current	100mA

1.3. 4G Frequency Band Description

Table2. 4G Operating Frequency

3GPP Frequency Band	Send	Receive	Unit
LTE-FDD B1	1920~1980	2110~2170	MHz
LTE-FDD B3	1710~1785	1805~1880	MHz
LTE-FDD B5	824~849	869~894	MHz
LTE-FDD B7	2500-2570	2620-2690	MHz
LTE-FDD B8	880~915	925~960	MHz
LTE-FDD B20	832~ 861.9	791~ 820.9	MHz
LTE-FDD B28	703~ 747.9	758~ 802.9	MHz
LTE-TDD B34	2010~2025	2010~2025	MHz
LTE-TDD B38	2570~2620	2570~2620	MHz
LTE-TDD B39	1880~1920	1880~1920	MHz
LTE-TDD B40	2300~2400	2300~2400	MHz
LTE-TDD B41	2555~2655	2555~2655	MHz

1.4. Main Application Fields

Solar Plug SGB1 connects serial devices to the Internet and transmits serial data in accordance with TCP/IP protocol

- Monitoring of photovoltaic solar energy and energy storage;

Figure 1. Typical Applications

2. HARDWARE INTRODUCTION

Solar Plug SGB1 is a cellular network solution for serial device networking, which enables data transmission through cellular networks, making product integration very easy.

2.1. Interface Diagram

Solar Plug SGB1 can use different interface styles to meet different device interface requirements, and currently there are three main interface styles.

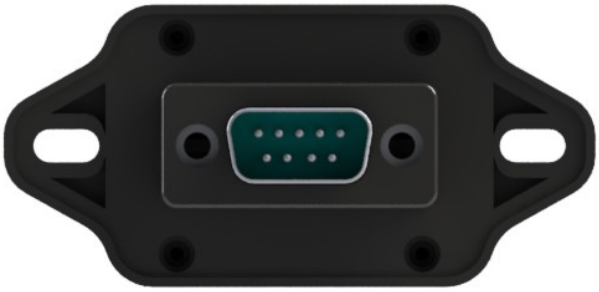


Figure 2. DB9 Interface Style

Figure 3. Red Aircraft Head Interface Style

Figure 4. Green Internal Thread Aviation Head Interface Style

The DB9 interface also has a short style, detailed as described in the size diagram.

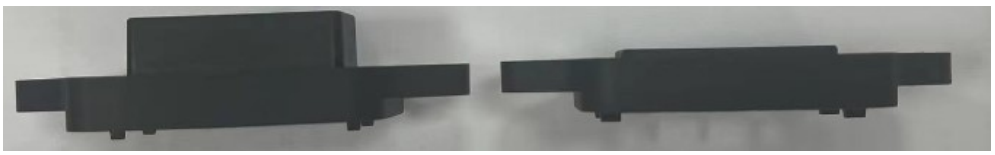


Figure 5. DB9 Interface Default Style And Short Style

If customers have customized interface requirements, they can contact our company for detailed discussion. An example of an extensible interface is as follows.

Figure 6. RJ45 Interface Style

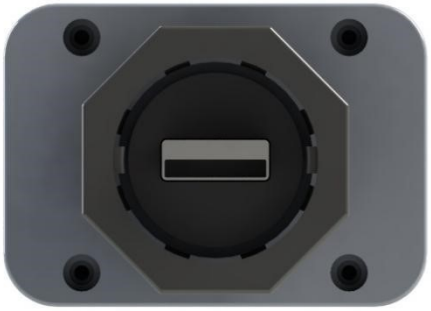


Figure 7. USB-Type A Interface Style

2.2. Product Appearance Diagram

Different interface sub models are defined according to - XX, and the following are the appearance diagrams of two interface styles.

Figure 8. Solar Plug-SGB1-09 Appearance Diagram

Figure 9. Solar Plug-SGB1-15 Appearance Diagram

2.3. Solar Plug-SGB1 Interface Pin Definition

The pin markings of the red aircraft female head and DB9 are shown in the following figure.

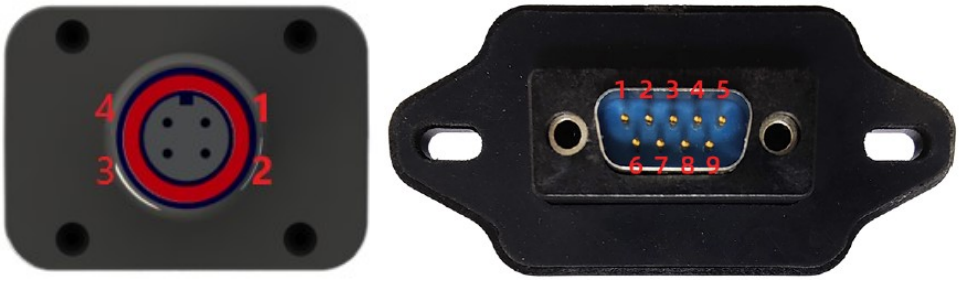


Figure 10. Pin Markings Of The Red Aircraft Female Head And DB9

The green aircraft female head and DB9's green aircraft carrier head side pin markings are shown in the following figure.

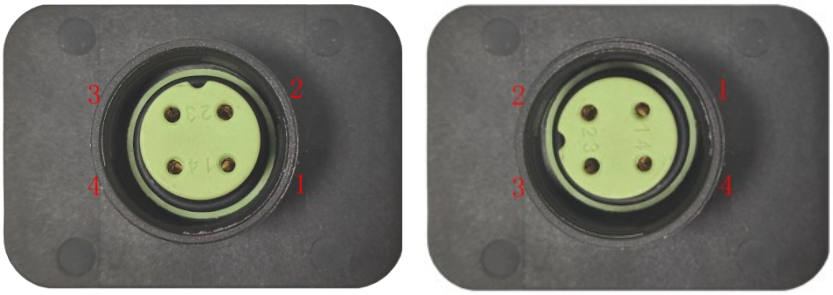


Figure 11. Green aircraft Female Head And Green Aircraft Female Head Side Pin Markings

Table3. Interface Sub Models And Pin Definition Diagram

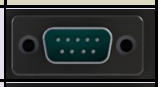
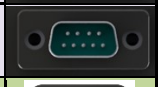
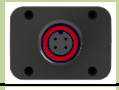
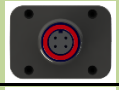
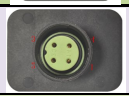
Sub Model Code	Interface Form	Serial Port Type	Line Sequence A/T/+	Line Sequence B/R/-	Line Sequence VCC/+	Line Sequence GND/-	Remarks
-06	DB9 Male Head Above	TTL	3Txd	2Rxd	9VCC	5GND	
-15	DB9 Male Head Above	RS232	3TXD	2RXD	9VCC	5GND	
-22	DB9 Male Head Above	RS485	7A	8B	9VCC	5GND	
-23	DB9 Male Head Below	TTL	3Txd	2Rxd	9VCC	5GND	
-24	DB9 Male Head Below	RS232	3TXD	2RXD	9VCC	5GND	
-25	DB9 Male Head Below	RS485	7A	8B	9VCC	5GND	
-13	DB9 Short Male Head Below	RS232	3TXD	2RXD	9VCC	5GND	
-09	4HKT Red Circle Female Head	RS232	2RXD	3TXD	1VCC	4GND	
-10	4HKT Red Circle Female Head	RS232	2TXD	3RXD	1VCC	4GND	
-12	4HKT Red Circle Female Head	RS485	2A	3B	1VCC	4GND	
-26	4HKT Red Circle Female Head	TTL	2Txd	3Rxd	1VCC	4GND	
-20	4HKT Green Female Head Side	RS485	3A	4B	1VCC	2GND	
-27	4HKT Green Female Head	RS485	3A	4B	1VCC	2GND	

Table4. Solar Plug-SGB1 Pin Description

Signal Description	Signal Type	Description
VCC	P	5~36VDC power supply input
GND	P	GND Ground
TXD	O	RS232 level serial port output
RXD-	I	RS232 level serial port input
A	IO	RS485 level A+phase
B	IO	RS485 level B+phase
Txd	O	3.3V TTL level serial port output
Rxd	I	3.3V TTL level serial port input

<Description>:

I — Input; O — Output; Power—Power supply

2.4. Solar Plug-SGB1 Indicator Light And Button Functions

There are 4 LED indicator lights on the front of the product, and there is also a reset button on the side of the antenna.

Figure 12. Front indicator Light And Reset Button Of The Product

Table5. Solar Plug SGB1 Indicator Light And Key Definition

Pin	Description	Network Name	Signal Type	Note
PWR	Power indicator light	PWR	O	On: Power supply is normal Off: Abnormal power supply
COM	Serial port transmission indicator light	COM	O	Off: No data interaction Off for 0.3 seconds, on for 0.9 seconds: serial port outputs data Off for 0.3 seconds, on for 0.3 seconds: serial port receives data On: Bidirectional sending and receiving.
NET	Network status indicator light	NET	O	On when powered on: Normal startup. Off for 2 seconds, on for 2 seconds: The 4G network has been registered and the connection is normal.

Pin	Description	Network Name	Signal Type	Note
				Off for 0.1 seconds, on for 0.1 seconds: The 4G network is in a data transmission and reception state
SRV	Server connection indicator light	SRV	O	On: connected to the server Off: Not connected to the server
Reload	Reset Button	Reload	I	Defaults to high. After being pulled down for more than 3 seconds, release and reset the parameters to their factory settings
ANT	Antenna interface	ANT		4G SMA antenna interface
	SIM Card			The SIM card is built-in to the product and is embedded by Hanfeng before leaving the factory. There are two ways to do this 1. The customer provides a SIM card before placing an order, and our company installs and embeds it. 2. Using our SIM card, our company provides a SIM management platform for traffic inquiry, reset, and renewal

2.5. Add SIM

Remove the screw.

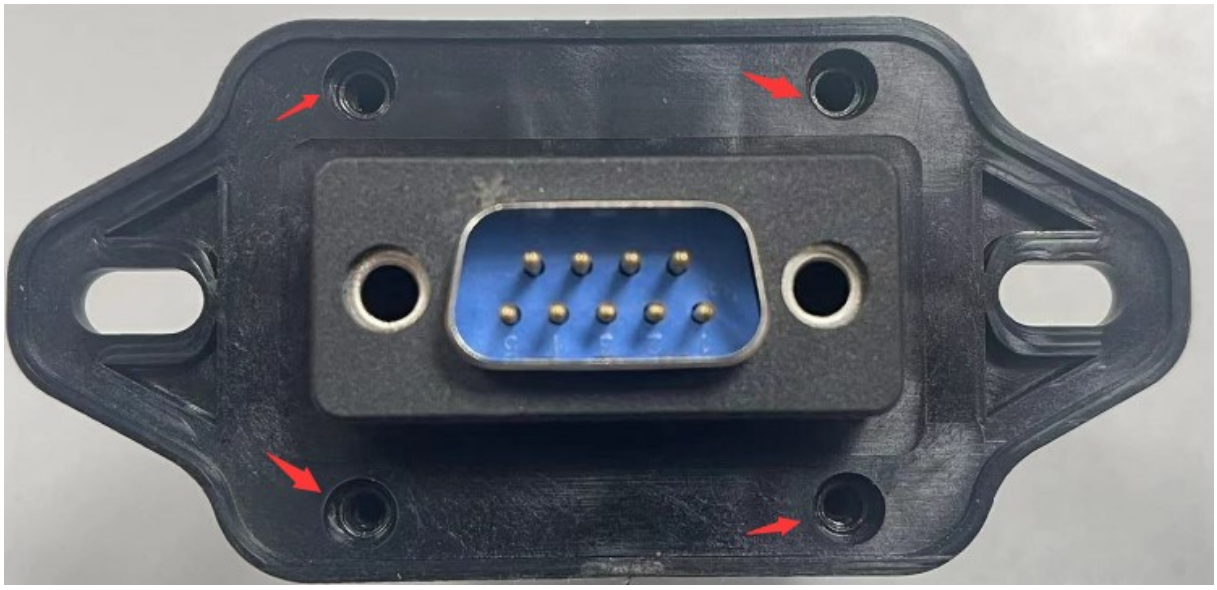


Figure 13. Add SIM Step 1

Remove the connector joint, and push the antenna to make PCBA out.

Figure 14. Add SIM Step 2

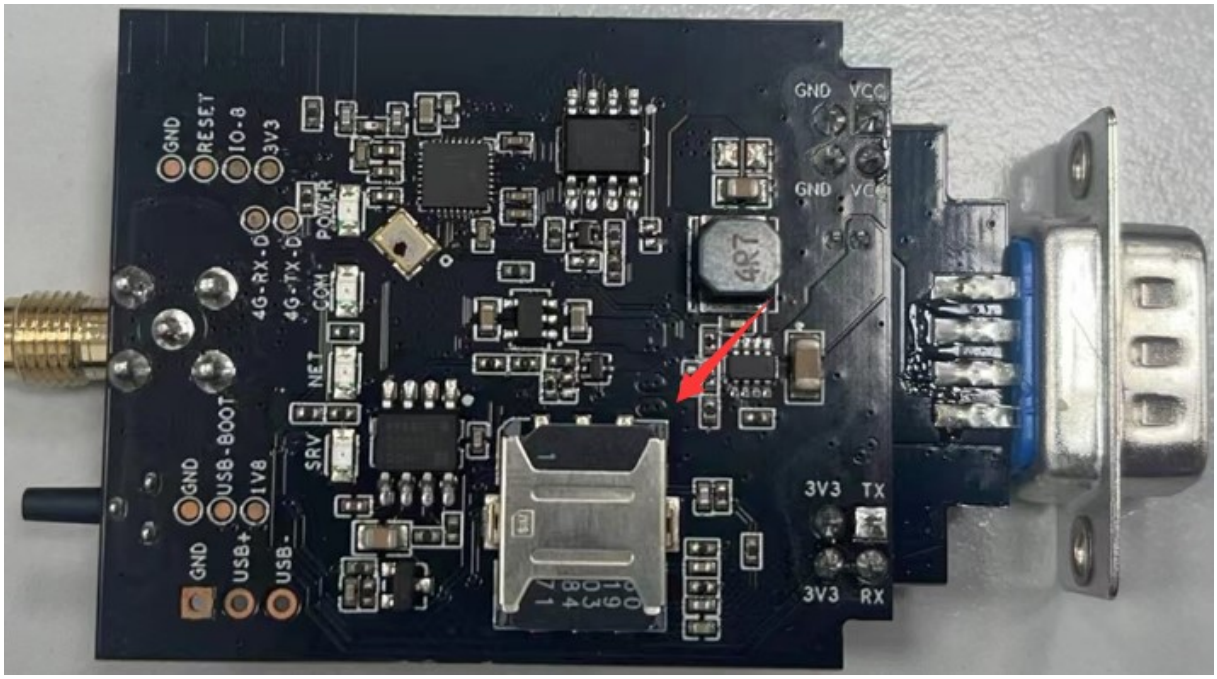


Figure 15. Add SIM Step 3

2.6. RS485 Interface Description

RS485 has outgoing lines A (data+) and B (data -) respectively. When connecting to device RS485, A (+) is connected to A (+), and B (-) is connected to B (-). In severe interference situations, it is recommended to connect GND together.

This product can come with 32 terminals and 485 devices. The maximum communication distance is 1200 meters. The 485 terminal resistance is 120 ohms, and it is generally necessary to use a terminal resistance when wiring over 300 meters. When wiring, A+and B - must be twisted together as a pair of twisted pairs to reduce signal interference.

2.7. RS232 Interface Description

When connecting the RS232 level male of this product to the device female, please use a direct connection (2-2, 3-3, 5-5, 9-9 direct connection). When connecting to the device, the relevant definition is shown in the following figure.

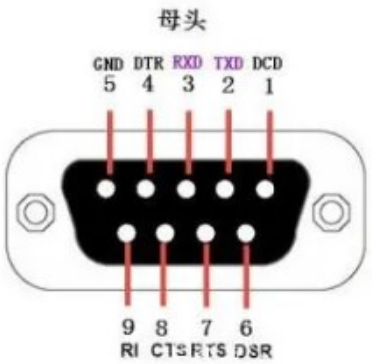


Figure 16. Standard DB9 Female Pin

Figure 17. Standard DB9 Female RS232 Interface

Pin Number	Network Name	Description
2	TXD	Send data
3	RXD	Receive data
5	GND	GND
9	RI(VCC)	Power input to this product

2.8. Solar Plug-SGB1 Mechanical Dimensions

The dimensions of different sub models of Solar Plug-SGB1 products are defined as follows (in millimeters).

2.8.1. Mechanical Dimensions For Types 06/-15/-22

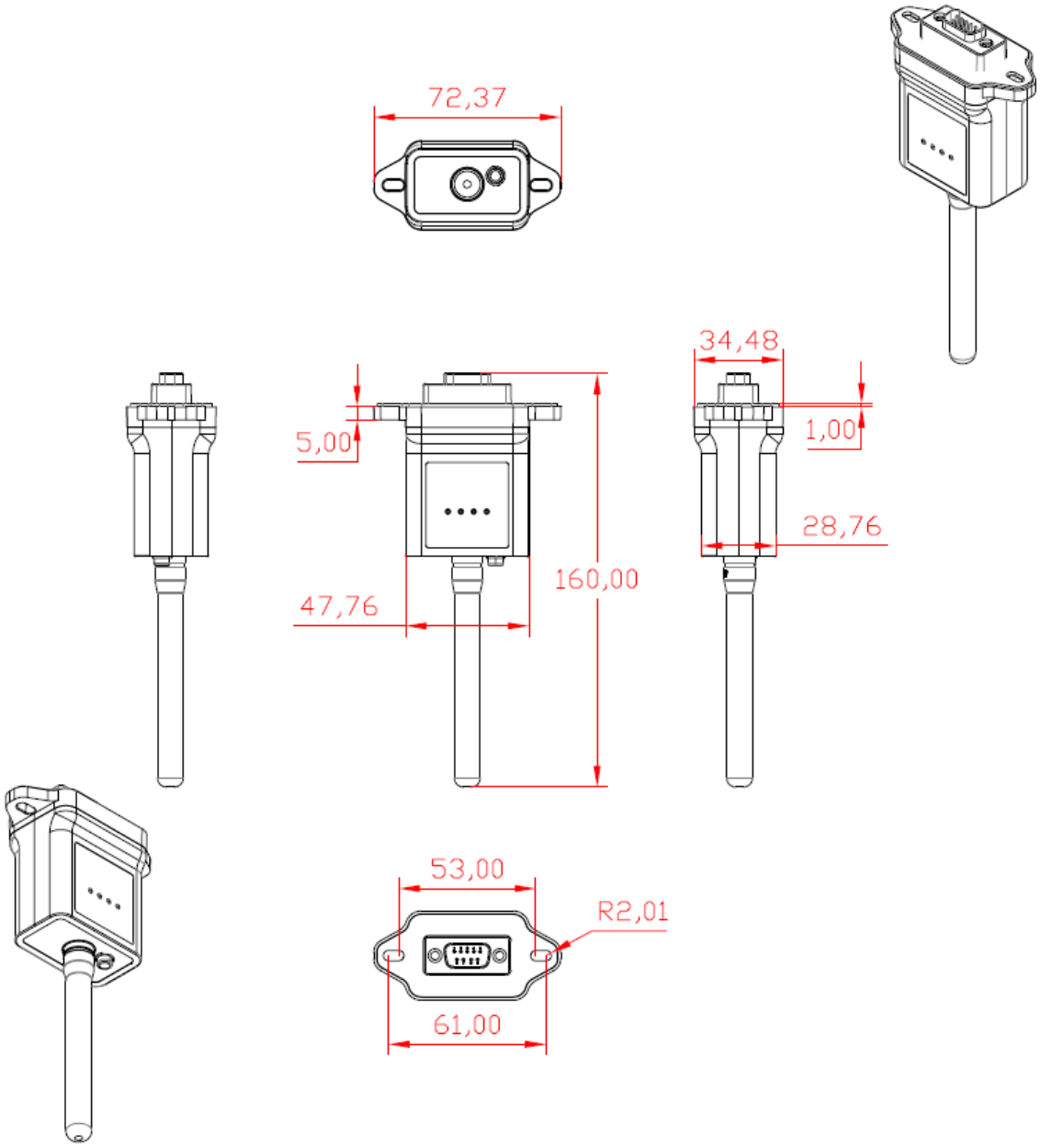


Figure 18. Solar Plug-SGB1-06/-15/-22 Mechanical Dimensions

2.8.2. Mechanical Dimensions For Types -23/-24/-25

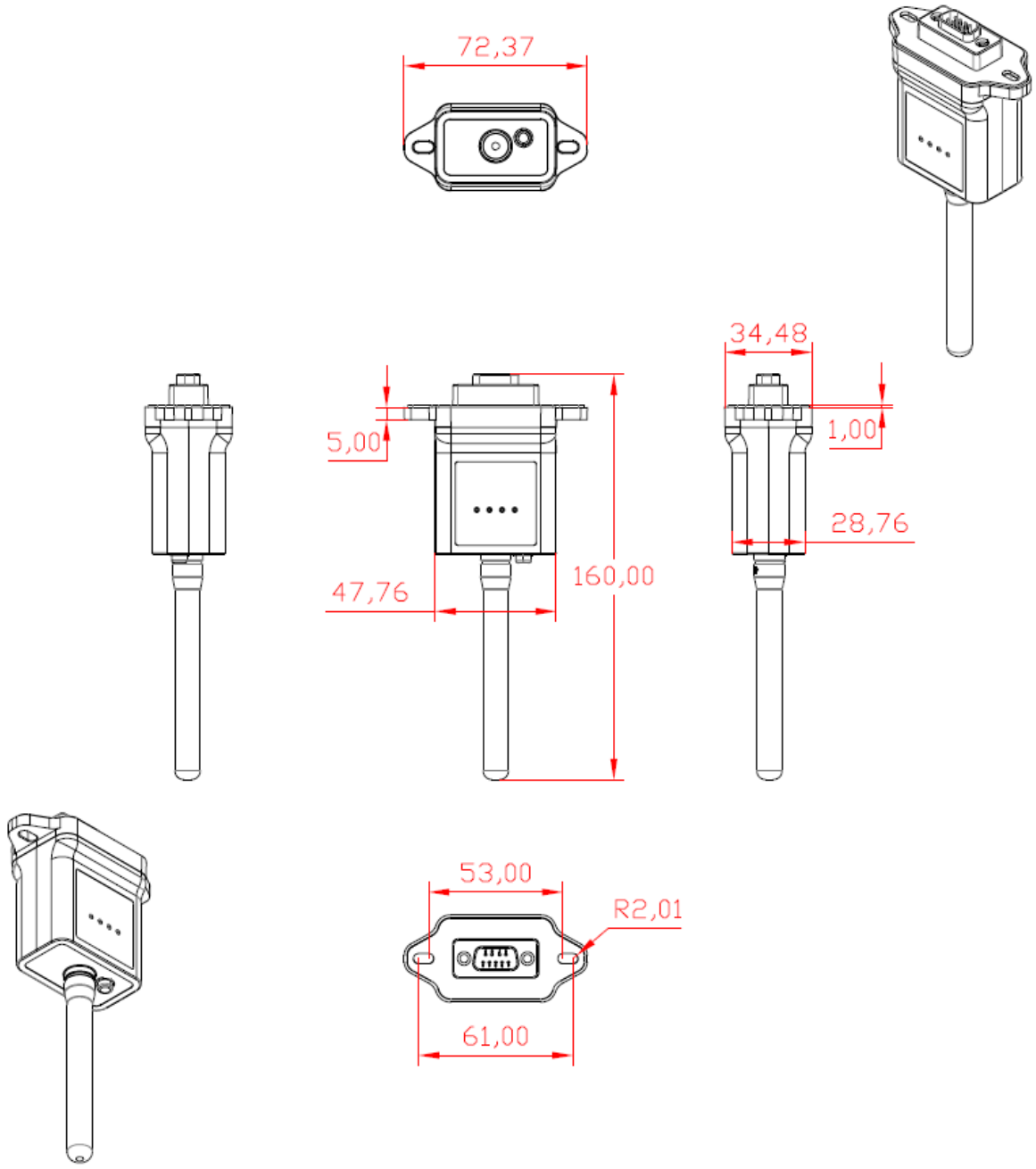


Figure 19. Solar Plug-SGB1-23/-24/-25 Mechanical Dimensions

2.8.3. Mechanical Dimensions For Types -13

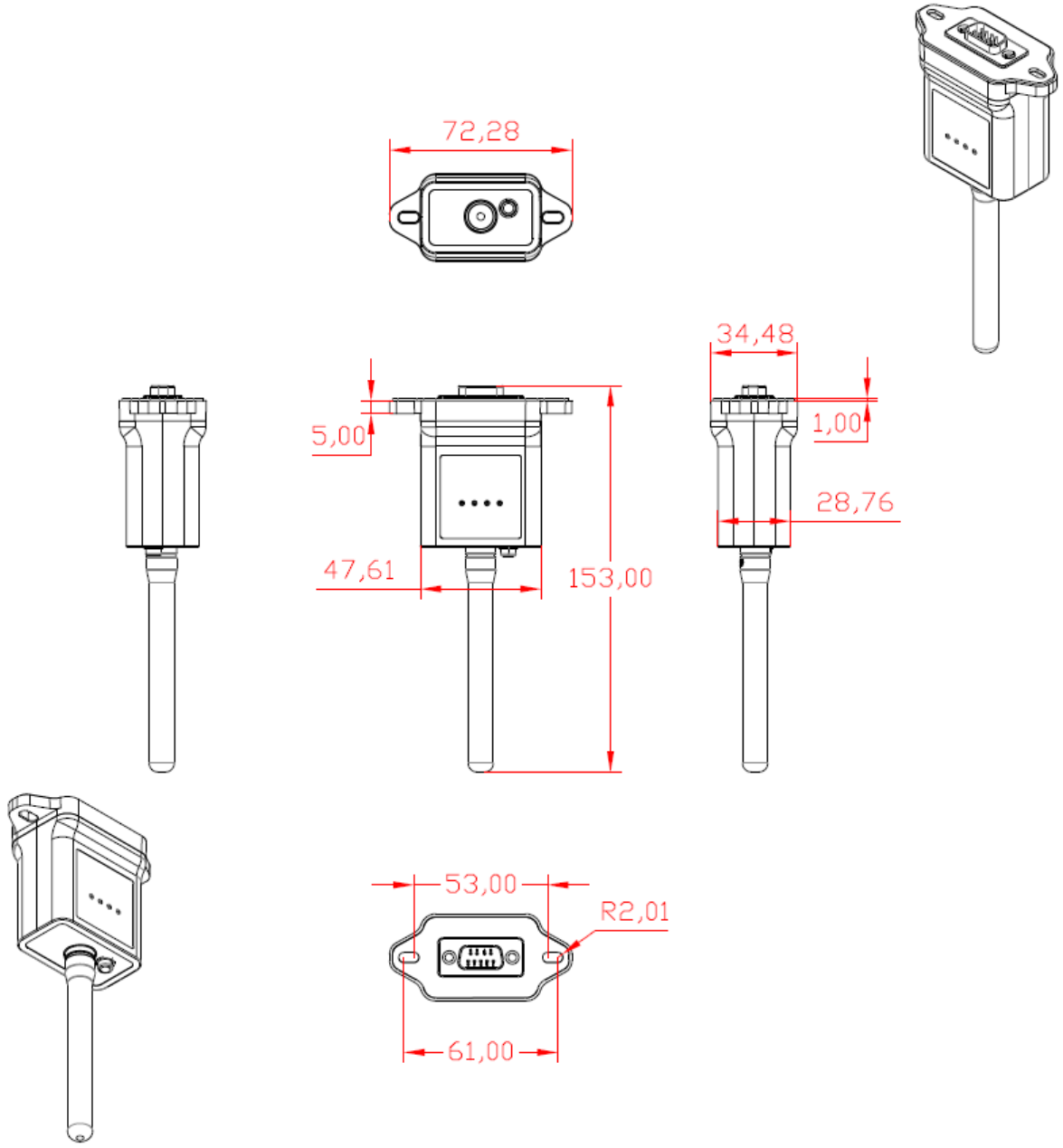


Figure 20. Solar Plug-SGB1-13 Mechanical Dimensions

2.8.4. Mechanical Dimensions For Types -09/-10/-12/-26

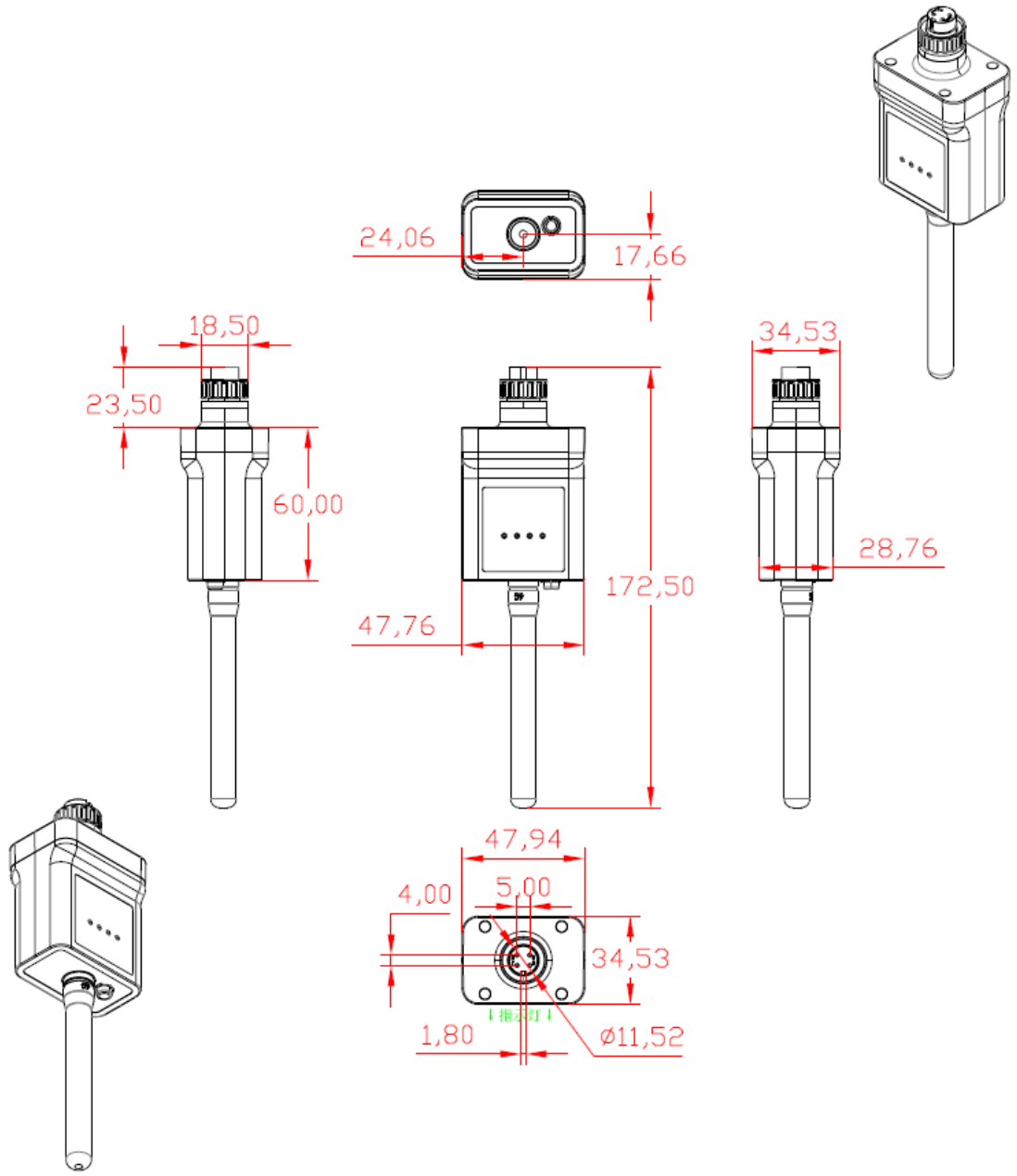


Figure 21. Solar Plug-SGB1-09/-10/-12/-26 Mechanical Dimensions

2.8.5. Mechanical Dimensions For Types-20

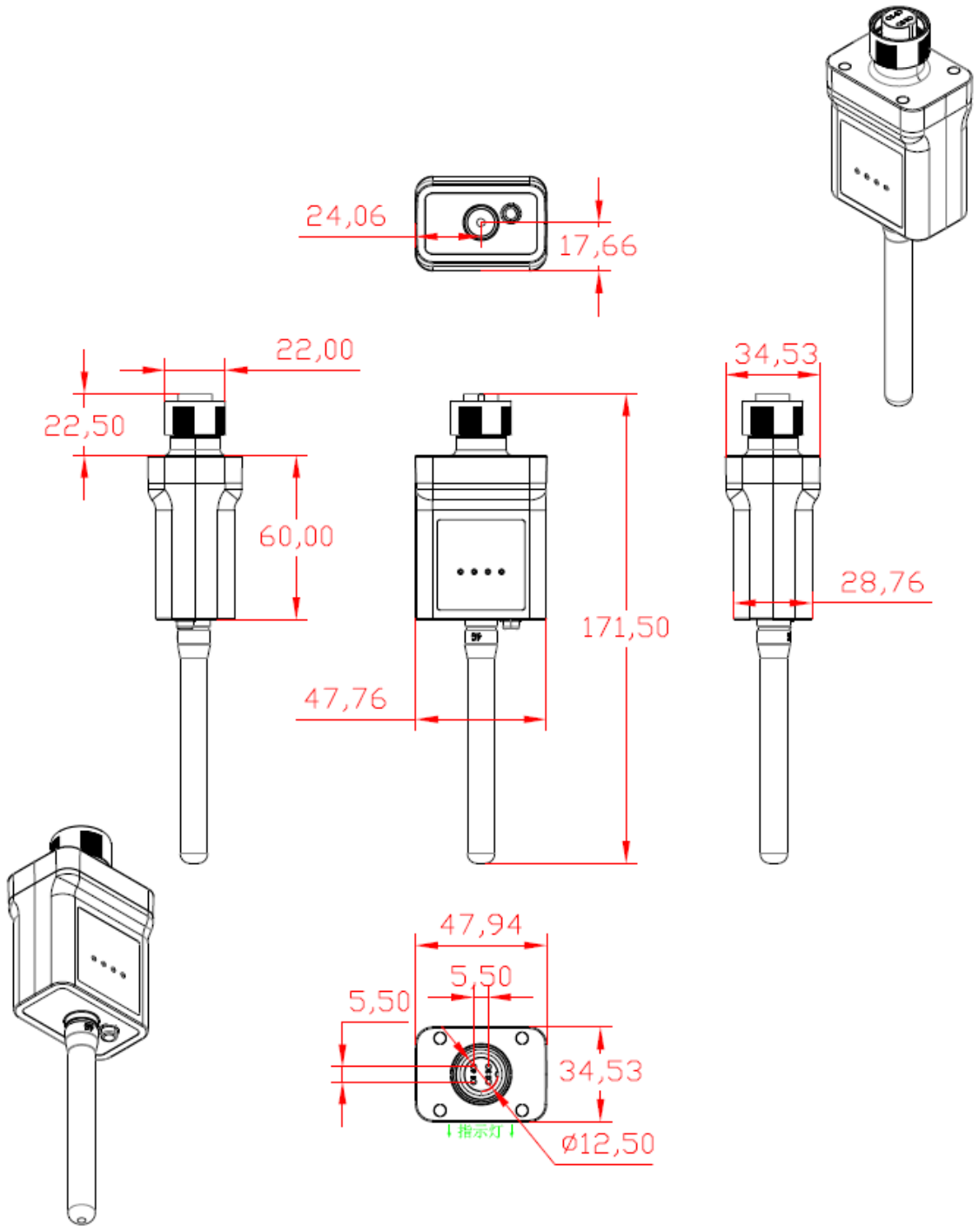


Figure 22. Solar Plug-SGB1-20 Mechanical Dimensions

2.8.6. Mechanical Dimensions For Types -27

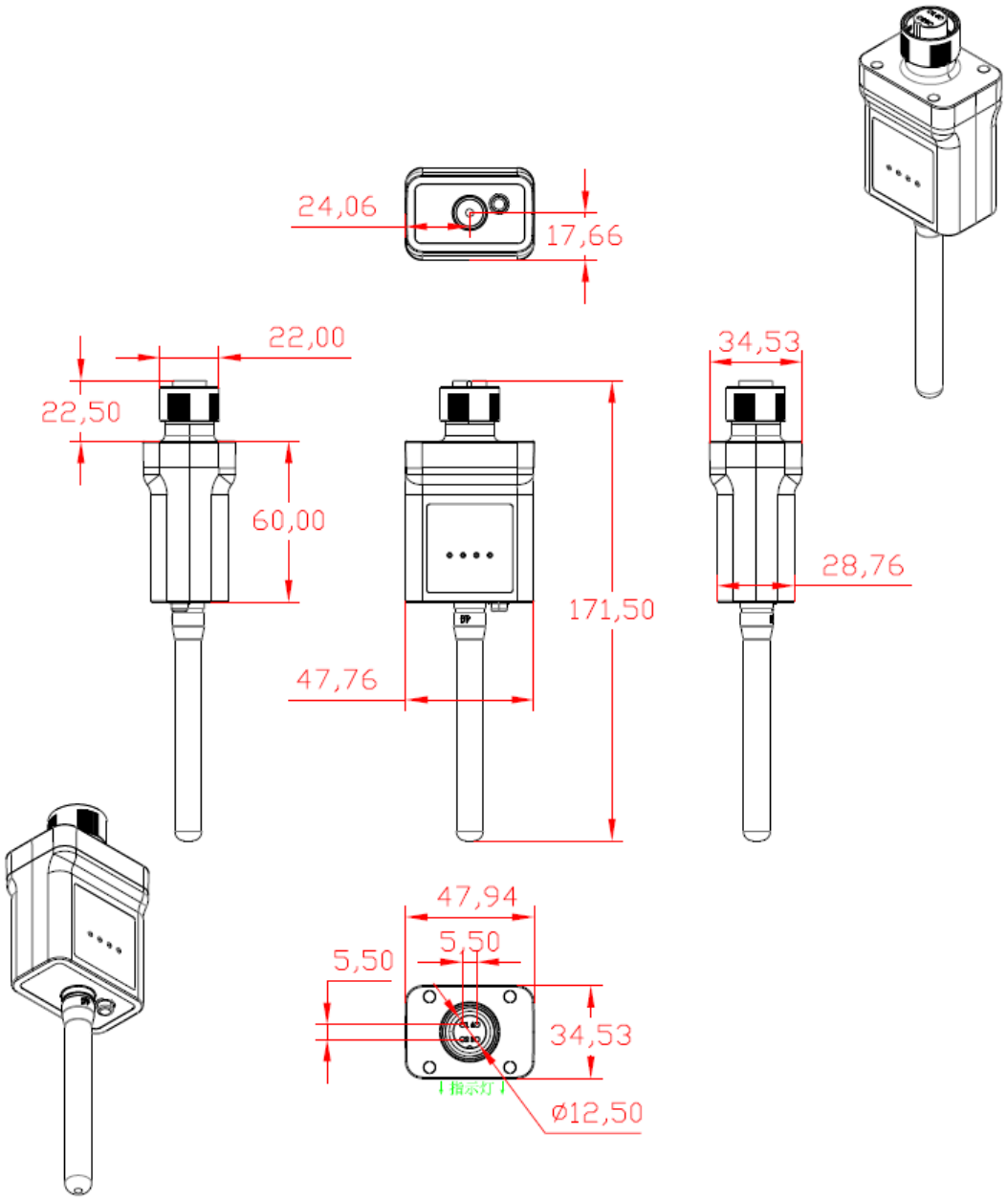


Figure 23. Solar Plug-SGB1-27 Mechanical Dimensions

2.9. Product Number

According to customer requirements, Solar Plug-SGB1 provides different configuration versions, as follows:

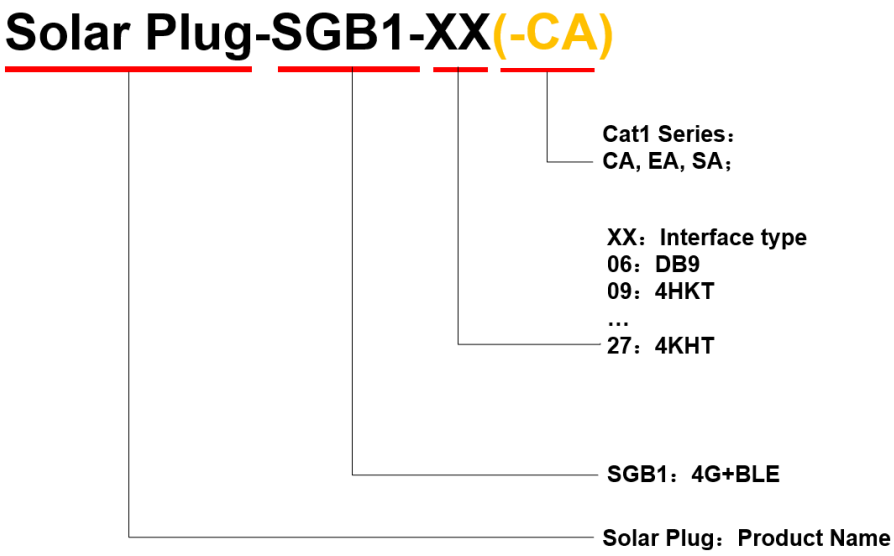


Figure 24. Solar Plug-SGB1 Product Number Definition

3. NETWORK TOPOLOGY

The application architecture of Solar Plug-SGB1 product is shown in the following figure.

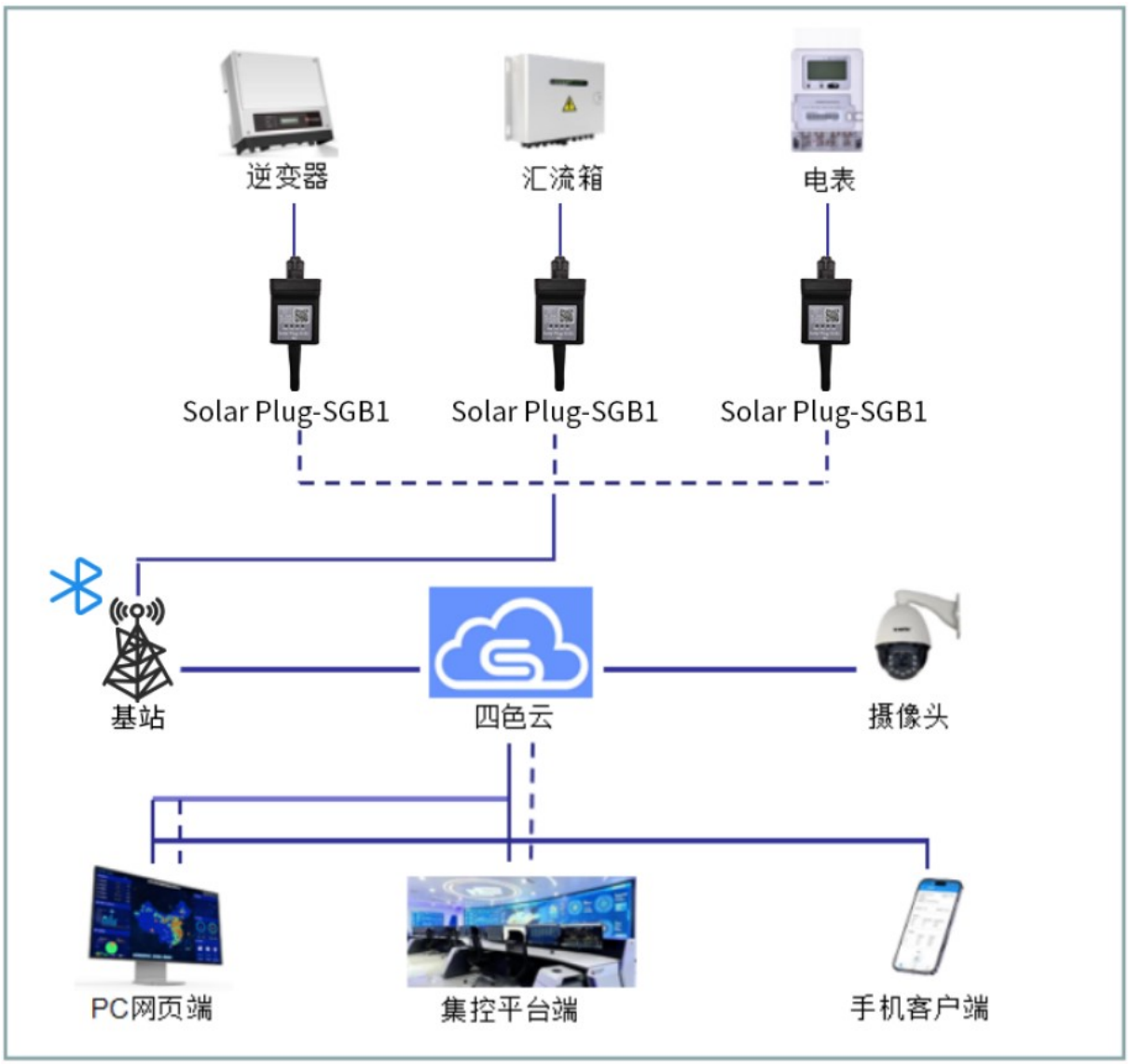


Figure 25. Product Application Architecture Diagram

APPENDIX A: CONTACT INFORMATION

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