

FusionSolar


24h Green Power Home Solution




"The most significant developments and pioneering solutions in the solar industry..."
-2019 InterSolar, Munich, Germany



Smart PV Optimizer
SUN2000-450W-P
Power optimization of each module




Smart Dongle-4G/WLAN-FE
Connect up to 10 inverters to the FusionSolar Portal



Smart Power Sensor
DDSU666-H (Single Phase)
DTSU666-H 100A (Three Phase)
DTSU666-H 250A/50mA (Three Phase)
Manage power export limitation



Smart ESS
LUNA2000-5/10/15-S0
Modular design with energy optimizer



Battery Ready



(Single Phase)
SUN2000-2/3/3.68/4/4.6/5/6/KTL-L1



(Three Phase)
SUN2000-3/4/5/6/8/10/KTL-M0

Smart Energy Center
Convert solar energy into electricity to power your house

FusionSolar Smart PV Management System
Web Portal & App

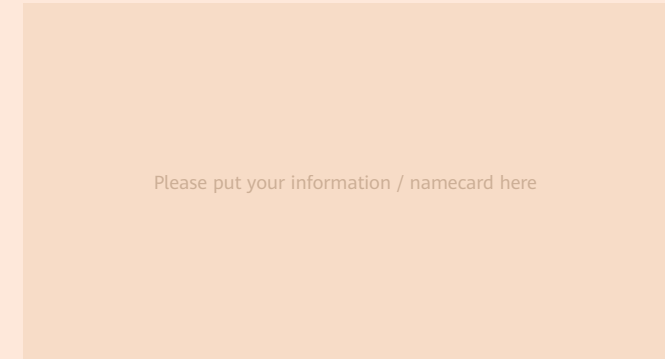


Get FusionSolar with peace in mind

Excellent product quality with extendable warranty to protect your investment



Where to buy



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Know

Huawei with 6 Numbers



170+

Countries & regions with Huawei products and services



194,000

Huawei employees worldwide



49

Fortune Global 500



61

Interbrand's Top 100 Best Global Brands



130GW+

Huawei inverters deployed worldwide



Optimal Electricity Cost

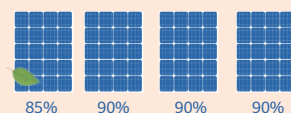
Up to 30%

More Energy by Optimizing Each Module's Performance



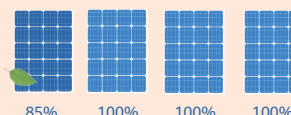
Without optimizer

All modules' performance is limited by the weakest one.



With optimizer

Each module can achieve its best performance independently for higher yields.



Modular Design

For Flexible Investment



Flexible

5kWh per pack scalable for flexible investment



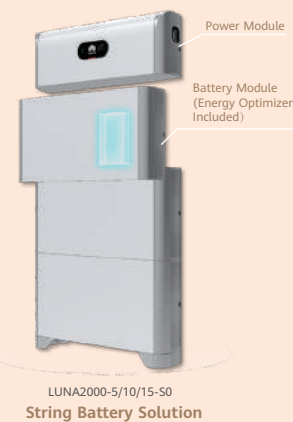
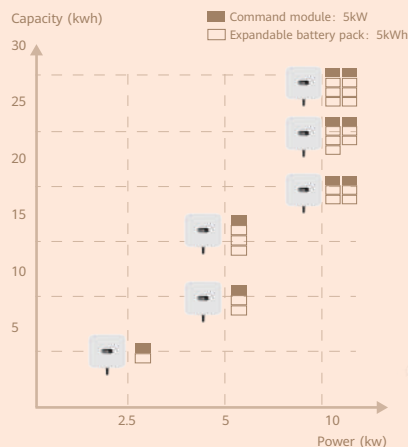
High Capacity

Up to 2 system operates in parallel, max 30kWh

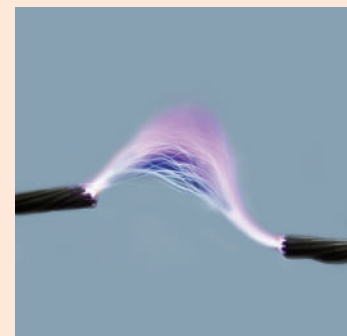


Fast Charge

max 5KW charge/discharge power per system



Active Safety



DC Arc Fault Has Been Found the Major Cause of Fire in PV System

What is Arc Fault?

Electrical breakdown of air that produces a prolonged electrical discharge.

What is the harm?

Temperature reaching above 3000°C, easily causes fires.

Where Does Arc Fault Occur in PV System?

- Loosen or incompatible PV connectors
- Broken PV cables

AI Powered Active Arcing Protection

What is AI Powered AFCI (Arc Fault Circuit Interrupter)?

HUAWEI inverter keeps self-learning new arc feature to accurately protect system from arc fault, even under complex noise.



Accurate

Accurate arc fault detection via local neural network algorithm



Speedy

Speedy arc fault protection by inverter shutdown in 2.5s



Smart

Pinpoint arc fault positioning, saving 80% onsite troubleshooting time and cost



Better Experience

One-Fits-All

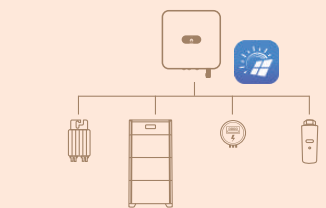
Solution, Easier Business

- One optimizer fits most of poly & mono PV module in the market (450w/80v)
- One inverter fits both on grid and off grid operating (via backup box)
- One battery model fits both single & three phase residential inverters.
- One app detects & configures all affiliated system components automatically
- One service window for all system components on pre & after sales.



System Devices Auto Detection in App

All inverter connected devices can be automatically detected in FusionSolar App



	HUAWEI	Other Solution
System Configuration Time	One App to automatically setup all devices 1.5-3 mins	Multiple App or Web tools to manually set up devices 30-60 mins



<5sec

Module Auto-Mapping by AI Image Recognition

	HUAWEI Solutions	
Physical view creation	<5sec (AI BOOST)	15min (manual)

Note: 10kw system <5s





Active Safety

AI Powered
Active Arcing Protection



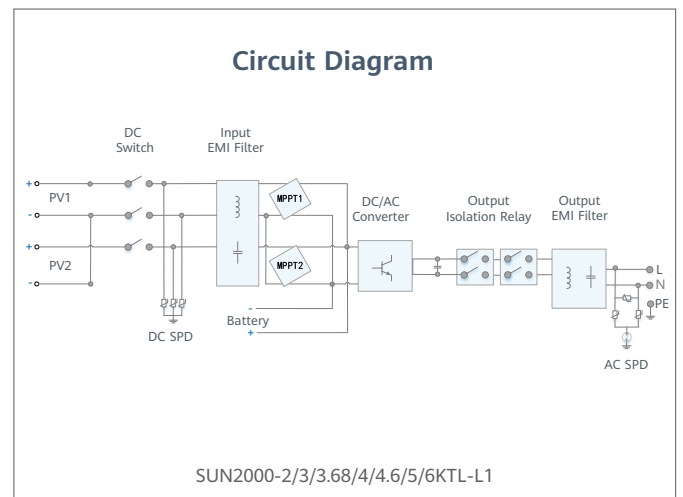
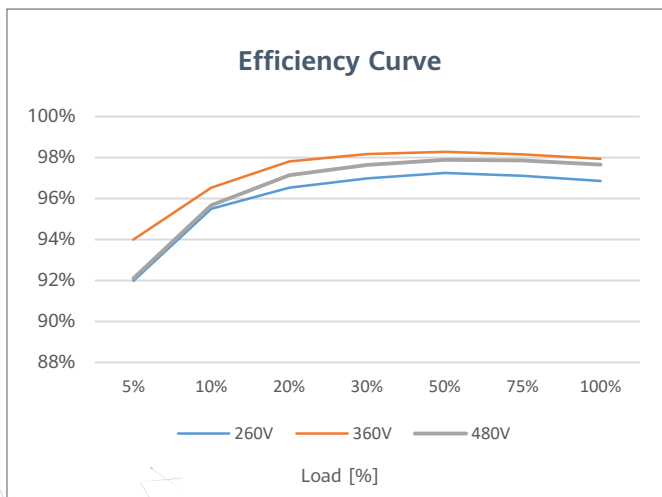
Higher Yields

Up to 30% More
Energy with Optimizer



2x POWER Battery Ready

5KW AC Output plus
5KW Battery Charge





Technical Specification	SUN2000 -2KTL-L1	SUN2000 -3KTL-L1	SUN2000 -3.68KTL-L1	SUN2000 -4KTL-L1	SUN2000 -4.6KTL-L1	SUN2000 -5KTL-L1	SUN2000 -6KTL-L1
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Efficiency

Max. efficiency	98.2 %	98.3 %	98.4 %	98.4 %	98.4 %	98.4 %	98.4 %
European weighted efficiency	96.7 %	97.3 %	97.3 %	97.5 %	97.7 %	97.8 %	97.8 %

Input (PV)

Recommended max. PV power ¹	3,000 Wp	4,500 Wp	5,520 Wp	6,000 Wp	6,900 Wp	7,500 Wp	9,000 Wp
Max. input voltage	600 V ²						
Start-up voltage	100 V						
MPPT operating voltage range	90 V – 560 V ²						
Rated input voltage	360 V						
Max. input current per MPPT	12.5 A						
Max. short-circuit current	18 A						
Number of MPP trackers	2						
Max. input number per MPP tracker	1						

Input (DC Battery)

Compatible Battery	LG Chem RESU 7H_R / 10H_R						
Operating voltage range	350 ~ 450 Vdc						
Max operating current	10 A @7H_R / 15 A @10H_R						
Max charge power	3,500 W @7H_R / 5,000 W @10H_R						
Max discharge Power @7H_R	2,200 W	3,300 W	3,500 W	3,500 W	3,500 W	3,500 W	3,500 W
Max discharge Power @10H_R	2,200 W	3,300 W	3,680 W	4,400 W	4,600 W	5,000 W	5,000 W

Compatible Battery	HUAWEI Smart ESS Battery 5kWh – 30kWh						
Operating voltage range	350 ~ 560 Vdc						
Max operating current	15 A						
Max charge Power	5,000 W ³						
Max discharge Power	2,200 W	3,300 W	3,680 W	4,400 W	4,600 W	5,000 W	5,000 W

Output (On Grid)

Grid connection	Single phase						
Rated output power	2,000 W	3,000 W	3,680 W	4,000 W	4,600 W	5,000 W ⁴	6,000 W
Max. apparent power	2,200 VA	3,300 VA	3,680 VA	4,400 VA	5,000 VA ⁵	5,500 VA ⁶	6,000 VA
Rated output voltage	220 Vac / 230 Vac / 240 Vac						
Rated AC grid frequency	50 Hz / 60 Hz						
Max. output current	10 A	15 A	16 A	20 A	23 A ⁷	25 A ⁷	27.3 A
Adjustable power factor	0.8 leading ... 0.8 lagging						
Max. total harmonic distortion	≤ 3 %						

Output (Backup Power via Backup Box-B0)

Maximum apparent power	5,000 VA						
Rated output voltage	220 V / 230 V						
Maximum output current	22.7 A						
Power factor range	0.8 leading ... 0.8 lagging						

¹ Inverter max input PV power is 10,000 Wp when long strings are designed and fully connected with SUN2000-450W-P power optimizers.

² The maximum input voltage and operating voltage upper limit will be reduced to 495 V when inverter connects and works with LG battery.

³ 2,500 W @ 5kWh HUAWEI ESS battery

⁴ AS4777.2: 4,991W. ⁵ VDE-AR-N 4105: 4,600VA / AS4777.2: 4,999VA. ⁶ AS4777.2: 4,999VA / C10/11:5,000VA ⁷ AS4777.2: 21.7A.

SUN2000-2/3/3.68/4/4.6/5/6KTL-L1
Technical Specification

Technical Specification	SUN2000 -2KTL-L1	SUN2000 -3KTL-L1	SUN2000 -3.68KTL-L1	SUN2000 -4KTL-L1	SUN2000 -4.6KTL-L1	SUN2000 -5KTL-L1	SUN2000 -6KTL-L1 ¹
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Protection & Feature	
Anti-Islanding protection	Yes
DC reverse polarity protection	Yes
Insulation monitoring	Yes
DC surge protection	Yes, compatible with TYPE II protection class according to EN/IEC 61643-11
AC surge protection	Yes, compatible with TYPE II protection class according to EN/IEC 61643-11
Residual current monitoring	Yes
AC overcurrent protection	Yes
AC short-circuit protection	Yes
AC overvoltage protection	Yes
Over-heat protection	Yes
Arc fault protection	Yes
Battery reverse charging from grid	Yes

General Data	
Operating temperature range	-25 ~ +60 °C
Relative operating humidity	0 %RH ~ 100 %RH
Operating altitude	0 ~ 4,000 m (Derating above 2,000 m)
Cooling	Natural convection
Display	LED indicators; integrated WLAN + FusionSolar APP
Communication	RS485, WLAN via inverter built-in WLAN module Ethernet via Smart Dongle-WLAN-FE (Optional); 4G / 3G / 2G via Smart Dongle-4G (Optional)
Weight (incl. mounting bracket)	12.0 kg (26.5 lb)
Dimension (incl. mounting bracket)	365mm * 365mm * 156 mm (14.4 x 14.4 x 6.1 inch)
Degree of protection	IP65
Nighttime Power Consumption	< 2.5 W

Optimizer Compatibility	
DC MBUS compatible optimizer	SUN2000-450W-P

Standard Compliance (more available upon request)	
Safety	EN/IEC 62109-1, EN/IEC 62109-2
Grid connection standards	G98, G99, EN 50549-1, CEI 0-21, VDE-AR-N-4105, AS 4777.2, C10/11, ABNT, UTE C15-712, RD 1699, TOR D4, IEC61727, IEC62116

Smart Energy Controller

SUN2000-3-10KTL-M1 (High Current Version)



Active Safety

AI Powered
Active Arcing Protection



Higher Yields

Up to 30% More Energy
with Optimizer ¹



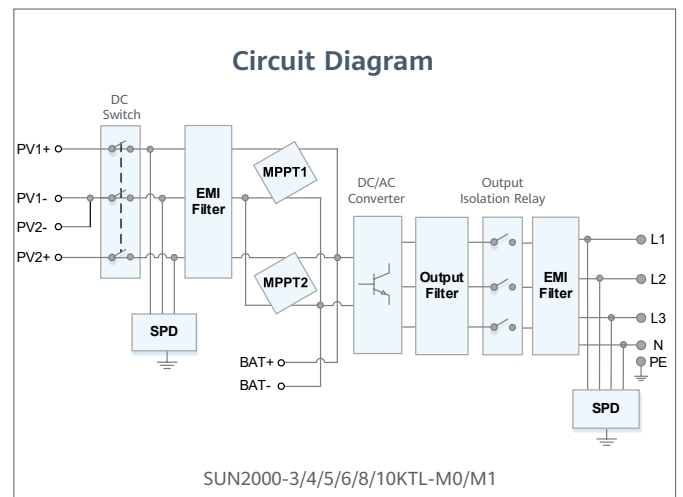
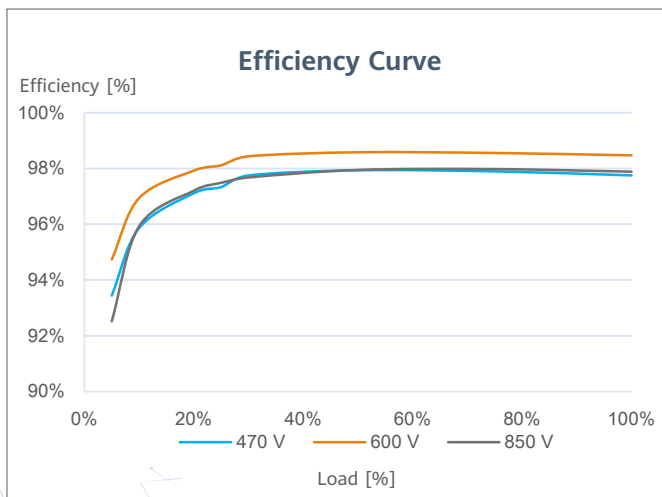
Battery Ready

Plug & Play battery interface ²



Flexible Communication

WLAN, Fast Ethernet, 4G
Communication Supported



¹ Only applicable to SUN2000-3/4/5/6/8/10KTL-M1 smart energy center.
² SUN2000-3/4/5/6/8/10KTL-M0 will be compatible with HUAWEI smart string ESS in Q1, 2021



Technical Specification

Technical Specification	SUN2000 -3KTL-M1	SUN2000 -4KTL-M1	SUN2000 -5KTL-M1	SUN2000 -6KTL-M1	SUN2000 -8KTL-M1	SUN2000 -10KTL-M1
Efficiency						
Max. efficiency	98.2%	98.3%	98.4%	98.6%	98.6%	98.6%
European weighted efficiency	96.7%	97.1%	97.5%	97.7%	98.0%	98.1%
Input (PV)						
Recommended max. PV power ¹	4,500 Wp	6,000 Wp	7,500 Wp	9,000 Wp	12,000 Wp	15,000 Wp
Max. input voltage ²	1,100 V					
Operating voltage range ³	140 V ~ 980 V					
Start-up voltage	200 V					
Rated input voltage	600 V					
Max. input current per MPPT	13.5 A					
Max. short-circuit current	19.5 A					
Number of MPP trackers	2					
Max. input number per MPP tracker	1					
Input (DC Battery)						
Compatible Battery	HUAWEI Smart String ESS 5kWh – 30kWh					
Operating voltage range	600 V ~ 980 V					
Max operating current	16.7 A					
Max charge Power	10,000 W					
Max discharge Power	3,300 W	4,400 W	5,500 W	6,600 W	8,800 W	10,000 W
Output (On Grid)						
Grid connection	Three-phase					
Rated output power	3,000 W	4,000 W	5,000 W	6,000 W	8,000 W	10,000 W
Max. apparent power	3,300 VA	4,400 VA	5,500 VA	6,600 VA	8,800 VA	11,000 VA ⁴
Rated output voltage	220 Vac / 380 Vac, 230 Vac / 400 Vac, 3W / N+PE					
Rated AC grid frequency	50 Hz / 60 Hz					
Max. output current	5.1 A	6.8 A	8.5 A	10.1 A	13.5 A	16.9 A
Adjustable power factor	0.8 leading ... 0.8 lagging					
Max. total harmonic distortion	≤ 3 %					
Output (Off Grid)						
Backup Box	Backup Box – B1					
Maximum apparent power	3,000 VA	3,300 VA	3,300 VA	3,300 VA	3,300 VA	3,300 VA
Rated output voltage	220 V / 230 V					
Maximum output current	13.6 A	15 A	15 A	15 A	15 A	15 A
Power factor range	0.8 leading ... 0.8 lagging					
Features & Protections						
Input-side disconnection device	Yes					
Anti-Islanding protection	Yes					
DC reverse polarity protection	Yes					
Insulation monitoring	Yes					
DC surge protection	Yes, compatible with TYPE II protection class according to EN/IEC 61643-11					
AC surge protection	Yes, compatible with TYPE II protection class according to EN/IEC 61643-11					
Residual current monitoring	Yes					
AC overcurrent protection	Yes					
AC short-circuit protection	Yes					
AC overvoltage protection	Yes					
Arc fault protection	Yes					
Ripple receiver control	Yes					
Integrated PID recovery ⁵	Yes					
Battery reverse charging from grid	Yes					
General Data						
Operating temperature range	-25 ~ + 60 °C (-13 °F ~ 140 °F)					
Relative operating humidity	0 %RH ~ 100 %RH					
Max. operating altitude	4,000 m (13,123 ft.) (Derating above 2000 m)					
Cooling	Natural convection					
Display	LED Indicators; Integrated WLAN + FusionSolar App					
Communication	RS485; WLAN/Ethernet via Smart Dongle-WLAN-FE; 4G / 3G / 2G via Smart Dongle-4G (Optional)					
Weight (incl. mounting bracket)	17 kg (37.5 lb)					
Dimension (incl. mounting bracket)	525 x 470 x 146.5 mm (20.7 x 18.5 x 5.8 inch)					
Degree of protection	IP65					
Nighttime Power Consumption	< 5.5 W ⁶					
Optimizer Compatibility						
DC MBUS compatible optimizer	SUN2000-450W-P					
Standard Compliance (more available upon request)						
Certificate	EN/IEC 62109-1, EN/IEC 62109-2, IEC 62116					
Grid connection standards	G98, G99, EN 50438, CEI 0-21, VDE-AR-N-4105, AS 4777, C10/11, ABNT, UTE C15-712, RD 1699, TOR D4, NRS 097-2-1, IEC61727, IEC62116, DEWA					

*1 Inverter max input PV power is 20,000 Wp when long strings are designed and fully connected with SUN2000-450W-P power optimizers.

*2 The maximum input voltage is the upper limit of the DC voltage. Any higher input DC voltage would probably damage inverter.

*3 Any DC input voltage beyond the operating voltage range may result in inverter improper operating. *4 C10 / 11: 10,000 VA

*5 SUN2000-3~10KTL-M1 raises potential between PV- and ground to above zero through integrated PID recovery function to recover module degradation from PID. Supported module types include: P-type (mono, poly).

*6. <10 W when PID recovery function is activated.

Smart String Battery



More Usable Energy

100% Depth of Discharge
Pack Level Energy Optimization



Flexible Investment

5kWh Modular Design,
Scalable from 5 to 30 kWh



Safe & Reliable

Lithium Iron Phosphate (LFP) Cell



Easy Installation

12 kg Power Module
50 kg Battery Module





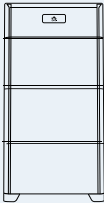
Quick Commissioning

Automatically Detected in App



Perfect Compatibility

Compatible to Both Residential
Single & Three Phase Inverter

Technical Specification	LUNA2000-5-S0	LUNA2000-10-S0	LUNA2000-15-S0
			

Performance			
Power module	LUNA2000-5KW-C0		
Number of power modules	1		
Battery module	LUNA2000-5-E0		
Battery module energy	5 kWh		
Number of battery Modules	1	2	3
Battery usable energy	5 kWh	10 kWh	15 kWh
Max. output power	2.5 kW	5 kW	5 kW
Peak output power	3.5 kW, 10 s	7 kW, 10 s	7 kW, 10 s
Nominal voltage (single phase system)	360 V		
Operating voltage range (single phase system)	350 – 560 V		
Nominal voltage (three phase system)	600 V		
Operating voltage range (three phase system)	600 – 980 V		

Communication	
Display	SOC status indicator, LED indicator
Communication	RS485 / CAN (only for parallel operation)

General Specification			
Dimension (W*D*H)	670 * 150 * 600 mm (26.4 * 5.9 * 23.6 inch)	670 * 150 * 960 mm (26.4 * 5.9 * 37.8 inch)	670 * 150 * 1320 mm (26.4 * 5.9 * 60.0 inch)
Weight (Floor stand toolkit included)	63.8 kg (140.7 lb)	113.8 kg (250.9 lb)	163.8 kg (361.1 lb)
Power module dimension (W*D*H)	670 * 150 * 240 mm (26.4 * 5.9 * 9.4 inch)		
Power module weight	12 kg (26.5 lb)		
Battery module dimension (W*D*H)	670 * 150 * 360 mm (26.4 * 5.9 * 14.0 inch)		
Battery module weight	50 kg (110.2 lb)		
Installation	Floor stand (standard), Wall mount (optional)		
Operating temperature	-10°C ~ + 55°C (14°F ~ 131°F) ¹		
Relative humidity	5% ~ 95%		
Cooling	Natural convection		
Protection rating	IP 55		
Noise emission	<29 dB		
Cell technology	Lithium-iron phosphate (LiFePO4)		
Warranty	10 years ²		
Scalability	Max. 2 systems in parallel operation		
Compatible inverters	SUN2000L-2/3/3.68/4/4.6/5KTL ³ , SUN2000-2/3/3.68/4/4.6/5/6KTL-L1, SUN2000-3/4/5/6/8/10KTL-M0 ³ , SUN2000-3/4/5/6/8/10KTL-M1		

Standard Compliance (more available upon request)	
Certificates	CE, RCM, CEC, VDE2510-50, IEC62619, IEC 60730, UN38.3

Ordering and Deliverable Part	
Product ordering model ⁴	LUNA2000-5KW-C0, LUNA2000-5-E0, LUNA2000 Wall Mounting Bracket

1. Charge/discharge derating occurs when the operating temperature from -10°C to 5 °C.
2. Refer to battery warranty letter for conditional application.
3. Available in Q1, 2021
4. Storage system is ordered and delivered in the form of power module and battery module separately with corresponding quantity.

Smart Power Sensor



Accurate

Class 1 measurement accuracy



Simple & Easy

LCD display, easy to set and check



Energy Efficient

Overall power consumption ≤ 1 W

Technical Specification	DDSU666-H	DTSU666-H	DTSU666-H 250A/50mA
General Data			
Dimension (H x W x D)	100 x 36 x 65.5 mm (3.9 x 1.4 x 2.6 inch)	100 x 72 x 65.5 mm (3.9 x 2.8 x 2.6 inch)	100 x 72 x 65.5 mm (3.9 x 2.8 x 2.6 inch)
Mounting type	DIN35 Rail		
Weight (including cables)	1.2 kg (2.6 lb)	1.5 kg (3.3 lb)	1.5 kg (3.3 lb)
Power Supply			
Power grid type	1P2W	3P4W	3P4W/3P3W
Input voltage (phase voltage)		176 Vac ~ 288 Vac	
Power consumption	≤ 0.8 W	≤ 1 W	≤ 1 W
Measurement Range			
Line voltage	/	304 Vac ~ 499 Vac	304 Vac ~ 499 Vac
Phase voltage		176 Vac ~ 288 Vac	
Current	0 ~ 100 A	0 ~ 100 A	0 ~ 250 A
Measurement Accuracy			
Voltage		± 0.5 %	
Current / Power / Energy		± 1 %	
Frequency		± 0.01 Hz	
Communication			
Interface	RS485		
Baud rate	9,600 bps		
Communication protocol	Modbus-RTU		
Environment			
Operating temperature range	-25 °C ~ 60 °C		
Storage temperature range	-40 °C ~ 70 °C		
Operating humidity	5 %RH ~ 95 %RH (non-condensing)		
Others			
Accessories	RS485 Cable (10 m / 33 ft.)		
	1 CT 100A / 40mA (5 m / 16.4 ft.)	3 CT 100A / 40mA (5 m / 16.4 ft.)	3 CT 250A / 50mA (5 m / 16.4 ft.)

Smart PV Optimizer



One-Fits-All Optimizer
Easier Business



<5s Module Auto-Mapping



Arc Fault Pinpoint
Positioning Along PV Cable

Technical Specification	SUN2000-450W-P2	SUN2000-600W-P		
Input				
Rated Input DC Power ¹	450 W	600 W		
Absolute maximum input voltage	80 V			
MPPT operating voltage range	10 - 80 V			
Maximum Short Circuit Current (Isc)	14.5 A			
Max. efficiency	99.5 %			
Weighted efficiency	99.0 %			
Overvoltage category	II			
Output				
Max. output voltage	80 V			
Max. output current	15 A			
Output bypass ²	Yes			
Shutdown output voltage per optimizer ³	0 V			
Shutdown output impedance per optimizer	1k ohm ± 10 %			
Communication				
Communication Method	MBUS			
Standard Compliance				
Safety	IEC62109-1 (class II safety)			
RoHS	Yes			
General Data				
Dimension (W x H x D)	75 x 140 x 28 mm (3.0 x 5.5 x 1.1 inch)			
Weight (including cables)	0.6 kg (1.3 lb.)			
Installation part (optional)	Frame Mounting Bracket / T-shaped Bolt ⁴			
Input connector	MC4			
Input wire length	0.15m			
Output connector	MC4			
Output wire length	1.3 m (4.3 ft.) ⁵			
Operating temperature / humidity range	-40 °C ~ 85 °C ⁵ / 0 %RH ~ 100 %RH			
Degree of protection	IP68			
Compatible product	SUN2000-2/3/3.68/4/4.6/5/6KTL-L1, SUN2000-3/4/5/6/8/10KTL-M1, SUN2000-12/15/17/20KTL-M2, SUN2000-30/36/40KTL-M3			
Long String Design (Full Optimizer)	SUN2000-2-6KTL-L1	SUN2000-3-10KTL-M1	SUN2000-12-20KTL-M2	SUN2000-30-40KTL-M3
Minimum optimizer number per string ⁶	4	6	6	6
Maximum optimizer number per string	25	35	35	25
Maximum DC power per string	6,000 W	10,000 W	12,000 W	12,000 W

*1 In the STC environment, The rated power of the module shall not exceed 1.05 times of the optimizer rated input power.

*2 Power optimizer is bypassed in the string connected to an operating inverter when it fails to work

*3 Power optimizer output 0Vdc when disconnecting to the inverter or inverter is shutdown.

*4 Allow PV module frame installation / extruded aluminum profile installation

*5 Fits PV module in landscape and portrait installation.

*6. Require standard 60 cells module to meet the inverter minimum startup voltage

*7 Full power capability refers to online smart design tool.



SUN2000-(3KTL-10KTL)-M1

Quick Guide

Issue: 03

Part Number: 31500FKA

Date: 2021-12-17

HUAWEI TECHNOLOGIES CO., LTD.



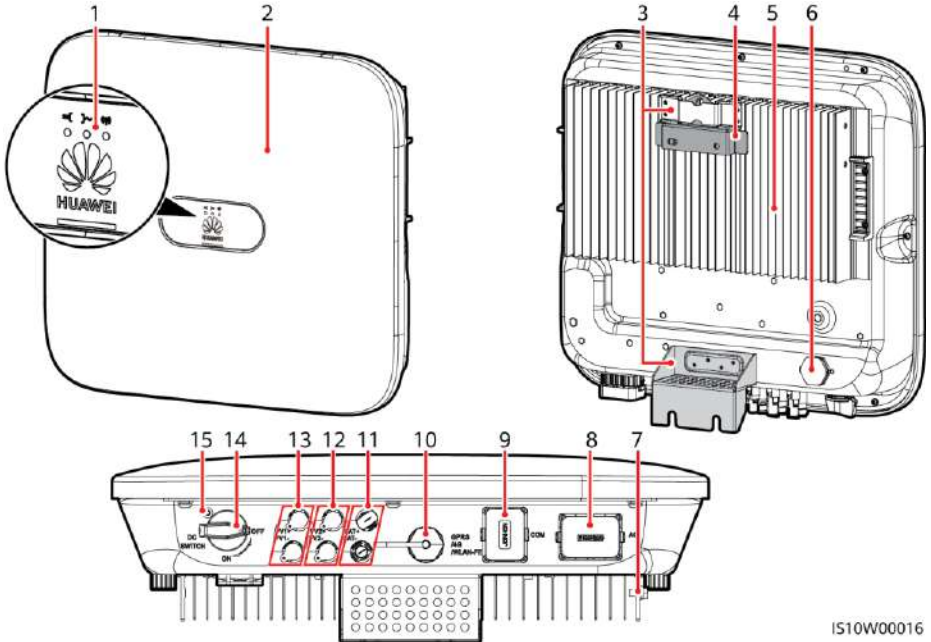
HUAWEI

NOTICE

1. The information in this document is subject to change due to version upgrades or other reasons. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied. You can download this document by scanning the QR code.
2. Before installing the device, read the user manual carefully to get familiar with product information and safety precautions.
3. Only qualified and trained electrical technicians are allowed to operate the device. Operation personnel should understand the composition and working principles of the grid-tied PV power system and local regulations.
4. Before installing the device, check that the package contents are intact and complete against the packing list. If any damage is found or any component is missing, contact your dealer.
5. Use insulating tools when installing the device. For personal safety, wear proper personal protective equipment (PPE).
6. Huawei shall not be liable for any consequences caused by the violation of the storage, transportation, installation, and operation regulations specified in this document and the user manual.



1 Product Description



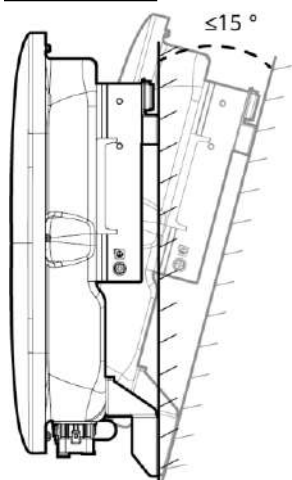
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- | | |
|-------------------------------------|--|
| (1) LED | (2) Front panel |
| (3) Hanging kit | (4) Mounting bracket |
| (5) Heat sink | (6) Ventilation valve |
| (7) Ground screw | (8) AC output port (AC) |
| (9) Communication port (COM) | (10) Smart Dongle port (GPRS/4G/WLAN-FE) |
| (11) Battery terminals (BAT+/BAT-) | (12) DC input terminals (PV2+/PV2-) |
| (13) DC input terminals (PV1+/PV1-) | (14) DC switch (DC SWITCH) |
| (15) Screw hole for the DC switch | |

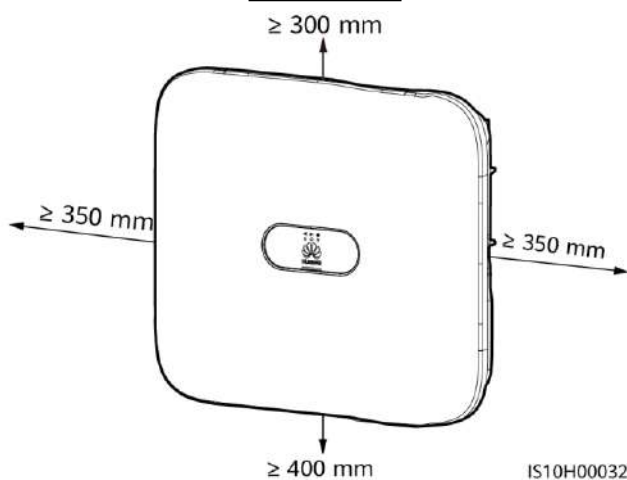
2 Installing the Equipment

2.1 Installation Requirements

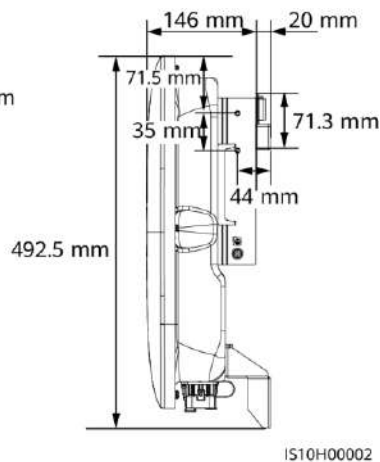
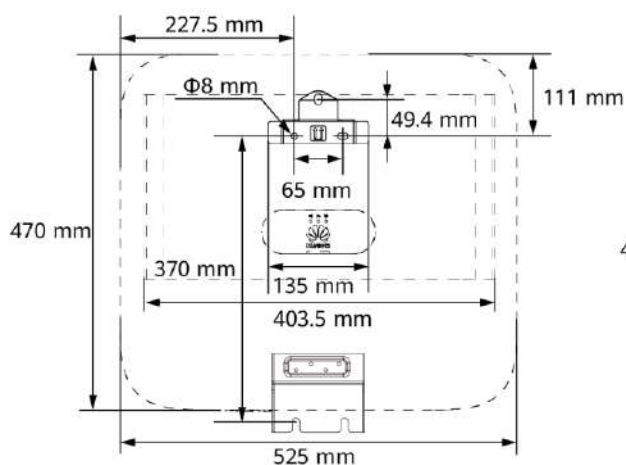
Angle



Space



Dimensions

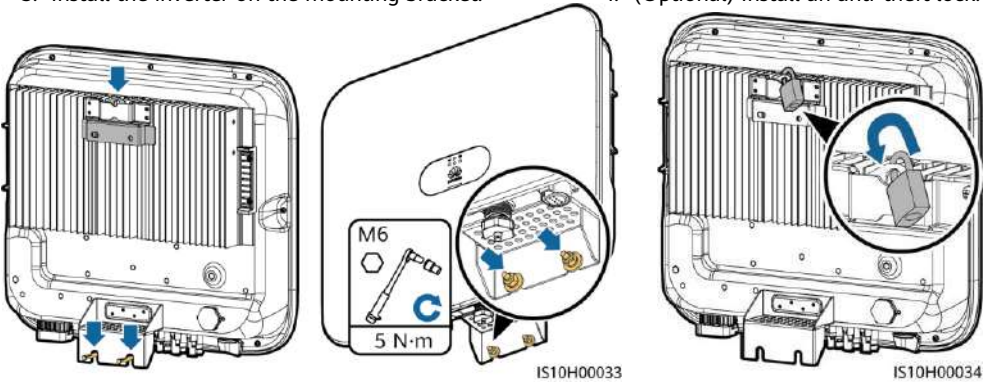


NOTE

Two M6 screw holes are reserved on both left and right sides of the inverter for installing an awning.

3. Install the inverter on the mounting bracket.

4. (Optional) Install an anti-theft lock.



NOTE

Prepare an anti-theft lock suitable for the lock hole diameter ($\Phi 8$ mm) and ensure that the lock can be installed successfully. An outdoor waterproof lock is recommended.

3 Electrical Connections

3.1 Preparing for Installation

NOTICE

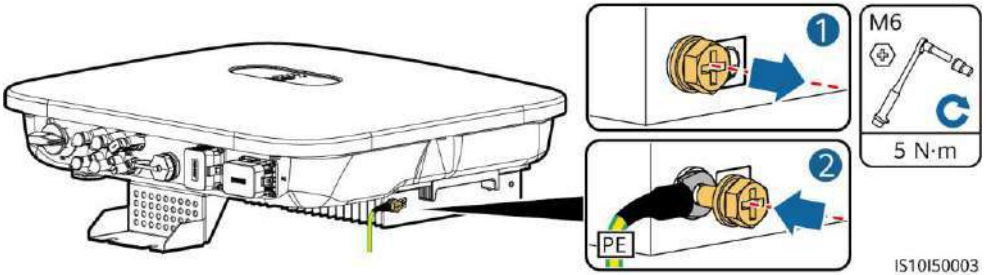
- Connect cables in accordance with the local installation laws and regulations.
- Before connecting cables, ensure that the DC switch on the inverter and all the switches connecting to the inverter are set to OFF. Otherwise, the high voltage of the inverter may result in electric shocks.

No.	Item	Type	Specifications
1	PE cable	Single-core outdoor copper cable	Conductor cross-sectional area $\geq 4 \text{ mm}^2$
2	AC output power cable	Outdoor copper cable	<ul style="list-style-type: none"> • Conductor cross-sectional area: 4–6 mm^2 • Cable outer diameter: 10–21 mm
3	DC input power cable and (optional) battery cable	Standard outdoor PV cable in the industry (recommended model: PV1-F)	<ul style="list-style-type: none"> • Conductor cross-sectional area: 4–6 mm^2 • Cable outer diameter: 5.5–9 mm
4	(Optional) RS485 communications cable (used to cascade inverters or connect to the RS485 signal port on the SmartLogger)	Two-core outdoor shielded twisted pair cable	<ul style="list-style-type: none"> • Conductor cross-sectional area: 0.2–1 mm^2 <p>Note: When devices such as the Smart Power Sensor and the energy storage device are both connected to the inverter, use 0.2–0.5 mm^2 cords.</p> <ul style="list-style-type: none"> • Cable outer diameter: 4–11 mm
5	(Optional) RS485 communications cable (used to connect to the RS485 signal port on devices such as the Smart Power Sensor and the energy storage device)		
6	(Optional) Rapid shutdown switch signal cable		
7	(Optional) Grid scheduling signal cable		
8	(Optional) Grid scheduling signal cable	Five-core outdoor cable	

3.2 Installing the PE Cable

DANGER

Do not connect the neutral wire to the enclosure as a PE cable. Otherwise, electric shocks may occur.



NOTE

- The PE point at the AC output port is used only as a PE equipotential point, and cannot substitute for the PE point on the enclosure.
- It is recommended that silica gel or paint be used around the ground terminal after the PE cable is connected.

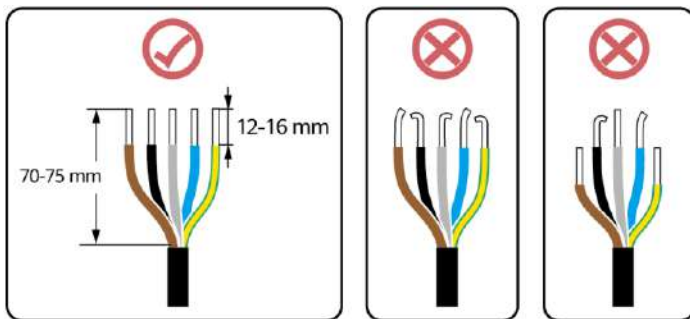
3.3 Installing the AC Output Power Cable

NOTICE

Ensure that the protection layer of the AC output power cable is inside the connector, the core wires are totally inserted into the cable hole, and the cable is connected securely. Failing to do so may cause device malfunction or damage.

1. Connect the AC output power cable to the AC connector.

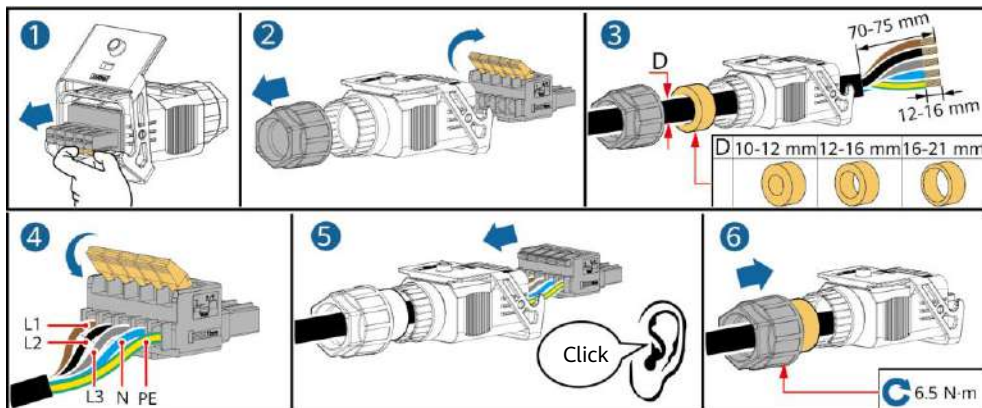
Stripping requirements



Five-Core Cable (L1, L2, L3, N, and PE)

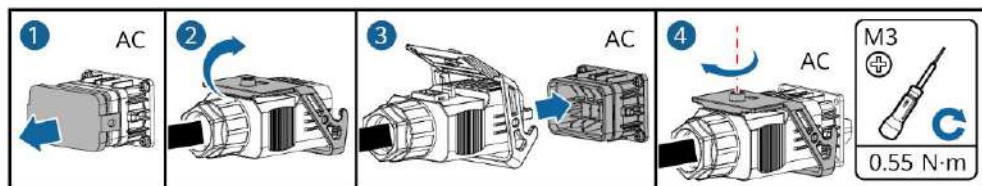
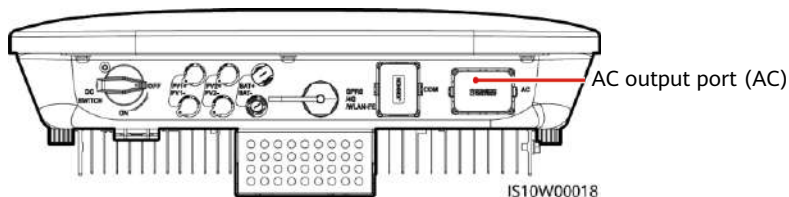
NOTE

- This section describes how to connect a five-core AC output power cable to an AC connector.
- A three-core AC output power cable can be connected similarly. The three-core cable (L1, L2, and L3) is not connected to the neutral wire or PE wire.
- A four-core or five-core AC output power cable can be connected similarly. The four-core cable (L1, L2, L3, and PE) is not connected to the N wire, and the four-core cable (L1, L2, L3, and N) is not connected to the PE wire.



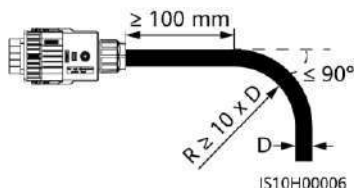
2. Connect the AC connector to the AC output port.

IS10I20001



3. Check the route of the AC output power cable.

IS10I20005



IS10H00006

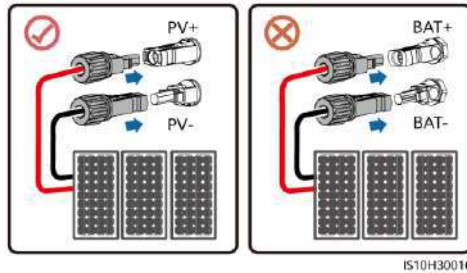
3.4 Installing the DC Input Power Cable

NOTICE

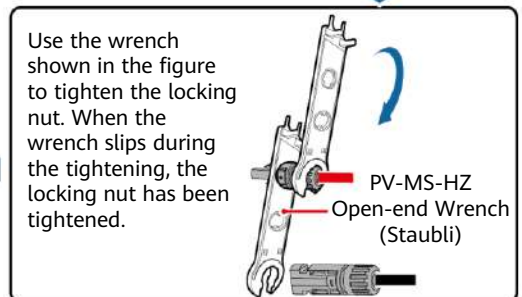
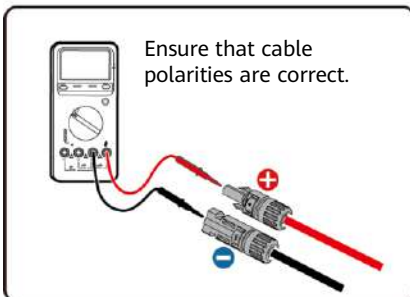
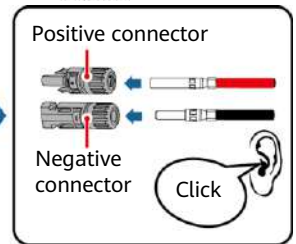
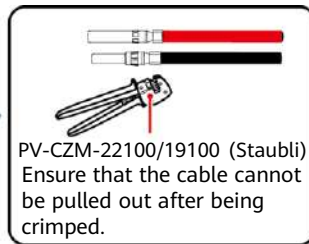
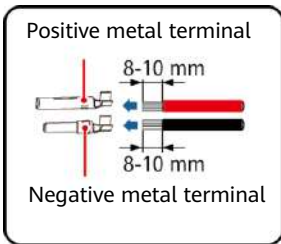
1. Ensure that the PV module output is well insulated to ground.
2. Use the Staubli MC4 positive and negative metal terminals and DC connectors supplied with the solar inverter. Using incompatible positive and negative metal terminals and DC connectors may result in serious consequences. The caused device damage is not covered under warranty.
3. The DC input voltage of the SUN2000 shall not exceed 1100 V DC under any circumstance.
4. Before installing the DC input power cable, label the cable polarities to ensure correct cable connections.
5. If the DC input power cable is reversely connected, do not operate the DC switch as well as positive and negative connectors immediately. Failing to do so may cause device damage, which is not covered under any warranty. Wait until the night when solar irradiance declines and the PV string current drops to below 0.5 A. Then set the DC switch to the OFF position, remove the positive and negative connectors, and correct the polarities of the DC input power cable.
6. If the PV strings are configured with Smart PV Optimizers, refer to the Smart PV Optimizer Quick Guide to check the cable polarity.

1. Assemble DC connectors.

Correct wiring terminals

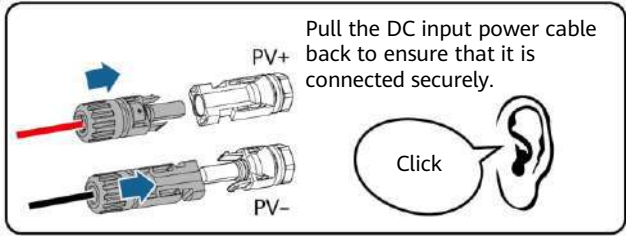
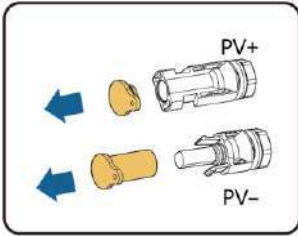
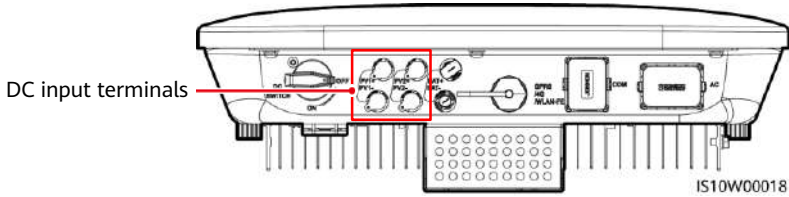


IS10H30010



IH07130001

2. Connect DC input power cables.

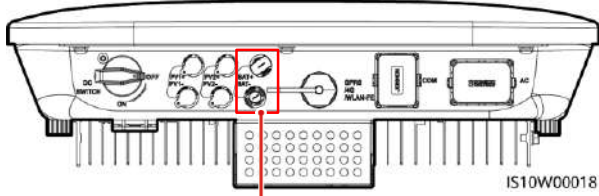


3.5 (Optional) Installing Battery Cables

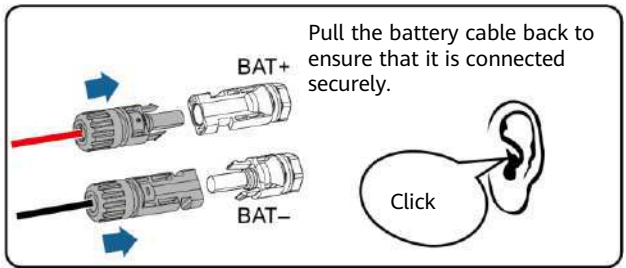
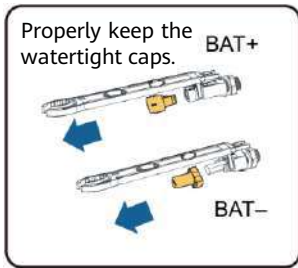
⚠ DANGER

- Use insulated tools when connecting cables.
- Connect battery cables with correct polarity. If battery cables are reversely connected, the solar inverter may be damaged.

Assemble the positive and negative connectors by following the instructions in section 3.4 "Installing DC Input Power Cables."



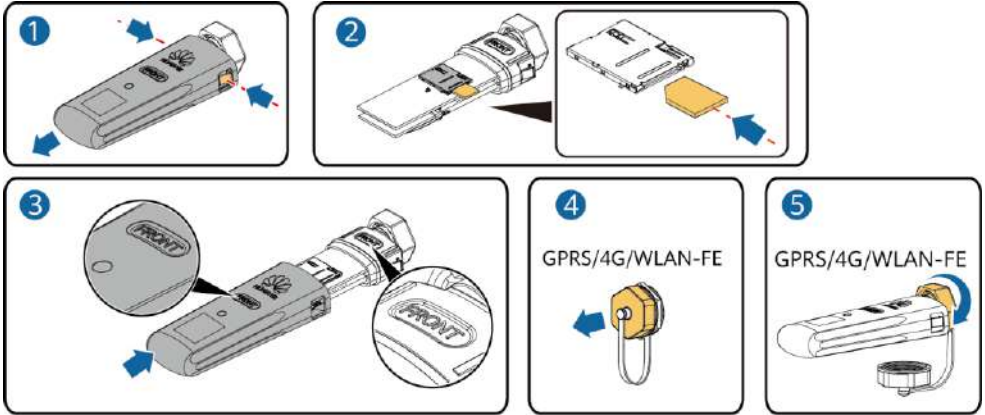
Battery terminals (BAT+/BAT-)



(Optional) 4G Smart Dongle (4G Communication)

NOTICE

- If your Smart Dongle is not equipped with a SIM card, prepare a standard SIM card (size: 25 mm x 15 mm) with the capacity greater than or equal to 64 KB.
- Install the SIM card in the arrow direction.
- When reinstalling the cover of the Smart Dongle, ensure that the buckle springs back in place (you can hear a click).



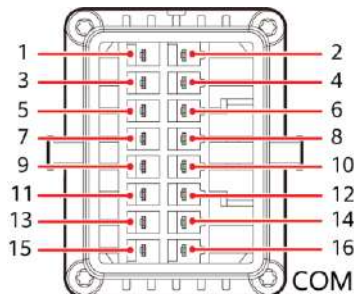
IS10H00016

3.7 (Optional) Installing the Signal Cable

NOTICE

- Not all inverter models are delivered with the signal cable connector.
- When laying out the signal cable, separate it from the power cable and keep it away from strong interference sources to avoid strong communication interference.
- Ensure that the protection layer of the cable is inside the connector, surplus core wires are cut off from the protection layer, the exposed core wire is totally inserted into the cable hole, and that the cable is connected securely.
- If the Smart Dongle is configured, you are advised to install the Smart Dongle before connecting the signal cable.

Communications Port Pin Definition



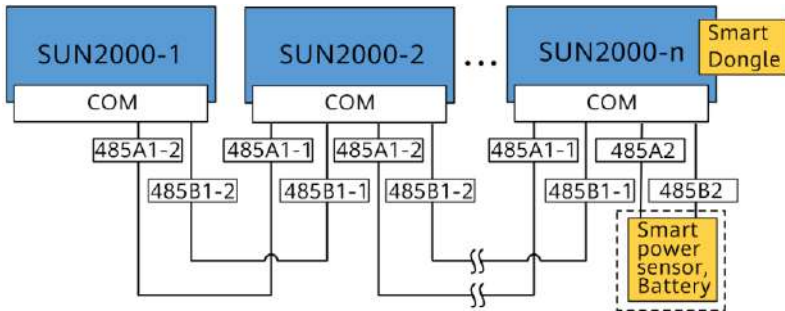
IS10W00002

NOTE

- When the RS485 communications cables of devices such as the Smart Power Sensor and the energy storage device are both connected to the inverter, 485A2 (pin 7), 485B2 (pin 9), and PE (pin 5) are shared.
- When the enable signal cable of the energy storage device and the signal cable of the rapid shutdown switch are both connected to the inverter, GND (pin 13) is shared.

Pin	Definition	Function	Description	Pin	Definition	Function	Description
1	485A1-1	RS485A, RS485 differential signal+	Used to cascade inverters or connect to the RS485 signal port on the SmartLogger	2	485A1-2	RS485A, RS485 differential signal+	Used to cascade inverters or connect to the RS485 signal port on the SmartLogger
3	485B1-1	RS485B, RS485 differential signal-		4	485B1-2	RS485B, RS485 differential signal-	
5	PE	Shielding ground	N/A	6	PE	Shielding ground	N/A
7	485A2	RS485A, RS485 differential signal+	Used to connect to the RS485 signal port on devices such as the Smart Power Sensor and the energy storage device	8	DIN1	Digital input signal 1+	Used to connect to dry contacts for grid scheduling or serve as a port for the feedback signal of the Backup Box.
9	485B2	RS485B, RS485 differential signal-		10	DIN2	Digital input signal 2+	
11	EN	Enabling signal		12	DIN3	Digital input signal 3+	
13	GND	GND	Used to connect to the enable signal port on an energy storage device	14	DIN4	Digital input signal 4+	Dry contact for grid scheduling
15	DIN5	Rapid shutdown signal+		16	GND	GND of DIN1/DIN2 /DIN3/DIN 4	
			Used to connect to the rapid shutdown DI signal port or serve as a port for the signal cable of the NS protection.				

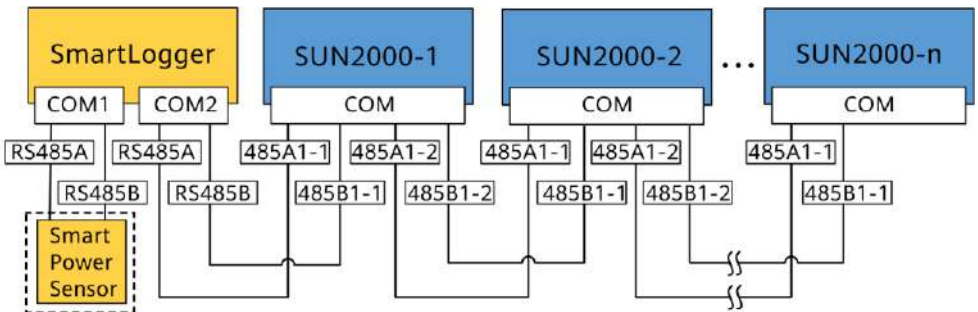
Smart Dongle Networking Scenario



NOTE

- In the Smart Dongle networking scenario, the SmartLogger cannot be connected.
- The Smart Power Sensor is necessary for export limitation. Only the DTSU666-H Smart Power Sensor (provided by Huawei) can be used.
- A maximum of 10 devices can be connected to the WLAN-FE and 4G Smart Dongles. The Smart Power Sensors connected to the RS485A2 and RS485B2 ports are not included.
- If a battery is connected, a maximum of three inverters can be cascaded. Any one of the inverters can be connected to the battery. (The inverter connected to the Smart Dongle must be connected to the battery.)
- If the SUN2000-(3KTL-10KTL)-M1 and SUN2000-(2KTL-6KTL)-L1 are cascaded, a maximum of three inverters can be cascaded.

SmartLogger Networking Scenario

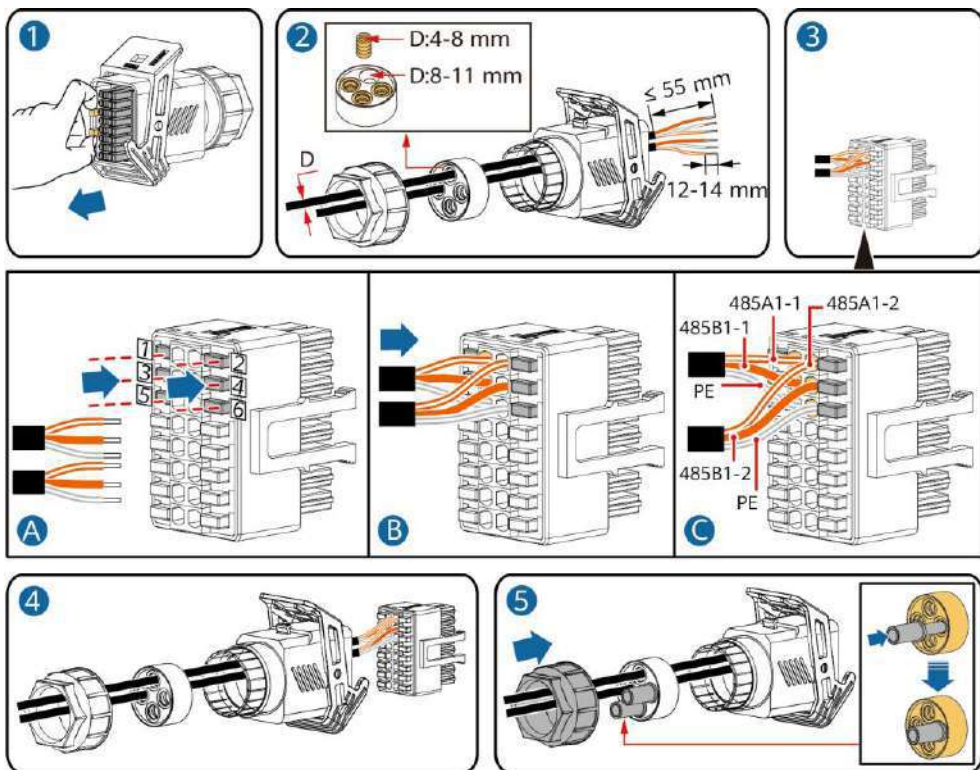


NOTE

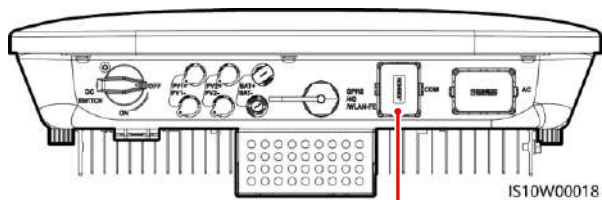
- In the SmartLogger networking scenario, the Smart Dongle cannot be connected.
- A maximum of 80 devices can connect to a single SmartLogger, such as inverters, Smart Power sensor, and EMI. You are advised to connect fewer than 30 devices to each RS485 route.
- The Smart Power Sensor is necessary for export limitation. Select the Smart Power Sensor according to the actual project.
- To ensure the system response speed, the Smart Power Sensor is recommended to be connected to a COM port separately from inverter COM port.

(Optional) Installing the RS485 Communications Cable (Inverter Cascading)

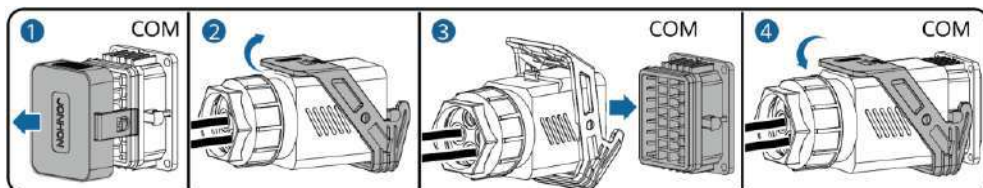
1. Connect the signal cable to the signal cable connector.



2. Connect the signal cable connector to the communication port.



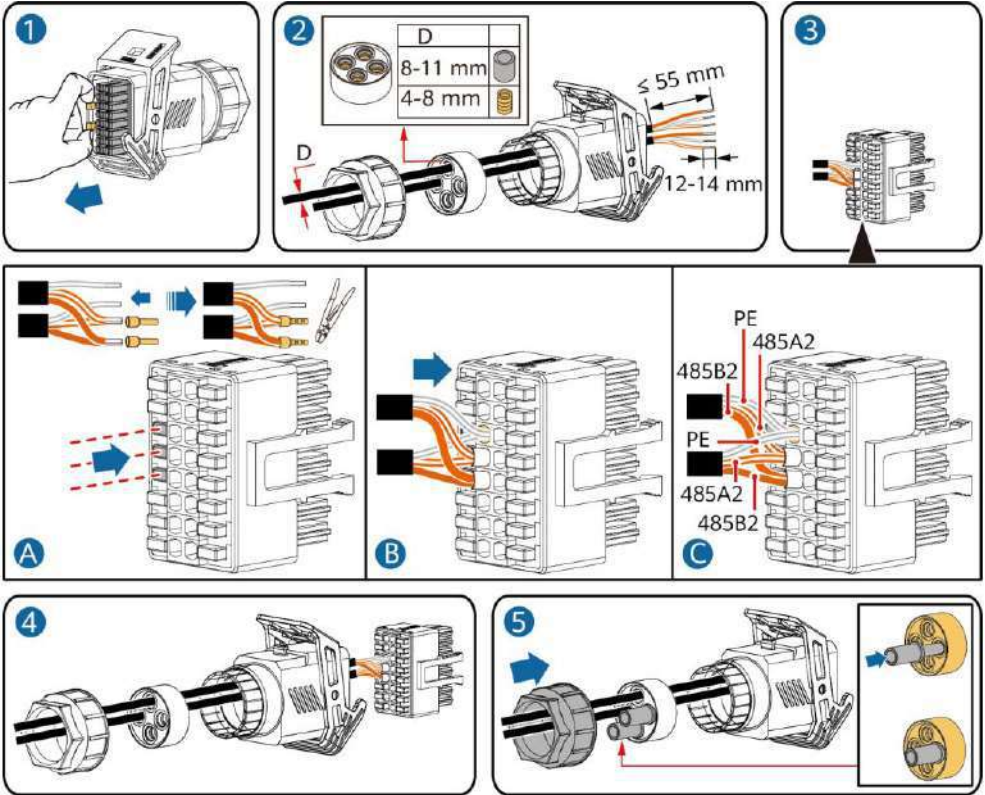
Communications port (COM)



IS10I20007

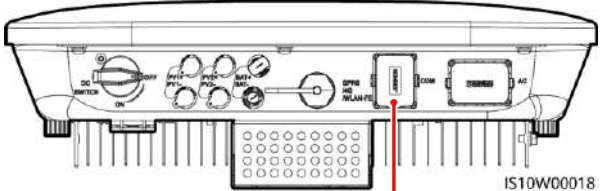
(Optional) Installing the RS485 Communications Cable (Smart Power Sensor and Energy Storage Device Connected)

1. Connect the signal cable to the signal cable connector.



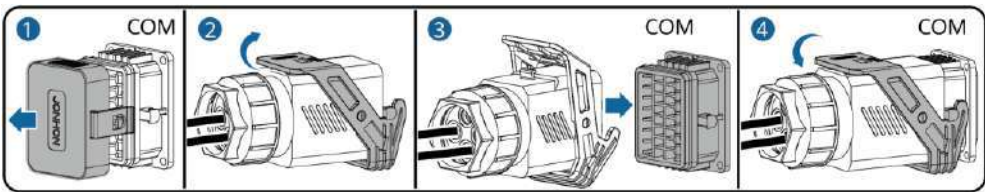
IS10I20012

2. Connect the signal cable connector to the Communication port.



IS10W00018

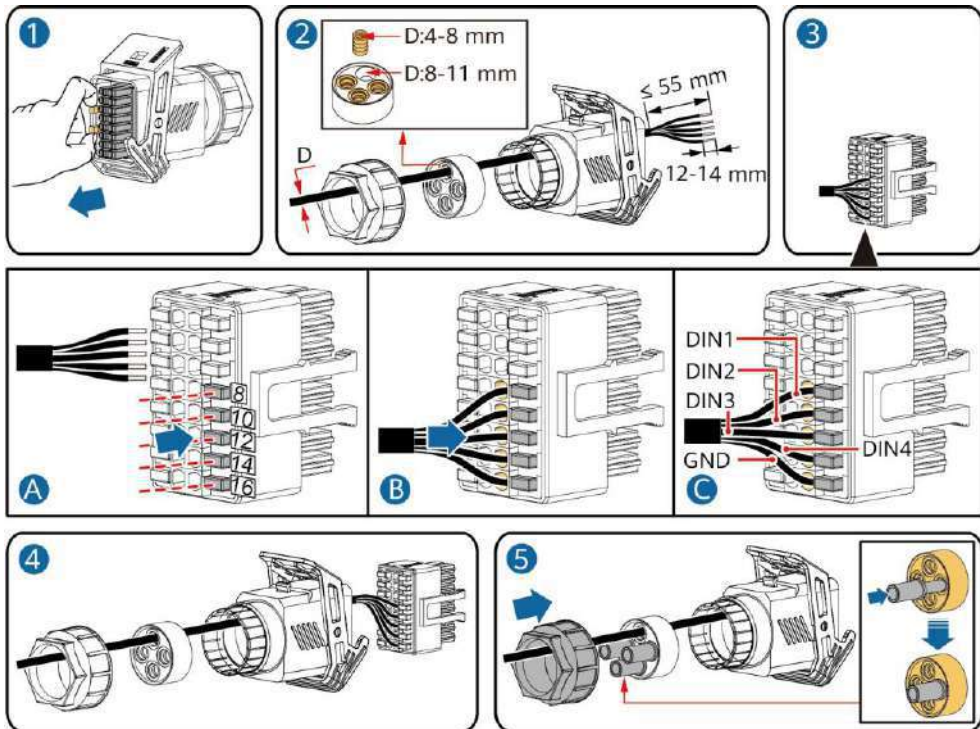
Communications port (COM)



IS10I20007

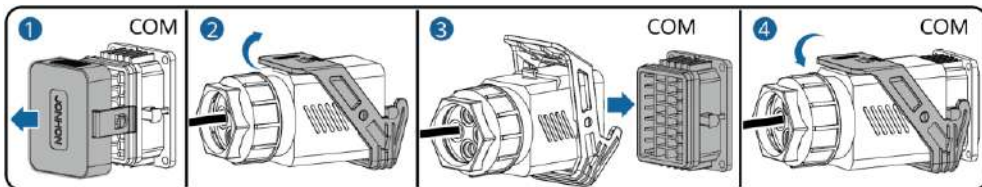
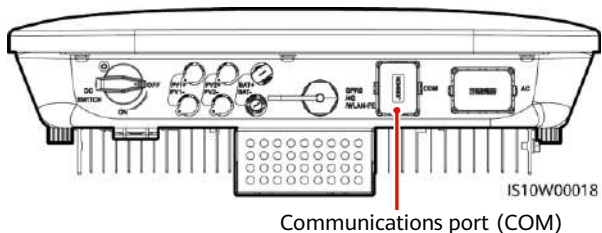
(Optional) Installing the Grid Scheduling Dry Contact Signal Cable

1. Connect the signal cable to the signal cable connector.



IS10I20010

2. Connect the signal cable connector to the Communication port.



IS10I20007

4 Verifying Installation

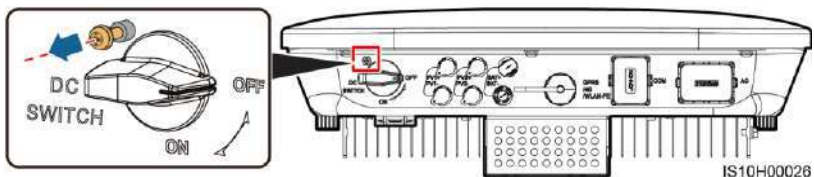
No.	Acceptance Criteria
1	The inverter is installed correctly and securely.
2	Cables are routed properly as required by the customer.
3	The Smart Dongle is installed correctly and securely.
4	Cable ties are evenly distributed and no burr exists.
5	The PE cable is connected correctly, securely, and reliably.
6	The DC switch and all the switches connected to the inverter are set to the OFF position.
7	The AC output power cable, DC input power cable, battery cable, and signal cable are connected correctly and securely.
8	Unused terminals and ports are locked by watertight caps.
9	The installation space is proper, and the installation environment is clean and tidy.

5 Powering On the System

NOTICE







- Before turning on the AC switch between the solar inverter and the power grid, check that the AC voltage is within the specified range using a multimeter set to the AC position.
- If the solar inverter is connected to an LG battery, turn on the DC switch within 1 minute after turning on the AC switch. If you turn on the DC switch after more than 1 minute, the solar inverter will shut down and start again.

1. If a battery is connected, turn on the battery switch.
2. Turn on the AC switch between the solar inverter and the power grid.
3. (Optional) Remove the screw for locking the DC switch.



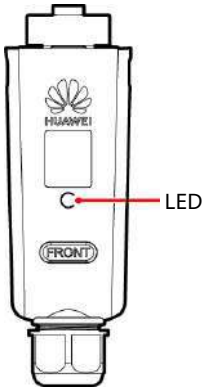
4. Turn on the DC switch (if any) between the PV string and the solar inverter.
5. Turn on the DC switch at the bottom of the solar inverter.

6. Observe the LEDs to check the operating status of the inverter.

Type	Status (Blinking at long intervals: On for 1s and then Off for 1s; Blinking at short intervals: On for 0.2s and then Off for 0.2s)		Meaning	
Running indication			N/A	
	Steady green	Steady green	The solar inverter is operating in grid-tied mode.	
	Blinking green at long intervals	Off	The DC is on and the AC is off.	
	Blinking green at long intervals	Blinking green at long intervals	Both the DC and AC are on, and the solar inverter is not exporting power to the power grid.	
	Off	Blinking green at long intervals	The DC is off and the AC is on.	
	Off	Off	Both the DC and AC are off.	
	Blinking red at short intervals	N/A	There is a DC environmental alarm, such as an alarm indicating that High String Input Voltage, String Reverse Connection, or Low Insulation Resistance.	
	N/A	Blinking red at short intervals	There is an AC environmental alarm, such as an alarm indicating Grid Undervoltage, Grid Overvoltage, Grid Overfrequency, or Grid Underfrequency.	
	Steady red	Steady red	Fault.	
Communication indication			N/A	
	Blinking green at short intervals		Communication is in progress.	
	Blinking green at long intervals		A mobile phone is connected to the solar inverter.	
	Off		There is no communication.	
Device replacement indication				N/A
	Steady red	Steady red	Steady red	The solar inverter hardware is faulty. The solar inverter needs to be replaced.

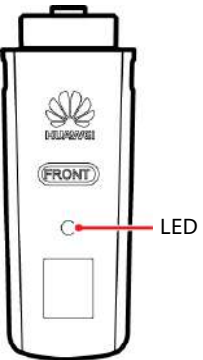
7. (Optional) Observe the LED to check the operating status of the Smart Dongle.

WLAN-FE Smart Dongle



LED		Description
Color	Status	
Yellow (blinking green and red simultaneously)	Steady on	The Dongle is secured and powered on.
Red	Blinking at short intervals (on for 0.2s and then off for 0.2s)	The parameters for connecting to the router are to be set.
Green	Blinking at long intervals (on for 0.5s and then off for 0.5s)	Connecting to the router
Green	Steady on	Successfully connected to the management system.
Green	Blinking at short intervals (on for 0.2s and then off for 0.2s)	The inverter is communicating with the management system through the Dongle.

4G Smart Dongle



LED		Description
Color	Status	
Yellow (blinking green and red simultaneously)	Steady on	The Dongle is secured and powered on.
Green	Blinking in a 2-second cycle (on for 0.1s and then off for 1.9s)	Dialing (duration < 1 min)
Green	Blinking at long intervals (on for 1s and then off for 1s)	The dial-up connection is set up successfully (duration < 30s).
Green	Steady on	Successfully connected to the management system.
Green	Blinking at short intervals (on for 0.2s and then off for 0.2s)	The inverter is communicating with the management system through the Dongle.

6 Commissioning

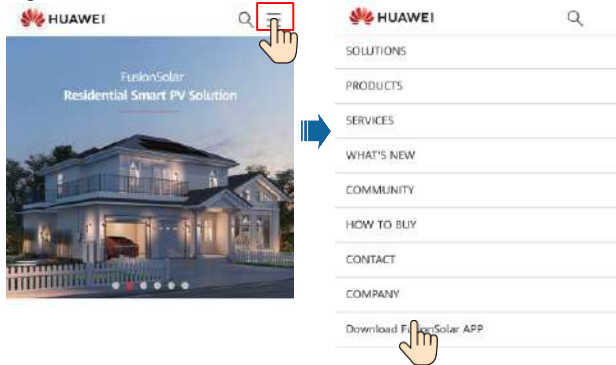
NOTE

- The screenshots are for reference only. The actual screens may vary.
- Obtain the initial password for connecting to the solar inverter WLAN from the label on the side of the solar inverter.
- To ensure account security, change the password periodically and keep the new password in mind. Not changing the password may cause password disclosure. A password left unchanged for a long period of time may be stolen or cracked. If a password is lost, devices cannot be accessed. In these cases, the user is liable for any loss caused to the PV plant.
- Before maintaining the optimizers and PV strings, turn off the AC switch and set the DC switch to OFF. Otherwise, the PV strings may be energized, resulting in electric shocks.

6.1 Downloading the App

Method 1: Search for FusionSolar on Huawei AppGallery and download the latest installation package.

Method 2: Access <https://solar.huawei.com> using the mobile phone browser and download the latest installation package.



Method 3: Scan the following QR code and download the latest installation package.



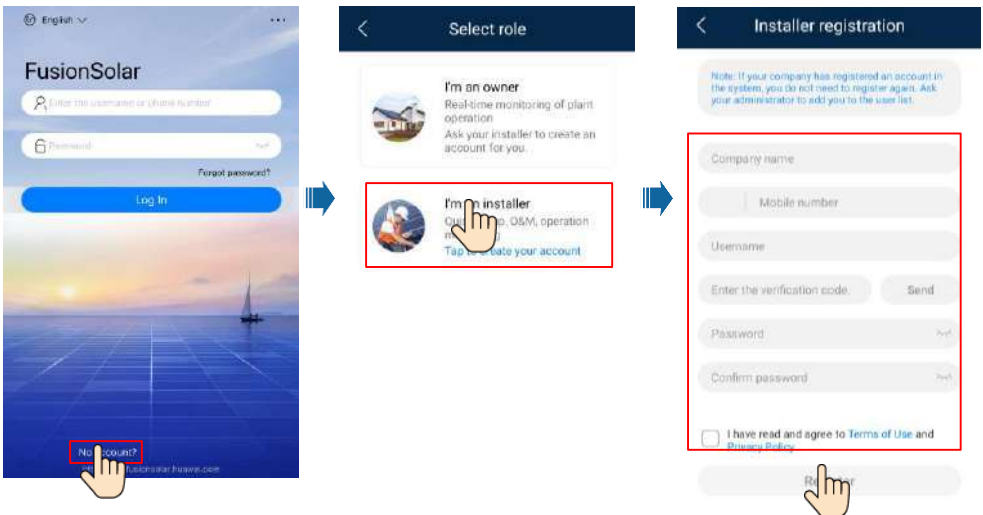
FusionSolar

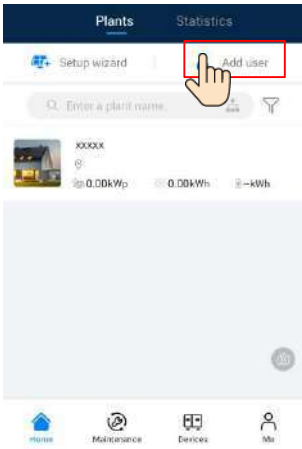
6.2 (Optional) Registering an Installer Account

NOTE

If you already have an installer account, skip this step.

Creating the first installer account will generate a domain named after the company.

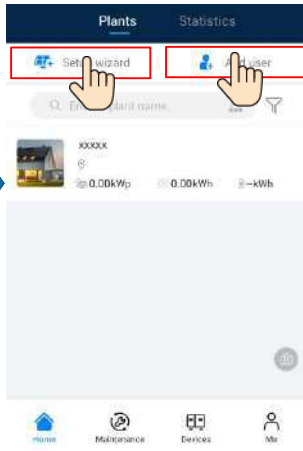




NOTICE


To create multiple installer accounts for a company, log in to the PV Monitor app and tap **Add User** to create an installer account.

6.3 Creating a PV Plant and a Plant Owner



NOTE

- In the quick settings, the grid code is set to N/A by default (automatic startup is not supported). Set the grid code based on the area where the PV plant is located.
- For details, see the *FusionSolar App Quick Guide*. You can scan the QR code to download the quick guide.




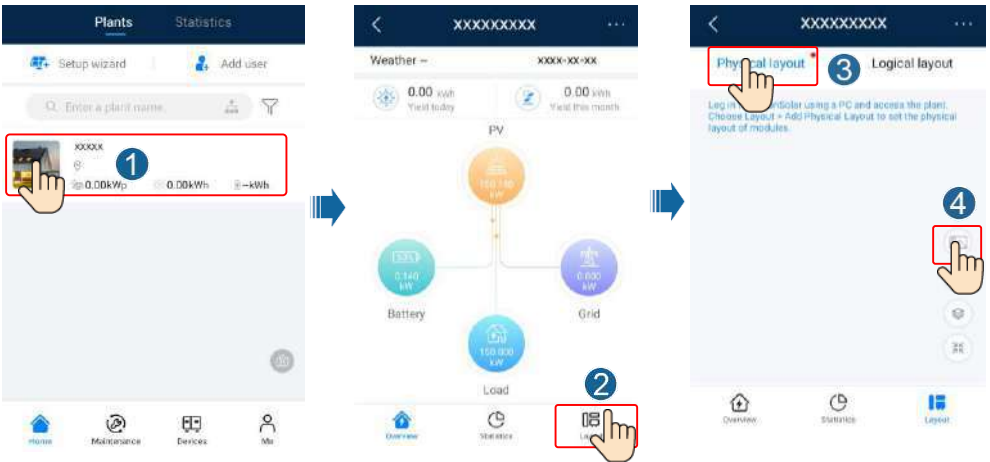
6.4 Setting the Physical Layout of Smart PV Optimizers

NOTE

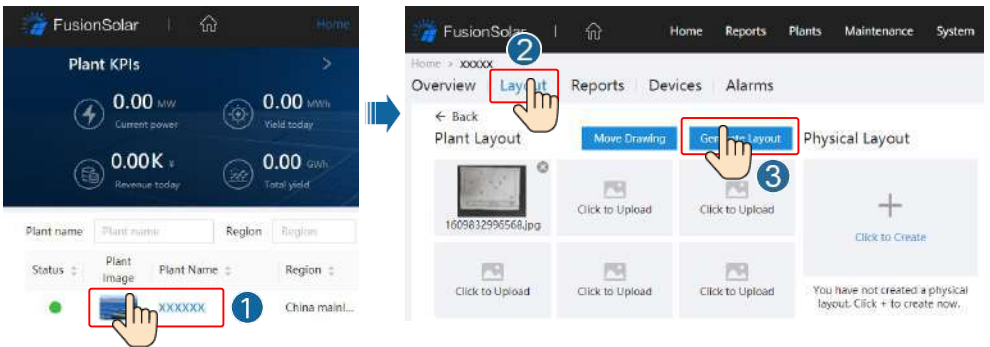
- If Smart PV Optimizers are configured for PV strings, ensure that the Smart PV Optimizers have been successfully connected to the solar inverter before performing the operations in this section.
- The PV strings connecting to the same MPPT route should contain the same number and model of PV modules or Smart PV optimizers.
- Check that the SN labels of Smart PV Optimizers are correctly attached to the physical layout template.
- Take and save a photo of the physical layout template. Place the template on a flat surface. Keep your phone parallel to the template and take a photo in landscape mode. Ensure that the four positioning points in the corners are in the frame. Ensure that each QR code is attached within the frame.
- For details about the physical layout of Smart PV Optimizers, see *FusionSolar App Quick Guide*.

Scenario 1: Setting on the FusionSolar Server Side (Solar Inverter Connected to the Management System)

1. Tap the plant name on the **Home** screen to access the plant screen. Select **layout**, tap  and upload the physical layout template photo of the PV plant as prompted.

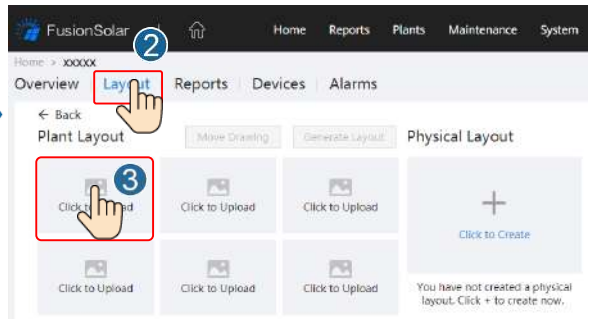
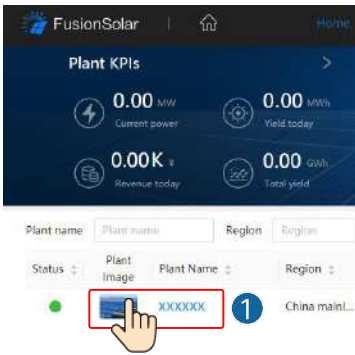


2. Log in to <https://intl.fusionsolar.huawei.com> to access the WebUI of the FusionSolar Smart PV Management System. On the **Home** page, click the plant name to go to the plant page. Select **layout**. Choose **Generate layout**, and create a physical layout as prompted. You can also manually create a physical location layout.



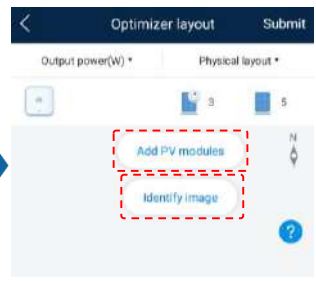
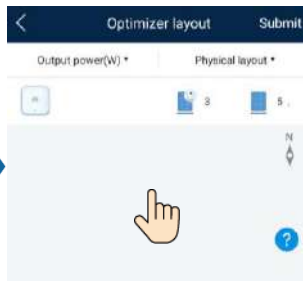
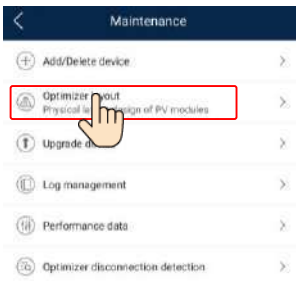
NOTE

You can also upload the physical layout template photo on the WebUI as follows: Log in to <https://intl.fusionsolar.huawei.com> to access the WebUI of the PV Monitor Smart PV Management System. On the **Home** page, click the plant name to go to the plant page. Select **layout**. Choose **Click to Upload**, and upload the physical layout template photo.



Scenario 2: Setting on the Solar Inverter Side (Solar Inverter Not Connected to the Management System)

1. If the solar inverter is not connected to the FusionSolar Smart PV Management System, access the **Device commissioning** screen (Refer to 7.1 Device Commissioning.) on the FusionSolar app to set the physical layout of Smart PV Optimizers.
 - a. Log in to the FusionSolar app. On the **Device commissioning** screen, choose **Maintenance > Optimizer layout**. The **Optimizer layout** screen is displayed.
 - b. Tap the blank area. The **Identify image** and **Add PV modules** buttons are displayed. You can use either of the following methods to perform operations as prompted:
 - Method 1: Tap **Identify image** and upload the physical layout template photo to complete the optimizer layout. (The optimizers that fail to be identified need to be manually bound.)
 - Method 2: Tap **Add PV modules** to manually add PV modules and bind the optimizers to the PV modules.



NOTE

For details about the physical layout of optimizers on the FusionSolar app and FusionSolar WebUI, see the *FusionSolar App Quick Guide*. You can scan the QR code to download the quick guide.



6.5 Setting Battery Parameters

NOTE

If the solar inverter connects to batteries, set battery parameters.

1. Log in to the **FusionSolar** app and choose **My > Device commissioning**. The **Device commissioning** screen (Refer to 7.1 Device Commissioning.) is displayed.
2. Choose **Power adjustment > Battery control** and set battery parameters, including **Charge from grid, Control mode (Fully fed to grid, TOU(Time-of-use), Maximum self-consumption)**, and so on.



6.6 SmartLogger Networking Scenario

For details, see the *Distributed PV Plants Connecting to Huawei Hosting Cloud Quick Guide (Distributed Solar Inverters + SmartLogger1000A + RS485 Networking)* and *PV Plants Connecting to Huawei Hosting Cloud Quick Guide (Inverters + SmartLogger3000 + RS485 Networking)*. You can scan the QR codes to obtain the documents.



SmartLogger1000A



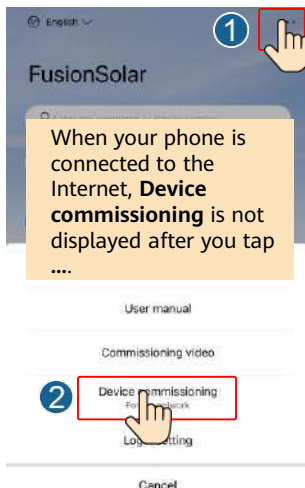
SmartLogger3000

7 FAQ

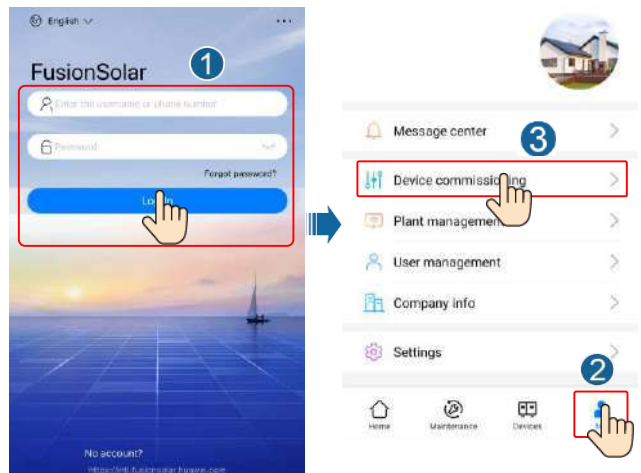
7.1 Device Commissioning

1. Access **Device commissioning**.

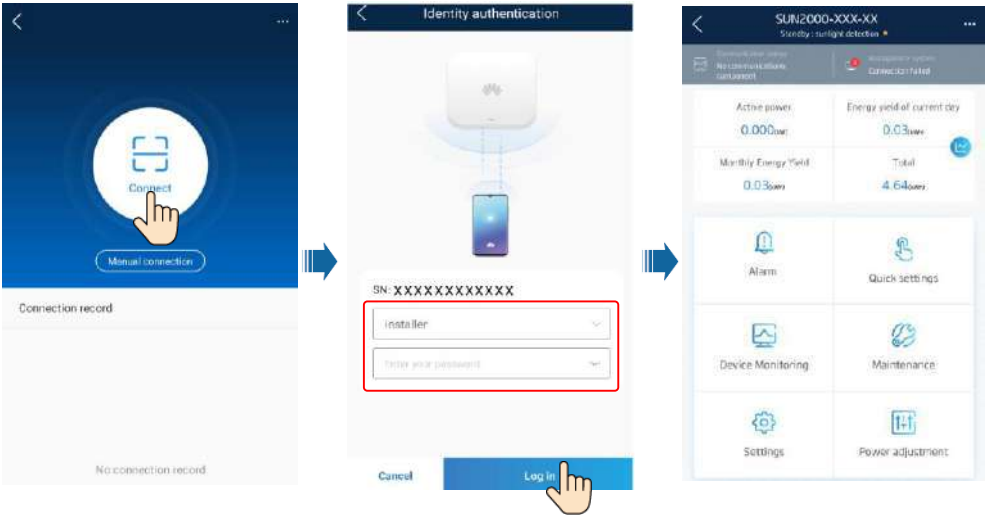
Scenario 1: Your phone is not connected to the Internet.



Scenario 2: Your phone is connected to the Internet.



2. Connect to the solar inverter WLAN and log in as **installer** to access the device commissioning screen.



7.2 Resetting the Password

1. Ensure that the SUN2000 connects to the AC and DC power supplies at the same time. Indicators and are steady green or blink at long intervals for more than 3 minutes.
2. Perform the following operations within 3 minutes:
 - a. Turn off the AC switch and set the DC switch at the bottom of the SUN2000 to OFF. If the SUN2000 connects to batteries, turn off the battery switch. Wait until all the LED indicators on the SUN2000 panel turn off.
 - b. Turn on the AC switch and set the DC switch to ON. Ensure that the indicator is blinking green at long intervals.
 - c. Turn off the AC switch and set the DC switch to OFF. Wait until all LED indicators on the SUN2000 panel are off.
 - d. Turn on the AC switch and set the DC switch to ON.
3. Reset the password within 10 minutes. (If no operation is performed within 10 minutes, all inverter parameters remain unchanged.)
 - a. Wait until the indicator blinks green at long intervals.
 - b. Obtain the initial WLAN hotspot name (SSID) and initial password (PSW) from the label on the side of the SUN2000 and connect to the app.
 - c. On the login screen, set a new login password and log in to the app.
4. Set router and management system parameters to implement remote management.

8 Installation Video

NOTE

You can scan the QR code below to obtain the installation video.



8 Customer Service Contact

Customer Service Contact			
Region	Country	Service Support Email	Phone
Europe	France	eu_inverter_support@huawei.com	0080033888888
	Germany		
	Spain		
	Italy		
	UK		
	Netherlands		
	Other countries		
Asia Pacific	Australia	eu_inverter_support@huawei.com	1800046639
	Turkey	eu_inverter_support@huawei.com	N/A
	Malaysia	apsupport@huawei.com	0080021686868 /1800220036
	Thailand		(+66) 26542662 (charged by local call)
			1800290055 (free in Thailand)
	China	solarservice@huawei.com	400-822-9999
	Other countries	apsupport@huawei.com	0060-3-21686868
Japan	Japan	Japan_ESC@ms.huawei.com	0120258367
India	India	indiaenterprise_TAC@huawei.com	1800 103 8009
South Korea	South Korea	Japan_ESC@ms.huawei.com	N/A
North America	USA	eu_inverter_support@huawei.com	1-877-948-2934
	Canada	eu_inverter_support@huawei.com	1-855-482-9343
Latin America	Mexico	la_inverter_support@huawei.com	018007703456 /0052-442-4288288
	Argentina		0-8009993456
	Brazil		0-8005953456
	Chile		800201866 (only for fixed)
	Other countries		0052-442-4288288
Middle East and Africa	Egypt	eu_inverter_support@huawei.com	08002229000 /0020235353900
	UAE		08002229000
	South Africa		0800222900
	Saudi Arabia		8001161177
	Pakistan		0092512800019
	Morocco		0800009900
	Other countries		0020235353900

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SUN2000-(3KTL-10KTL)-M1

User Manual

Issue 06
Date 2021-12-20



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People's Republic of China

Website: <https://e.huawei.com>

About This Document

Overview

This document describes the SUN2000-3KTL-M1, SUN2000-4KTL-M1, SUN2000-5KTL-M1, SUN2000-6KTL-M1, SUN2000-8KTL-M1, and SUN2000-10KTL-M1 (SUN2000 for short) in terms of their installation, electrical connections, commissioning, maintenance, and troubleshooting. Before installing and operating the SUN2000, ensure that you are familiar with the features, functions, and safety precautions provided in this document.

 **NOTE**

The SUN2000-8KTL-M1 and SUN2000-10KTL-M1 are not applicable to Australia.




Intended Audience



This document is applicable to:

- Installers
- Users

Symbol Conventions

The symbols that may be found in this document are defined as follows:

Symbol	Description
	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Symbol	Description
	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. Notice is used to address practices not related to personal injury.
 NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 06 (2021-12-20)

- Updated [7.1.3 Creating a PV Plant and a User](#).
- Updated [7.2.1 Energy Control](#).
- Updated [10.1 SUN2000 Technical Specifications](#).

Issue 05 (2021-11-24)

Updated [10.1 SUN2000 Technical Specifications](#).

Issue 04 (2021-08-10)

- Updated [2.1 Product Introduction](#).
- Updated [5.4 Installing DC Input Power Cables](#).
- Updated [5.5 \(Optional\) Connecting Battery Cables](#).
- Updated [5.7 \(Optional\) Connecting the Signal Cable](#).
- Updated [7 Man-Machine Interaction](#).
- Updated [B Device Commissioning](#).

Issue 03 (2021-02-01)

- Updated [4.3.2 Space Requirements](#).
- Updated [5.7.2 Connecting the RS485 Communications Cable \(Smart Power Sensor\)](#).
- Updated [6.2 SUN2000 power-on](#).
- Updated [8.3 Troubleshooting](#).

Issue 02 (2020-11-20)

Updated [7.2.1.3 Battery Control](#).

Issue 01 (2020-09-30)

This issue is used for first office application (FOA).

Contents

About This Document.....	ii
1 Safety Information.....	1
1.1 General Safety.....	1
1.2 Personnel Requirements.....	2
1.3 Electrical Safety.....	3
1.4 Installation Environment Requirements.....	4
1.5 Mechanical Safety.....	4
1.6 Commissioning.....	6
1.7 Maintenance and Replacement.....	6
2 Overview.....	7
2.1 Product Introduction.....	7
2.2 Appearance.....	10
2.3 Label Description.....	12
2.3.1 Enclosure Labels.....	12
2.3.2 Product Nameplate.....	14
2.4 Working Principles.....	14
2.4.1 Circuit Diagram.....	14
2.4.2 Working Modes.....	15
3 Storage.....	17
4 Installation.....	18
4.1 Checking Before Installation.....	18
4.2 Tools.....	19
4.3 Determining the Installation Position.....	20
4.3.1 Environment Requirements.....	20
4.3.2 Space Requirements.....	21
4.4 Moving the SUN2000.....	24
4.5 Installing the Mounting Bracket.....	24
4.5.1 Wall-mounted Installation.....	25
4.5.2 Support-mounted Installation.....	27
5 Electrical Connections.....	31
5.1 Installation Preparation.....	31

5.2 Connecting the PE cable.....	34
5.3 Connecting the AC Output Power Cable.....	36
5.4 Installing DC Input Power Cables.....	40
5.5 (Optional) Connecting Battery Cables.....	44
5.6 Installing the Smart Dongle.....	46
5.7 (Optional) Connecting the Signal Cable.....	48
5.7.1 Connecting the RS485 Communications Cable (Inverter Cascading).....	52
5.7.2 Connecting the RS485 Communications Cable (Smart Power Sensor).....	53
5.7.3 Connecting an RS485 Communications Cable (Between a Power Meter and a Battery).....	57
5.7.4 Connecting the Power Grid Scheduling Signal Cable.....	58
5.7.5 Connecting a Signal Cable to the Smart Backup Box.....	59
5.7.6 Connecting the NS Protection Signal Cable.....	60
6 Commissioning.....	63
6.1 Checking Before Power-On.....	63
6.2 SUN2000 power-on.....	64
7 Man-Machine Interaction.....	70
7.1 App Commissioning.....	70
7.1.1 Downloading the FusionSolar App.....	70
7.1.2 (Optional) Registering an Installer Account.....	71
7.1.3 Creating a PV Plant and a User.....	72
7.1.4 (Optional) Setting the Physical Layout of the Smart PV Optimizers.....	72
7.1.5 Detecting Optimizer Disconnection.....	74
7.2 Parameters Settings.....	75
7.2.1 Energy Control.....	75
7.2.1.1 Grid-tied Point Control.....	75
7.2.1.2 Apparent Power Control on the Inverter Output Side.....	80
7.2.1.3 Battery Control.....	81
7.2.2 AFCI.....	83
7.2.3 IPS Check (for Italy CEI0-21 Grid Code Only).....	84
7.3 SmartLogger Networking Scenario.....	86
8 Maintenance.....	87
8.1 SUN2000 Power-Off.....	87
8.2 Routine Maintenance.....	88
8.3 Troubleshooting.....	88
9 Handling the Inverter.....	101
9.1 Removing the SUN2000.....	101
9.2 Packing the SUN2000.....	101
9.3 Disposing of the SUN2000.....	101
10 Technical Specifications.....	102
10.1 SUN2000 Technical Specifications.....	102

10.2 Optimizer Technical Specifications.....	107
A Grid Code.....	110
B Device Commissioning.....	112
C Resetting Password.....	115
D Rapid Shutdown.....	118
E Locating Insulation Resistance Faults.....	119
F Acronyms and Abbreviations.....	122

1 Safety Information

1.1 General Safety

Statement

Before installing, operating, and maintaining the equipment, read this document and observe all the safety instructions on the equipment and in this document.

The "NOTICE", "CAUTION", "WARNING", and "DANGER" statements in this document do not cover all the safety instructions. They are only supplements to the safety instructions. Huawei will not be liable for any consequence caused by the violation of general safety requirements or design, production, and usage safety standards.

Ensure that the equipment is used in environments that meet its design specifications. Otherwise, the equipment may become faulty, and the resulting equipment malfunction, component damage, personal injuries, or property damage are not covered under the warranty.

Follow local laws and regulations when installing, operating, or maintaining the equipment. The safety instructions in this document are only supplements to local laws and regulations.

Huawei will not be liable for any consequences of the following circumstances:

- Operation beyond the conditions specified in this document
- Installation or use in environments which are not specified in relevant international or national standards
- Unauthorized modifications to the product or software code or removal of the product
- Failure to follow the operation instructions and safety precautions on the product and in this document
- Equipment damage due to force majeure, such as earthquakes, fire, and storms
- Damage caused during transportation by the customer
- Storage conditions that do not meet the requirements specified in this document

General Requirements



Do not work with power on during installation.

- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, and performing outdoor installation) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- After installing the equipment, remove idle packing materials such as cartons, foam, plastics, and cable ties from the equipment area.
- In the case of a fire, immediately leave the building or the equipment area, and turn on the fire alarm bell or make an emergency call. Do not enter the building on fire in any case.
- Do not scrawl, damage, or block any warning label on the equipment.
- Tighten the screws to the specified torque using tools when installing the equipment.
- Understand the components and functioning of a grid-tied PV power system and relevant local standards.
- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches cannot be exposed to an outdoor environment for a long period of time.
- Do not open the host panel of the equipment.
- You shall not reverse engineer, decompile, disassemble, adapt, add code to the device software or alter the device software in any other way, research the internal implementation of the device, obtain the device software source code, infringe on Huawei's intellectual property, or disclose any device software performance test results.

Personal Safety

- If there is a probability of personal injury or equipment damage during operations on the equipment, immediately stop the operations, report the case to the supervisor, and take feasible protective measures.
- Use tools correctly to avoid hurting people or damaging the equipment.
- Do not touch the energized equipment, as the enclosure is hot.

1.2 Personnel Requirements

- Personnel who plan to install or maintain Huawei equipment must receive thorough training, understand all necessary safety precautions, and be able to correctly perform all operations.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.

- Personnel who will operate the equipment, including operators, trained personnel, and professionals, should possess the local national required qualifications in special operations such as high-voltage operations, working at heights, and operations of special equipment.
- Only professionals or authorized personnel are allowed to replace the equipment or components (including software).

 **NOTE**

- Professionals: personnel who are trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, and maintenance
- Trained personnel: personnel who are technically trained, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Operators: operation personnel who may come in contact with the equipment, except trained personnel and professionals

1.3 Electrical Safety

Grounding

- For the equipment that needs to be grounded, install the ground cable first when installing the equipment and remove the ground cable last when removing the equipment.
- Do not damage the ground conductor.
- Do not operate the equipment in the absence of a properly installed ground conductor.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is securely grounded.

General Requirements

 **DANGER**

Before connecting cables, ensure that the equipment is intact. Otherwise, electric shocks or fire may occur.

- Ensure that all electrical connections comply with local electrical standards.
- Obtain approval from the local electric utility company before using the equipment in grid-tied mode.
- Ensure that the cables you prepared meet local regulations.
- Use dedicated insulated tools when performing high-voltage operations.

AC and DC Power

 **DANGER**

Do not connect or disconnect power cables with power on. Transient contact between the core of the power cable and the conductor will generate electric arcs or sparks, which may cause fire or personal injury.

- Before making electrical connections, switch off the disconnecter on the upstream device to cut off the power supply if people may contact energized components.
- Before connecting a power cable, check that the label on the power cable is correct.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.

Cabling

- When routing cables, ensure that a distance of at least 30 mm exists between the cables and heat-generating components or areas. This prevents damage to the insulation layer of the cables.
- Bind cables of the same type together. When routing cables of different types, ensure that they are at least 30 mm away from each other.
- Ensure that the cables used in a grid-tied PV power system are properly connected and insulated and meet specifications.

1.4 Installation Environment Requirements

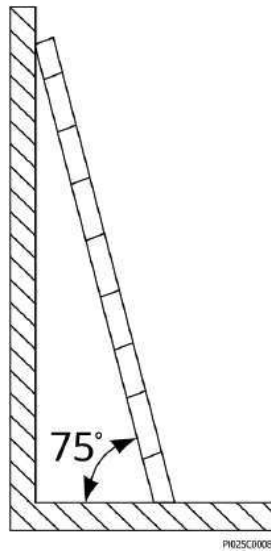
- Ensure that the equipment is installed in a well ventilated environment.
- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

1.5 Mechanical Safety

Using Ladders

- Use wooden or fiberglass ladders when you need to perform live working at heights.
- When a step ladder is used, ensure that the pull ropes are secured and the ladder is held firm.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the wider end of the ladder is at the bottom, or protective measures have been taken at the bottom to prevent the ladder from sliding.

- Ensure that the ladder is securely positioned. The recommended angle for a ladder against the floor is 75 degrees, as shown in the following figure. An angle rule can be used to measure the angle.



- When climbing a ladder, take the following precautions to reduce risks and ensure safety:
 - Keep your body steady.
 - Do not climb higher than the fourth rung of the ladder from the top.
 - Ensure that your body's center of gravity does not shift outside the legs of the ladder.

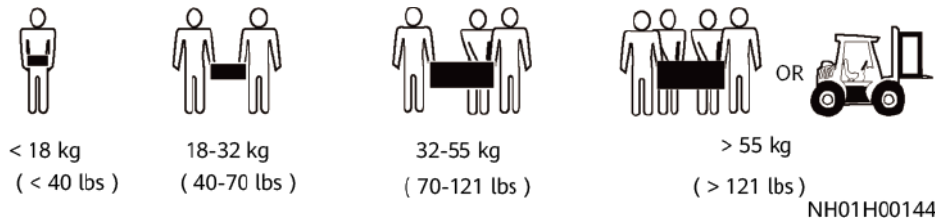
Drilling Holes

When drilling holes into a wall or floor, observe the following safety precautions:

- Wear goggles and protective gloves when drilling holes.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings that have accumulated inside or outside the equipment.

Moving Heavy Objects

- Be cautious to avoid injury when moving heavy objects.



- When moving the equipment by hand, wear protective gloves to prevent injuries.

1.6 Commissioning

When the equipment is powered on for the first time, ensure that professional personnel set parameters correctly. Incorrect settings may result in inconsistency with local certification and affect the normal operation of the equipment.

1.7 Maintenance and Replacement

 **DANGER**

High voltage generated by the equipment during operation may cause an electric shock, which could result in death, serious injury, or serious property damage. Prior to maintenance, power off the equipment and strictly comply with the safety precautions in this document and relevant documents.

-
- Maintain the equipment with sufficient knowledge of this document and using proper tools and testing equipment.
 - Before maintaining the equipment, power it off and follow the instructions on the delayed discharge label to ensure that the equipment is powered off.
 - Turn off the AC and DC switches of the SUN2000 when maintaining the electric equipment or power distribution equipment connected the SUN2000.
 - Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.
 - If the equipment is faulty, contact your dealer.
 - The equipment can be powered on only after all faults are rectified. Failing to do so may escalate faults or damage the equipment.

2 Overview

2.1 Product Introduction

Functions

The SUN2000 inverter is a three-phase grid-tied PV string inverter that converts the DC power generated by PV strings into AC power and feeds the power into the power grid.

Model

This document covers the following SUN2000 models:

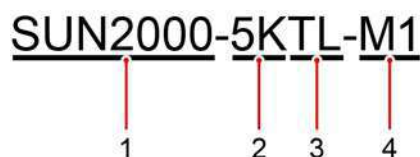
- SUN2000-3KTL-M1
- SUN2000-4KTL-M1
- SUN2000-5KTL-M1
- SUN2000-6KTL-M1
- SUN2000-8KTL-M1
- SUN2000-10KTL-M1

NOTE

The SUN2000-8KTL-M1 and SUN2000-10KTL-M1 are not applicable to Australia.

Figure 2-1 Model description (using SUN2000-5KTL-M1 as an example)

SUN2000-5KTL-M1



1 2 3 4

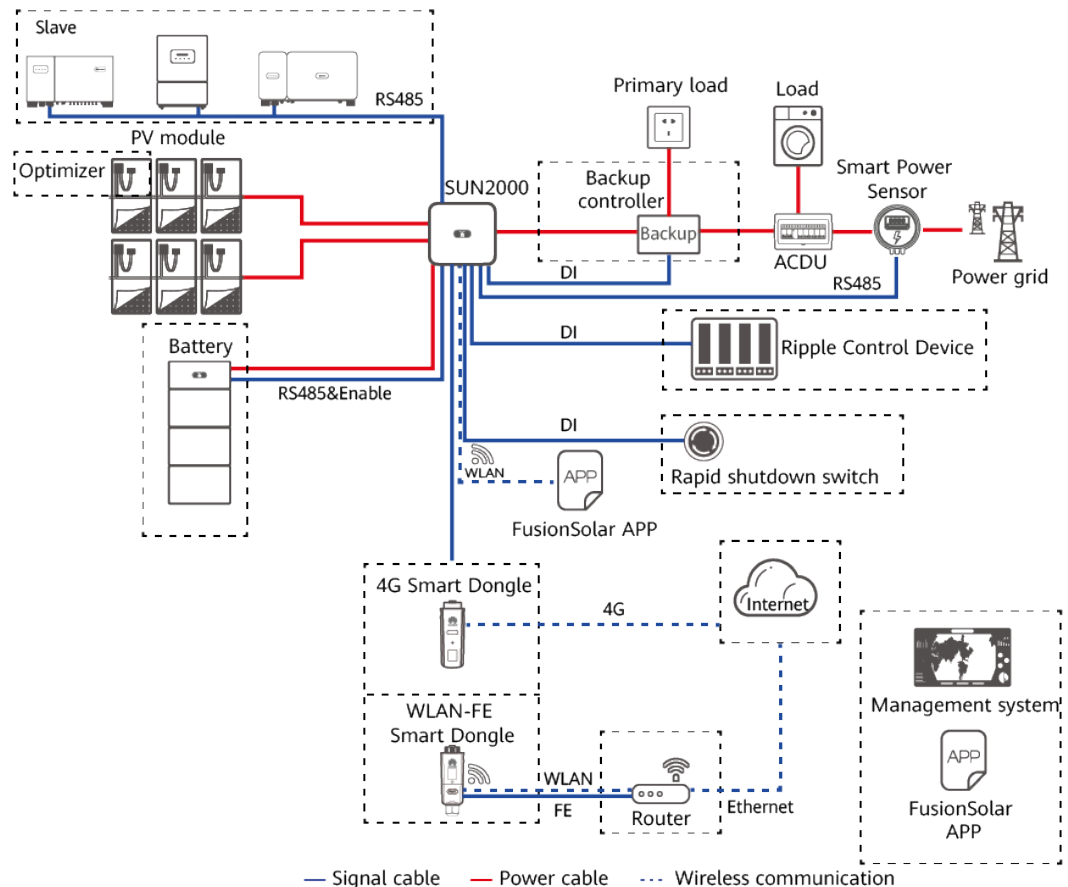
Table 2-1 Model description

Identifier	Description	Value
1	Product family name	SUN2000: three-phase grid-tied PV string inverter
2	Power class	<ul style="list-style-type: none"> • 3K: rated power of 3 kW • 4K: rated power of 4 kW • 5K: rated power of 5 kW • 6K: rated power of 6 kW • 8K: rated power of 8 kW • 10K: rated power of 10 kW
3	Topology	TL: transformerless
4	Product code	M1: product series with an input voltage level of 1100 V DC

Networking Application

The SUN2000 applies to residential rooftop grid-tied systems and small-sized ground PV plant grid-tied systems. Typically, a grid-tied system consists of PV strings, grid-tied inverters, AC switches, and power distribution units.

Figure 2-2 Networking application (dashed boxes indicate optional components)



NOTE

- If the built-in Wi-Fi module of the SUN2000 connects to the app, only device commissioning can be performed.
- In the SUN2000 cascading scenario, the master inverter model can be SUN2000-(3KTL-10KTL)-M1, and the slave inverter model can be SUN2000-(3KTL-10KTL)-M1, SUN2000-(8KTL-20KTL)-M2, SUN2000-(20KTL-40KTL)-M3, SUN2000-(5KTL-20KTL)-M0, SUN2000-50KTL/60KTL/65KTL-M0, SUN2000-29.9KTL/36KTL, or SUN2000-33KTL-A.

NOTE

For detailed operations on devices in the network, see the following guides:

- [SUN2000-450W-P Smart PV Optimizer Quick Guide](#)
- [LUNA2000-\(5-30\)-S0 User Manual](#)
- [Backup Box-\(B0, B1\) Quick Guide](#)

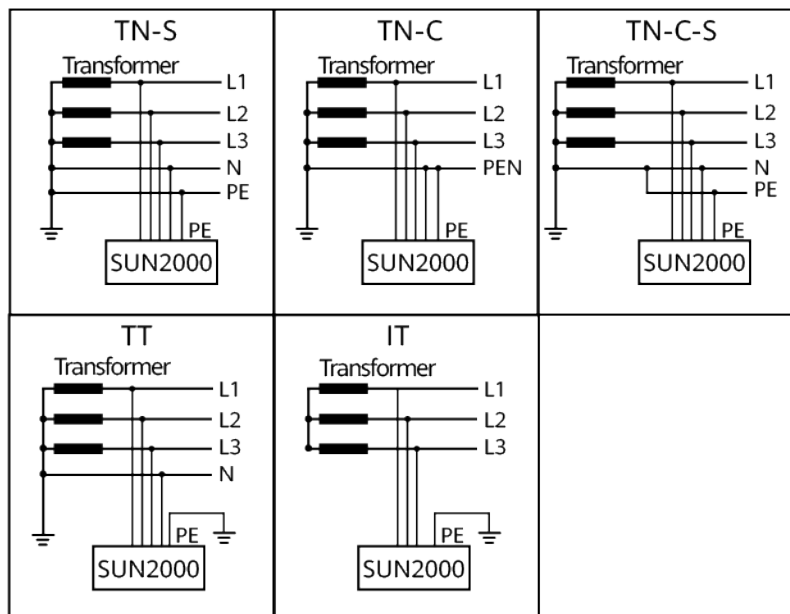
CAUTION

The off-grid load output port of the Backup Box cannot be directly connected to the power grid. Otherwise, the Backup Box will be shut down due to overload.

Supported Power Grid Types

The SUN2000 supports TN-S, TN-C, TN-C-S, TT, and IT power grids.

Figure 2-3 Power grid types



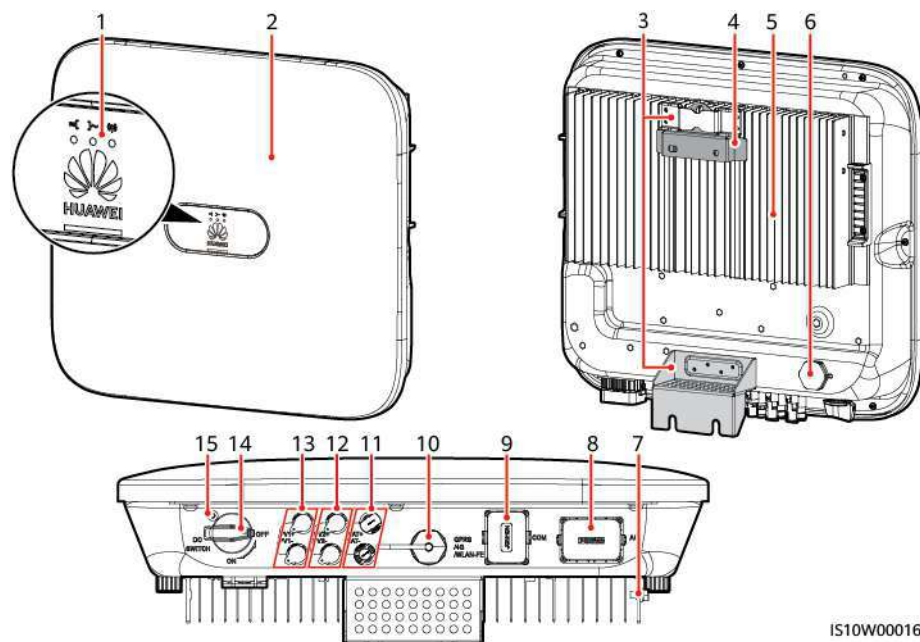
IS01S10001

NOTE

- When the SUN2000 is used in the TT power grid, the N-to-PE voltage must be less than 30 V.
- When the SUN2000 is used in the IT power grid, set **Isolation** to **Input ungrounded, with TF**.

2.2 Appearance

Figure 2-4 Appearance

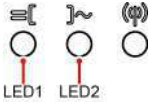


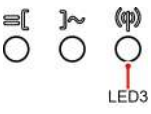
- | | |
|---|--|
| (1) LED indicator | (2) Front panel |
| (3) Hanging kit | (4) Mounting bracket |
| (5) Heat sink | (6) Ventilation valve |
| (7) Ground screw | (8) AC output port (AC) |
| (9) Communications port (COM) | (10) Smart Dongle port (GPRS/4G/WLAN-FE) |
| (11) Battery terminals (BAT+/BAT-) | (12) DC input terminals (PV2+/PV2-) |
| (13) DC input terminals (PV1+/PV1-) | (14) DC switch (DC SWITCH) |
| (15) Hole for the DC switch locking screw | |

NOTE

Two M6 screw holes are reserved on the left and right sides of the SUN2000 for installing the awning.

Table 2-2 Indicator description

Category	Status		Description
Running indicator 	LED1	LED2	-
	Steady green	Steady green	The SUN2000 is operating in grid-tied mode.
	Blinking green at long intervals (on for 1s and then off for 1s)	Off	The DC is on and the AC is off.
	Blinking green at long intervals (on for 1s and then off for 1s)	Blinking green at long intervals (on for 1s and then off for 1s)	Both the DC and AC are on, and the SUN2000 is not supplying power to the power grid.
	Off	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is off and the AC is on.
	Steady orange	Steady orange	The SUN2000 is operating in the off-grid mode.
	Blinking orange slowly	Off	The DC is on, and the SUN2000 has no output in the off-grid mode.
	Blinking orange slowly	Blinking orange slowly	The SUN2000 is operating in the overload in backup mode.
	Off	Off	Both the DC and AC are off.
	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	-	DC environment alarm. For example, the input voltage of the PV string is high, the PV string is reversely connected, or the insulation resistance is low.


Category	Status			Description
	-	Blinking red at short intervals		AC environment alarm. For example, the power grid is undervoltage, overvoltage, overfrequency, or underfrequency.
	Steady red	Steady red		Fault
Communica tions indicator 	LED3			-
	Blinking green at short intervals (on for 0.2s and then off for 0.2s)		Communication is in progress. (When a mobile phone is connected to the SUN2000, the indicator blinks green at long intervals, indicating that the phone is connected to the SUN2000.)	
	Blinking green at long intervals (on for 1s and then off for 1s)		Mobile phone access	
	Off		No communication	
Device replacement indicator	LED1	LED2	LED3	-
	Steady red	Steady red	Steady red	The SUN2000 hardware is faulty and the SUN2000 needs to be replaced.

2.3 Label Description

2.3.1 Enclosure Labels

Symbol	Name	Description
	Delay discharge	Residual voltage exists after the SUN2000 is powered off. It takes 5 minutes for the SUN2000 to discharge to the safe voltage.

Symbol	Name	Description
	Burn warning	Do not touch a running SUN2000 because it generates high temperatures on the shell.
	Electric shock warning	<ul style="list-style-type: none"> High voltage exists after the SUN2000 is powered on. Only qualified and trained electrical technicians are allowed to perform operations on the SUN2000. High touch current exists after the SUN2000 is powered on. Before powering on the SUN2000, ensure that the SUN2000 is properly grounded.
	Refer to documentation	Reminds operators to refer to the documents delivered with the SUN2000.
	Grounding label	Indicates the position for connecting the PE cable.
	Operation warning	Do not remove the DC input connector or AC output connector when the SUN2000 is running.
<p>(1P)PN/ITEM:XXXXXXXX (32P)Model: SUN2000-XKTL-XX (S)SN:XXXXXXXXXXXXX MADE IN CHINA</p>	SUN2000 serial number	Indicates the serial number.
<p>MAC: xxxxxxxxxxxx</p>	SUN2000 MAC address	Indicates the MAC address.

Symbol	Name	Description
	SUN2000 Wi-Fi login QR code	Scan the QR code to connect to the Huawei SUN2000 Wi-Fi network.

2.3.2 Product Nameplate

Figure 2-5 Nameplate (using SUN2000-10KTL-M1 as an example)



(1) Trademark and product model

(2) Key technical parameters

(3) Certification marks

(4) Company name and country of origin

NOTE

The nameplate figure is for reference only.

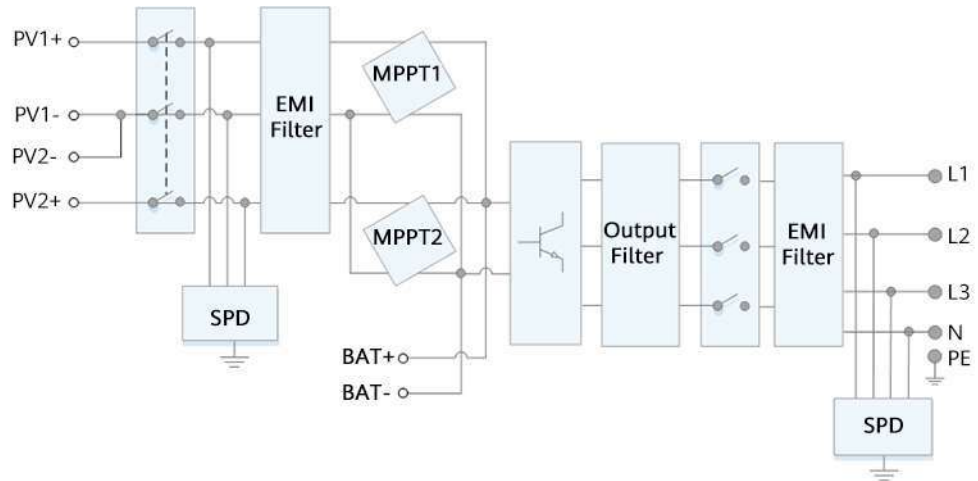
2.4 Working Principles

2.4.1 Circuit Diagram

Two PV strings connect to the SUN2000, and their maximum power points are tracked by two maximum power point tracking (MPPT) circuits. The SUN2000

converts DC power into three-phase AC power through an inverter circuit. Surge protection is supported on both the DC and AC sides.

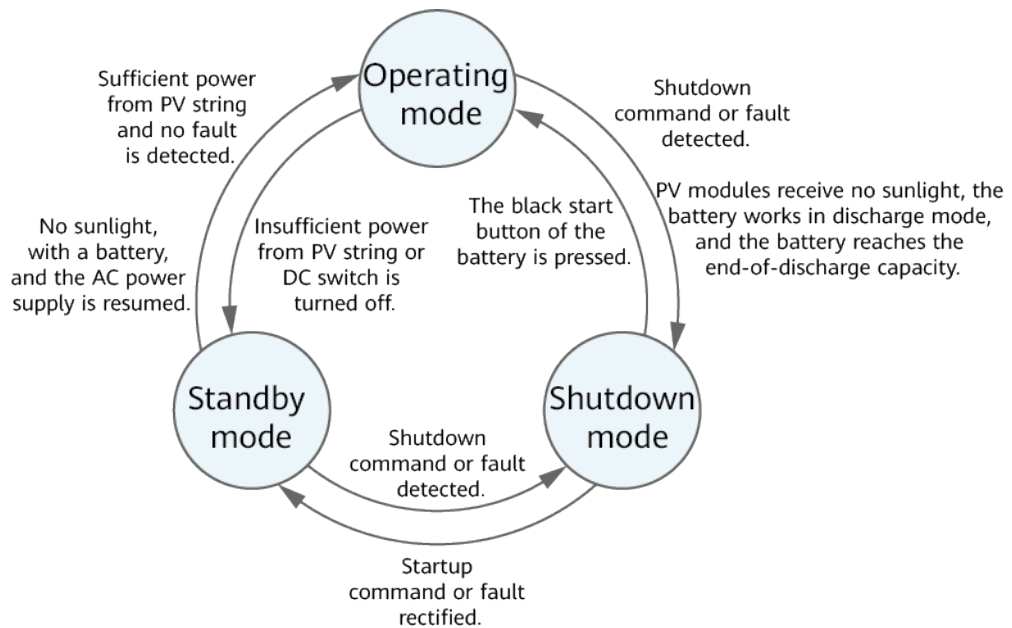
Figure 2-6 SUN2000 conceptual diagram



2.4.2 Working Modes

The SUN2000 can work in Standby, Operating, or Shutdown mode.

Figure 2-7 Working modes



IS07500002

Table 2-3 Working mode description

Working Mode	Description
Standby	<p>The SUN2000 enters Standby mode when the external environment does not meet the operating requirements. In Standby mode:</p> <ul style="list-style-type: none"> ● The SUN2000 continuously performs status check and enters the Operating mode once the operating requirements are met. ● The SUN2000 enters Shutdown mode after detecting a shutdown command or a fault after startup.
Operating	<p>In Operating mode:</p> <ul style="list-style-type: none"> ● The SUN2000 converts DC power from PV strings into AC power and feeds the power to the power grid. ● The SUN2000 tracks the maximum power point to maximize the PV string output. ● If the SUN2000 detects a fault or a shutdown command, it enters the Shutdown mode. ● The SUN2000 enters Standby mode after detecting that the PV string output power is not suitable for connecting to the power grid for generating power. ● If the PV modules receive no sunlight, the battery works in discharge mode, and the battery reaches the end-of-discharge capacity, the SUN2000 enters Shutdown mode.
Shutdown	<ul style="list-style-type: none"> ● In Standby or Operating mode, the SUN2000 enters Shutdown mode after detecting a fault or shutdown command. ● In Shutdown mode, the SUN2000 enters Standby mode after detecting a startup command or that the fault is rectified. ● In Shutdown mode, if the black start button of the battery is pressed, the SUN2000 enters Operating mode.

3 Storage

The following requirements should be met if the SUN2000 is not put into use directly:

- Do not unpack the SUN2000.
- Keep the storage temperature at -40°C to $+70^{\circ}\text{C}$ and the humidity at 5%–95% RH.
- The SUN2000 should be stored in a clean and dry place and be protected from dust and water vapor corrosion.
- A maximum of eight SUN2000s can be stacked. To avoid personal injury or device damage, stack SUN2000s with caution to prevent them from falling over.
- Periodic inspections are required during the storage. Replace the packing materials if necessary.
- If the SUN2000 has been long-term stored, inspections and tests should be conducted by qualified personnel before it is put into use.

4 Installation

4.1 Checking Before Installation

Outer Packing Materials

Before unpacking the inverter, check the outer packing materials for damage, such as holes and cracks, and check the inverter model. If any damage is found or the inverter model is not what you requested, do not unpack the package and contact your supplier as soon as possible.

 **NOTE**

You are advised to remove the packing materials within 24 hours before installing the inverter.

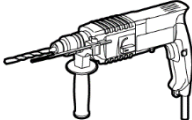
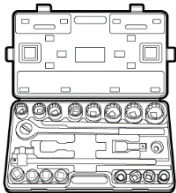
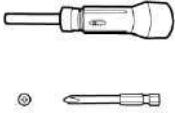
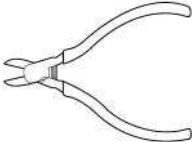
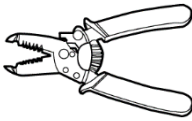


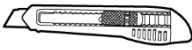
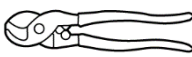
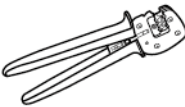



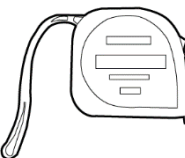


Package Contents




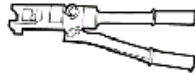

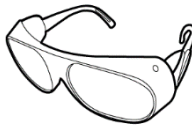


After unpacking the inverter, check that the contents are intact and complete. If any damage is found or any component is missing, contact your supplier.

 **NOTE**

For details about the number of contents, see the *Packing List* in the packing case.

4.2 Tools

Type	Tool			
Installation Tools				
	Hammer drill Drill bit: $\Phi 8$ mm and $\Phi 6$ mm	Socket wrench set	Torque screwdriver Phillips head: M3	Diagonal pliers
				
	Wire stripper	Removal wrench Model: PV-MS-HZ Open-end Wrench; manufacturer: Staubli	Rubber mallet	Utility knife
				
Cable cutter	Crimping tool Model: PV-CZM-22100/19100; manufacturer: Staubli	Multimeter DC voltage measurement range ≥ 1100 V DC	Vacuum cleaner	
				
Marker	Measuring tape	Bubble or digital level	Cord end terminal crimper	

Type	Tool			
	 Heat shrink tubing	 Heat gun	 Cable tie	 Hydraulic pliers
PPE	 Safety gloves	 Safety goggles	 Dust mask	 Safety shoes

4.3 Determining the Installation Position

4.3.1 Environment Requirements

Basic Requirements

- The SUN2000 is protected to IP65 and can be installed indoors or outdoors.
- Do not install the SUN2000 in a place where personnel are easy to come into contact with its enclosure and heat sinks, because these parts are extremely hot during operation.
- Do not install the SUN2000 in areas with flammable or explosive materials.
- Do not install the SUN2000 at a place within children's reach.
- Do not install the SUN2000 outdoors in salt areas because it will be corroded there and may cause fire. A salt area refers to the region within 500 meters from the coast or prone to sea breeze. The regions prone to sea breeze vary depending on weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).
- The SUN2000 must be installed in a well-ventilated environment to ensure good heat dissipation.
- Recommended: Install the SUN2000 in a sheltered place or a place with an awning.

Mounting Structure Requirements

- The mounting structure where the SUN2000 is installed must be fireproof.
- Do not install the SUN2000 on flammable building materials.
- The SUN2000 is heavy. Ensure that the installation surface is solid enough to bear the weight load.

- In residential areas, do not install the SUN2000 on drywalls or walls made of similar materials which have a weak sound insulation performance because the noise generated by the SUN2000 is noticeable.

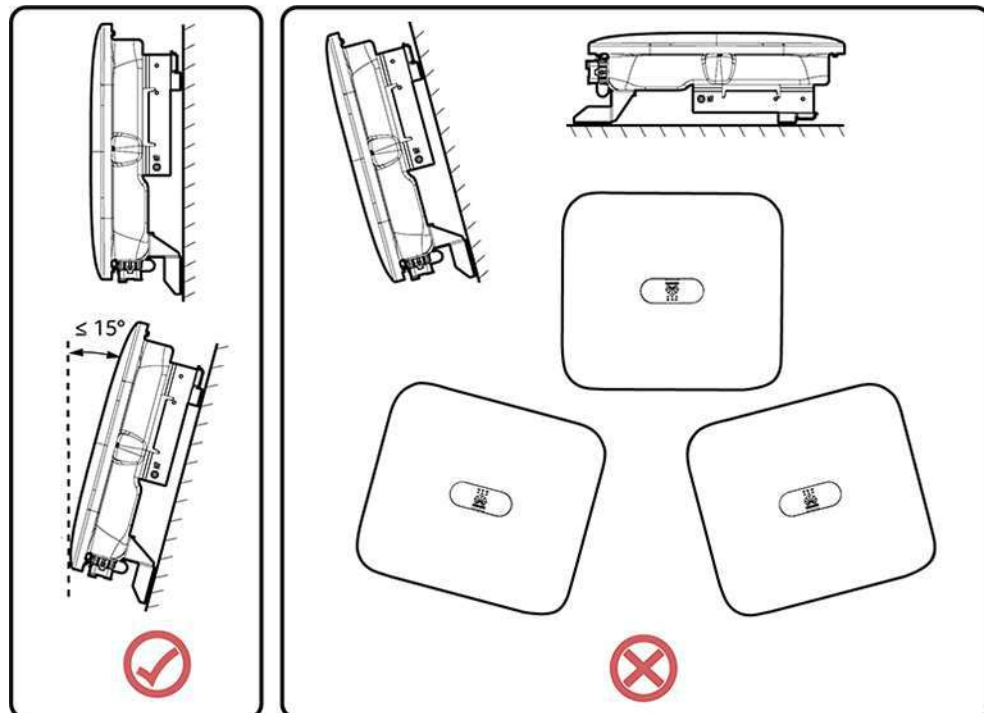
4.3.2 Space Requirements

Installation Angle Requirements

The SUN2000 can be wall-mounted or pole-mounted. The installation angle requirements are as follows:

- Install the SUN2000 vertically or at a maximum back tilt of 15 degrees to facilitate heat dissipation.
- Do not install the SUN2000 at forward tilted, excessive back tilted, side tilted, horizontal, or upside down positions.

Figure 4-1 Installation tilts

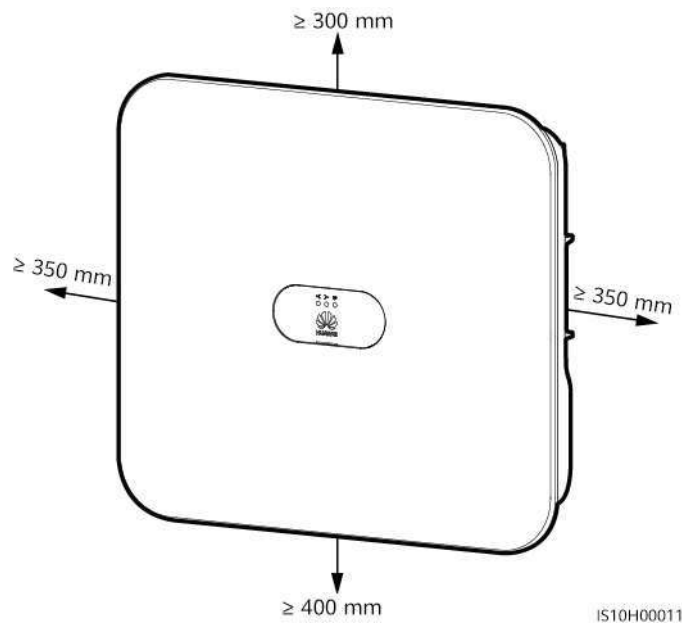


IS10H00012

Installation Space Requirements

- Reserve enough space around the SUN2000 to ensure sufficient space for installation and heat dissipation.

Figure 4-2 Installation space



- When installing multiple SUN2000s, install them in horizontal mode if sufficient space is available and install them in triangle mode if no sufficient space is available. Stacked installation is not recommended.

Figure 4-3 Horizontal installation (recommended)

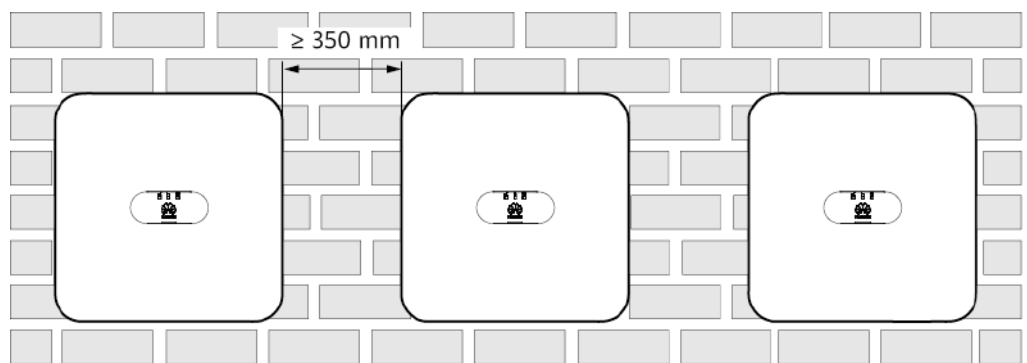
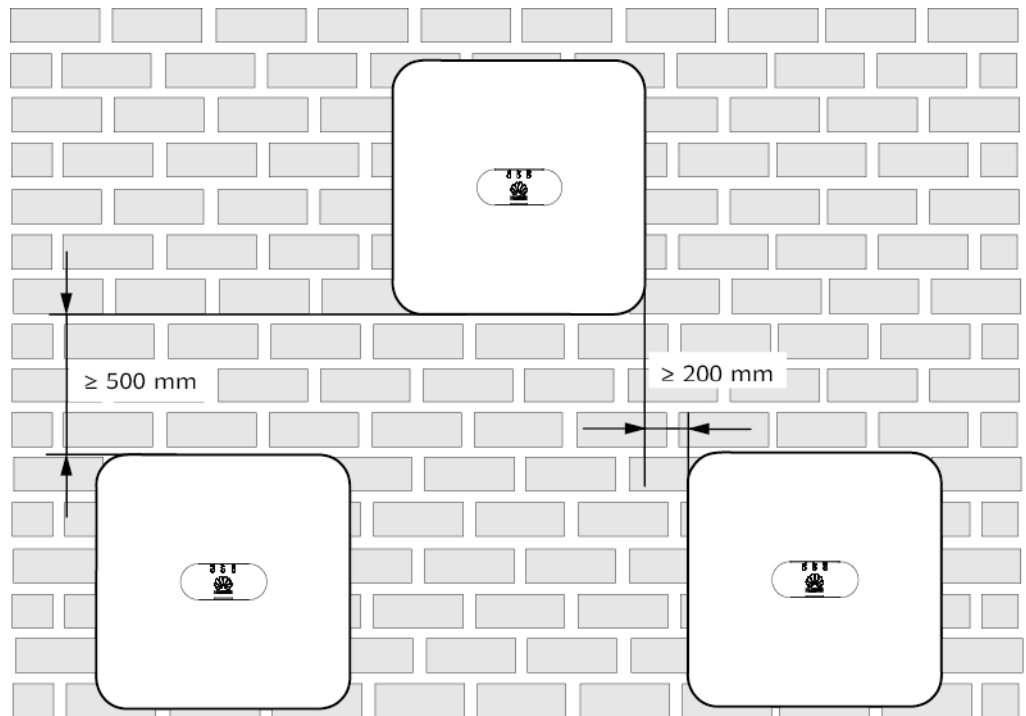
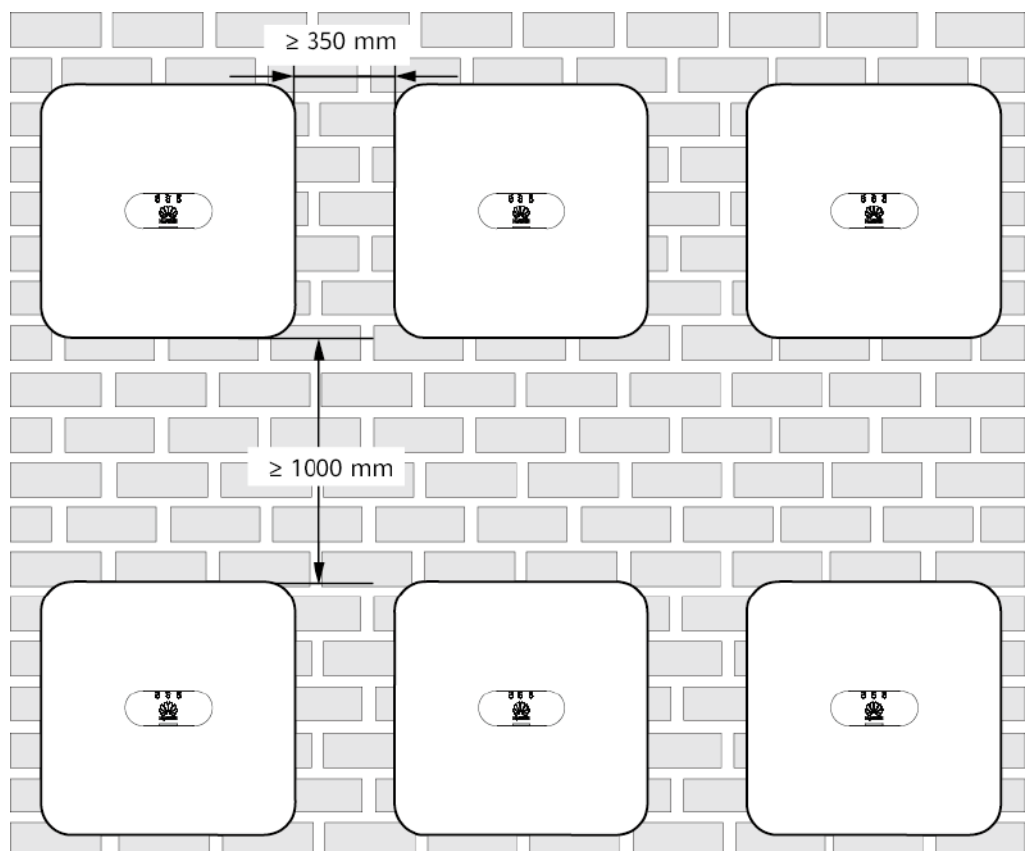


Figure 4-4 Staggered installation (recommended)



IS05W00017

Figure 4-5 Stacked installation (not recommended)



IS05W00016

4.4 Moving the SUN2000

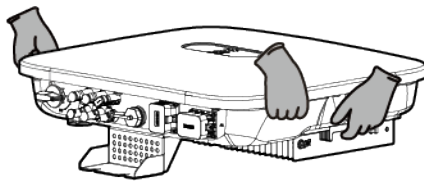
Procedure

- Step 1** Two persons are required to move the SUN2000 with one person on both sides. Lift the SUN2000 from the packing case and move it to the specified installation position.

CAUTION

- Move the SUN2000 with care to prevent device damage and personal injury.
- Do not use the wiring terminals and ports at the bottom to support any weight of the SUN2000.
- Place a foam pad or cardboard under the SUN2000 to protect the SUN2000 enclosure from damage.

Figure 4-6 Moving the SUN2000



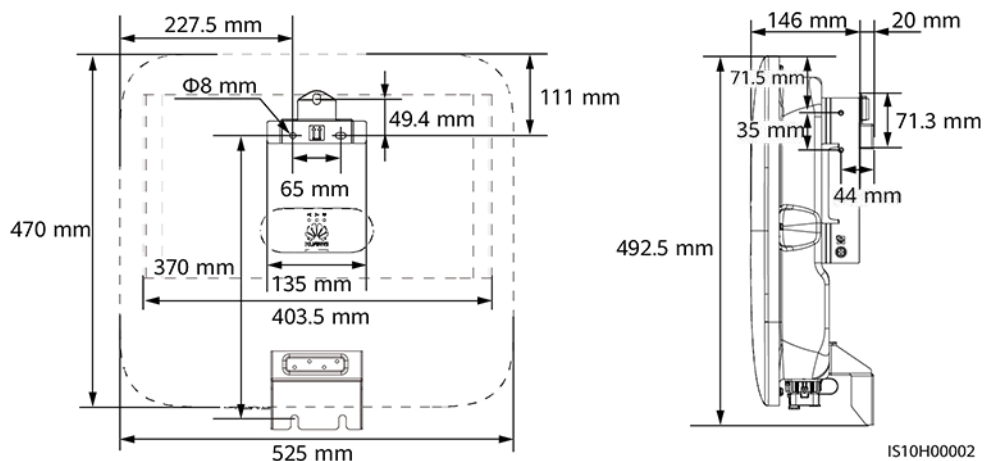
----End

4.5 Installing the Mounting Bracket

Installation Precautions

Figure 4-7 shows the dimensions of installation holes on the SUN2000.

Figure 4-7 Mounting bracket dimensions



 **NOTE**

Two M6 screw holes are reserved on both left and right sides of the enclosure for installing an awning.

4.5.1 Wall-mounted Installation

Procedure

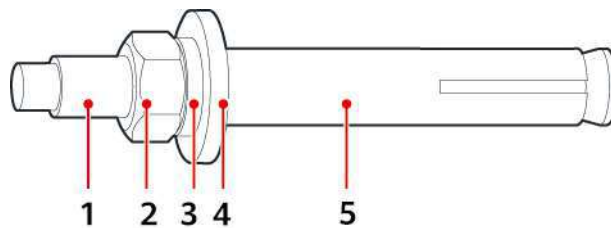
Step 1 Determine the positions for drilling holes and mark the positions using a marker.

Step 2 Secure the mounting bracket.

 **NOTE**

- M6x60 expansion bolts are delivered with the SUN2000. If the length and number of the bolts do not meet installation requirements, prepare M6 stainless steel expansion bolts by yourself.
- The expansion bolts delivered with the inverter are used for solid concrete walls. For other types of walls, prepare bolts by yourself and ensure that the wall meets the load bearing requirements of the inverter.

Figure 4-8 Expansion bolt composition



IS05W00018

(1) Bolt

(2) Nut

(3) Spring washer

(4) Flat washer

(5) Expansion sleeve

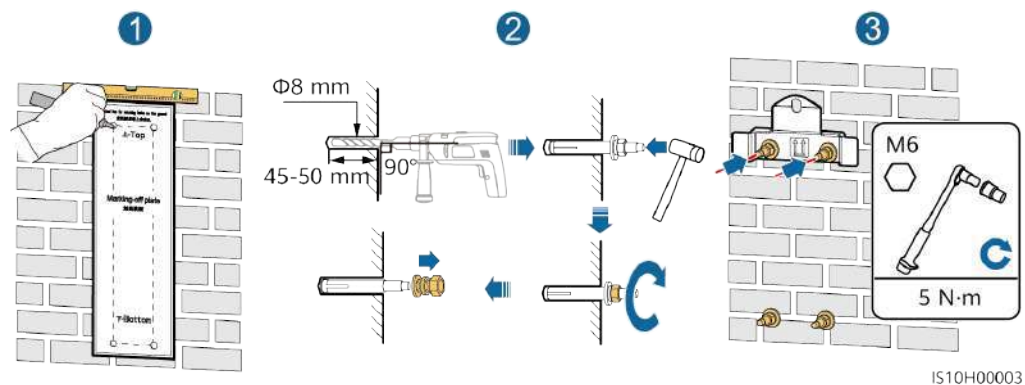
 **DANGER**

Avoid drilling holes in the water pipes and cables buried in the wall.

NOTICE

- To prevent dust inhalation or contact with eyes, wear safety goggles and an dust mask when drilling holes.
- Clean up any dust in and around the holes using a vacuum cleaner and measure the distance between holes. If the holes are inaccurately positioned, drill holes again.
- Level the top of the expansion sleeve with the concrete wall after removing the bolt, spring washer, and flat washer. Otherwise, the mounting bracket will not be securely installed on the concrete wall.
- Loosen the nuts, flat washers, and spring washers of the two expansion bolts below.

Figure 4-9 Installing the mounting bracket



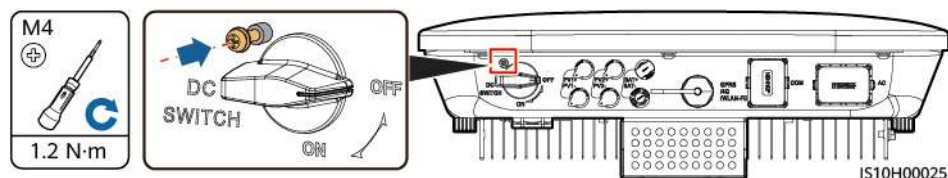
IS10H00003

Step 3 (Optional) Install the locking screw for the DC switch.

NOTE

- The locking screw for the DC switch is delivered with the SUN2000. According to the Australian standard, the locking screw is used to secure the DC switch to prevent the SUN2000 from being started by mistake.
- For the model used in Australia, perform this step based on the local standards.

Figure 4-10 Installing the locking screw for the DC switch

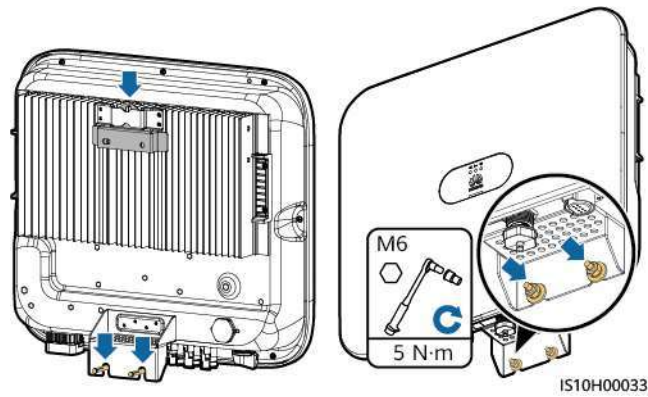


IS10H00025

Step 4 Install the SUN2000 onto the mounting bracket.

Step 5 Tighten the nut.

Figure 4-11 Installing a SUN2000

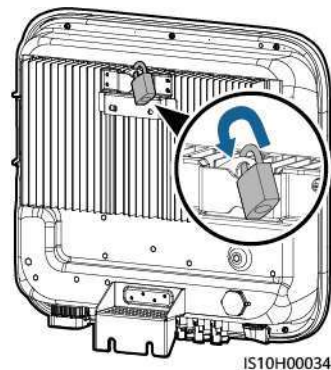


Step 6 (Optional) Install an anti-theft lock.

NOTICE

- Prepare an anti-theft lock suitable for the lock hole diameter ($\Phi 8$ mm) by yourself. Ensure that the lock can be installed successfully.
- Outdoor waterproof lock is recommended.
- Keep the key to the anti-theft lock properly.

Figure 4-12 Installing an anti-theft lock



----End

4.5.2 Support-mounted Installation

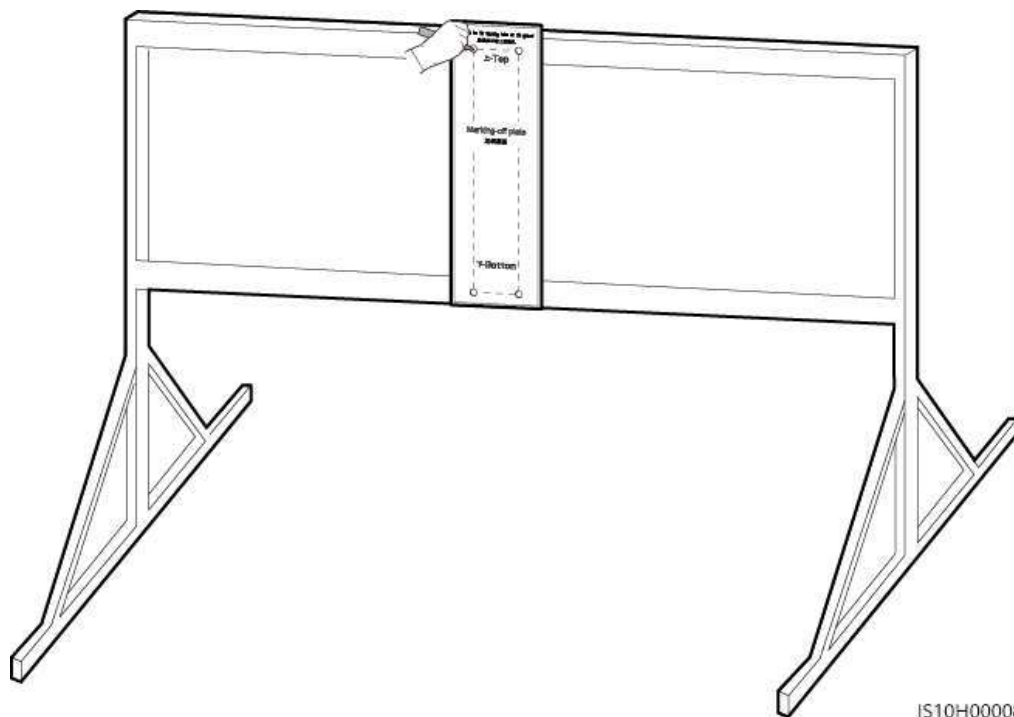
Prerequisites

Prepare M6 stainless bolt assemblies (including flat washers, spring washers, and M6 bolts) with appropriate lengths as well as matched flat washers and nuts based on the support specifications.

Procedure

Step 1 Determine the hole positions based on the marking-off template, and then mark the hole positions using a marker.

Figure 4-13 Determining the positions for drilling holes

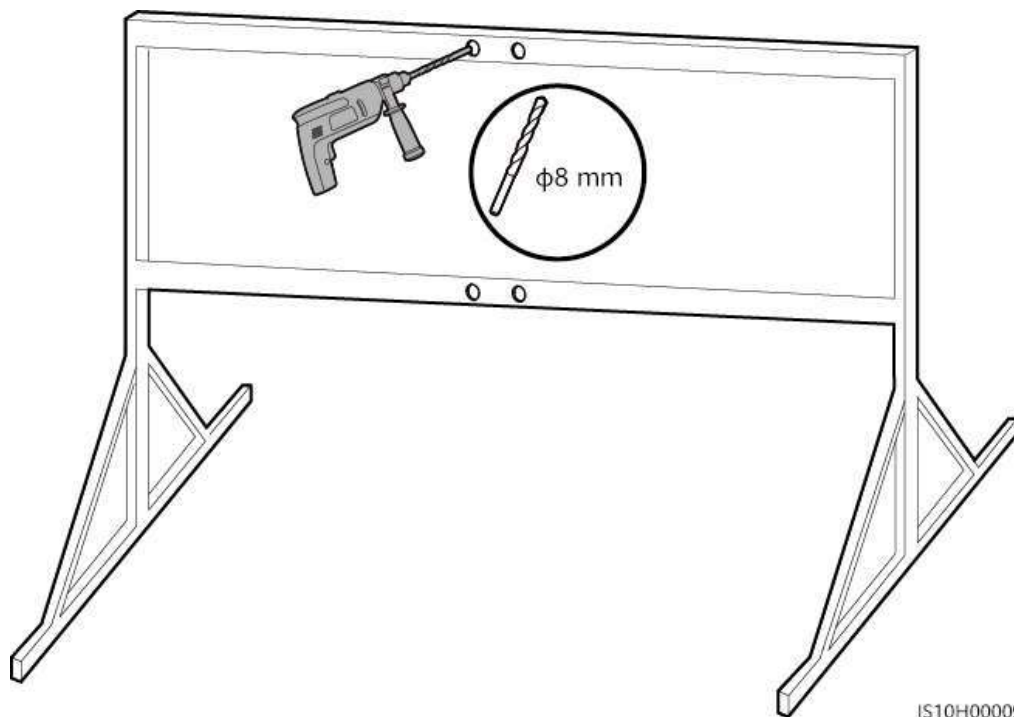


Step 2 Drill holes using a hammer drill.

NOTE

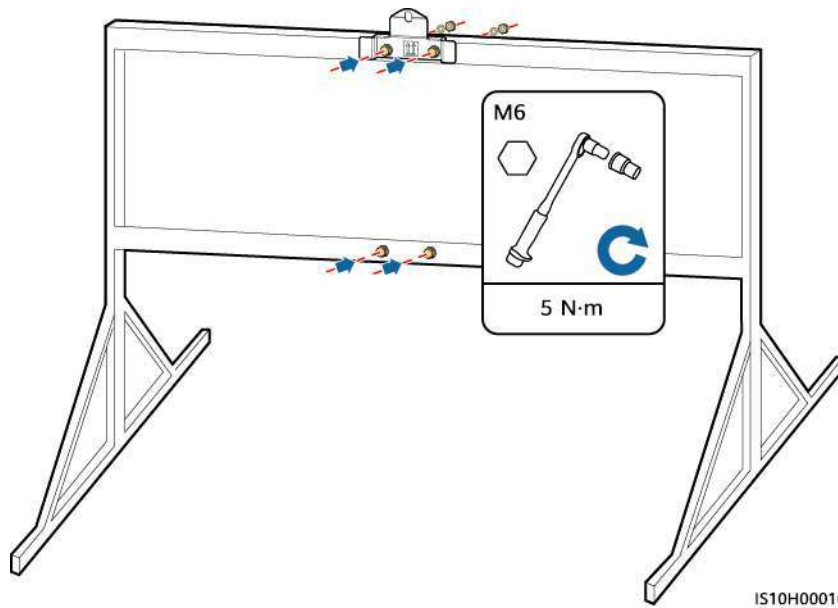
You are advised to apply anti-rust paint on the hole positions for protection.

Figure 4-14 Drilling holes



Step 3 Secure the mounting bracket.

Figure 4-15 Securing the mounting bracket

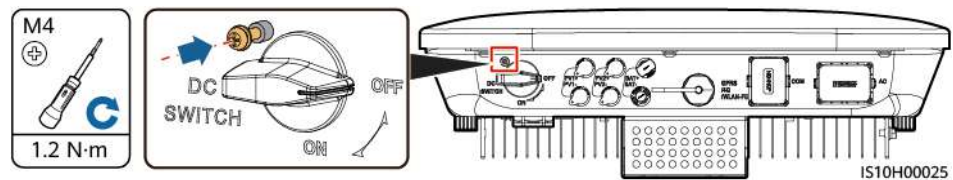


Step 4 (Optional) Install the locking screw for the DC switch.

NOTE

- The locking screw for the DC switch is delivered with the SUN2000. According to the Australian standard, the locking screw is used to secure the DC switch to prevent the SUN2000 from being started by mistake.
- For the model used in Australia, perform this step based on the local standards.

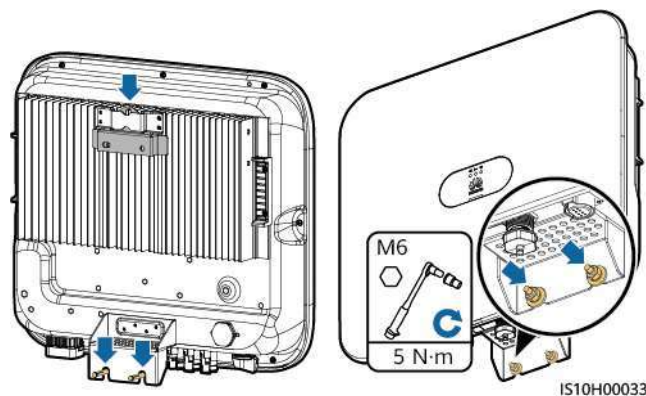
Figure 4-16 Installing the locking screw for the DC switch



Step 5 Install the SUN2000 onto the mounting bracket.

Step 6 Tighten bolt assemblies.

Figure 4-17 Installing a SUN2000

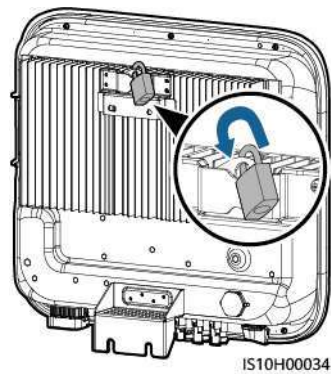


Step 7 (Optional) Install an anti-theft lock.

NOTICE

- Prepare an anti-theft lock suitable for the lock hole diameter ($\Phi 8$ mm) by yourself. Ensure that the lock can be installed successfully.
 - Outdoor waterproof lock is recommended.
 - Keep the key to the anti-theft lock properly.
-

Figure 4-18 Installing an anti-theft lock

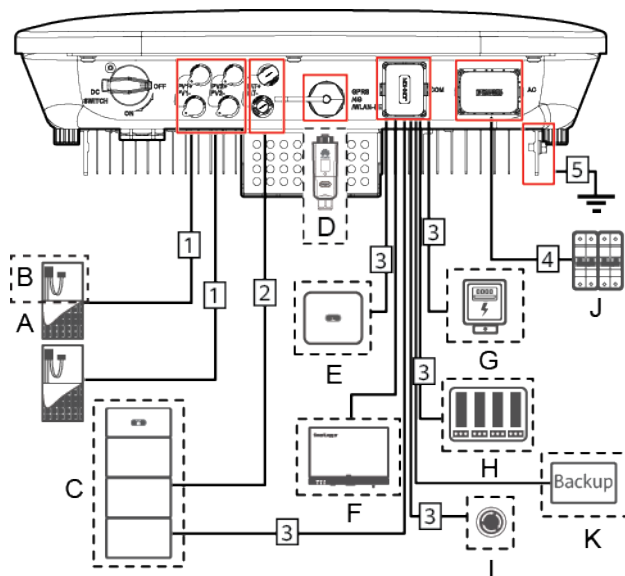


----End

5 Electrical Connections

5.1 Installation Preparation

Figure 5-1 SUN2000 cable connections (dashed boxes indicate optional components)



NOTICE

If a Smart Dongle is configured, it is recommended that you install it before connecting the signal cable.

Table 5-1 Component description

No.	Component	Description	Source
A	PV module	<ul style="list-style-type: none"> A PV string is composed of the PV modules connected in series and can work with an optimizer. The SUN2000 supports the input from two PV strings. 	Prepared by users
B	(Optional) Smart PV optimizer	The SUN2000-450W-P smart PV optimizer is supported.	Purchased from Huawei
C	(Optional) Battery	The LUNA2000-5-S0, LUNA2000-10-S0, and LUNA2000-15-S0 batteries can be connected to the SUN2000.	Purchased from Huawei
D	(Optional) Smart Dongle ¹	Supported models: <ul style="list-style-type: none"> WLAN-FE Smart Dongle: SDongleA-05 4G Smart Dongle: SDongleA-03 	Purchased from Huawei
E	(Optional) SUN2000	Select a proper model as required.	Purchased from Huawei
F	(Optional) SmartLogger	Select a proper model as required.	Purchased from Huawei
G	(Optional) Power meter	The DTSU666-H power meter is recommended.	Purchased from Huawei
H	(Optional) Power grid scheduling device	Select the devices that meet the power grid scheduling requirements.	Provided by the local power grid company
I	(Optional) Rapid shutdown switch	Select a proper model as required.	Prepared by users

No.	Component	Description	Source
J	AC switch	Recommended: a three-phase AC circuit breaker with a rated voltage greater than or equal to 380 V AC and a rated current of: <ul style="list-style-type: none"> • 16 A (SUN2000-3KTL-M1, SUN2000-4KTL-M1, SUN2000-5KTL-M1, and SUN2000-6KTL-M1) • 25 A (SUN2000-8KTL-M1 and SUN2000-10KTL-M1) 	Prepared by users
K	(Optional) Smart Backup Box	Select a proper model as required.	Purchased from Huawei

Note 1:

- For details about how to operate the WLAN-FE Smart Dongle SDongleA-05, see *SDongleA-05 Quick Guide (WLAN-FE)*.
- For details about how to operate the 4G Smart Dongle SDongleA-03, see *SDongleA-03 Quick Guide (4G)*.

You can obtain the quick guide at <https://support.huawei.com/enterprise/en/index.html> by searching for the Smart Dongle model.

Table 5-2 Cable description

No.	Name	Type	Recommended Specifications
1	DC input power cable	Common outdoor PV cable in the industry (Recommended model: PV1-F)	<ul style="list-style-type: none"> • Conductor cross-sectional area: 4–6 mm² • Cable outer diameter: 5.5–9 mm
2	(Optional) Battery cable		
3	(Optional) Signal cable ^a	Outdoor shielded twisted pair	<ul style="list-style-type: none"> • Conductor cross-sectional area: 0.2–1 mm² • Cable outer diameter: 4–11 mm

No.	Name	Type	Recommended Specifications
4	AC output power cable ^b	Outdoor copper cable	<ul style="list-style-type: none"> Conductor cross-sectional area: 4–6 mm² Cable outer diameter: 10–21 mm
5	PE cable	Single-core outdoor copper-core cable	Conductor cross-sectional area: ≥ 4 mm ²

Note a: When the smart power sensor and battery are connected to the SUN2000 at the same time, use a cable core with a cross-sectional area of 0.2 mm² to 0.5 mm².

Note b: The minimum cable diameter depends on the fuse rating on the AC side.

 NOTE

- The minimum cable diameter should comply with the local cable standard.
- Factors influencing cable selection are as follows: rated current, type of cable, routing method, ambient temperature, and maximum desired line losses.

5.2 Connecting the PE cable

Important Notes

 **DANGER**

- Ensure that the PE cable is securely connected. Otherwise, electric shocks may occur.
- Do not connect the N wire to the enclosure as a PE cable. Otherwise, electric shocks may occur.

 NOTE

- The PE point at the AC output port is used only as a PE equipotential point, not a substitute for the PE point on the enclosure.
- It is recommended that silica gel or paint be applied around the ground terminal after the PE cable is connected.

Supplementary Notes

The SUN2000 has the grounding detection function. This function is used to check whether the SUN2000 is properly grounded before the SUN2000 starts, or check

whether the SUN2000 ground cable is disconnected when the SUN2000 is running. This function is used to check whether the SUN2000 is properly grounded under limited conditions. To ensure the safe operation of the SUN2000, properly ground the SUN2000 according to the connection requirements of the ground cable. For some power grid types, if the output side of the SUN2000 is connected to an isolation transformer, ensure that the SUN2000 is properly grounded and set **Isolation to Input ungrounded, with TF** to enable the SUN2000 to run properly.

- According to IEC 62109, to ensure the safe operation of the SUN2000 in the case of ground cable damage or disconnection, properly connect the ground cable of the SUN2000 and ensure that it meets at least one of the following requirements before the grounding detection function becomes invalid.
 - The ground cable is a single-core outdoor copper cable with a conductor cross-sectional area greater than or equal to 10 mm².
 - Use cables with the same diameter as the AC output power cable and ground the PE terminal on the AC connector and the ground screw on the chassis.
- In some countries and regions, the SUN2000 must have additional ground cables. Use cables with the same diameter as the AC output power cable and ground the PE terminal on the AC connector and the ground screw on the chassis.

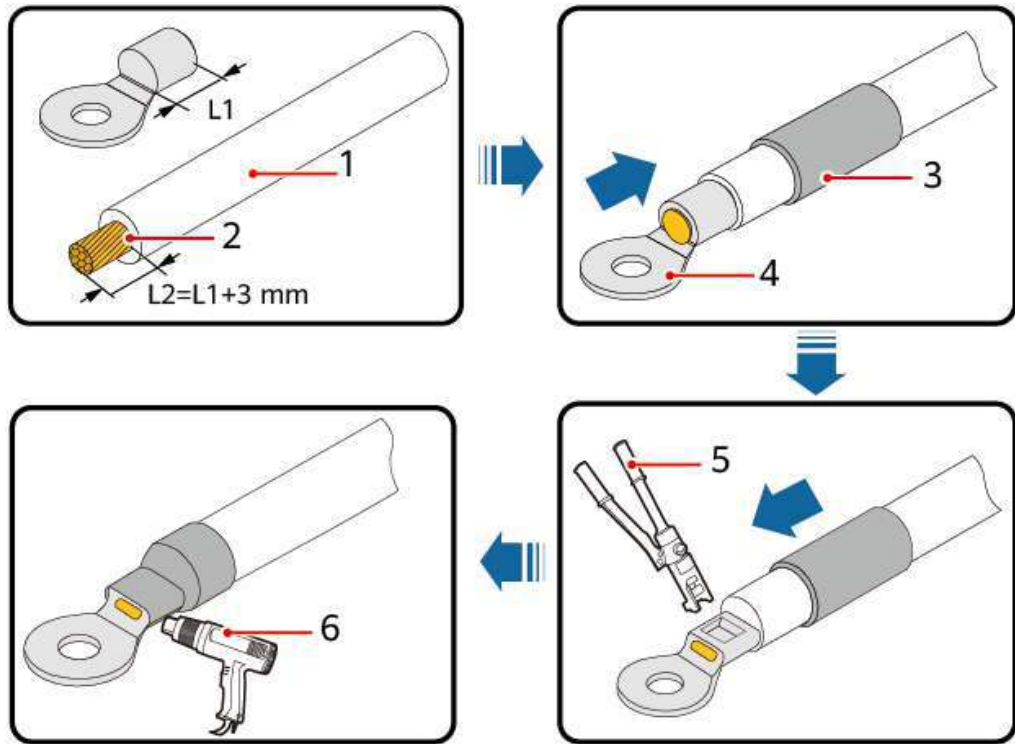
Procedure

Step 1 Crimp OT terminals.

NOTICE

- Avoid scratching the core wire when stripping a cable.
 - The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wires completely. The core wires must contact the OT terminal closely.
 - Wrap the wire crimping area with heat shrink tubing or PVC insulation tape. The heat shrink tubing is used as an example.
 - When using a heat gun, protect devices from being scorched.
-

Figure 5-2 Crimping an OT terminal

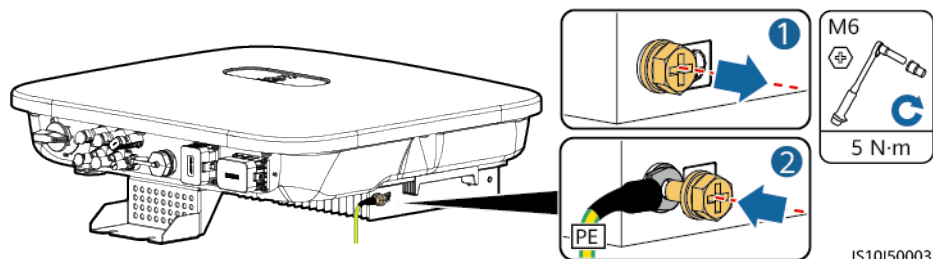


IS06Z00001

- | | | |
|-----------------|-------------------|------------------------|
| (1) Cable | (2) Core | (3) Heat shrink tubing |
| (4) OT terminal | (5) Crimping tool | (6) Heat gun |

Step 2 Connect the PE cable.

Figure 5-3 Connecting the PE cable



----End

5.3 Connecting the AC Output Power Cable

Precautions

A three-phase AC switch needs to be installed on the AC side of the SUN2000. To ensure that the SUN2000 can safely disconnect itself from the power grid when an

exception occurs, select a proper overcurrent protection device in compliance with local power distribution regulations.

WARNING

Do not connect loads between the SUN2000 and the AC switch directly connected to it.

The SUN2000 is integrated with a comprehensive residual current monitoring unit. Once detecting that the residual current exceeds the threshold, the SUN2000 immediately disconnects itself from the power grid.

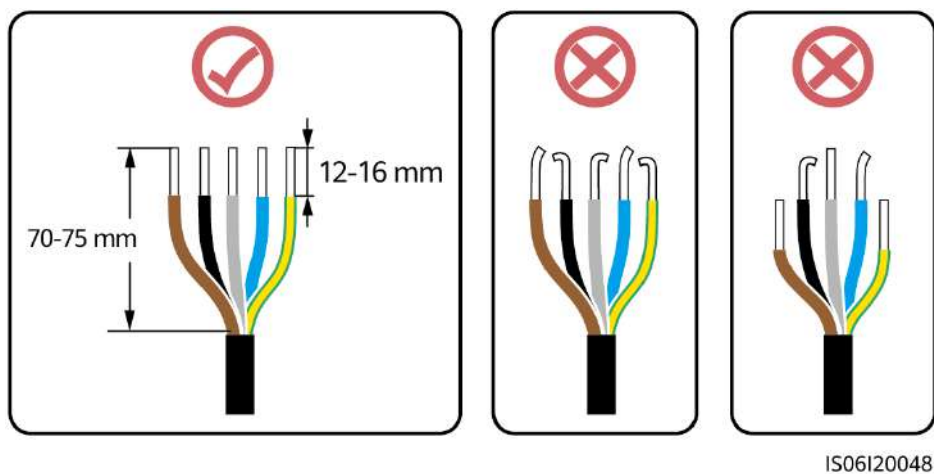
NOTICE

- If the external AC switch can perform earth leakage protection, the rated leakage action current should be greater than or equal to 100 mA.
- If multiple SUN2000s connect to the general residual current device (RCD) through their respective external AC switches, the rated leakage action current of the general RCD should be greater than or equal to the number of SUN2000s multiplied by 100 mA.
- A knife switch cannot be used as an AC switch.

Procedure

Step 1 Connect the AC output power cable to the AC connector.

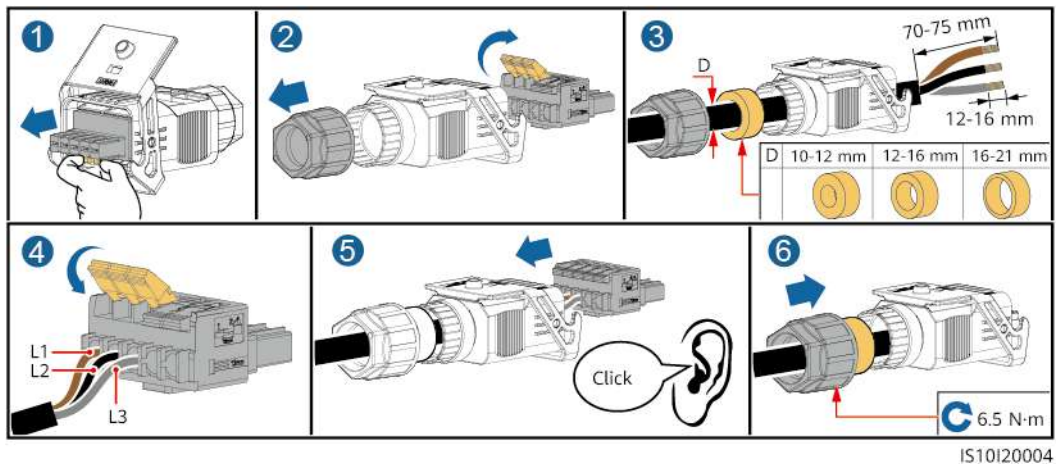
Figure 5-4 Stripping requirements



NOTICE

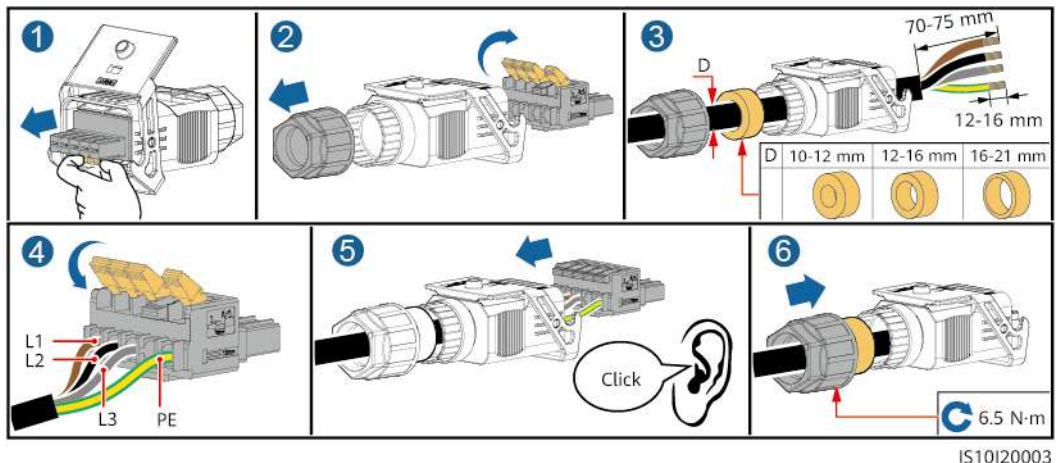
- Ensure that the cable jacket is inside the connector.
- Ensure that the exposed core wire is totally inserted into the cable hole.
- Ensure that AC terminations provide firm and solid electrical connections. Failing to do so may cause SUN2000 malfunction and damage to its AC connectors.
- Ensure that the cable is not twisted.

Figure 5-5 Three-core cable (L1, L2, and L3)



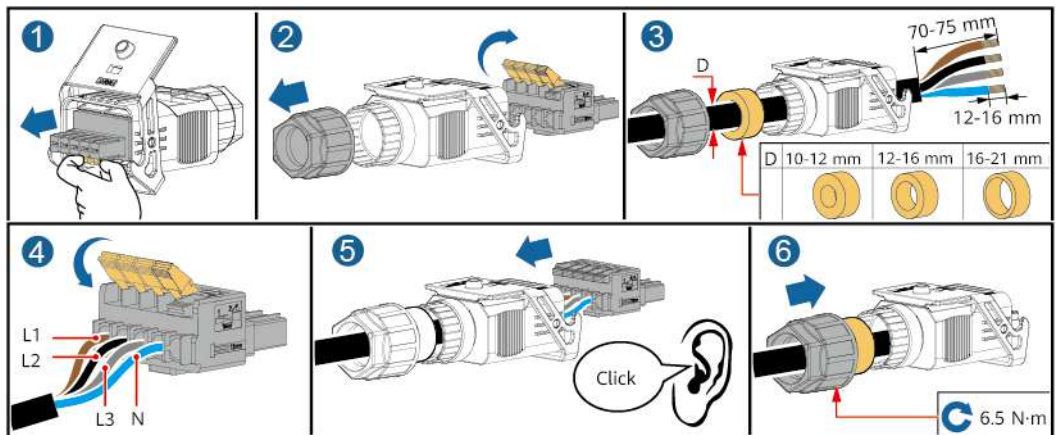
IS10I20004

Figure 5-6 Four-core cable (L1, L2, L3, and PE)



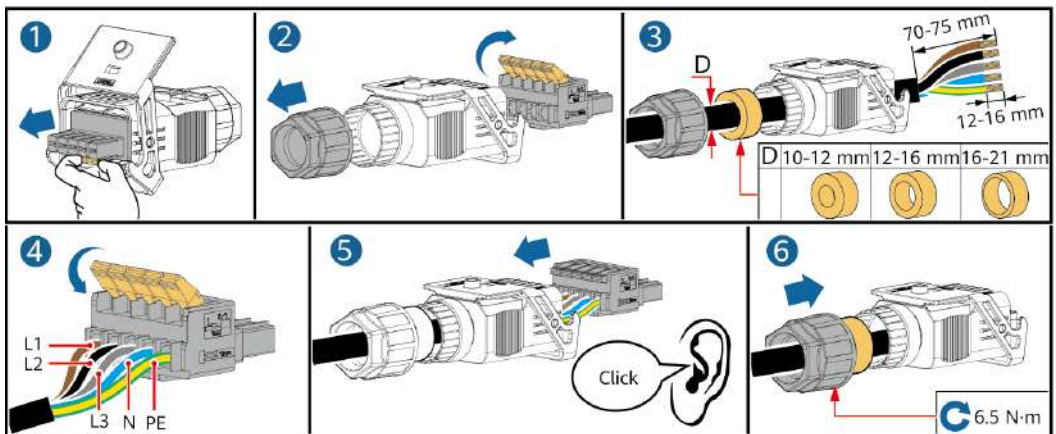
IS10I20003

Figure 5-7 Four-core cable (L1, L2, L3, and N)



IS10I20002

Figure 5-8 Five-core cable (L1, L2, L3, N, and PE)



IS10I20001

NOTE

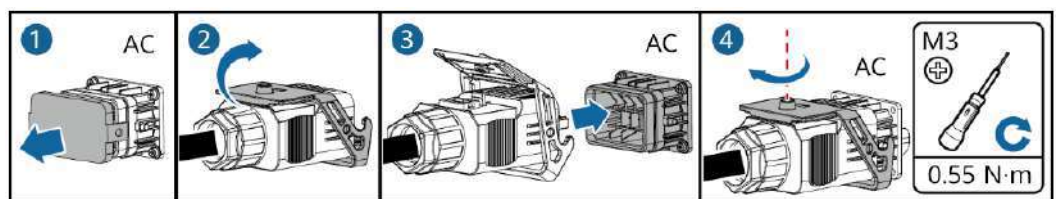
The cable colors shown in the figures are for reference only. Select an appropriate cable according to local standards.

Step 2 Connect the AC connector to the AC output port.

NOTICE

Ensure that the AC connector is connected securely.

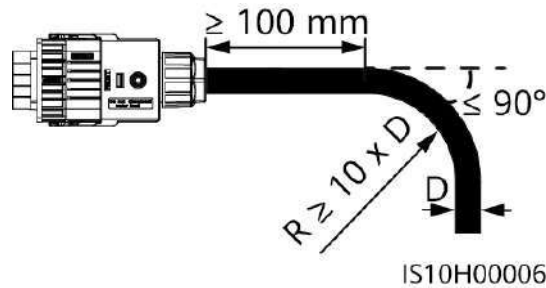
Figure 5-9 Securing the AC connector



IS10I20005

Step 3 Check the route of the AC output power cable.

Figure 5-10 Cable route



----End

Disconnection

Disconnection can be performed in reverse order.

5.4 Installing DC Input Power Cables

Important Notes

⚠ DANGER

- Before connecting the DC input power cable, ensure that the DC voltage is within the safe range (lower than 60 V DC) and that the DC switch on the SUN2000 is OFF. Otherwise, electric shocks may occur.
 - When the SUN2000 is operating, it is not allowed to work on the DC input power cables, such as connecting or disconnecting a PV string or a PV module in a PV string. Otherwise, electric shocks may occur.
 - If no PV string connects to a DC input terminal of the SUN2000, do not remove the watertight cap from the DC input terminals. Otherwise, the IP rating of the SUN2000 will be affected.
-

WARNING

Ensure that the following conditions are met. Otherwise, the SUN2000 may be damaged, or even fire could happen.

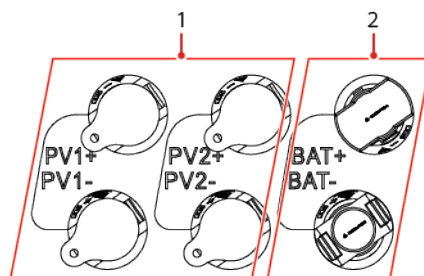
- PV modules connected in series in each PV string are of the same specifications.
- The open-circuit voltage of each PV string must always be 1100 V DC or lower.
- The maximum short-circuit current of each PV string must always be 15 A or lower.
- The polarities of electric connections are correct on the DC input side. The positive and negative terminals of a PV string connect to corresponding positive and negative DC input terminals of the SUN2000.
- If polarity of the DC input power cable is reversed, do not turn off the DC switch immediately or remove positive and negative connectors. Wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A, and then turn off the DC switch and remove the positive and negative connectors. Correct the PV string polarity before reconnecting the PV string to the SUN2000.

NOTICE

- Since the output of the PV string connected to the SUN2000 cannot be grounded, ensure that the PV module output is well insulated to ground.
- During the installation of PV strings and the SUN2000, the positive or negative terminals of PV strings may be short-circuited to ground if the power cable is not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the SUN2000. The caused device damage is not covered under any warranty.

Terminal Description

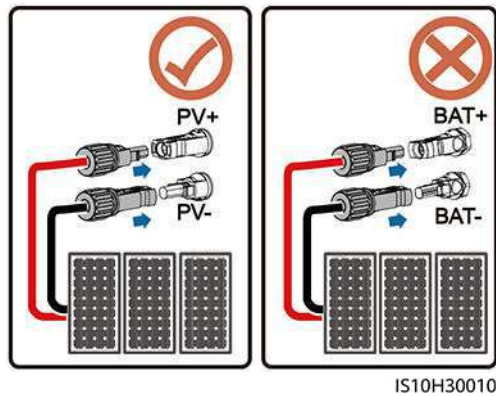
Figure 5-11 Terminal



(1) DC input terminal

(2) Battery terminal

Figure 5-12 Correct wiring terminals



Procedure

Step 1 Install the DC input power cables.

WARNING

Before inserting the positive and negative connectors into the positive and negative DC input terminals of the SUN2000, ensure that the DC switch is set to OFF.

CAUTION

Use the positive and negative Staubli MC4 metal terminals and DC connectors supplied with the SUN2000. Using incompatible positive and negative metal terminals and DC connectors may result in serious consequences. The caused device damage is not covered under warranty.

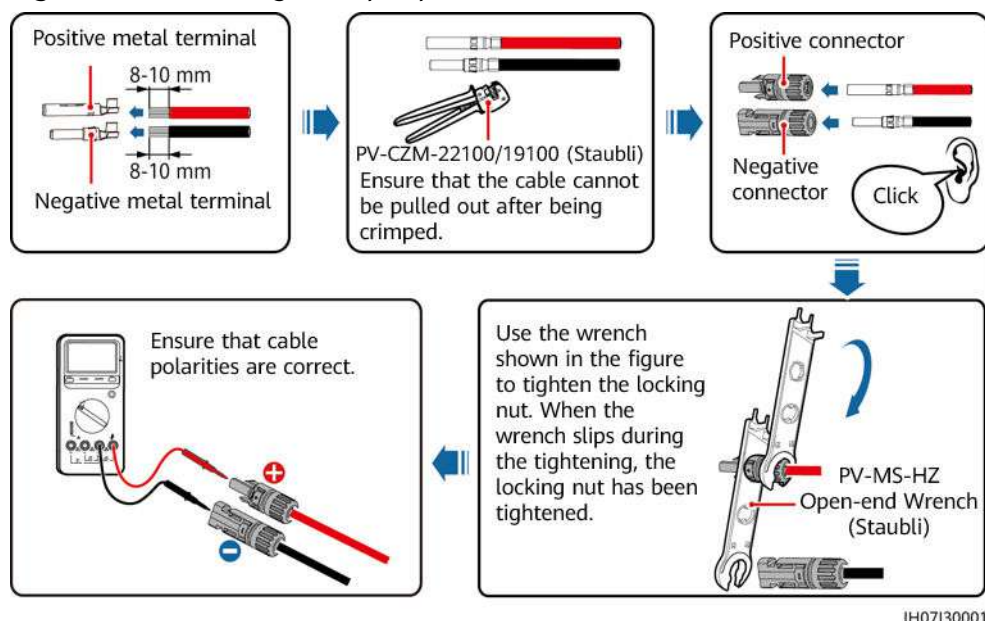
NOTICE

- Cables with high rigidity, such as armored cables, are not recommended as DC input power cables, because poor contact may be caused by the bending of the cables.
- Before assembling DC connectors, label the cable polarities correctly to ensure correct cable connections.
- After crimping the positive and negative metal terminals, pull back the DC input power cables to ensure that they are securely connected.
- Insert the crimped metal terminals of the positive and negative power cables into the appropriate positive and negative connectors. Then pull back the DC input power cables to ensure that they are connected securely.
- If a DC input power cable is reversely connected and the DC switch is turned on, do not operate on the DC switch or the positive/negative connectors immediately. Otherwise, the device may be damaged. The caused device damage is not covered under any warranty. Wait until the solar irradiance declines at night and the PV string current reduces to below 0.5 A, and then turn off the DC switch and remove the positive and negative connectors. Correct the PV string polarity before reconnecting the PV string to the SUN2000.

NOTE

- The DC voltage measurement range of the multimeter must be at least 1100 V.
- If the voltage is a negative value, the DC input polarity is incorrect. Correct the polarity.
- If the voltage is greater than 1100 V DC, too many PV modules configured to the same string. Remove some PV modules.
- If the PV string is configured with an optimizer, check the cable polarity by referring to the smart PV optimizer quick guide.

Figure 5-13 Installing DC input power cables



----End

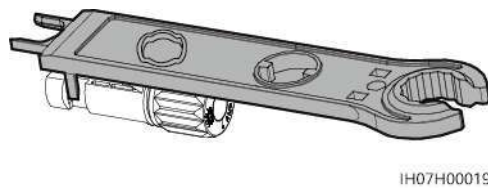
Removing DC Connectors

WARNING

Before removing the positive and negative connectors, ensure that the DC switch is OFF.

To remove the positive and negative connectors from the SUN2000, insert an open-end wrench into the bayonet and press the wrench with force. Then remove the DC connectors with caution.

Figure 5-14 Removing DC connectors



5.5 (Optional) Connecting Battery Cables

Prerequisites

DANGER

- Battery short-circuit may cause personal injury. The high transient current generated by a short-circuit may release a surge of energy and cause fire.
- Do not connect or disconnect the battery cables when the SUN2000 is running. Otherwise, electric shocks may occur.
- Before connecting the battery cables, ensure that the DC switch on the SUN2000 and all the switches connecting to the SUN2000 are OFF, and the SUN2000 has no residual electricity. Otherwise, the high voltage of the SUN2000 and battery may result in electric shocks.
- If no battery connects to the SUN2000, do not remove the watertight caps from the battery terminals. Otherwise, the protection level of the SUN2000 will be affected. If a battery connects to the SUN2000, set aside the watertight caps. Reinstall the watertight caps immediately after removing the connectors.

A battery switch can be configured between the SUN2000 and the battery to ensure that the SUN2000 can be safely disconnected from the battery.

 **WARNING**

- Do not connect loads between the SUN2000 and the battery.
 - The battery cables should be connected correctly. That is, the positive and negative terminals of the battery connect to the positive and negative battery terminals on the SUN2000 respectively. Otherwise, the SUN2000 may be damaged, or even fire could happen.
-

NOTICE

- During the installation of batteries and the SUN2000, the positive or negative terminals of batteries may be short-circuited to ground if the power cable is not properly installed or routed. In this case, an AC or DC short circuit may occur and damage the SUN2000. The caused device damage is not covered under any warranty.
 - The cabling distance between the battery and the SUN2000 should be less than or equal to 10 meters (recommended: within 5 meters).
-

Procedure

- Step 1** Assemble the positive and negative connectors by referring to [5.4 Installing DC Input Power Cables](#).

 **DANGER**

- The battery voltage may result in serious injury. Use dedicated insulation tools when connecting cables.
 - Ensure that cables are correctly connected between the battery terminal and the battery switch, and between the battery switch and the SUN2000 battery terminal.
-

NOTICE

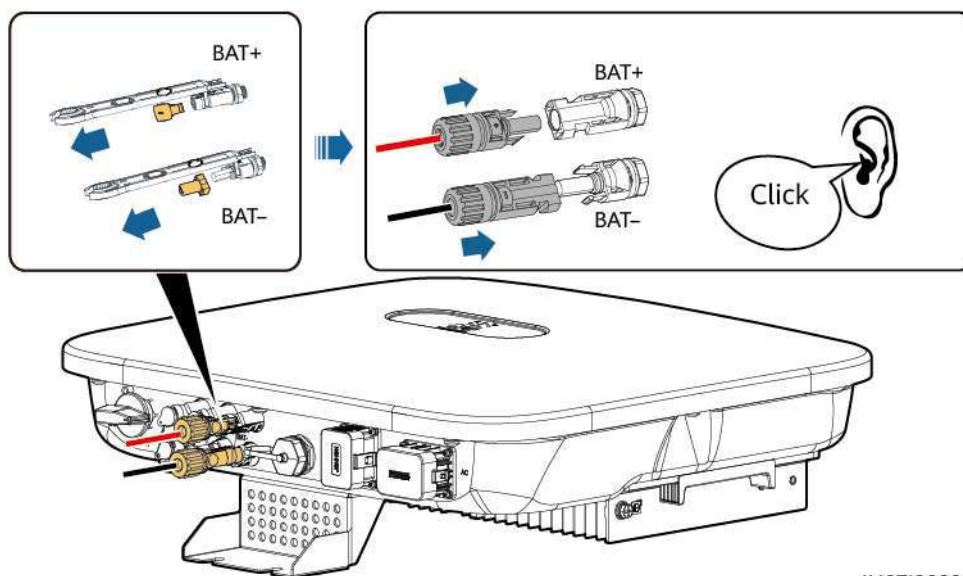
Cables with high rigidity, such as armored cables, are not recommended as battery cables, because poor contact may be caused by the bending of the cables.

- Step 2** Insert the positive and negative connectors into corresponding battery terminals on the SUN2000.

NOTICE

After the positive and negative connectors snap into place, pull the battery cables back to ensure that they are connected securely.

Figure 5-15 Connecting battery cables



IH07130003

----End

5.6 Installing the Smart Dongle

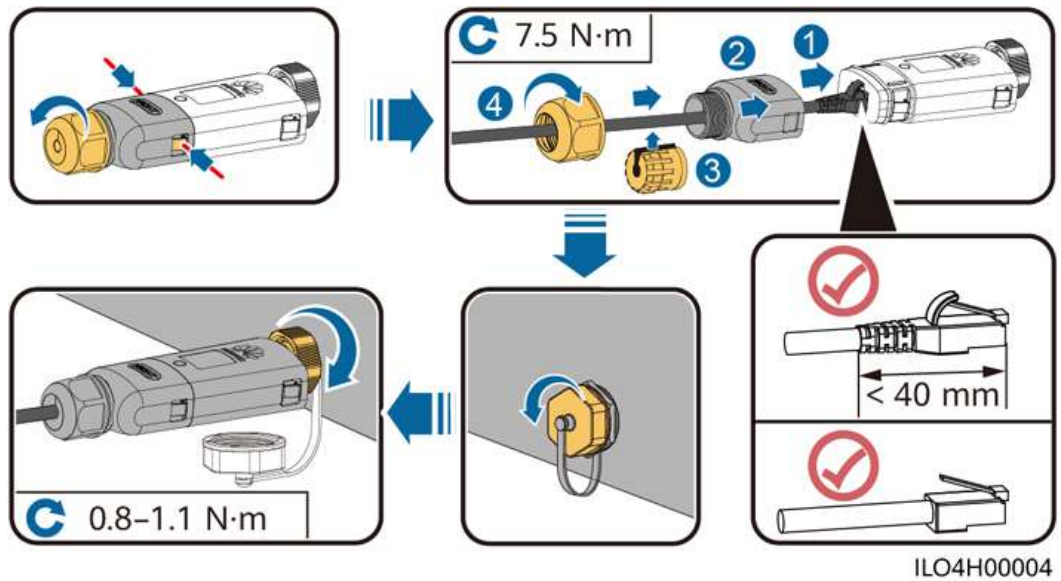
Procedure

NOTE

- If WLAN-FE communication is used, install the WLAN-FE Smart Dongle (SDongleA-05). The WLAN-FE Smart Dongle is delivered with the SUN2000.
- If 4G communication is used, install the 4G Smart Dongle (SDongleA-03). The 4G Smart Dongle needs to be purchased by the user.
- WLAN-FE Smart Dongle (FE Communication)

You are advised to use a Cat 5e outdoor shielded network cable (outer diameter < 9 mm; internal resistance ≤ 1.5 ohms/10 m) and shielded RJ45 connectors.

Figure 5-16 Installing a WLAN-FE Smart Dongle (FE communication)

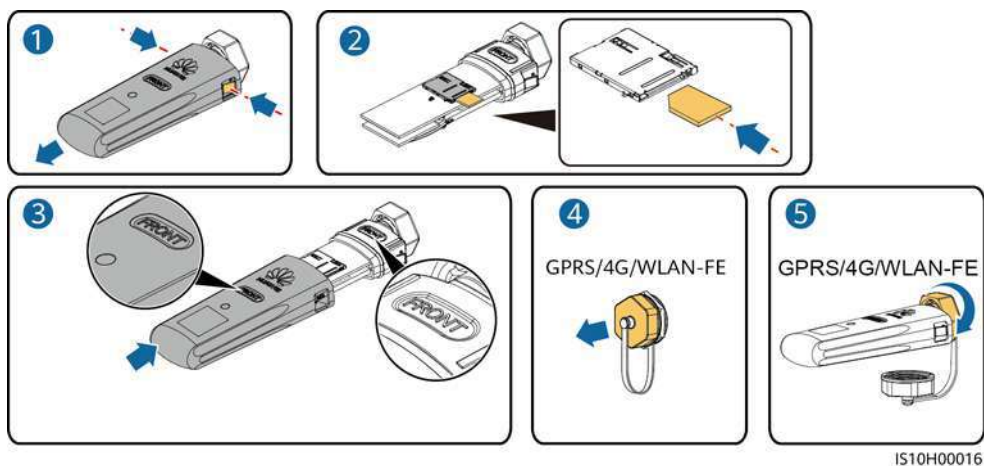


- (Optional) 4G Smart Dongle (4G communication)

NOTE

- If your Smart Dongle is not equipped with a SIM card, prepare a standard SIM card (size: 25 mm x 15 mm) with the capacity greater than or equal to 64 KB.
- When installing the SIM card, determine its installation direction based on the silk screen and arrow on the card slot.
- Press the SIM card in place to lock it, indicating that the SIM card is correctly installed.
- When removing the SIM card, push it inwards to eject it.
- When reinstalling the shell of the Smart Dongle, ensure that the buckle springs back in place and a click sound is generated.

Figure 5-17 Installing a 4G Smart Dongle



 NOTE

There are two types of Smart Dongle.

- For details about how to operate the WLAN-FE Smart Dongle SDongleA-05, see [SDongleA-05 Quick Guide \(WLAN-FE\)](#). You can also scan the QR code to obtain the document.



- For details about how to operate the 4G Smart Dongle SDongleA-03, see [SDongleA-03 Quick Guide \(4G\)](#). You can also scan the QR code to obtain the document.



The quick guide is delivered with the Smart Dongle.

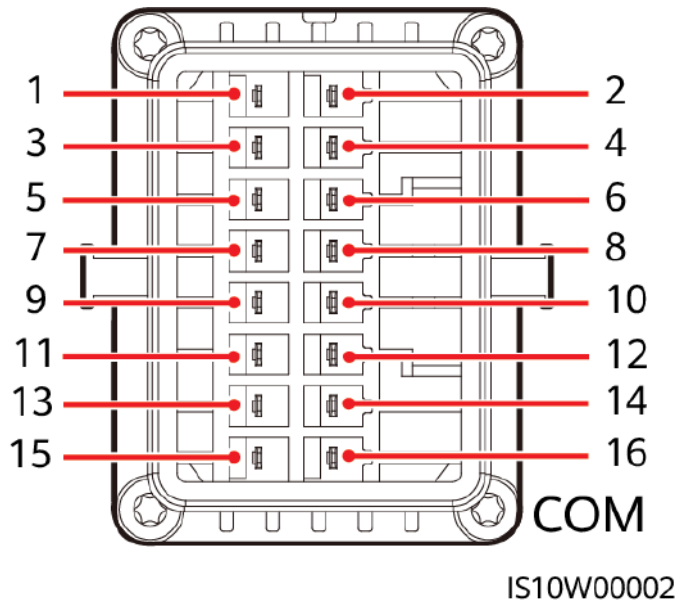
5.7 (Optional) Connecting the Signal Cable

COM Port Pin Definitions

NOTICE

- When laying out the signal cable, separate it from the power cable and keep it away from strong interference sources to avoid strong communication interference.
 - Ensure that the protective layer of the cable is inside the connector, that excess core wires are cut off from the protection layer, that the exposed core wire is totally inserted into the cable hole, and that the cable is connected securely.
-

Figure 5-18 Pin definitions



NOTE

- If the RS485 communications cables of devices such as the smart power sensor and battery are connected to the SUN2000 at the same time, the pins RS485A2 (pin 7), RS485B2 (pin 9), and PE (pin 5) are shared.
- If both the battery enable signal cable and rapid shutdown switch signal cable are connected to the SUN2000 at the same time, the GND pin (pin 13) is shared.

Pin	Definition	Functions	Remarks	Pin	Definition	Functions	Remarks
1	485A1-1	RS485A, RS485 differential signal+	Used for SUN2000 cascading or connecting to the RS485 signal port on the SmartLogger	2	485A1-2	RS485A, RS485 differential signal+	Used for SUN2000 cascading or connecting to the RS485 signal port on the SmartLogger
3	485B1-1	RS485B, RS485 differential signal-		4	485B1-2	RS485B, RS485 differential signal-	
5	PE	Ground point on the shield layer	-	6	PE	Ground point on the shield layer	-

Pin	Definition	Functions	Remarks	Pin	Definition	Functions	Remarks
7	485A2	RS485A, RS485 differential signal+	Used to connect to the RS485 signal port on a power meter or battery	8	DIN1	Digital input signal 1+	Used to connect to dry contacts for grid scheduling or serve as a port for the feedback signal of the Backup Box.
9	485B2	RS485B, RS485 differential signal-		10	DIN2	Digital input signal 2+	
11	EN	Enable signal	Used to connect to the enable signal of the battery.	12	DIN3	Digital input signal 3+	Used to connect to dry contacts for grid scheduling
13	GND	GND	-	14	DIN4	Digital input signal 4+	
15	DIN5	Rapid shutdown	Used to connect to the rapid shutdown DI signal port or serve as a port for the signal cable of the NS protection.	16	GND	GND of DI1/DI2/DI3/ DI4	Used to connect to the GND of DI1/DI2/DI3/ DI4

Networking Modes

- Smart Dongle networking

Figure 5-19 Smart Dongle networking (the dashed box indicates optional components)

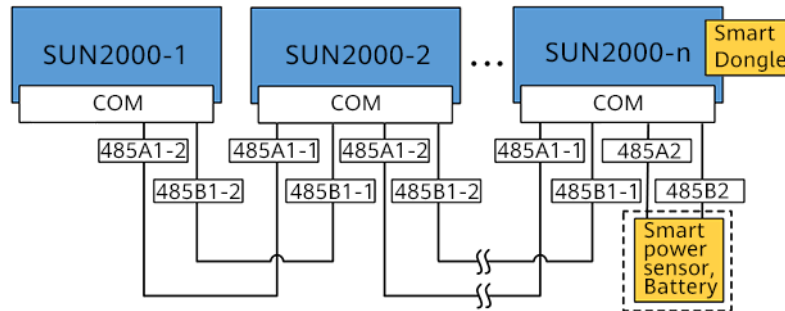


Table 5-3 Usage Restrictions

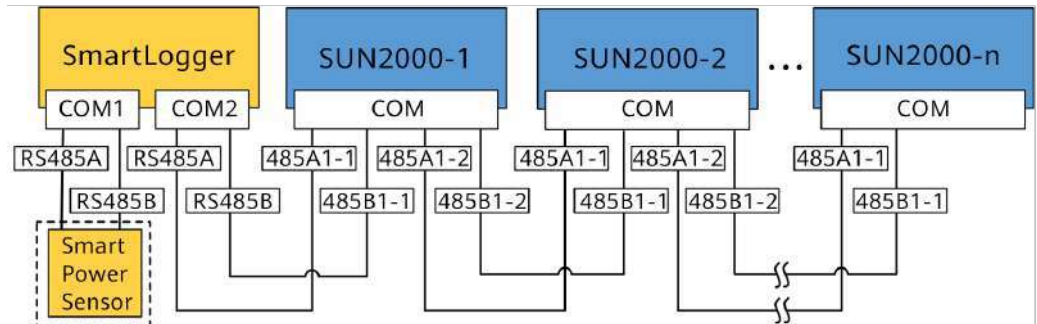
Smart Dongle	Usage Restrictions	Actual Connection	
	Maximum Number of Devices That Can Be Connected to the Smart Dongle	Number of SUN2000s	Number of Other Devices ^a
4G	10	$n \leq 10$	$\leq 10-n$
WLAN-FE	10	$n \leq 10$	$\leq 10-n$

Note a: If the power meter and battery are connected through the RS485A2 and RS485B2 ports, they are not included as cascaded devices.

NOTE

- If the SUN2000 is networked with the Smart Dongle, it cannot connect to the SmartLogger.
- A DTSU666-H smart power meter (provided by Huawei) is required to prevent backflow.
- The power meter and Smart Dongle must be connected to the same SUN2000.
- If a battery is connected, a maximum of three inverters can be cascaded. Any one of the inverters can be connected to the battery. (The inverter connected to the Smart Dongle must be connected to the battery.)
- If the SUN2000-(3KTL-10KTL)-M1 and SUN2000-(2KTL-6KTL)-L1 are cascaded, a maximum of three inverters can be cascaded.
- SmartLogger networking

Figure 5-20 SmartLogger networking (the dashed box indicates optional components)



NOTE

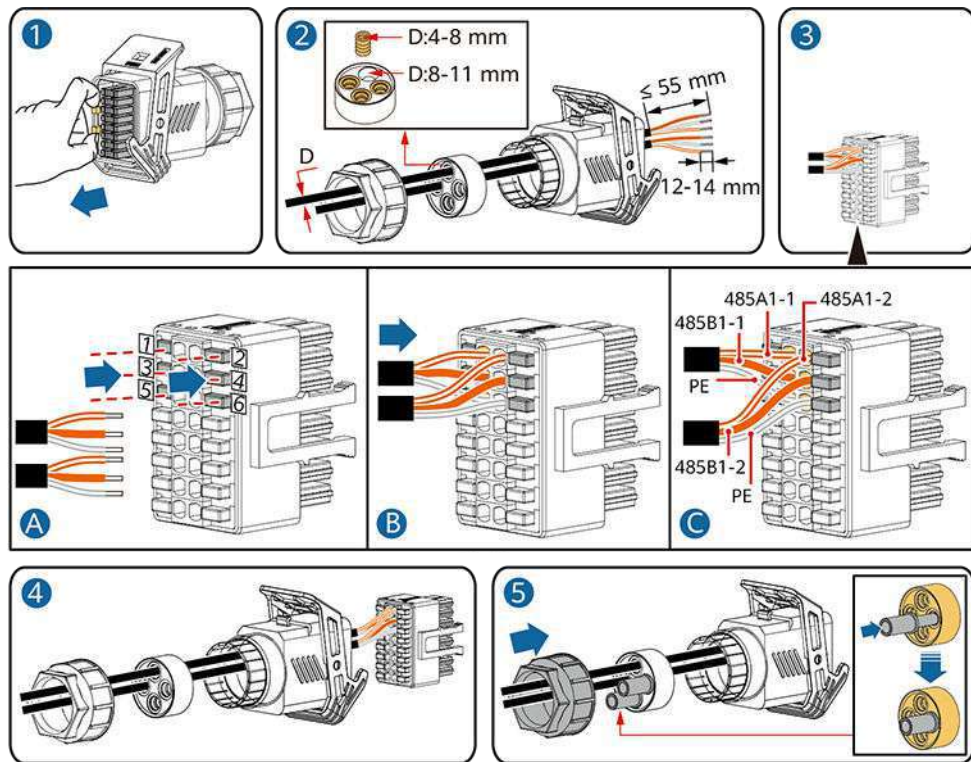
- A maximum of 80 devices can connect to a single SmartLogger. You are advised to connect fewer than 30 devices to each RS485 route.
- If the SUN2000 is networked over the SmartLogger, it cannot connect to the Smart Dongle.
- A DTSU666-H smart power meter (provided by Huawei) is required to prevent backflow.
- To ensure the system response speed, it is recommended that the power meter be connected to one COM port.

5.7.1 Connecting the RS485 Communications Cable (Inverter Cascading)

Procedure

- Step 1** Connect the signal cable to the signal cable connector.

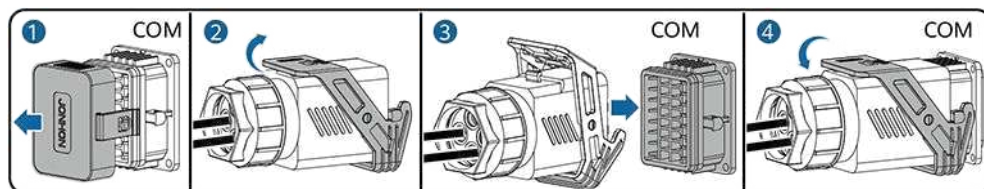
Figure 5-21 Installing the cable



IS10120006

Step 2 Connect the signal cable connector to the COM port.

Figure 5-22 Securing the signal cable connector



IS10120007

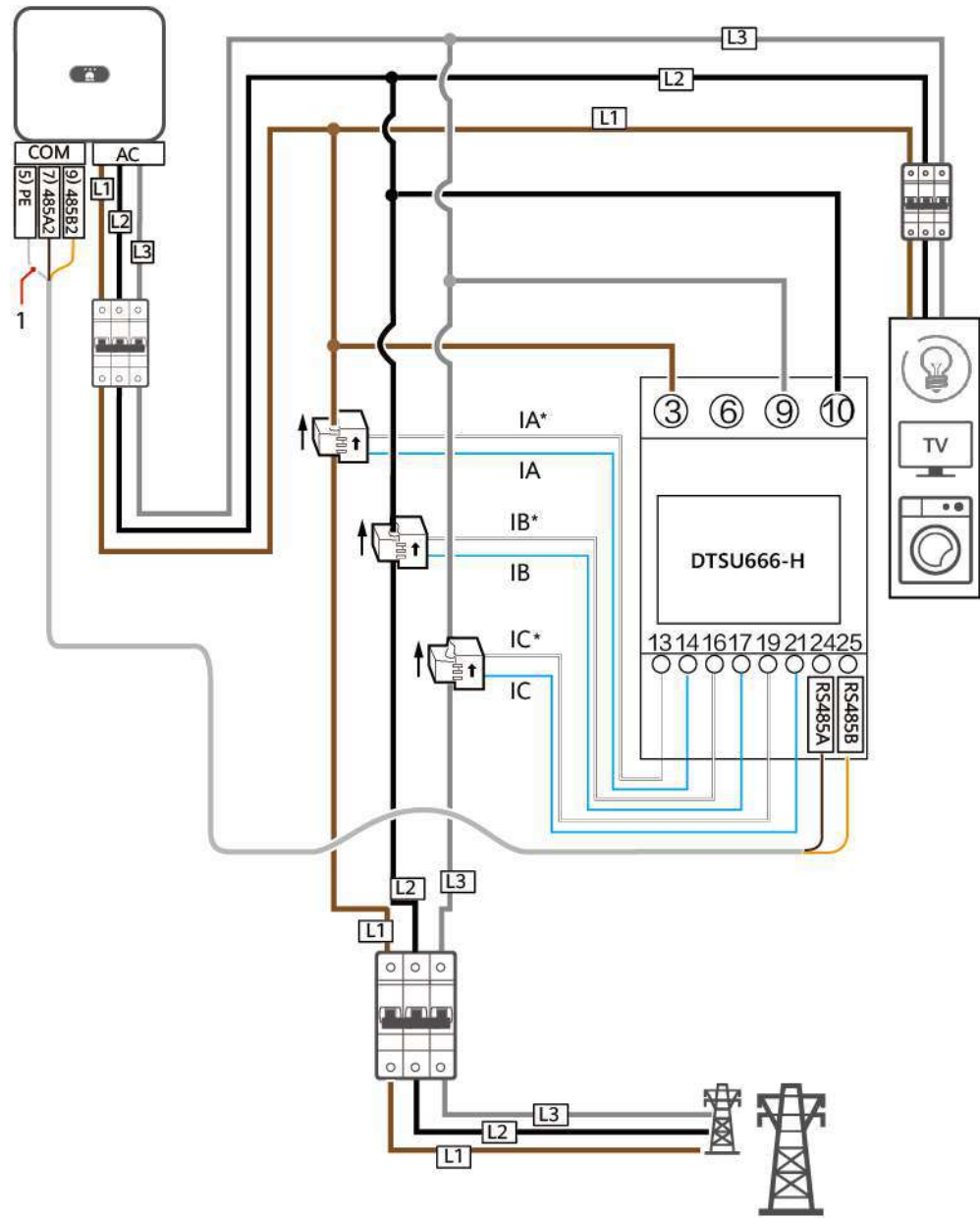
----End

5.7.2 Connecting the RS485 Communications Cable (Smart Power Sensor)

Cable Connection

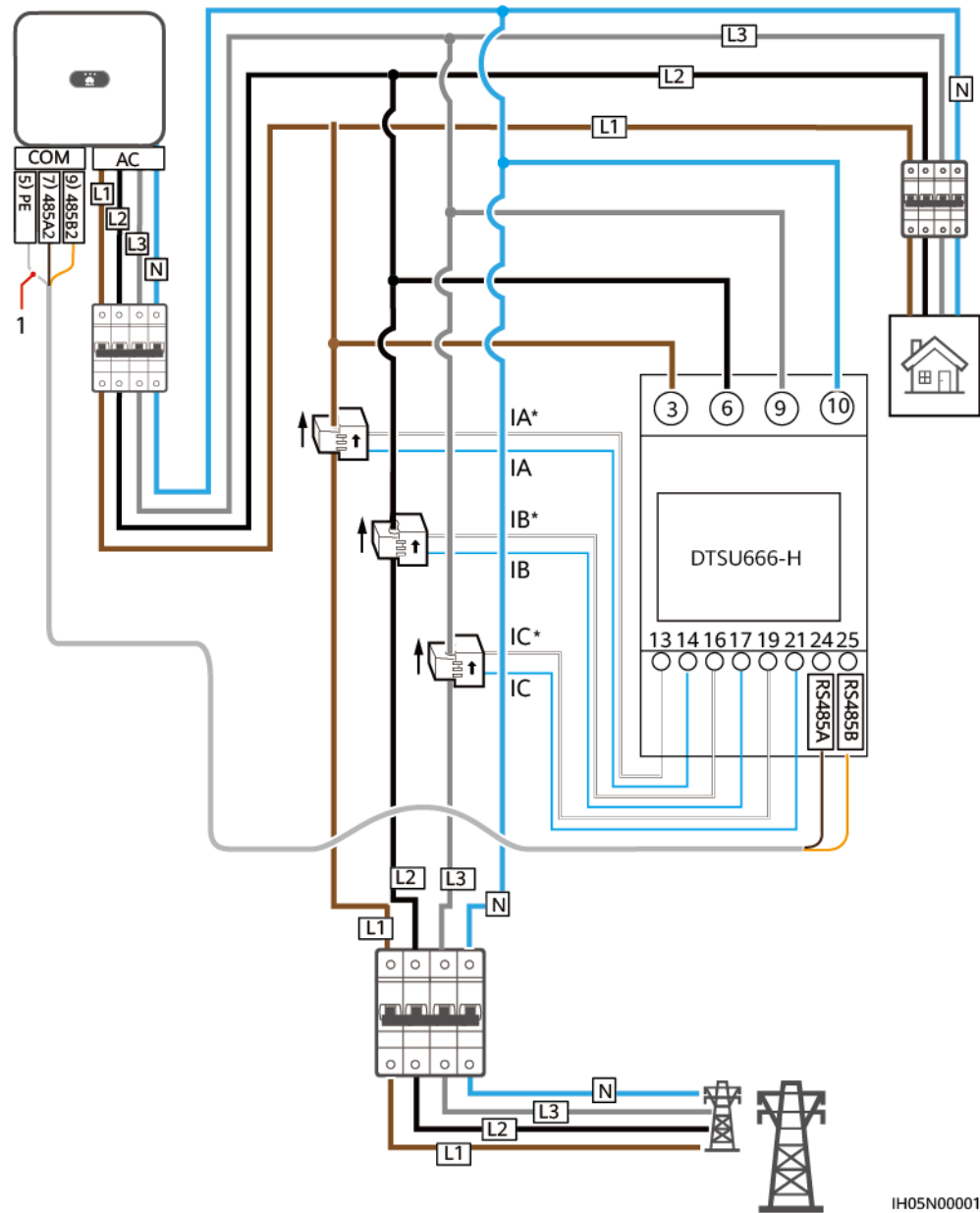
The following figure shows the cable connections between the inverter and the Smart Power Sensor.

Figure 5-23 Cable connection (Three Phase Three Wire)



IH05N00005

Figure 5-24 Cable connection (Three Phase Four Wire)



IH05N00001

(1) Shielding layer of the signal cable

NOTE

For a three-phase three-wire system, you need to set the cable connection mode. Otherwise, the displayed voltage is incorrect.

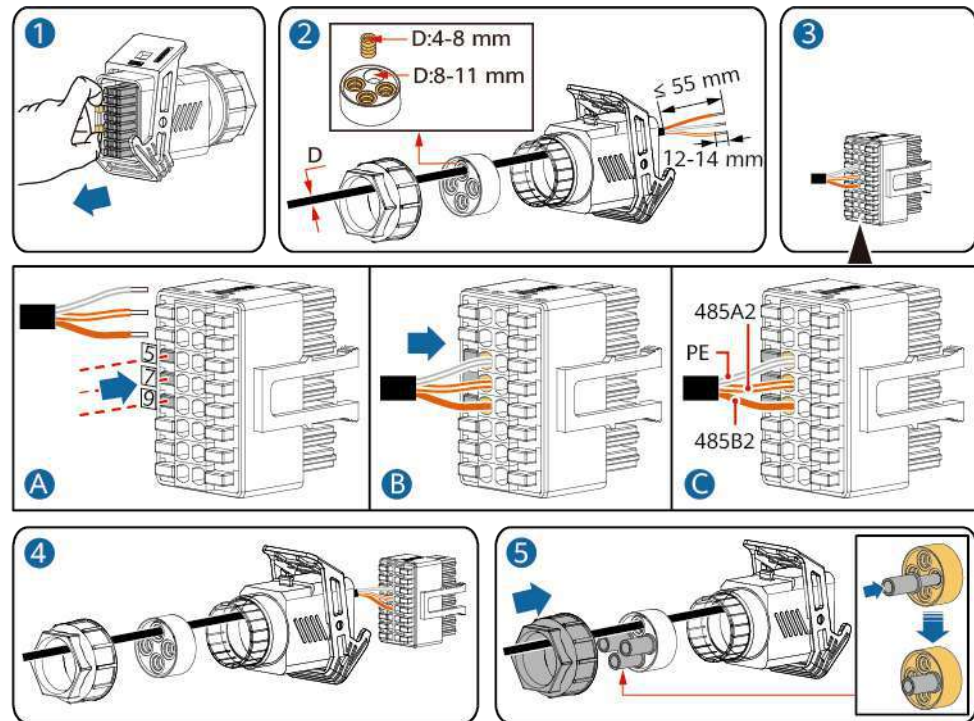
Table 5-4

Parameter	Note
nEt	Select the cable connection mode: 0: n.34 indicates three-phase four-wire. 1: n.33 indicates three-phase three-wire.

Procedure

Step 1 Connect the signal cable to the signal cable connector.

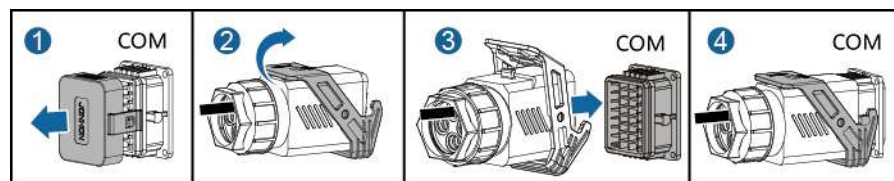
Figure 5-25 Installing the cable



IS10I20008

Step 2 Connect the signal cable to the COM port.

Figure 5-26 Securing the signal cable connector



IS10I20007

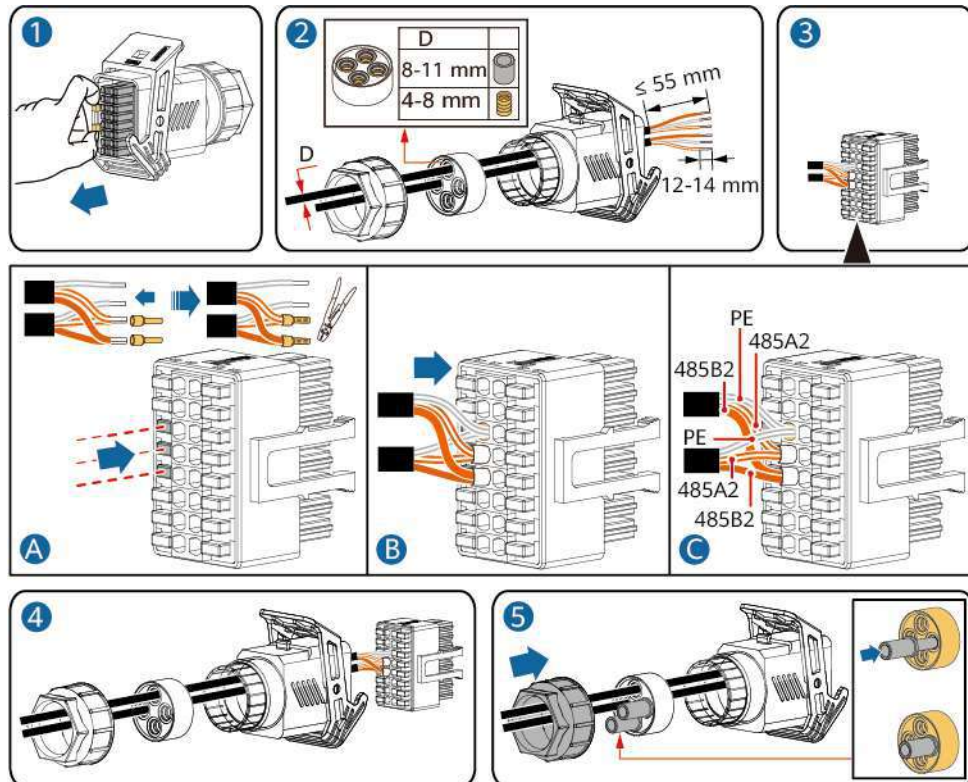
----End

5.7.3 Connecting an RS485 Communications Cable (Between a Power Meter and a Battery)

Procedure

Step 1 Connect the signal cable to the signal cable connector.

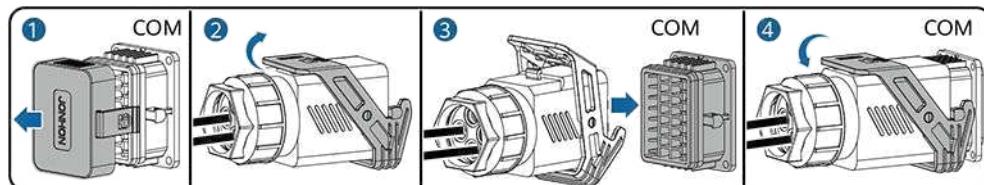
Figure 5-27 Installing the cable



IS10120012

Step 2 Connect the signal cable connector to the COM port.

Figure 5-28 Securing the signal cable connector



IS10120007

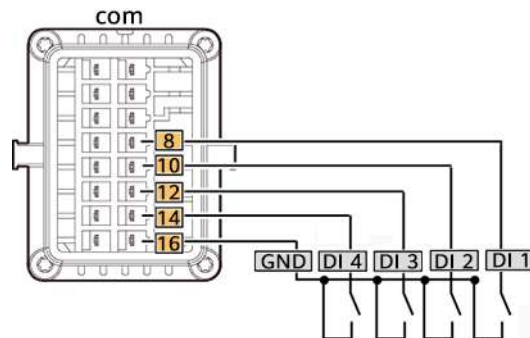
----End

5.7.4 Connecting the Power Grid Scheduling Signal Cable

Cable Connection

The following figure shows the cable connections between the inverter and the Ripple Control Device.

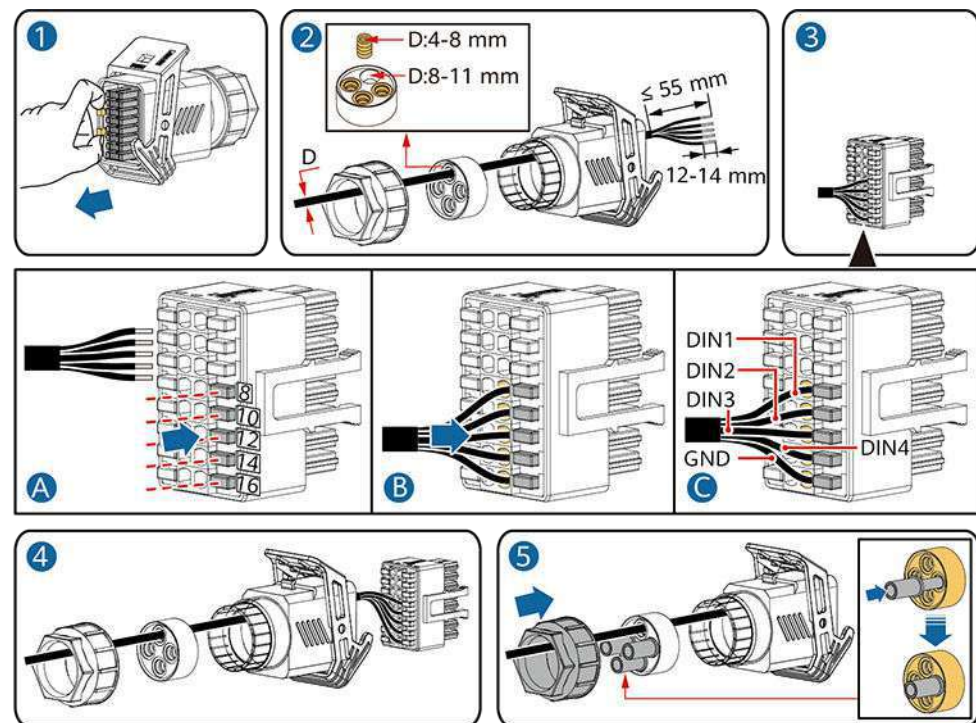
Figure 5-29 Cable connection



Procedure

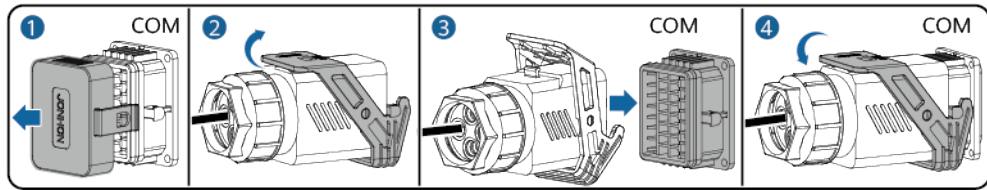
Step 1 Connect the signal cable to the signal cable connector.

Figure 5-30 Installing the cable



Step 2 Connect the signal cable to the COM port.

Figure 5-31 Securing the signal cable connector



IS10120007

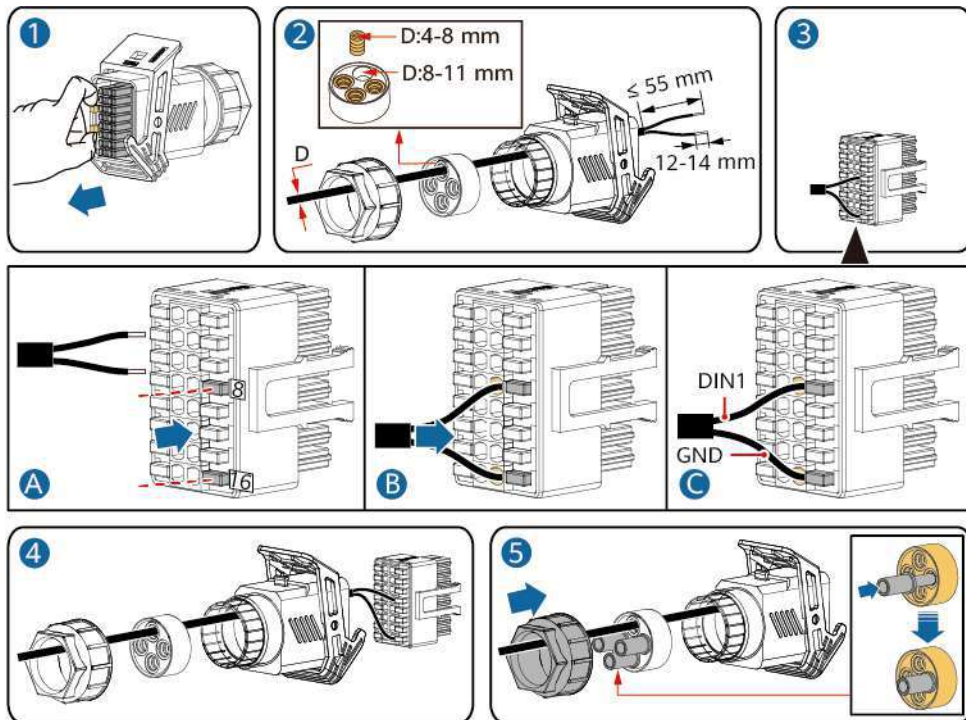
----End

5.7.5 Connecting a Signal Cable to the Smart Backup Box

Procedure

Step 1 Connect the signal cable to the signal cable connector.

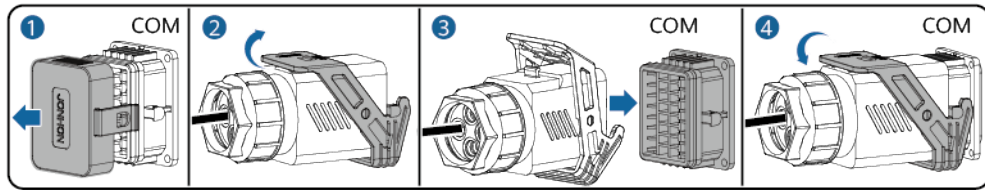
Figure 5-32 Installing the cable



IS10120018

Step 2 Connect the signal cable connector to the COM port.

Figure 5-33 Securing the signal cable connector



IS10120007

----End

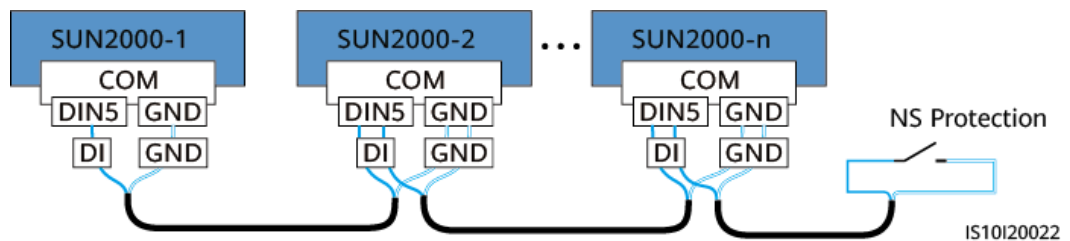
5.7.6 Connecting the NS Protection Signal Cable

Connecting the Inverter to the NS Protection Signal Cable

NOTE

- The NS protection function applies to areas in compliance with the VDE4105 standard, and the grid code needs to be set to **VDE-AR-N-4105**.
- The NS protection switch is connected to GND (pin 13) at one end and to DIN5 (pin 15) at the other end. The switch is turned off by default. When the switch is turned on, NS protection is triggered. Rapid shutdown and NS protection use the same pins, which are GND (pin 13) and DIN5 (pin 15). Therefore, you can use only one of the functions.
- The NS protection switch connection is the same for a single inverter and for cascaded inverters.
- Log in to the FusionSolar app as an installer, choose **My > Device Commissioning**, and connect to the WLAN hotspot of the SUN2000. Log in to the local commissioning system as an installer user, choose **Settings > Feature parameters > Dry contact function**, and set **Dry contact function** to **NS protection**.

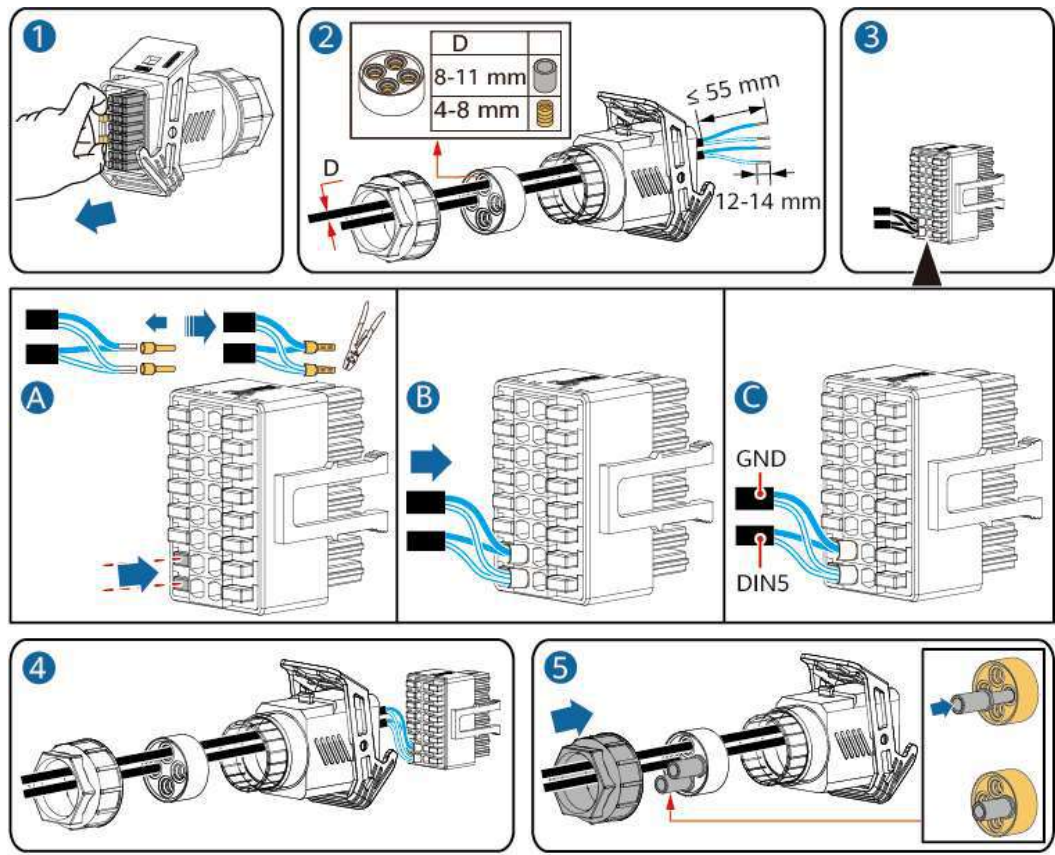
Figure 5-34 Connecting cascaded inverters to the NS protection switch



IS10120022

Step 1 Connect the signal cables of the cascaded inverters to the signal cable connectors.

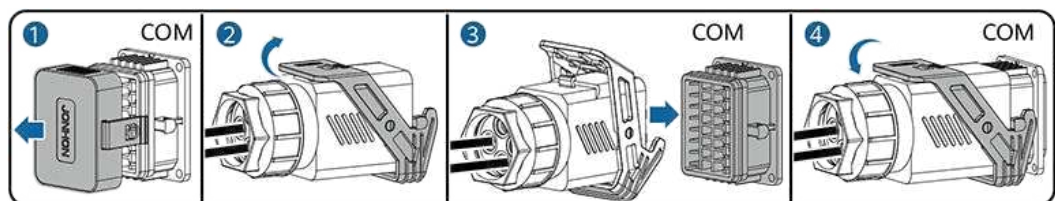
Figure 5-35 Installing cables



IS10I20021

Step 2 Connect the signal cable connectors to the COM ports.

Figure 5-36 Securing the signal cable connector



IS10I20007

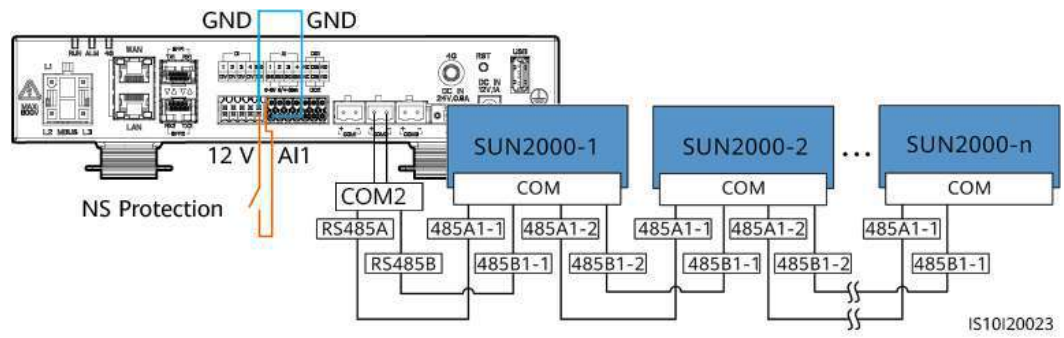
----End

Setting NS Protection Remote Shutdown

NOTE

- The NS protection function is applicable to areas in compliance with the VDE4105 standard. To configure this function, choose **Monitoring > Running Param. > Grid Parameters** and set **Grid code** to **VDE-AR-N-4105**.
- The NS protection device is connected to the AI1 port and 12V power output port. The SmartLogger shuts down the inverter over the voltage change detected at the AI1 port. When the NS protection device is disconnected, the AI1 port voltage is 0 V, and the inverter shuts down. When the NS protection device is connected again, the AI1 port voltage is 12 V, and you need to start the inverter manually.

Figure 5-37 Connecting the SmartLogger to the NS protection switch



6 Commissioning

6.1 Checking Before Power-On

Table 6-1 Checklist

No.	Item	Acceptance Criterion
1	SUN2000 installation	The SUN2000 is installed correctly and securely.
2	Smart Dongle	The Smart Dongle is installed correctly and securely.
3	Cable routing	The cables are routed properly as required by the customer.
4	Cable ties	Cable ties are secured evenly and no burr exists.
5	Reliable grounding	The PE cable is connected correctly and securely.
6	Switch	DC switches and all the switches connecting to the SUN2000 are OFF.
7	Cable connection	The AC output power cable, DC input power cables, battery cable, and signal cable are connected correctly and securely.
8	Unused terminals and ports	Unused terminals and ports are locked by watertight caps.
9	Installation environment	The installation space is proper, and the installation environment is clean and tidy.

6.2 SUN2000 power-on

Important Notes

NOTICE

Before turning on the AC switch between the SUN2000 and the power grid, check that the AC voltage is within the specified range using a multimeter.

Procedure

Step 1 If a battery is connected, turn on the battery switch.

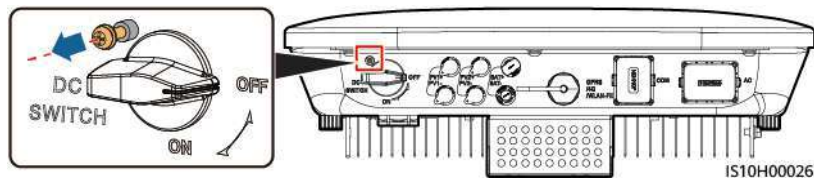
Step 2 Turn on the AC switch between the SUN2000 and the power grid.

NOTICE

If the DC is on and the AC is off, the SUN2000 reports a **Grid Failure** alarm. The SUN2000 starts normally only after the fault is automatically rectified.

Step 3 (Optional) Remove the locking screw from the DC switch.

Figure 6-1 Removing the locking screw from a DC switch

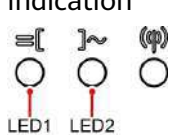


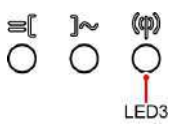
Step 4 Turn on the DC switch (if any) between the PV string and the SUN2000.

Step 5 Turn on the DC switch at the bottom of the SUN2000.

Step 6 Wait for about 1 minute and observe the LED indicators on the SUN2000 to check its running status.

Table 6-2 LED indicator description

Category	Status		Meaning
Running indication  LED1 LED2	LED1	LED2	N/A
	Steady green	Steady green	The SUN2000 is operating in grid-tied mode.

Category	Status	Meaning	
	Blinking green at long intervals (on for 1s and then off for 1s)	Off	The DC is on and the AC is off.
	Blinking green at long intervals (on for 1s and then off for 1s)	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is on, the AC is on, and the SUN2000 is not exporting power to the power grid.
	Off	Blinking green at long intervals (on for 1s and then off for 1s)	The DC is off and the AC is on.
	Steady orange	Steady orange	The SUN2000 is operating in the off-grid mode.
	Blinking orange slowly	Off	The DC is on, and the SUN2000 has no output in the off-grid mode.
	Blinking orange slowly	Blinking orange slowly	The SUN2000 is operating in the overload in backup mode.
	Off	Off	Both the DC and AC are off.
	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	N/A	There is a DC environmental alarm, such as an alarm indicating that High String Input Voltage, String Reverse Connection, or Low Insulation Resistance.
	N/A	Blinking red at short intervals (on for 0.2s and then off for 0.2s)	There is an AC environmental alarm, such as an alarm indicating Grid Undervoltage, Grid Overvoltage, Grid Overfrequency, or Grid Underfrequency.
	Steady red	Steady red	Fault
Communication indication 	LED3	N/A	
	Blinking green at short intervals (on for 0.2s and then off for 0.2s)		Communication is in progress. (When a mobile phone is connected to the SUN2000, the indicator first indicates that the phone is connected to the SUN2000): blinks green at long intervals.)
	Blinking green at long intervals (on for 1s and then off for 1s)		The mobile phone is connected to the SUN2000.

Category	Status			Meaning
	Off			There is no communication.
Device replacement indication	LED1	LED2	LED3	N/A
	Steady red	Steady red	Steady red	The SUN2000 hardware is faulty. The SUN2000 needs to be replaced.

NOTE

If the off-grid load is overloaded, indicators LED1 and LED2 on the inverter blink orange slowly. Reduce the off-grid load power and manually clear the alarm or until the inverter is recovered. The inverter attempts to restart at an interval of 5 minutes. If the inverter fails to restart for three times, the interval changes to 2 hours. If the inverter is standby in off-grid mode, check the inverter alarms and rectify the fault.

Step 7 (Optional) Observe the LED indicator on the Smart Dongle to check its running status.

- WLAN-FE Smart Dongle

Figure 6-2 WLAN-FE Smart Dongle

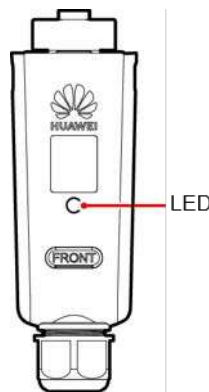


Table 6-3 Indicator description

Indicators	Status	Remarks	Description
-	Off	Normal	The Smart Dongle is not secured or not powered on.
Yellow (blinking green and red simultaneously)	Steady on		The Smart Dongle is secured and powered on.

Indicators	Status	Remarks	Description
Red	Blinking at short intervals (on for 0.2s and then off for 0.2s)		The parameters for connecting to the router are not set.
Red	Steady on	Abnormal	The Smart Dongle is faulty. Replace the Smart Dongle.
Blinking red and green alternatively	Blinking at long intervals (on for 1s and then off for 1s)	Abnormal	No communication with the SUN2000 <ul style="list-style-type: none"> - Remove and then insert the Smart Dongle. - Check whether the SUN2000 matches the Smart Dongle. - Connect the Smart Dongle to another SUN2000. Check whether the Smart Dongle is faulty or the USB port of the SUN2000 is faulty.
Green	Blinking at long intervals (on for 0.5s on and then off for 0.5s)	Normal	Connecting to the router.
Green	Steady on		Connected to the management system.
Green	Blinking at short intervals (on for 0.2s and then off for 0.2s)		The SUN2000 communicates with the management system through the Smart Dongle.

- 4G Smart Dongle

Table 6-4 Indicator description

Indicators	Status	Remarks	Description
-	Off	Normal	The Smart Dongle is not secured or not powered on.

Indicators	Status	Remarks	Description
Yellow (blinking green and red simultaneously)	Steady on	Normal	The Smart Dongle is secured and powered on.
Green	The blinking interval is 2s. The indicator is on for 0.1s and then off for 1.9s alternately.	Normal	Dialing (lasting for less than 1 minute)
		Abnormal	If the duration is longer than 1 minute, the 4G parameter settings are incorrect. Reset the parameters.
	Blinking at long intervals (on for 1s and then off for 1s)	Normal	The dialup is successful (lasting for less than 30s).
		Abnormal	If the duration is longer than 30s, the management system parameters are incorrectly set. Reset the parameters.
	Steady on	Normal	Connected to the management system.
Blinking at short intervals (on for 0.2s and then off for 0.2s)	The SUN2000 communicates with the management system through the Smart Dongle.		
Red	Steady on	Abnormal	The Smart Dongle is faulty. Replace the Smart Dongle.
	Blinking at short intervals (on for 0.2s and then off for 0.2s)		The Smart Dongle has no SIM card or the SIM card is in poor contact. Check whether the SIM card has been installed or is in good contact. If not, install the SIM card or remove and insert the SIM card.

Indicators	Status	Remarks	Description
	Blinking at long intervals (on for 1s and then off for 1s)		The Smart Dongle fails to be connected to a management system because the SIM card has no signals, weak signal strength, or no traffic. If the Smart Dongle is reliably connected, check the SIM card signal through the SUN2000 app. If no signal is received or the signal strength is weak, contact the carrier. Check whether the tariff and traffic of the SIM card are normal. If not, recharge the SIM card or buy traffic.
Blinking red and green alternatively	Blinking at long intervals (on for 1s and then off for 1s)		No communication with the SUN2000 <ul style="list-style-type: none"> - Remove and then insert the Smart Dongle. - Check whether the SUN2000 matches the Smart Dongle. - Connect the Smart Dongle to another SUN2000. Check whether the Smart Dongle is faulty or the USB port of the SUN2000 is faulty.

----End

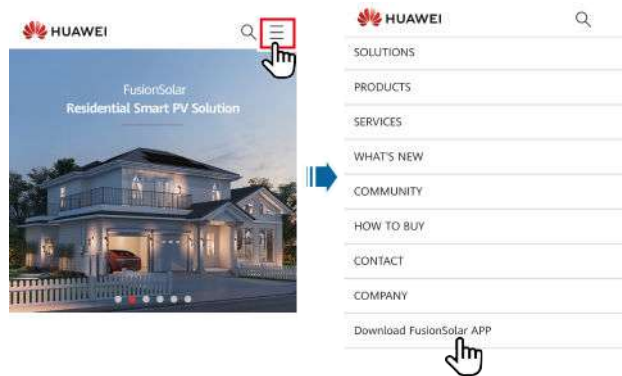
7 Man-Machine Interaction

7.1 App Commissioning

7.1.1 Downloading the FusionSolar App

- Method 1: Access <https://solar.huawei.com> using the mobile phone browser and download the latest installation package.

Figure 7-1 Download Mode



- Method 2: Search for FusionSolar on Huawei AppGallery and download the latest installation package.
- Method 3: Scan the following QR code and download the latest installation package.

Figure 7-2 QR code



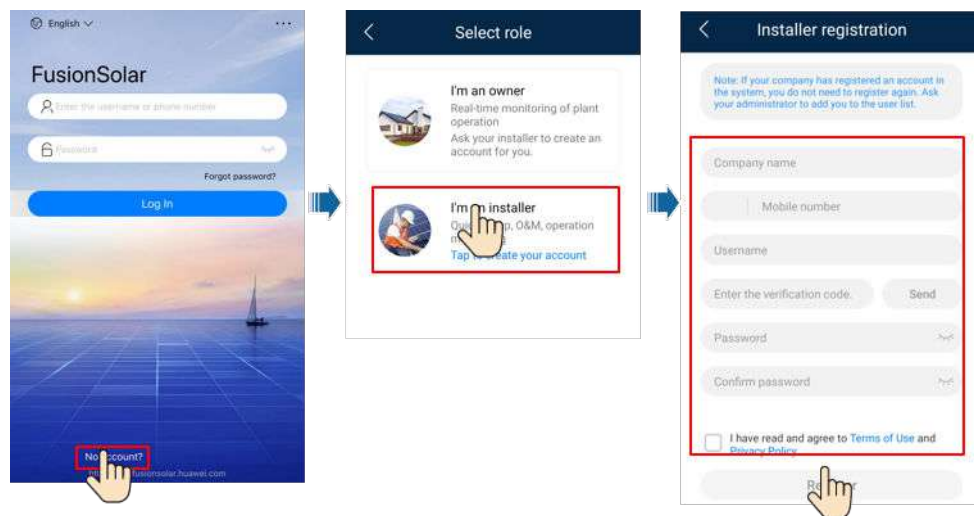
7.1.2 (Optional) Registering an Installer Account

NOTE

- If you have an installer account, skip this step.
- You can register an account only using a mobile phone only in China.
- The mobile number or email address used for registration is the user name for logging in to the FusionSolar app.

Create the first installer account and create a domain named after the company name.

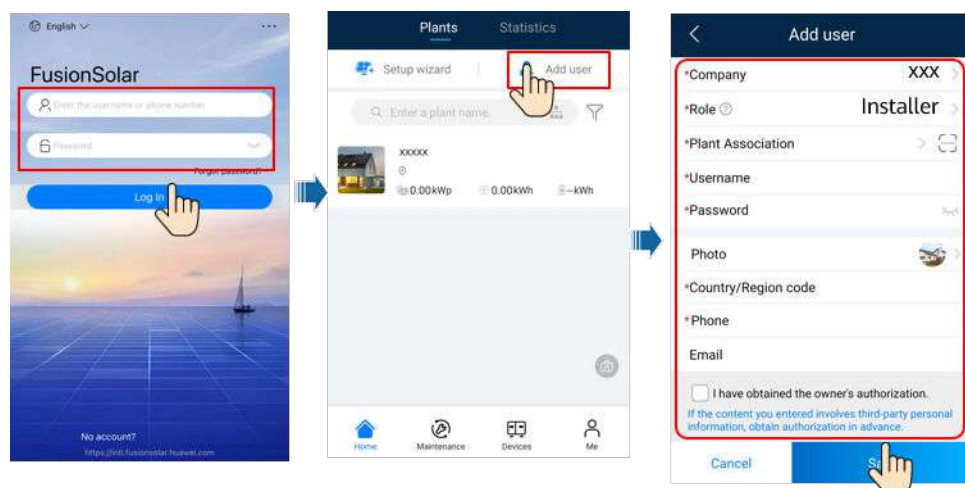
Figure 7-3 Creating the first installer account



NOTICE

To create multiple installer accounts for a company, log in to the FusionSolar app and tap **Add User** to create an installer account.

Figure 7-4 Creating multiple installer accounts for the same company



7.1.3 Creating a PV Plant and a User

Figure 7-5 Creating a PV plant and a user



NOTE

- In the quick settings, the grid code is set to N/A by default (automatic startup is not supported). Set the grid code based on the area where the PV plant is located.
- For details about how to use the site deployment wizard, see [FusionSolar App Quick Guide](#). You can scan the QR code to download the quick guide.



7.1.4 (Optional) Setting the Physical Layout of the Smart PV Optimizers

NOTE

- If smart PV optimizers are configured for PV strings, ensure that the smart PV optimizers have been successfully connected to the SUN2000 before performing the operations in this section.
- Check that the SN labels of smart PV optimizers are correctly attached to the physical layout template.
- Take and save a photo of the physical layout template. Keep your phone parallel to the template and take a photo in landscape mode. Ensure that the four positioning points in the corners are in the frame. Ensure that each QR code is attached within the frame.
- For details about the physical layout of smart PV optimizers, see [FusionSolar App Quick Guide](#). You can scan the QR code to download the quick guide.



Scenario 1: Setting on the FusionSolar Server Side (Solar Inverter Connected to the Management System)


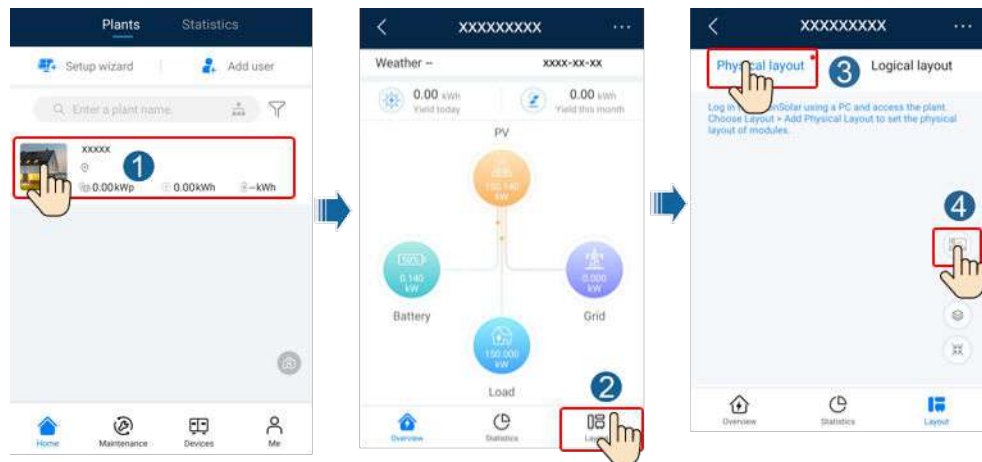
Step 1 Log in to the FusionSolar app and tap the plant name on the **Home** screen to access the plant screen. Select **Layout**, tap , and upload the physical layout template photo as prompted.

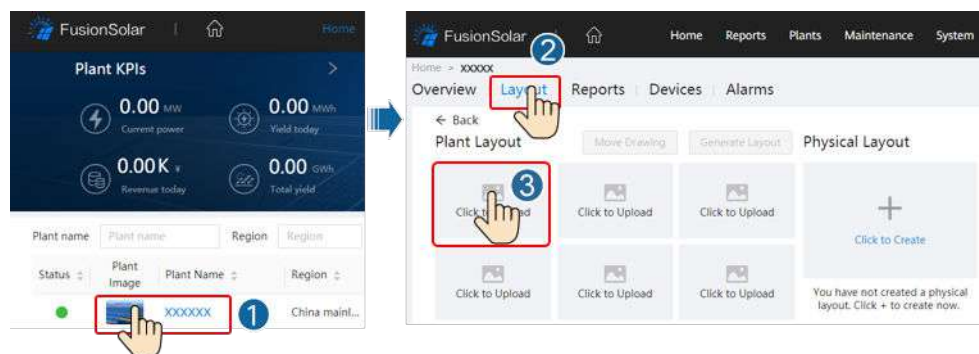
Figure 7-6 Uploading the physical layout template photo (App)



NOTE

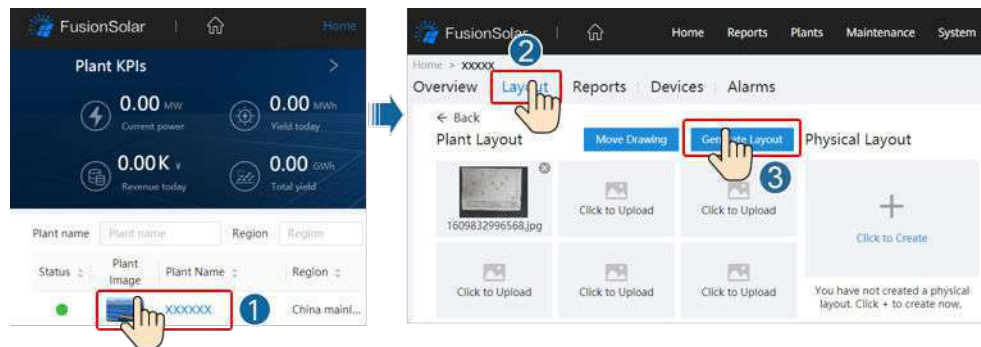
You can also upload the physical layout template photo on the WebUI as follows: Log in to <https://intl.fusionsolar.huawei.com> to access the WebUI of the FusionSolar Smart PV Management System. On the **Home** page, click the plant name to go to the plant page. Choose **Layout**, click **Click to Upload**, and upload the physical layout template photo.

Figure 7-7 Uploading the physical layout template photo (WebUI)



Step 2 Log in to <https://intl.fusionsolar.huawei.com> to access the WebUI of the FusionSolar Smart PV Management System. On the **Home** page, click the plant name to go to the plant page. Select **Layout**. Choose **Generate layout**, and create a physical layout as prompted. You can also manually create a physical location layout.

Figure 7-8 Physical layout design of PV modules



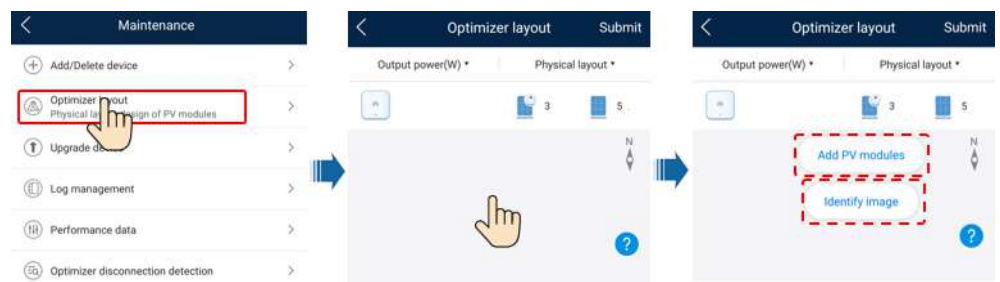
----End

Scenario 2: Setting on the Solar Inverter Side (Solar Inverter Not Connected to the Management System)

Step 1 Access the **Device Commissioning** screen on the FusionSolar app to set the physical layout of Smart PV Optimizers.

1. Log in to the FusionSolar app. On the **Device Commissioning** screen, choose **Maintenance > Optimizer layout**. The **Optimizer layout** screen is displayed.
2. Tap the blank area. The **Identify image** and **Add PV modules** buttons are displayed. You can use either of the following methods to perform operations as prompted:
 - Method 1: Tap **Identify image** and upload the physical layout template photo to complete the optimizer layout. (The optimizers that fail to be identified need to be manually bound.)
 - Method 2: Tap **Add PV modules** to manually add PV modules and bind the optimizers to the PV modules.

Figure 7-9 Physical layout design of PV modules

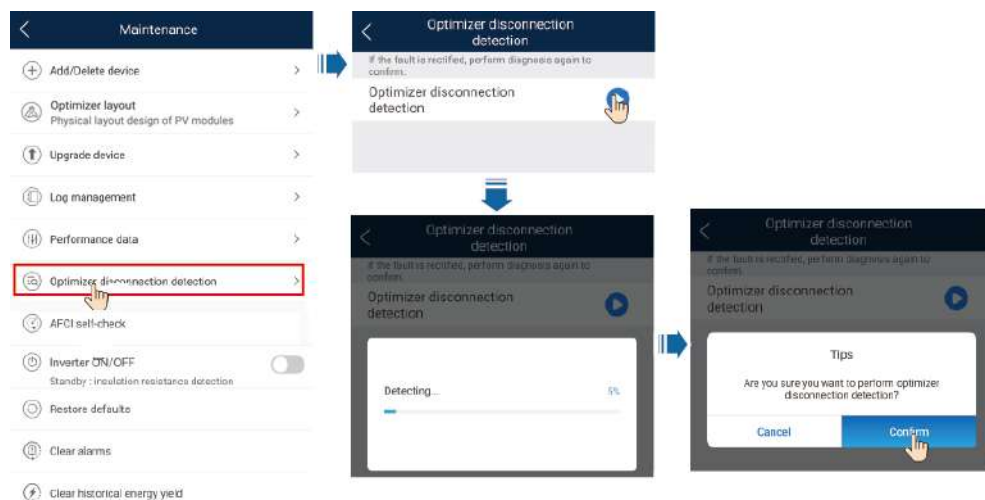


----End

7.1.5 Detecting Optimizer Disconnection

Log in to the FusionSolar app, choose **Device Commissioning > Maintenance > Optimizer disconnection detection**, tap the detection button to detect the optimizer disconnection, and rectify the fault based on the detection result.

Figure 7-10 Detect optimizer disconnection



7.2 Parameters Settings

Go to the **Device Commissioning** screen and set SUN2000 parameters. For details about entering the **Device Commissioning** screen, see [B Device Commissioning](#).

To set more parameters, tap **Settings**. For details about the parameters, see the [FusionSolar APP and SUN2000 App User Manual](#). You can also scan the QR code to obtain the document.



7.2.1 Energy Control

7.2.1.1 Grid-tied Point Control

Function

Limits or reduces the output power of the PV power system to ensure that the output power is within the power deviation limit.

Procedure

Step 1 On the home screen, choose **Power adjustment > Grid-tied point control**.

Figure 7-11 Grid-tied point control



Table 7-1 Grid-tied point control

Parameter Name			Description
Active power	Unlimited	-	If this parameter is set to Unlimited , the output power of the SUN2000 is not limited and the SUN2000 can connect to the power grid at the rated power.
	Grid connection with zero power	Closed-loop controller	<ul style="list-style-type: none"> If multiple SUN2000s are cascaded, set this parameter to SDongle/SmartLogger. If there is only one SUN2000, set this parameter to Inverter.
		Limitation mode	Total power indicates export limitation of the total power at the grid-tied point.
		Power adjustment period	Specifies the shortest interval for a single anti-backfeeding adjustment.
		Power control hysteresis	Specifies the dead zone for adjusting the SUN2000 output power. If the power fluctuation is within the power control hysteresis, the power is not adjusted.
		Active power output limit for fail-safe	Specifies the derating value of the SUN2000 active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the SUN2000 is disconnected, the Smart Dongle delivers the derating value of the SUN2000 active power by percentage.

Parameter Name		Description
	Communication disconnection fail-safe	In the SUN2000 anti-backfeeding scenario, if this parameter is set to Enable , the SUN2000 will derate according to the active power derating percentage when the communication between the SUN2000 and the Smart Dongle is disconnected for a period longer than Communication disconnection detection time .
	Communication disconnection detection time	Specifies the time for determining the communication disconnection between the SUN2000 and the Dongle. This parameter is displayed when Communication disconnection fail-safe is set to Enable .
Grid connection with limited power (kW)	Closed-loop controller	<ul style="list-style-type: none"> • If multiple SUN2000s are cascaded, set this parameter to SDongle/SmartLogger. • If there is only one SUN2000, set this parameter to Inverter.
	Limitation mode	Total power indicates export limitation of the total power at the grid-tied point.
	Maximum grid feed-in power	Specifies the maximum active power transmitted from the grid-tied point to the power grid.
	Power adjustment period	Specifies the shortest interval for a single anti-backfeeding adjustment.
	Power control hysteresis	Specifies the dead zone for adjusting the SUN2000 output power. If the power fluctuation is within the power control hysteresis, the power is not adjusted.
	Active power output limit for fail-safe	Specifies the derating value of the SUN2000 active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the SUN2000 is disconnected, the Smart Dongle delivers the derating value of the SUN2000 active power by percentage.

Parameter Name		Description
	Communication disconnection fail-safe	In the SUN2000 anti-backfeeding scenario, if this parameter is set to Enable , the SUN2000 will derate according to the active power derating percentage when the communication between the SUN2000 and the Smart Dongle is disconnected for a period longer than Communication disconnection detection time .
	Communication disconnection detection time	Specifies the time for determining the communication disconnection between the SUN2000 and the Dongle. This parameter is displayed when Communication disconnection fail-safe is set to Enable .
Grid connection with limited power (%)	Closed-loop controller	<ul style="list-style-type: none"> • If multiple SUN2000s are cascaded, set this parameter to SDongle/SmartLogger. • If there is only one SUN2000, set this parameter to Inverter.
	Limitation mode	Total power indicates export limitation of the total power at the grid-tied point.
	PV plant capacity	Specifies the total maximum active power in the SUN2000 cascading scenario.
	Maximum grid feed-in power	Specifies the percentage of the maximum active power of the grid-tied point to the PV plant capacity.
	Power adjustment period	Specifies the shortest interval for a single anti-backfeeding adjustment.
	Power control hysteresis	Specifies the dead zone for adjusting the SUN2000 output power. If the power fluctuation is within the power control hysteresis, the power is not adjusted.

Parameter Name		Description
	Active power output limit for fail-safe	Specifies the derating value of the SUN2000 active power by percentage. If the Smart Dongle does not detect any meter data or the communication between the Smart Dongle and the SUN2000 is disconnected, the Smart Dongle delivers the derating value of the SUN2000 active power by percentage.
	Communication disconnection fail-safe	In the SUN2000 anti-backfeeding scenario, if this parameter is set to Enable , the SUN2000 will derate according to the active power derating percentage when the communication between the SUN2000 and the Smart Dongle is disconnected for a period longer than Communication disconnection detection time .
	Communication disconnection detection time	Specifies the time for determining the communication disconnection between the SUN2000 and the Dongle. This parameter is displayed when Communication disconnection fail-safe is set to Enable .
Shutdown at high feed-in power ^a	Shutdown at high feed-in power	<ul style="list-style-type: none"> The default value is Disable. If this parameter is set to Enable, the inverter shuts down for protection when the grid-connection point power exceeds the threshold and remains in this condition for the specified time threshold.
	Upper feed-in power threshold for inverter shutdown	<ul style="list-style-type: none"> The default value is 0. This parameter specifies the power threshold of the grid-connection point for triggering inverter shutdown.

Parameter Name		Description
	High feed-in power duration threshold for triggering inverter shutdown	<p>The default value is 20. This parameter specifies the duration threshold of high feed-in power for triggering inverter shutdown.</p> <ul style="list-style-type: none"> • When High feed-in power duration threshold for triggering inverter shutdown is set to 5, Shutdown at high feed-in power takes precedence. • When High feed-in power duration threshold for triggering inverter shutdown is set to 20, Limited feed-in takes precedence (when Active power control is set to Limited feed-in).
<p>Note a: This parameter is supported only for the AS4777 grid code.</p>		

----End

7.2.1.2 Apparent Power Control on the Inverter Output Side

On the home screen, tap **Settings > Power adjustment** to set inverter parameters.

Figure 7-12 Apparent power control

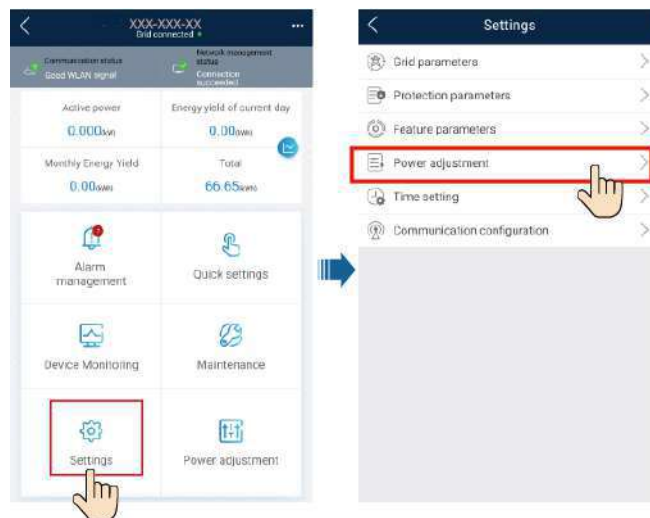


Table 7-2 Apparent power

Parameter	Description	Value Range
Maximum apparent power (kVA)	Specifies the output upper threshold for the maximum apparent power to adapt to the capacity requirements of standard and customized inverters.	[Maximum active power, S_{max}]
Maximum active power (kW)	Specifies the output upper threshold for the maximum active power to adapt to different market requirements.	[0.1, P_{max}]

 **NOTE**

The lower threshold for the maximum apparent power is the maximum active power. To lower the maximum apparent power, lower the maximum active power first.

7.2.1.3 Battery Control

Prerequisites

The screenshots in this chapter are taken in the SUN2000 3.2.00.011 app. The app is being updated. The actual screens may vary.

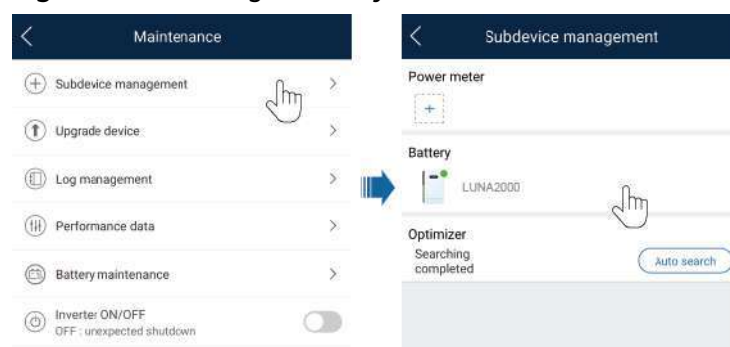
Function

When the inverter connects to a battery, add the battery and set battery parameters.

Adding a Battery

To add a battery, choose **Maintenance > Subdevice management** on the home screen.

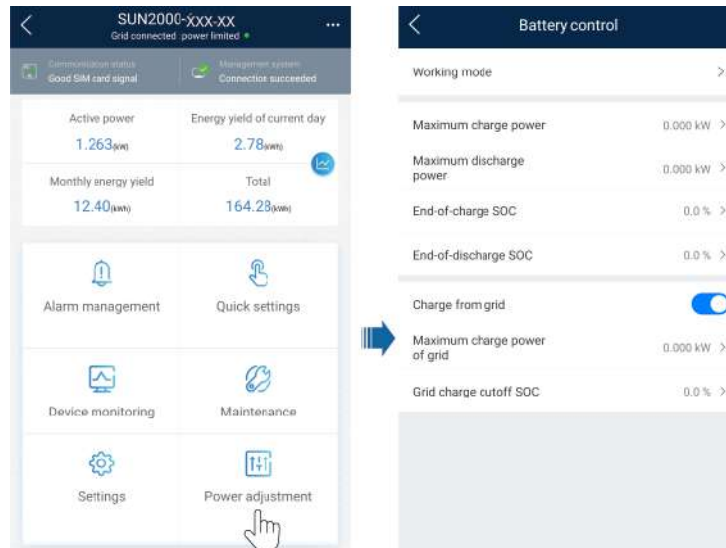
Figure 7-13 Adding a battery



Parameters Settings

On the home screen, choose **Power adjustment** > **Battery control**, and set the battery parameters and working mode.

Figure 7-14 Battery control parameter setting



Parameter	Description	Value Range
Working mode	For details, see the description on the app screen.	<ul style="list-style-type: none"> Maximum self-consumption Time-of-use Fully fed to grid
Maximum charge power (kW)	Retain this parameter to the maximum charge power. Additional configuration is not required.	<ul style="list-style-type: none"> Charge: [0, Maximum charge power]
Maximum discharge power (kW)	Retain this parameter to the maximum discharge power. Additional configuration is not required.	<ul style="list-style-type: none"> Discharge: [0, Maximum discharge power]
End-of-charge SOC (%)	Set the charge cutoff capacity.	90%–100%
End-of-discharge SOC (%)	Set the discharge cutoff capacity.	0%–20% (When no PV module is configured or the PV modules have no voltage for 24 hours, the minimum value is 15%.)

Parameter	Description	Value Range
Charge from grid	If Charge from grid function is disabled by default, comply with the grid charge requirements stipulated in local laws and regulations when this function is enabled.	<ul style="list-style-type: none"> • Disable • Enable
Grid charge cutoff SOC	Set the grid charge cutoff SOC.	[20%, 100%]

7.2.2 AFCI

Function

If PV modules or cables are not properly connected or damaged, electric arcs may occur, which may cause fire. Huawei SUN2000s provide unique arc detection in compliance with UL 1699B-2018 to ensure the safety of users' lives and property.

This function is enabled by default. The SUN2000 automatically detects arc faults. To disable this function, log in to the FusionSolar app, enter the **Device Commissioning** screen, choose **Settings > Feature parameters**, and disable **AFCI**.

Clearing Alarms

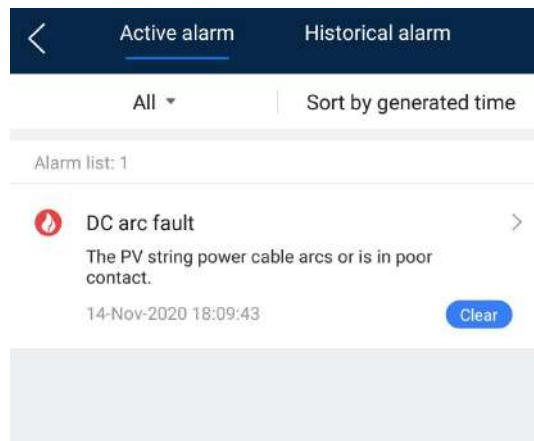
The AFCI function involves the **DC arc fault** alarm.

The SUN2000 has the AFCI alarm automatic clearance mechanism. If an alarm is triggered for less than five times within 24 hours, the SUN2000 automatically clears the alarm. If the alarm is triggered for five times or more within 24 hours, the SUN2000 locks for protection. You need to manually clear the alarm on the SUN2000 so that it can work properly.

You can manually clear the alarm as follows:

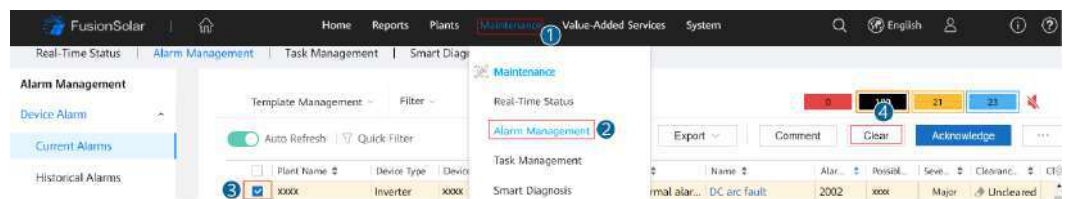
- **Method 1: FusionSolar App**
Log in to the FusionSolar app and choose **My > Device Commissioning**. On the **Device Commissioning** screen, connect and log in to the SUN2000 that generates the AFCI alarm, tap **Alarm management**, and tap **Clear** on the right of the **DC arc fault** alarm to clear the alarm.

Figure 7-15 Alarm management



- Method 2: FusionSolar Smart PV Management System**
 Log in to the FusionSolar Smart PV Management System using a non-owner account, choose **Maintenance** > **Alarm Management**, select the **DC arc fault** alarm, and click **Clear** to clear the alarm.

Figure 7-16 Clearing alarms



Switch to the owner account with PV plant management rights. On the home page, click the PV plant name to go to the PV plant page, and click **OK** as prompted to clear the alarm.

7.2.3 IPS Check (for Italy CEI0-21 Grid Code Only)

Function

The Italy CEI0-21 grid code requires an IPS check for the SUN2000. During the self-check, the SUN2000 checks the protection threshold and protection time of the maximum voltage over 10 min (59.S1), maximum overvoltage (59.S2), minimum undervoltage (27.S1), minimum undervoltage (27.S2), maximum overfrequency (81.S1), maximum overfrequency (81.S2), minimum underfrequency (81.S), and minimum underfrequency (81.S2).

Procedure

- Step 1** On the home screen, choose **Maintenance** > **IPS test** to access the IPS test screen.
- Step 2** Tap **Start** to start an IPS test. The SUN2000 detects maximum voltage over 10 min (59.S1), maximum overvoltage (59.S2), minimum undervoltage (27.S1), minimum undervoltage (27.S2), maximum overfrequency (81.S1), maximum overfrequency (81.S2), and minimum underfrequency (81.S1), and minimum underfrequency (81.S2).

Figure 7-17 IPS test

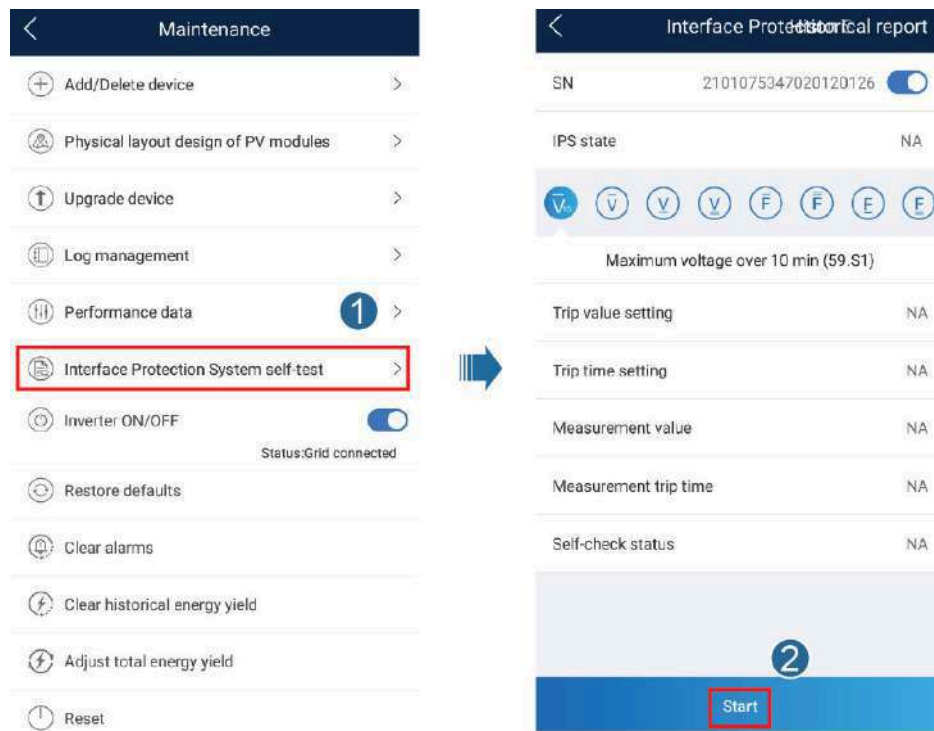


Table 7-3 IPS test type

IPS Test Type	Description
Maximum voltage over 10 min (59.S1)	The default maximum voltage over 10 min protection threshold is 253 V (1.10 Vn), and the default protection time threshold is 3s.
Maximum overvoltage (59.S2)	The default overvoltage protection threshold is 264.5 V (1.15 Vn), and the default protection time threshold is 0.2s.
Minimum undervoltage (27.S1)	The default undervoltage protection threshold is 195.5 V (0.85 Vn), and the default protection time threshold is 1.5s.
Minimum undervoltage (27.S2)	The default undervoltage protection threshold is 34.5 V (0.15 Vn), and the default protection time threshold is 0.2s.
Maximum overfrequency (81.S1)	The default overfrequency protection threshold is 50.2 Hz, and the default protection time threshold is 0.1s.
Maximum overfrequency (81.S2)	The default overfrequency protection threshold is 51.5 Hz, and the default protection time threshold is 0.1s.

IPS Test Type	Description
Minimum underfrequency (81.S1)	The default underfrequency protection threshold is 49.8 Hz, and the default protection time threshold is 0.1s.
Minimum underfrequency (81.S2)	The default underfrequency protection threshold is 47.5 Hz, and the default protection time threshold is 0.1s.

Step 3 After the IPS test is complete, **IPS State** is displayed as **IPS state success**. Tap **Historical report** in the upper right corner of the screen to view the IPS check report.

----End

7.3 SmartLogger Networking Scenario

See the [Distributed PV Plants Connecting to Huawei Hosting Cloud Quick Guide \(Distributed Inverters + SmartLogger1000A + RS485 Networking\)](#) and [PV Plants Connecting to Huawei Hosting Cloud Quick Guide \(Inverters + SmartLogger3000 + RS485 Networking\)](#). You can scan the QR code to obtain it.

Figure 7-18 SmartLogger1000A



Figure 7-19 SmartLogger3000



8 Maintenance

8.1 SUN2000 Power-Off

Important Notes

WARNING

- After the SUN2000 powers off, the remaining electricity and heat may still cause electric shocks and body burns. Therefore, put on protective gloves and begin operating the SUN2000 five minutes after the power-off.
- Before maintaining the optimizer and PV string, turn off the AC switch and DC switch. Otherwise, electric shocks may occur as the PV string is energized.

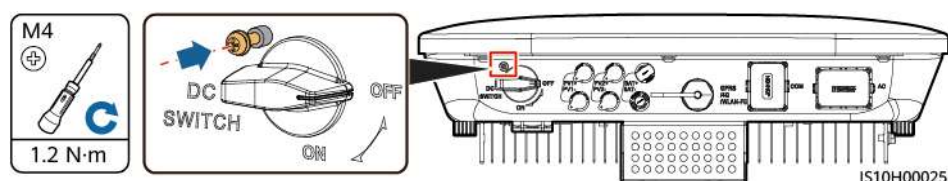
Procedure

Step 1 Turn off the AC switch between the SUN2000 and the power grid.

Step 2 Turn off the DC switch at the bottom of the SUN2000.

Step 3 (Optional) Install the locking screw beside the DC switch.

Figure 8-1 Installing the locking screw for the DC switch



Step 4 If there is a DC switch between the inverter and PV string, turn off the DC switch.

Step 5 (Optional) Turn off the battery switch between the SUN2000 and batteries.

----End

8.2 Routine Maintenance

To ensure that the SUN2000 can operate properly for a long term, you are advised to perform routine maintenance on it as described in this chapter.

 **CAUTION**

Before cleaning the system, connecting cables, and maintaining the grounding reliability, power off the system.

Table 8-1 Maintenance list

Check Detail	Check Method	Maintenance Interval
System cleanliness	Check the heat sink for foreign matter or the overall health of the SUN2000.	Annual or every time an abnormality is detected
System running status	Check the SUN2000 for damage or deformation.	Annual
Electrical connections	<ul style="list-style-type: none"> • Cables are securely connected. • Cables are intact, in particular, the parts touching the metallic surface are not scratched. 	The first inspection is 6 months after the initial commissioning. From then on, the interval can be 6 to 12 months.
Grounding reliability	Check whether the ground terminal and ground cable are securely connected.	Annual
Sealing	Check whether all terminals and ports are properly sealed.	Annual

8.3 Troubleshooting

Alarm severities are defined as follows:

- Major: The SUN2000 is faulty. As a result, the output power decreases or the grid-tied power generation is stopped.
- Minor: Some components are faulty without affecting the grid-tied power generation.
- Warning: The SUN2000 works properly. The output power decreases or some authorization functions fail due to external factors.

Table 8-2 Common fault alarm list

ID	Name	Severity	Cause	Solution
2001	High string input voltage	Major	The PV array is not properly configured. Excessive PV modules are connected in series to the PV string; therefore the PV string open-circuit voltage exceeds the maximum SUN2000 operating voltage. Cause ID 1 or 2: PV strings 1 and 2	Reduce the number of PV modules connected in series to the PV string until the PV string open-circuit voltage is less than or equal to the maximum SUN2000 operating voltage. After the PV string configuration is corrected, the alarm disappears.
2002	DC arc fault	Major	The PV string power cables arc or are in poor contact. Cause ID 1 = PV1 and PV2 Cause ID 2 = PV3 and PV4	Check whether the PV string cables arc or are in poor contact.
2003	DC arc fault	Major	The PV string power cables arc or are in poor contact. <ul style="list-style-type: none"> • Cause ID 1 = PV1 • Cause ID 2 = PV2 	Check whether the PV string cables arc or are in poor contact.
2011	String reverse connection	Major	The PV string polarity is reversed. <ul style="list-style-type: none"> • Cause ID 1 = PV1 • Cause ID 2 = PV2 	Check whether the PV string is reversely connected to the SUN2000. If so, wait until the PV string current decreases to below 0.5 A. Then, turn off the DC switch and correct the PV string polarity.
2012	String current backfeed	Warning	The number of PV modules connected in series to the PV string is insufficient. As a result, the end voltage is lower than that of other strings. <ul style="list-style-type: none"> • Cause ID 1 = PV1 • Cause ID 2 = PV2 	<ol style="list-style-type: none"> 1. Check whether the number of PV modules connected in series to this PV string is less than that of the other PV strings connected in parallel. If so, wait until the PV string current decreases to below 0.5 A. Then, turn off the DC switch and adjust the number of PV modules in the PV string. 2. Check whether the PV string is shaded. 3. Check whether the open-circuit voltage of the PV string is abnormal.

ID	Name	Severity	Cause	Solution
2021	AFCI self-check failure	Major	Cause ID = 1, 2 The AFCI self-check fails.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the alarm persists, contact your dealer or Huawei technical support.
2031	Phase wire short-circuited to PE	Major	Cause ID = 1 The impedance of the output phase wire to PE is low or the output phase wire is short-circuited to PE.	Check the impedance of the output phase wire to PE, locate the position with low impedance, and rectify the fault.
2032	Grid loss	Major	Cause ID = 1 <ul style="list-style-type: none">Power grid outage occurs.The AC circuit is disconnected or the AC switch is off.	<ol style="list-style-type: none">The alarm is cleared automatically after the power grid recovers.Check whether the AC circuit is disconnected or the AC switch is off.
2033	Grid undervoltage	Major	Cause ID = 1 The grid voltage is below the lower threshold or the low-voltage duration has lasted for more than the value specified by low voltage ride-through (LVRT).	<ol style="list-style-type: none">If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal.If the alarm persists, check whether the power grid voltage is within the acceptable range. If not, contact the local power operator. If yes, modify the grid undervoltage protection threshold through the mobile app, SmartLogger, or network management system (NMS) with the consent of the local power operator.If the alarm persists for a long time, check the connection between the AC circuit breaker and the output power cable.

ID	Name	Severity	Cause	Solution
2034	Grid overvoltage	Major	Cause ID = 1 The grid voltage exceeds the upper threshold or the high voltage duration has lasted for more than the value specified by high voltage ride-through (HVRT).	<ol style="list-style-type: none"> 1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid voltage is within the acceptable range. If not, contact the local power operator. If yes, modify the grid overvoltage protection threshold through the mobile app, SmartLogger, or NMS with the consent of the local power operator. 3. Check whether the peak voltage of the power grid is too high. If the alarm persists and cannot be rectified for a long time, contact the power operator.
2035	Grid volt. Imbalance	Major	Cause ID = 1 The difference between grid phase voltages exceeds the upper threshold.	<ol style="list-style-type: none"> 1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid voltage is within the acceptable range. If not, contact the local power operator. 3. If the alarm lasts for a long time, check the AC output power cable connection. 4. If the AC output power cable is correctly connected, yet the alarm persists and affects the energy yield of the PV plant, contact the local power operator.

ID	Name	Severity	Cause	Solution
2036	Grid overfrequency	Major	Cause ID = 1 Power grid exception: The actual power grid frequency is higher than the requirements for the local power grid code.	<ol style="list-style-type: none"> 1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid frequency is within the acceptable range. If not, contact the local power operator. If yes, modify the grid overfrequency protection threshold through the app, SmartLogger, or NMS with the consent of the local power operator.
2037	Grid underfrequency	Major	Cause ID = 1 Power grid exception: The actual power grid frequency is lower than the requirements for the local power grid code.	<ol style="list-style-type: none"> 1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid frequency is within the acceptable range. If not, contact the local power operator. If yes, modify the grid underfrequency protection threshold through the app, SmartLogger, or NMS with the consent of the local power operator.

ID	Name	Severity	Cause	Solution
2038	Unstable grid frequency	Major	Cause ID = 1 Power grid exception: The actual change rate of the power grid frequency does not meet the requirements for the local power grid code.	<ol style="list-style-type: none"> 1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The SUN2000 automatically recovers after detecting that the power grid becomes normal. 2. If the alarm persists, check whether the power grid frequency is within the acceptable range. If not, contact the local power operator.
2039	Output overcurrent	Major	Cause ID = 1 The power grid voltage drops dramatically or the power grid is short-circuited. As a result, the SUN2000 transient output current exceeds the upper threshold, and protection is triggered.	<ol style="list-style-type: none"> 1. The SUN2000 monitors its external operating conditions in real time and automatically recovers after the fault is rectified. 2. If the alarm persists and affects the energy yield of the power plant, check whether the output is short-circuited. If the fault persists, contact your dealer or Huawei technical support.
2040	Output DC component overhigh	Major	Cause ID = 1 The DC component in the power grid current exceeds the upper threshold.	<ol style="list-style-type: none"> 1. The SUN2000 monitors its external operating conditions in real time and automatically recovers after the fault is rectified. 2. If the alarm persists, contact your dealer or Huawei technical support.
2051	Abnormal residual current	Major	Cause ID = 1 The input-to-ground insulation impedance has decreased during the SUN2000 operation.	<ol style="list-style-type: none"> 1. If the alarm occurs accidentally, the external power cable may be abnormal temporarily. The SUN2000 automatically recovers after the fault is rectified. 2. If the alarm persists or lasts a long time, check whether the impedance between the PV string and ground is too low.

ID	Name	Severity	Cause	Solution
2061	Abnormal grounding	Major	Cause ID = 1 <ul style="list-style-type: none"> • The neutral wire or PE cable of the inverter is not connected. • The output mode set for the inverter is inconsistent with the cable connection mode. 	Power off the inverter (turn off the AC output switch and DC input switch, and wait for a period of time. For details about the wait time, see the description on the device safety warning label), and then perform the following operations: <ol style="list-style-type: none"> 1. Check whether the PE cable for the inverter is connected properly. 2. If the inverter is connected to a TN power grid, check whether the neutral wire is properly connected and whether the voltage of the neutral wire to ground is normal. 3. After the inverter is powered on, check whether the output mode set for the inverter is consistent with the output cable connection mode.
2062	Low insulation resistance	Major	Cause ID = 1 <ul style="list-style-type: none"> • A short circuit exists between the PV array and the ground. • The PV array is in a moist environment and the circuit is not well insulated to the ground. 	<ol style="list-style-type: none"> 1. Check the impedance between the PV array output and the ground. If a short circuit occurs or the insulation is insufficient, rectify the fault. 2. Check whether the PE cable of the SUN2000 is correctly connected. 3. If you have confirmed that the impedance is lower than the specified protection threshold in a cloudy or rainy environment, log in to the app, SmartLogger, or NMS and set the Insulation resistance protection threshold.

ID	Name	Severity	Cause	Solution
2063	Cabinet overtemperature	Minor	Cause ID = 1 <ul style="list-style-type: none"> • The SUN2000 is installed in a place with poor ventilation. • The ambient temperature exceeds the upper threshold. • The SUN2000 is not operating properly. 	<ul style="list-style-type: none"> • Check the ventilation and ambient temperature at the SUN2000 installation position. • If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. • If the ventilation and ambient temperature are normal, contact your dealer or Huawei technical support.
2064	Equipment fault	Major	Cause ID = 1-12 An unrecoverable fault occurs on a circuit inside the SUN2000.	Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the alarm persists, contact your dealer or Huawei technical support.
2065	Upgrade failed or version mismatch	Minor	Cause ID = 1-6 The upgrade is not completed normally.	<ol style="list-style-type: none"> 1. Perform an upgrade again. 2. If the upgrade fails several times, contact your dealer or Huawei technical support.

ID	Name	Severity	Cause	Solution
2068	Battery Abnormal	Minor	<p>The battery is faulty, disconnected, or the battery circuit breaker is OFF when the battery is running.</p> <p>Cause ID = 1-4</p> <ul style="list-style-type: none"> • 1: The battery communication is abnormal. • 2: The battery port experiences overcurrent. • 3: The battery enabling cable is not properly connected. • 4: The battery port voltage is abnormal. 	<ol style="list-style-type: none"> 1. If the battery fault indicator is steady on or blinking, contact the battery supplier. 2. Check that the battery enabling/power/communications cable is correctly installed, and that the communications parameters are the same as the SUN2000 RS485 configurations. 3. Check that the auxiliary power switch on the battery is set to ON. 4. Send a shutdown command on the app. Turn off the AC output switch, DC input switch, and battery switch. Then turn on the battery switch, AC output switch, and DC input switch in sequence after 5 minutes. 5. If the fault persists, contact your dealer or Huawei technical support.
61440	Faulty monitoring unit	Minor	<p>Cause ID = 1</p> <ul style="list-style-type: none"> • The flash memory is insufficient. • The flash memory has bad sectors. 	<p>Turn off the AC output switch and DC input switch, and then turn them on after 5 minutes. If the alarm persists, replace the monitoring board or contact your dealer or Huawei technical support.</p>
2072	Transient AC overvoltage	Major	<p>Cause ID = 1</p> <p>The SUN2000 detects that the phase voltage exceeds the transient AC overvoltage protection threshold.</p>	<ol style="list-style-type: none"> 1. If the voltage at the grid connection point is too high, contact the local power operator. 2. If you have confirmed that the voltage at the grid connection point exceeds the upper threshold and obtained consent from the local power operator, modify the overvoltage protection thresholds. 3. Check whether the peak grid voltage exceeds the upper threshold.

ID	Name	Severity	Cause	Solution
2077	Off-grid output overload	Major	Cause ID = 1/2 The output is overloaded or short-circuited.	<ol style="list-style-type: none"><li data-bbox="1010 297 1382 365">1. Check whether the device output is short-circuited.<li data-bbox="1010 376 1398 470">2. Check whether the device load configuration exceeds the rated value.

ID	Name	Severity	Cause	Solution
2080	Abnormal PV module configuration	Major	<ul style="list-style-type: none"> ● Cause ID = 1 The number of optimizers connected to the inverter exceeds the upper threshold. ● Cause ID = 2 The PV string power or the number of optimizers connected in series in a PV string exceeds the upper threshold. ● Cause ID = 3 The number of optimizers connected in series in a PV string is less than the lower threshold, the PV string output is reversely connected, or the output of some optimizers in the PV string is reversely connected. ● Cause ID = 4 The number of PV strings connected to the inverter exceeds the upper threshold. ● Cause ID = 5 The PV string output is reversely connected or the PV string output is short-circuited. ● Cause ID = 6 Under the same MPPT, the number of optimizers connected in series in PV strings connected in parallel is different, or the output of some optimizers in PV strings is reversely connected. ● Cause ID = 7 The optimizer installation position is changed, or PV strings 	<p>Check whether the total number of PV modules, number of PV modules in a PV string, and number of PV strings meet requirements and whether the PV module output is reversely connected.</p> <ul style="list-style-type: none"> ● Cause ID 1: Check whether the total number of optimizers exceeds the upper threshold. ● Cause ID 2: Check whether the PV string power or the number of PV strings connected in series exceeds the upper threshold. ● Cause ID 3: <ol style="list-style-type: none"> 1. Check whether the number of optimizers connected in series in the PV string is below the lower threshold. 2. Check whether the PV string output is reversely connected. 3. Check whether the PV string output is disconnected. 4. Check whether the optimizer output extension cable is correct (positive connector at one end and negative connector at the other). ● Cause ID 4: Check whether the number of PV strings exceeds the upper threshold. ● Cause ID 5: Check whether the PV string output is reversely connected or short-circuited. ● Cause ID 6: <ol style="list-style-type: none"> 1. Check whether the number of optimizers connected in series in the PV strings connected in

ID	Name	Severity	Cause	Solution
			<p>are combined or exchanged.</p> <ul style="list-style-type: none"> ● Cause ID = 8 The sunlight is weak or changes abnormally. ● Cause ID = 9 In partial configuration scenarios, the PV string voltage exceeds the inverter input voltage specifications. 	<p>parallel under the same MPPT is the same.</p> <p>2. Check whether the optimizer output extension cable is correct (positive connector at one end and negative connector at the other).</p> <ul style="list-style-type: none"> ● Cause ID 7: When the sunlight is normal, perform the optimizer search function again. ● Cause ID 8: When the sunlight is normal, perform the optimizer search function again. ● Cause ID 9: Calculate the PV string voltage based on the number of PV modules in the string and check whether the string voltage exceeds the upper threshold of the inverter input voltage.
2081	Optimizer fault	Warning	<p>Cause ID = 1 The optimizer is offline or faulty.</p>	<p>Go to the optimizer information screen to view the fault details.</p>
2082	Grid-tied/Off-grid Controller Abnormal	Major	<p>Cause ID = 1 The inverter fails to communicate with the Smart Backup Box.</p> <p>Cause ID = 2 An unrecoverable fault occurs on a circuit inside the Smart Backup Box.</p>	<ol style="list-style-type: none"> 1. Send a shutdown command on the app. Turn off the AC output switch, DC input switch, and battery switch. 2. Check whether the power cable and RS485 cable between the Smart Backup Box and the inverter are normal. 3. After 5 minutes, turn on the battery switch, AC output side, AC output switch, and DC input switch. 4. If the alarm persists, contact your dealer or Huawei technical support.

 **NOTE**

Contact your dealer or Huawei technical support if all troubleshooting procedures listed above are completed and the fault still exists.

9 Handling the Inverter

9.1 Removing the SUN2000

NOTICE

Before removing the SUN2000, power off the AC and DC (batteries).

Perform the following operations to remove the SUN2000:

1. Disconnect all cables from the SUN2000, including RS485 communications cables, DC input power cables, AC output power cables, and PGND cables.
2. Remove the SUN2000 from the mounting bracket.
3. Remove the mounting bracket.

9.2 Packing the SUN2000

- If the original packing materials are available, put the SUN2000 inside them and then seal them by using adhesive tape.
- If the original packing materials are not available, put the SUN2000 inside a suitable cardboard box and seal it properly.

9.3 Disposing of the SUN2000

If the SUN2000 service life expires, dispose of it according to the local disposal rules for electrical equipment waste.

10 Technical Specifications

10.1 SUN2000 Technical Specifications

Efficiency

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Maximum efficiency	98.2%	98.3%	98.4%	98.6%	98.6%	98.6%
European efficiency	96.7%	97.1%	97.5%	97.7%	98.0%	98.1%

Input

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Maximum input voltage ^a	1100 V					
Maximum input current (per MPPT)	11 A/13.5 A (Subject to the product nameplate)					
Maximum short-circuit current (per MPPT)	15 A/19.5 A (Subject to the product nameplate)					
Minimum startup voltage	200 V					

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
MPP voltage range	140–980 V					
Full-load MPPT voltage range	140–850 V DC	190–850 V DC	240–850 V DC	285–850 V DC	380–850 V DC	470–850 V DC
Rated input voltage	600 V					
Maximum number of inputs	2					
Number of MPPTs	2					
Battery normal voltage	600 Vdc					
Battery voltage range	600-1000 Vdc					
Battery maximum current	16.7 A					
Battery type	Li-ion					
Note a: The maximum input voltage is the maximum DC input voltage that the SUN2000 can withstand. If the input voltage exceeds this value, the SUN2000 may be damaged.						

Output

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Rated output power	3000 W	4000 W	5000 W	6000 W	8000 W	10,000 W
Maximum apparent power	3300 VA	4400 VA	5500 VA	6600 VA	8800 VA	11,000 VA
Maximum active power (cos ϕ = 1)	3300 W	4400 W	5500 W	6600 W	8800 W	11,000 W
Rated output voltage	220 V/380 V, 230 V/400 V, 3W+N+PE					

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Maximum output voltage at long-term operation	See standards about the local power grid.					
Rated output current	4.6 A (380 V)/ 4.4 A (400 V)	6.1 A (380 V) /5.8 A (400 V)	7.6 A (380 V)/ 7.3 A (400 V)	9.1 A (380 V)/ 8.7 A (400 V)	12.2 A (380 V) /11.6 A (400 V)	15.2 A (380 V)/ 14.5 A (400 V)
Maximum output current	5.1 A	6.8 A	8.5 A	10.1 A	13.5 A	16.9 A
Rated apparent power	3 kVA	4 kVA	5 kVA	6 kVA	8 kVA	10 kVA
Inrush current	5.1 A	6.8 A	8.5 A	10.1 A	13.5 A	16.9 A
Max output fault current	15.06 A	20.08 A	25.1 A	30.12 A	40.16 A	50.2 A
Max output overcurrent protection	31.8 A	31.8 A	31.8 A	31.8 A	31.8 A	31.8 A
Output voltage frequency	50 Hz/60 Hz					
Power factor	0.8 leading-0.8 lagging					
Maximum total harmonic distortion (THD) AC THDi	< 3% under rated conditions. Single harmonic meets the VDE4105 requirements.					

Protection

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Overvoltage category	PV II/AC III					
Input DC switch	Supported					

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Islanding protection	Supported					
Output overcurrent protection	Supported					
Input reverse connection protection	Supported					
PV string fault detection	Supported					
DC surge protection	DC common mode: 10 kA					
AC surge protection	Common mode: 5 kA; differential mode: 5 kA					
Insulation resistance detection	Supported					
Residual current monitoring (RCMU)	Supported					
AFCI	Supported					
PV module safe shutdown, optimizer	Supported					
PID repair	Supported					
Active anti-islanding method	AFD					
Protection class	I					
PV and AC port	DVCC					
Communication port	DVCA					

Display and Communication

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Display	LED and WLAN+app					
RS485	Supported					
External expansion communication module	Supports WLAN and 4G.					
remote ripple control	Supported					

General Specifications

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Dimensions (W x H x D, mm)	525 x 470 x 166 (including only the rear mounting kit of the SUN2000)					
Weight	17 kg (including only the rear mounting kit of the SUN2000)					
Noise	29 dB (A) (typical working condition)					
Operating temperature	-25°C to +60°C (derated when the temperature is higher than 45°C)					
Operating humidity	0-100% RH					
Cooling mode	Natural convection					
Maximum operating altitude	4000 m (derated when the altitude is greater than 3000 m)					
Storage temperature	-40°C to +70°C					
Storage humidity	5-95% RH (non-condensing)					
Input terminal	Staubli MC4					
Output terminal	Waterproof quick-connect terminal					
IP rating	IP65					
Topology	Non-Isolation					

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Environmental protection requirements	RoHS 6					

Standards Compliance

Technical Specifications	SUN2000-3KTL-M1	SUN2000-4KTL-M1	SUN2000-5KTL-M1	SUN2000-6KTL-M1	SUN2000-8KTL-M1	SUN2000-10KTL-M1
Criteria	EN/IEC 62109-1, EN/IEC 62109-2					

10.2 Optimizer Technical Specifications

Efficiency

Technical Specifications	SUN2000-450W-P
Maximum efficiency	99.5%
European weighted efficiency	99.0%

Input

Technical Specifications	SUN2000-450W-P
Rated PV module power	450 W
Maximum PV module power	472.5 W
Maximum input voltage	80 V
MPPT voltage range	8–80 V
Maximum short-circuit current	13 A

Technical Specifications	SUN2000-450W-P
Overvoltage level	II

Output

Technical Specifications	SUN2000-450W-P
Rated output power	450 W
Output voltage	4–80 V
Maximum output current	15 A
Output bypass	Yes
Shutdown output voltage/impedance	0 V/1 k Ω ($\pm 10\%$)

Common Parameters

Technical Specifications	SUN2000-450W-P
Dimensions (W x H x D)	71 mm x 138 mm x 25 mm
Net weight	≤ 550 g
DC input and output terminals	Staubli MC4
Operating temperature	-40°C to $+85^{\circ}\text{C}$
Storage temperature	-40°C to $+70^{\circ}\text{C}$
Operating humidity	0–100% RH
Maximum operating altitude	4000 m
IP rating	IP68
Installation mode	<ul style="list-style-type: none">• PV module support installation• PV module frame installation

Long String Design (Full Optimizer Configuration)

Technical Specifications	SUN2000-3 KTL-M1	SUN2000-4 KTL-M1	SUN2000-5 KTL-M1	SUN2000-6 KTL-M1	SUN2000-8 KTL-M1	SUN2000-10KTL-M1
Minimum optimizer number per string	6					
Maximum optimizer number per string	50					
Maximum DC power per string	10,000 W					

A Grid Code

 NOTE

The grid codes are subject to change. The listed codes are for reference only.

Table A-1 Grid Code

No.	Grid Code	Remarks
1	VDE-AR-N-4105	Germany low-voltage (LV) power grid
2	UTE C 15-712-1(A)	France mainland power grid
3	UTE C 15-712-1(B)	France island power grid
4	UTE C 15-712-1(C)	France island power grid
5	EN50438-CZ	Czech power grid
6	RD1699/661	Spain LV power grid
7	EN50438-NL	Netherlands power grid
8	C10/11	Belgium power grid
9	IEC61727	IEC 61727 LV grid-tied power grid (50 Hz)
10	Custom (50 Hz)	Reserved
11	Custom (60 Hz)	Reserved
12	TAI-PEA	Thailand grid-tied standard power grid
13	TAI-MEA	Thailand grid-tied standard power grid
14	EN50438-TR	Turkey LV power grid code

No.	Grid Code	Remarks
15	IEC61727-60Hz	IEC61727 low-voltage power grid (60 Hz)
16	EN50438_IE	Ireland LV power grid
17	PO12.3	Spain LV power grid
18	EN50549-LV	Ireland power grid
19	ABNT NBR 16149	Brazil power grid
20	DUBAI	Dubai LV power grid
21	TAIPOWER	Taiwan LV power grid
22	EN50438-SE	Sweden LV power grid
23	Austria	Austria power grid
24	G98	UK G98 power grid
25	G99-TYPEA-LV	UK G99_TypeA_LV power grid
26	SINGAPORE	Singapore LV power grid
27	HONGKONG	Hong Kong LV power grid
28	EN50549-SE	Sweden LV power grid
29	AUSTRALIA-AS4777_A-LV230	Australia power grid
30	AUSTRALIA-AS4777_B-LV230	Australia power grid
31	AUSTRALIA-AS4777_C-LV230	Australia power grid
32	AUSTRALIA-AS4777_NZ-LV230	Australia power grid
33	EN50549-PL	Poland
34	CEI0-21	Italy LV power grid
35	SWITZERLAND-NA/EEA:2020-LV230	Switzerland
36	DENMARK-EN50549-DK1-LV230	Denmark power grid
37	DENMARK-EN50549-DK2-LV230	Denmark power grid
38	Pakistan	Pakistan

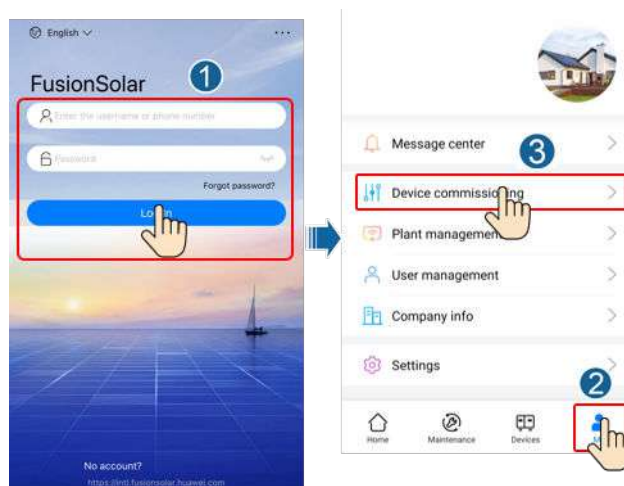
B Device Commissioning

Step 1 Access **Device Commissioning** screen.

Figure B-1 Method 1: before login (not connected to the Internet)



Figure B-2 Method 2: after login (connected to the Internet)

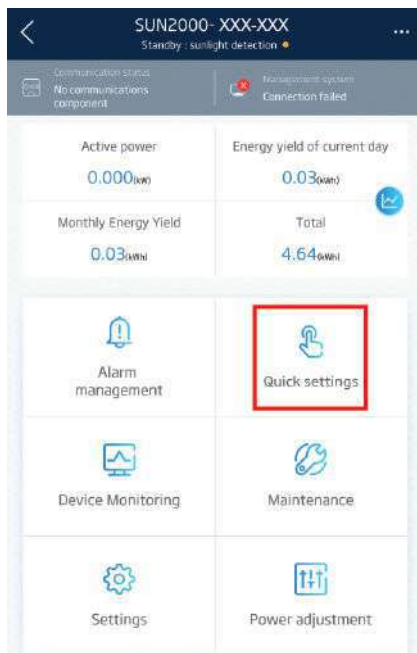


Step 2 Connect to the solar inverter WLAN and log in to the device commissioning screen as the **installer** user.

NOTICE

- When connecting to the SUN2000 directly from the mobile phone, keep the mobile phone visible within 3 meters of the SUN2000 to ensure the communication quality between the app and SUN2000. The distances are for reference only and may vary with mobile phones and shielding conditions.
- When connecting the SUN2000 to the WLAN over a router, ensure that the mobile phone and SUN2000 are in the WLAN coverage of the router and the SUN2000 is connected to the router.
- The router supports WLAN (IEEE 802.11 b/g/n, 2.4 GHz) and the WLAN signal reaches the SUN2000.
- The WPA, WPA2, or WPA/WPA2 encryption mode is recommended for routers. Enterprise-level encryption is not supported (for example, public hotspots requiring authentication such as airport WLAN). WEP and WPA TKIP are not recommended because these two encryption modes have serious security defects. If the access fails in WEP mode, log in to the router and change the encryption mode of the router to WPA2 or WPA/WPA2.

Figure B-3 Quick settings



 **NOTE**

- Obtain the initial password for connecting to the solar inverter WLAN from the label on the side of the solar inverter.
- Use the initial password upon first power-on and change it immediately after login. To ensure account security, change the password periodically and keep the new password in mind. Not changing the initial password may cause password disclosure. A password left unchanged for a long period of time may be stolen or cracked. If a password is lost, devices cannot be accessed. In these cases, the user is liable for any loss caused to the PV plant.
- When you access the **Device Commissioning** screen of the SUN2000 for the first time, you need to manually set the login password because the SUN2000 does not have an initial login password.

----End

C Resetting Password





- Step 1** Ensure that the SUN2000 connects to the AC and DC power supplies at the same time. Indicators  and  are steady green or blink at long intervals for more than 3 minutes.
- Step 2** Perform the following operations within 3 minutes:
1. Turn off the AC switch and set the DC switch at the bottom of the SUN2000 to OFF. If the SUN2000 connects to batteries, turn off the battery switch. Wait until all the LED indicators on the SUN2000 panel turn off.
 2. Turn on the AC switch and set the DC switch to ON. Ensure that the indicator  is blinking green at long intervals.
 3. Turn off the AC switch and set the DC switch to OFF. Wait until all LED indicators on the SUN2000 panel are off.
 4. Turn on the AC switch and set the DC switch to ON. Wait until all indicators on the solar inverter panel blink and turn off 30 seconds later.
- Step 3** Reset the password within 10 minutes. (If no operation is performed within 10 minutes, all inverter parameters remain unchanged.)
1. Wait until the indicator  blinks green at long intervals.
 2. Obtain the initial WLAN hotspot name (SSID) and initial password (PSW) from the label on the side of the SUN2000 and connect to the app.
 3. On the login screen, set a new login password and log in to the app.

Figure C-1 Setting the password

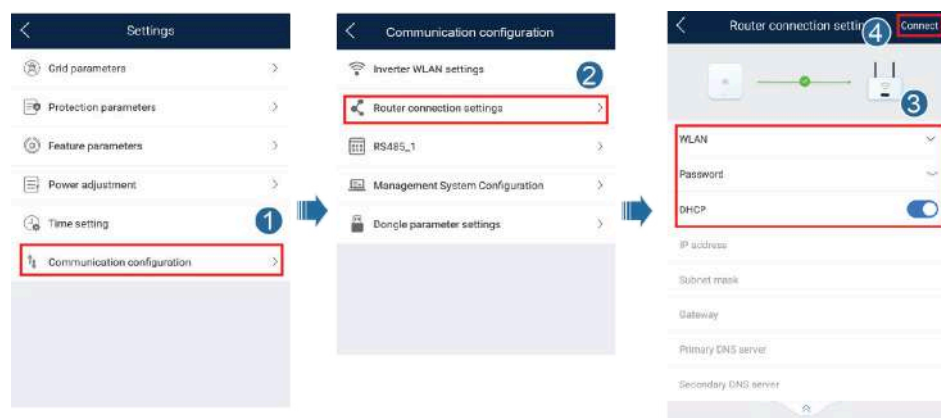


Step 4 Set router and management system parameters to implement remote management.

- Setting router parameters

Log in to the FusionSolar app, choose **Device Commissioning > Settings > Communication configuration > Router connection settings**, and set router parameters.

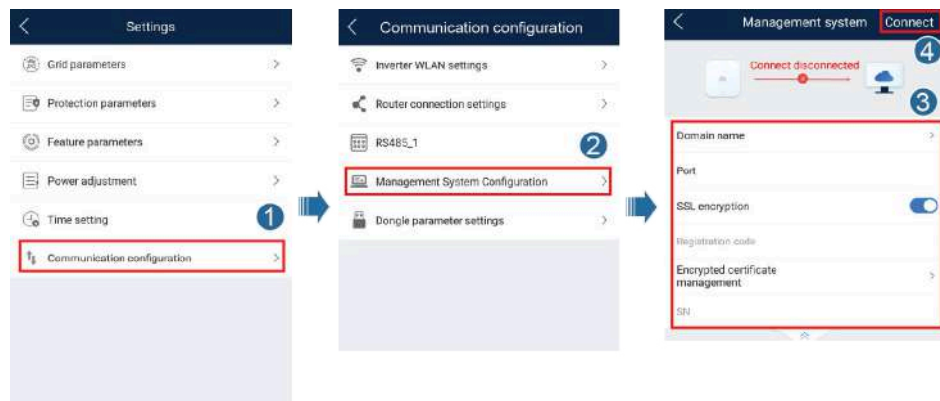
Figure C-2 Setting router parameters



- Setting management system parameters

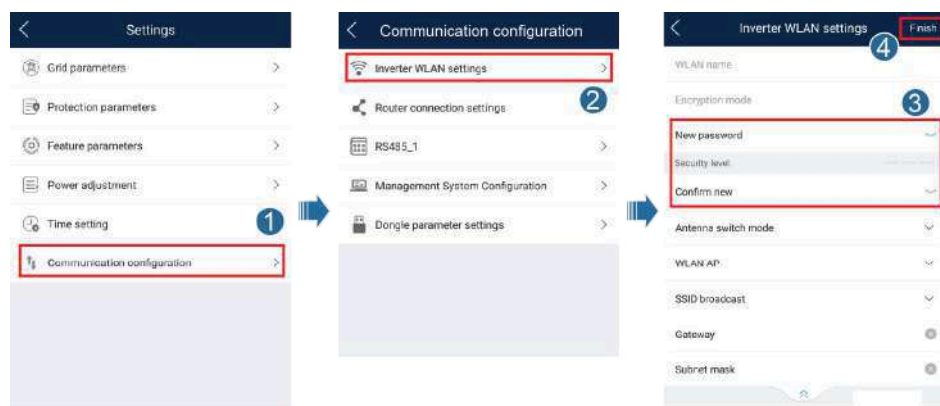
Log in to the FusionSolar app, choose **Device Commissioning > Settings > Communication configuration > Management System Configuration**, and set management system parameters.

Figure C-3 Setting management system parameters



- (Optional) Resetting the WLAN password
Log in to the FusionSolar app, choose **Device Commissioning > Settings > Communication configuration > Inverter WLAN settings**, and reset the WLAN password.

Figure C-4 Resetting the WLAN password



----End

D Rapid Shutdown

 **NOTE**

- If optimizers are configured for some PV modules, the rapid shutdown function is not supported.
- You are advised to periodically check whether the rapid shutdown function is normal.

When all PV modules connected to the solar inverter are configured with optimizers, the PV system shuts down quickly and reduces the output voltage of the PV string to below 30 V within 30 seconds.

Perform the following step to trigger rapid shutdown:

- Method 1: To enable the rapid shutdown function, you need to connect the access switch to pins 13 and 15 of the SUN2000 communications terminal. The switch is closed by default. The rapid shutdown is triggered when the switch changes from closed to open.
- Method 2: Turn off the AC switch between the solar inverter and the power grid.
- Method 3: Set the DC switch at the bottom of the SUN2000 to OFF. (Turning off an extra switch on the DC side of the SUN2000 will not trigger rapid shutdown. The PV string may be energized.)

E Locating Insulation Resistance Faults

If the ground resistance of a PV string connected to a solar inverter is too low, the solar inverter generates a **Low Insulation Resistance** alarm.

The possible causes are as follows:

- A short circuit occurs between the PV array and the ground.
- The ambient air of the PV array is damp and the insulation between the PV array and the ground is poor.

To locate the fault, connect each PV string to a solar inverter, power on and check the solar inverter, and locate the fault based on the alarm information reported by the FusionSolar app. If a system is not configured with any optimizer, skip the corresponding operations. Perform the following steps to locate an insulation resistance fault.

NOTICE

If two or more ground insulation faults occur in a single PV string, the following method cannot locate the fault. You need to check the PV modules one by one.

- Step 1** The AC power supply is connected, and set the DC switch at the bottom of the solar inverter to OFF. If the solar inverter connects to batteries, wait for 1 minute, and turn off the battery switch and then the auxiliary power switch of the battery.
- Step 2** Connect each PV string to the solar inverter and set the DC switch to ON. If the solar inverter status is **Shutdown: Command**, choose **Device Commissioning > Maintenance > Inverter ON/OFF** on the app and send a startup command.
- Step 3** Log in to the FusionSolar app and choose **My > Device Commissioning**. On the **Device Commissioning** screen, connect and log in to the solar inverter, and access the **Alarm management** screen. Check whether the **Low Insulation Resistance** alarm is reported.
 - If the **Low Insulation Resistance** alarm is not reported one minute after the DC is supplied, choose **Device Commissioning > Maintenance > Inverter ON/OFF** on the app and send a shutdown command. Set the DC switch to OFF and go to **Step 2** to connect another PV string to the solar inverter for a check.

- If a **Low Insulation Resistance** alarm is still reported one minute after the DC is supplied, check the percentage for possible short-circuit positions on the **Alarm details** page and go to **Step 4**.

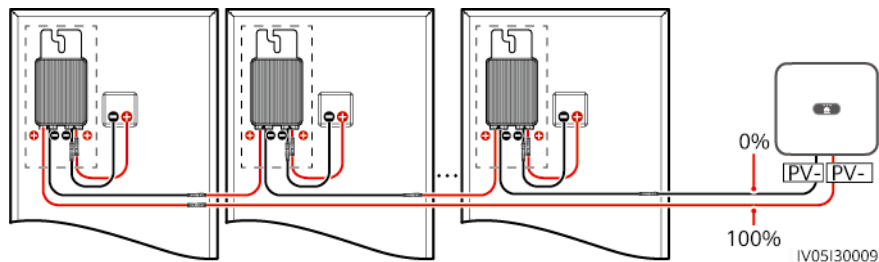
Figure E-1 Alarm details



NOTE

- The positive and negative terminals of a PV string are connected to the PV+ and PV- terminals of the solar inverter. The PV- terminal represents a possibility of 0% for the short-circuit position and the PV+ terminal represents a possibility of 100% for the short-circuit position. Other percentages indicate that the fault occurs on a PV module or cable in the PV string.
- Possible fault position = Total number of PV modules in a PV string x Percentage of possible short-circuit positions. For example, if a PV string consists of 14 PV modules and the percentage of the possible short-circuit position is 34%, the possible fault position is 4.76 (14 x 34%), indicating that the fault is located near PV module 4, including the previous and the next PV modules and the cables of PV module 4. The solar inverter has a detection precision of ± 1 PV module.

Figure E-2 Definition of the percentage of the short-circuit position



Step 4 Set the DC switch to OFF and check whether the connector or DC cable between the possible faulty PV modules and the corresponding optimizers, or those between the adjacent PV modules and the corresponding optimizers are damaged.

- If yes, replace the damaged connector or DC cable, set the DC switch to ON, and view the alarm information.
 - If the **Low Insulation Resistance** alarm is not reported one minute after the DC is supplied, the inspection on the PV string is complete. Choose **Device Commissioning > Maintenance > Inverter ON/OFF** on the app and send a shutdown command. Set the DC switch to OFF. Go to **Step 2** to check other PV strings. Then go to **Step 8**.
 - If the **Low Insulation Resistance** alarm is still reported one minute after the DC is supplied, go to **Step 5**.
- If not, go to **Step 5**.

- Step 5** Set the DC switch to OFF, disconnect the possible faulty PV modules and corresponding optimizers from the PV string, and connect a DC extension cable with an MC4 connector to the adjacent PV modules or optimizers. Set the DC switch to ON and view the alarm information.
- If the **Low Insulation Resistance** alarm is not reported one minute after the DC is supplied, the fault occurs on the disconnected PV module and optimizer. Choose **Device Commissioning > Maintenance > Inverter ON/OFF** on the app and send a shutdown command. Go to **Step 7**.
 - If the **Low Insulation Resistance** alarm is still reported one minute after the DC is supplied, the fault does not occur on the disconnected PV module or optimizer. Go to **Step 6**.
- Step 6** Set the DC switch to OFF, reconnect the removed PV module and optimizer, and repeat **Step 5** to check the adjacent PV modules and optimizers.
- Step 7** Determine the position of the ground insulation fault.
1. Disconnect the possible faulty PV module from the optimizer.
 2. Set the DC switch to OFF.
 3. Connect the possible faulty optimizer to the PV string.
 4. Set the DC switch to ON. If the solar inverter status is **Shutdown: Command**, choose **Device Commissioning > Maintenance > Inverter ON/OFF** on the app and send a startup command. Check whether the **Low Insulation Resistance** alarm is reported.
 - If the **Low Insulation Resistance** alarm is not reported one minute after the solar inverter is powered on, the PV module is faulty. Choose **Device Commissioning > Maintenance > Inverter ON/OFF** on the app and send a shutdown command.
 - If the **Low Insulation Resistance** alarm is still reported one minute after the solar inverter is powered on, the optimizer is faulty.
 5. Set the DC switch to OFF. Replace the faulty component to rectify the insulation resistance fault. Go to **Step 2** to check other PV strings. Then go to **Step 8**.
- Step 8** If the solar inverter connects to batteries, turn on the auxiliary power switch of the battery and then the battery switch. Set the DC switch to ON. If the solar inverter status is **Shutdown: Command**, choose **Device Commissioning > Maintenance > Inverter ON/OFF** on the app and send a startup command.

----End

F Acronyms and Abbreviations

L	
LED	light emitting diode
M	
MPP	maximum power point
MPPT	maximum power point tracking
P	
PV	photovoltaic

LUNA2000-(5-30)-S0

Quick Guide

Issue: 04

Part Number: 31500EMA

Date: 2021-01-10

HUAWEI TECHNOLOGIES CO., LTD.

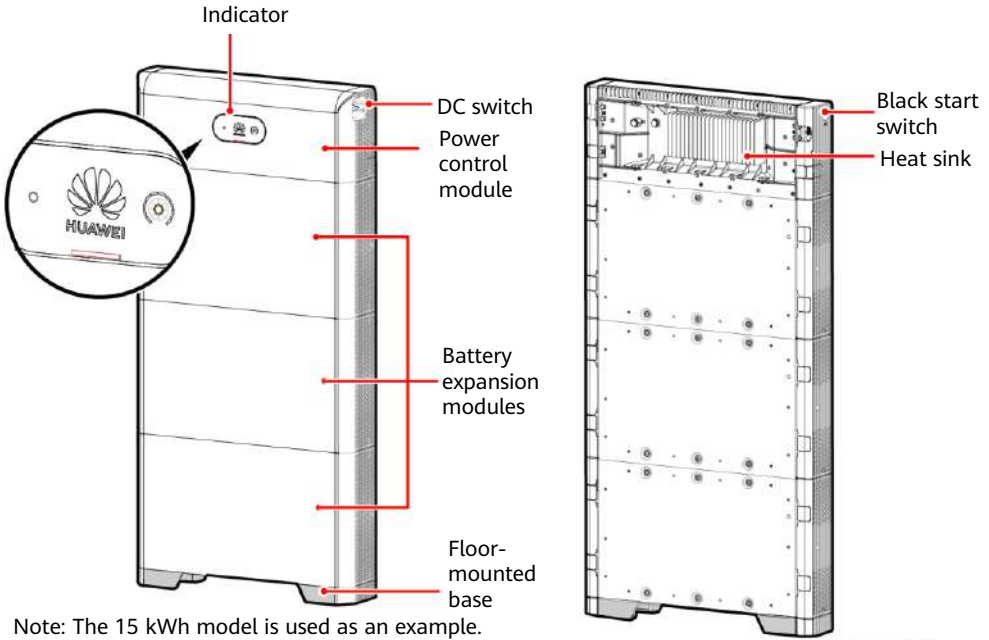


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1 Product Overview

LUNA2000 Battery Appearance

The LUNA2000 battery is applicable to the grid-tied or off-grid systems of residential rooftop PV plants. It can store and release electric energy based on service requirements.

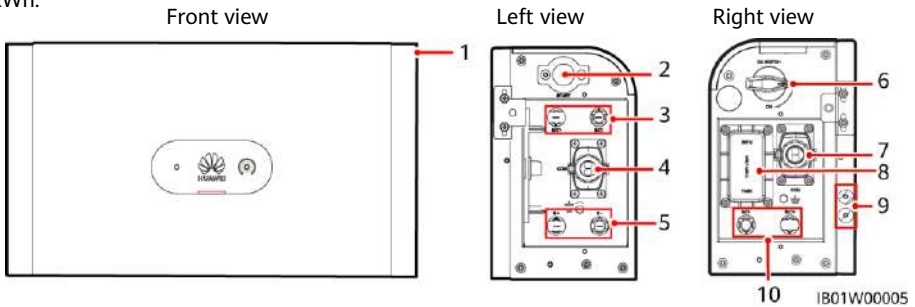


Note: The 15 kWh model is used as an example.

Power Control Module and Battery Expansion Modules

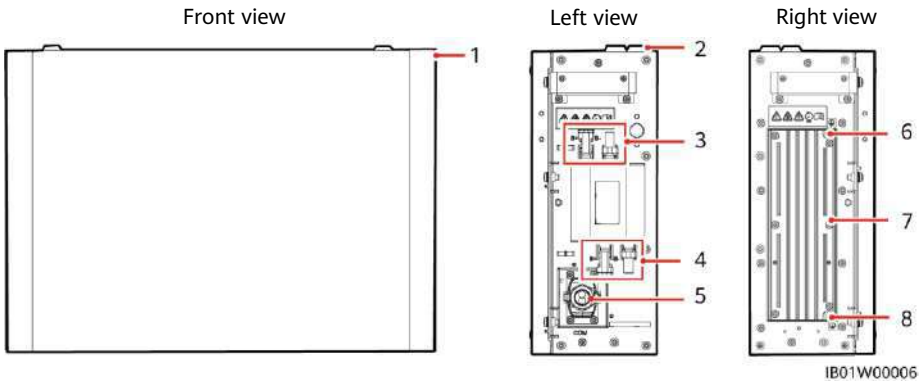
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The LUNA2000 battery consists of a power control module and battery expansion modules. The power control module is 5 kW, and a battery expansion module has a standard capacity of 5 kWh.



IB01W00005

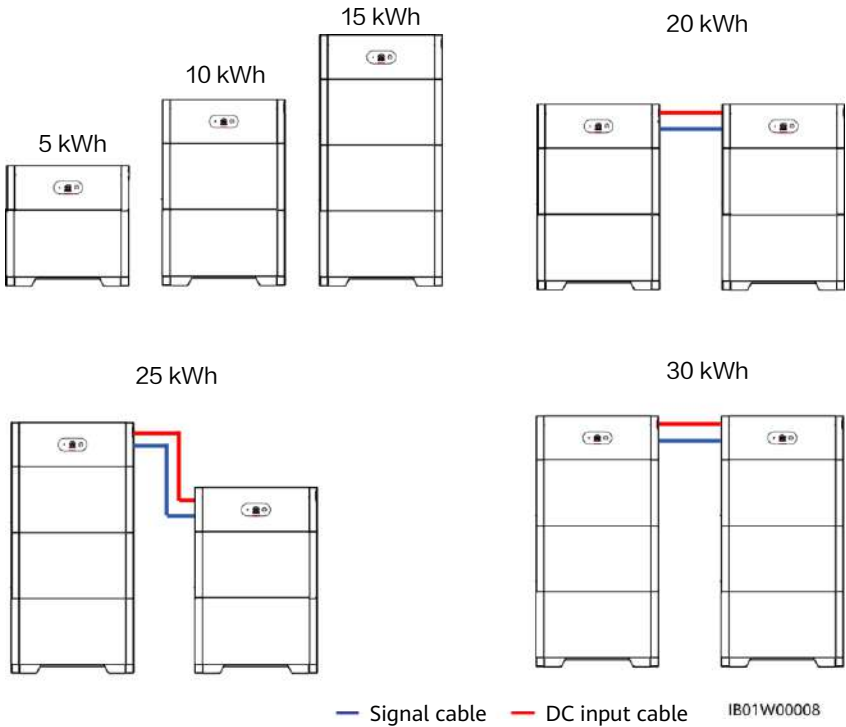
- | | | |
|---------------------------------|---|------------------------------------|
| (1) Power control module (DCDC) | (2) Black start switch | (3) Battery terminals (BAT+/BAT-) |
| (4) COM port (COM) | (5) Battery cascading terminals (B+/B-) | (6) DC switch (DC SWITCH) |
| (7) COM port (COM) | (8) Fuse point | (9) Ground |
| | | (10) Battery terminals (BAT+/BAT-) |



- (1) Battery expansion module
- (2) Boss for alignment
- (3) Battery cascading terminals (B+/B-)
- (4) Battery cascading terminals (B+/B-)
- (5) COM port (COM)
- (6) Ground point
- (7) Heat sink
- (8) Ground point

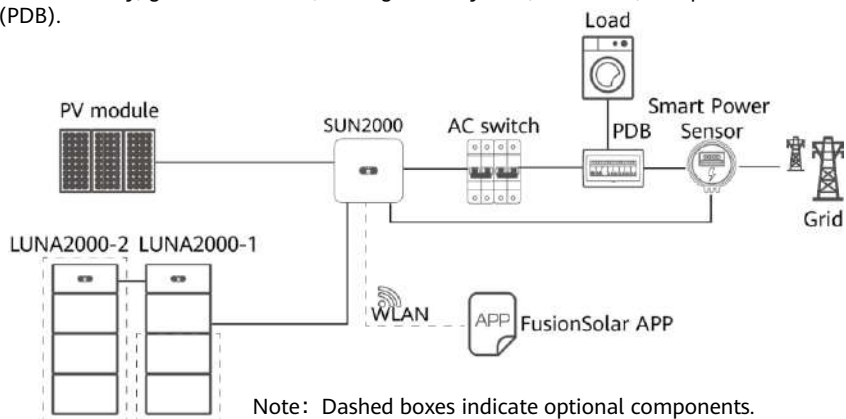
Battery Capacity Description

The battery supports power and capacity expansion. Two power control modules can be connected in parallel. One power control module supports a maximum of three battery expansion modules.



Residential Rooftop PV System for Grid Connection

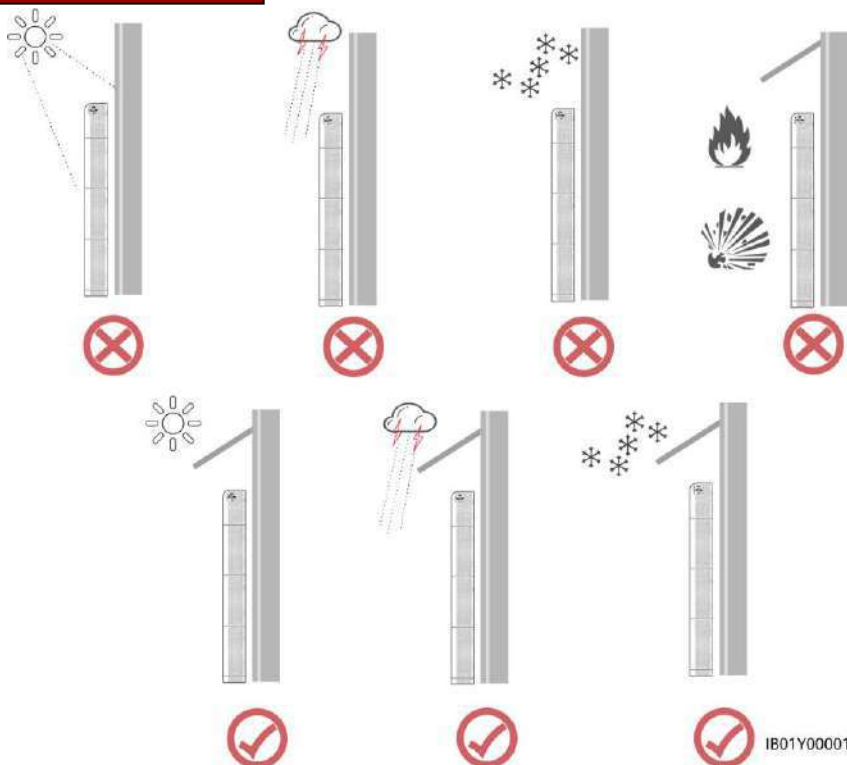
The residential rooftop PV system for grid connection generally consists of the PV module, LUNA2000 battery, grid-tied inverter, management system, AC switch, and power distribution box (PDB).



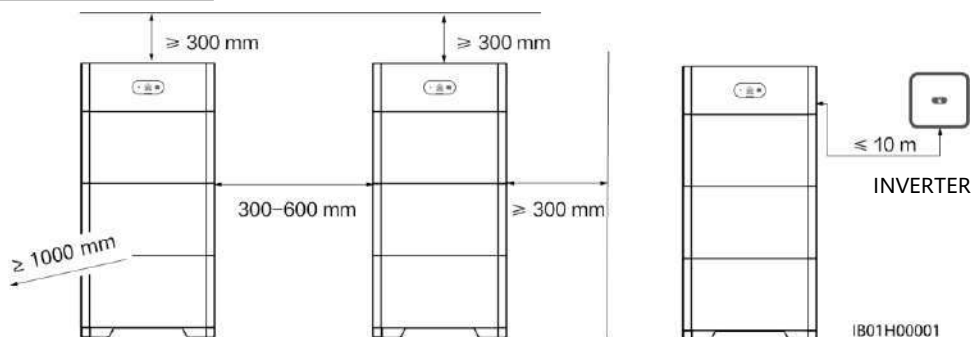
2 Device Installation

2.1 Installation Requirements

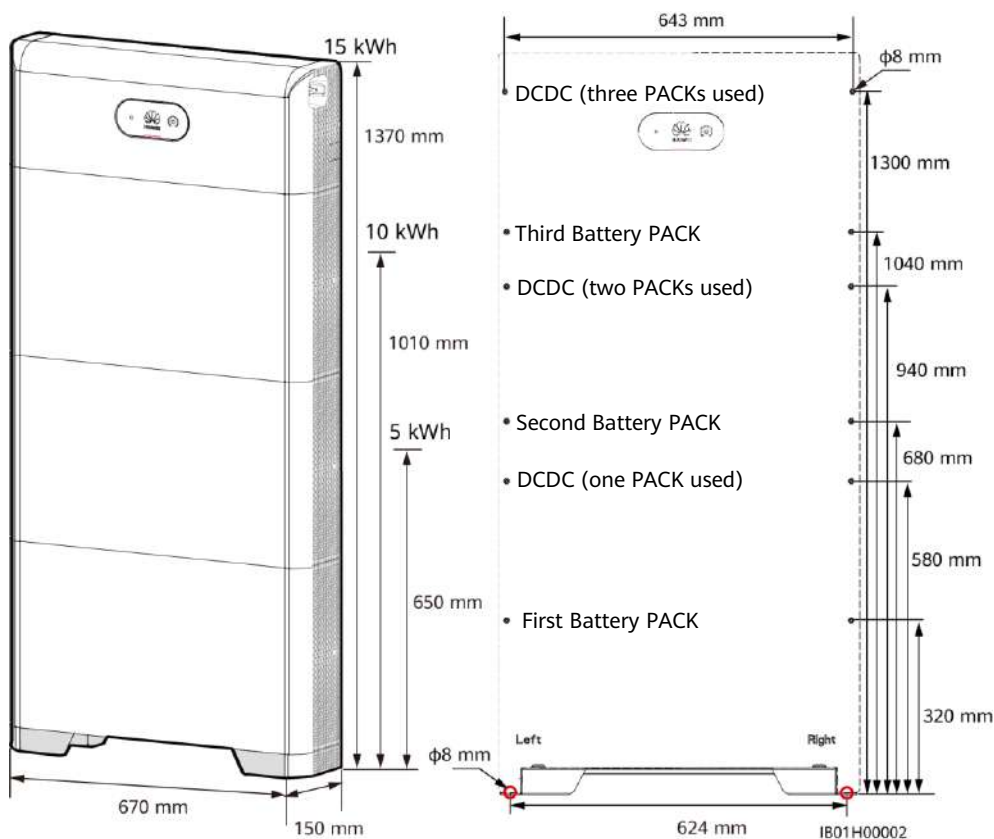
Installation Environment



Installation Space



Mounting Hole Dimensions



2.2 Installing the Floor Support



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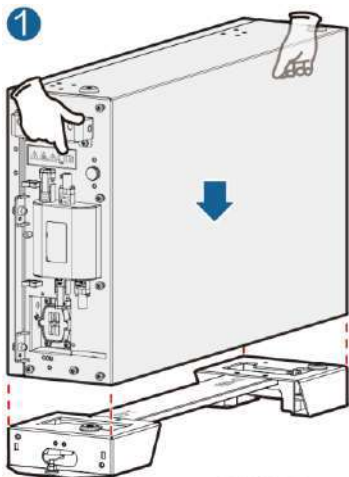
Avoid drilling holes in the water pipes and cables buried in the wall.

2.3 Installing Battery Expansion Modules

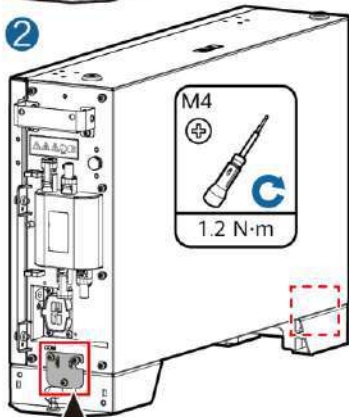
1. Install the battery expansion modules and power control module on the support.

NOTICE

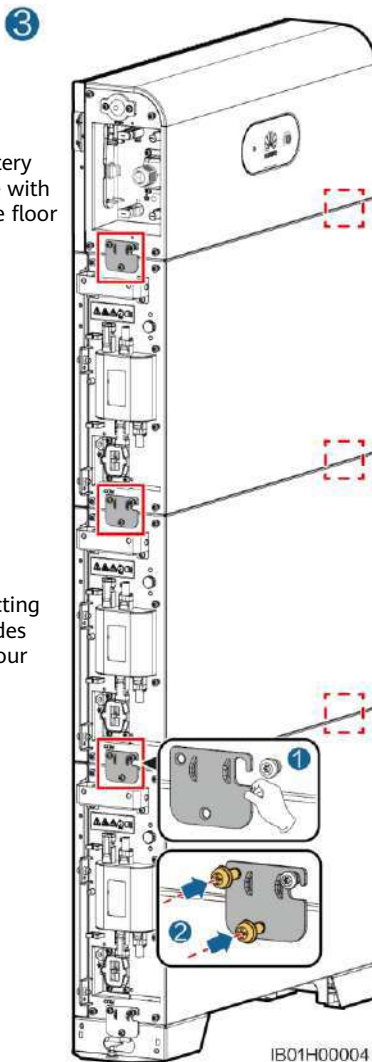
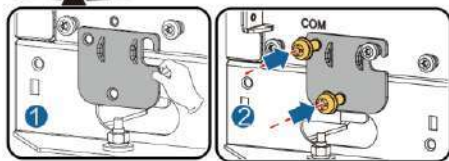
- The following describes how to install the battery expansion modules for a 15 kWh model.
- The installation of battery expansion modules for 5 kWh and 10 kWh models is the same. One battery expansion module is installed for a 5 kWh model, and two battery expansion modules are installed for a 10 kWh model.



Align the first battery expansion module with the support on the floor support.



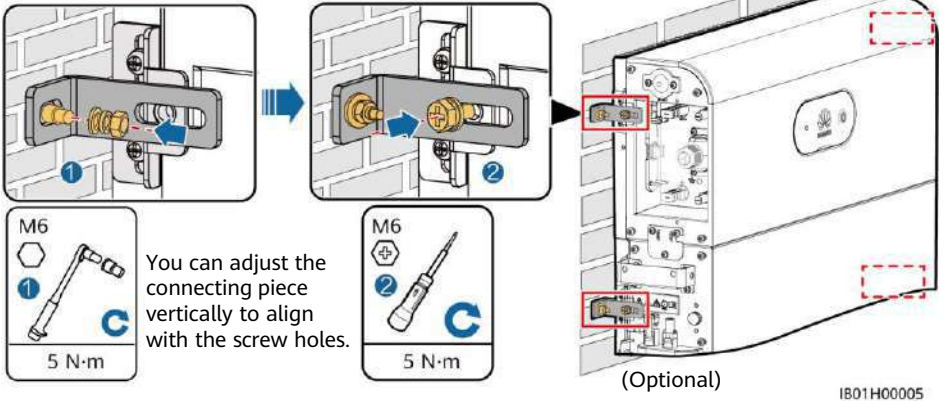
Install the connecting pieces on both sides and tighten the four screws.



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Install the remaining battery modules and power module from bottom to top. After installing a module, secure the left and right connecting pieces, and then install the next module.

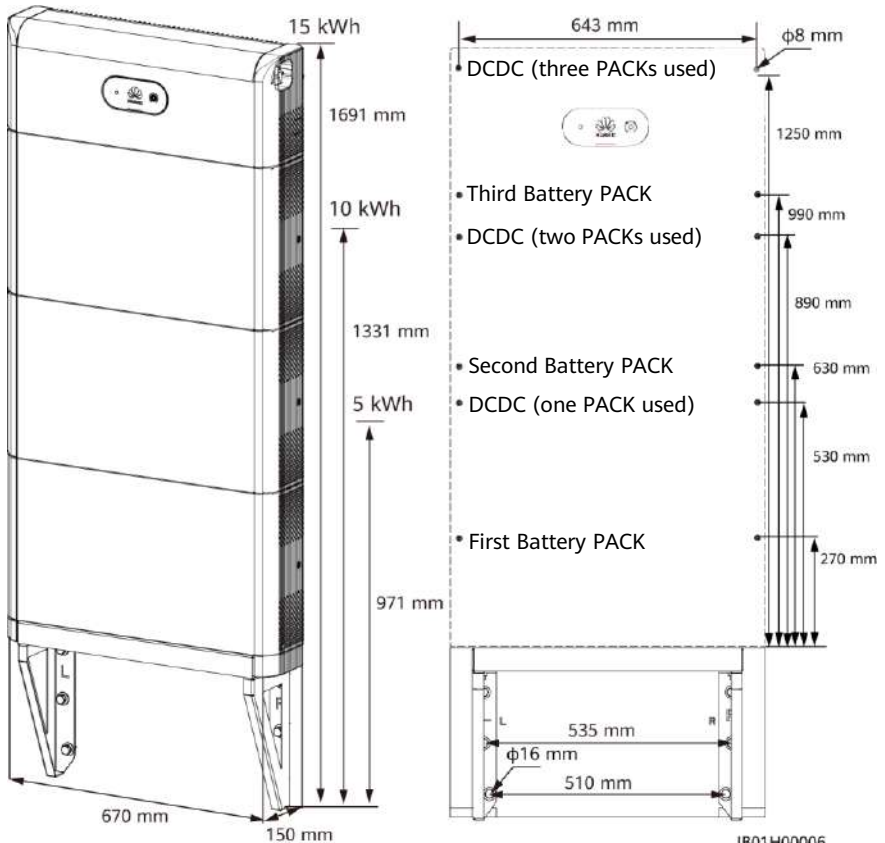
2. Secure the power control module to the wall.



3. (Optional) Secure the battery expansion modules to the wall by referring to step 2.

2.4 Wall-mounted Installation

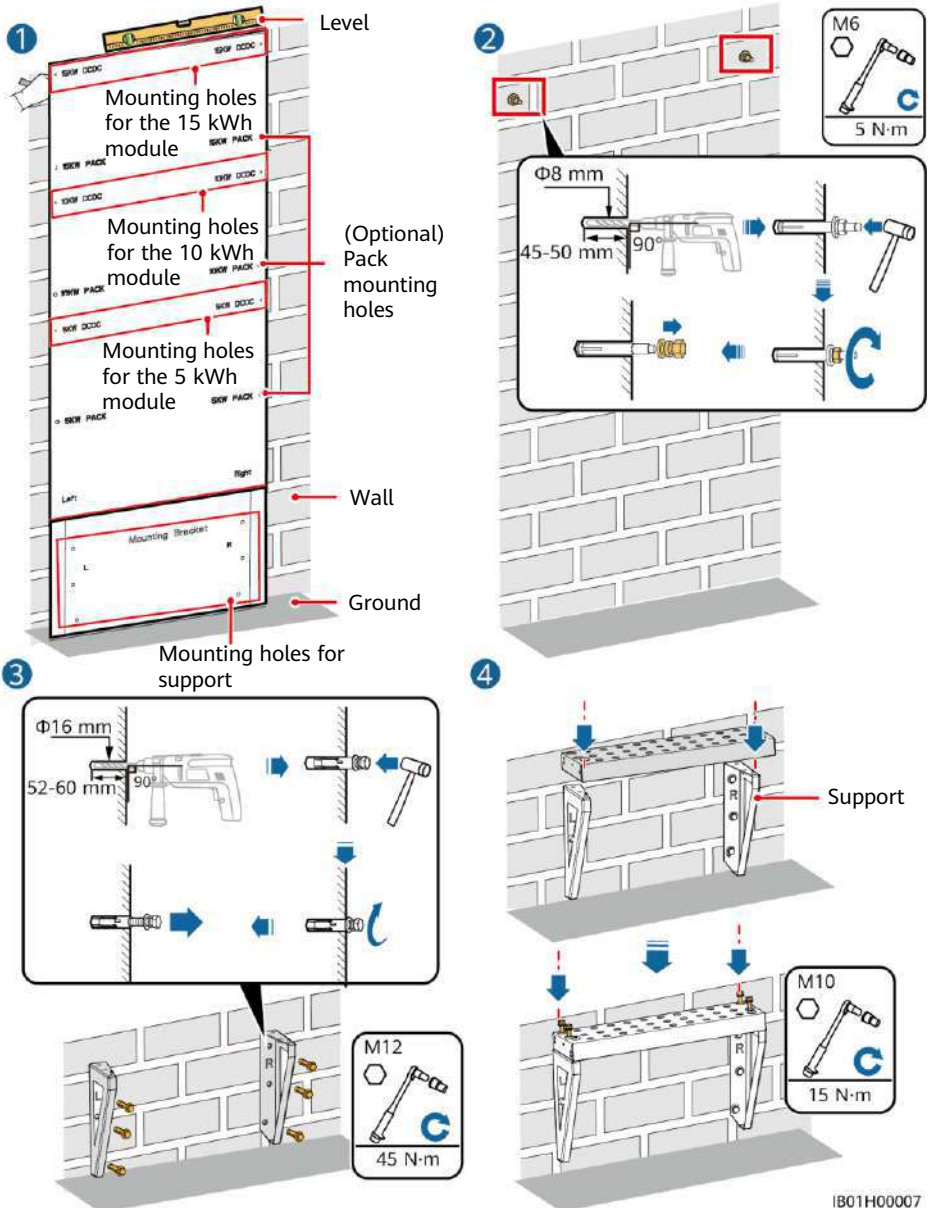
Mounting Hole Dimensions



Installing the Support for Wall-mounted Installation

NOTE

For floor-mounted installation, the base is 50 mm high. If waterproofing requirements cannot be met, the battery can be installed on a wall. The mounting kits need to be purchased separately. For wall- and floor-mounted installation, ensure that the load-bearing capacity meets the requirements (one battery expansion module weighs 50 kg).



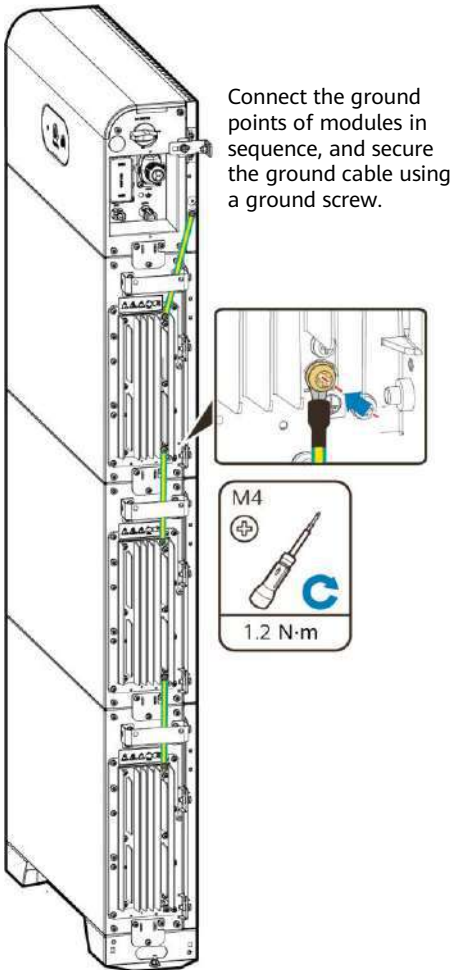
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3 Internal Electrical Connections of the Battery

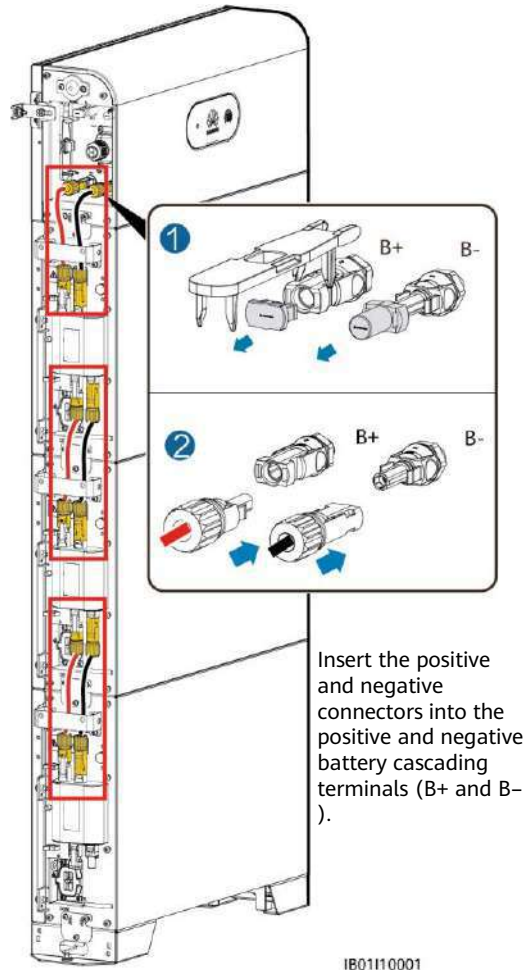
NOTICE

- Connect cables in accordance with local installation laws and regulations.
- Before connecting cables, ensure that the DC switch on the battery and all the switches connected to the battery are set to OFF. Otherwise, the high voltage of the battery may result in electric shocks.

3.1 Installing an Internal Ground Cable



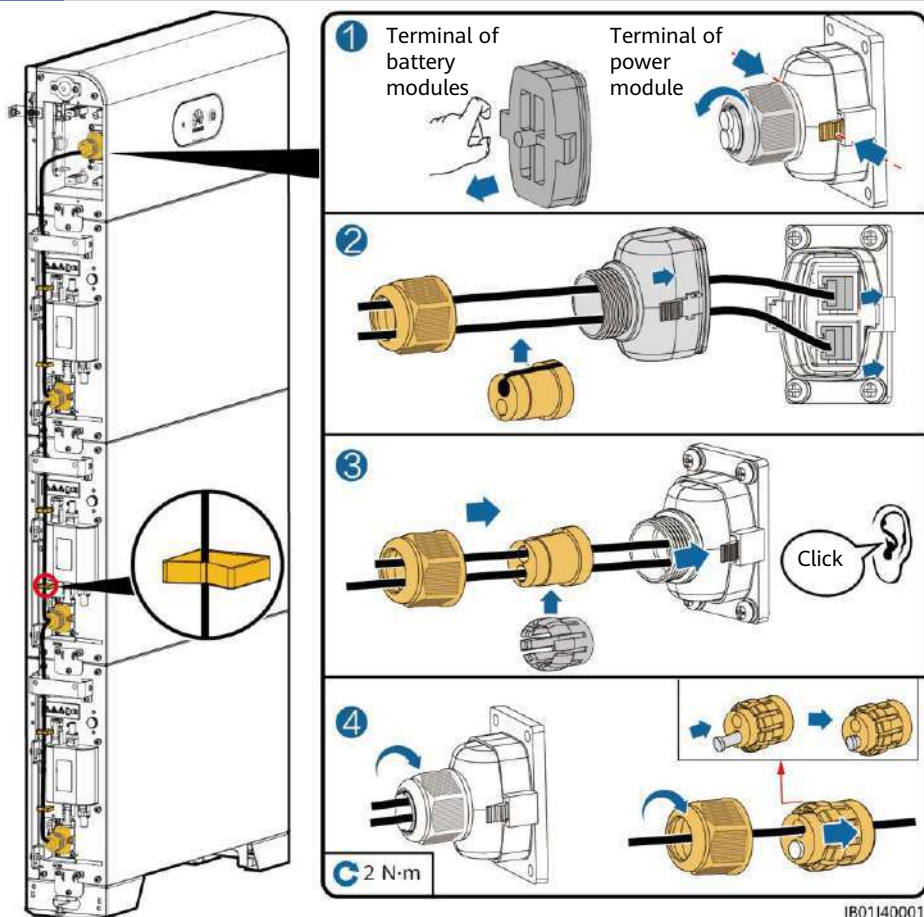
3.2 Installing Internal DC Terminals



NOTE

- Internal electrical cables are delivered with the battery, see the *Packing List* in the packing case.
- The Amphenol terminal is used as the DC terminal between the power control module and the battery expansion modules.

3.3 Connecting Internal Signal Cables



NOTICE

- When a communications terminal is connected to a single network cable, a waterproof rubber plug must be installed.
- After inserting the terminal shell into the COM port, shake the terminal shell left and right and pull it back to ensure that it is securely installed, and tighten the nut (ensure that the rubber plug is tightly compressed). Otherwise, the waterproof performance is affected.

4 External Electrical Connections of the Battery

4.1 Preparing Cables

NOTICE

- Connect cables in accordance with local installation laws and regulations.
- Before connecting cables, ensure that the DC switch on the battery and all the switches connected to the battery are set to OFF. Otherwise, the high voltage of the battery may result in electric shocks.

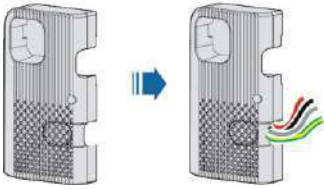
NOTICE

The DC input power cable and signal cable between the battery and the inverter must be less than or equal to 10 m.

Prepare cables based on site requirements.

No.	Cable	Type	Conductor Cross-Sectional Area Range	Outer Diameter
1	Ground cable	Single-core outdoor copper-core cable	10 mm ²	-
2	DC input power cable (inverter to battery and battery to battery)	Common outdoor PV cable in the industry	4–6 mm ²	5.5–9 mm
3	Signal cable (inverter to battery and battery to battery)	Outdoor shielded twisted pair cable (8 cores)	0.20–0.35 mm ²	6.2–7 mm

4.2 Routing Cables Out of the Cable Hole



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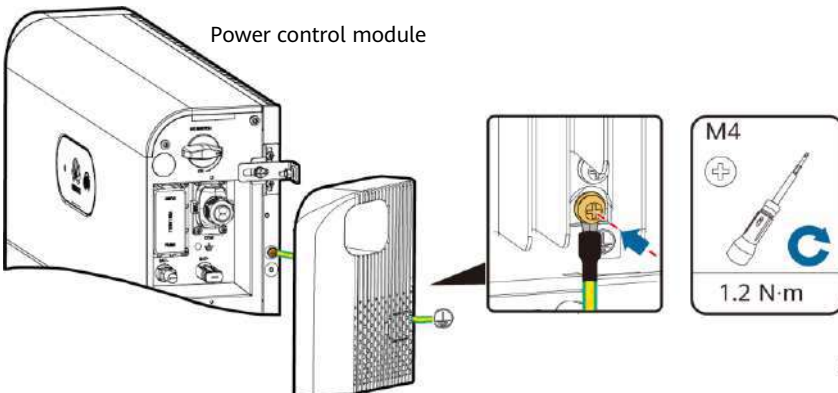
NOTICE

Before connecting external cables, route the cables through the cable hole to avoid disconnecting after installation.

4.3 Installing a Ground Cable

NOTE

- Ground a ground point of the power control module.
- Apply silica gel or paint around the ground terminal after the ground cable is connected.



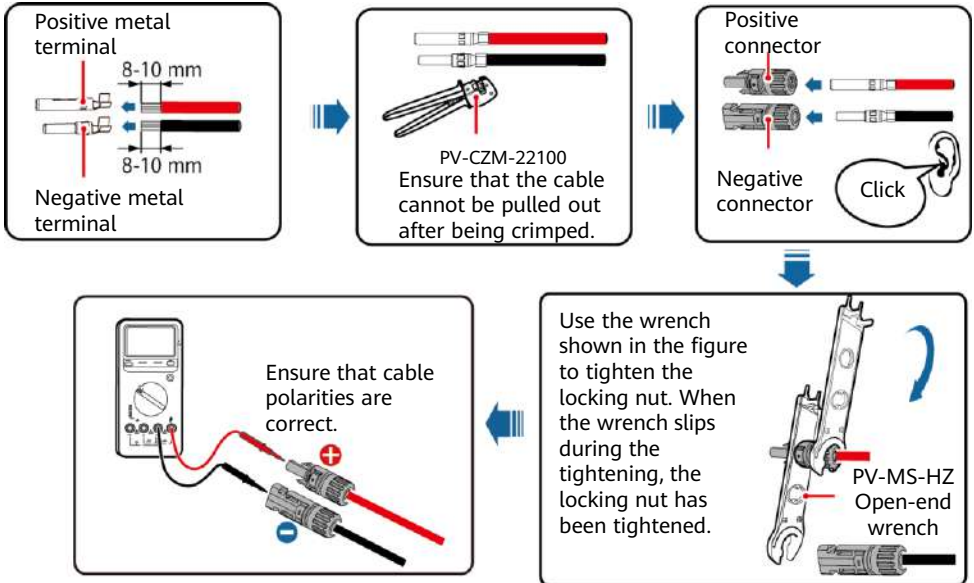
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4.4 Installing DC Input Power Cables

NOTICE

1. You are advised to connect the battery terminals (BAT+ and BAT-) on the switch side to the inverter and connect the other side to the cascaded battery.
2. The battery terminals use the Staubli MC4 positive and negative metal terminals and DC connectors supplied with the solar inverter. Using incompatible positive and negative metal terminals and DC connectors may result in serious consequences. The caused device damage is not covered under warranty.

Assembling DC Connectors

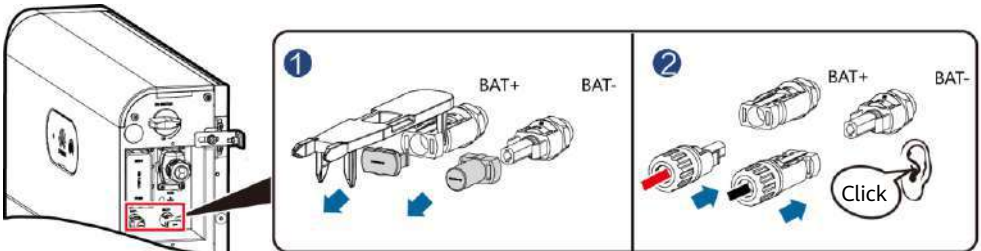


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Installing DC Input Power Cables

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Use dedicated insulated tools to connect cables. Ensure that battery cables are connected to correct polarities. If the battery cables are reversely connected, the battery may be damaged.



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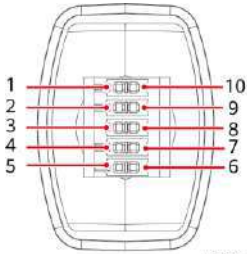
4.5 Installing a Signal Cable

NOTICE

- When laying out a signal cable, separate it from power cables and keep it away from strong interference sources to prevent communication interruption.
- Ensure that the protection layer of the cable is inside the connector, that excess core wires are cut off from the protection layer, that the exposed core wire is totally inserted into the cable hole, and that the cable is connected securely.
- Use a plug to block the idle cable hole with the waterproof rubber ring, and then tighten the locking cap.
- If multiple signal cables need to be connected, ensure that the outer diameters of the signal cables are the same.

COM Port Pin Definitions

The COM port definitions on both sides of the power control module are the same. It is recommended that the COM port on the switch side be connected to the inverter and the COM port on the other side be connected to the cascaded battery.



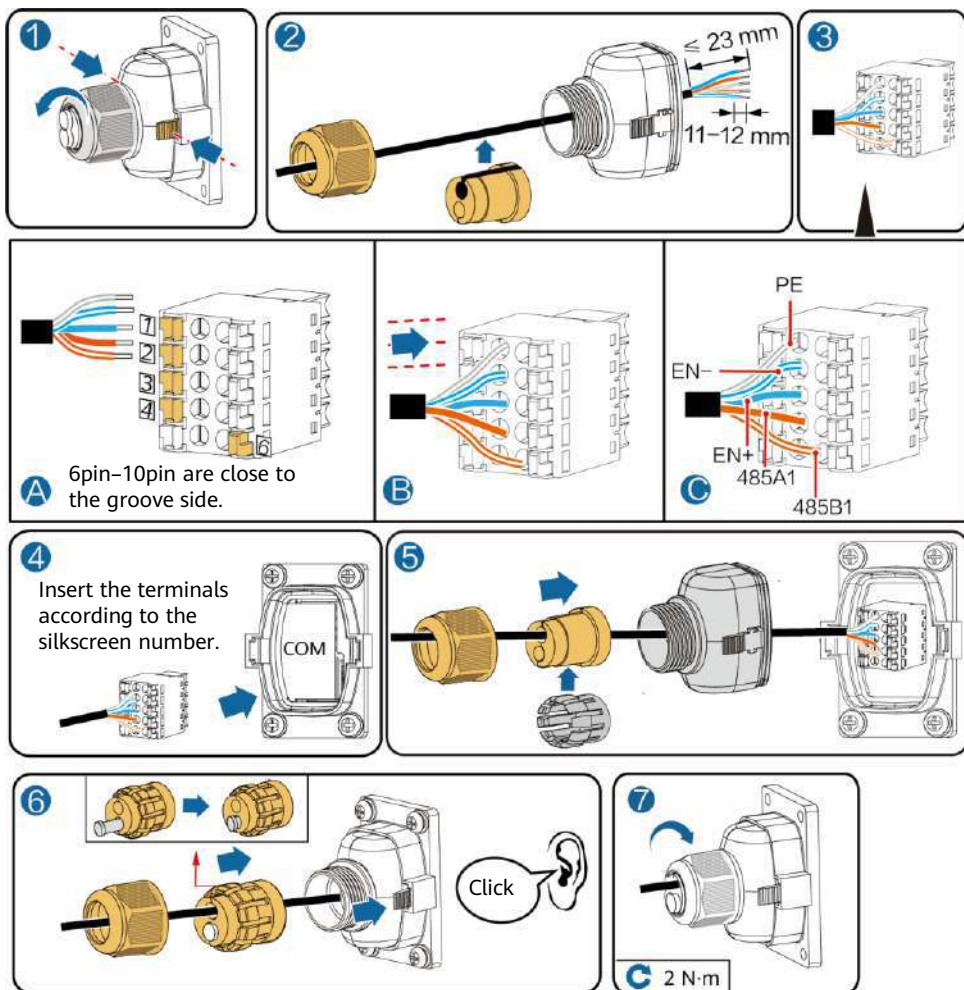
IB01W10007

NOTE

The communications terminals on the inverter side need to be connected to RS485+\RS485-, EN+\EN-, and PE. The communications terminals on the cascading side need to be connected to RS485+\RS485-, EN+\EN-, CANH\CANL, and PE.

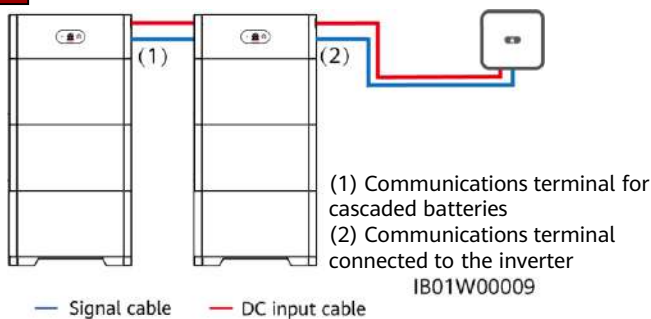
No.	Label	Definition	Description
1	PE	Ground point on the shield layer	Ground point on the shield layer
2	Enable-	Enable signal GND	Connects to the enable signal GND of the inverter.
3	Enable+	Enable signal+	Connects to the enable signal of the inverter.
4	485A1	RS485A, RS485 differential signal+	Connects to the RS485 signal port of the inverter.
5	485A2	RS485A, RS485 differential signal+	
6	485B1	RS485B, RS485 differential signal-	Connects to the RS485 signal port of the inverter.
7	485B2	RS485B, RS485 differential signal-	
8	CANL	Extended CAN bus port	Used for signal cable cascading in battery cascading scenarios.
9	CANH	Extended CAN bus port	Used for signal cable cascading in battery cascading scenarios.
10	PE	Ground point on the shield layer	Ground point on the shield layer

Connecting the Communications Terminal to the Inverter



4.6 (Optional) Cable Connections in Cascading Scenarios

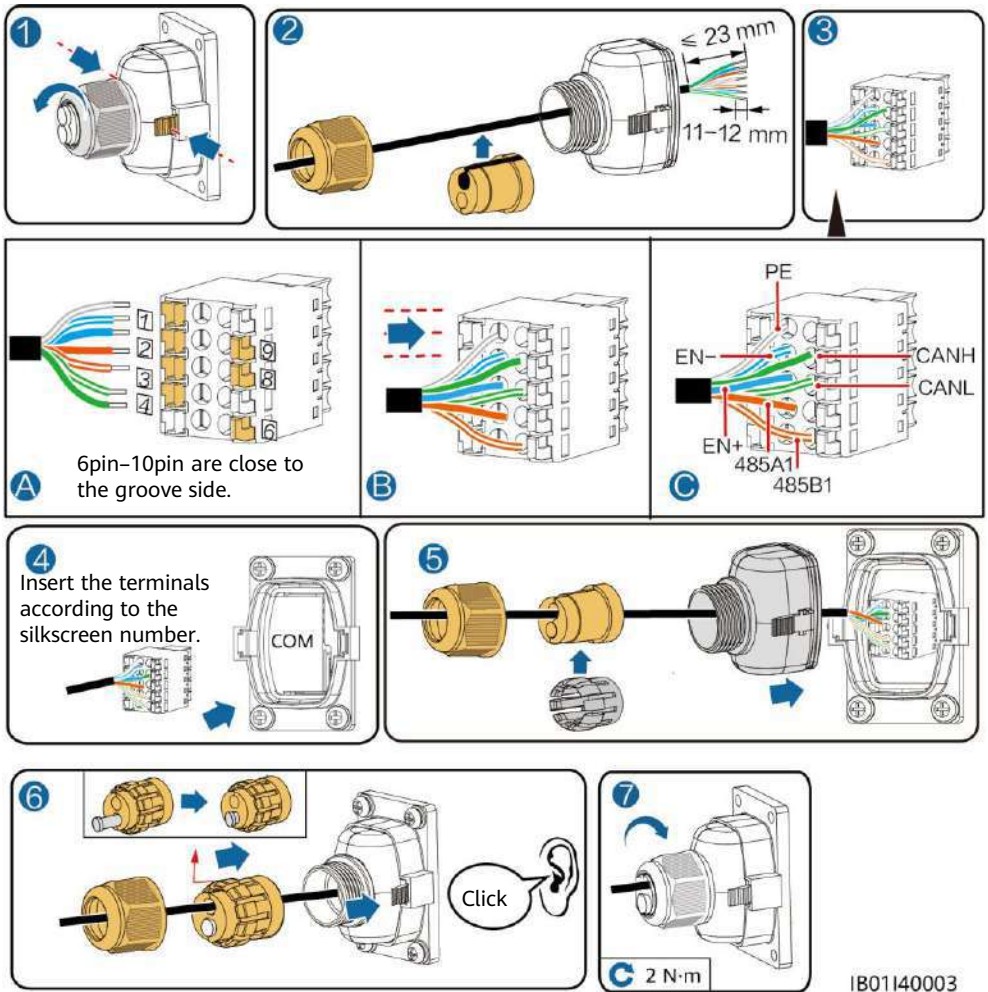
Cascading Networking



Cascading DC Input Connection

Prepare DC connectors and connect DC battery cascading terminals (BAT+ and BAT-) for cascaded batteries. For details, see section 4.4 "Installing DC Input Power Cables."

Connecting the Communications Terminal for Cascaded Batteries

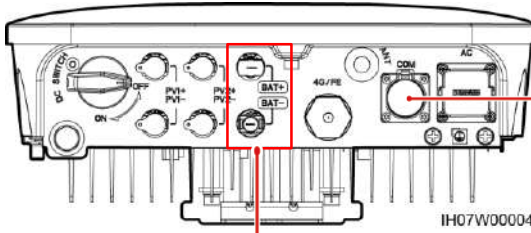


NOTICE

- When a communications terminal is connected to a single network cable, a waterproof rubber plug must be installed.
- After inserting the terminal shell into the COM port, shake the terminal shell left and right and pull it back to ensure that it is securely installed, and tighten the nut (ensure that the rubber plug is tightly compressed). Otherwise, the waterproof performance is affected

4.7 Connecting Cables to the Inverter

SUN2000-(2KTL-6KTL)-L1

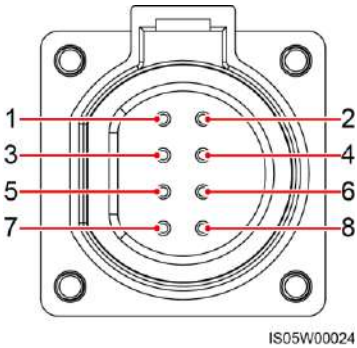


COM port (COM)

IH07W00004

Battery terminals (BAT+/BAT-)

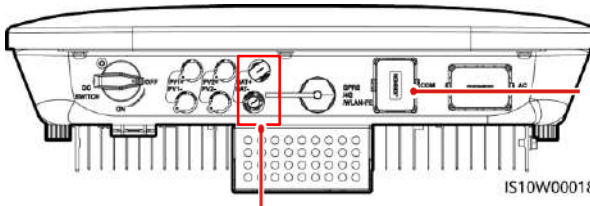
COM Port Pin Definitions



IS05W00024

No.	Label	Definition	Description
3	485 B2	RS485B, RS485 differential signal-	Used for connecting to the RS485 signal ports of the battery.
4	485 A2	RS485A, RS485 differential signal+	
5	GND	GND	Used for connecting to GND of the enable signal.
6	EN+	Enable signal+	Used for connecting to the enable signal of the battery.

SUN2000-(3KTL-12KTL)-M1

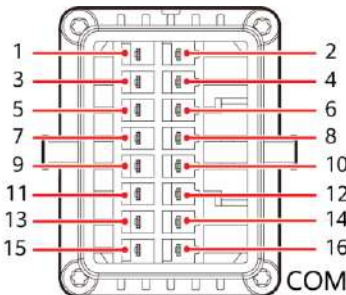


COM port (COM)

IS10W00018

Battery terminals (BAT+/BAT-)

COM Port Pin Definitions



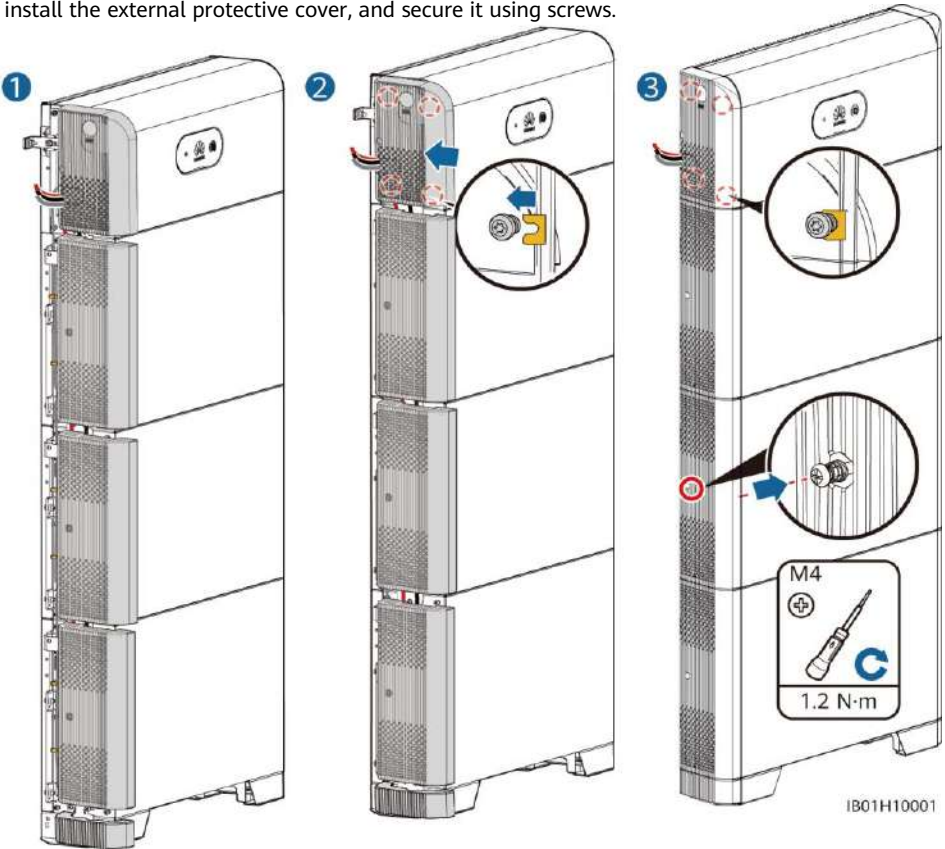
IS10W00002

No.	Label	Definition	Description
7	485A2	RS485A, RS485 differential signal+	Used for connecting to the RS485 signal ports of the battery.
9	485B2	RS485B, RS485 differential signal-	
11	EN	Enable signal+	Used for connecting to the enable signal of the battery.
13	GND	GND	Used for connecting to GND of the enable signal.

5 Verifying the Installation

5.1 Installing the Cover

After electrical connections are complete, check that cables are correctly and securely connected, install the external protective cover, and secure it using screws.



5.2 Verifying the Installation

No.	Acceptance Criterion
1	The battery is installed correctly and securely.
2	The cables are routed properly as required by the customer.
3	Cable ties are secured evenly and no burr exists.
4	The ground cable is connected correctly and securely.
5	The battery switch and all switches connected to the battery are OFF.
6	The DC input power cables and signal cables are connected correctly and securely.
7	Idle terminals and ports are locked by watertight caps.
8	The installation space is proper, and the installation environment is clean and tidy.


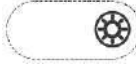

6 Power-On Commissioning

6.1 Connecting the Battery Supply

NOTICE

- Power on the LUNA2000 within 24 hours after unpacking. The power-off time cannot exceed 24 hours during maintenance.
- After turning on the battery switch, power on the inverter. For details about how to power on the inverter, see the quick guide for the corresponding inverter model.
- If no PV module is configured, press the black start button.

Turn on the DC switch on the battery. After the battery is installed and powered on for the first time, the ring LED blinks for three circles. Observe the battery indicator to check the running status.

Type	Status (Blinking at long intervals: On for 1s and then Off for 1s; Blinking at short intervals: On for 0.2s and then Off for 0.2s)		Meaning
Running indication			N/A
	Steady green	Steady green	Operating mode
	Blinking green at long intervals	Blinking green at long intervals	Standby mode
	Off	Off	Sleep mode
	Blinking red at short intervals	N/A	Battery power control module environment alarm
	N/A	Blinking red at short intervals	Battery expansion module environment alarm
	Steady red	N/A	Battery power control module fault
	N/A	Steady red	Battery expansion module fault
Battery system indication			N/A
	Display green		Indicates battery level. One bar represents 10%.
	Steady red		The first three bars indicate the number of faulty battery expansion modules.

6.2 Battery Deployment

Download and install the FusionSolar app of the latest version by referring to the quick guide for the corresponding inverter model or the FusionSolar App Quick Guide. Register as an installer and create a PV plant or owner (skip this step if an account exists). You can obtain the FusionSolar App Quick Guide by scanning the QR code.



(Optional) Upgrading the Inverter and Smart Dongle

When the app connects to the inverter, a message is displayed, asking you to upgrade the inverter version. Smart Dongle V100R001C00SPC117 and later versions support LUNA2000 battery. But the Smart Dongle cannot be upgraded locally. You need to perform the upgrade through the management system. The upgrade procedure is updated in the Quick Guide. You can scan the QR code on the right to obtain the Quick Guide.



Quick Setup (New Deployment)

Log in to the FusionSolar app using the installer's account. Tap **Quick Settings** on the home screen to add the battery and set the battery working mode.

The sequence of screenshots illustrates the Quick Setup process:

- Home Screen:** Shows the main dashboard with 'Quick settings' highlighted by a hand icon.
- Quick settings:** Shows the 'Energy storage control' step highlighted by a hand icon. Below the device list, a hand icon points to the 'Next' button.
- Working mode settings:** Shows the 'Maximum self-consumption' option highlighted by a hand icon. A text box states: "You can tap ? to obtain the detailed working mode information."

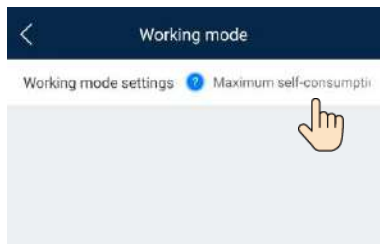
Adding a Device (Battery Expansion Scenario)

On the home screen, choose **Maintenance > Subdevice management**, select the battery model, and add batteries.

The screenshot shows the 'Subdevice management' screen with the 'Battery' section highlighted. A hand icon points to the 'HIJAUWEI-LUNA2000' battery model.

Setting Battery Control

On the home screen, choose **Power adjustment > Battery control**, and set the battery parameters and working mode.



6.3 Battery Status Check

After the battery is added, tap **Device monitoring** on the home screen to view the running status, level, power, and charge and discharge status of the battery.



6.4 Maintenance and Upgrade

Battery Upgrade

When the network is connected, the app connection screen, tap **...** > **File download** in the upper-right corner. Then on the home screen, choose **Maintenance** > **Upgrade device** to upgrade the battery version.



Storage and Recharging

The batteries need to be recharged for a certain period of storage. For details, see the user manual.

Fuse Replacement

If a fuse needs to be replaced, replace it by referring to the user manual.

7 Statement

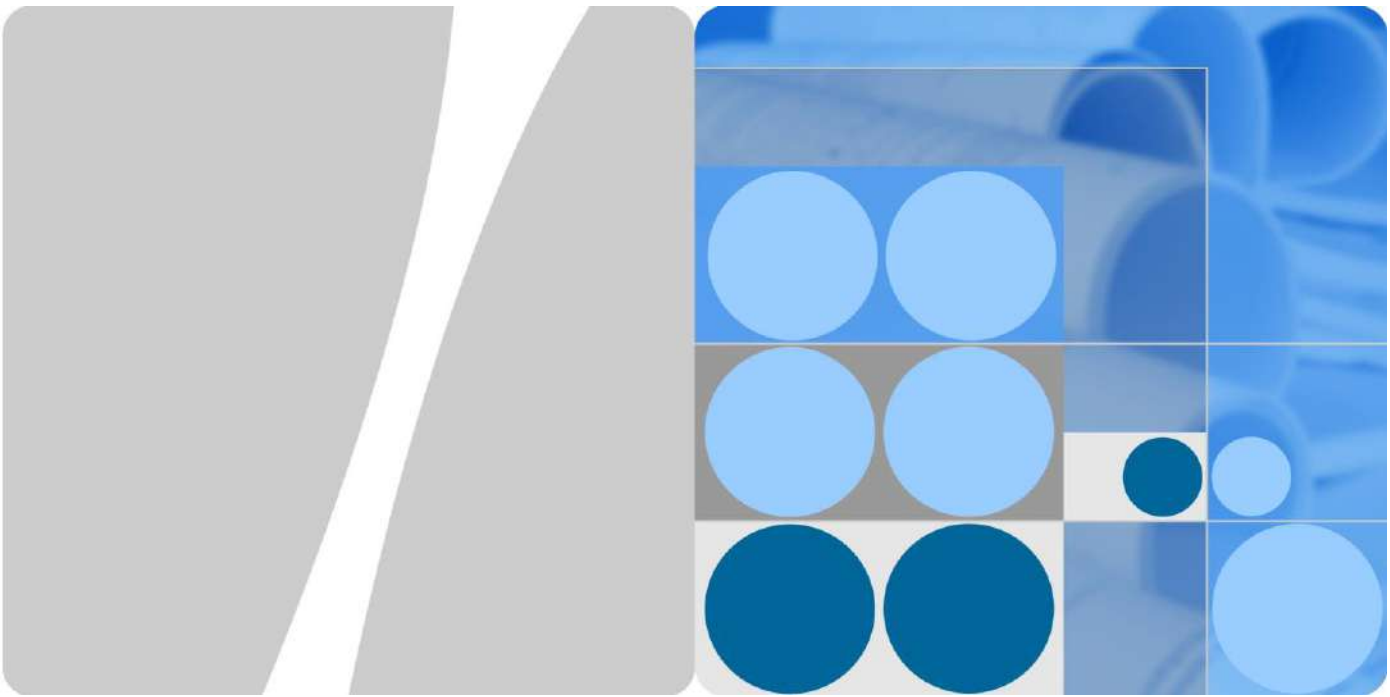
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2. Before installing the device, read the user manual carefully to get familiar with product information and safety precautions.
3. Only certified electricians are allowed to operate the device. Operation personnel must wear proper personal protective equipment (PPE).
4. Before installing the device, check that the package contents are intact and complete against the packing list. If any damage is found or any component is missing, contact your dealer.
5. The device damage caused by the violation of instructions in this document is not covered under warranty.
6. The cable colors involved in this document are for reference only. Select cables in accordance with local cable specifications.



8 Customer Service Contact Information

Customer Service Contact Information			
Region	Country	Email	Hotline
Europe	France	eu_inverter_support@huawei.com	0080033888888
	Germany		
	Spain		
	Italy		
	United Kingdom		
	Netherlands		
	Others		
Asia Pacific	Australia	eu_inverter_support@huawei.com	1800046639
	Turkey	eu_inverter_support@huawei.com	N/A
	Malaysia	apsupport@huawei.com	0080021686868 /1800220036
	Thailand		(+66) 26542662 (charged by local call)
			1800290055 (toll-free in Thailand)
	China	solarservice@huawei.com	400-822-9999
	Others	apsupport@huawei.com	0060-3-21686868
Japan	Japan	Japan_ESC@ms.huawei.com	0120258367
India	India	indiaenterprise_TAC@huawei.com	1800 103 8009
South Korea	South Korea	Japan_ESC@ms.huawei.com	N/A
North America	United States	eu_inverter_support@huawei.com	1-877-948-2934
	Canada	eu_inverter_support@huawei.com	1-855-482-9343
Latin America	Mexico	la_inverter_support@huawei.com	018007703456 /0052-442-4288288
	Argentina		0-8009993456
	Brazil		0-8005953456
	Chile		800201866 (Only for Fixed)
	Others		0052-442-4288288
Middle East and Africa	Egypt	eu_inverter_support@huawei.com	08002229000 /0020235353900
	United Arab Emirates		08002229000
	South Africa		0800222900
	Saudi Arabia		8001161177
	Pakistan		0092512800019
	Morocco		0800009900
	Others		0020235353900

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LUNA2000-(5-30)-S0

User Manual

Issue 01
Date 2020-09-18

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About This Document

Purpose

This document describes the LUNA2000 battery in terms of its overview, application scenarios, installation and commissioning, system maintenance, and technical specifications. The LUNA2000 battery consists of a LUNA2000-5KW-C0 power control module and LUNA2000-5-E0 battery expansion modules.






Intended Audience

This document is intended for:

- Sales engineers
- System engineers
- Technical support engineers

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
 NOTICE	Indicates warning information about device or environment security which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
 NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 01 (2020-09-15)

This issue is the first official release.

Contents

About This Document	ii
1 Safety Precautions	1
1.1 General Safety	1
1.2 Personnel Requirements	3
1.3 Electrical Safety	4
1.4 Installation Environment Requirements	5
1.5 Transportation Requirements	6
1.6 Mechanical Safety	6
1.7 Commissioning	7
1.8 Maintenance and Replacement	8
2 Product Description	9
2.1 Overview	9
2.2 Appearance	13
2.3 Label Description.....	15
2.4 Features.....	16
2.5 Working Principles	17
3 Application Scenarios and Settings	19
3.1 Grid-tied ESS.....	19
3.1.1 Grid-tied ESS Networking.....	19
3.1.2 Setting the Grid-tied ESS Mode	22
3.2 Grid-tied and Off-grid ESS	27
3.2.1 Grid-tied and Off-grid ESS Networking.....	27
3.2.2 Setting the Grid-tied and Off-grid ESS Mode.....	28
3.3 Pure Off-grid ESS.....	30
3.3.1 Pure Off-grid ESS Networking.....	30
3.3.2 Setting the Pure Off-grid ESS Mode.....	30
4 System Installation	32
4.1 Checking Before the Installation	32
4.2 Preparing Tools and Instruments.....	32
4.3 Determining the Installation Position	34
4.4 Equipment Installation.....	35

4.4.1 Floor-Mounted Installation	35
4.4.2 Wall-Mounted Installation	41
5 Electrical Connection.....	45
5.1 Preparing Cables.....	46
5.2 Internal Electrical Connections of the Battery	47
5.2.1 Installing an Internal Ground Cable.....	47
5.2.2 Installing Internal DC Terminals.....	48
5.2.3 Connecting Internal Signal Cables.....	49
5.3 External Electrical Connections of the Battery	50
5.3.1 Installing a PE Cable	51
5.3.2 Installing DC Input Power Cables	53
5.3.3 Installing a Signal Cable.....	55
5.4 (Optional) Cascading Batteries.....	58
5.5 Installing the Cover.....	59
6 System Commissioning	61
6.1 Verification Before Power-On	61
6.2 System Power-On	62
6.3 Battery Commissioning	63
6.3.1 Battery Deployment.....	63
6.3.2 Battery Control	64
6.3.3 Battery Status Check.....	67
6.3.4 Battery Maintenance and Upgrade.....	67
7 System Maintenance	71
7.1 System Power-Off.....	71
7.2 Routine Maintenance	71
7.3 Troubleshooting	72
7.4 Battery Storage and Recharge.....	72
8 Technical Specifications	75
8.1 LUNA2000-5KW-C0	75
8.2 LUNA2000-5-E0	76
9 FAQ.....	77
9.1 How Do I Replace a Fuse?	77
A Acronyms and Abbreviations.....	79

1 Safety Precautions

- 1.1 General Safety
- 1.2 Personnel Requirements
- 1.3 Electrical Safety
- 1.4 Installation Environment Requirements
- 1.5 Transportation Requirements
- 1.6 Mechanical Safety
- 1.7 Commissioning
- 1.8 Maintenance and Replacement

1.1 General Safety

Declaration

Before installing, operating, and maintaining the equipment, read this document and observe all the safety instructions on the equipment and in this document.

The "NOTICE", "WARNING", and "DANGER" statements in this document do not cover all the safety instructions. They are only supplements to the safety instructions. Huawei will not be liable for any consequence caused by the violation of general safety requirements or design, production, and usage safety standards.

Ensure that the equipment is used in environments that meet its design specifications. Otherwise, the equipment may become faulty, and the resulting malfunction, component damage, personal injuries, or property damage are not covered under the warranty.

Follow local laws and regulations when installing, operating, or maintaining the equipment. The safety instructions in this document are only supplements to local laws and regulations.

Huawei will not be liable for any consequences of the following circumstances:

- Operation beyond the conditions specified in this document
- Installation or use in environments which are not specified in relevant international or national standards

- Unauthorized modifications to the product or software code or removal of the product
- Failure to follow the operation instructions and safety precautions on the product and in this document
- Equipment damage due to force majeure, such as earthquakes, fire, and storms
- Damage caused during transportation by the customer
- Damage caused by storage conditions that do not meet the requirements specified in related documents

General Requirements



Do not work with power on during installation.

- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, and performing outdoor installation) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- After installing the equipment, remove idle packing materials such as cartons, foam, plastics, and cable ties from the equipment area.
- In the case of a fire, immediately leave the building or the equipment area, and turn on the fire alarm bell or make an emergency call. Do not enter the building on fire in any case.
- Do not scrawl, damage, or block any warning label on the equipment.
- Tighten screws using tools when installing the equipment.
- Understand the components and functioning of a grid-tied PV power system and relevant local standards.
- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches cannot be exposed to an outdoor environment for a long period of time.
- Do not open the host panel of the equipment.
- Without prior consent from the manufacturer, do not alter the internal structure or installation procedure of the equipment.

Personal Safety

- Wear proper personal protective equipment (PPE) during operation. If there is a probability of personal injury or equipment damage, immediately stop the operations, report the case to the supervisor, and take feasible protective measures.
- Use tools correctly to avoid hurting people or damaging the equipment.
- Do not touch the energized equipment, as the enclosure is hot.
- To ensure personal safety and normal use of the equipment, the equipment must be reliably grounded before use.
- When a battery is faulty, the temperature may exceed the burn threshold of the touchable surface. Therefore, avoid touching the battery.
- Do not disassemble or damage the battery. The released electrolyte is harmful to your skin and eyes. Avoid contact with the electrolyte.

- Do not place irrelevant objects on the top of the equipment or insert them into any position of the equipment.
- Do not place inflammables around the equipment.
- To prevent explosions and body injury, do not place batteries in a fire.
- Do not place the battery module in water or other liquids.
- Do not short-circuit wiring terminals of batteries. Short circuits can cause a fire.
- Batteries may cause electric shocks and high short-circuit currents. When using the battery, pay attention to the following points:
 - (a) Remove any metal objects from yourself, such as watches and rings.
 - (b) Use tools with insulated handles.
 - (c) Wear rubber gloves and boots.
 - (d) Do not place tools or metal parts on top of batteries.
 - (e) Before connecting or disconnecting battery terminals, disconnect the charging power supply.
 - (f) Check whether batteries are accidentally grounded. If it is accidentally grounded, remove the power supply from the ground. Touching any part of a grounded battery can cause an electric shock. If these grounding points are removed during installation and maintenance, the possibility of electric shocks can be reduced.
- Do not use water to clean electrical components inside or outside of a cabinet.
- Do not stand on, lean on, or sit on the top of the equipment.
- Do not damage the modules of the equipment.

1.2 Personnel Requirements

- Personnel who plan to install or maintain Huawei equipment must receive thorough training, understand all necessary safety precautions, and be able to correctly perform all operations.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Personnel who will operate the equipment, including operators, trained personnel, and professionals, should possess the local national required qualifications in special operations such as high-voltage operations, working at heights, and operations of special equipment.
- Only professionals or authorized personnel are allowed to replace the equipment or components (including software).

NOTE

- Professionals: personnel who are trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation, operation, and maintenance
- Trained personnel: personnel who are technically trained, have required experience, are aware of possible hazards on themselves in certain operations, and are able to take protective measures to minimize the hazards on themselves and other people
- Operators: operation personnel who may come in contact with the equipment, except trained personnel and professionals

1.3 Electrical Safety

Grounding Requirements

- For the equipment that needs to be grounded, install the protective earthing (PE) cable first when installing the equipment and remove the PE cable last when removing the equipment.
- Do not damage the ground conductor.
- Do not operate the equipment in the absence of a properly installed ground conductor.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check the electrical connection to ensure that it is securely grounded.

General Requirements



Before connecting cables, ensure that the equipment is intact. Otherwise, electric shocks or fire may occur.

-
- Ensure that all electrical connections comply with local electrical standards.
 - Obtain approval from the local electric utility company before using the equipment in grid-tied mode.
 - Ensure that the cables you prepared meet local regulations.
 - Use dedicated insulated tools when performing high-voltage operations.

DC Operation



Do not connect or disconnect power cables with power-on. Transient contact between the core of the power cable and the conductor will generate electric arcs or sparks, which may cause fire or personal injury.

-
- Before connecting cables, switch off the disconnecter on the upstream equipment to cut off the power supply if people may contact energized components.
 - Before connecting a power cable, check that the label on the power cable is correct.
 - If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.

Cabling Requirements

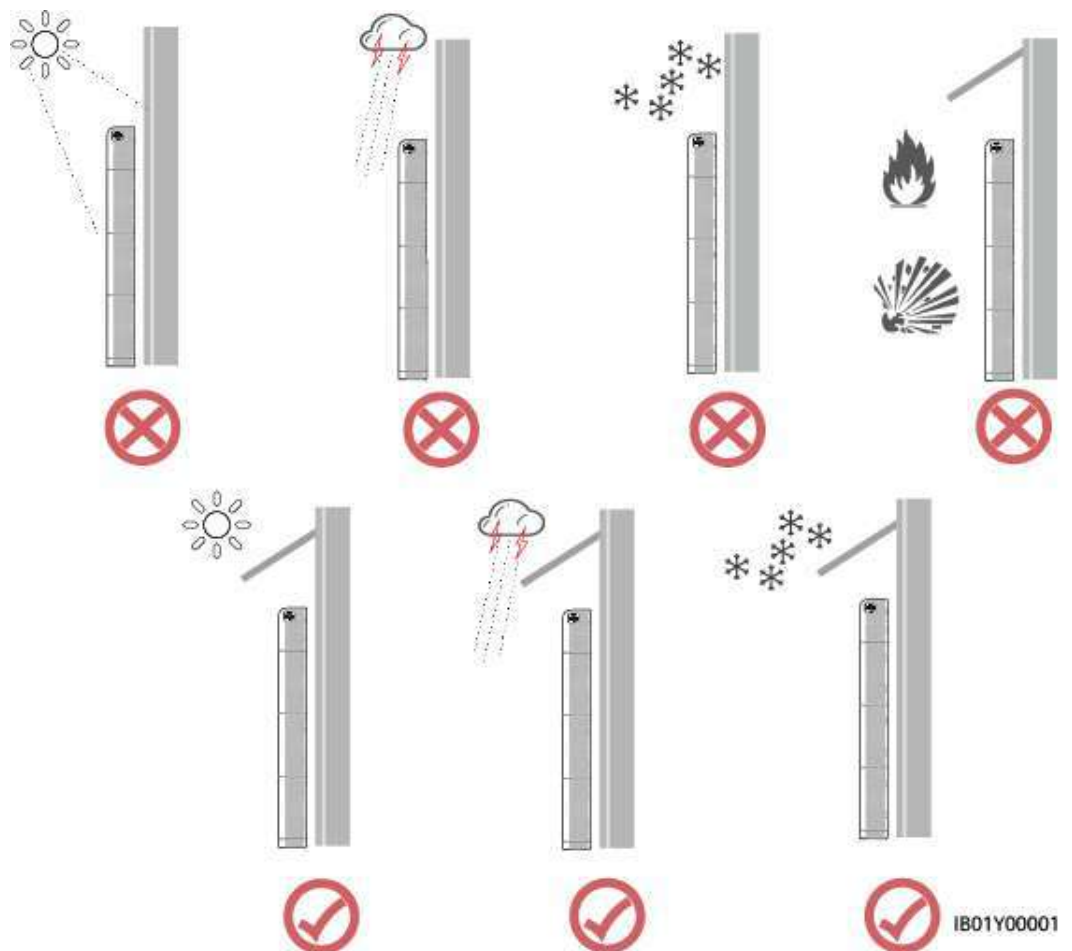
- When routing cables, ensure that a distance of at least 30 mm exists between the cables and heat-generating components or areas. This prevents damage to the insulation layer of the cables.
- Bind cables of the same type together. When routing cables of different types, ensure that they are at least 30 mm away from each other.

- Ensure that the cables used in a grid-tied PV power system are properly connected and insulated and meet specifications.

1.4 Installation Environment Requirements

- Ensure that the equipment is installed in a dry and well-ventilated environment.
- The installation position must be away from direct sunlight and rain.
- The installation position must be far away from fire sources.
- The installation position must be far away from water sources such as taps, sewer pipes, and sprinklers to prevent water seepage.
- The support surface must be solid and flat.
- Children are not allowed to enter the installation position.
- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

Figure 1-1 Installation environment



 **CAUTION**

The operation and service life of the battery depend on the operating temperature. Operate the battery at a temperature equal to or better than the ambient temperature. The recommended operating temperature ranges from 15 °C to 30 °C.

1.5 Transportation Requirements

The product passes the certifications of the UN38.3 (UN38.3: Section 38.3 of the Sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria) and SN/T 0370.2-2009 (Part 2: Performance Test of the Rules for the Inspection of Packaging for Exporting Dangerous Goods). This product belongs to class 9 dangerous goods.

The product can be delivered to the site directly and transported by land and water. The packing case must be secured for transportation, compliant with related China standards, and printed with marks such as anti-collision and moisture prevention. Affected by external environment factors, such as temperature, transportation, and storage, the product specifications at the delivery date prevail.

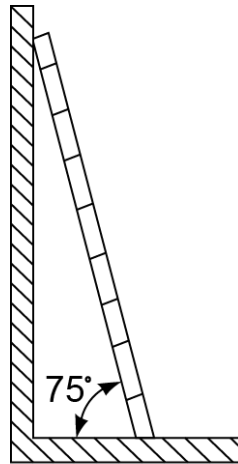
Protect the packing case with the product from the following situations:

- Being dampened by rains, snows, or falling into water
- Falling or mechanical impact
- Being upside-down or tilted

1.6 Mechanical Safety

Using Ladders

- Use wooden or fiberglass ladders when you need to perform live working at heights.
- When a step ladder is used, ensure that the pull ropes are secured and the ladder is held firm.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- Ensure that the wider end of the ladder is at the bottom, or protective measures have been taken at the bottom to prevent the ladder from sliding.
- Ensure that the ladder is securely positioned. The recommended angle for a ladder against the floor is 75 degrees, as shown in the following figure. An angle rule can be used to measure the angle.



PI02SC0008

- When climbing a ladder, take the following precautions to reduce risks and ensure safety:
 - Keep your body steady.
 - Do not climb higher than the fourth rung of the ladder from the top.
 - Ensure that your body's center of gravity does not shift outside the legs of the ladder.

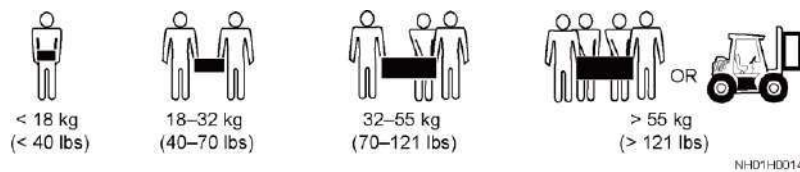
Drilling Holes

When drilling holes into a wall or floor, observe the following safety precautions:

- Wear goggles and protective gloves when drilling holes.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings that have accumulated inside or outside the equipment.

Moving Heavy Objects

- Be cautious to avoid injury when moving heavy objects.



- When moving the equipment by hand, wear protective gloves to prevent injuries.

1.7 Commissioning

When the equipment is powered on for the first time, ensure that professional personnel set parameters correctly. Incorrect settings may result in inconsistency with local certification and affect the normal operation of the equipment.

1.8 Maintenance and Replacement

 **DANGER**

High voltage generated by the equipment during operation may cause an electric shock, which could result in death, serious injury, or serious property damage. Prior to maintenance, power off the equipment and strictly comply with the safety precautions in this document and relevant documents.

-
- Maintain the equipment with sufficient knowledge of this document and using proper tools and testing equipment.
 - Before maintaining the equipment, power it off and follow the instructions on the delayed discharge label to ensure that the equipment is powered off.
 - Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.
 - If the equipment is faulty, contact your dealer.
 - The equipment can be powered on only after all faults are rectified. Failing to do so may escalate faults or damage the equipment.
 - Do not open the cover without authorization. Otherwise, electric shocks may occur, and the resulting faults are beyond warranty scope.
 - Installation personnel, maintenance personnel, and technical support personnel must be trained to operate and maintain the equipment safely and correctly, take comprehensive precautionary measures, and be equipped with protective instruments.
 - Before moving or reconnecting the equipment, disconnect the mains and batteries and wait for five minutes until the equipment powers off. Before maintaining the equipment, check that no dangerous voltages remain in the DC bus or components to be maintained by using a multimeter.
 - Battery maintenance should be carried out or supervised by personnel who are familiar with batteries and the precautions required.
 - When replacing batteries, replace them with batteries or battery strings of the same type.
 - Take out all tools and parts from the equipment after maintenance is complete.
 - If the equipment is not used for a long time, store and recharge batteries according to this document.

2 Product Description

- 2.1 Overview
- 2.2 Appearance
- 2.3 Label Description
- 2.4 Features
- 2.5 Working Principles

2.1 Overview

Function

The LUNA2000 battery consists of a power control module and battery expansion modules. It can store and release electric energy based on the requirements of the inverter management system. The input and output ports of the LUNA2000 battery are high-voltage direct current (HVDC) ports.

- Battery charge: The power control module connects to the battery terminals (BAT+ and BAT-) of the inverter. Under the control of the inverter, the power control module charges the batteries and stores excessive PV energy in batteries.
- Battery discharge: When the PV energy is insufficient to supply power to the loads, the system controls the batteries to supply power to the loads. The battery energy is output to the loads through the inverter.

Model

- Model of the power control module in the LUNA2000 battery: LUNA2000-5KW-C0

Figure 2-1 Model number

LUNA2000-5KW-C0

1 2 3

IB01W00001

Table 2-1 Model description

No.	Meaning	Value
1	Product	LUNA2000: LUNA2000 battery
2	Power level	5KW: The power level is 5 kW.
3	Design code	C0: product series of the power control module

- Model of battery expansion modules in the LUNA2000 battery: LUNA2000-5-E0

Figure 2-2 Model number

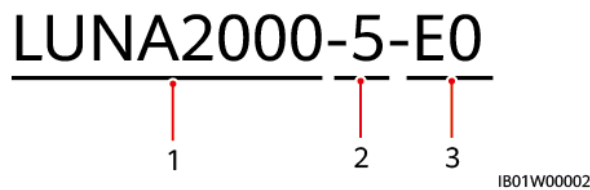


Table 2-2 Model description

No.	Meaning	Value
1	Product	LUNA2000: residential battery
2	Energy level	5: The energy level is 5 kWh.
3	Design code	E0: battery pack module

- The model of the LUNA2000 battery is LUNA2000-5-S0.

Figure 2-3 Model number

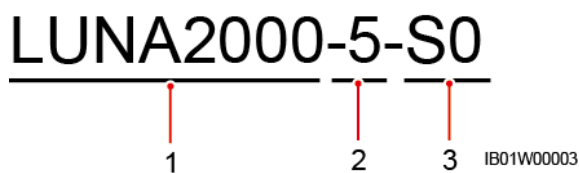


Table 2-3 Model description

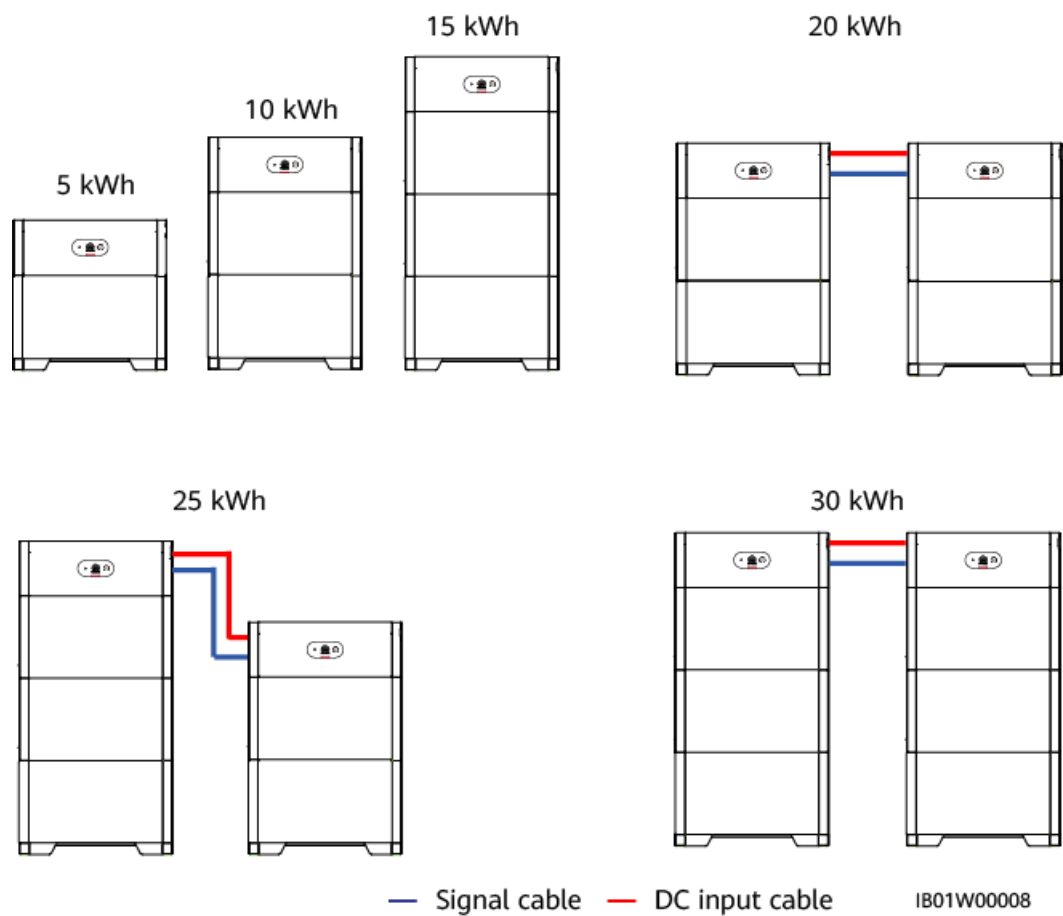
No.	Meaning	Value
1	Product	LUNA2000: residential battery
2	Energy level	5: The capacity level is 5 kWh. This product supports 5 kWh to 30 kWh.

No.	Meaning	Value
3	Design code	S0: battery

Battery Capacity Description

The battery supports power and capacity expansion. Two power control modules can be connected in parallel. One power control module supports a maximum of three battery expansion modules.

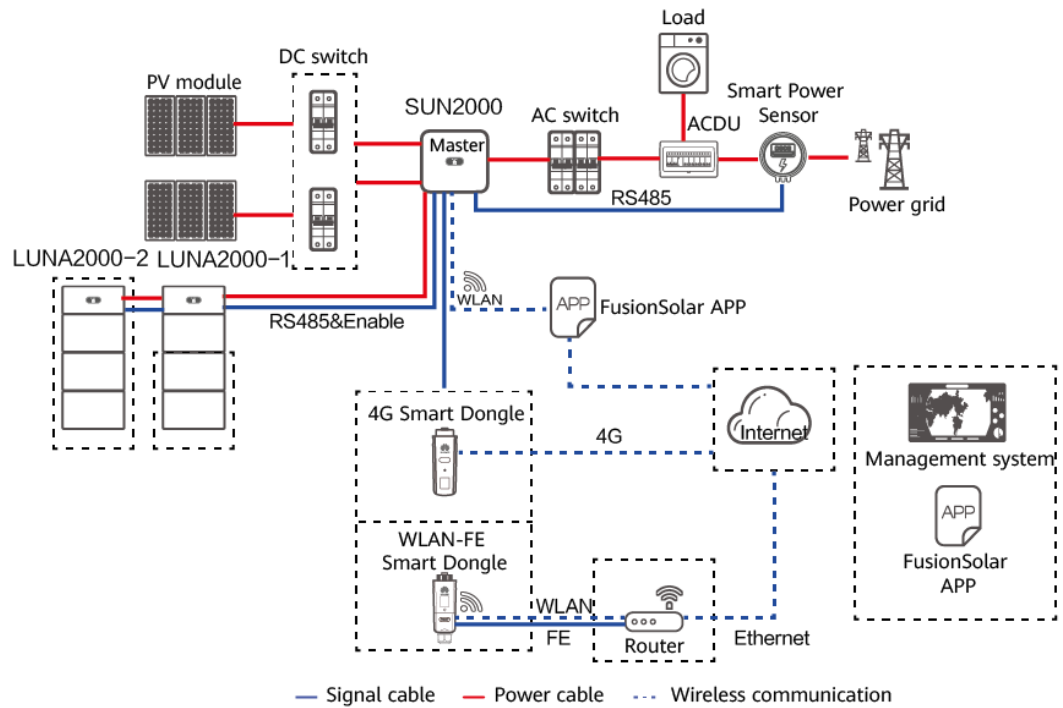
Figure 2-4 Battery capacity description



Networking Application

The LUNA2000 battery is applicable to the grid-tied systems of residential rooftop PV plants. Typically, a grid-tied system consists of PV strings, LUNA2000 batteries, an inverter, an AC switch, and a power distribution box (PDB).

Figure 2-5 Networking (dashed boxes indicate optional components)

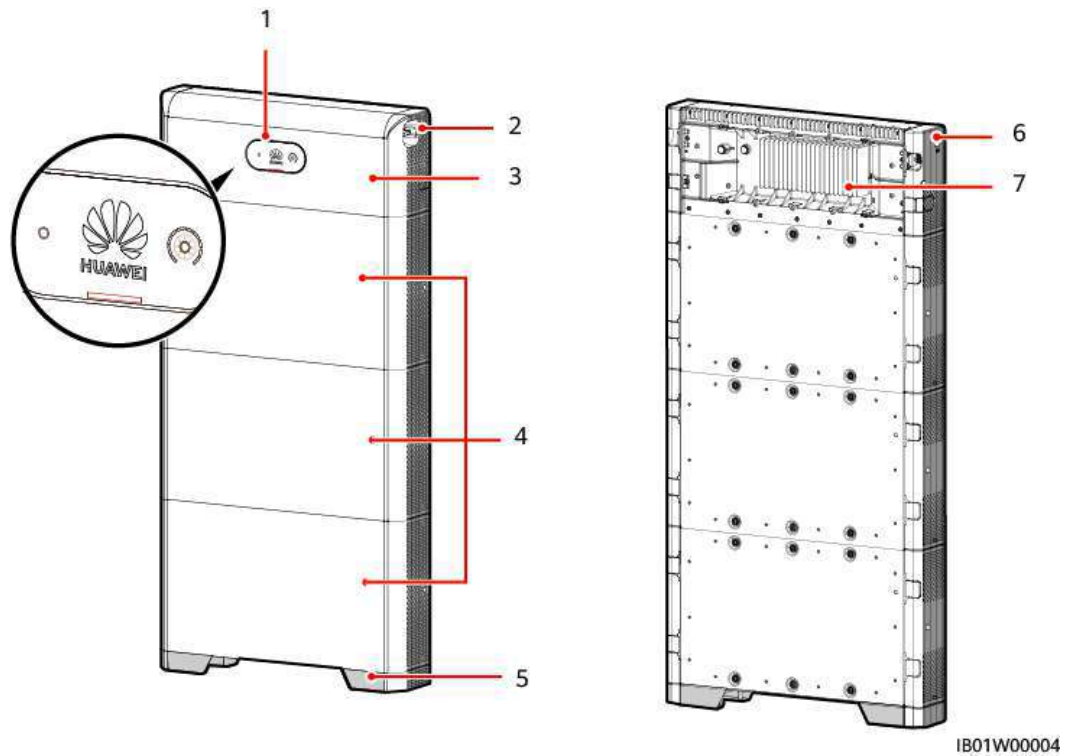


- The input and output ports of the LUNA2000 battery are connected to the battery ports of the inverter.
- The following communication modes are supported by the LUNA2000 battery:
 - Connect the LUNA2000 battery to the inverter over the RS485 port and Enable port to implement communication and control between the inverter and the LUNA2000 battery.
 - Use the mobile phone app to directly connect to the inverter or connect to the inverter in the same LAN to manage and maintain the LUNA2000 battery.
 - Connect the inverter to the public network through the Smart Dongle to manage and maintain the LUNA2000 battery through the management system.

2.2 Appearance

Battery

Figure 2-6 Battery appearance

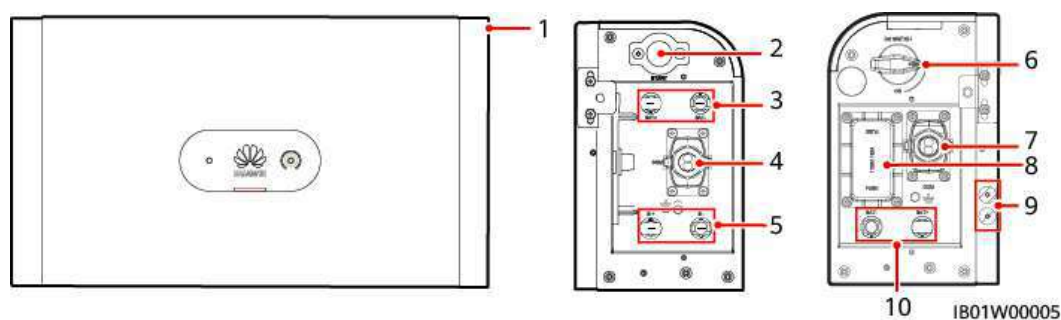


(1) LED indicator	(2) DC switch (DC SWITCH)	(3) Power control module
(4) Battery expansion modules	(5) Installation base	(6) Black start switch
(7) Heat sink		

Power Control Module

The power of the power control module is 5 kW.

Figure 2-7 Power control module

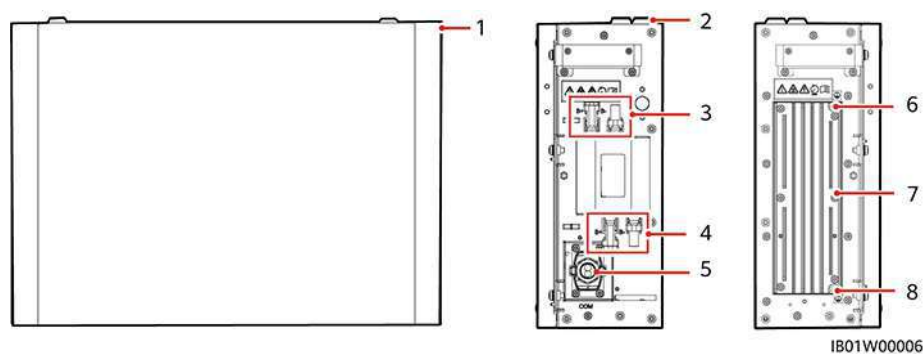


(1) Power control module	(2) Black start switch	(3) Battery terminals (BAT+/BAT-)
(4) COM port (COM)	(5) Battery cascading terminals (B+/B-)	(6) DC switch (DC SWITCH)
(7) COM port (COM)	(8) Fuse (9) Ground point	(10) Battery terminals (BAT+/BAT-)

Battery Expansion Module

The standard capacity of a battery expansion module is 5 kWh.

Figure 2-8 Battery expansion module



(1) Battery expansion module	(2) Boss for alignment	(3) Battery cascading terminals (B+/B-)
(4) Battery cascading terminals (B+/B-)	(5) COM port (COM)	(6) Ground point
(7) Heat sink	(8) Ground point	

2.3 Label Description

Enclosure Labels

Table 2-4 Enclosure label description

Icon	Name	Meaning
	Burn warning	Do not touch the product, as the shell is hot when it is running.
	Delayed discharge	<ul style="list-style-type: none"> High voltage exists after the battery is powered off. It takes 5 minutes for the battery to discharge to the safe voltage.
	Operator	<ul style="list-style-type: none"> High voltage exists after the battery is powered on. Only qualified and trained electrical technicians are allowed to install and operate the battery. Ground the battery before powering it on.
	Refer to documentation	Reminds operators to refer to the documentation provided with the equipment.
	Grounding	Indicates the position for connecting the PE cable.

NOTE

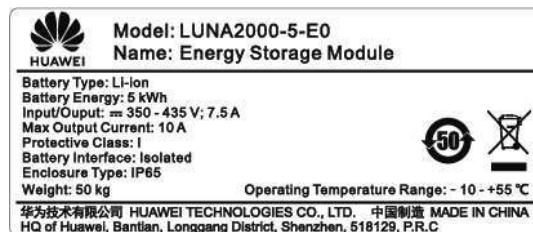
The labels are for reference only.

Nameplate

Figure 2-9 Nameplate (power control module)



Figure 2-10 Nameplate (battery expansion module)



2.4 Features

Multi-Scenario and Multi-Working Mode

- Supports multiple working modes such as grid-tied, grid-tied and off-grid, pure off-grid multi-scenario, self-consumption, time-of-use, and full fed to the grid modes.
- Allows users to query the total discharge capacity in the product life cycle in real time.

Intelligent and Simple Operation

Works with the inverter, supports plug-and-play, and integrates the mobile phone app and management system.

Easy Installation and Replacement

- Standard battery DC terminals are used for system connection.
- Modular design is adopted for batteries.
- The installation or replacement can be performed by two persons.

Flexible Scalability

The battery supports power expansion, battery capacity expansion, and hybrid use of old and new batteries.

Intelligent O&M

- The factory defaults meet the requirements of target markets and the battery can be started by pressing only one button and supports black startup.
- The LED indicator shows the status. You can also use the mobile phone app to perform local and remote operations.
- The cloud data management system is used to manage the battery anytime and anywhere.

Low Investment

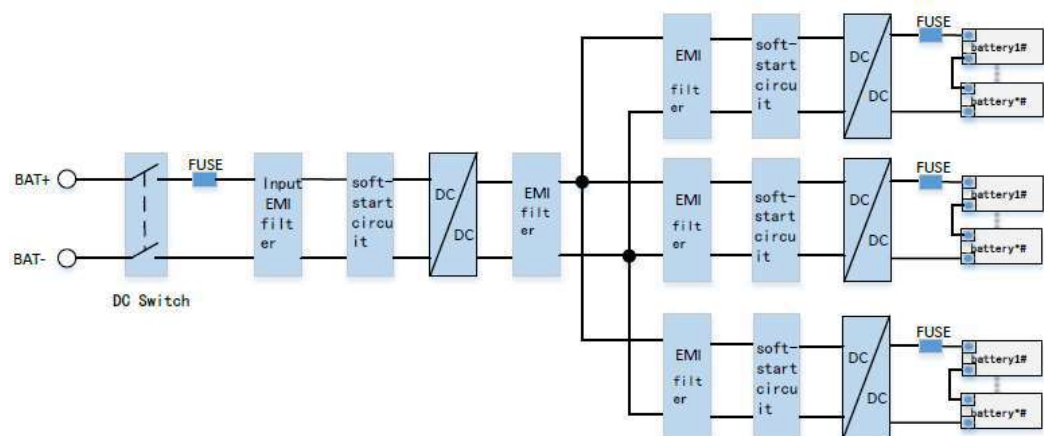
- Only common installation tools are required.
- The battery features high efficiency and power density, which saves installation space.
- The battery features easy O&M.

2.5 Working Principles

Schematic Diagram

The LUNA2000 converts HVDC generated by PV strings into low-voltage direct current (LVDC) through DC-to-DC conversion and stores the power in batteries. It can also convert LVDC into HVDC and feed the power into the power grid through the inverter.

Figure 2-11 Schematic diagram



Working Mode

The LUNA2000 battery can work in hibernation, standby, or operating mode.

Table 2-5 Working mode

Working Mode	Description
Hibernation mode	The internal auxiliary power source and DC-DC converter of the battery do not work.
Standby mode	The auxiliary power source inside the battery works, and the DC-DC converter does not work.
Operating mode	The internal auxiliary power source of the battery works, and the DC-DC converter charges the battery. The DC-DC converter discharges.

3 Application Scenarios and Settings

The LUNA2000 battery is mainly used in grid-tied systems of residential rooftop PV plants. The system can be classified into the following three types based on application scenarios:

- Grid-tied energy storage system (ESS)
- Grid-tied and off-grid ESS
- Off-grid ESS

Multiple working modes can be set, such as maximum self-consumption, time-of-use, and fully fed to the grid.

3.1 [Grid-tied ESS](#)

3.2 [Grid-tied and Off-grid ESS](#)

3.3 [Pure Off-grid ESS](#)

3.1 Grid-tied ESS

3.1.1 Grid-tied ESS Networking

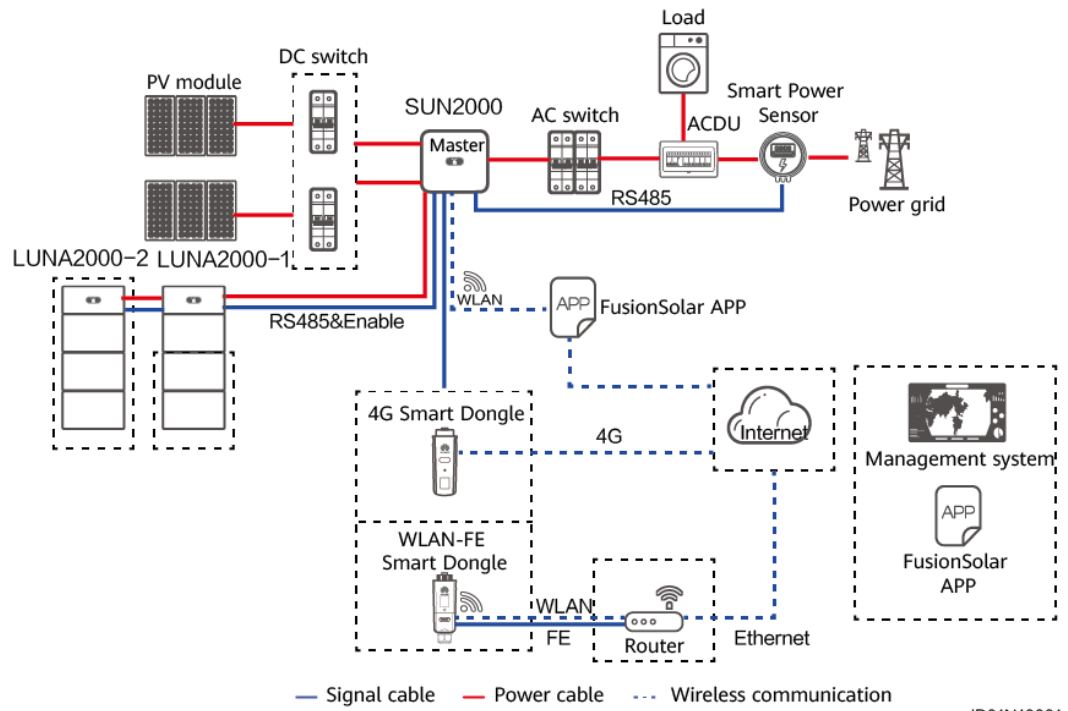
Networking 1: Inverter + Batteries

The grid-tied ESS consists of the PV strings, LUNA2000 batteries, inverter, AC switch, load, power distribution unit (PDU), and grid.

The SUN2000-(2KTL-6KTL)-L1 or SUN2000-(3KTL-10KTL)-M1 inverters are supported.

The PV string converts solar energy into electric energy, which is then converted by the inverter into power for loads and then fed to the power grid.

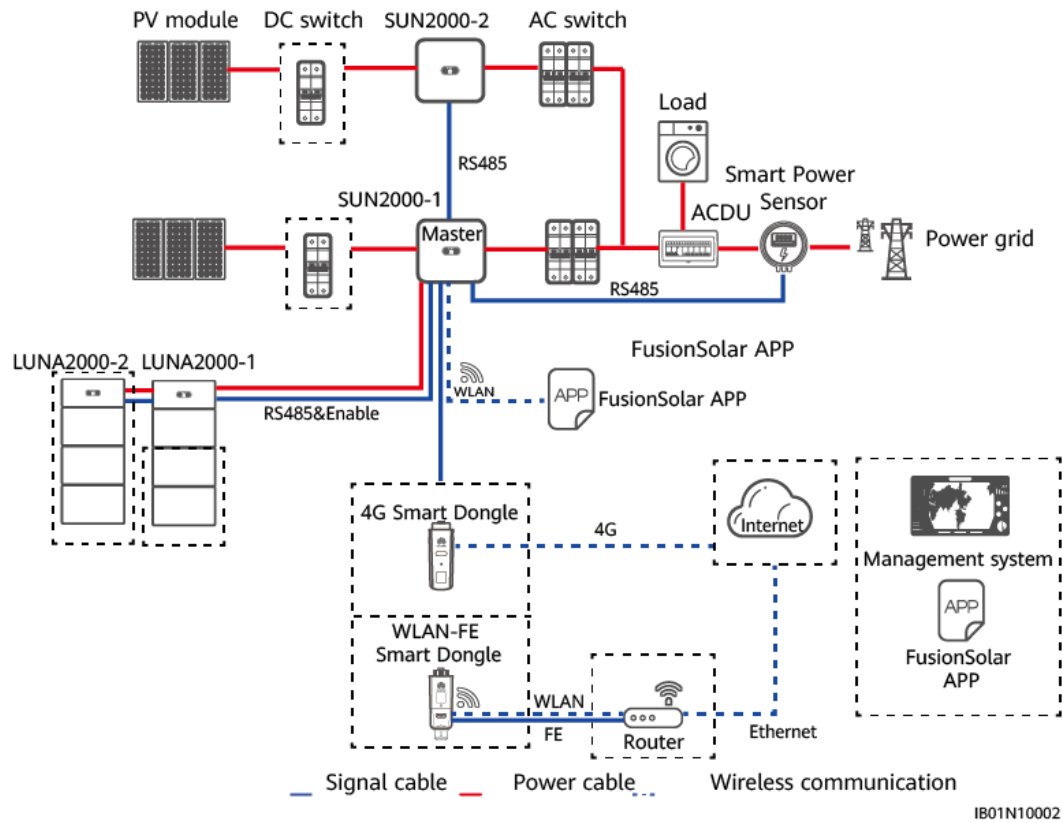
Figure 3-1 Grid-tied ESS basic networking diagram



Networking 2: Inverter (with Batteries) + Inverter (Without Batteries)

The grid-tied ESS supports inverter cascading. A maximum of three inverters can be cascaded. One inverter connects to and manages batteries, and the other inverters are used to generate extra energy.

Figure 3-2 Inverter (with batteries) + Inverter (without batteries)



IB01N10002

Table 3-1 Mapping relationship

Inverter	SUN2000-1	SUN2000-2
Model	SUN2000-(2KTL-6KTL)-L1/SUN2000-(3KTL-10KTL)-M1	--

Networking 3: Inverter (with Batteries) + Inverter (with Batteries)

When the capacity requirement is high, you can add inverters and batteries. A maximum of three inverters can be cascaded. Each battery connects to the inverter through an independent RS485 port and is managed by the inverter connected to it.

Figure 3-3 Inverter (with batteries) + Inverter (with batteries)

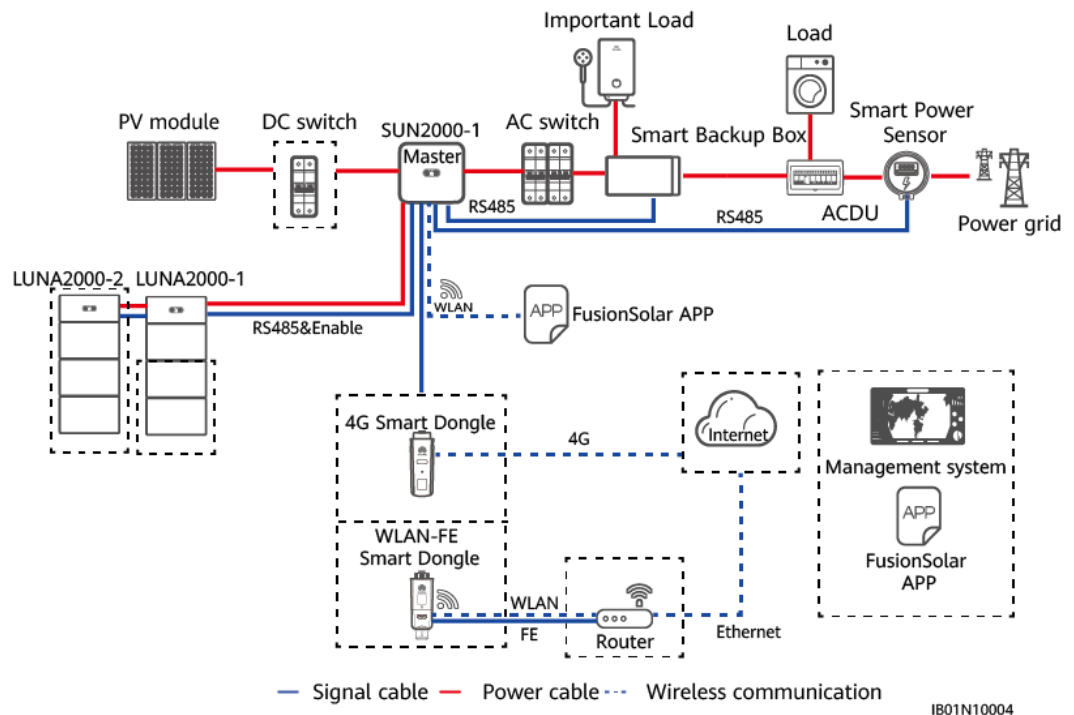


Table 3-2 Mapping relationship

Inverter	SUN2000-1	SUN2000-2
Model	SUN2000-(2KTL-6KTL)-L1/SUN2000-(3KTL-10KTL)-M1	SUN2000-(2KTL-6KTL)-L1/SUN2000-(3KTL-10KTL)-M1

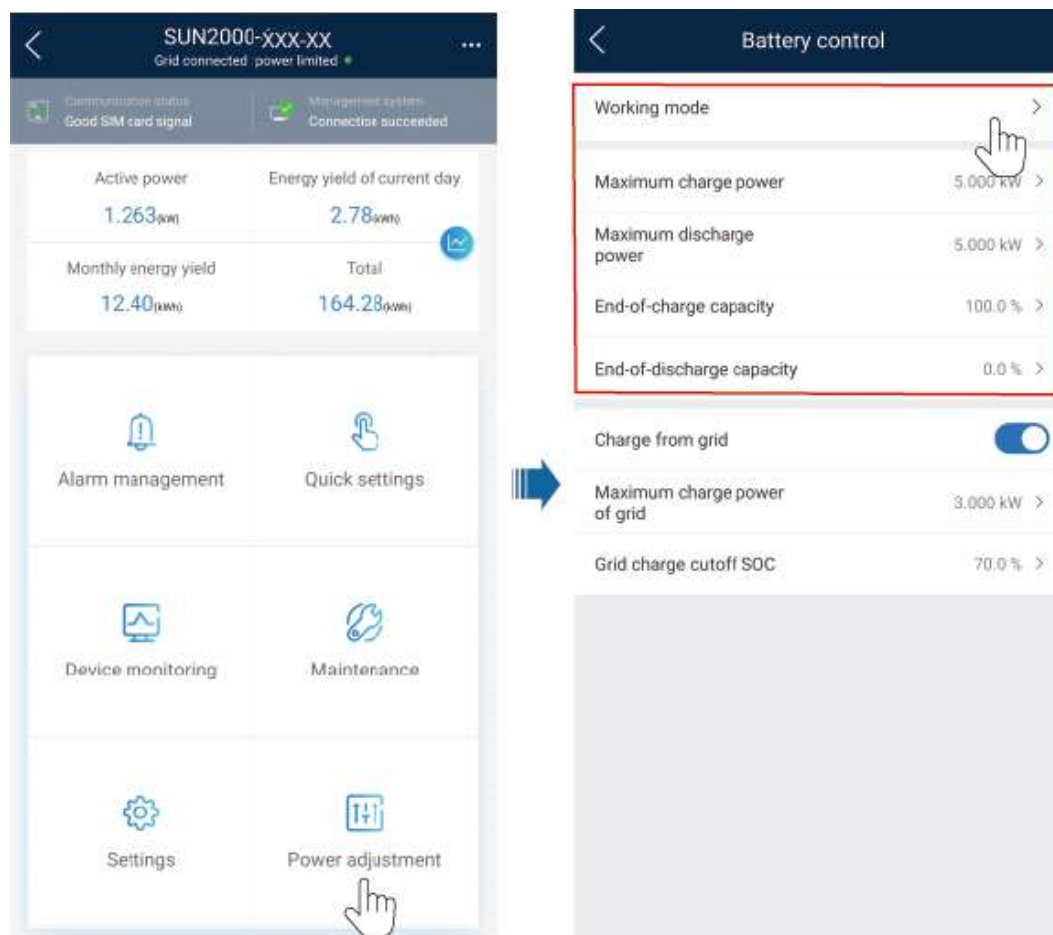
3.1.2 Setting the Grid-tied ESS Mode

The grid-tied ESS has three main working modes: self-consumption, time-of-use, and excess fed to the grid.

Self-Consumption

- This mode applies to areas where the electricity price is high, or areas where the FIT subsidy is low or unavailable.
- Excess PV energy is stored in batteries. When PV power is insufficient or no PV power is generated at night, batteries discharge to supply power to the loads, improving the self-consumption rate of the PV system and the self-sufficiency rate of residential energy, and reducing electricity costs.
- In this mode, **Maximum self-consumption** is selected. By default, the charge cutoff capacity is 100% and the discharge cutoff capacity is 0% for Huawei LUNA2000 batteries. For details about how to change the charge or discharge cutoff capacity, see [6.3 Battery Commissioning](#).

Figure 3-4 Battery control parameter setting



Parameter	Description	Value Range
Working mode	Set this parameter to the maximum self-consumption mode.	<ul style="list-style-type: none"> Maximum self-consumption Time-of-use Fully fed to grid
Maximum charge power (kW)	Retain this parameter to the maximum charge power. Additional configuration is not required.	[0, Maximum charge power]
Maximum discharge power (kW)	Retain this parameter to the maximum discharge power. Additional configuration is not required.	[0, Maximum discharge power]
End-of-charge capacity (%)	Set the charge cutoff capacity.	80%–100%

Parameter	Description	Value Range
End-of-discharge capacity (%)	Set the discharge cutoff capacity.	0%–20%

Time-of-Use

- This mode applies to scenarios where the price difference between peak and off-peak hours is large.
- In this mode, **Time-of-use** is selected. You can manually set the charge and discharge time segments. For example, you can allow the grid to charge batteries in low electricity price periods at night and discharge batteries during high electricity price periods, saving electricity fee. The charge from grid function must be enabled.
- A maximum of 14 time segments can be set. For details about how to set charge and discharge parameters, see [6.3 Battery Commissioning](#).
- In some countries, the grid is not allowed to charge batteries. Therefore, this mode cannot be used.
- If the charge time is set but the discharge time is not set, the ESS charges the batteries during the charge period. In other periods, the battery works in self-consumption mode and supplies power to loads.

If both the charge time and discharge time are set, the ESS charges and discharges batteries during the charge time and supplies power to loads during the discharge time. If no time segment is set, the ESS does not discharge, and the PV modules and power grid supply power to loads.

Figure 3-5 Time-of-use working mode

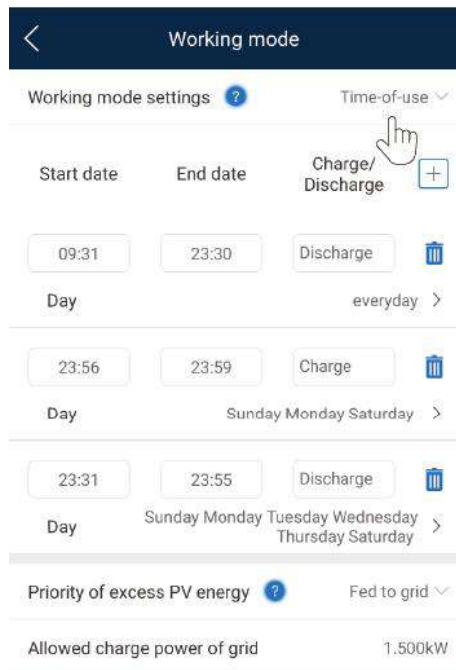


Table 3-3 Time-of-use mode setting

Parameter	Description	Value Range
Priority of excess PV energy	<ul style="list-style-type: none"> • Charge: When the generated PV energy is greater than the loads, excess PV energy is used to charge the batteries. After the maximum charge power is reached or the batteries are fully charged, the excess PV energy is fed to the grid. • Fed to grid: When the generated PV energy is greater than the loads, the excess PV energy is preferentially fed to the grid rather than used for battery charging. This setting is applicable to the scenario where the FIT is higher than the electricity price. Batteries are used only for backup power. 	<ul style="list-style-type: none"> • Charge • Fed to grid
Allowed charge power of grid (kW)	Indicates the maximum charge power allowed by the grid. The value is determined by the local grid company. If there is no requirement, the value is the maximum charge power of the ESS by default.	<ul style="list-style-type: none"> • [0, Maximum charge power allowed by the grid]

Figure 3-6 Battery control parameter setting

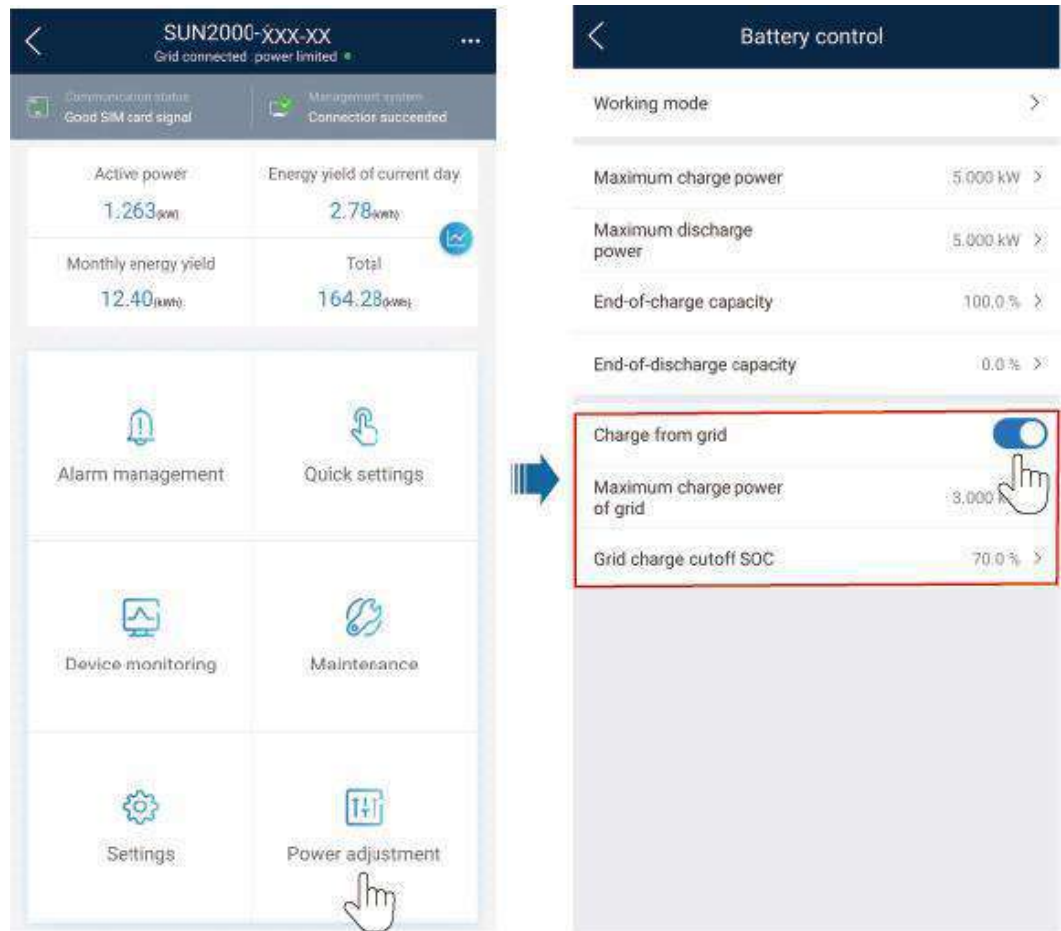


Table 3-4 Time-of-use parameter setting

Parameter	Description	Value Range
Charge from grid	If Charge from grid function is disabled by default, comply with the grid charge requirements stipulated in local laws and regulations when this function is enabled.	<ul style="list-style-type: none"> • Disable • Enable
Grid charge cutoff SOC	Set the grid charge cutoff state of charge (SOC).	[0, 100%]

Fully Fed to Grid

- This mode applies to the grid-tied scenario where PV energy is fully fed to the grid.
- This mode maximizes the PV energy for grid connection. When the generated PV energy in the daytime is greater than the maximum output capability of the inverter, the batteries are charged to store energy. When the PV energy is less than the maximum output capability of the inverter, batteries discharge to maximize the output energy of the inverter to the grid.

- In this mode, **Fully fed to grid** is selected. For details, see [6.3 Battery Commissioning](#).

3.2 Grid-tied and Off-grid ESS

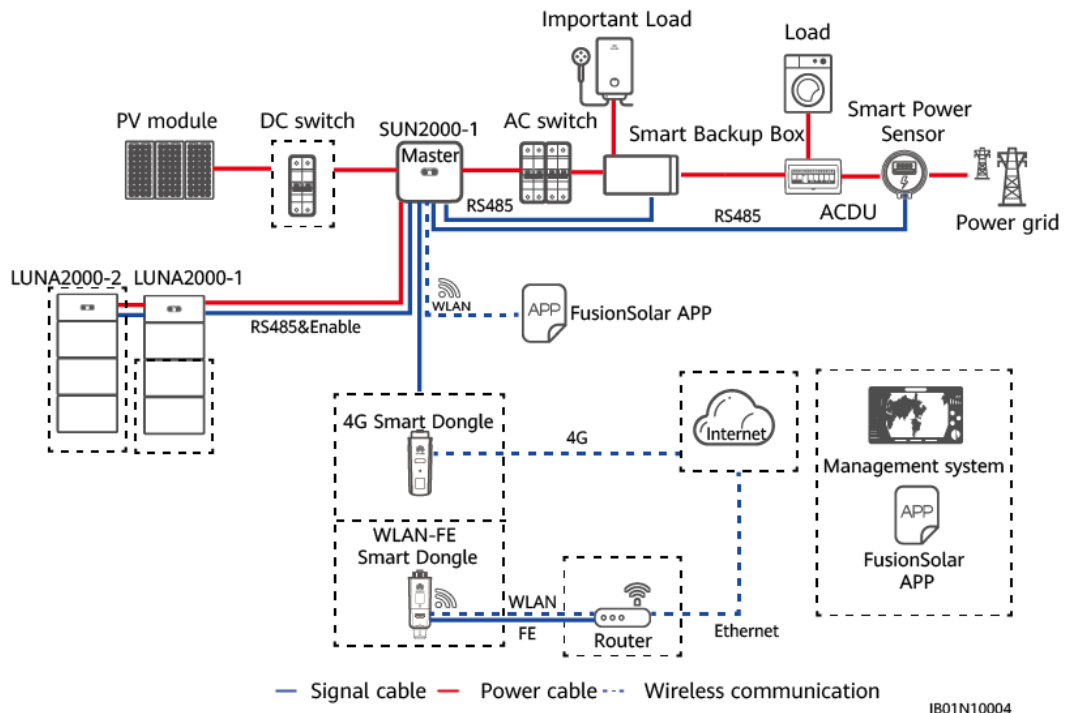
The grid-tied and off-grid ESS is mainly used to supply power to loads when the grid is unstable and there are primary loads. The grid-tied and off-grid ESS switches the inverter to the grid-tied or off-grid state through the Backup Box. When the grid fails, the inverter switches to the off-grid state and supplies power to primary loads in backup mode. When the grid recovers, the inverter switches back to the grid-tied state.

3.2.1 Grid-tied and Off-grid ESS Networking

Networking 1: Inverter + Batteries

The grid-tied and off-grid ESS consists of the PV strings, LUNA2000 batteries, inverter, AC switch, load, Backup Box, PDU, and grid. The grid connection status of the inverter is switched by using the Backup Box.

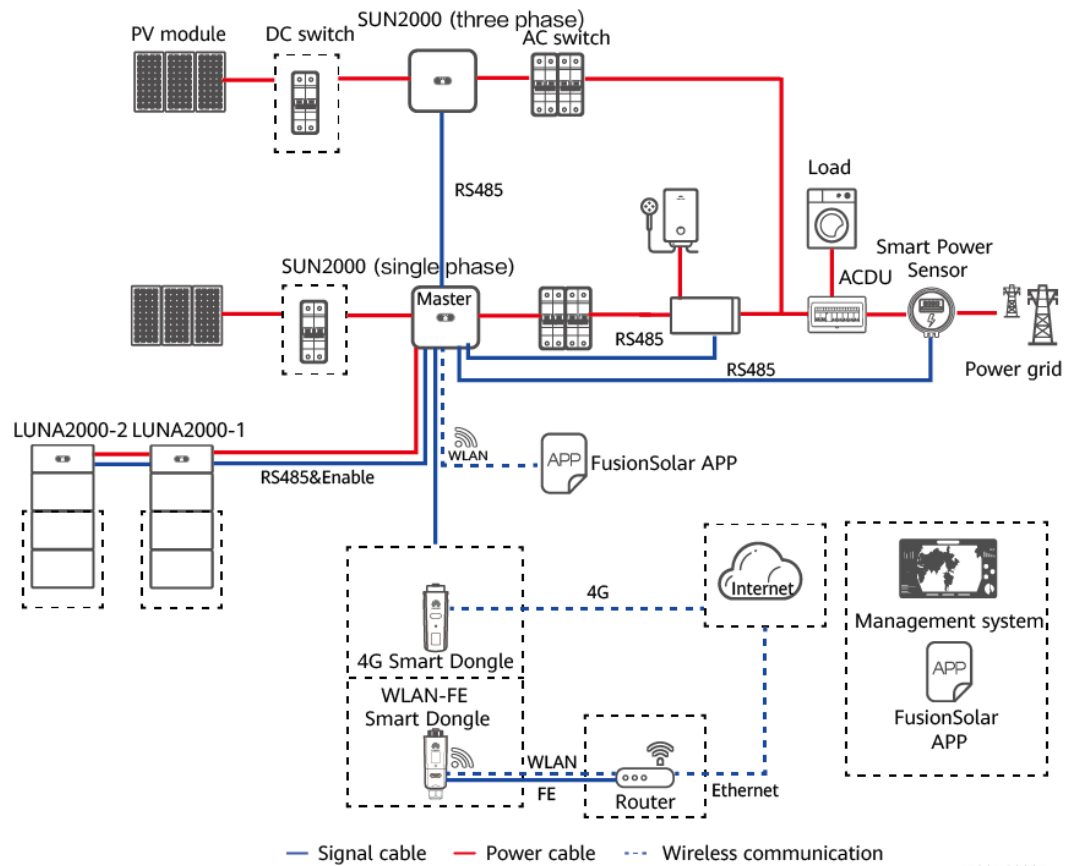
Figure 3-7 Grid-tied and off-grid ESS basic networking diagram



Networking 2: Inverter (with Batteries) + Inverter (Without Batteries)

The grid-tied and off-grid ESS supports inverter cascading. One inverter connects to and manages batteries, and the other inverter is used to generate extra energy. The Backup Box can be connected to only one inverter.

Figure 3-8 Inverter (with batteries) + Inverter (without batteries)



IB01N10005

WARNING

When the inverter switches to the off-grid state, different output primary loads of the Backup Box cannot be connected in parallel due to different output phases of off-grid inverters. Therefore, the primary loads must be connected to different buses.

3.2.2 Setting the Grid-tied and Off-grid ESS Mode

The grid-tied and off-grid ESS switches the inverter to the grid connection status through the Backup Box. When the grid fails, the ESS supplies power to primary loads in backup mode.

- This mode can be used together with the self-consumption or time-of-use mode.
 - When the grid is normal, the self-consumption or time-of-use mode is used.
 - After the grid fails, the ESS switches to the power backup mode. The battery backup time depends on the battery SOC when the grid fails. (The battery SOC for power backup can be set based on customer requirements.)

Enabling Off-grid Mode

On the home screen, choose **Settings > Feature parameters** and enable **Off-grid mode**.

Figure 3-9 Backup power setting

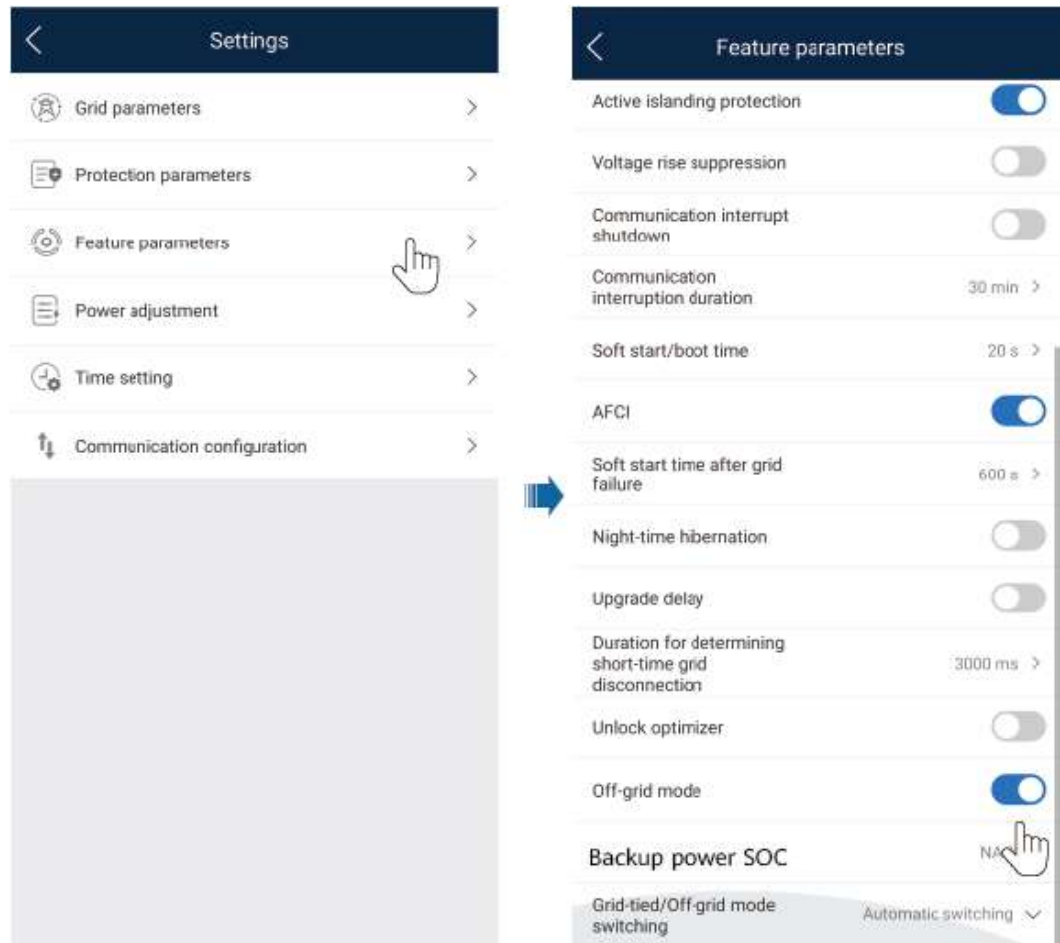


Table 3-5 Grid-tied and off-grid parameter setting

Parameter	Description	Value Range
Off-grid mode	Enable the off-grid mode. When the grid fails, the ESS switches the inverter to the off-grid mode through the Backup Box.	<ul style="list-style-type: none"> • Enable • Disable
Backup power SOC	When Off-grid mode is enabled, you can set the backup power SOC. The battery stops discharging when it is discharged to the backup power SOC. When the grid fails, loads are powered in backup mode.	[0, 50%]
Grid-tied/Off-grid mode switching	Set the grid-tied/off-grid switching mode. When the mode is set to Automatic switching , if the grid fails, the inverter is switched to off-grid mode. If the grid recovers, the inverter is switched to grid-tied mode.	<ul style="list-style-type: none"> • Automatic switching • Manual switching

Setting a Working Mode

The grid-tied and off-grid ESS mode can be used together with the self-consumption or time-of-use mode. Enable **Off-grid mode** during site deployment. For details about how to set the self-consumption or time-of-use mode, see [3.1.2 Setting the Grid-tied ESS Mode](#).

3.3 Pure Off-grid ESS

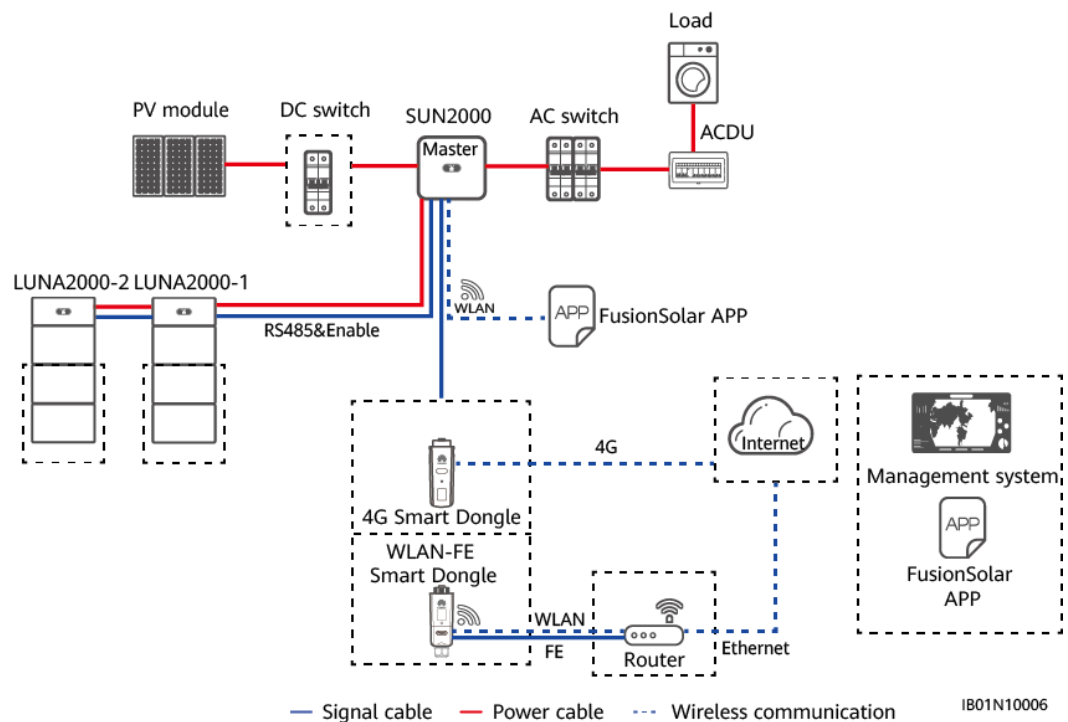
The pure off-grid ESS is mainly used in the scenario where there is no grid and the system operates in pure off-grid mode. The pure off-grid ESS stores the generated PV energy in batteries and supplies power to loads when the PV energy is insufficient or there is no PV energy at night.

3.3.1 Pure Off-grid ESS Networking

The pure off-grid ESS consists of the PV strings, LUNA2000 batteries, inverter, AC switch, and load.

The pure off-grid ESS supports only a single inverter and does not support parallel connection of inverters.

Figure 3-10 Pure off-grid ESS

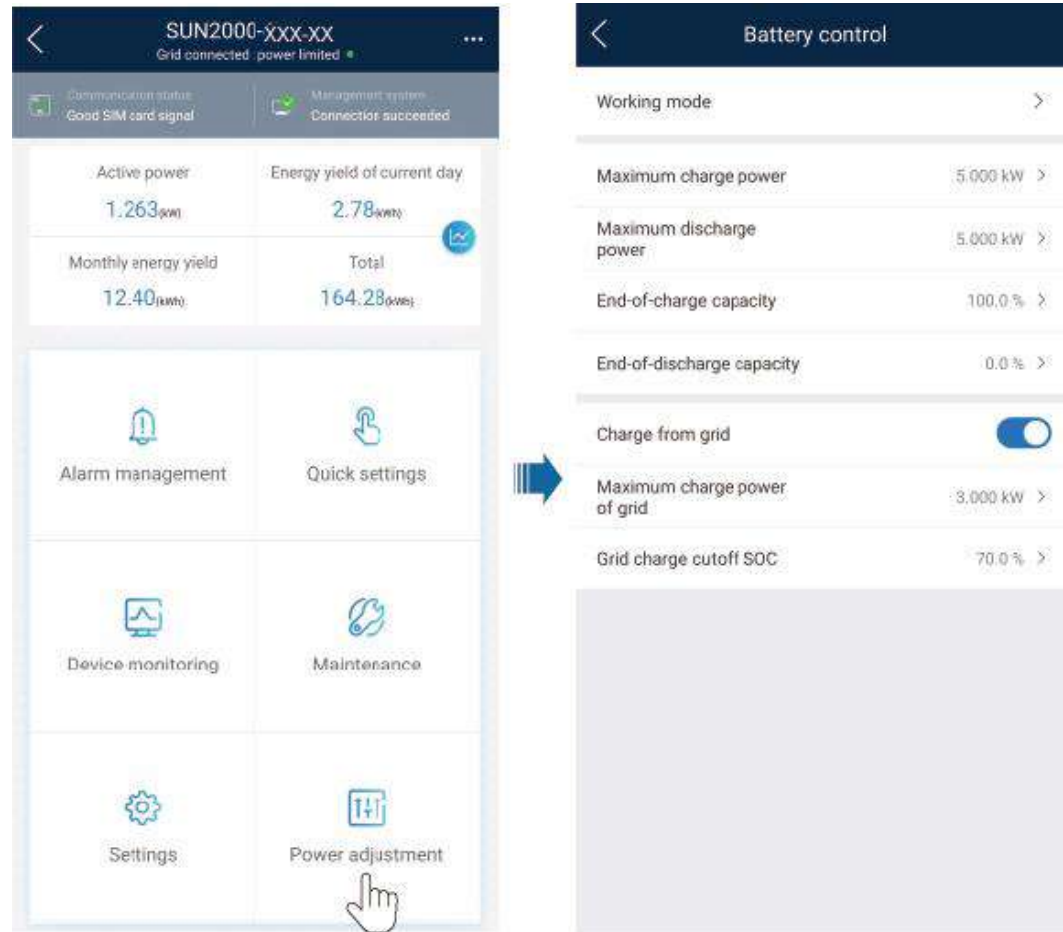


3.3.2 Setting the Pure Off-grid ESS Mode

The inverter works in off-grid mode. When the sunlight is sufficient, the ESS supplies power to loads and stores excess PV energy in batteries. When the sunlight is insufficient or there is no sunlight, batteries discharge to supply power to loads. By default, the charge cutoff capacity of Huawei LUNA2000 batteries is 100% and the discharge cutoff capacity is 0%. For

details about how to change the charge or discharge cutoff capacity, see [6.3 Battery Commissioning](#).

Figure 3-11 Battery control parameter setting



4 System Installation

- 4.1 Checking Before the Installation
- 4.2 Preparing Tools and Instruments
- 4.3 Determining the Installation Position
- 4.4 Equipment Installation

4.1 Checking Before the Installation

Checking the Outer Packing

Before unpacking the battery, check the outer packing for damage, such as holes and cracks, and check the battery model. If any damage is found or the battery model is not what you requested, do not unpack the product and contact your dealer as soon as possible.

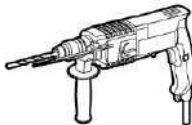

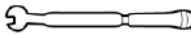
Checking Deliverables

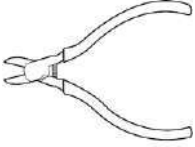
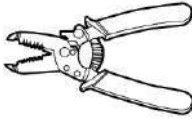
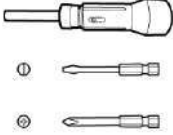



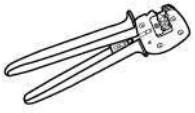
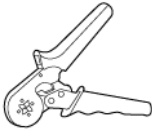




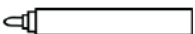
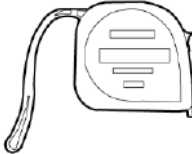

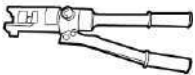


After unpacking the battery, check that the deliverables are intact and complete, and free from any obvious damage. If any item is missing or damaged, contact your dealer.





 **NOTE**

For details about the number of deliverables delivered with the battery, see the *Packing List* in the packing case.

4.2 Preparing Tools and Instruments

Type	Tools and Instruments		
Installation			

Type	Tools and Instruments		
	Hammer drill (with a drill bit of 8 mm)	Torque socket wrench	Torque wrench
	 Diagonal pliers	 Wire strippers	 Torque screwdriver
	 Rubber mallet	 Utility knife	 Cable cutter
	 Crimping tool (model: PV-CZM-22100)	 Cord end terminal crimper	 Disassembly and Assembly Tool (model: PV-MS-HZ open-end wrench)
	 Cable tie	 Vacuum cleaner	 Multimeter (DC voltage measurement range ≥ 600 V DC)
	 Marker	 Steel measuring tape	 Level
	 Crimping tool	 Steel measuring tape	 Heat gun

Type	Tools and Instruments		
	Hydraulic pliers	Heat-shrink tubing	Heat gun
Personal protective equipment (PPE)	 Safety gloves	 Safety goggles	 Anti-dust mask
	 Safety boots	-	-

4.3 Determining the Installation Position

Basic Requirements

- Do not install the battery in a position where it is easy to touch because the temperature of the chassis and heat sink is high when the battery is running.
- Do not install the battery in areas with flammable or explosive materials.
- Do not install the battery outdoors in salt-affected areas because it may corrode and cause fires. A salt-affected area refers to the region within 500 meters from the coast or prone to sea breeze. The regions prone to sea breeze vary with weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).
- Do not install the battery in a position where children can touch it.

Installation Environment Requirements

- Install the battery in a dry and well-ventilated environment to ensure good heat dissipation.
- You are advised to install the battery in a sheltered place or install an awning over it.
- Install the battery in a clean environment that is free from sources of strong infrared radiation, organic solvents, and corrosive gases. Avoid exposing the battery to sunlight or water.
- The installation position must be far away from fire sources.
- The installation position must be far away from water sources such as taps, sewer pipes, and sprinklers to prevent water seepage.
- The equipment must be placed on a solid and flat supporting surface.
- Do not place any flammable or explosive materials around the equipment.
- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.

- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

Installation Angle Requirement

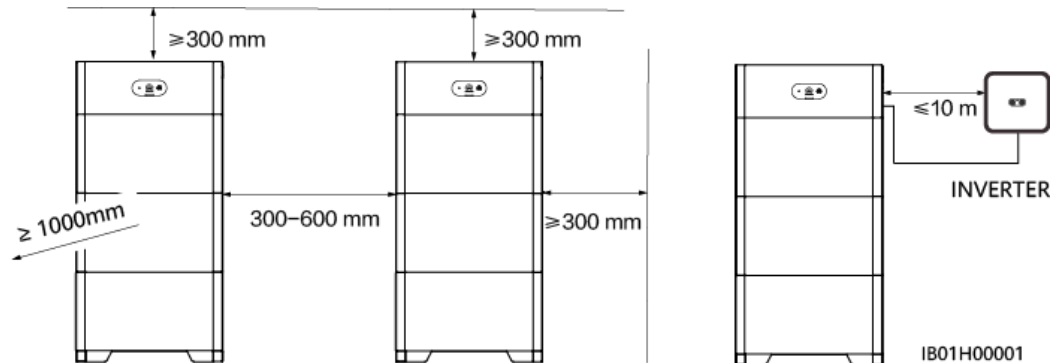
The battery can be floor-mounted and wall-mounted. The installation angle requirement is as follow:

- Do not install the battery at forward tilted, back tilted, side tilted, horizontal, or upside down positions.

Installation Space Requirements

- Reserve sufficient clearance around the battery to ensure sufficient space for installation and heat dissipation.

Figure 4-1 Installation space



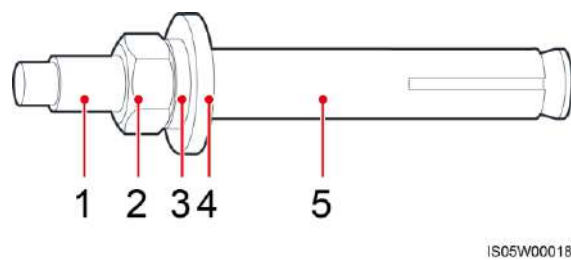
4.4 Equipment Installation

4.4.1 Floor-Mounted Installation

Installation Precautions

Figure 4-2 shows the dimensions of mounting holes for a battery.

Figure 4-3 M6 expansion bolt composition



(1) Bolt

(2) Nut

(3) Spring washer

(4) Flat washer

(5) Expansion sleeve

NOTICE

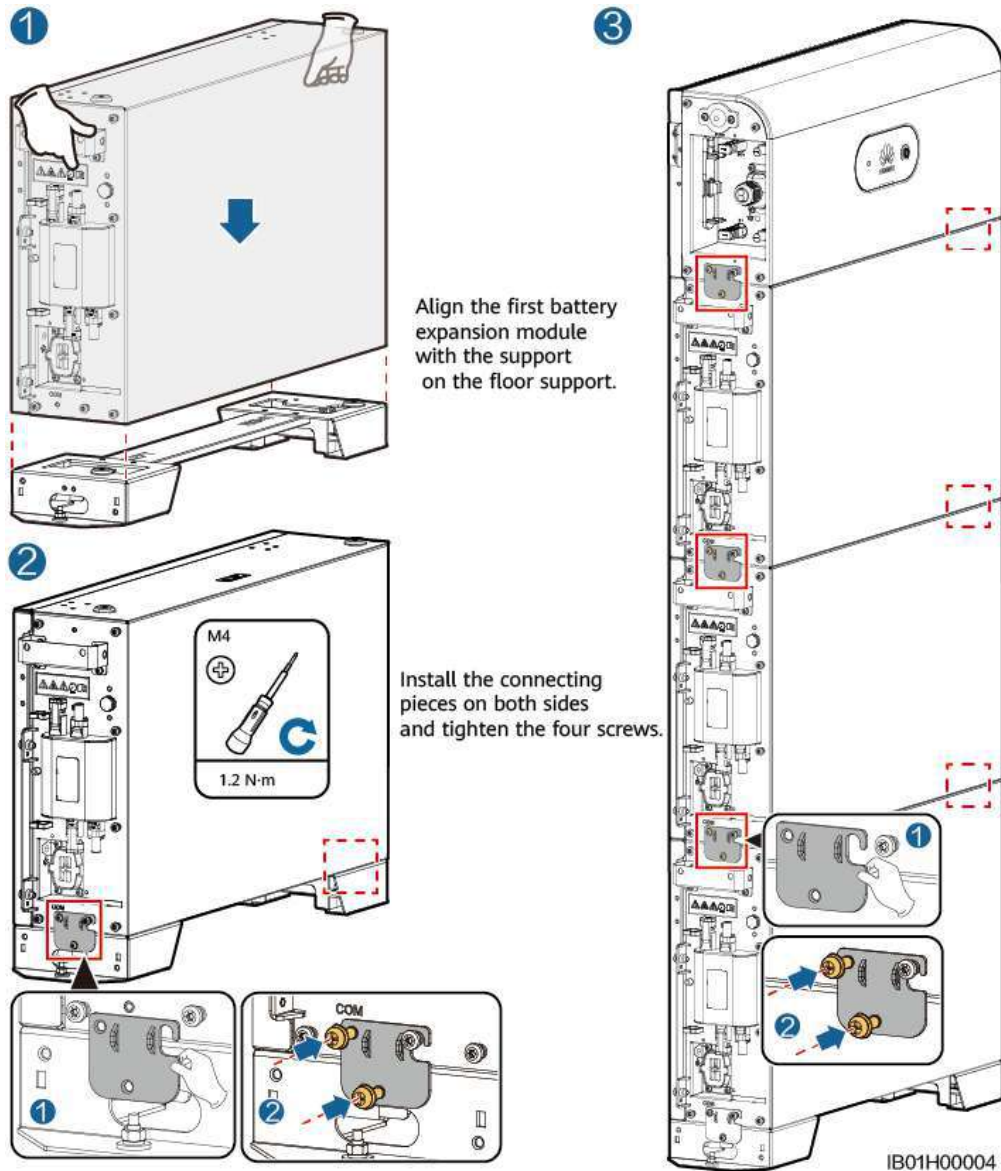
- To prevent dust inhalation or contact with eyes, wear safety goggles and an anti-dust mask when drilling holes.
 - Wipe away any dust in or around the holes and measure the hole distances. If the holes are inaccurately positioned, drill holes again.
 - Level the head of the expansion sleeve with the concrete wall or floor after removing the nut, spring washer, and flat washer. Otherwise, the mounting kit will not be securely installed on the wall or ground.
 - Loosen the nut, spring washer, and flat washer of the expansion bolt at the bottom.
-

Figure 4-4 Installing expansion bolts

⚠ WARNING

After installing a module, install and tighten the connecting pieces and screws on the left and right sides of the module, and then install the next module.

Figure 4-5 Installing the battery expansion modules and power control module



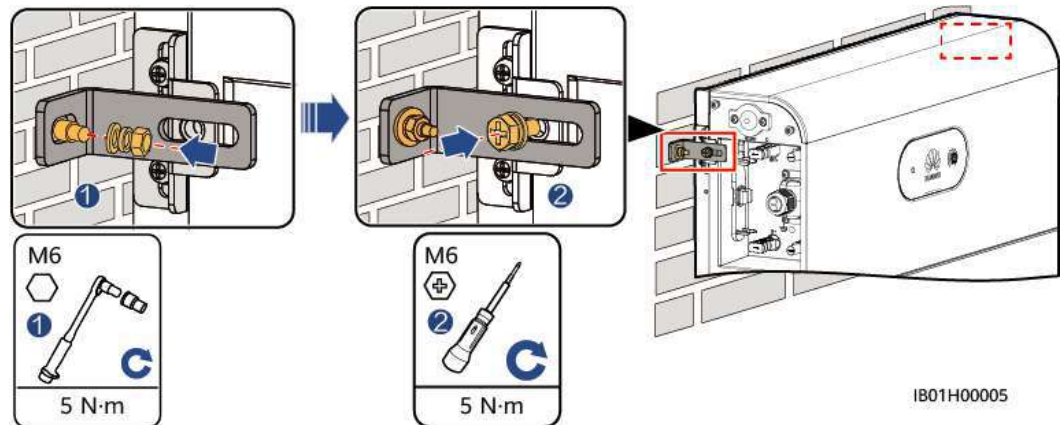
Install the remaining battery expansion modules and power control module from bottom to top.

Step 4 Secure the power control module to the wall.

⚠ WARNING

The power control module must be fixed on the wall to prevent it from falling down.

Figure 4-6 Securing the power control module



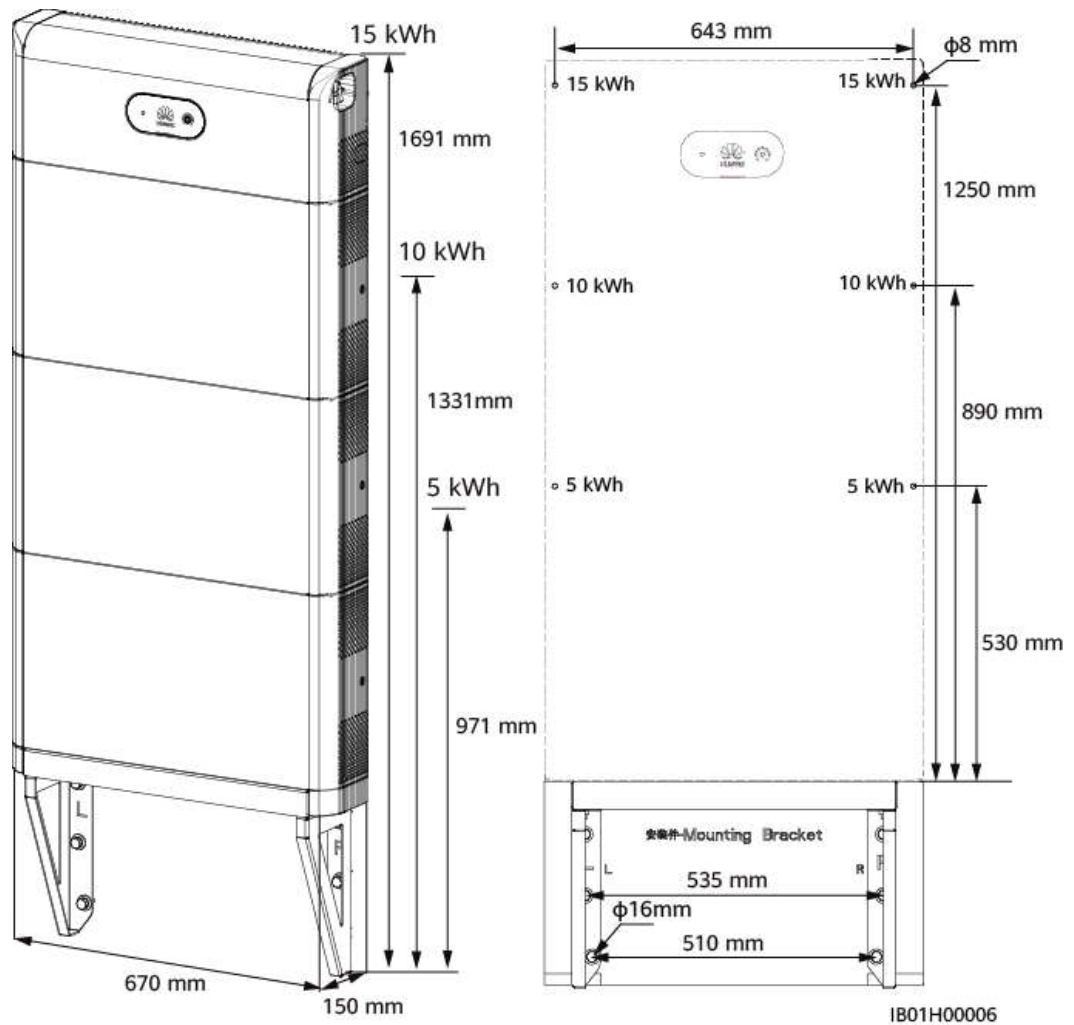
----End

4.4.2 Wall-Mounted Installation

Installation Precautions

Figure 4-7 shows the dimensions of mounting holes for the battery on the wall.

Figure 4-7 Wall-mounted installation dimensions



Procedure

Step 1 Determine the positions for drilling holes using the marking-off template. Level the positions of mounting holes using a level, and mark the positions with a marker.

Step 2 Install the mounting kit.

DANGER

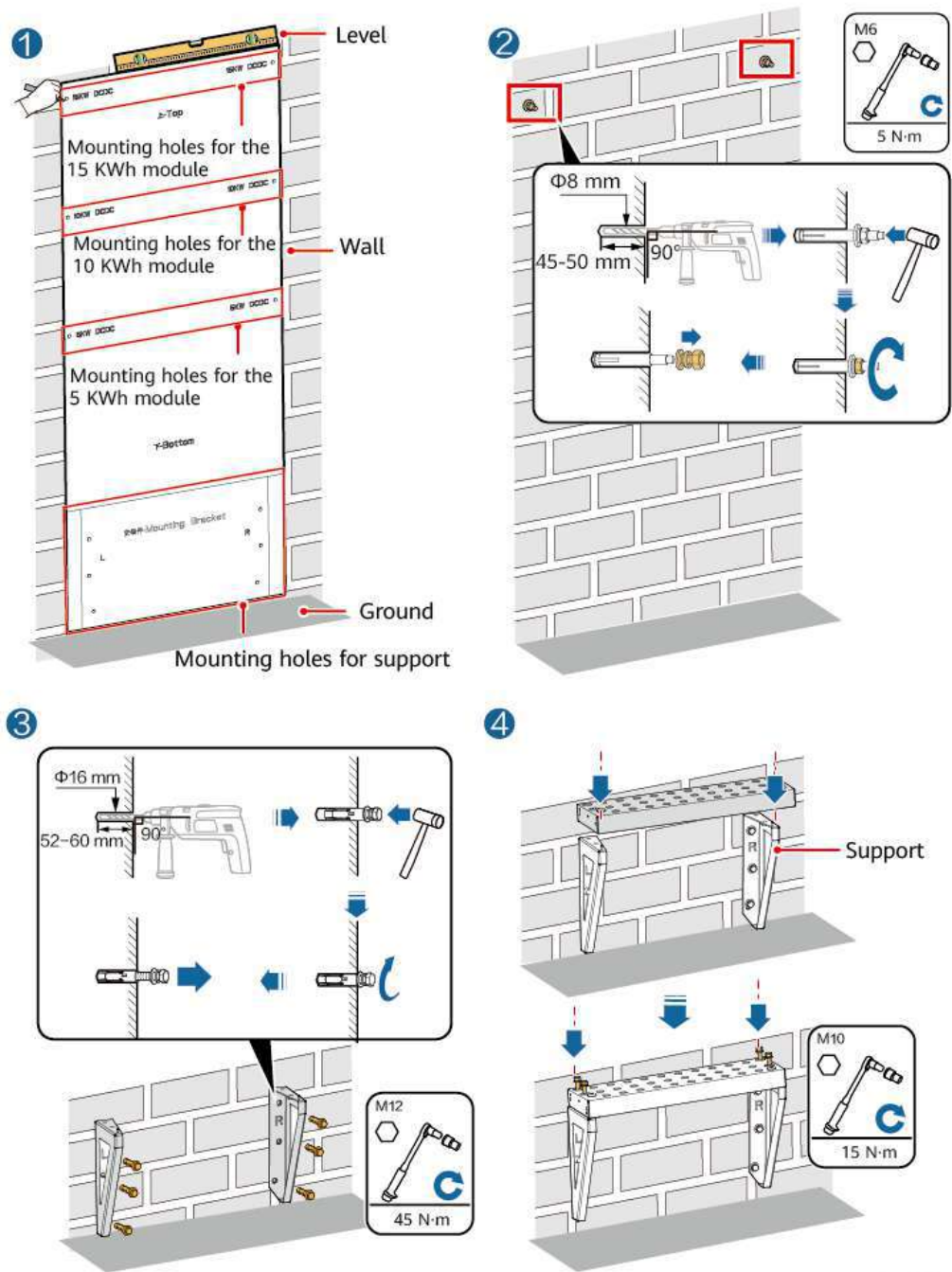
When drilling holes, avoid the water pipes and power cables buried in the wall.

NOTE

M12x60 expansion bolts delivered with the battery are used to fix the wall mounting support. If the length and quantity of the bolts do not meet installation requirements, prepare M12 stainless steel expansion bolts by yourself.

M6x60 expansion bolts delivered with the battery are used to fix the power control module. If the length and quantity of the bolts do not meet installation requirements, prepare M6 stainless steel expansion bolts by yourself.

Figure 4-8 Wall-mounted installation



IB01H00007

Step 3 Place the first battery expansion module on the wall-mounted support, install the left and right connective pieces, and install the second battery expansion module, third battery expansion module, and power control module from bottom to top.

⚠ WARNING

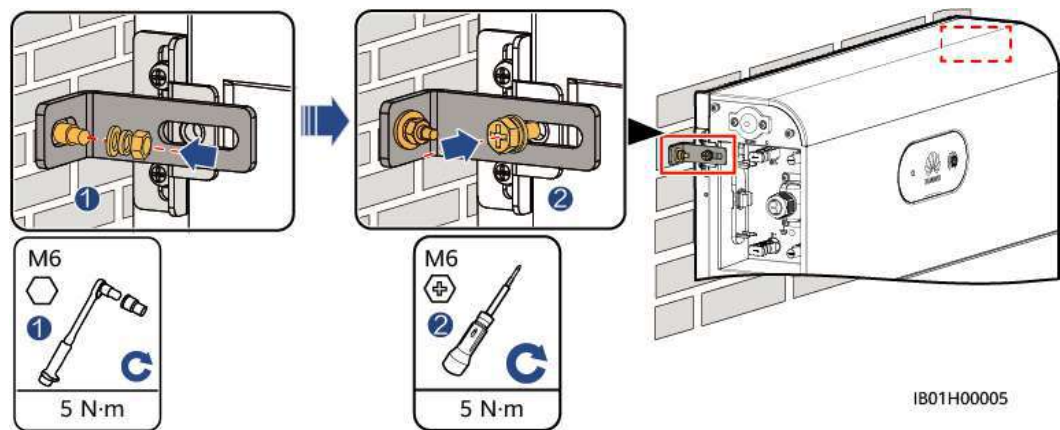
After installing a module, install and tighten the connecting pieces and screws on the left and right sides of the module, and then install the next module.

Step 4 Secure the power control module to the wall.

⚠ WARNING

The power control module must be fixed on the wall to prevent the battery from falling down.

Figure 4-9 Securing the power control module



----End

5 Electrical Connection

Precautions

 DANGER

Before connecting cables, ensure that the DC switch on the battery and all the switches connected to the battery are set to OFF. Otherwise, the high voltage of the battery may result in electric shocks.

 WARNING

- The equipment damage caused by incorrect cable connections is not covered under any warranty.
 - Only certified electricians are allowed to connect cables.
 - Operation personnel must wear proper PPE when connecting cables.
-

 NOTE

The cable colors shown in the electrical connection diagrams provided in this chapter are for reference only. Select cables in accordance with local cable specifications (green-and-yellow cables are only used for PE).

- [5.1 Preparing Cables](#)
- [5.2 Internal Electrical Connections of the Battery](#)
- [5.3 External Electrical Connections of the Battery](#)
- [5.4 \(Optional\) Cascading Batteries](#)
- [5.5 Installing the Cover](#)

5.1 Preparing Cables

Figure 5-1 Battery cable connections

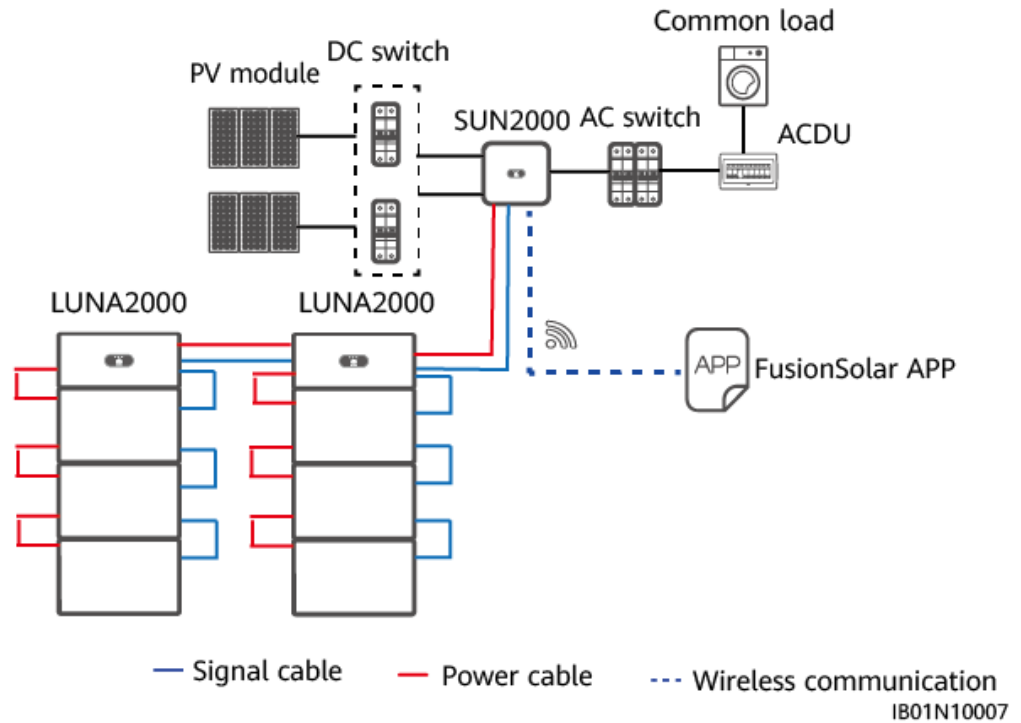


Table 5-1 Cables prepared by the customer

No.	Cable	Type	Recommended Specifications	Source
1	DC input power cable (inverter to battery and battery to battery)	Common outdoor PV cable in the industry	<ul style="list-style-type: none"> Conductor cross-sectional area: 4–6 mm² Cable outer diameter: 5.5–9 mm 	Prepared by the customer
2	Signal cable (inverter to battery and battery to battery)	Outdoor shielded twisted pair cable (8 cores)	<ul style="list-style-type: none"> Conductor cross-sectional area: 0.20–0.35 mm² Cable outer diameter: 6.2–7 mm 	Prepared by the customer
3	Ground cable	Single-core outdoor copper cable	<ul style="list-style-type: none"> 10mm² 	Prepared by the customer

Table 5-2 Cables delivered with the battery

No.	Cable	Type	Source
1	DC input power cable (power control module to battery expansion module)	Common outdoor PV cable in the industry	Delivered with the product
2	Signal cable (power control module to battery expansion module)	Outdoor shielded twisted pair cable	Delivered with the product
3	Ground cable	Single-core outdoor copper cable	Delivered with the product

 **NOTE**

- The minimum cable diameter must comply with local cable standards.
- The factors that affect cable selection include the rated current, cable type, routing mode, ambient temperature, and maximum expected line loss.

5.2 Internal Electrical Connections of the Battery

 **NOTE**

- Internal cables are delivered with the battery. For details, see the *Packing List* in the packing case.

5.2.1 Installing an Internal Ground Cable

Precautions

 **DANGER**

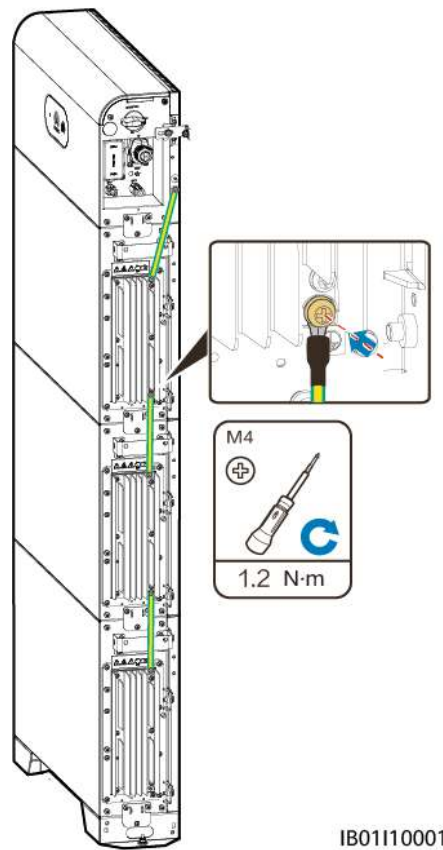
- Ensure that the PE cable is securely connected. Otherwise, electric shocks may occur.

 **NOTE**

- It is recommended that silica gel or paint be used around the ground terminal after the PE cable is connected.

Step 1 Connect the PE cable to the battery power control modules and battery expansion modules.

Figure 5-2 Connecting the internal PE cable



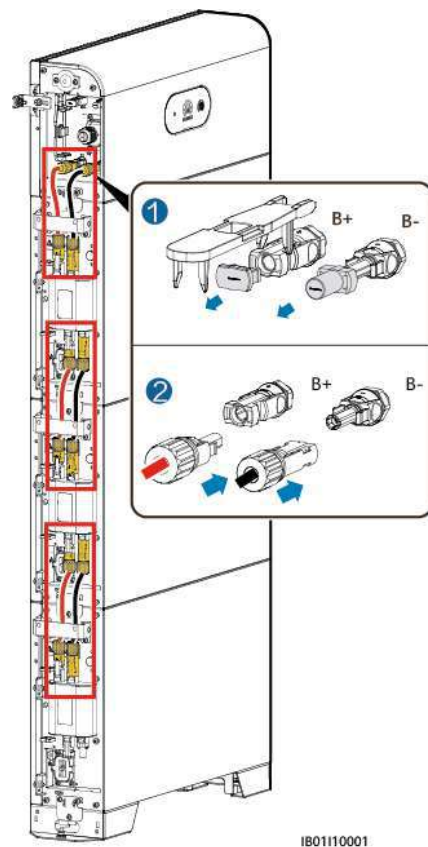
IB01110001

----End

5.2.2 Installing Internal DC Terminals

Step 1 Insert the positive and negative connectors delivered with the battery into the positive and negative battery cascading terminals (B+ and B-).

Figure 5-3 DC power cable connection inside the battery



NOTE

The DC terminals between the power control module and the battery expansion modules use the DC connection cable (Amphenol terminal) delivered with the battery.

NOTICE

After the positive and negative connectors snap into place, pull the DC input power cables back to ensure that they are connected securely.

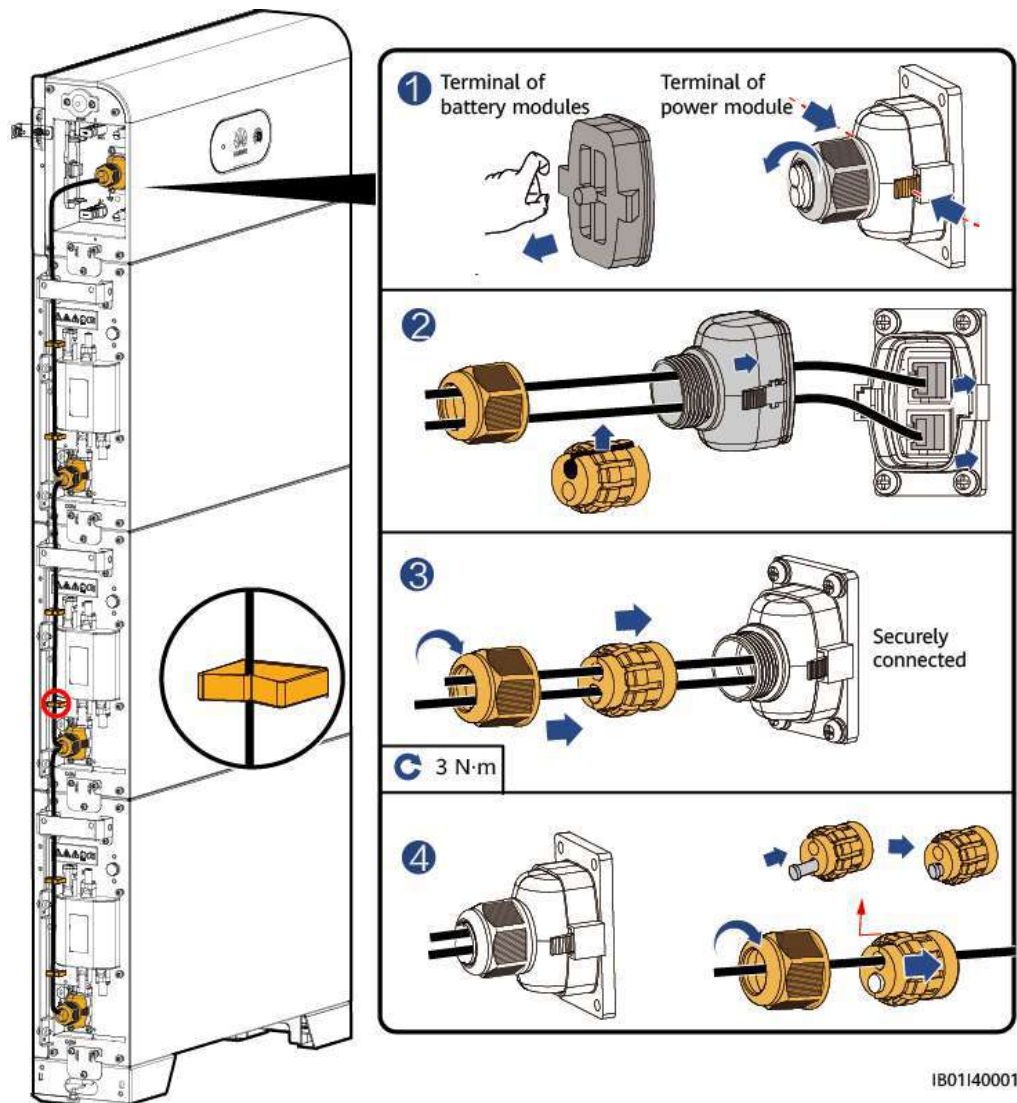
----End

5.2.3 Connecting Internal Signal Cables

Connecting Signal Cables Between the Power Control Module and Battery Expansion Modules

Connect the communications terminals of the power control module and battery expansion modules in sequence and secure them using cable clips.

Figure 5-4 Signal cable connections between the power module and battery modules



NOTE

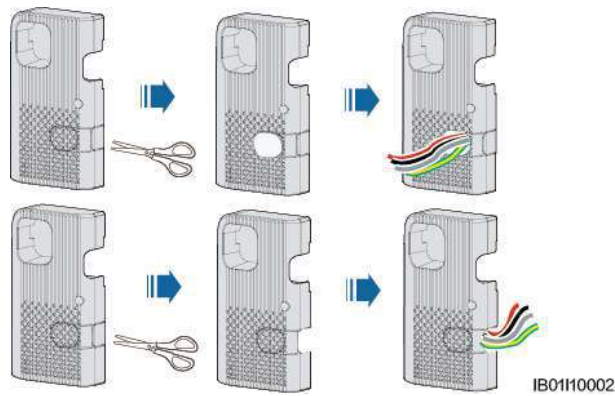
When a communications terminal is connected to a single network cable, a waterproof rubber plug must be installed.

5.3 External Electrical Connections of the Battery

Routing Cables Out of the Cable Hole

Cut a cable hole based on the cabling mode, and route external cables through the cable hole.

Figure 5-5 Routing cables out of the cable hole



NOTICE

Before connecting external cables, route the cables through the cable hole to avoid disconnecting after installation.

5.3.1 Installing a PE Cable

Precautions

DANGER

- Ensure that the PE cable is securely connected. Otherwise, electric shocks may occur.

NOTE

- It is recommended that silica gel or paint be used around the ground terminal after the PE cable is connected.

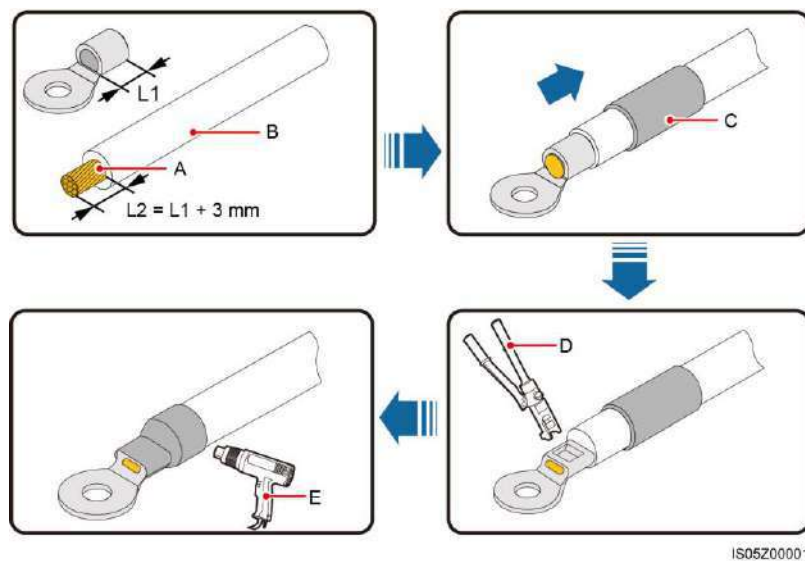
Procedure

- Step 1** Crimp an OT terminal.

NOTICE

- Avoid scratching the core wire when stripping a cable.
- The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wires completely. The core wires must contact the OT terminal closely.
- Wrap the wire crimping area with heat shrink tubing. The heat shrink tubing is used as an example.
- When using a heat gun, protect the equipment from being scorched.

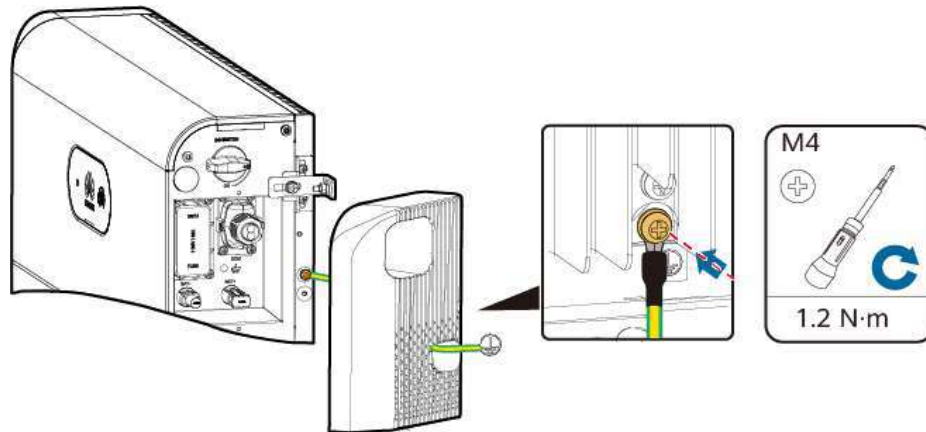
Figure 5-6 Crimping an OT terminal



(A) Core wire	(B) Insulation layer	(C) Heat shrink tubing
(D) Hydraulic pliers	(E) Heat gun	

Step 2 Ground the PE cable.

Figure 5-7 Grounding the PE cable



IB01150001

NOTE

- It is recommended that silica gel or paint be used around the ground terminal after the PE cable is connected.

----End

5.3.2 Installing DC Input Power Cables

Connect DC input power cables to the inverter

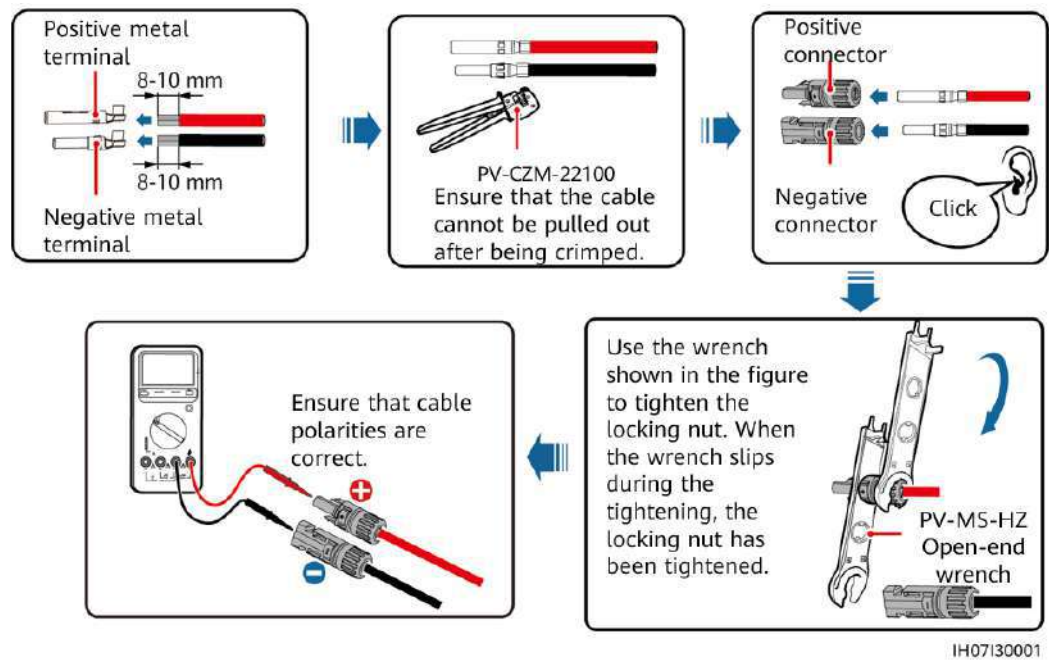
Insert the positive and negative battery connectors (Staubli) into the corresponding DC input terminals (BAT+ and BAT-).

NOTE

The DC input terminals (BAT+ and BAT-) on the left and right sides of the battery are the same.

Step 1 Assemble DC connectors.

Figure 5-8 Assembling DC connectors



CAUTION

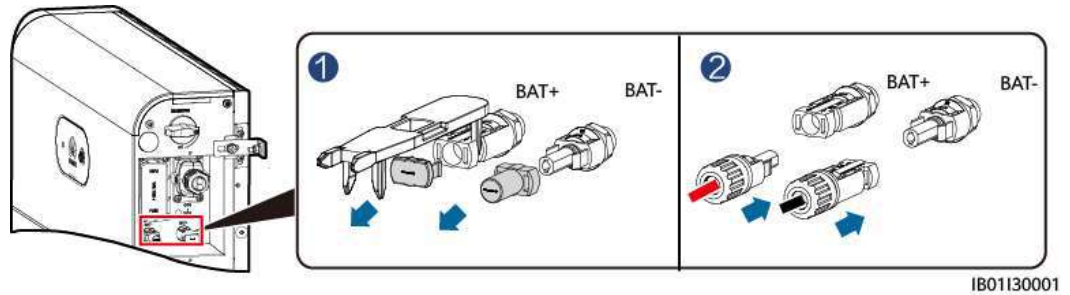
Use Staubli MC4 positive and negative metal terminals and DC connectors. Using incompatible positive and negative metal terminals and DC connectors may result in serious consequences. The caused equipment damage is not covered under any warranty or service agreement.

NOTICE

- Keep the DC input BAT+ cable and BAT- cable close to each other.
- Cables with high rigidity, such as armored cables, are not recommended as DC input power cables to avoid cable folding.
- Before assembling DC connectors, label the cable polarities correctly to ensure correct cable connections.
- After crimping the positive and negative metal terminals, pull the DC input power cables back to ensure that they are connected securely.
- Insert the crimped metal terminals of the positive and negative power cables into the appropriate positive and negative connectors. Then pull back the DC input power cables to ensure that they are connected securely.

Step 2 Insert the positive and negative connectors into the battery terminals (BAT+ and BAT-) on the switch and connect the other end to the cascaded battery.

Figure 5-9 Connecting battery cables



----End

5.3.3 Installing a Signal Cable

Connecting the Signal Cable between the Power Control Module and the Inverter

NOTICE

When laying out a signal cable, separate it from power cables and keep it away from strong interference sources to prevent communication interruption.

The COM port definitions on both sides of the power control module are the same. It is recommended that the COM port on the switch side be connected to the inverter and the COM port on the other side be connected to the cascaded battery.

Figure 5-10 Signal cable ports

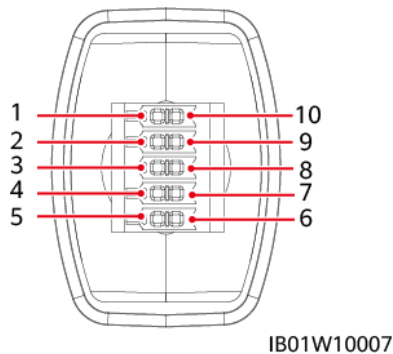


Table 5-3 COM port definition

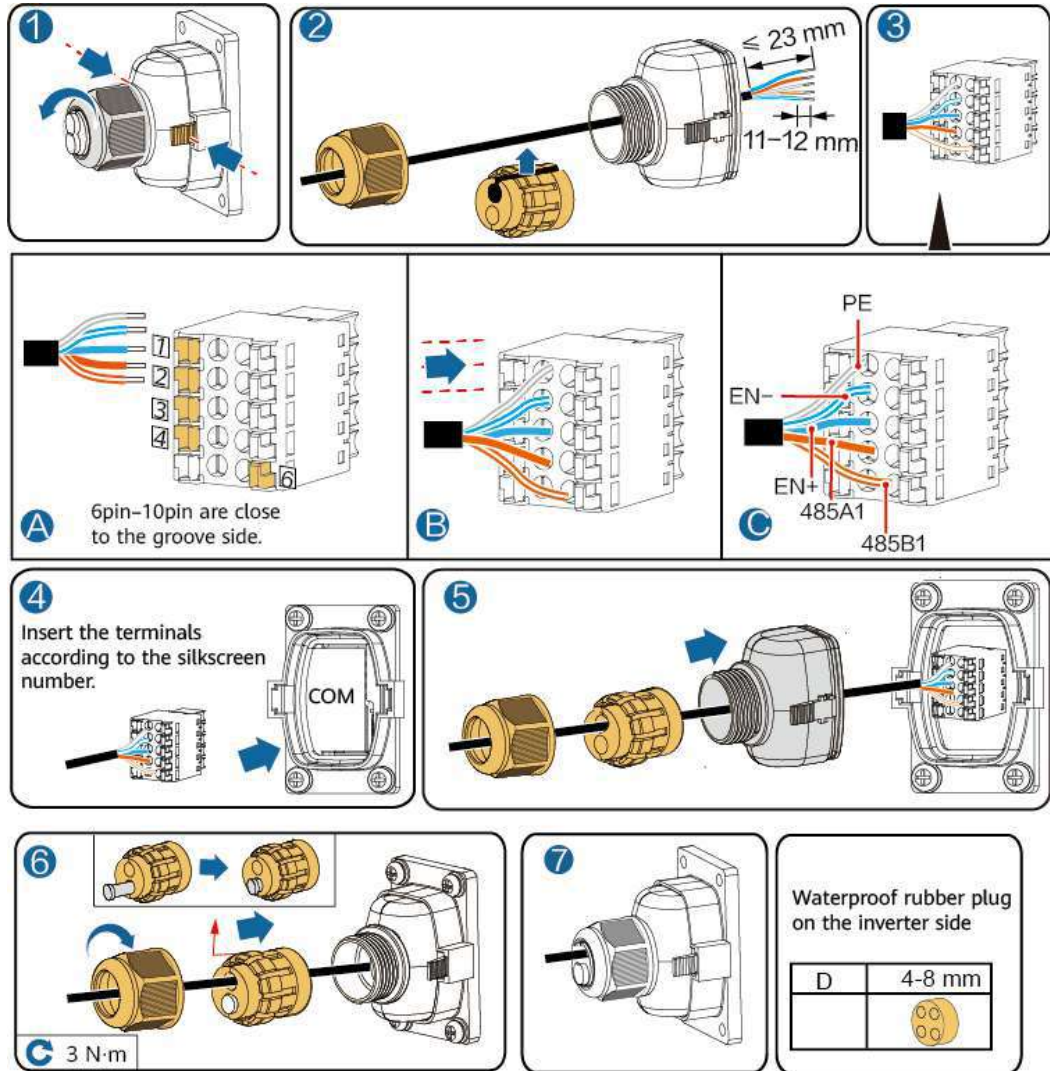
No.	Label	Definition	Description
1	PE	Shield layer grounding	Shield layer grounding
2	Enable-	Enable signal GND	Connects to the enable signal GND of the inverter.

No.	Label	Definition	Description
3	Enable+	Enable signal+/12V+	Connects to the enable signal of the inverter and the positive terminal of the 12 V power supply.
4	485A1	RS485B, RS485 differential signal+	Connects to the RS485 signal port of the inverter.
5	485A2	RS485A, RS485 differential signal+	
6	485B1	RS485B, RS485 differential signal-	Connects to the RS485 signal port of the inverter.
7	485B2	RS485A, RS485 differential signal-	
8	CANL	Extended CAN bus port	Used for signal cable cascading in battery cascading scenarios.
9	CANH	Extended CAN bus port	Used for signal cable cascading in battery cascading scenarios.
10	PE	Shield layer grounding	Shield layer grounding

Connecting a Signal Cable (Cascading)

Prepare signal cable terminals for connecting the power control module.

Figure 5-11 Connecting inverter terminals

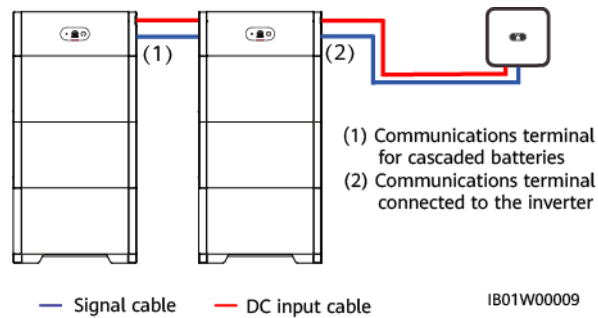


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5.4 (Optional) Cascading Batteries

Battery Cascading Cable Connection

Figure 5-12 Battery cascading cable connection



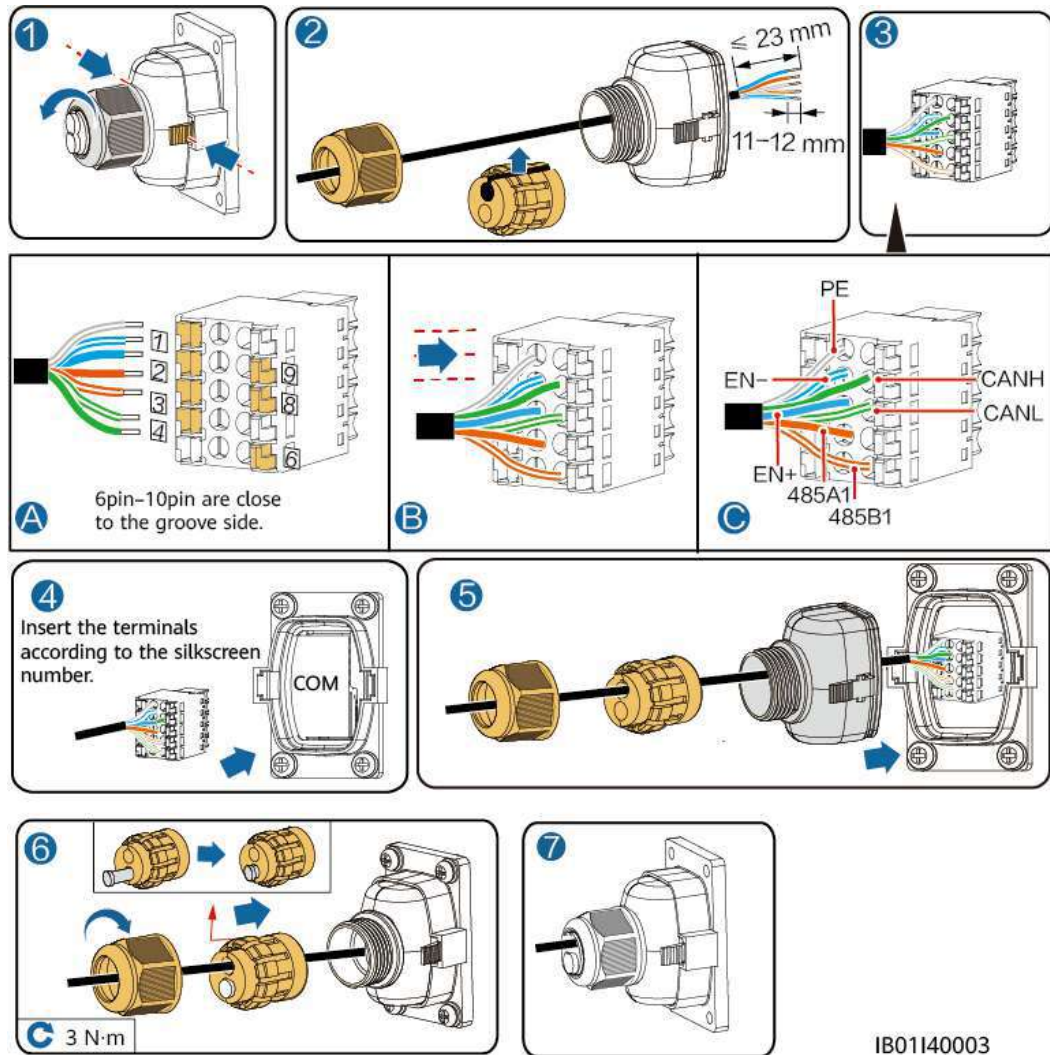
Connecting Cascading DC Input Power Cables (Cascading)

Connect the DC input terminals (BAT+ and BAT-) between the power control module by referring to [5.3.2 Installing DC Input Power Cables](#).

Connecting a Signal Cable (Cascading)

Prepare a signal cable terminal for connecting the power control module.

Figure 5-13 Cascading communication terminal

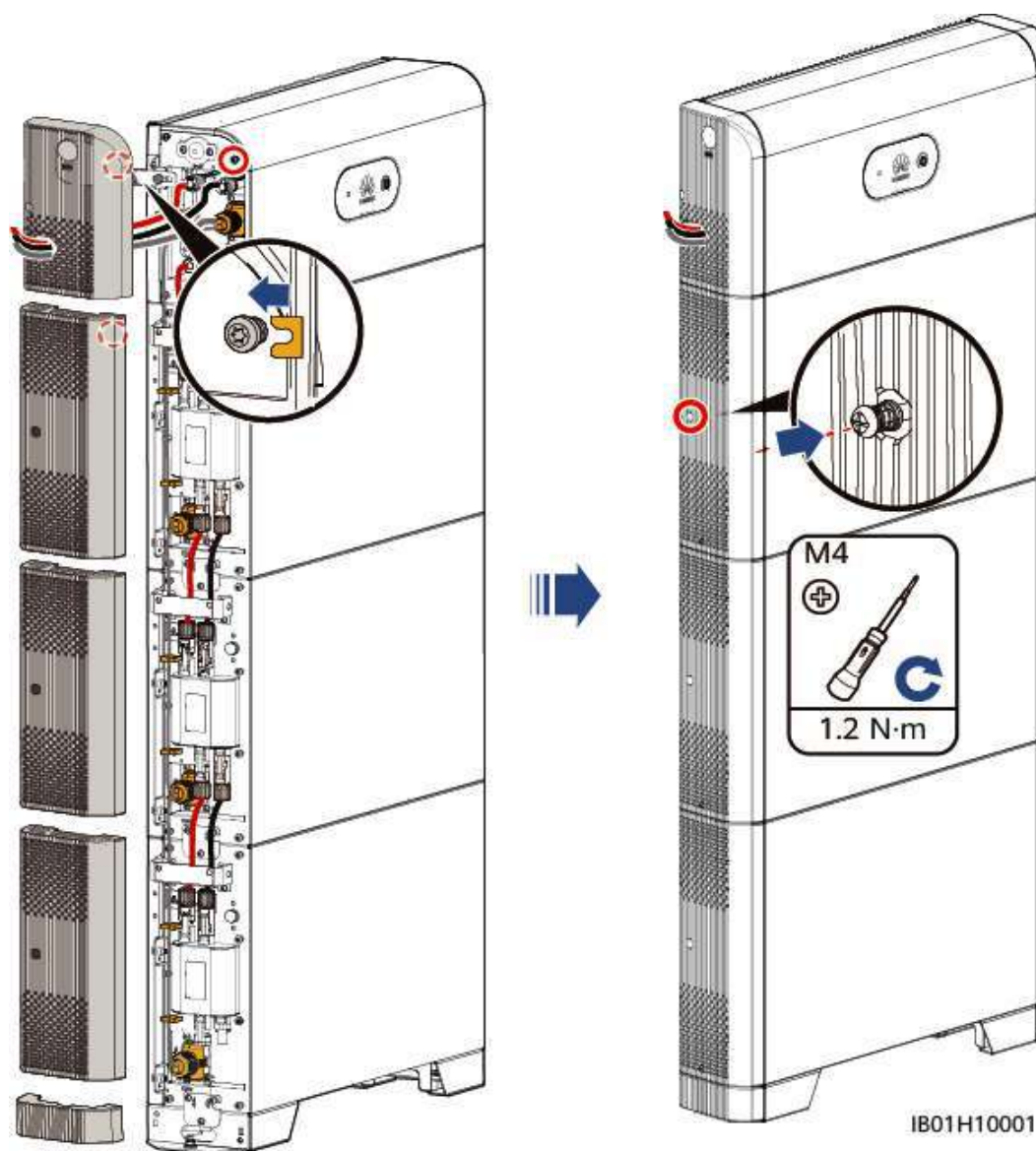


IB01140003

5.5 Installing the Cover

After electrical connections are complete, check that cables are correctly and securely connected, install the external protective cover, and secure it using screws.

Figure 5-14 Installing the cover



6 System Commissioning

- 6.1 Verification Before Power-On
- 6.2 System Power-On
- 6.3 Battery Commissioning

6.1 Verification Before Power-On

Table 6-1 Check items and acceptance criteria

No.	Check Item	Acceptance Criteria
1	Battery installation	The installation is correct and reliable.
2	Cables routing	Cables are routed properly as required by the customer.
3	Cable tie	Cable ties are evenly distributed and no burr exists.
4	Grounding	The PE cable is connected correctly, securely, and reliably.
5	Switch	The DC switch and all switches connected to the battery are OFF.
6	Cable connection	The AC output power cable, DC input power cable, battery cable, and signal cable are connected correctly, securely, and reliably.
7	Unused terminal and port	Unused terminals and ports are locked by watertight caps.
8	Installation environment	The installation space is proper, and the installation environment is clean and tidy.

6.2 System Power-On

NOTICE

After turning on the battery switch, power on the inverter. For details about how to power on the inverter, see the quick guide for the corresponding inverter model.




NOTE

If no PV module is configured, press the black start button first.

Turn on the DC switch on the battery. After the battery is installed and powered on for the first time, the ring LED blinks for three circles. Touch the LED and observe the battery indicator to check the running status.

LED Indicators

Table 6-2 LED indicators

Category	Status (Blinking at Long Intervals: On for 1s and then Off for 1s; Blinking at Short Intervals: On for 0.2s and then Off for 0.2s)		Description
Running indicator			N/A
	Steady green	Steady green	Operating mode
	Blinking green slowly	Blinking green slowly	Standby mode
	Off	Off	Hibernation mode
	Blinking red fast	N/A	Power control module environment alarm
	N/A	Blinking red fast	Battery expansion module environment alarm
	Steady red	N/A	The power control module is faulty.
	N/A	Steady red	The battery expansion module is faulty.
	Steady red	Steady red	Faulty
Battery system indicator			N/A
	Green after touching		Battery level. Each bar indicates 10%.
	Steady red		The first three bars indicate the number of faulty battery expansion modules.

6.3 Battery Commissioning

Download and install the FusionSolar app.

Download and install the FusionSolar app of the latest version by referring to the quick guide for the corresponding inverter model or the *FusionSolar App Quick Guide*. Then register the installer and create a PV plant and owner (skip this step if the account has been created). You can obtain the *FusionSolar App Quick Guide* by scanning the following QR code.

Figure 6-1 FusionSolar App Quick Guide



6.3.1 Battery Deployment

Function

Add a battery and set the working mode on the quick settings screen of the inverter.

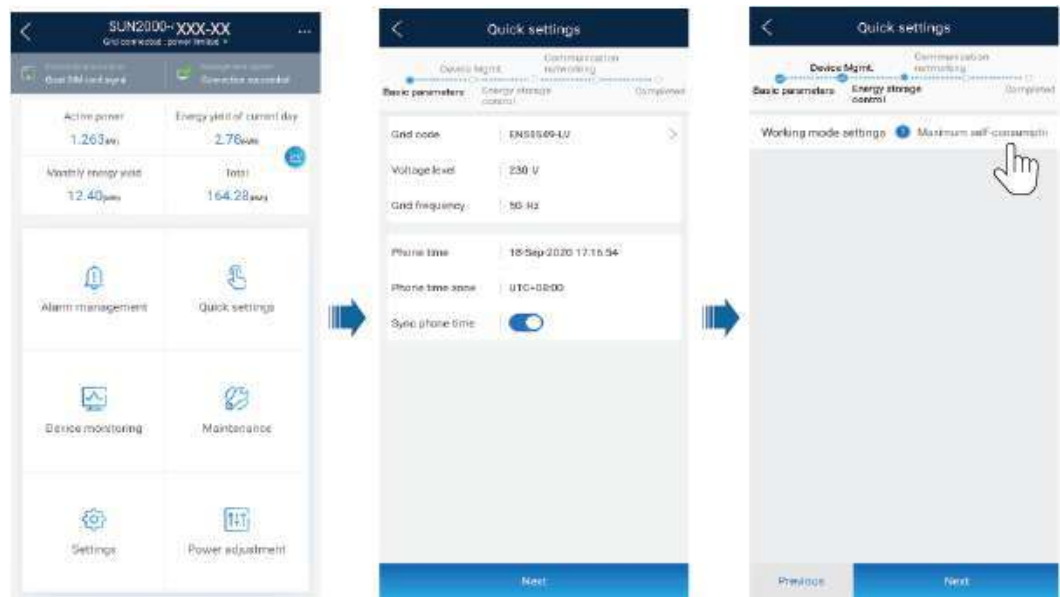
(Optional) Upgrading the Inverter and Smart Dongle

When the app connects to the inverter, a message is displayed, asking you to upgrade the inverter version. Smart Dongle V100R001C00SPC117 and later versions support LUNA2000 battery. But the Smart Dongle cannot be upgraded locally. You need to perform the upgrade through the management system. The operation procedure will be updated later.

Quick Settings

- Step 1** Log in to the FusionSolar app using the installer's account. Tap **Quick Settings** on the home screen to add the battery and set the battery working mode. The battery working mode is set to **Maximum self-consumption** by default. Tap **?** to view the details. View the detailed settings and select a working mode by referring to [3 Application Scenarios and Settings](#).

Figure 6-2 Quick settings



---End

6.3.2 Battery Control

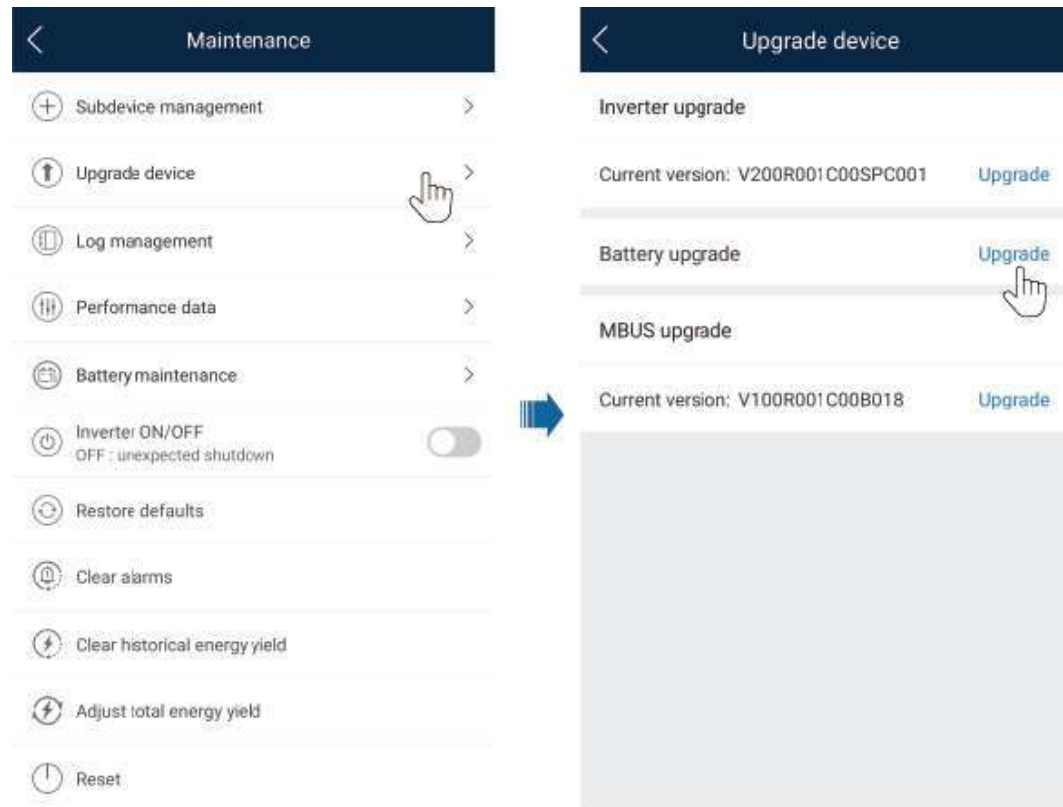
Function

When the inverter connects to a battery, add the battery and set battery parameters.

Adding a Battery

To add a battery, choose **Maintenance > Subdevice management** on the home screen.

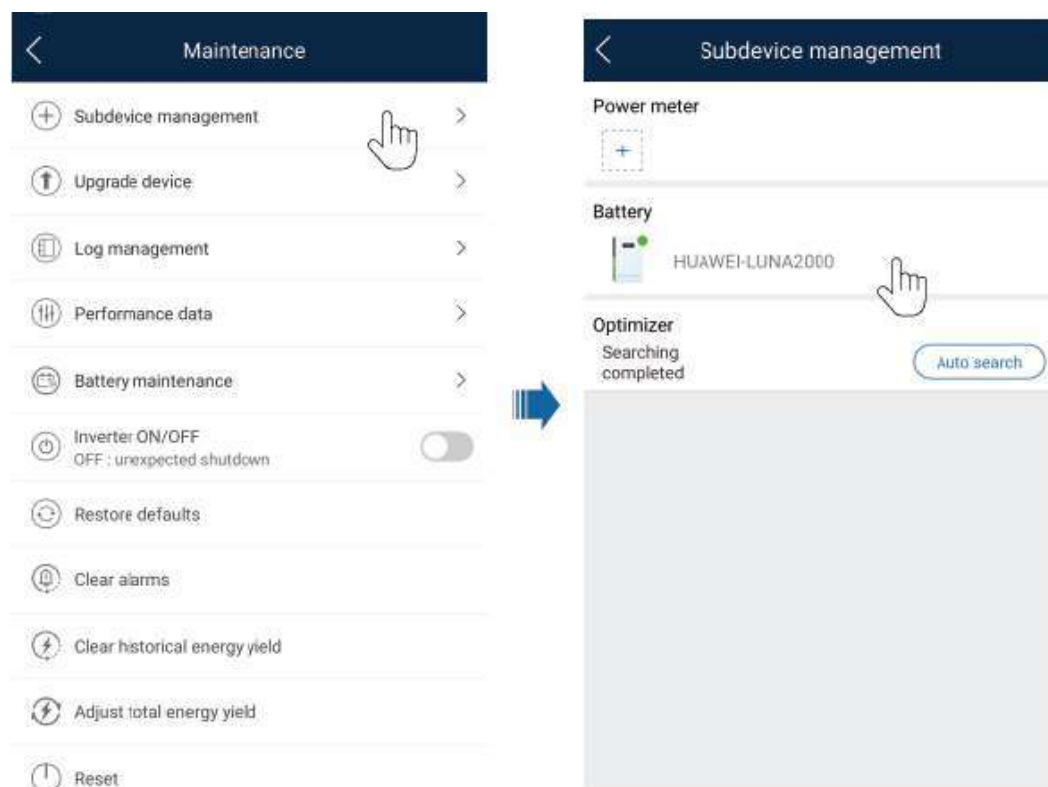
Figure 6-3 Adding a battery



Parameters Settings

On the home screen, choose **Power adjustment** > **Battery control**, and set the battery parameters and working mode.

Figure 6-4 Battery control parameter setting



Parameter	Description	Value Range
Working mode	For details, see the description on the app screen.	<ul style="list-style-type: none"> Maximum self-consumption Time-of-use Fully fed to grid
Maximum charge power (kW)	Retain this parameter to the maximum charge power. Additional configuration is not required.	<ul style="list-style-type: none"> Charge: [0, Maximum charge power]
Maximum discharge power (kW)	Retain this parameter to the maximum discharge power. Additional configuration is not required.	<ul style="list-style-type: none"> Discharge: [0, Maximum discharge power]
End-of-charge capacity (%)	Set the charge cutoff capacity.	80%–100%
End-of-discharge capacity (%)	Set the charge cutoff capacity.	0%–20%
Charge from grid	If Charge from grid function is disabled by	<ul style="list-style-type: none"> Disable

Parameter	Description	Value Range
	default, comply with the grid charge requirements stipulated in local laws and regulations when this function is enabled.	<ul style="list-style-type: none"> Enable
Grid charge cutoff SOC	Set the grid charge cutoff SOC.	[0, 100%]

6.3.3 Battery Status Check

On the home screen, tap **Device monitoring** on the home screen to view the running status, level, power, and charge and discharge status of the battery.

Figure 6-5 Device monitoring



6.3.4 Battery Maintenance and Upgrade

On the home screen, choose **Maintenance** > **Battery upgrade** and set related parameters.

Forced Charge and Discharge

- Step 1** Choose **Maintenance** > **Battery maintenance** > **Forced charge/discharge**, perform operations, and click **Submit**.

Figure 6-6 Forced charge and discharge

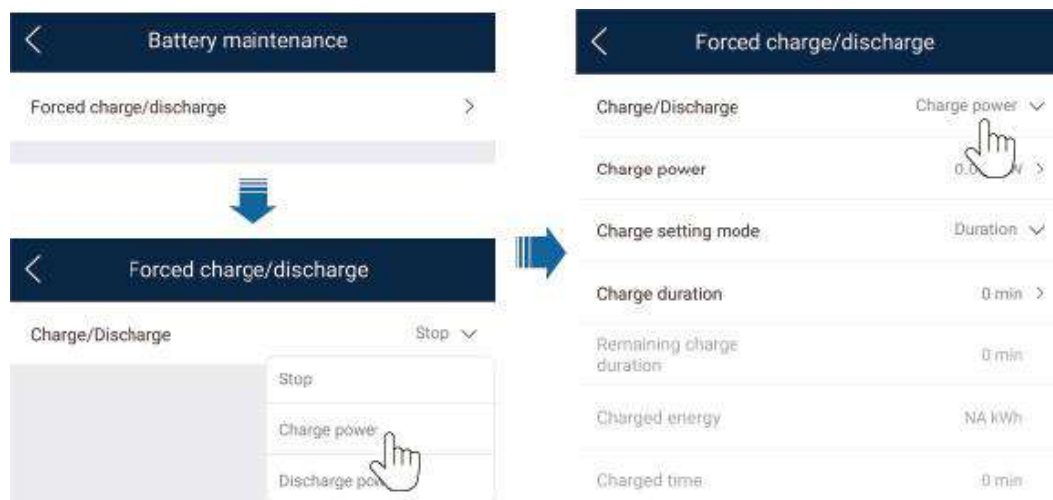


Table 6-3 Description of forced charge/discharge parameters

Parameter	Description	Value Range
Charge/discharge	Specifies whether to charge or discharge the battery.	<ul style="list-style-type: none"> • Stop • Charge • Discharge
Charge/Discharge power (kW)	Specifies the forced charge/discharge power.	<ul style="list-style-type: none"> • Charge: [0, Maximum charge power] • Discharge: [0, Maximum discharge power]
Charge/Discharge setting mode	Set the charge and discharge mode.	<ul style="list-style-type: none"> • Duration • Charged/Discharged energy
Charge/Discharge duration (min)	Sets the charge and discharge duration.	[0, 1440]
Remaining charge/discharge duration (min)	Indicates the remaining charge and discharge duration. This parameter cannot be set.	-
Charged/Discharged energy (kWh)	Indicates the charged or discharged battery level. This parameter cannot be set.	-
Charged/Discharged duration (min)	Indicates the charged and discharged duration. This parameter cannot be set.	-

----End

Downloading an Upgrade Package


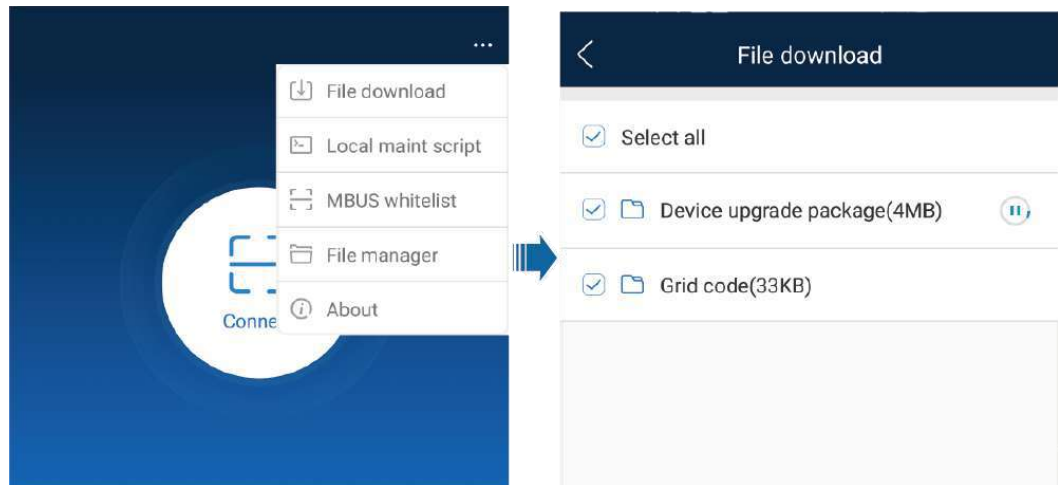
Step 1 When the network is connected, on the app connection screen, tap  in the upper right corner and choose **File download**.

Figure 6-7 Downloading a file



Step 2 Download the device upgrade package and grid code when an update is detected.

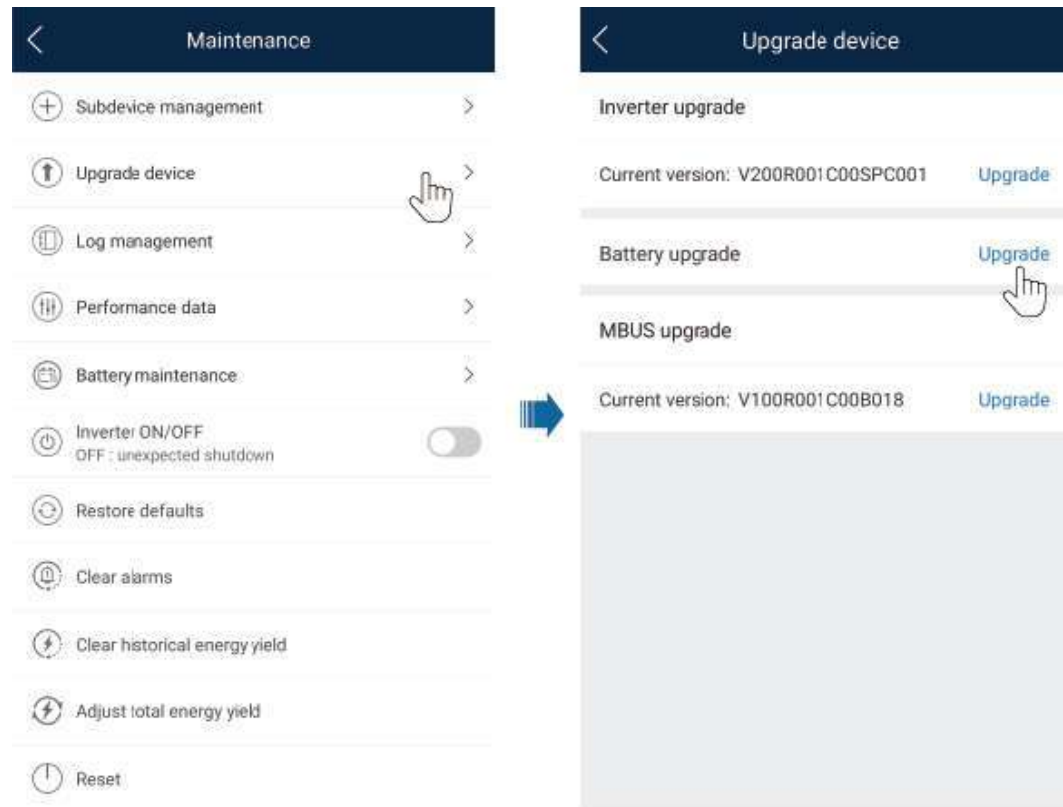
Step 3 On the screen for downloading the upgrade package, tap **Download**.

----End

Version Upgrade

Step 1 Choose **Maintenance > Subdevice management** to upgrade the battery version.

Figure 6-8 Upgrading the battery



----End

7 System Maintenance

- 7.1 System Power-Off
- 7.2 Routine Maintenance
- 7.3 Troubleshooting
- 7.4 Battery Storage and Recharge

7.1 System Power-Off

Precautions

 **WARNING**

After the system powers off, the remaining electricity and heat may still cause electric shocks and body burns. Therefore, wear protective gloves 5 minutes after the system is powered off before performing any operation on the battery.

After powering off the connected inverter, turn off the DC switch for the battery.

7.2 Routine Maintenance

To ensure that the battery can operate properly for a long term, you are advised to perform routine maintenance on it as described in this chapter.

 **CAUTION**

Before cleaning the system, connecting cables, and ensuring the grounding reliability, power off the system.

Table 7-1 Maintenance checklist

Check Item	Check Method	Maintenance Interval
System cleanliness	Check periodically that the heat sinks are free from obstacles and dust.	Once every 6 to 12 months
System running status	<ul style="list-style-type: none">• Check that the battery is not damaged or deformed.• Check that the battery does not generate abnormal sound when it is in operation.• Check that the battery parameters are correctly set when the battery is running.	Once every 6 months
Electrical Connection	<ul style="list-style-type: none">• Check that cables are secured.• Check that cables are intact, and that in particular, the parts touching the metallic surface are not scratched.• Check that unused DC input terminals, battery terminals, and COM ports are locked by watertight caps.	The first inspection is 6 months after the initial commissioning. From then on, the interval can be 6 to 12 months.
Grounding reliability	Check that ground cables are securely connected.	The first inspection is 6 months after the initial commissioning. From then on, the interval can be 6 to 12 months.

7.3 Troubleshooting

Alarm severities are defined as follows:

- Major: The inverter shuts down or some functions are abnormal due to a fault.
- Minor: Some components of the inverter are faulty but the system can still connect to the grid and generate power.

7.4 Battery Storage and Recharge

Battery Storage

1. Place batteries according to the labels on the packing case. Do not put batteries upside down or sidelong.
2. Stack battery packing cases by complying with the stacking requirements on the external package.
3. Handle batteries with caution to avoid damage.
4. Storage environment requirements:

Ambient temperature: 0–40 °C; recommended storage temperature: 20–30 °C

Relative humidity: 5% to 80%

Place batteries in a dry and clean place with proper ventilation.

Place batteries in a place that is away from corrosive organic solvents and gases.

Keep batteries away from direct sunlight.

Keep batteries at least 2 meters away from heat sources.

Battery Recharge Period

Recharge the battery if it is not used for a long time.

Table 7-2 Recharge interval

Required Storage Temperature	Actual Storage Temperature	Recharge Interval	Remarks
0 °C–40 °C	$0^{\circ}\text{C} \leq T \leq 30^{\circ}\text{C}$	12 months	Within the recharge interval: Use the battery as soon as possible. Beyond the recharge interval: Recharge the battery. The total storage duration should not exceed the warranty period.
	$30^{\circ}\text{C} < T \leq 40^{\circ}\text{C}$	8 months	

Battery Recharge Requirements

It is recommended that one distributed lithium battery be charged. (Use the default charge current limit. The default current of LUNA2000-5-E0 is less than or equal to 0.5C.)

Installing Battery Cables

Step 1 Prepare the battery qualified for recharge.

Step 2 Connect cables by referring to the battery quick guide and inverter quick guide.

Step 3 Check that all cables are reliably connected with correct polarity and there is no short circuit.

----End

Battery Power-On and Commissioning

NOTICE

- Ensure that the charge process is supervised to prevent any abnormality.
 - If a battery experiences an abnormality such as bulging or smoking, stop charging immediately and dispose of it.
 - Ensure that only trained professionals perform recharge operations.
-

For details about how to store and recharge the battery, see the *Lithium Battery Storage and Recharge Guide*.

8 Technical Specifications

8.1 LUNA2000-5KW-C0

8.2 LUNA2000-5-E0

8.1 LUNA2000-5KW-C0

Technical Specifications	LUNA2000-5KW-C0
Rated charge and discharge power	5 kW
Peak discharge power (10s)	7 kW
Charge and discharge voltage range on the high-voltage side	<ul style="list-style-type: none">• Single-phase inverter: 350–560 V• Three-phase inverter: 600–980 V
Working mode when the charge/discharge voltage on the high-voltage side is beyond the range	<ul style="list-style-type: none">• Single-phase inverter:<ul style="list-style-type: none">– 550–620 V. The DC-DC converter does not work and is not damaged.• Three-phase inverter:<ul style="list-style-type: none">– 1000–1100 V. The DC-DC converter does not work and is not damaged.
Voltage range on the low-voltage side	300–400 V
Dimensions (H x W x D)	240 mm x 670 mm x 150 mm
Weight	62 kg
Cooling mode	Free cooling
IP rating	IP55
Communications	RS485, CAN

Technical Specifications	LUNA2000-5KW-C0
Operating temperature	-10 °C to +55 °C
Operating humidity	5%–95% RH
Maximum operating altitude	4000 m

8.2 LUNA2000-5-E0

Technical Specifications	LUNA2000-5-E0
Total nominal capacity	5.12 kWh
Nominal available capacity	5 kWh
Operating voltage range	300–400 V
Battery cell type	LiFePO ₄
Dimensions (H x W x D)	360 mm x 670 mm x 150 mm
Weight	48 kg
Cooling mode	Free cooling
IP rating	IP55
Operating temperature	-10 °C to +55 °C
Maximum operating altitude	4000 m

9 FAQ

9.1 How Do I Replace a Fuse?

9.1 How Do I Replace a Fuse?

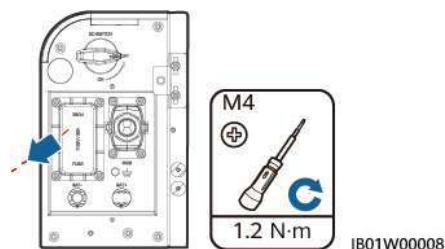
Step 1 Power off the system. For details, see [7.1 System Power-Off](#).

WARNING

After the system is powered off, the remaining electricity and heat still exist in the chassis, which may cause electric shocks or burns. Therefore, you need to wear protective gloves and perform operations 5 minutes after the system is powered off.

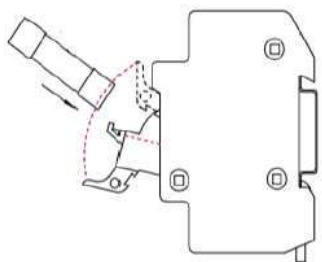
Step 2 Loosen the screws on the fuse shell.

Figure 9-1 Removing the screw shell



Step 3 Lift the fuse box opening, remove the fuse, insert a new fuse into the slot, and close the fuse box. If you hear a click sound and the bulge on the side is inside the box, the fuse box is properly installed.

Figure 9-2 Replacing a fuse



----End

Fuse Specifications

Table 9-1 Fuse specifications

	Required Specifications		
	Lower Limit	Typical Value	Upper Limit
Component type		Fuse	
Fuse type		Fast blow fuse	
Rated voltage (V AC&V DC)	1100 V DC		
Rated current	32 A		
Breaking capacity	10 kA		
Nominal fusing heat I ² T	600		1000
Cold resistance value			0.005 Ω
Package dimensions (the dimension tolerance should be specified in the specifications provided by the supplier)		14 mm x 51 mm	

A Acronyms and Abbreviations

A

APP application

B

BMS battery management system

D

DC direct current

F

FIT feed-in tariff

E

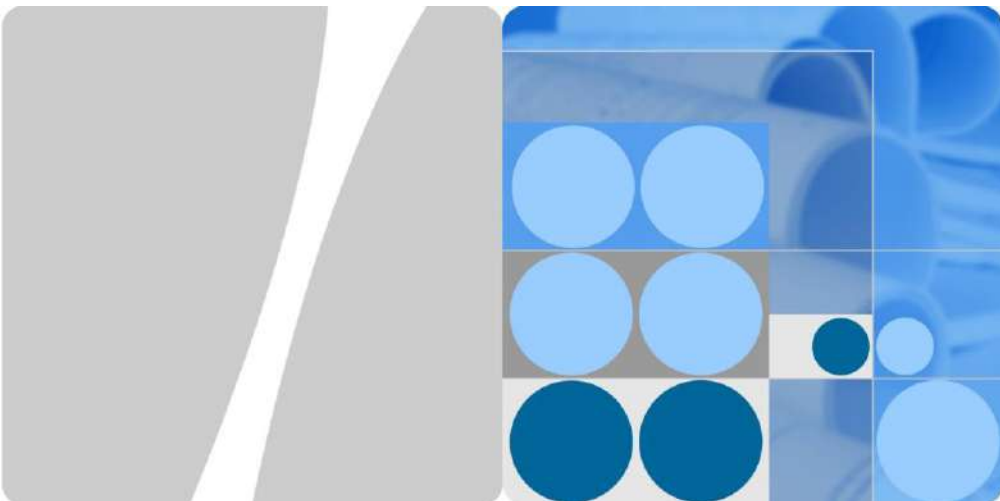
EMI electromagnetic interference

P

PV photovoltaic

V

VPP virtual power plant



DTSU666-H and DTSU666-H 250 A/50mA Smart Power Sensor Quick Guide

Issue: 03

Date: 2019-09-29

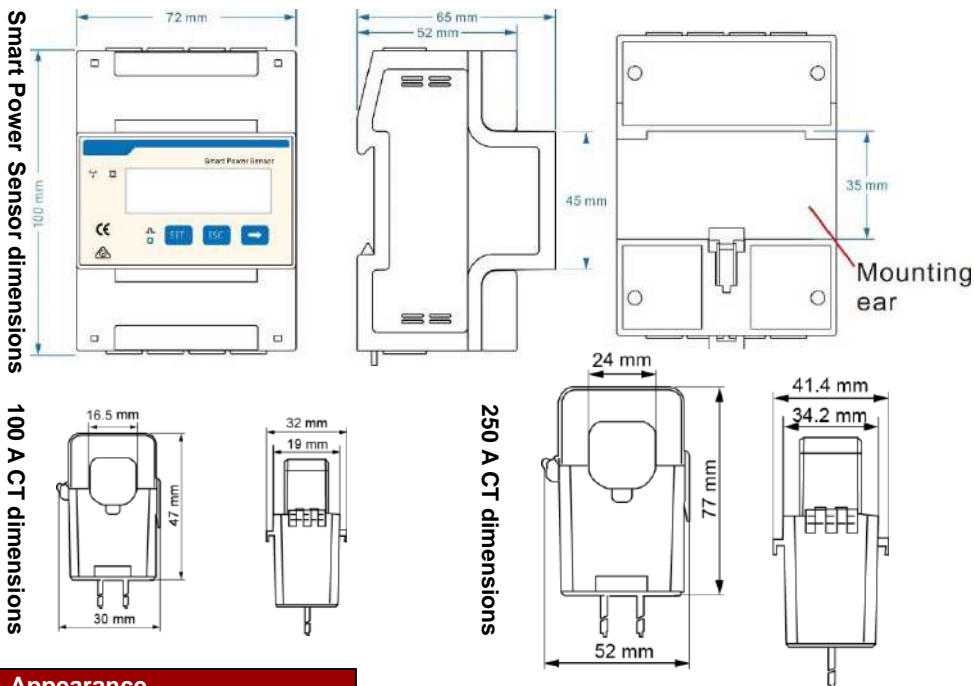
HUAWEI TECHNOLOGIES CO., LTD.



1 Overview

Models

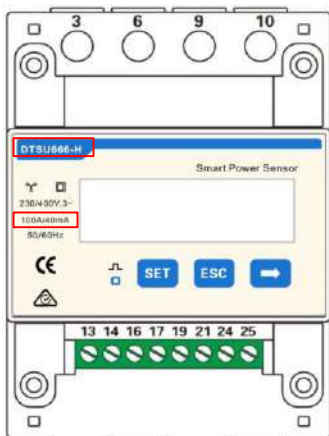
- DTSU666-H: with three 100 A/40 mA CT
- DTSU666-H 250 A/50 mA: with three 250 A/50 mA CT



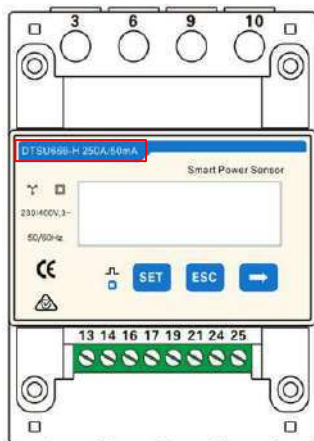
Appearance

Differences between DTSU666-H and DTSU666-H 250 A/50 mA:

- Parameters on the panel



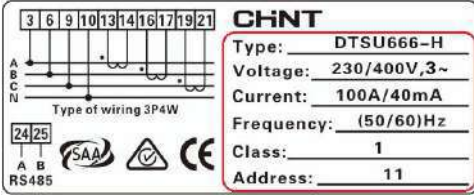
DTSU666-H



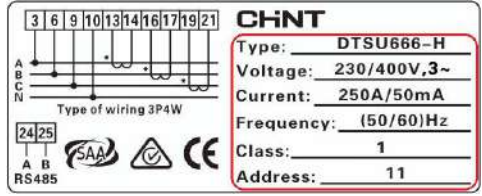
DTSU666-H 250 A/50 mA

Appearance

- Nameplate



DTSU666-H



DTSU666-H 250 A/50 mA

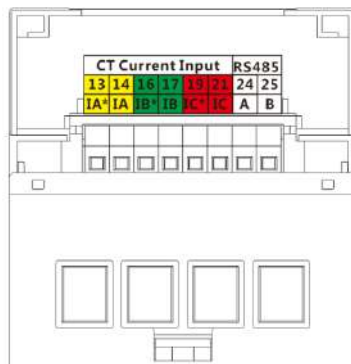
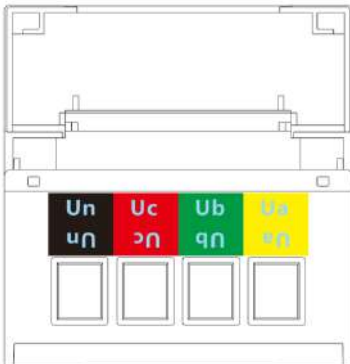
Performance and Specification

Category	DTSU666-H	DTSU666-H 250 A/50 mA
Nominal voltage	230 V AC / 400 V AC	230 V AC / 400 V AC
Current Measurement range	0–100 A	0–250 A
Power grid system	3P4W	3P4W or 3P3W

Port Definition

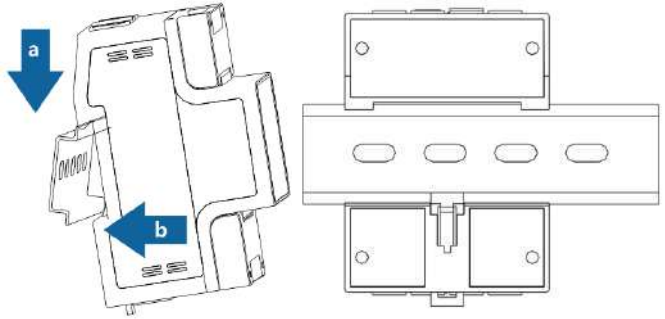
Voltage Input: $3 \times 230/400$ V or 3×400 V

Current Transformer(CT): 100 A/40 mA or 250 A/50 mA;



2 Installing the DTSU666-H and DTSU666-H 250 A/50 mA

1. Install the smart power sensor on the standard din rail of DIN35mm
2. Install the Smart Power Sensor to the standard din rail from the top to the bottom, and then push the instrument to the din rail from the bottom to the front part.



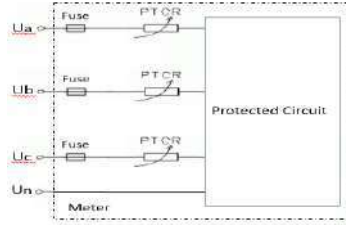
3 Installing the Cable

Prepare cables

Cable	Port	Type	Conductor Cross-sectional Area Range	Outer Diameter	Source
AC power cable	Ua-3	Four-core outdoor copper cable	4-6 mm ²	10-21 mm	Prepared by the customer
	Ub-6				
	Uc-9				
	Un-10				
CT cable	IA*-13	/	/	/	Manufacturer
	IA-14	/	/	/	
	IB*-16	/	/	/	
	IB-17	/	/	/	
	IC*-19	/	/	/	
	IC-21	/	/	/	
Comm. cable	RS485A-24	Two-core outdoor shielded twisted pair	0.25-1 mm ²	4-11 mm	Manufacturer
	RS485B-25				

**NOTE**

A fuse and a thermistor are connected to each phase of U_a , U_b , and U_c inside the power meter to prevent damage caused by external short circuits. U_a , U_b , and U_c do not need to be protected by external fuses.

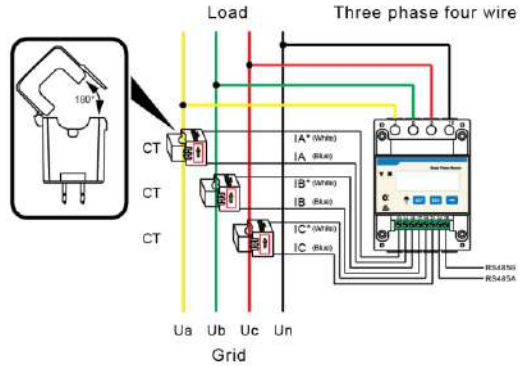
**Wiring Diagram--Three Phase Four Wire**

Support model:

- DTSU666-H
- DTSU666-H 250 A/50 mA

Operating voltage: 0.7–1.3 U_n

1. Three phase four wire:
Connect the U_a , U_b , U_c , U_n voltage lines to the 3, 6, 9 and 10 terminals of the collector. Connect current transformer outlets IA^* , IA , IB^* , IB , IC^* , IC to terminals 13, 14, 16, 17, 19, 21 of the collector.
2. Connect RS485A and RS485B to the communication host.

**NOTE**

The CT direction must be consistent with the arrow direction as shown in the preceding figure.

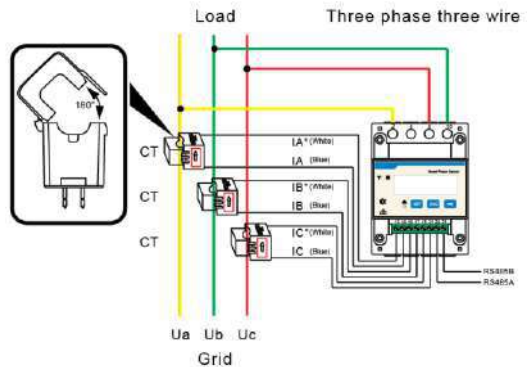
Wiring Diagram--Three Phase Three Wire

Support model:

- DTSU666-H 250 A/50 mA

Operating voltage: 0.7–1.3 U_n

1. Three phase three wire:
Connect the U_a , U_c , U_b voltage lines to the 3, 9 and 10 terminals of the collector. Connect current transformer outlets IA^* , IA , IB^* , IB , IC^* , IC to terminals 13, 14, 16, 17, 19, 21 of the collector.
2. Connect RS485A and RS485B to the communication host.










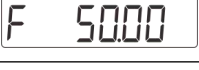
**NOTE**

The CT direction must be consistent with the arrow direction as shown in the preceding figure.

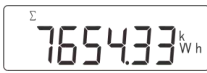

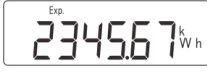
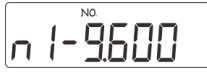
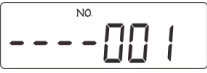






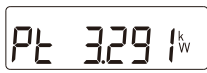








4 User Interface

Display (Auto loop)

If no button is pressed for 60 seconds, the backlight turns off. Auto loop Switch time = 5s.

No.	Display interface	Description	No.	Display interface	Description
1		Imp. active energy = 10000.0 kWh	2		Exp. active energy = 2345.67 kWh
3		Active power = 3.291 kW	4		Phase A voltage = 220.0 V
5		Phase B voltage = 220.1 V	6		Phase C voltage = 220.2 V
7		Phase A current = 5.000 A	8		Phase B current = 5.001 A
9		Phase C current = 5.002 A	10		Frequency freq = 50.00 Hz

Display (Change by key "→")

No.	Display interface	Description	No.	Display interface	Description
1		Comb. active energy = 7654.33 kWh	2		Imp. active energy = 10000.0 kWh
3		Exp. active energy = 2345.67 kWh	4		None parity, 1 stop bit, Baud = 9600 bps
5		001 represents address	6		Phase A voltage = 220.0 V
7		Phase B voltage = 220.1 V	8		Phase C voltage = 220.20 V
9		Phase A current = 5.000 A	10		Phase B current = 5.001 A
11		Phase C current = 5.002 A	12		Phase active power = 3.291 kW
13		Phase A active power = 1.090 kW	14		Phase B active power = 1.101 kW
15		Phase C active power = 1.100 kW	16		Power factor PFt = 0.500 L
17		Phase A power factor Pfa = 1.000 L	18		Phase B power factor PFb = 0.500 L
19		Phase C power factor Pfc = 0.500 C	20		Frequency freq = 50.00 Hz

Comb. active energy = Imp. active energy - Exp. active energy

Parameter

Parameter	Value range	Description
<i>Prot</i>	1: 645; 2: n.2; 3: n.1; 4: E.1; 5: O.1;	Settings for communication stop bit and Parity bits: 1: Factory mode; 2: None parity, 2 stop bits, n.2; 3: None parity, 1 stop bit, n.1; 4: Even parity, 1 stop bit, E.1; 5: Odd parity, 1 stop bit, O.1;
<i>Addr</i>	0: 4.800; 1: 9.600;	Communication baud rate: 0: 4800 bps; 1: 9600 bps;
<i>bAud</i>	11–19	Communication address

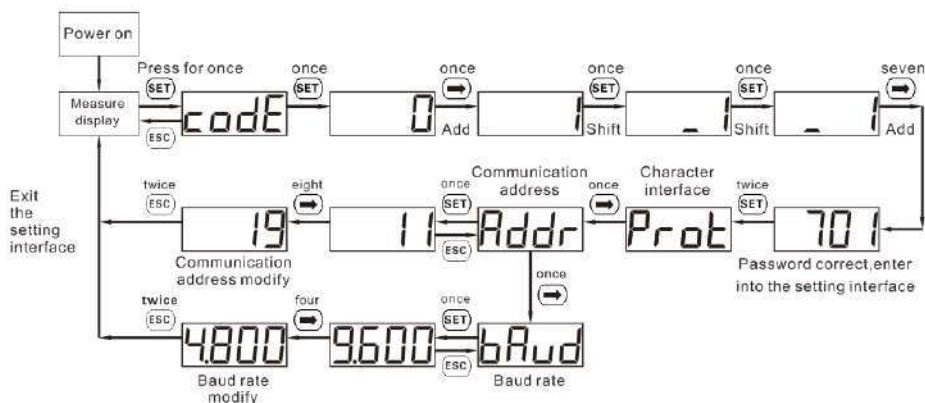
(Optional) Parameter Setup



NOTE

Communications parameters have been configured for the power meter before delivery. If the communication is abnormal, check and set the parameters.

Button description: "SET" represents "confirm" or "cursor shift" (when entering digits), "ESC" represents "exit", and "→" represents "add". The password is **701** by default.



When modify digits, "SET" can be used as cursor shift button; "→" is "add" button; "ESC" represents exiting the setting interface or switch to the character interface from digit modification interface, restarting adding from zero after setting the digits to be the maximum value.

5 Troubleshooting

Fault phenomenon	Factor analysis	Elimination method
No display after the instrument being powered on	<ol style="list-style-type: none">1. Incorrect wiring mode.2. Abnormal voltage supplied for the instrument.	<ol style="list-style-type: none">1. If the wiring mode is incorrect, please connect based on the correct wiring mode (see the wiring diagram).2. If the supplied voltage is abnormal, please supply the voltage on the instrument specification.
Abnormal RS485 communication	<ol style="list-style-type: none">1. The RS485 communication cable is disconnected, short circuit or reversely connected.2. The address, baud rate, data bit and parity bit of the instrument is not in accordance with the inverter.	<ol style="list-style-type: none">1. If any problems for the communication cable, please change the cable.2. Set the address, baud rate, data bit and parity bit of the instrument to be the same as the inverter through buttons and so as the "parameter setting".
Power metering inaccuracy	<ol style="list-style-type: none">1. Wrong wiring, please check whether the corresponding phase sequence of voltage and current is correct.2. Check whether the high and low ends of the current transformer inlet are reversely connected. Pa, Pb, and Pc are abnormal if the values are negative.	<ol style="list-style-type: none">1. For wrong wiring, please connect based on the correct wiring mode (see the wiring diagram).2. If a negative value is displayed, change the cable connection mode of the current transformer to ensure that the high and low ends are connected properly.

6 Verifying the Installation

1. Check that all mounting brackets are securely installed and all screws are tightened.
2. Check that all cables are reliably connected with correct polarity and no short circuit.

7 Powering On the System

For details, see *DTSU666-H and DTSU666-H 250 A (50 mA) Smart Power Sensor User Manual*.

8 Customer Service Contact

Customer Service Contact			
Region	Country	Service Support Email	Phone
Europe	France	eu_inverter_support@huawei.com	0080033888888
	Germany		
	Spain		
	Italy		
	UK		
	Netherlands		
	Other countries		
Asia Pacific	Australia	au_inverter_support@huawei.com	1800046639
	Turkey	tr_inverter_support@huawei.com	-
	Malaysia	apsupport@huawei.com	0080021686868 /1800220036
	Thailand		(+66) 26542662 (charged by local call) 1800290055 (free in Thailand)
	China	solarservice@huawei.com	4008229999
	Other countries	apsupport@huawei.com	0060-3-21686868
Japan	Japan	Japan_ESC@ms.huawei.com	0120258367
India	India	indiaenterprise_TAC@huawei.com	1800 103 8009
South Korea	South Korea	Japan_ESC@ms.huawei.com	-
North America	USA	na_inverter_support@huawei.com	1-877-948-2934
	Canada	na_inverter_support@huawei.com	1-855-482-9343
Latin America	Mexico	la_inverter_support@huawei.com	018007703456 /0052-442-4288288
	Argentina		0-8009993456
	Brazil		0-8005953456
	Chile		800201866 (only for fixed)
	Other countries		0052-442-4288288
Middle East and Africa	Egypt	mea_inverter_support@huawei.com	08002229000 /0020235353900
	UAE		08002229000
	South Africa		0800222900
	Saudi Arabia		8001161177
	Pakistan		0092512800019
	Morocco		0800009900
	Other countries		0020235353900

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DTSU666-H 100 A and 250 A Smart Power Sensor

User Manual

Issue 05
Date 2021-10-10



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Website: <https://e.huawei.com>

About This Document

Purpose

This document describes the DTSU666-H (100 A/40 mA) and DTSU666-H 250 A/50 mA Smart Power Sensor in terms of its functions, electrical properties, and structure. DTSU666-H (100 A/40 mA) is abbreviated as DTSU666-H.

Figures provided in this document are for reference only.




Intended Audience



This document is intended for:

- Sales engineers
- Technical support engineers
- Maintenance engineers

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Symbol	Description
	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all updates made in previous issues.

Issue 05 (2021-10-10)

- Updated [2.3 Application Scenarios](#).
- Updated [4.4 Structure Specifications](#).

Issue 04 (2021-03-01)

Updated [4.4 Structure Specifications](#).

Issue 03 (2019-12-10)

- Updated [2.5 Product Structure](#).
- Updated [4.4 Structure Specifications](#)
- Added [5 Current Transformer](#).

Issue 02 (2019-08-30)

Added the DTSU666-H 250 A/50 mA Smart Power Sensor.

Issue 01 (2018-03-01)

This issue is the first official release.

Contents

About This Document.....	ii
1 Safety Precautions.....	1
2 Overview.....	4
2.1 Product Overview.....	4
2.2 Working Principles.....	5
2.2.1 Conceptual Diagram.....	5
2.2.2 Functions.....	6
2.3 Application Scenarios.....	9
2.4 Model Naming Conventions.....	10
2.5 Product Structure.....	11
3 System Maintenance.....	15
3.1 Troubleshooting.....	15
4 Technical Specifications.....	17
4.1 Environmental Specifications.....	17
4.2 Main Technical Performance and Parameters.....	17
4.3 EMC Specifications.....	19
4.4 Structure Specifications.....	20
5 Current Transformer.....	24
6 Acronyms and Abbreviations.....	28

1 Safety Precautions

General Safety

- Follow the precautions and special safety instructions provided by Huawei when operating this product. Personnel who plan to install or maintain Huawei devices must receive a thorough training, understand all necessary safety precautions, and be able to correctly perform all operations. The manufacturer will not be liable for any consequences that are caused by the violation of general safety regulations and device usage safety standards.
- Before performing operations, read through this manual and follow all the precautions to prevent accidents. The "DANGER", "WARNING", "CAUTION", and "NOTICE" statements in this document do not represent all the safety instructions. They are only supplements to the safety instructions.
- Operation personnel should comply with local laws and regulations. The safety instructions in this document are only supplements to local laws and regulations.
- Do not operate the product or handle cables during thunderstorms.
- Before operating the product, remove any conductors such as jewelry or watches.
- Use insulated tools during operations.
- Follow specified procedures during installation and maintenance. Do not attempt to alter the device or deviate from the recommended installation procedures without prior consent from the manufacturer.
- Install the product in strict accordance with the quick guide.

Disclaimer

The manufacturer shall not be liable for any consequence caused by any of the following events:

- Transportation damage.
- The storage conditions do not meet the requirements specified in this document.
- Incorrect installation or use.
- Installation or use by unqualified personnel.

- Failure to obey the operation instructions and safety precautions in this document.
- Operation in extreme environments which are not covered in this document.
- The DTSU666-H or DTSU666-H 250 A/50 mA operates beyond specified ranges.
- Unauthorized modifications to the product or software code or removal of the product.
- Device damage due to force majeure (such as lightning, fire, and storm).
- The warranty expires and the warranty service is not extended.
- Installation or use in environments which are not specified in related international standards.

Personnel Requirements

Only certified electricians are allowed to install, connect cables for, maintain, troubleshoot, and replace the DTSU666-H or DTSU666-H 250 A/50 mA.

- Operation personnel should receive professional training.
- Operation personnel should read through this document and follow all the precautions.
- Operation personnel should be familiar with the safety specifications about the electrical system.
- Operation personnel should understand the composition and working principles of the grid-tied PV power system and local regulations.
- Operation personnel must wear proper personal protective equipment (PPE).

Protect Labels

Do not scrawl or damage the nameplate on the back of the DTSU666-H or DTSU666-H 250 A/50 mA because it contains important product information.

Installation

- Ensure that the DTSU666-H or DTSU666-H 250 A/50 mA is not connected to a power supply or powered on before finishing installation.
- To allow proper heat dissipation and installation, maintain appropriate clearances between the DTSU666-H or DTSU666-H 250 A/50 mA and other objects.

Electrical Connections



Before connecting cables, ensure that the DTSU666-H or DTSU666-H 250 A/50 mA is not damaged in any way. Otherwise, electric shocks or fire may occur.

- Ensure that all electrical connections comply with local electrical standards.

- Ensure that the cables used in a grid-tied PV system are properly connected and insulated and meet all specification requirements.

Operation

 **DANGER**

High voltage may cause an electric shock, which results in serious injury, death, or serious property damage from the DTSU666-H or DTSU666-H 250 A/50 mA in operation. Strictly comply with the safety precautions in this document and associated documents when operating the DTSU666-H or DTSU666-H 250 A/50 mA.

-
- Do not touch an energized DTSU666-H or DTSU666-H 250 A/50 mA because it may result in an electric shock.
 - Follow local laws and regulations when operating the device.

Maintenance and Replacement

 **DANGER**

High voltage may cause an electric shock, which results in serious injury, death, or serious property damage from the DTSU666-H or DTSU666-H 250 A/50 mA in operation. Therefore, before maintenance, power off the DTSU666-H or DTSU666-H 250 A/50 mA and strictly comply with the safety precautions in this document and associated documents to operate the DTSU666-H or DTSU666-H 250 A/50 mA.

-
- Maintain the DTSU666-H or DTSU666-H 250 A/50 mA with sufficient knowledge of this document and proper tools and testing devices.
 - Temporary warning signs or fences must be placed to prevent unauthorized people from entering the site.
 - The DTSU666-H or DTSU666-H 250 A/50 mA can be powered on only after all faults are rectified. Failing to do so may escalate faults or damage the device.
 - During the maintenance, observe ESD precautions and wear ESD gloves.

2 Overview

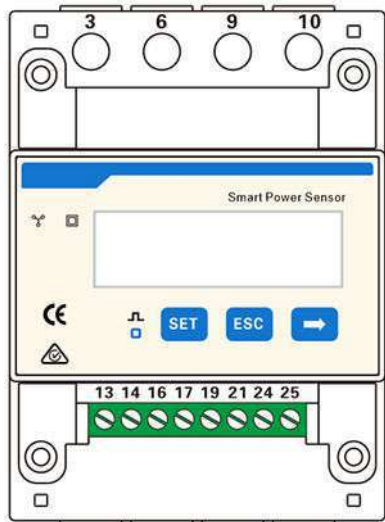
2.1 Product Overview

Type DTSU666-H and DTSU666-H 250 A/50 mA Smart Power Sensor (here in after referred to as the "sensor") adopts large-scaled integrated circuit with digital sampling technology, specially designed for power monitoring and energy metering demands including power system, communication industry, construction industry, mainly applied into real-time measurement and display for parameters such as three phase voltage, three phase current, active power, reactive power, frequency, positive and reverse energy, four quadrant electric energy, etc. Adopting the standard DIN35mm din rail mounting, structural module design, it is characterized with small volume, easy installation and networking, etc. As a monitoring terminal product towards energy management system, it can be widely applied into internal power assessment and monitoring of the industrial and mining enterprises, hotels, schools, large public buildings.

This performance index of the meter conforms to the following relevant technical standard:

- EN 61326-1:2013
- IEC 61326-1:2012
- EN 61326-2-1:2013
- IEC 61326-2-1:2012
- EN 61010-1:2010
- IEC 61010-1:2010
- EN 61010-2-1:2010
- IEC 61010-2-1:2010

Figure 2-1 DTSU666-H or DTSU666-H 250 A/50 mA

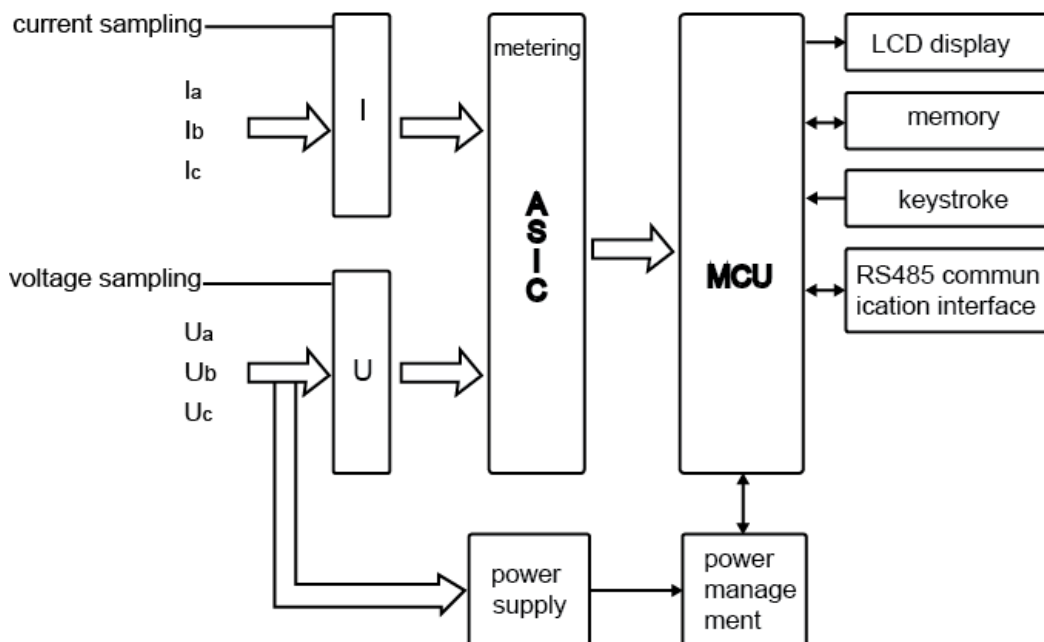


2.2 Working Principles

2.2.1 Conceptual Diagram

The instrument is composed of highly accurate metering integrated circuit (ASIC), management MCU, storage chip, RS485 communication module, etc. The conceptual diagram is shown in [Figure 2-2](#).

Figure 2-2 Conceptual diagram



2.2.2 Functions

- Display function:
The displayed interfacial electrical parameter and power data are both primary-side data (which is calculated based on the value of the current and voltage). The energy measurement value is displayed in seven bits, with the display range from 0.00kWh to 999999.9 kWh.

Figure 2-3 Liquid crystal display



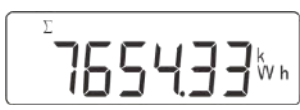


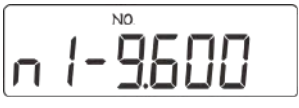


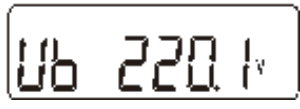
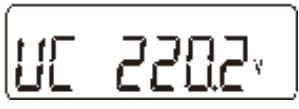



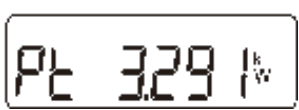
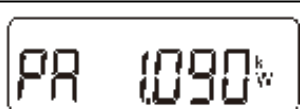
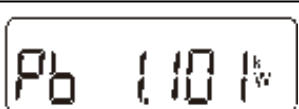
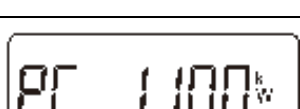
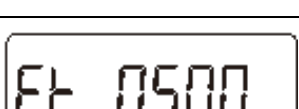
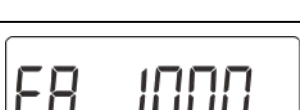
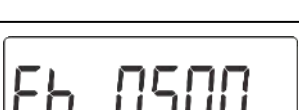


Table 2-1 Display (auto loop)

No.	Display Interface	Instruction	No.	Display Interface	Instruction
1		Imp. active power = 10000.0 kWh	2		Exp. active energy = 2345.67 kWh
3		Active power = 3.291 kW	4		Phase A voltage = 220.0 V
5		Phase B voltage = 220.1 V	6		Phase C voltage = 220.20 V
7		Phase A current = 5.000 A	8		Phase B current = 5.001 A
9		Phase C current = 5.002 A	10		Frequency freq= 50.00 Hz

NOTE

If no button is pressed for 60 seconds, the backlight turns off. Auto loop Switch time = 5s.

Table 2-2 Display (change by key)

No.	Display Interface	Instruction	No.	Display Interface	Instruction
1		Comb.active energy = 7654.33 kWh	2		Imp. active power = 10000.0 kWh
3		Exp. active energy = 2345.67 kWh	4		None parity, 1 stop bit, baud = 9600 bps
5		001 represents address	6		Phase A voltage = 220.0 V
7		Phase B voltage = 220.1 V	8		Phase C voltage = 220.20 V
9		Phase A current = 5.000 A	10		Phase B current = 5.001 A
11		Phase C current = 5.002 A	12		Active power = 3.291 kW
13		Phase A active power = 1.090 kW	14		Phase B active power = 1.101 kW
15		Phase C active power = 1.100 kW	16		Power factor = 0.500 L
17		Phase A power factor PFa = 1.000 L	18		Phase B power factor PFb = 0.500 L
19		Phase C power factor PFc = 0.500 C	20		Frequency freq = 50.00 Hz

 NOTE

- Change by key "→".
- Comb. active energy = Imp. active energy – Exp. active energy
- Programming function:

Table 2-3 Programming function

Parameter	Value Range	Description
<i>Prot</i>	1: 645 2: n.2 3: n.1 4: E.1 5: O.1	Settings for communication stop bit and parity bits: 1: factory mode 2: none parity, 2 stop bits, n.2 3: none parity, 1 stop bit, n.1 4: even parity, 1 stop bit, E.1 5: odd parity, 1 stop bit, O.1
<i>bAud</i>	0: 4.800 1: 9.600	Communication baud rate: 0: 4800 bps 1: 9600 bps
<i>Addr</i>	11-19	Communication address

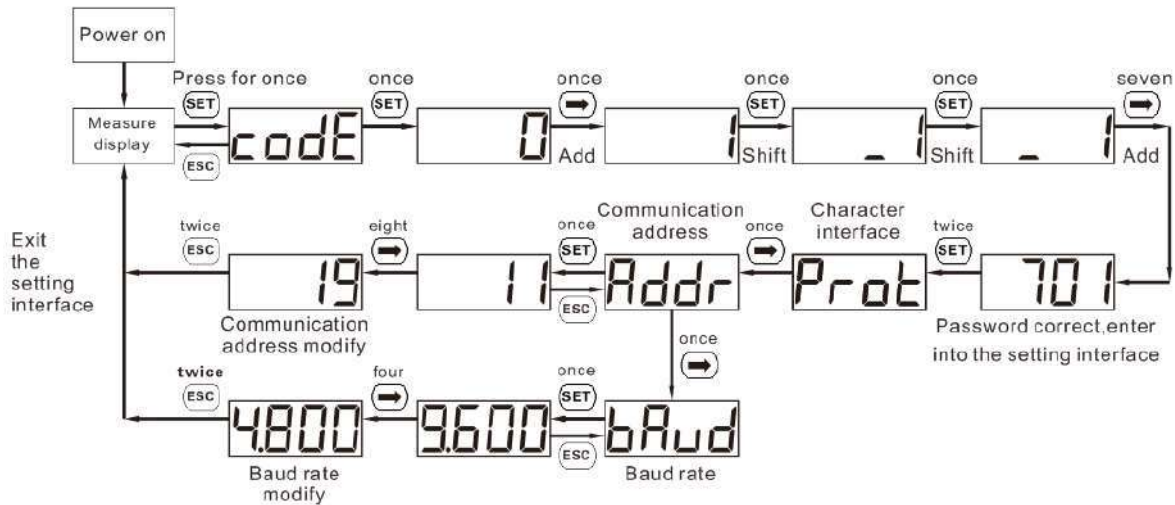
- Programming operation:

 NOTE

Communications parameters have been configured for the power meter before delivery. If the communication is abnormal, check and set the parameters.

Button description: **SET** represents **confirm** or **cursor shift** (when entering digits), **ESC** represents **exit**, and → represents **add**. The password is 701 by default.

Figure 2-4 Setting example for modifying communication address or baud rate



When modify digits, "SET" can be used as cursor shift button; "➡" is "add" button; "ESC" represents exiting the setting interface or switch to the character interface from digit modification interface, restarting adding from zero after setting the digits to be the maximum value.

- Communication function
The Sensor has an RS485 communication interface, the baud rate can be changed between 1200 bps, 2400 bps, 4800 bps and 9600 bps. The default Communication parameters is 9600 bps, none parity bits and 1 stop bit, and communication addresses (see factory numbers or LCD display), support ModBus RTU protocol.

2.3 Application Scenarios

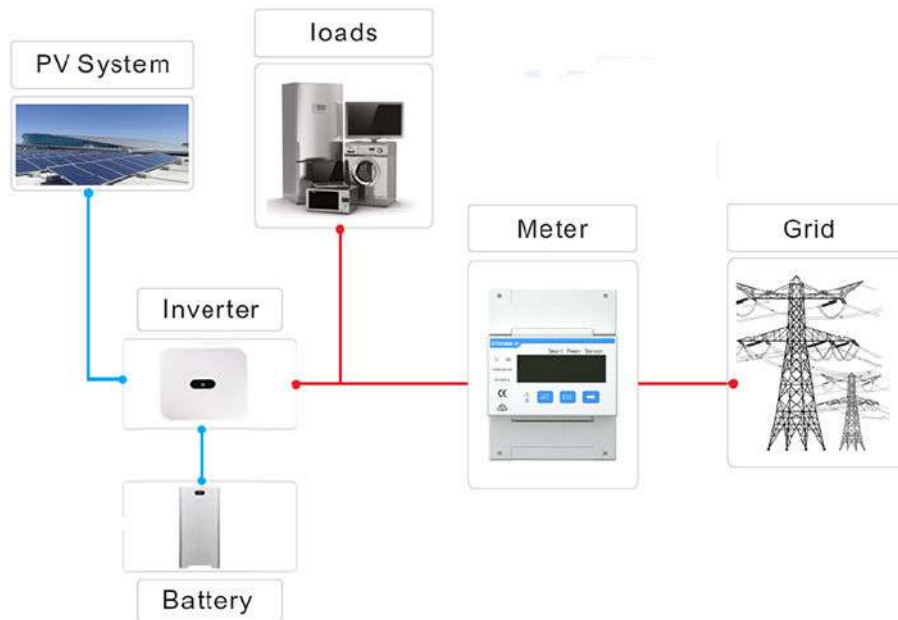
Scenario 1: In the residential power station scenario (three-phase grid), sometimes according to the requirements of the grid, it is necessary to limit the active power of the grid-connected point. At this time, the smart power sensor needs to collect the power information of the grid-connected point to control the output power of the inverter. In the PV and storage scenario, the smart power sensor is required to control the battery charge and discharge. It adopts RS485 communication, which can realize the electrical quantity measurement and energy metering function, and respond to the upper host for the real-time data query.

Scenario 2: In commercial roof power plants, sometimes according to the requirements of the power grid, it is necessary to limit the active power of grid-connected points. At this time, the smart power sensor needs to collect the power information of the grid-connected point to control the output power of the inverter. It adopts RS485 communication, which can realize the electrical quantity measurement and energy metering function, and respond to the upper host for the real-time data query.

NOTE

The smart power sensor is mainly used for power control at the grid-connection point. The measured energy yield and electricity consumption are for reference only and cannot be used as a basis for calculating electricity fees. Electricity fee measurement is subject to the meter provided by the grid company.

Figure 2-5 Application Scenarios



2.4 Model Naming Conventions

Figure 2-6 Model naming conventions

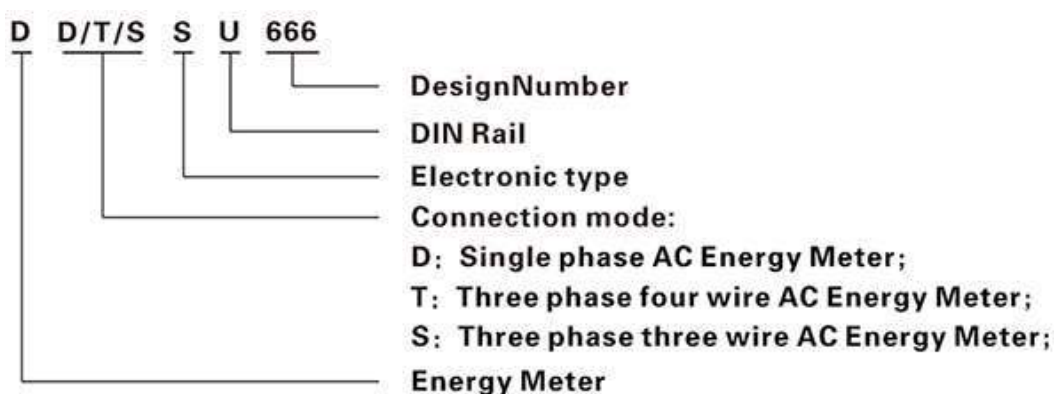


Table 2-4 Model specification

Model No.	Accuracy Grade	Referenced Voltage	Current Specification	Instrument Constant	Type
DTSU666-H	Active class 1	3 x 230/400 V	100 A/40 mA	400 imp/kWh	Via transformer
DTSU666-H 250A/50mA	Active class 1	3 x 230/400 V or 3 x 400 V	250 A/50 mA	400 imp/kWh	Via transformer

NOTE

Please take the physical label as standard.

2.5 Product Structure

Table 2-5 Product Structure

Model No.	Module	Outline Dimension (H x W x D) mm	Installation Dimension (Din-rail)	CT
DTSU666-H	4	72 x 100 x 65.5	DIN35 standard din-rail	with three 100 A/40 mA CT
DTSU666-H 250 A/50 mA	4	72 x 100 x 65.5	DIN35 standard din-rail	with three 200 A/50 mA CT

Figure 2-7 Product dimensions (Smart Power Sensor)

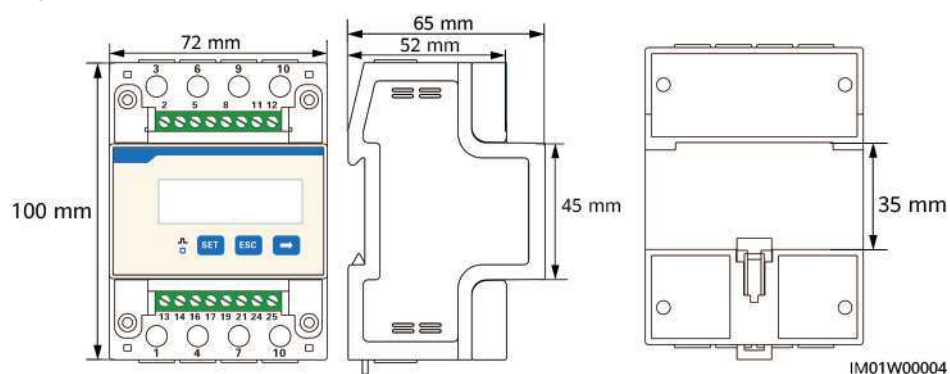


Figure 2-8 100 A CT dimensions

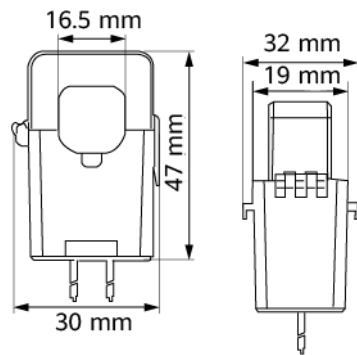
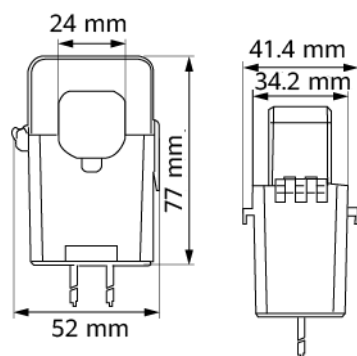


Figure 2-9 250 A CT dimensions



Appearance

Differences between DTSU666-H and DTSU666-H 250 A/50 mA:

- Parameters on the panel

Figure 2-10 DTSU666-H

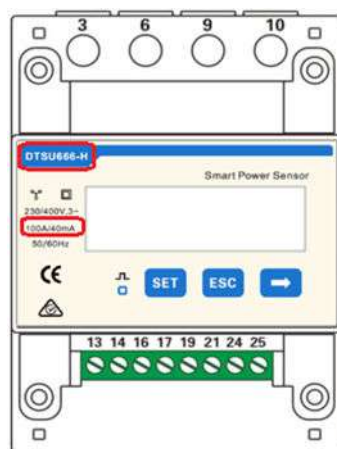
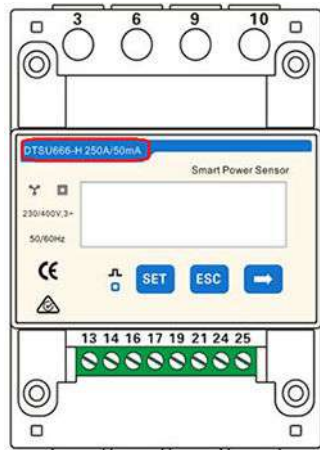


Figure 2-11 DTSU666-H 250 A/50 mA



- Nameplate

Figure 2-12 DTSU666-H

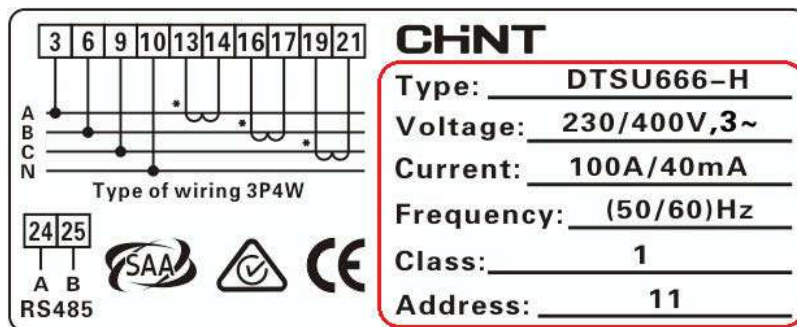
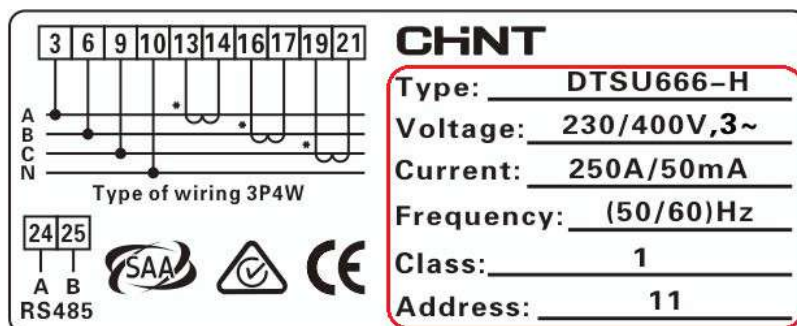


Figure 2-13 DTSU666-H 250 A/50 mA



Performance and Specifications

Table 2-6 Performance and specifications

Category	DTSU666-H	DTSU666-H 250 A/50 mA
Nominal voltage	230 V AC / 400 V AC	230 V AC / 400 V AC
Measurement range	0–100 A	0–250 A
Power grid system	3P4W	3P4W or 3P3W

3 System Maintenance

3.1 Troubleshooting

Table 3-1 Common alarms and troubleshooting measures

Fault Phenomenon	Factor Analysis	Troubleshooting
No display after the instrument being powered on	<ol style="list-style-type: none"> 1. Incorrect wiring mode. 2. Abnormal voltage supplied for the instrument. 	<ol style="list-style-type: none"> 1. If the wiring mode is incorrect, please connect based on the correct wiring mode (see 4.4 Structure Specifications). 2. If the supplied voltage is abnormal, please supply the voltage on the instrument specification.
Abnormal RS485 communication	<ol style="list-style-type: none"> 1. The RS485 communication cable is disconnected, short circuit or reversely connected. 2. The address, baud rate, data bit and parity bit of the instrument is not in accordance with the inverter. 	<ol style="list-style-type: none"> 1. If any problems for the communication cable, please change the cable. 2. Set the address, baud rate, data bit and parity bit of the instrument to be the same as the inverter through buttons and so as the parameter setting.
Power metering inaccuracy	<ol style="list-style-type: none"> 1. Wrong wiring, please check whether the corresponding phase sequence of voltage and current is correct. 2. Check whether the high and low ends of the current transformer inlet are reversely connected. Pa, Pb, and Pc are abnormal if the values are negative. 	<ol style="list-style-type: none"> 1. For wrong wiring, please connect based on the correct wiring mode (see 4.4 Structure Specifications). 2. If a negative value is displayed, change the cable connection mode of the current transformer to ensure that the high and low ends are connected properly.

 **NOTE**

Contact the installation vendor if all failure analysis procedures listed above are completed and the fault still exists.

4 Technical Specifications

4.1 Environmental Specifications

Table 4-1 Environmental specifications

Item	Specifications
Regulated working temperature range	-25°C to +60°C
Limited working temperature range	-40°C to +70°C
Relative humidity (annual average)	≤ 75% RH
Atmospheric pressure	86–106 kPa

4.2 Main Technical Performance and Parameters

Electrical Parameters

Table 4-2 Electrical parameters

Item	Specifications	
Regulated working voltage range	0.9–1.1 Un	
Extended working voltage range	0.7–1.3 Un	
Power consumption of voltage	≤ 1.5 W/6 VA	
Power consumption of current	I _b < 10 A	≤ 0.2 VA

Item	Specifications	
	$I_b \geq 10 \text{ A}$	$\leq 0.4 \text{ VA}$
Data storage time after power interruption	$\geq 10 \text{ years}$	

Percentage Error

Table 4-3 Limited value of active percentage error of the energy meter on balanced load

Type	Current Range	Power Factor	Limited Value of Percentage Error Towards Various Grades of Instruments
Connect via current transformer	$0.01 I_n \leq I < 0.05 I_n$	1	± 1.5
	$0.05 I_n \leq I \leq I_{max}$	1	± 1.0
	$0.02 I_n \leq I < 0.1 I_n$	0.5 L, 0.8 C	± 1.5
	$0.1 I_n \leq I \leq I_{max}$	0.5 L, 0.8 C	± 1.0
Notes	I_n : secondary rated current of the current transformer L: inductive; C: capacitive		

Table 4-4 Limited value of active percentage error of the energy meter on unbalanced load

Type	Current Range	Power Factor	Limited Value of Percentage Error Towards Various Grades of Instruments
Connect via current transformer	$0.05 I_n \leq I \leq I_{max}$	1	± 2.0
	$0.1 I_n \leq I \leq I_{max}$	0.5 L	± 2.0
Notes	I_n : secondary rated current of the current transformer L: inductive; C: capacitive		

Start

Under the power factor of 1.0 and 2‰ In, the instrument can be started with continuous metering (if it is multiple phase instrument, then it has balanced load). If the instrument is designed based on measurement for bi-directional energy, then it is suitable for each direction of energy.

Defluction

When applying voltage while the current circuit has no current, the test output of the instrument shall not produce a superfluous pulse. When testing, the current circuit shall be disconnected and the applied voltage of the voltage circuit shall be 115% of the referenced voltage.

$$\Delta t \geq \frac{600 \times 10^6}{k \cdot m \cdot U_n \cdot I_{max}} \text{ [min]}$$

The shortest testing time Δt :

For instrument of class 1:

From the formula: k represents energy meter constant (imp/kWh), m represents the testing component quantity, U_n represents the referenced voltage (V), I_{max} represents the large current (A).

Other Technical Parameters

Table 4-5 Other technical parameters

Scale Range	0-999999.9 kWh
Communication Protocol	Modbus-RTU

4.3 EMC Specifications

EMC performance of the meter conforms to the following relevant technical standard:

- IEC 61326-1:2012
- IEC 61326-2-1:2012
- EN 61326-1:2013
- EN 61326-2-1:2013
- EN 61000-3-2:2005/A2:2009
- EN 61000-3-3:2008

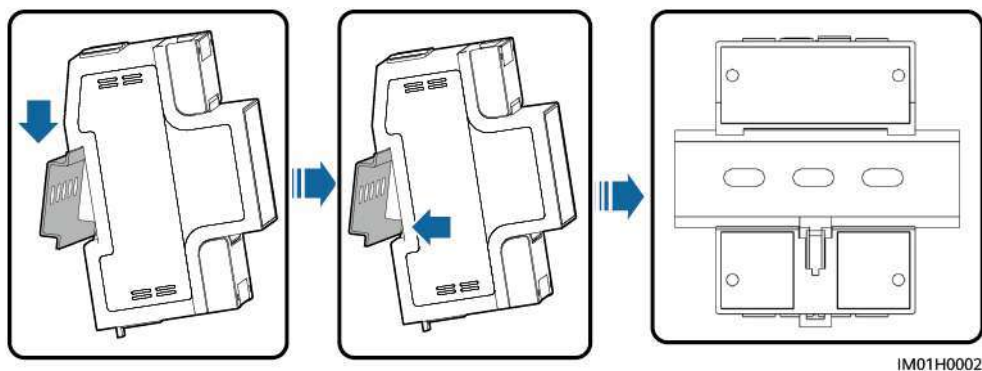
4.4 Structure Specifications

Table 4-6 Structure specifications

Item	Specifications
Installation mode	<p>Directly stuck the sensor on the din rail and finally install it on the power distribution box.</p> <ol style="list-style-type: none"> 1. When installing, please firstly stuck one side of the card slot and then forcibly stuck it on the din rail. 2. When disassembling, please use a screwdriver to forcibly hold the flexible card and then take out the sensor.
Dimensions (H x W x D)	72 mm x100 mm x 65.5 mm (± 0.5 mm)
Weight	≤ 0.8 kg

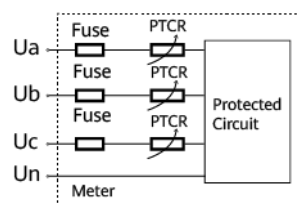
1. Install the smart power sensor on the standard din rail of DIN35mm.
2. Install the Smart Power Sensor to the standard din rail from the top to the bottom, and then push the instrument to the din rail from the bottom to the front part.

Figure 4-1 Install the smart power sensor



NOTE

A fuse and a thermistor are connected to each phase of Ua, Ub, and Uc inside the power meter to prevent damage caused by external short circuits. Ua, Ub, and Uc do not need to be protected by external fuses.



DTSU666-H or DTSU666-H 250 A/50 mA Wiring Terminal Instruction (Three-Phase Four-Wire)

Cable	DTSU666-H	Type	Conductor Cross-sectional Area Range	Outer Diameter	Source
AC power cable	Ua-3	Four-core outdoor copper cable	4-6 mm ²	10-21 mm	Prepared by the customer
	Ub-6				
	Uc-9				
	Un-10				
CT cable	IA*-13	-	-	-	Manufacturer
	IA-14	-	-	-	
	IB*-16	-	-	-	
	IB-17	-	-	-	
	IC*-19	-	-	-	
	IC-21	-	-	-	
Comm. cable	RS485A - 24	Two-core outdoor shielded twisted pair	0.20-1 mm ²	4-11 mm	Manufacturer
	RS485B - 25				

NOTE

- The minimum cable diameter must comply with local cable standards.
- The factors that affect cable selection include the rated current, cable type, routing mode, ambient temperature, and maximum expected line loss.

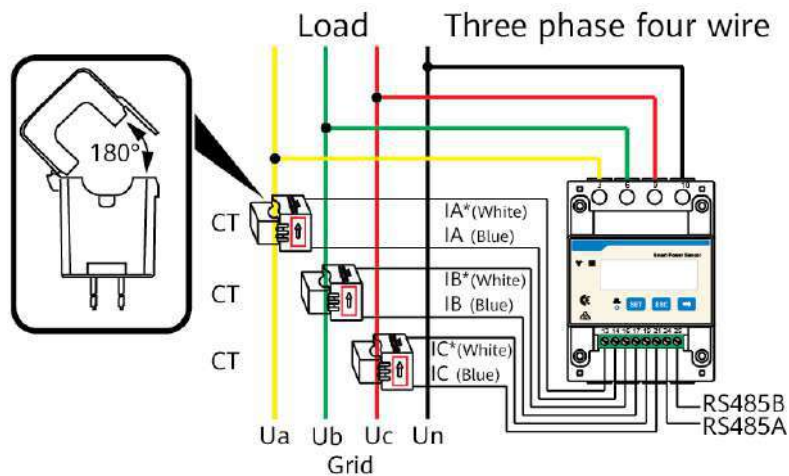
Operating voltage: 0.7–1.3 Un

1. Three phase four wire: Connect the Ua, Ub, Uc, Un voltage lines to the 3, 6, 9 and 10 terminals of the collector. Connect current transformer outlets IA*, IA, IB*, IB, IC*, IC to terminals 13, 14, 16, 17, 19, 21 of the collector.
2. Connect RS485A and RS485B to the communication host.

NOTE

- In the SmartLogger networking, the RS485A and RS485B need to connect to the SmartLogger. In the Smart Dongle networking, the RS485A and RS485B need to connect to the inverter.
- The CT direction must be consistent with the arrow direction as shown in the preceding figure.

Figure 4-2 Three-phase four-wire (supported model: DTSU666-H or DTSU666-H 250 A/50 mA)



DTSU666-H 250 A/50 mA Wiring Terminal Instruction (Three-Phase Three-Wire)

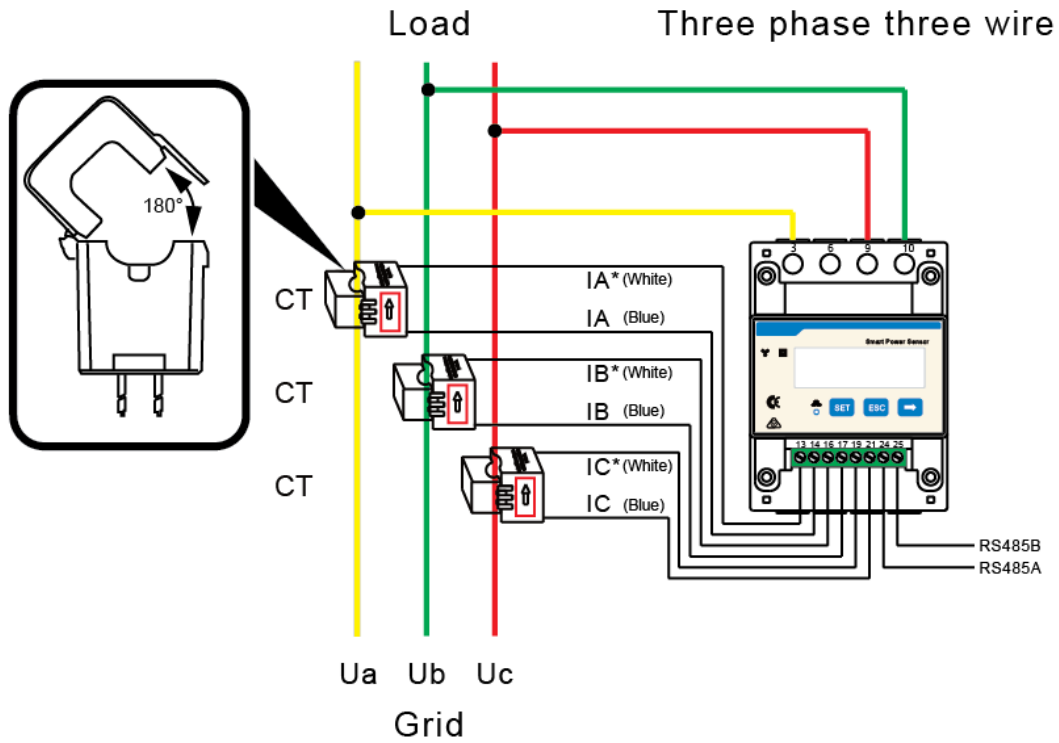
Operating voltage: 0.7–1.3 U_n

1. Three phase three wire: Connect the U_a , U_c , U_b voltage lines to the 3, 9 and 10 terminals of the collector. Connect current transformer outlets IA*, IA, IB*, IB, IC*, IC to terminals 13, 14, 16, 17, 19, 21 of the collector.
2. Connect RS485A and RS485B to the communication host.

NOTE

- In the SmartLogger networking, the RS485A and RS485B need to connect to the SmartLogger. In the Smart Dongle networking, the RS485A and RS485B need to connect to the inverter.
- The CT direction must be consistent with the arrow direction as shown in the preceding figure.

Figure 4-3 Three-phase three-wire (supported model: DTSU666-H 250 A/50 mA)



5 Current Transformer

Application

This product is suitable for 50 Hz multi-function electronic energy meter, anti-theft meter, digital display and other electrical measuring equipment.

This performance index of the current transformer conforms to the following relevant technical standard:

- JB/T 10665-2016
- JJG 313-2010

Environmental Specifications

Table 5-1 Environmental specifications

Item	Specifications
Operating temperature	-40°C to +70°C
Operating humidity	≤ 95% RH
Altitude	No more than 4000 m
Atmospheric conditions	No gas, steam, chemical deposits, grime and other corrosive or explosive media that seriously affect the insulation of the transformer

Electrical Parameters

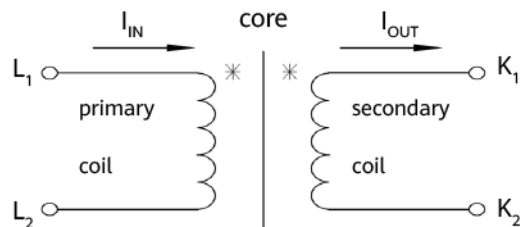
Table 5-2 Electrical parameters

Item	Specifications
Line Frequency	50/60 Hz

Item	Specifications
Rated Primary Current I_{pr}	<ul style="list-style-type: none"> • 100 A • 250 A
Rated transformation ratio N	<ul style="list-style-type: none"> • 100 A, 2500 : 1 • 250 A, 5000 : 1
Rated Load R_b	20 Ω
DC component and even harmonic	No
Accuracy	0.5
AC withstand voltage	Power frequency voltage between primary winding and secondary winding: 3 KV/min, no breakdown or arcing, Leakage current < 1 mA
Insulation Resistance	Between the primary winding and the secondary winding $\geq 500 \text{ M}\Omega/500 \text{ V DC}$

Electrical Circuit Diagram

Figure 5-1 Electrical Circuit Diagram



Product Size

The following figures show the CT structure of the DTSU666-H and DTSU666-H 250 A/50 mA meters.

Figure 5-2 CT structure of the DTSU666-H

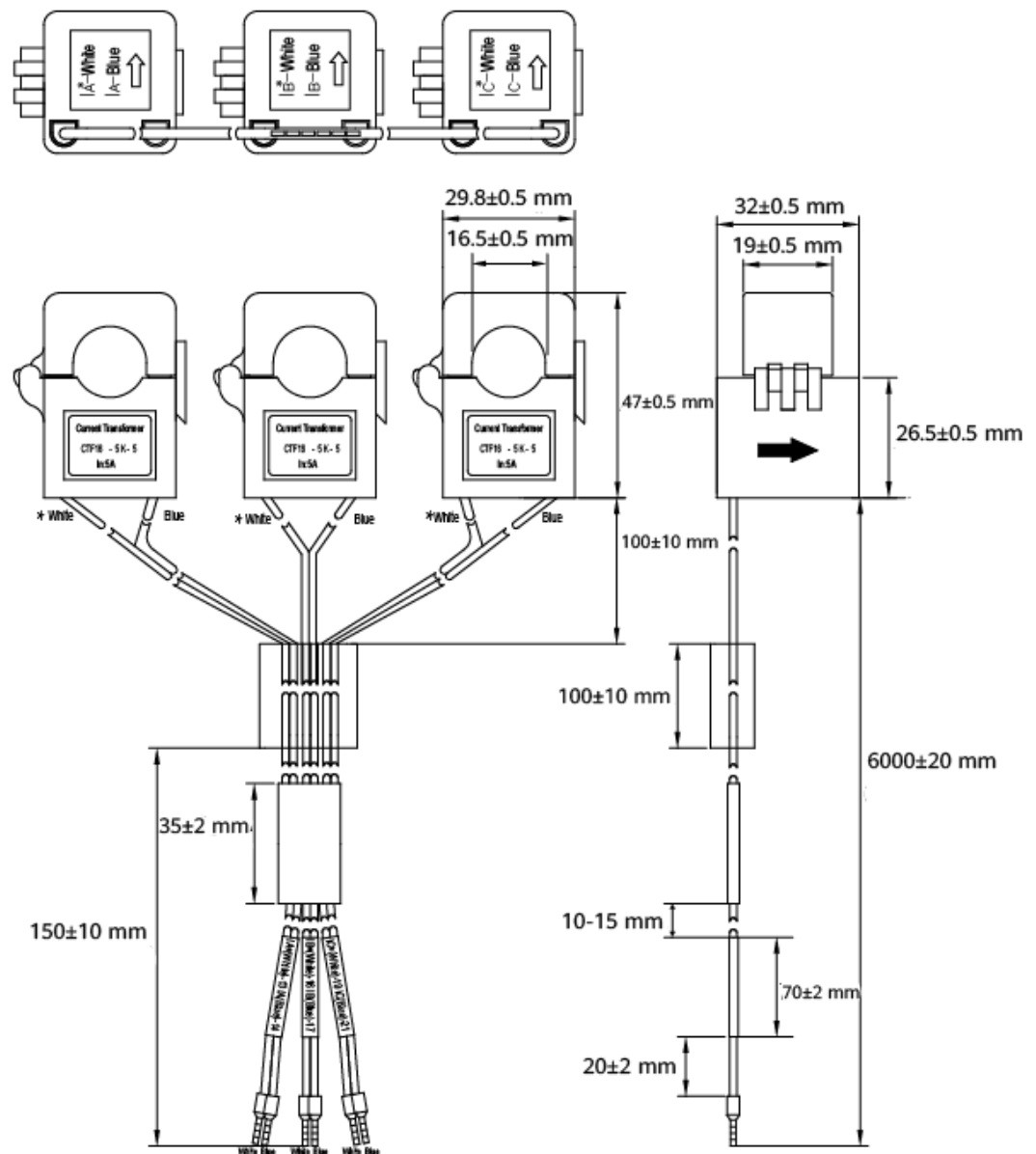
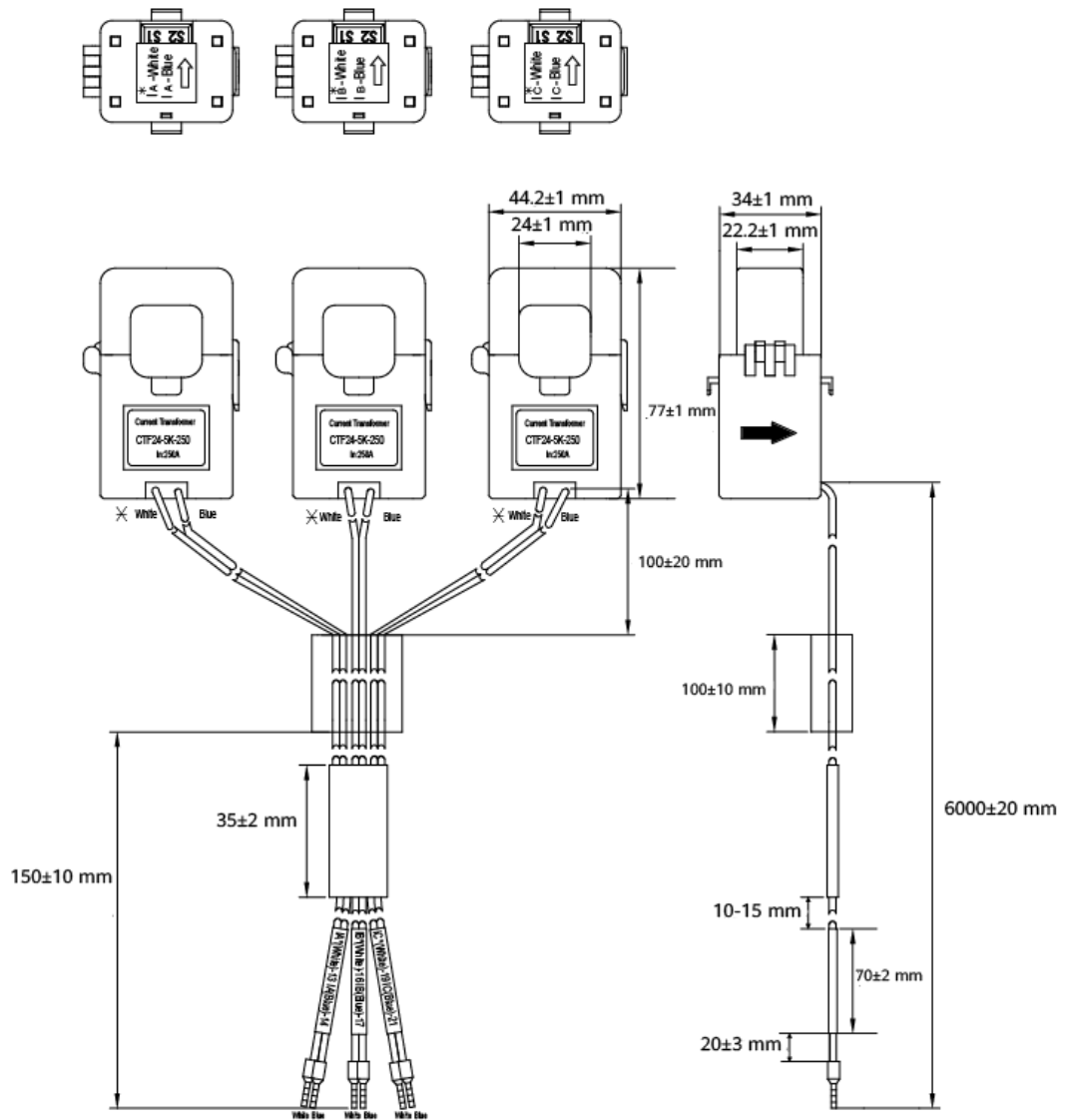


Figure 5-3 CT structure of the DTSU666-H 250 A/50 mA



6 Acronyms and Abbreviations

D	
DC	direct current
E	
EFT	electrical fast transient
EMI	electromagnetic interference
EMS	electromagnetic susceptibility
ESD	electrostatic discharge
M	
MPPT	maximum power point tracking
R	
RE	radiated emission
RS	radiated susceptibility

SUN2000-(600W-P, 450W-P2) Smart PV Optimizer

Quick Guide

Issue: 03

Part Number: 31500GLF

Date: 2022-07-29

HUAWEI DIGITAL POWER TECHNOLOGIES CO., LTD.



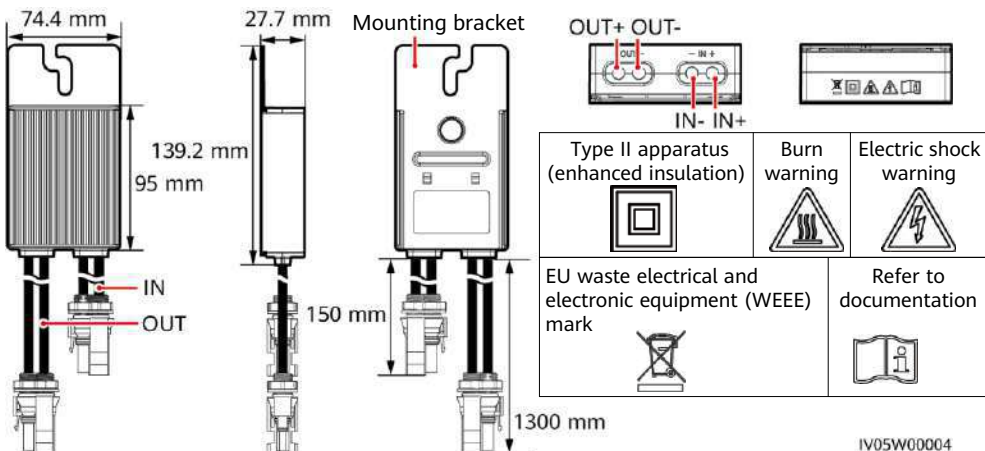
HUAWEI

1 Product Overview

The Smart PV Optimizer is a DC-DC converter installed on the rear of PV modules in a PV system. It manages the maximum power point (MPP) of each PV module to improve the energy yield of the PV system, and performs functions such as module-level shutdown and module-level management.

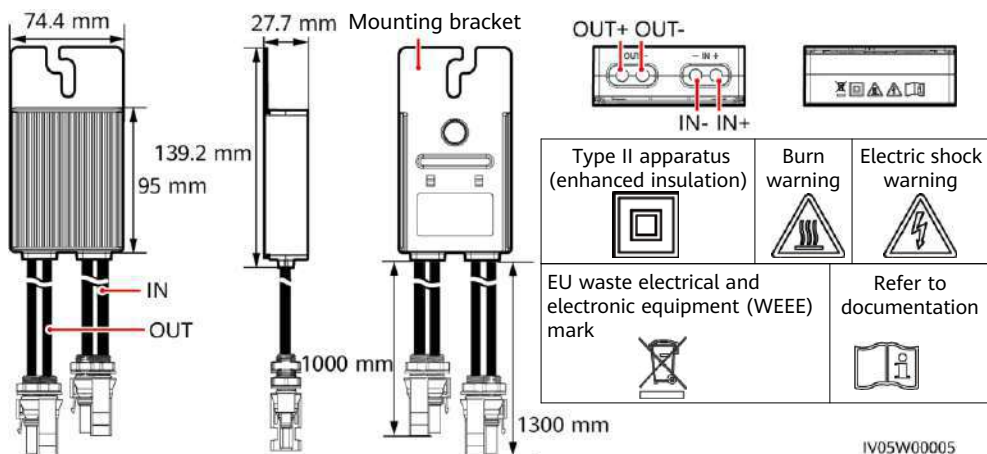
SUN2000-600W-P (Short Input Cable)/SUN2000-450W-P2

The length of the input power cable delivered with the optimizer is 150 mm. Select PV modules with appropriate cable length to ensure that the optimizer can connect to PV modules.



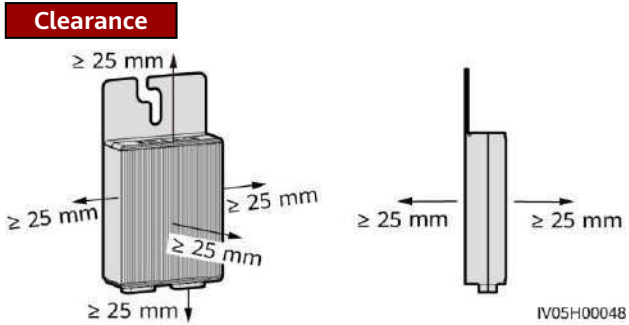
SUN2000-600W-P (Long Input Cable)

The length of the input power cable delivered with the optimizer is 1000 mm. Select PV modules with appropriate cable length to ensure that the optimizer can connect to PV modules.

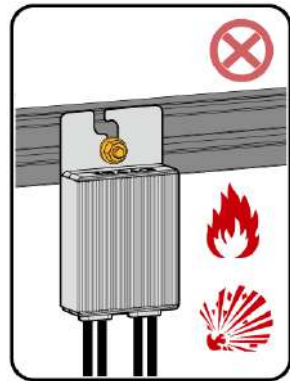
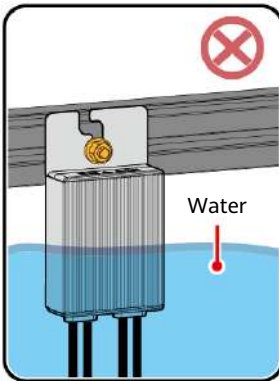


2 Installing the Device

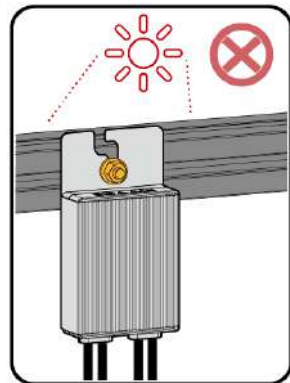
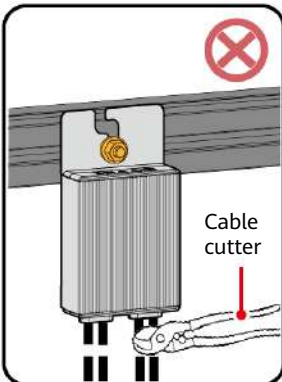
2.1 Installation Requirements



1. Do not install the optimizers in a position that might be soaked in water for two hours or longer.
2. Improper operations during the installation and running of optimizers may cause fire. Do not store flammable or explosive materials in the installation area.



3. Do not cut the cables delivered with the optimizers. Otherwise, the warranty will be voided.
4. Avoid direct sunlight.

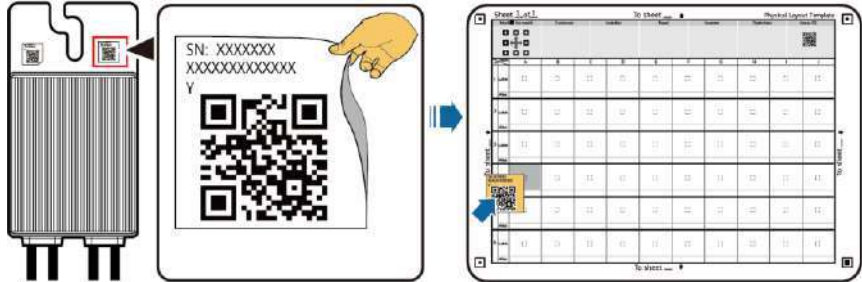


2.2 Installing the Optimizer

NOTICE

Properly plan the installation position of optimizers to ensure that the cables between the optimizer and the PV module and between adjacent optimizers can be properly connected, and the maximum communication distance between the optimizer and the solar inverter is within 350 m.

1. After determining the installation position of the optimizer, remove the SN label from the optimizer and attach it to the physical layout template. For details, see instructions on the back of the physical layout template.



2. Install the optimizer based on the selected installation mode.

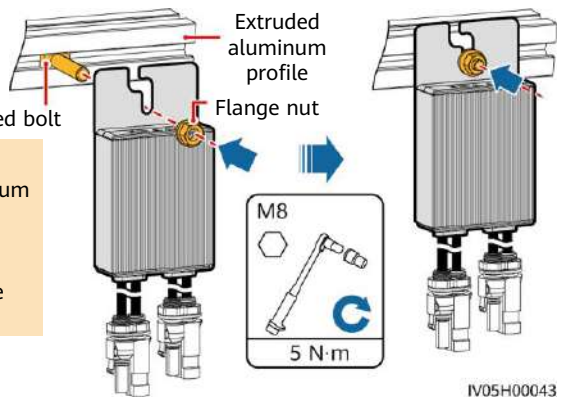
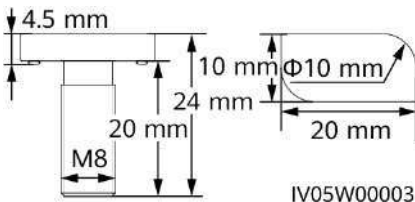
Installed on an Extruded Aluminum Profile – T-shaped Bolt

M8x20 T-shaped bolt

Extruded aluminum profile
Flange nut

NOTE

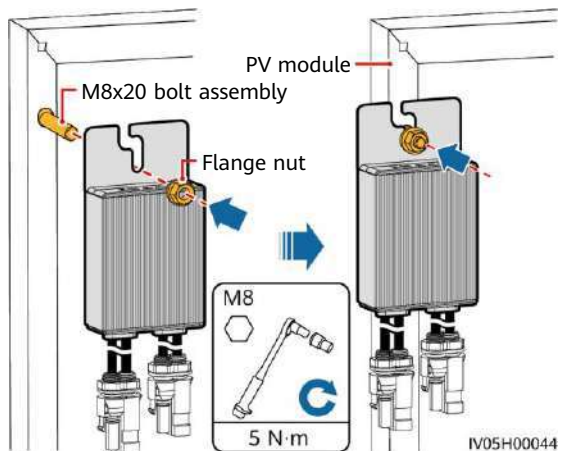
- The optimizer is mounted to an aluminum profile on the front or rear side with T-shaped bolt and nut.
- The T-shaped bolt and nut need to be purchased separately from Huawei. The bolt dimensions are as follows.



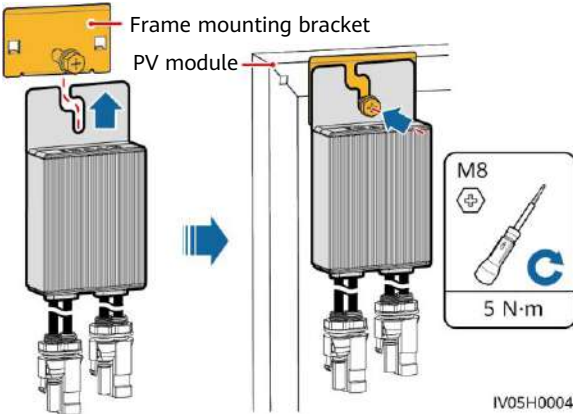
Installed on a PV Module Frame – Bolt Assembly

NOTE

- Before installation, ensure that a mounting hole has been reserved on the PV module frame.
- The bolt assembly and nut need to be purchased from a third party. Ensure that the length meets the installation requirements of the PV module frame.



Installed on a PV Module Frame – Frame Mounting Bracket (Front-mounted)



NOTICE

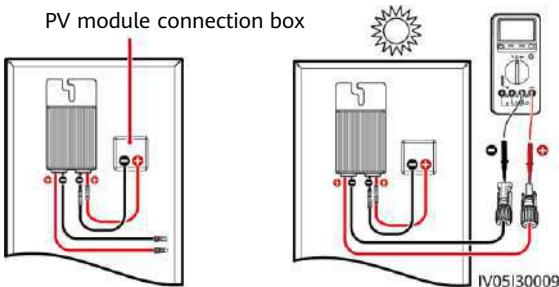
- Do not press the optimizer mounting ear against the positioning pole of the frame mounting bracket.
- Purchase the frame mounting bracket separately from Huawei.
- Install the PV module after the optimizer is installed.

3 Installing the Optimizer Cables

NOTICE

Ensure that the input (IN) and output (OUT) cables of the optimizer are correctly connected. If they are reversely connected, the device may be damaged.

1. Connect the optimizer input (IN) cable to the PV module connection box.
2. Connect the positive probe of the multimeter to the positive output terminal of the optimizer and the negative probe to the negative output terminal. Check the output voltage and resistance of a single optimizer.



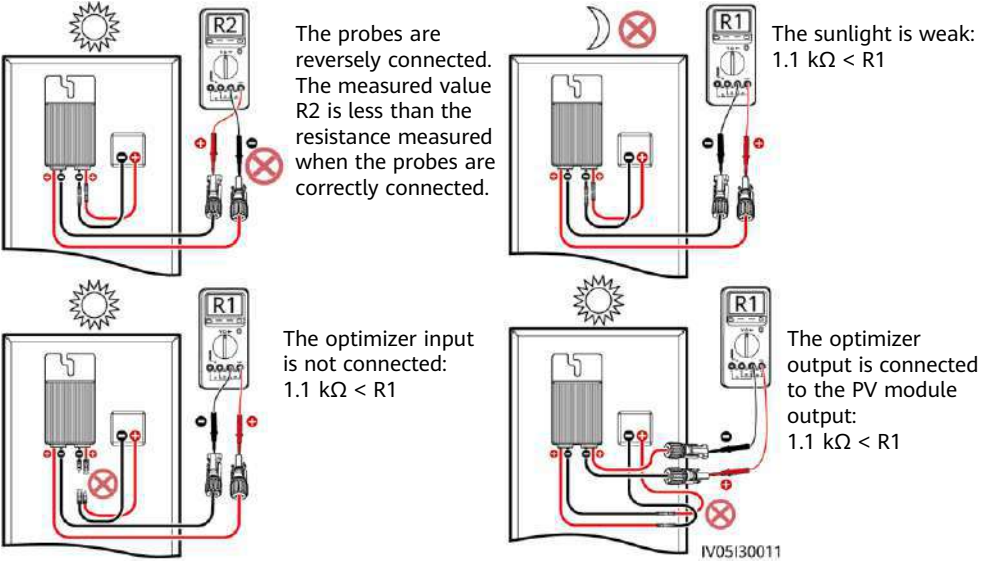
- The voltage V_1 is 0 V.
- The resistance R_1 is 1 k Ω ($\pm 10\%$). If the probes are reversely connected, the measured resistance is less than the resistance measured when the probes are correctly connected, which might be less than 0.9 k Ω .

Resistance	Cause	Suggestions
$0.9 \text{ k}\Omega \leq R_1 \leq 1.1 \text{ k}\Omega$	The optimizer is normal.	N/A
$R_1 < 0.9 \text{ k}\Omega$	If the probes of the multimeter are correctly connected, the optimizer is faulty.	Replace the optimizer.
$1.1 \text{ k}\Omega < R_1$	<ul style="list-style-type: none"> • The sunlight is weak. • The optimizer input is not connected. • The optimizer output is connected to the PV module output. • The optimizer is faulty. 	<ol style="list-style-type: none"> 1. Measure the resistance when the sunlight is sufficient. 2. Connect the optimizer input power cables. 3. Correct the optimizer cable connection. Connect the optimizer input power cables to the output cables of the PV module. 4. If the resistance is still abnormal, replace the optimizer.

NOTE

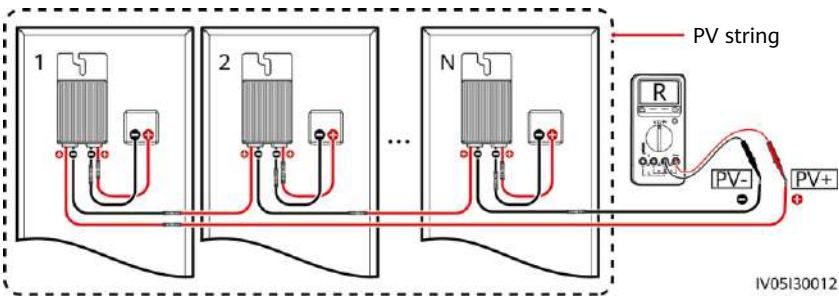
The measurement precision of the PV string output resistance depends on the resistance setting of the multimeter. Select the lowest resistance setting that can meet the measurement requirements.

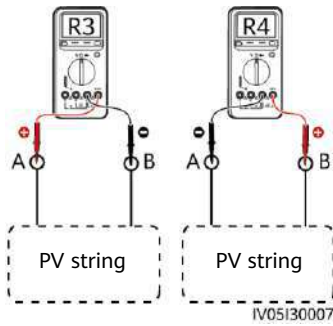
Common Exception Scenarios



3. Check that the optimizer input is properly connected, and connect the output power cables to the optimizer. Measure the PV string resistance when the sunlight is sufficient.

Full Configuration of Optimizers

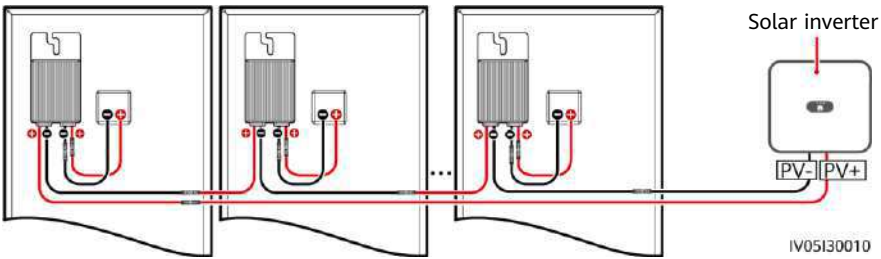




IV05130007

- a. If R is infinite, an open circuit occurs in the PV string or the cables are connected to different PV strings. Rectify the PV string open-circuit fault and correctly group the PV string cables.
- b. If R4 is less than R3, A is the positive cable of the PV string, and B is the negative cable of the PV string. If R3 is less than R4, B is the positive cable of the PV string, and A is the negative cable of the PV string. Attach correct cable labels.
- c. The resistance of each pair of PV module and optimizer is 1 k Ω . The total resistance of a PV string is 1 k Ω times the number of optimizers. If the total resistance is 10 k Ω , the number of optimizers in the PV string is 10.
Note: The total resistance of a PV string is $(R3 + R4)/2$.

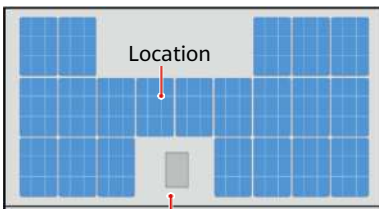
4. Connect cables between the PV string and the solar inverter.



IV05130010

4 Power-On Commissioning

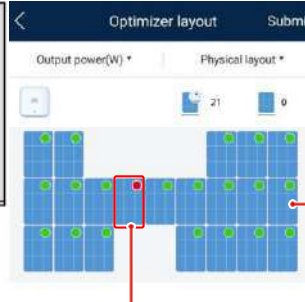
1. The physical layout of the optimizers must be provided so that you can easily locate faulty optimizers based on the physical layout diagram.
2. The physical layout of the optimizers must be provided to use the optimizer disconnection detection function. After optimizer disconnection detection is performed, the locating result can be viewed on the **Optimizer layout** page.
3. Choose **Maintenance > Subdevice management > Auto search** to add an optimizer. Create a physical layout on the **Physical layout design** screen. For details, see the corresponding solar inverter quick guide or *FusionSolar App Quick Guide*. The solar inverter quick guide is delivered with the solar inverter. You can scan the QR code to obtain *FusionSolar App Quick Guide*.



PV rooftop

Disconnection icon

Fault icon



Physical layout

IV05130013

Faulty optimizer



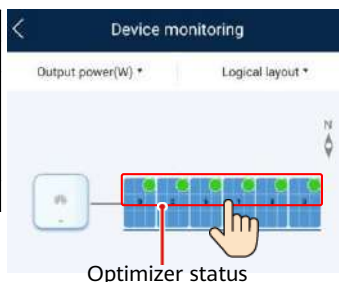
NOTICE

If the system has change requirements, such as adding, deleting, and replacing an optimizer, adjusting the physical position of an optimizer, or adjusting the PV string connected to the solar inverter input, power off the inverter and wait for 5 minutes before performing the change operation to avoid human injuries. After the change is performed, the optimizer search process must be performed again and the physical layout diagram must be updated. Otherwise, the networking is incomplete, optimizer faults cannot be located, or the system fails.

5 Troubleshooting

1. Open the FusionSolar app, log in to intl.fusionsolar.huawei.com using the installer account, choose **Me > Device Commissioning**, and connect to the WLAN hotspot of the solar inverter.
2. Select **installer** and enter the login password. Click **Log In**. The device commissioning screen is displayed.
3. Choose **Device Monitoring**, select the PV string and check the optimizer status.

Status	Description
Green	The optimizer is running properly.
Gray	The optimizer is offline. Check that the SN and location information are correct and search for the device again.
Red	The optimizer is faulty.

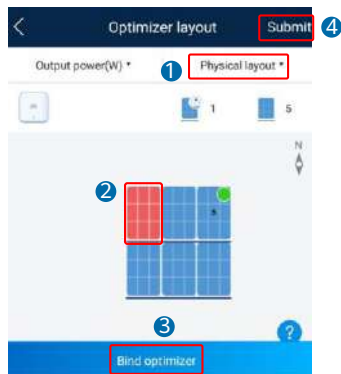
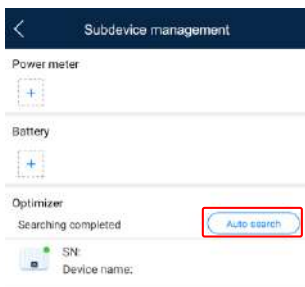


Fault Alarm	Cause	Suggestions
Input overvoltage	Optimizer input overvoltage occurred.	Check whether the open-circuit voltage of the PV module connected to the optimizer exceeds 80 V.
Overtemperature protection	The optimizer internal temperature is too high.	<ol style="list-style-type: none"> 1. Check the ventilation and ambient temperature at the optimizer installation position. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. 2. If the ventilation and ambient temperature are normal, contact your dealer or Huawei technical support.
Internal hardware fault	An internal fault occurred in the optimizer.	Contact your dealer or Huawei technical support.
Output backfeed	Optimizer output backfeed occurred.	<ol style="list-style-type: none"> 1. Check whether PV modules are severely blocked when PV strings are connected in parallel. 2. If the fault persists, contact your dealer or Huawei technical support.
Abnormal output voltage	The optimizer output voltage is abnormal.	<ol style="list-style-type: none"> 1. When the sunlight is normal, perform the optimizer search function again. 2. Check whether the optimizer output extension cable is correct (positive connector at one end and negative connector at the other). 3. Check whether the PV string is correctly connected to the inverter or whether there is a breakpoint in the PV string. 4. If the fault persists, contact your dealer or Huawei technical support.

Fault Alarm	Cause	Suggestions
Upgrade failed	The optimizer software upgrade failed.	<ol style="list-style-type: none"> 1. When the sunlight is normal, perform the optimizer upgrade again. 2. If the fault persists, contact your dealer or Huawei technical support.

6 Replacing an Optimizer

1. Power off the solar inverter and remove the faulty optimizer.
2. Install a new optimizer and correctly connect its cables.
3. Power on the solar inverter. On the Device Commissioning screen, choose **Maintenance > Subdevice management**, and tap **Auto search** to add the new optimizer.
4. On the Device Commissioning screen, choose **Maintenance > Optimizer layout**, select the corresponding PV module, and bind the new optimizer. Click **Submit**.



7 Precautions

Scenario	Optimizer	Energy Storage	Description
Off-grid	No	Yes	Optimizers are not supported.
On/Off-grid	Yes	No	After the power grid fails, the system switches to the off-grid mode and is powered off at night. If the power grid is not recovered on the next day, the system cannot start automatically when the irradiance is normal. After the power grid recovers and the irradiance is normal, the system automatically starts.
On/Off-grid	Yes	Yes	<ul style="list-style-type: none"> • After the power grid fails, the system switches to the off-grid mode. If the battery end-of-discharge SOC is greater than or equal to 5%, the system shuts down at night when the SOC reaches the lower limit. If the power grid is not recovered on the next day, the system can black start through battery when the irradiance is normal. • After the power grid fails, the system switches to the off-grid mode. If the battery end-of-discharge SOC is less than 5%, the system shuts down at night when the SOC reaches the lower limit. If the power grid is not recovered on the next day, the system may fail to black start through battery when the irradiance is normal. After the power grid recovers and the irradiance is normal, the system automatically starts.

⚠ WARNING

- The optimizer uses Staubli MC4 DC connectors. Ensure that the DC connectors to be connected are of this model. If the DC connectors to be connected are not of the Staubli MC4 model, the connector compatibility report and third-party lab (TUV, VED, or Bureau Veritas) report from the DC connector manufacturer must be available. Using incompatible DC connectors may result in serious consequences. The resulting device damage is beyond the warranty scope.
- The optimizer is not supported in the pure off-grid ESS networking. Otherwise, the system may fail to start.
- Partial configuration scenario: The total open-circuit voltage of the PV modules in a PV string cannot exceed the maximum input voltage of the solar inverter under any condition.

NOTICE

- The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.
- Only qualified and trained electrical technicians are allowed to operate the device. Operation personnel should understand the composition and working principles of the grid-tied PV power system and local regulations.
- Carefully read this document prior to installation to get familiar with product information and safety precautions. Huawei shall not be liable for any consequence caused by violation of the storage, installation, and operation regulations specified in this document and the solar inverter user manual.
- Use insulated tools when installing the device. For personal safety, wear proper personal protective equipment (PPE).
- If an optimizer does not connect to any other device, connect the OUT+ and OUT- ports of the optimizer respectively to the IN+ and IN- ports to protect the terminals from water.
- It is recommended that the positive and negative cables (PV+/PV-) between the optimizer and the solar inverter be placed side by side to avoid cable winding.
- The input end of the optimizer should be connected to the PV module connection box, and the output end to the adjacent optimizer or a solar inverter. Do not reversely connect the input and output cables. Otherwise, the optimizer may be damaged.
- The screenshots are for reference only. The actual screens may vary. Local physical layout using the solar inverter is used as an example. For details about the remote physical layout using the management system, see the *FusionSolar App Quick Guide*.

8 Installation Video

📖 NOTE

You can scan the QR codes below to obtain the installation videos.



English

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SUN2000 Smart PV Optimizer

User Manual

Issue 02
Date 2022-03-25



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About This Document

Purpose

This document describes the functions, electrical specifications, and structure of the smart photovoltaic (PV) optimizer.

Figures provided in this document are for reference only.





Intended Audience


This document is intended for:

- Sales engineers
- Technical support engineers
- Maintenance engineers

Symbol Conventions

The symbols that may be found in this guide are defined as follows.

Symbol	Description
	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	Indicates a potential hazard which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

Symbol	Description
 NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all updates made in previous issues.

Issue 02 (2021-03-25)

Updated [2.1 Overview](#).

Updated [5.1 SUN2000-600W-P Technical Specifications](#).

Updated [5.3 SUN2000-450W-P2 Technical Specifications](#).

Issue 01 (2021-10-30)

This issue is the first official release.

Contents

About This Document.....	ii
1 Safety Precautions.....	1
2 Product Introduction.....	4
2.1 Overview.....	4
2.2 Structure.....	5
2.3 Application Scenarios.....	7
2.4 Configuration Principles.....	7
3 Smart PV Solution Documentation.....	10
4 System Maintenance.....	11
4.1 Setting the Physical Layout of the Smart PV Optimizers.....	11
4.2 Detecting Optimizer Disconnection.....	13
4.3 Rapid Shutdown.....	14
4.4 Troubleshooting.....	15
4.5 Replacing an Optimizer.....	16
5 Technical Specifications.....	18
5.1 SUN2000-600W-P Technical Specifications.....	18
5.2 SUN2000-450W-P Technical Specifications.....	19
5.3 SUN2000-450W-P2 Technical Specifications.....	21
A Acronyms and Abbreviations.....	23

1 Safety Precautions

General Safety

- Follow the precautions and special safety instructions provided by Huawei when operating this product. Installation or maintenance personnel must be well trained, fully understand all safety precautions, and be able to correctly perform all operations. Huawei will not be liable for any consequences that may arise due to violations of general safety requirements or safety standards concerning the usage of the equipment.
- Before performing operations, read through the safety precautions to prevent accidents. The information provided under the "NOTICE", "CAUTION", "WARNING", and "DANGER" headings within this manual is not intended to cover all applicable safety policies, and instead acts as a supplement to the comprehensive safety information provided.
- Follow local laws and regulations when operating the equipment. The safety instructions in this document are considered supplementary to local laws and regulations.
- Do not operate the equipment or cables during thunderstorms.
- Before operating the product, remove any conductors such as jewelry or watches.
- Use insulated tools during operations.
- Tighten screws using a torque wrench, and mark them in red and blue for double-check. Installation personnel should mark tightened screws in blue. Inspection personnel should confirm that the screws are tightened and then mark them in red. If screws or bolts used to secure the equipment are not tightened to the required torque, the equipment may fall off the mounting kits.
- Follow specified procedures during installation and maintenance. Do not modify the equipment structure or the recommended installation procedures without prior consent from the manufacturer.
- Install the product in strict accordance with the quick guide.

Declaration

Huawei will not be liable for any consequences in any of the following circumstances:

- Damage during transportation
- Storage conditions that do not meet the requirements specified in this document
- Incorrect installation or use
- Installation or use by unqualified personnel
- Failure to follow the operation instructions and safety precautions on the product and in this document
- Operation beyond the conditions specified in this document
- Operation beyond the specified parameter ranges
- Unauthorized modifications to the product or software code or removal of the product
- Equipment damage due to force majeure (such as lightning, fire, and storms)
- Warranty expired and not extended
- Installation or use in environments which are not specified in relevant international standards

Personnel Requirements

Only qualified electricians are allowed to install, connect cables for, maintain, troubleshoot, and replace the optimizer.

- Receive professional training.
- Read through this document and understand all safety precautions.
- Get familiar with the safety specifications about the electrical system.
- Understand the composition and working principles of the grid-tied PV power system and local regulations.
- Wear proper personal protective equipment (PPE).

Label Protection

- Do not scrawl or damage any warning labels on the optimizer because these labels contain important information about safe operation.
- Do not scrawl or damage the nameplate on the back of the optimizer because it contains important product information.

System Installation

- Ensure that the optimizer is not powered on during the installation.
- Reserve appropriate clearances around the optimizer for installation and heat dissipation.

Electrical Connections



Before connecting cables, ensure that the optimizer is not damaged. Otherwise, electric shocks or fire may occur.

- Ensure that all electrical connections comply with local electrical standards.
- Ensure that the cables used in a grid-tied PV power system are properly connected and insulated and meet specifications.
- The output wiring terminals of the optimizer are not hot-swappable. If the terminals are hot-swapped, the optimizer may be damaged.

Operation

 **DANGER**

High voltage from the optimizer in operation may cause an electric shock, resulting in serious property damage, injury, or death. Strictly comply with the safety precautions in this document and other related documents when operating the optimizer.

-
- Do not touch the optimizer in operation as its surface temperature is high and may cause burning.
 - When operating the equipment, comply with local laws and regulations.

Maintenance and Replacement

 **DANGER**

High voltage from the optimizer in operation may cause an electric shock, resulting in serious property damage, injury, or death. Before maintenance, power off the optimizer and strictly comply with the safety precautions in this document and other related documents when operating the optimizer.

-
- Maintain the optimizer with proper understanding of this document and appropriate tools and testing equipment.
 - Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.
 - The optimizer can be powered on only after all faults are rectified. Otherwise, faults may escalate or equipment may be damaged.
 - Observe ESD precautions and wear ESD gloves during maintenance.

2 Product Introduction

2.1 Overview

The smart PV optimizer is a DC to DC converter which implements maximum power point tracking (MPPT) of each PV module to improve the energy yield of the PV system. It enables module-level shutdown and monitoring, and supports long-string design.

Functions and Features

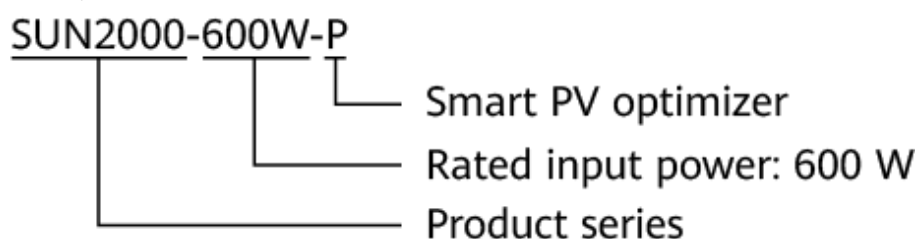
- Module-level MPPT: Implements maximum power point tracking of each PV module to improve the energy yield of the PV system.
- Module-level shutdown: Adjusts the module output voltage to a safe range when the output is disconnected or the inverter shuts down.
- Module-level monitoring: Monitors the operating status of each PV module.
- Long PV string supported: If all PV modules are configured with optimizers, a PV string can contain more PV modules than conventional PV strings.

Model

This document involves the following product models:

- SUN2000-600W-P (Long input cable / Short input cable)
- SUN2000-450W-P
- SUN2000-450W-P2

Figure 2-1 Model description (The SUN2000-600W-P optimizer is used as an example)

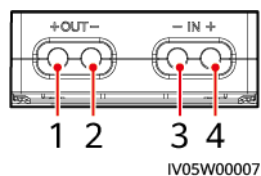


Optimizer Model	Rated Input Power	Input Cable Length	Output Cable Length
SUN2000-600W-P (Long input cable)	600 W	1000 mm	1300 mm
SUN2000-600W-P (Short input cable)	600 W	150 mm	1300 mm
SUN2000-450W-P	450 W	150 mm	1200 mm
SUN2000-450W-P2	450 W	150 mm	1300 mm

2.2 Structure

Optimizer Ports

Figure 2-2 Ports



(1) Output port (positive)

(2) Output port (negative)

(3) Input port (negative)

(4) Input port (positive)

Optimizer Dimensions

Figure 2-3 SUN2000-600W-P (short input cable)/SUN2000-450W-P2 dimensions

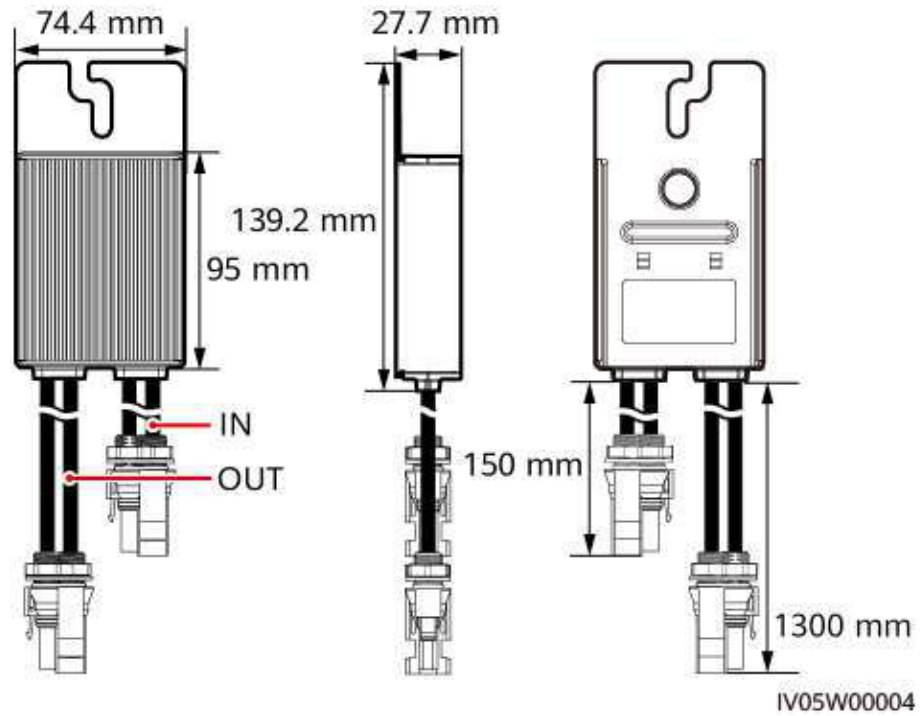


Figure 2-4 SUN2000-600W-P (long input cable) dimensions

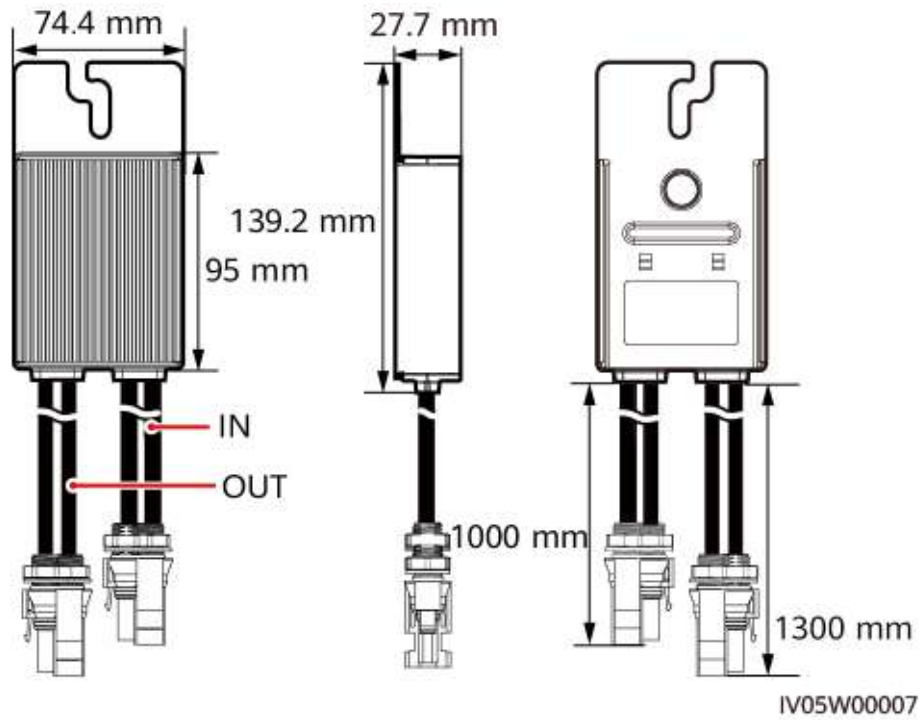
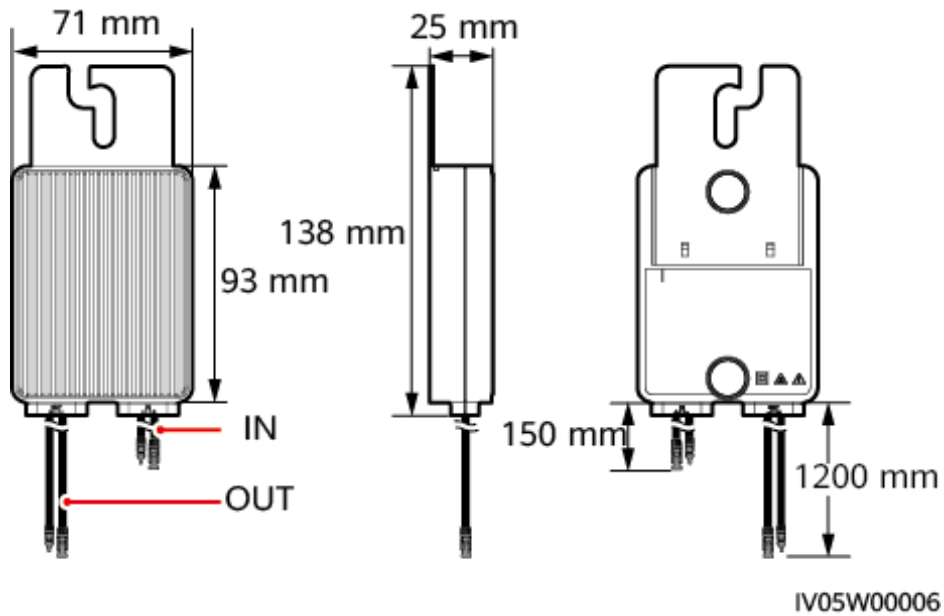


Figure 2-5 SUN2000-450W-P dimensions



2.3 Application Scenarios

NOTE

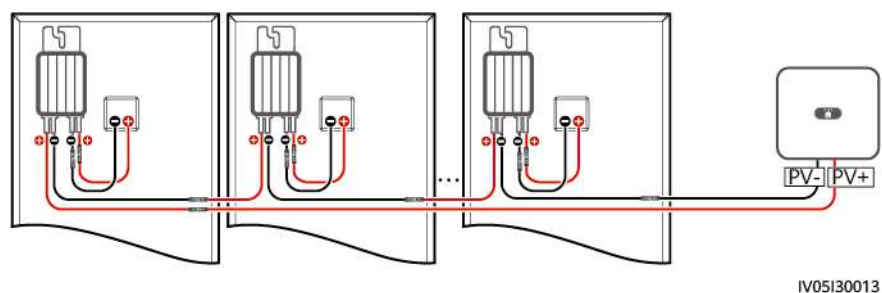
Select PV modules with appropriate cable length to ensure that the optimizer can connect to PV modules.

Optimizers configured for all PV modules

All PV modules are connected to optimizers.

In this scenario, the MPPT function, module-level shutdown and monitoring, and long-string design are supported.

Figure 2-6 Optimizers configured for all PV modules



2.4 Configuration Principles

The optimizer models supported by different inverters may vary, and different optimizers may be configured for the same inverter. Select the optimizer model as required.

Configuration Principles

The number of optimizers supported in a PV string, the upper limit of the string power, and requirements for connecting PV strings in parallel vary according to the inverter model. The configuration principles for different inverter models are as follows:

NOTE

If two strings are connected in parallel to the inverter under the same MPPT circuit, the restrictions for configuring optimizers are as follows:

- The PV strings connecting to the same MPPT should contain the same number and model of PV modules and optimizers.
- All PV modules in the two strings must have the same orientation and tilt angle.

You are advised to use long strings instead of Y-shaped terminals.

Table 2-1 SUN2000-600W-P/SUN2000-450W-P2 configuration principles

Supported Inverter Models	Maximum Number of Optimizers Supported in a String	String Power Upper Limit
SUN2000-2/3/3.68/4/4.6/5/6KT L-L1	4 to 25	6 kW
SUN2000-3/4/5/6/8/10KTL-M1	6 to 35	10 kW
SUN2000-8/10/12/15/17/20KT L-M2	6 to 35	12 kW
SUN2000-29.9/30/36/40KTL-M3	6 to 25	12 kW
SUN2000-20KTL-M3 (Brazil and Japan)	6 to 25	8 kW
SUN2000-4.95KTL-JPL1	4 to 25	6 kW
SUN2000-4.95KTL-NHL2	4 to 25	6 kW

Table 2-2 SUN2000-450W-P configuration principles

Supported Inverter Models	Number of Optimizers Supported in the String	String Power Upper Limit
SUN2000-2/3/3.68/4/4.6/5/6KT L-L1	4 to 25	5 kW
SUN2000-3/4/5/6/8/10KTL-M1	6 to 35	10 kW
SUN2000-8/10/12/15/17/20KT L-M2	6 to 35	10 kW

Supported Inverter Models	Number of Optimizers Supported in the String	String Power Upper Limit
SUN2000-29.9/30/36/40KTL-M3	6 to 25	10 kW
SUN2000-20KTL-M3 (Brazil)	6 to 25	7 kW

Optimizers supported by Inverters

The optimizer models supported by different inverters may vary, as described in the following table.

NOTE

"√" indicates supported. "×" indicates not supported.

Inverter Model	SUN2000-600W-P	SUN2000-450W-P	SUN2000-450W-P2
SUN2000-2/3/3.68/4/4.6/5/6KTL-L1	√	√	√
SUN2000-3/4/5/6/8/10KTL-M1	√	√	√
SUN2000-8/10/12/15/17/20KTL-M2	√	√	√
SUN2000-29.9/30/36/40KTL-M3	√	√	√
SUN2000-4.95KTL-JPL1	√	×	√
SUN2000-4.95KTL-NHL2	√	×	√
SUN2000-20KTL-M3 (Brazil)	√	√	√
SUN2000-20KTL-M3 (Japan)	√	×	√

Compatibility Between Optimizers

Different models of optimizers can be used in the same string. The compatibility between different optimizers is described in the following table.

NOTE

"√" indicates mixed use supported. "×" indicates mixed use not supported.

Optimizer Compatibility	SUN2000-600W-P	SUN2000-450W-P	SUN2000-450W-P2
SUN2000-450W-P	√	√	√
SUN2000-600W-P	√	√	√

3 Smart PV Solution Documentation

Quick Guide

Quick installation guides for different optimizers are:

- SUN2000-600W-P: [SUN2000-\(600W-P, 450W-P2\) Smart PV Optimizer Quick Guide](#)
- SUN2000-450W-P: [SUN2000-450W-P Smart PV Optimizer Quick Guide](#)
- SUN2000-450W-P2: [SUN2000-\(600W-P, 450W-P2\) Smart PV Optimizer Quick Guide](#)

Optimizer Installation Video

See [SUN2000-\(600W-P, 450W-P2, 450W-P\) Smart PV Optimizer Installation Video](#).

You can also scan the QR code below to obtain the installation video:



4 System Maintenance

4.1 Setting the Physical Layout of the Smart PV Optimizers

NOTE

- If smart PV optimizers are configured for PV strings, ensure that the smart PV optimizers have been successfully connected to the SUN2000 before performing the operations in this section.
- Check that the SN labels of smart PV optimizers are correctly attached to the physical layout template.
- Take and save a photo of the physical layout template. Keep your phone parallel to the template and take a photo in landscape mode. Ensure that the four positioning points in the corners are in the frame. Ensure that each QR code is attached within the frame.
- For some unidentified QR codes, log in to the FusionSolar WebUI to manually bind them. For details, see section "FAQ 3" of [FusionSolar App Quick Guide](#).
- For details about the physical layout of smart PV optimizers, see [FusionSolar App Quick Guide](#). You can scan the QR code to download the quick guide.



Scenario 1: Setting on the FusionSolar Server Side (Solar Inverter Connected to the Management System)


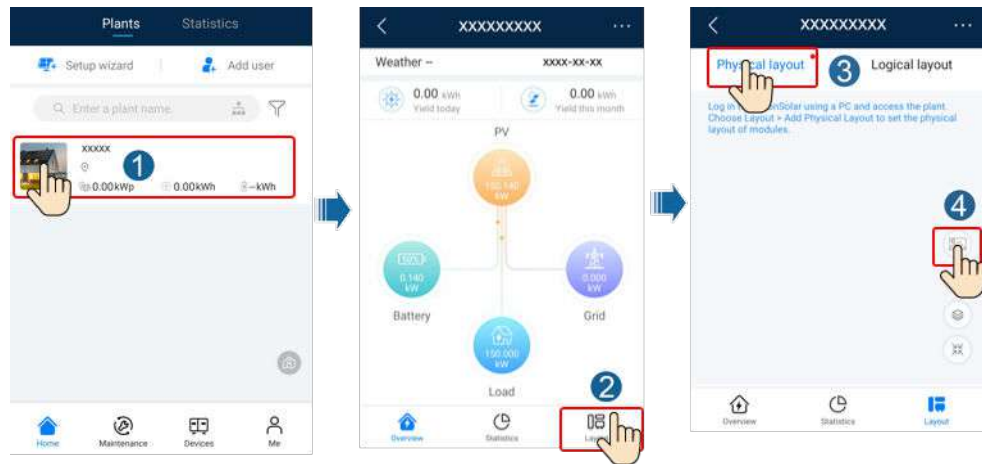
- Step 1** Log in to the FusionSolar app and tap the plant name on the **Home** screen to access the plant screen. Select **Layout**, tap , and upload the physical layout template photo as prompted.

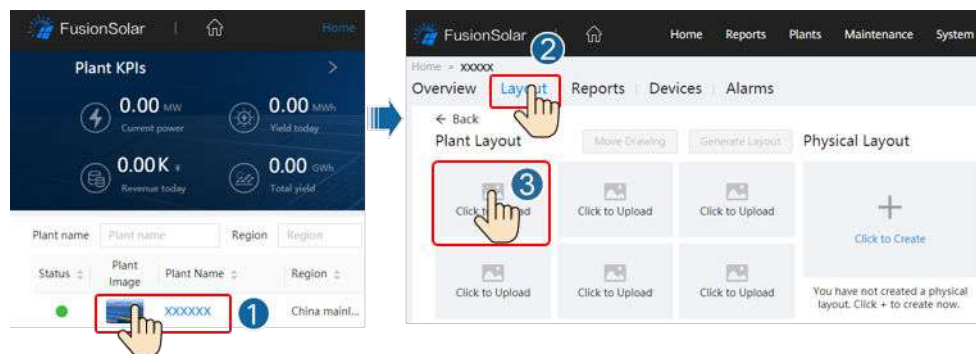
Figure 4-1 Uploading the physical layout template photo



NOTE

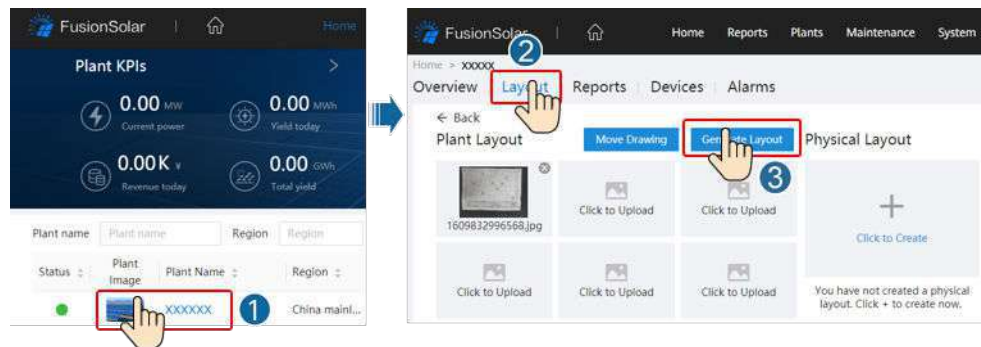
You can also upload the physical layout template photo on the WebUI as follows: Log in to <https://intl.fusionsolar.huawei.com> to access the WebUI of the FusionSolar Smart PV Management System. On the **Home** page, click the plant name to go to the plant page. Choose **Layout**, click **Click to Upload**, and upload the physical layout template photo.

Figure 4-2 Uploading the physical layout template photo (Web)



Step 2 Log in to <https://intl.fusionsolar.huawei.com> to access the WebUI of the FusionSolar Smart PV Management System. On the **Home** page, click the plant name to go to the plant page. Select **Layout**. Choose **Generate layout**, and create a physical layout as prompted. You can also manually create a physical location layout.

Figure 4-3 Physical layout design of PV modules



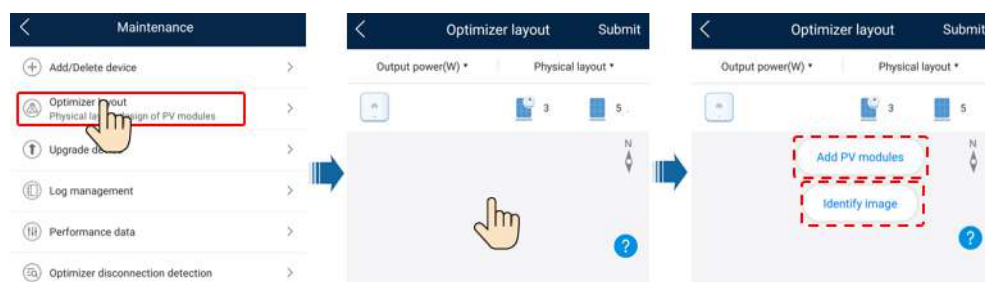
----End

Scenario 2: Setting on the Solar Inverter Side (Solar Inverter Not Connected to the Management System)

Step 1 Access the Device Commissioning screen on the FusionSolar app to set the physical layout of Smart PV Optimizers.

1. Log in to the FusionSolar app. On the **Device Commissioning** screen, choose **Maintenance > Optimizer layout**. The **Optimizer layout** screen is displayed.
2. Tap the blank area. The **Identify image** and **Add PV modules** buttons are displayed. You can use either of the following methods to perform operations as prompted:
 - Method 1: Tap **Identify image** and upload the physical layout template photo to complete the optimizer layout. (The optimizers that fail to be identified need to be manually bound.)
 - Method 2: Tap **Add PV modules** to manually add PV modules and bind the optimizers to the PV modules.

Figure 4-4 Physical layout design of PV modules

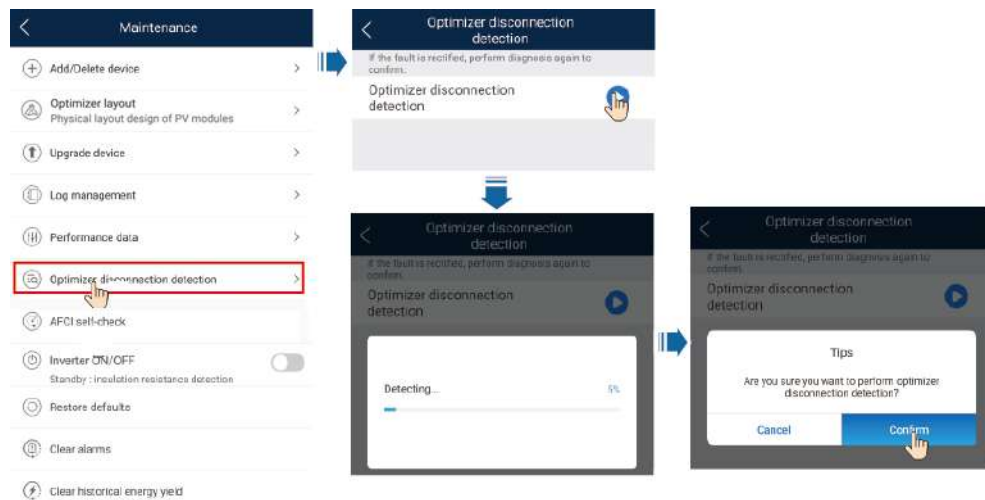


----End

4.2 Detecting Optimizer Disconnection

Log in to the FusionSolar app, choose **Device Commissioning > Maintenance > Optimizer disconnection detection**, tap the detection button to detect the optimizer disconnection, and rectify the fault based on the detection result.

Figure 4-5 Detect optimizer disconnection



4.3 Rapid Shutdown

When the output is disconnected or the inverter shuts down, the optimizer can adjust the module output voltage to a safe range to ensure the safety of the construction and O&M personnel as well as firefighters.

NOTE

- The rapid shutdown function is not supported if optimizers are configured for some PV modules.
- You are advised to periodically check whether the rapid shutdown function is normal.

If optimizers are configured for all PV modules, the PV system can perform a rapid shutdown to decrease the output voltage to below 120 V within 15s and to below 30 V within 30s.

Perform the following steps to trigger a rapid shutdown:

- Method 1: Turn off the AC switch between the inverter and the power grid.
- Method 2: Turn off the DC switch on the inverter.
- Method 3: Connect a switch to the DI and GND ports of the inverter to form a circuit. (For details about the DI port, see the corresponding inverter user manual.) The switch is turned on by default. Turn off the switch to trigger a rapid shutdown.

4.4 Troubleshooting

Table 4-1 Common alarms and troubleshooting measures

Alarm Name	Cause	Suggestions
Input overvoltage	Optimizer input overvoltage occurred.	Check whether the open-circuit voltage of the PV module connected to the optimizer exceeds 80 V.
Overtemperature	The optimizer internal temperature is too high.	<ol style="list-style-type: none"> 1. Check the ventilation and ambient temperature at the optimizer installation position. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. 2. If the ventilation and ambient temperature are normal, contact the installation contractor.
Internal hardware fault	An internal fault occurred in an optimizer.	Contact the installation contractor.
Output backfeed	Optimizer output backfeed occurred.	<ol style="list-style-type: none"> 1. Check whether PV modules are shaded when PV strings are connected in parallel. 2. If the fault persists, contact the installation contractor.
Abnormal output voltage	The optimizer output voltage is abnormal.	<ol style="list-style-type: none"> 1. When the sunlight is normal, perform optimizer search again. 2. Check whether the optimizer output extension cable is correctly prepared (positive connector at one end and negative connector at the other). 3. Check whether the PV string is correctly connected to the inverter or whether there is a breakpoint in the PV string. 4. If the fault persists, contact the installation contractor.
Upgrade failed	The optimizer software upgrade failed.	<ol style="list-style-type: none"> 1. When the sunlight is normal, perform the optimizer upgrade again. 2. If the fault persists, contact the installation contractor.

 NOTE

Contact the service provider if all suggested measures listed above are completed and the fault still exists.

4.5 Replacing an Optimizer

Prerequisites

- Use dedicated insulation tools, and wear insulation shoes and protective gloves before performing operations.
- A new smart PV optimizer is available.

Procedure

Step 1 Put on the protective gloves.

Step 2 Power off the inverter.

Step 3 Disconnect the input terminals of the optimizer.

Step 4 Remove the old optimizer.

1. Record the cable connection positions on the optimizer and disconnect the cables.
2. Loosen the bolt that secures the optimizer and remove the optimizer.

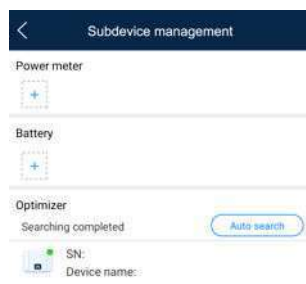
Step 5 Install a new optimizer.

1. Secure the new optimizer to the corresponding bolt and tighten the bolt.
2. Connect the cables to the new optimizer based on the recorded information.

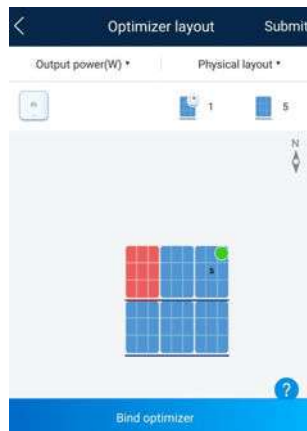
 NOTE

If multiple optimizers need to be replaced, record the mapping information.

Step 6 Power on the inverter. On the **Device Commissioning** screen, choose **Maintenance > Subdevice management**, and tap **Auto search** to add the new optimizer.



Step 7 On the **Device Commissioning** screen, choose **Maintenance > Optimizer layout**, select the corresponding PV module, and bind the new optimizer according to the recorded mapping information. Tap **Submit**.



Step 8 Remove the protective gloves.

----End

Follow-up Procedure

Pack the faulty component and return it to the local Huawei warehouse.

5 Technical Specifications

5.1 SUN2000-600W-P Technical Specifications

Efficiency

Technical Specifications	SUN2000-600W-P
Maximum efficiency	99.5%
European weighted efficiency	99.0%

Input

Technical Specifications	SUN2000-600W-P
Rated PV module power	600 W
Maximum PV module power	630 W
Maximum input voltage	80 V
MPPT voltage range	10–80 V
Maximum short-circuit current	14.5 A
Overvoltage level	II

Output

Technical Specifications	SUN2000-600W-P
Rated output power	600 W
Output voltage	0–80 V

Technical Specifications	SUN2000-600W-P
Maximum output current	15 A
Output bypass	Yes
Shutdown output voltage/impedance	0 V/1 k Ω (\pm 10%)

General Specifications

Technical Specifications	SUN2000-600W-P
Dimensions (W x H x D)	75 mm x 140 mm x 28 mm
Net weight	<ul style="list-style-type: none"> SUN2000-600W-P (short input cable) \leq 600 g SUN2000-600W-P (long input cable) \leq 700 g
DC input and output terminals	Staubli MC4
Operating temperature	-40°C to +85°C
Storage temperature	-40°C to +70°C
Operating humidity	0-100% RH
Maximum operating altitude	4000 m
IP rating	IP68
Installation mode	<ul style="list-style-type: none"> PV module support installation PV module frame installation

5.2 SUN2000-450W-P Technical Specifications

Efficiency

Technical Specifications	SUN2000-450W-P
Maximum efficiency	99.5%
European weighted efficiency	99.0%

Input

Technical Specifications	SUN2000-450W-P
Rated PV module power	450 W
Maximum PV module power	472.5 W

Technical Specifications	SUN2000-450W-P
Maximum input voltage	80 V
MPPT voltage range	8–80 V
Maximum short-circuit current	13 A
Overvoltage level	II

Output

Technical Specifications	SUN2000-450W-P
Rated output power	450 W
Output voltage	4–80 V
Maximum output current	15 A
Output bypass	Yes
Shutdown output voltage/impedance	0 V/1 k Ω ($\pm 10\%$)

General Specifications

Technical Specifications	SUN2000-450W-P
Dimensions (W x H x D)	71 mm x 138 mm x 25 mm
Net weight	≤ 550 g
DC input and output terminals	Staubli MC4
Operating temperature	-40°C to +85°C
Storage temperature	-40°C to +70°C
Operating humidity	0–100% RH
Maximum operating altitude	4000 m
IP rating	IP68
Installation mode	<ul style="list-style-type: none">• PV module support installation• PV module frame installation

5.3 SUN2000-450W-P2 Technical Specifications

Efficiency

Technical Specifications	SUN2000-450W-P2
Maximum efficiency	99.5%
European weighted efficiency	99.0%

Input

Technical Specifications	SUN2000-450W-P2
Rated PV module power	450 W
Maximum PV module power	472.5 W
Maximum input voltage	80 V
MPPT voltage range	10–80 V
Maximum short-circuit current	14.5 A
Overvoltage level	II

Output

Technical Specifications	SUN2000-450W-P2
Rated output power	450 W
Output voltage	0–80 V
Maximum output current	15 A
Output bypass	Yes
Shutdown output voltage/impedance	0 V/1 k Ω ($\pm 10\%$)

General Specifications

Technical Specifications	SUN2000-450W-P2
Dimensions (W x H x D)	75 mm x 140 mm x 28 mm
Net weight	≤ 600 g
DC input and output terminals	Staubli MC4

Technical Specifications	SUN2000-450W-P2
Operating temperature	-40°C to +85°C
Storage temperature	-40°C to +70°C
Operating humidity	0-100% RH
Maximum operating altitude	4000 m
IP rating	IP68
Installation mode	<ul style="list-style-type: none">• PV module support installation• PV module frame installation

A Acronyms and Abbreviations

D

DC direct current

E

EFT electrical fast transient

EMI electromagnetic interference

EMS electromagnetic susceptibility

ESD electrostatic discharge

M

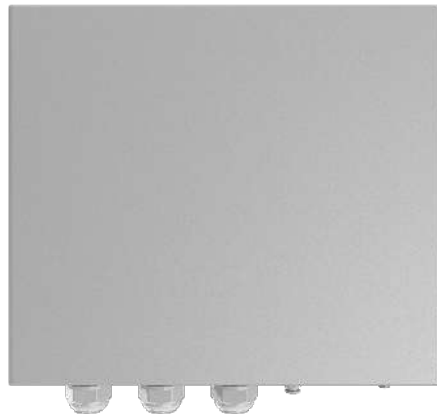
MPPT maximum power point tracking

R

RE radiated emission

RS radiated susceptibility

Backup Box



Simple

Automatic detection & switchover



Reliable

Provide Reliable backup power

Technical Specification	Backup Box-B0	Backup Box-B1
AC Output (On grid)		
Grid connection	Single Phase	Three Phase
Rated voltage	220 V / 230 V	380 V / 400 V
AC frequency	50Hz / 60Hz	
AC output voltage range	198 V ~ 253 V	342 V ~ 440 V
AC Output (Backup)		
Load connection	Single Phase	Single Phase
Rated voltage	220 V / 230 V	220 V / 230 V
AC frequency	50Hz / 60Hz	
Maximum apparent power	5,000 VA	3,300 VA
Maximum output current	22.7 A	15.2 A
Switchover time	< 3 s	
AC Input (Inverter)		
Rated voltage	220 V / 230 V	380 V / 400 V
AC frequency	50Hz / 60Hz	
Compatible inverter	SUN2000-2/3/3.68/4/4.6/5/6KTL-L1	SUN2000-3/4/5/6/8/10KTL-M1
General Specification		
Operating temperature range	-20 °C to +45 °C (-4 °F to 113 °F)	
Relative humidity range	0 %RH ~ 100 %RH	
Dimensions (W * H * D)	400 x 350 x 130 mm (15.8 x 13.8 x 5.1 inch)	
Weight	11 kg	
Degree of protection	IP 65	



Backup Box-(B0, B1)

Quick Guide

Issue: 03

Date: 2021-04-08



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NOTICE

1. The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.
2. Before installing the device, read the user manual carefully to get familiar with product information and safety precautions.
3. Only certified electricians are allowed to operate the device. Operation personnel must wear proper personal protective equipment (PPE).
4. Before installing the device, check that the package contents are intact and complete against the packing list. If any item is missing or damaged, contact your dealer.
5. The device damage caused by the violation of instructions in this document is not covered under warranty.
6. The cable colors involved in this document are for reference only. Select cables in accordance with local cable specifications.

1 Overview

Function

The Backup Box is used in a residential rooftop PV plant system to control the inverter grid-tied or off-grid state. When the grid fails, the inverter switches to the off-grid state and supplies power to off-grid loads in backup mode. When the grid recovers, the inverter switches back to the grid-tied state.

Model Number

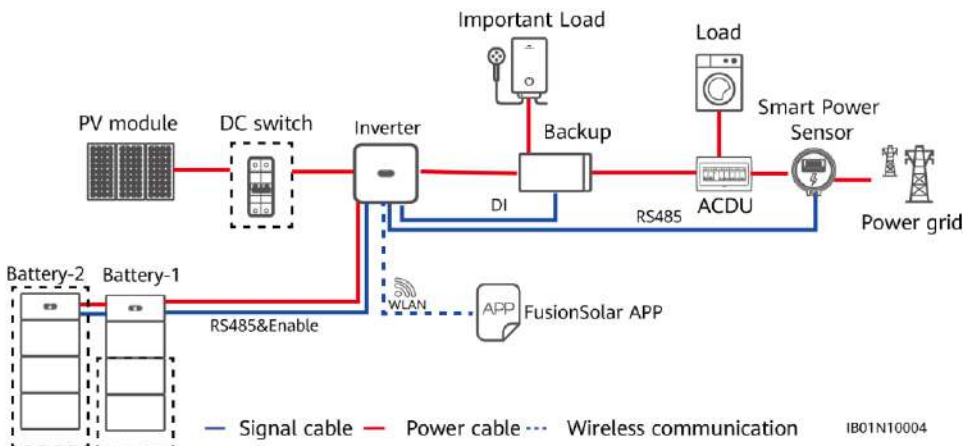
Backup Box-B0



No.	Meaning	Value
1	Product name	Backup Box: Backup Box
2	Design code	B0: single-phase B1: three-phase

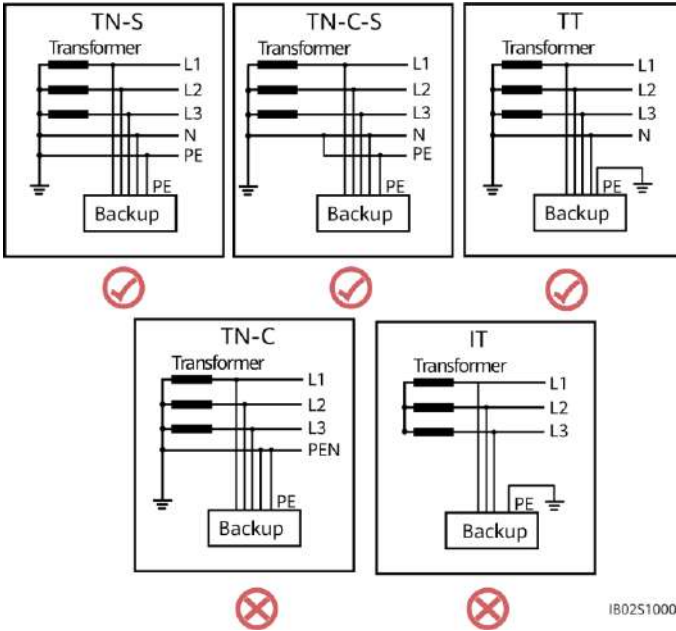
System Networking

The grid-tied system of a rooftop PV plant consists of PV strings, an energy storage system (ESS), an inverter, a Backup Box, a management system, an AC switch, and a power distribution unit.

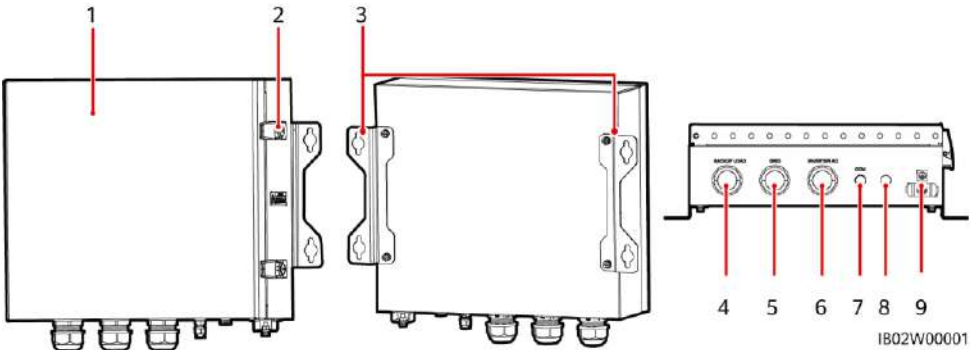


Supported Grid Types

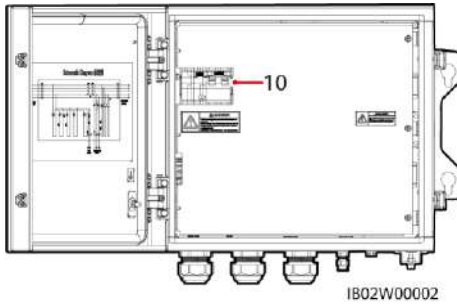
The Backup Box supports the following grid types: TN-S, TN-C-S and TT. When the inverter is in three-phase, three-wire mode, the Backup Box does not support off-grid operation.



Appearance



- | | |
|-------------------------|--------------------------------------|
| (1) Front panel | (2) Lock |
| (3) Hanging kit | (4) Off-grid load port (BACKUP LOAD) |
| (5) Grid AC port (GRID) | (6) Inverter AC port (INVERTER AC) |
| (7) COM port (COM) | (8) Ventilation valve |
| (9) Ground point | |



(10) Off-grid load switch

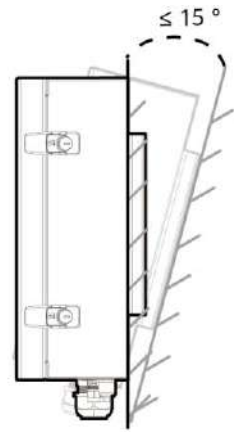
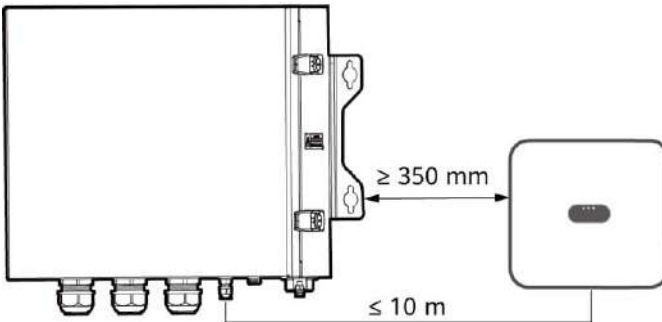
2 Device Installation

2.1 Installation Requirements

⚠ DANGER

1. When a Backup Box is installed outdoors, avoid direct sunlight. You are advised to install it in a sheltered place or install an awning over it.
2. A surge protective device (SPD) needs to be installed on the grid side of the Backup Box.

Installation Space Angle

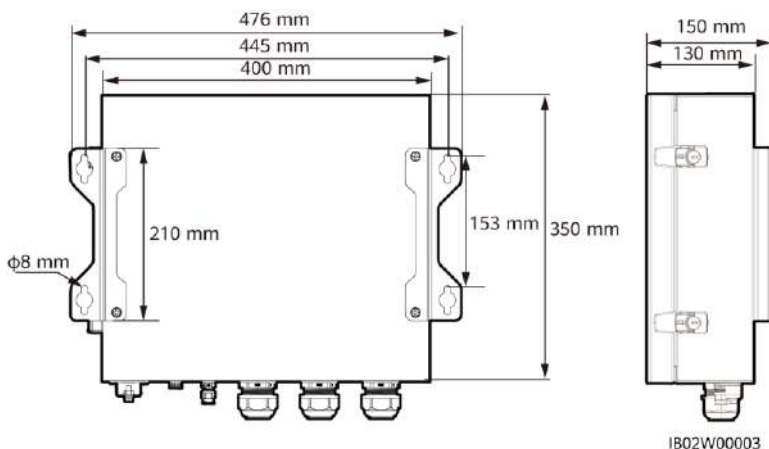


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Mounting Holes and Dimensions

⚠ DANGER

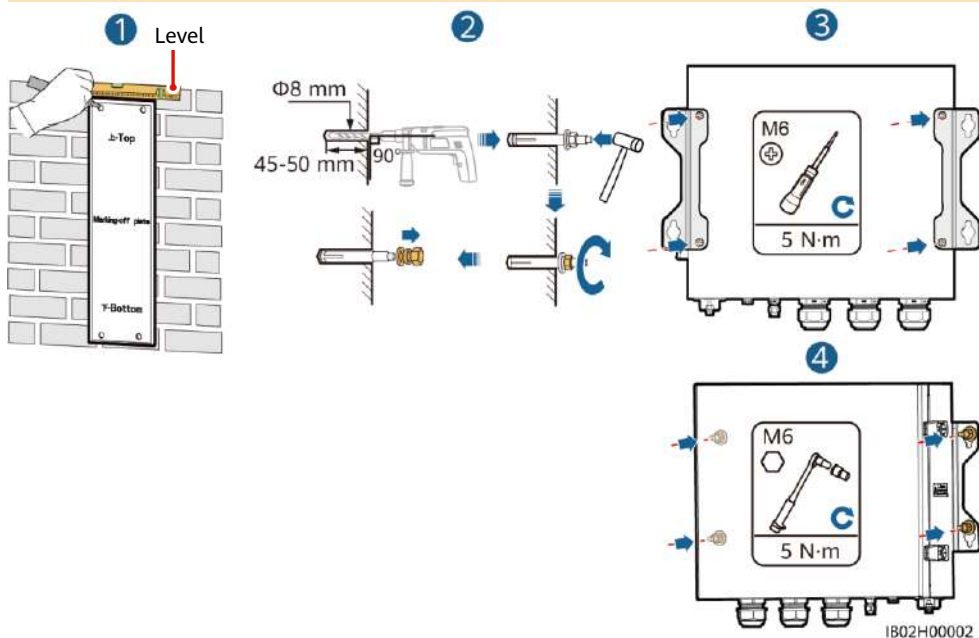
When drilling holes, avoid the water pipes and power cables buried in the wall.



2.2 Installing a Backup Box

NOTE

- M6x60 expansion bolts are delivered with the Backup Box. If the length and number of the bolts do not meet installation requirements, prepare M6 stainless steel expansion bolts by yourself.
- The expansion bolts delivered with the inverter are mainly used for solid concrete walls. For other types of walls, prepare bolts by yourself and ensure that the wall meets the load bearing requirements of the inverter.
- In residential areas, do not install the inverter on drywalls or walls made of similar materials which have a weak sound insulation performance because the noise generated by the inverter is noticeable.



3 Electrical Connection

3.1 Preparations

NOTICE

- Connect cables in accordance with local installation laws and regulations.
- Before connecting cables, ensure that the circuit breaker on the Backup Box and all the switches connecting to the Backup Box are set to OFF position. Otherwise, the high voltage of the Backup Box may result in electric shocks.
- After opening the device panel of the Backup Box, remove the shockproof foam. Otherwise, the circuit breaker cannot work properly.
- If the external AC switch can perform earth leakage protection, the rated leakage action current should be greater than or equal to 100 mA.
- If multiple SUN2000s connect to the general residual current device (RCD) through their respective external AC switches, the rated leakage action current of the general RCD should be greater than or equal to the number of SUN2000s multiplied by 100 mA.

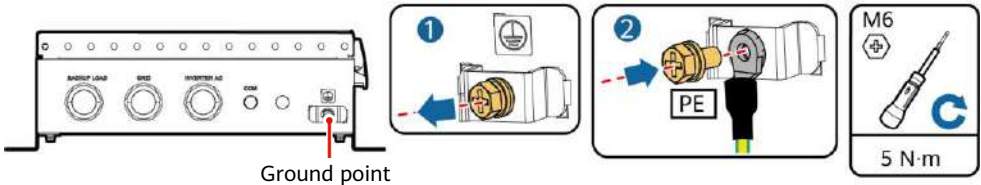
Prepare cables based on site requirements.

No.	Cable	Type	Conductor Cross-Sectional Area Range	Outer Diameter
1	PE cable	Single-core outdoor copper cable	4-10 mm ²	N/A
2	Off-grid load output power cable	Outdoor copper cable	4-6 mm ²	10-21 mm
3	Grid AC output power cable	Outdoor copper cable	4-6 mm ²	10-21 mm
4	Inverter AC input power cable	Outdoor copper cable	4-6 mm ²	10-21 mm
5	Signal cable	Two-core outdoor shielded twisted pair cable	0.20-1 mm ²	4-8 mm

3.2 Installing a PE Cable

DANGER

Do not connect the neutral wire to the enclosure as a PE cable. Otherwise, electric shocks may occur.



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3.3 Installing an Output Power Cable for Off-Grid Loads

NOTE

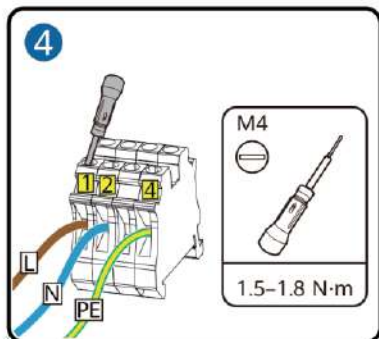
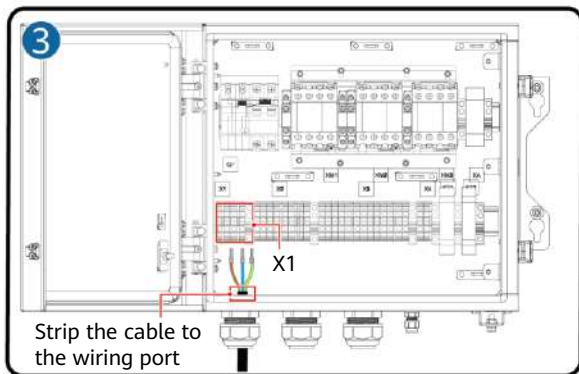
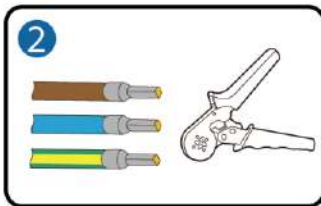
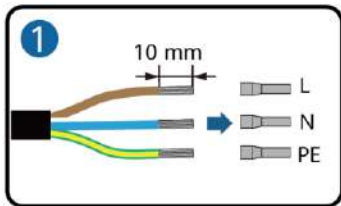
Before installing a cable, open the panel of the Backup Box, route the cable through the off-grid load port, and connect the cable. After all cables are connected, reinstall the panel.

Off-Grid Load Terminal (X1)

No.	1	2	3	4
Single-Phase	L	N	-	PE

Off-Grid Load Terminal (X1)

No.	1	2	3	4
Three-Phase	L	N	-	PE



IB02120001

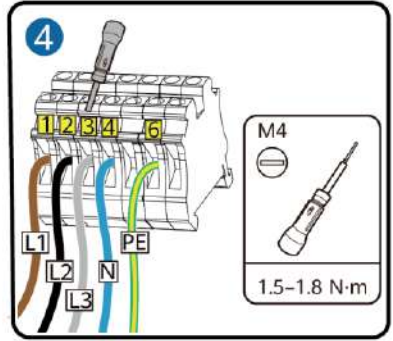
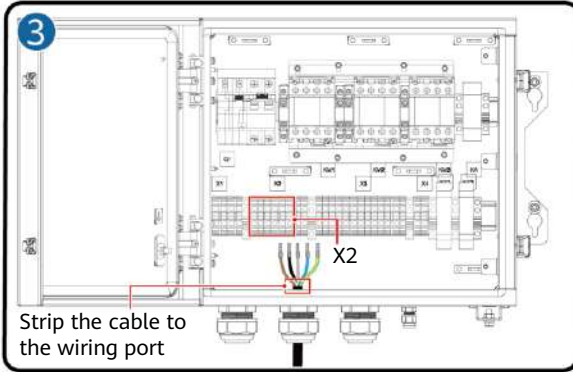
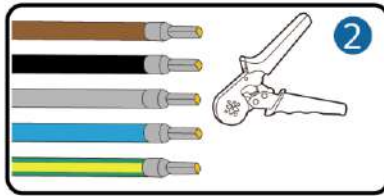
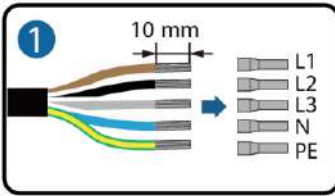
3.4 Installing a Grid AC Output Power Cable

Connecting Grid AC Terminals (X2)

No.	1	2	3	4	5	6	7
Single-Phase	L	-	-	N	-	PE	-

Connecting Grid AC Terminals (X2)

No.	1	2	3	4	5	6	7
Three-Phase	L1	L2	L3	N	-	PE	-



IB02I20002

NOTICE

If multiple inverters are connected in parallel, the connection of AC power cables L1, L2, and L3 on the power grid side of the Backup Boxes connected to each inverter must be the same.

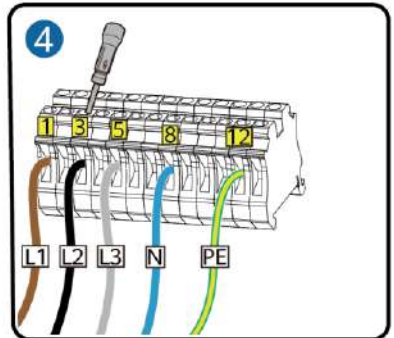
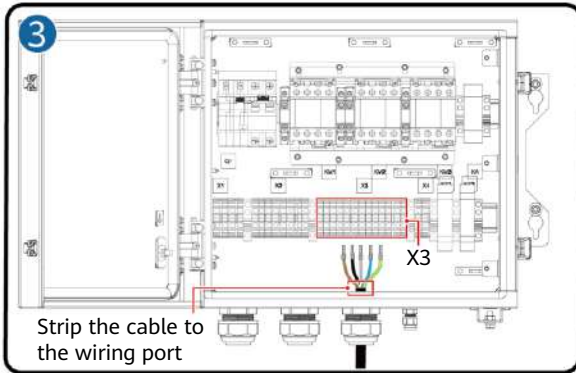
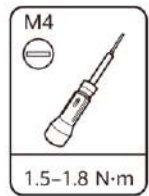
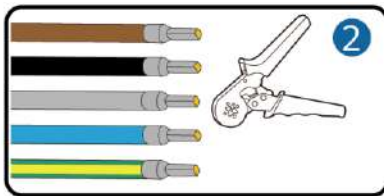
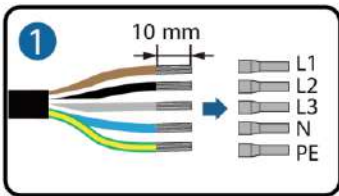
3.5 Installing an Inverter AC Input Power Cable

Connecting AC Input Terminals of the Inverter (X3)

No.	1	2	3	4	5	6	7	8	9	10	11
Single-Phase	-	L	-	-	-	N	-	-	-	PE	-

Connecting AC Input Terminals of the Inverter (X3)

No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Three-Phase	L1	-	L2	-	L3	-	-	N	-	-	-	PE	-

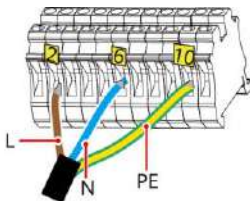


IB02120003

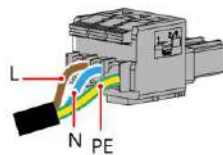
NOTICE

The sequence of connecting the cables to a single-phase Backup Box and to the AC terminals L, N, and PE on the inverter must be the same. The sequence of connecting the cables to a three-phase Backup Box and to the AC terminals L1, L2, and L3 on the inverter must be the same. Otherwise, the device cannot work properly. (As shown in the following figures, connect the cables to a single-phase Backup Box in the sequence of L, N, and PE from left to right, and connect the cables to a three-phase Backup Box in the sequence of L1, L2, and L3.)

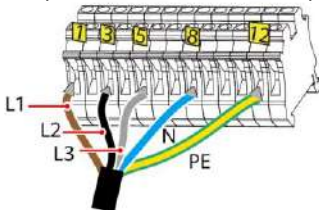
Backup Box-side terminal (single-phase)



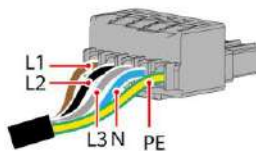
Inverter-side terminal (single-phase)



Backup Box-side terminal (three-phase)



Inverter-side terminal (three-phase)



IB02120004

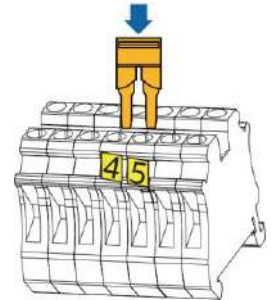
3.6 Installing a Short-Circuiting Plate

DANGER

- When installing a short-circuiting plate, ensure that it is inserted into the correct port and securely installed to avoid short circuits caused by incorrect installation.
- If no short-circuiting plate is installed, the neutral wire will be suspended in off-grid mode, but the off-grid/grid-tied switching function is not affected. You are advised to install a short-circuiting plate according to the local power grid standard.

Neutral Wire Connected

If the neutral wire cannot be disconnected from the power grid in off-grid mode (such as in Australia), insert the short-circuiting plate between 4 and 5 of the AC terminal X2 according to the local power grid standard.



IB02H00003

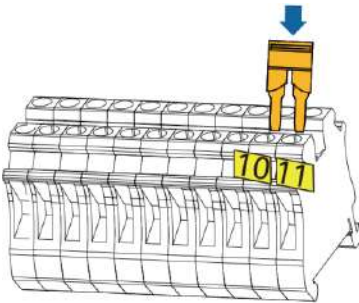
Power grid AC terminal X2 (Single-Phase/Three-Phase)

NOTE

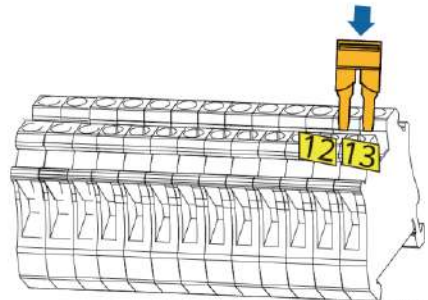
The short-circuiting bar delivered with the product is bound to the ground cable inside the chassis.

Neutral Wire Disconnected

If the neutral wire needs to be disconnected in off-grid mode (such as in German), according to the local power grid standard, insert the short-circuiting plate between 10 and 11 of the AC terminal X3 for the single-phase Backup Box. Insert the short-circuiting plate between 12 and 13 of the AC terminal X3 for the three-phase Backup Box.



Inverter AC terminal X3 (single-phase)



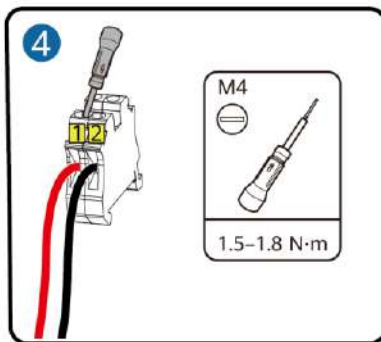
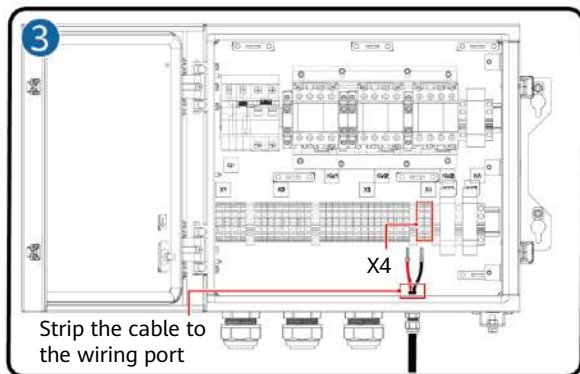
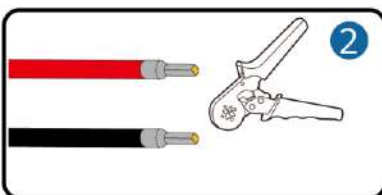
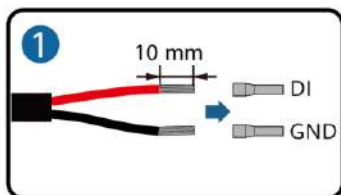
IB02H00004

Inverter AC terminal X3 (three-phase)

3.7 Installing Signal Cables

Communications Terminal Definition

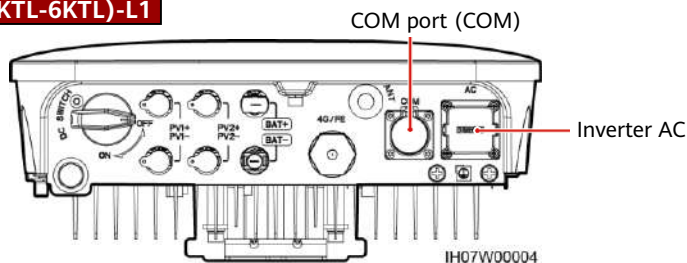
No.	Label	Definition	Note
1	DI	Digital input signal+	Connects to the positive pole of the DI port and functions as the port for the Backup Box to send feedback signals.
2	GND	GND of the DI port	Connects to the GND of the DI port.



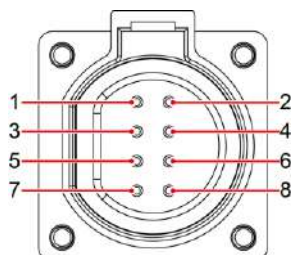
IB02120005

3.8 Connecting Signal Cables on the Inverter Side

SUN2000-(2KTL-6KTL)-L1





COM Port Pin Definitions





IS05W00024

No.	Label	Definition	Description
5	GND	GND	Connects to the GND of the DI2 port.
8	DI2	Digital input signal 2+	Connects to the positive terminal of DI2 and functions as the port for the Backup Box to send feedback signals.

8. After ensuring that the load circuit is normal, turn on the AC switch of the Backup Box.
9. Observe the LED indicators on the front of the inverter to check the running status of the inverter.

Category	Status (Blinking orange at long intervals , On for 1s and then Off for 1s)		Definition
Running indication			N/A
	Steady green	Steady green	On-grid
	Steady orange	Steady orange	Backup
	Blinking orange at long intervals	Off	Standby in backup mode
	Blinking orange at long intervals	Blinking orange at long intervals	Overload in backup mode

NOTE

If the off-grid load is overloaded, indicators  and  on the inverter blink orange slowly. Reduce the off-grid load power and manually clear the alarm or until the inverter is recovered. The inverter attempts to restart at an interval of 5 minutes. If the inverter fails to restart for three times, the interval changes to 2 hours. If the inverter is standby in off-grid mode, check the inverter alarms and rectify the fault.

6 System Commissioning

NOTE

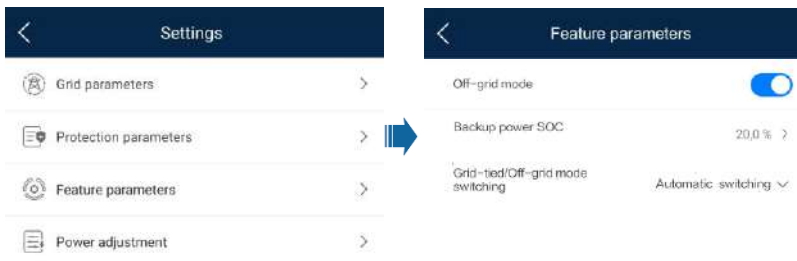
During system deployment, the AC power supply needs to be connected to ensure that the off-grid/grid-tied switching function of the Backup Box can be verified.

Download and install the latest version of the FusionSolar app by referring to the quick guide for the corresponding inverter model or the *FusionSolar App Quick Guide*. Register an installer account and create a plant and owner (skip this step if an account has been created). You can scan the QR code to obtain the *FusionSolar App Quick Guide*.







Parameter Settings

Open the FusionSolar app, log in to intl.fusionsolar.huawei.com using the installer account, choose **My > Device Commissioning**, and connect to the WLAN hotspot of the solar inverter. On the home page, choose **Setting > Feature parameters** to set the off-grid/grid-tied control parameters.



Parameter	Settings	Value
Off-grid mode	If this parameter is enabled, the Backup Box switches to the off-grid mode when the grid fails. This parameter can be set only when the Backup Box is configured. If the Backup Box is not configured, this parameter cannot be enabled. Otherwise, an alarm is generated.	<ul style="list-style-type: none"> • Enable • Disabled (default)
Backup power SOC	Sets the backup power SOC. In grid-tied mode, the battery does not discharge when it is discharged to the backup power SOC. When the grid fails, the battery supplies power to loads in off-grid mode until it reaches the end-of-discharge capacity.	[20%, 100%] Default value: N/A
Grid-tied/Off-grid mode switching	If this parameter is set to Automatic switching, the system switches to the off-grid mode when the grid fails, and switches to the grid-tied mode when the grid recovers. If this parameter is set to Manual switching, you need to log in to the app and connect the inverter to enable the off-grid mode when the grid fails.	<ul style="list-style-type: none"> • Automatic switching (default) • Manual switching

Verifying the Off-grid/Grid-tied Switching Function

1. Power on the Backup Box according to the power-on procedure, wait for the inverter to connect to the power grid, and log in to the app to enable **Off-grid mode**.
2. Turn off the AC switch in the PDB between the Backup Box and the power grid, and check whether the off-grid output is normal. The inverter indicators  and  are steady orange. (If the AC switch between the inverter and the Backup Box is turned off, the off-grid switching is not triggered and the inverter is in off-grid standby mode.)
3. Turn on the AC switch in the PDB between the Backup Box and the power grid. The inverter indicators  and  blink green slowly until the inverter is connected to the power grid.

7 Routine Maintenance

To ensure the long-term and proper running of the system, you are advised to perform routine maintenance on the Backup Box periodically.

1. Check the system cleanliness, system running status, electrical connection, and grounding reliability every half year.
2. Check whether the off-grid/grid-tied switching function is normal each quarter.

8 Troubleshooting

1. Backup Box checking solution:

After arriving at the site, the personnel can check whether the Backup Box is damaged as follows:

- a. It is recommended that loads be disconnected before checking.
- b. Use a multimeter to check the connectivity between the Backup Box terminals, as shown in the following tables.

Single-Phase Backup Box

No.	Wiring Requirements			Detection Terminal				
	Circuit Breaker (QF)	Grid	Inverter	X4-1 & X4-2 COM-1 & COM-2	X2-1 & X3-2 GRID-L & INVERTER-L	X3-6 & X3-10 INVERTER-N & INVERTER-PE	X2-1 & X1-1 GRID-L & LOAD-L	X3-6 & X1-2 INVERTER-N & LOAD-N
1	On	Power off	Shutdown	Connected	Disconnected	Disconnected	Disconnected	Connected
2	On	Power on	Shutdown	Disconnected	Connected	Disconnected	Connected	Connected
3	On	Power off	Off-grid output	Connected	Disconnected	Connected	Disconnected	Connected

Three-Phase Backup Box

No.	Wiring Requirements			Detection Terminal				
	Circuit Breaker (QF)	Grid	Inverter	X4-1 & X4-2 COM-1 & COM-2	X2-1 & X3-1 GRID-L1 & INVERTER-L1	X3-3 & X3-8 INVERTER-L2 & INVERTER-N	X2-1 & X1-1 GRID-L1 & LOAD-L	X3-3 & X1-2 INVERTER-L2 & LOAD-N
1	On	Power off	Shutdown	Connected	Disconnected	Disconnected	Disconnected	Disconnected
2	On	Power on	Shutdown	Disconnected	Connected	Disconnected	Connected	Disconnected
3	On	Power off	Off-grid output	Connected	Disconnected	Connected	Disconnected	Connected

- c. If the conduction status of an item is inconsistent with that in the tables, the Backup Box is damaged.
2. If the mains recovers but the inverter still works in off-grid state (LED1 and LED2 are steady orange), contact the customer service personnel or dealer for repair.
3. If the off-grid mode is enabled when no Backup Box is connected, an alarm indicating that the Backup Box is abnormal is reported when the AC power supply is disconnected. In this case, the fault cannot be rectified. The fault is rectified only after the inverter and battery are powered off.
4. If the Backup Box is used for the first time and is not used later, you must disable the off-grid mode when the inverter is running properly. Otherwise, you need to power on the inverter again and modify the settings.
5. If the single-phase Backup Box generates abnormal noises during repeated switching, check whether the inverter AC terminal is reversely connected to the power grid AC terminal.

9 Customer Service Contact Information

Customer Service Contact			
Region	Country	Service Support Email	Phone
Europe	France	eu_inverter_support@huawei.com	0080033888888
	Germany		
	Spain		
	Italy		
	UK		
	Netherlands		
	Other countries		
Asia Pacific	Australia	eu_inverter_support@huawei.com	1800046639
	Turkey	eu_inverter_support@huawei.com	N/A
	Malaysia	apsupport@huawei.com	0080021686868 /1800220036
	Thailand		(+66) 26542662 (charged by local call)
			1800290055 (free in Thailand)
	China	solarservice@huawei.com	400-822-9999
	Other countries	apsupport@huawei.com	0060-3-21686868
Japan	Japan	Japan_ESC@ms.huawei.com	0120258367
India	India	indiaenterprise_TAC@huawei.com	1800 103 8009
South Korea	South Korea	Japan_ESC@ms.huawei.com	N/A
North America	USA	eu_inverter_support@huawei.com	1-877-948-2934
	Canada	eu_inverter_support@huawei.com	1-855-482-9343
Latin America	Mexico	la_inverter_support@huawei.com	018007703456 /0052-442-4288288
	Argentina		0-8009993456
	Brazil		0-8005953456
	Chile		800201866 (only for fixed)
	Other countries		0052-442-4288288
Middle East and Africa	Egypt	eu_inverter_support@huawei.com	08002229000 /0020235353900
	UAE		08002229000
	South Africa		0800222900
	Saudi Arabia		8001161177
	Pakistan		0092512800019
	Morocco		0800009900
	Other countries		0020235353900