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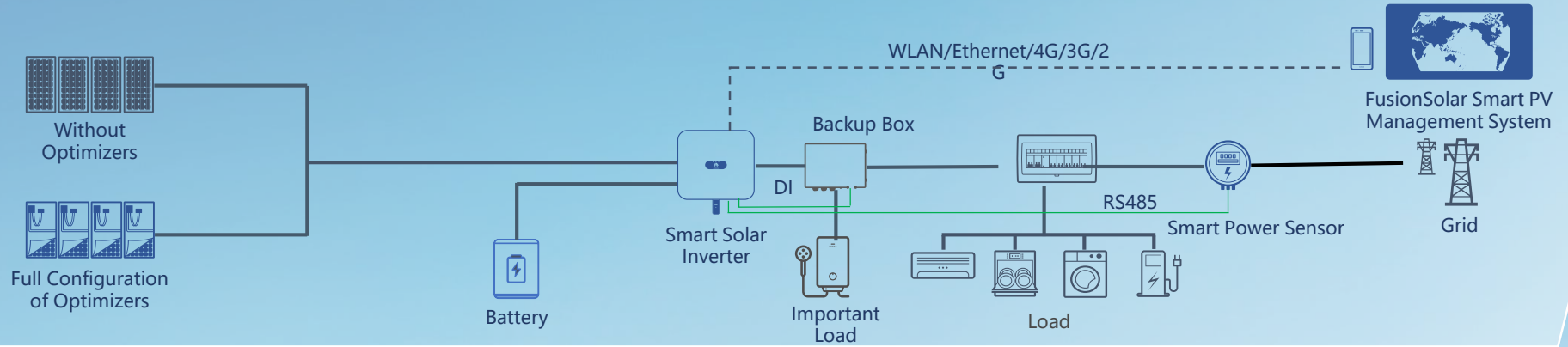
community.solar.huawei.com



FusionSolar Residential Smart PV Solution Overview

Residential

(≤ 10 kW)



Smart Solar Inverter

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

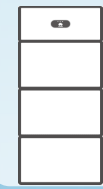
Single-phase



Smart Solar Inverter

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

Three-phase



Residential Battery

LUNA2000-(5-30)-S0



Backup Box

Backup Box-B0 (single-phase)
Backup Box-B1 (three-phase)



Smart PV Optimizer

SUN2000-450W-P



Smart Dongle

Smart Dongle-WLAN-FE
Smart Dongle-4G



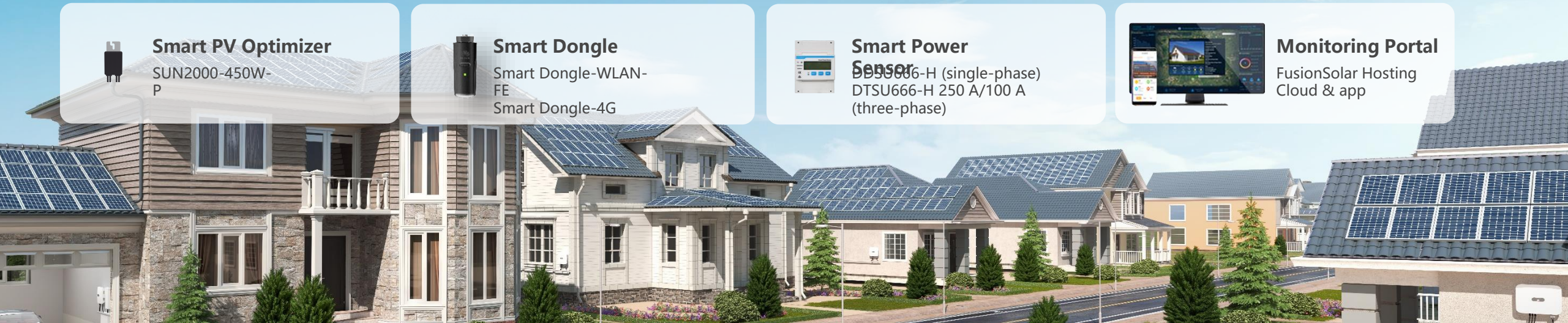
Smart Power Sensor

DTSU666-H (single-phase)
DTSU666-H 250 A/100 A (three-phase)



Monitoring Portal

FusionSolar Hosting Cloud & app



Contents

01 Products

02 Installation

03 Commissioning

04 Maintenance and
Troubleshooting

1.1 FusionSolar Residential Inverter



**SUN2000-
2/3/3.68/4/4.6/5/6KTL-L1**
(Single-phase inverter)

MPPT/Inputs: 2/2

Local commissioning:

- Built-in WLAN

Communication:

- Built-in WLAN (standard configuration)

- Smart Dongle-WLAN-FE (optional)

- Smart Dongle-4G (optional)

AFCI: Yes

Compatible optimizer: SUN2000-450W-P

Battery: LG and Huawei

Incompatible with SUN2000P-375W and SmartPSB2000L (to be compatible after spare part replacements in 2021)

SUN2000L-2-5KTL: EOM; replaced by SUN2000-2/3/3.68/4/4.6/5/6KTL-L1



SUN2000-3/4/5/6/8/10KTL-M1
(Three-phase inverter)

MPPT/Inputs: 2/2

Local commissioning:

- Built-in WLAN

Communication:

- Smart Dongle-WLAN-FE (standard configuration)

- Smart Dongle-4G (optional)

AFCI: Yes

PID Recovery: Yes

Ripple Control Interface: Yes

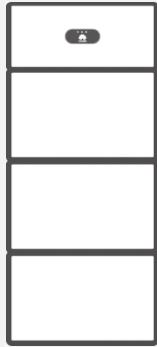
Battery: Huawei

Compatible optimizer: SUN2000-450W-P

Incompatible with SUN2000P-375W and SmartPSB2000L

SUN2000-3/4/5/6/8/10KTL-M0: replaced by SUN2000-3/4/5/6/8/10KTL-M1

1.2 Battery



Battery

LUNA2000-(5-30)-S0

Capacity: 5 kWh for a single module, supporting the cascading of two batteries with a maximum of 30 kWh capacity

DC/DC output power: 5 kW

DC/DC peak output power: 7 kW, 10s

5 kWh battery expansion module power: 2.5 kW

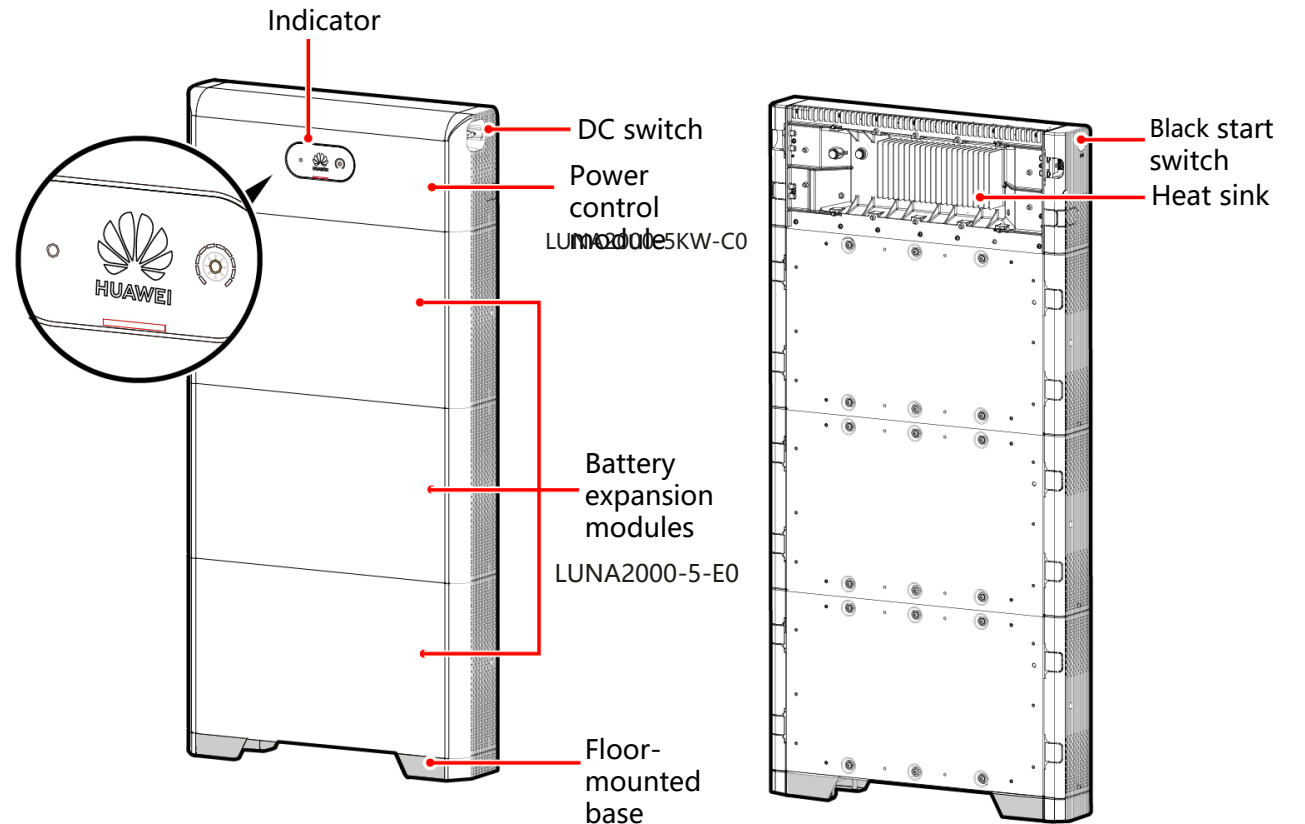
Cell type: LiFePO₄

Supported inverter: SUN2000-(2KTL-6KTL)-L1/SUN2000-(3KTL-12KTL)-M1 (The 12KTL model is sold only in China.)

Hybrid use of old and new batteries: supported

Installation mode: floor- and support-mounted installation

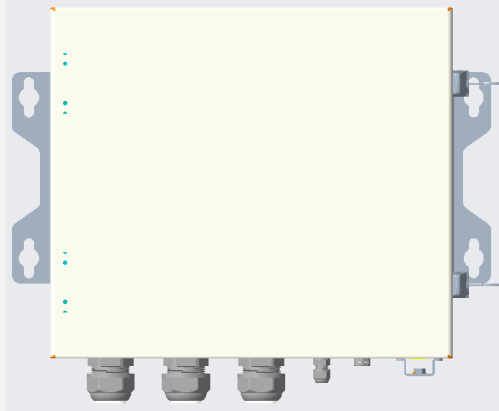
Battery Appearance



IB01W00004

1.3 Backup Box

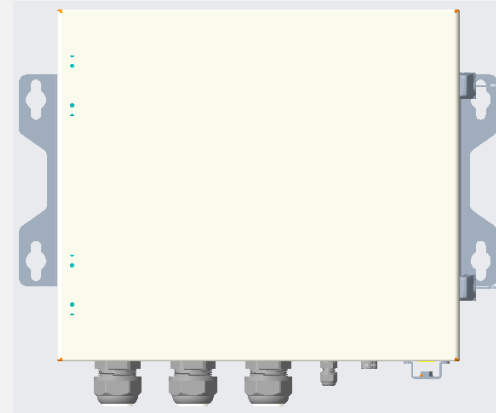
**Backup Box-B0
(single-phase Backup Box)**



Backup Gri Inverter COM(DI)
Load d AC

Supported inverter: SUN2000-2/3/3.68/4/4.6/5/6KTL-L1
Rated voltage: 220 V/230 V
AC output voltage range: 198 V–253 V
Switching time: 3s
Overload auto-recovery in off-grid mode: supported
Maximum off-grid apparent power: 5000 VA

**Backup Box-B1
(three-phase Backup Box)**



Backup Inverter COM(DI)
Load AC Gri

Supported inverter: SUN2000-5/6/8/10/12KTL-M1
Rated voltage: 380 V/400 V
AC output voltage range:
On-Grid: 3 phase, 342 V–440 V
Off-Grid: Single phase, 220/230V
Switching time: 3s
Overload auto-recovery in off-grid mode: supported
Maximum off-grid apparent power: 3300 VA for all M1 modules

1.4 Optimizer and Smart Power Sensor



**Smart PV Optimizer
SUN2000-450W-P**

- Communicates with inverters over the DC MBUS
- Supports maximum power point tracking (MPPT) control of PV modules
- Supports module-level monitoring
- The open-circuit impedance is 1 k Ω ($\pm 10\%$) after the input cables are correctly connected
- Reduces the PV string cable voltage to the safety voltage (compliant with the NEC 2017 standard) when the inverter shuts down

Compatible with SUN2000-2-6KTL-L1 and SUN2000-3-10KTL-M1
Incompatible with SUN2000P-375W and SmartPSB2000L



**Smart Power Sensor
DDSU666-H (single-phase)
DTSU666-H 250 A (three-phase)
DTSU666-H 100 A (three-phase)**

- Connect to an inverter over RS485
- Bi-directional grid meter, which can collect statistics on the online power and purchased power
- Measure the input and output power for export limitation
- Current transformer included

1.5 Smart Dongle



Smart Dongle-WLAN-FE

- Supports a maximum of 10 inverters, but only 3 inverters can be cascaded when configured with LUNA2000
- Provides a plug & play USB interface for connecting to inverters and management systems over WLAN or FE
- Local Firmware Upgrade: Supported when the APP connect to Dongle WLAN

Smart Dongle-WLAN: replaced by Smart Dongle-WLAN-FE



Smart Dongle-4G

- Supports a maximum of 10 inverters, but only 3 inverters can be cascaded when configured with LUNA2000
- Provides a plug & play USB interface for connecting to inverters and management systems over 4G
- Local Firmware Upgrade: Not supported

SUN2000-3-10KTL-M0 Compatibility with LUNA2000

PCN Information

Before	After
Compatible Inverter Models with LUNA2000 Smart	Compatible Inverter Models with LUNA2000 Smart
SUN2000-3/4/5/6/8/10KTL-M0 SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 SUN2000-3/4/5/6/8/10KTL-M1	SUN2000-3/4/5/6/8/10KTL-M0 (limited supporting*) SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 SUN2000-3/4/5/6/8/10KTL-M1

*Note: Distributors and customers can identify whether an M0 series inverter is compatible with LUNA2000 Smart

String ESS based on the series number (SN) of SUN2000-3/4/5/6/8/10KTL-M0.

Unsupported Version: SN between **HV191XXXXXX~HV199XXXXXX** are not compatible with LUNA2000 Smart ESS.

The rest of the M0 version are supported after FW is upgraded, which will be released on XXX.XXX.2021

Example:

To resolve the issue, if customers buy LUNA2000 Smart String ESS, Huawei will provide SUN2000-3/4/5/6/8/10KTL-M1 for free to replace the M0 of unsupported version and arrange recycling of the M0.

1.6 Residential Accessory Packages_available for sale

Product	Accessory BOM Number	Configuration Rule (the default value is 1%, rounded up)
LUNA2000-(5-30)-S0	21155238	Accessories for wall-mounted installation
	02233EHU	14191131: female PV connector, 2 PCS 14191133: male PV connector, 2 PCS 14180540: signal terminal, 1 PCS
	21206195	Plastic protective cover
SUN2000-2/3/3.68/4/4.6/5/6KTL-L1	02233DXX	Inverter Accessory Package The default value is 1% (rounded up). You can adjust the proportion. Key components in the accessory package: 14191131: female PV connector, 3 PCS 14191133: male PV connector, 3 PCS 14190919: AC connector, 1 PCS 14210053-002: COM connector, 1 PCS
SUN2000-3/4/5/6/8/10KTL-M1	02232UEP	Inverter Accessory Package The default value is 1% (rounded up). You can adjust the proportion. Key components in the accessory package: 14190937: female PV connector, 2 PCS 14190939: male PV connector, 2 PCS 14191312: AC connector, 1 PCS 14191328: DC female connector for battery, 1 PCS 14191330: DC male connector for battery, 1 PCS 14191315: COM connector, 1 PCS

1.7 FusionSolar App, Management System



FusionSolar App(7.0)

- Supports inverter commissioning and plant registration on the management system
- Auto-detection of system devices
- Allows user to register a PV plant by scanning any device in the PV plant



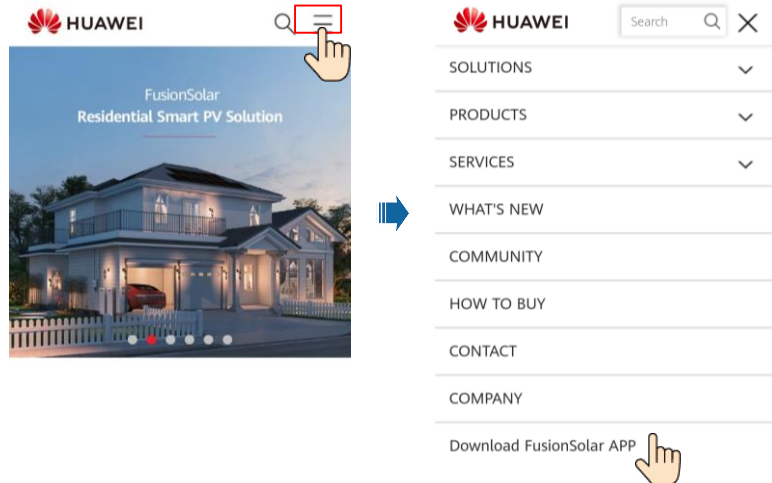
FusionSolar Smart PV Management System

- Unified address
<https://intl.fusionsolar.huawei.com>
- Real-time energy monitoring
- Smart I-V Curve Diagnosis
- Demo site available for all customers

Downloading the FusionSolar App

Method 1: Search for **FusionSolar** in Huawei AppGallery to download and install the app.

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



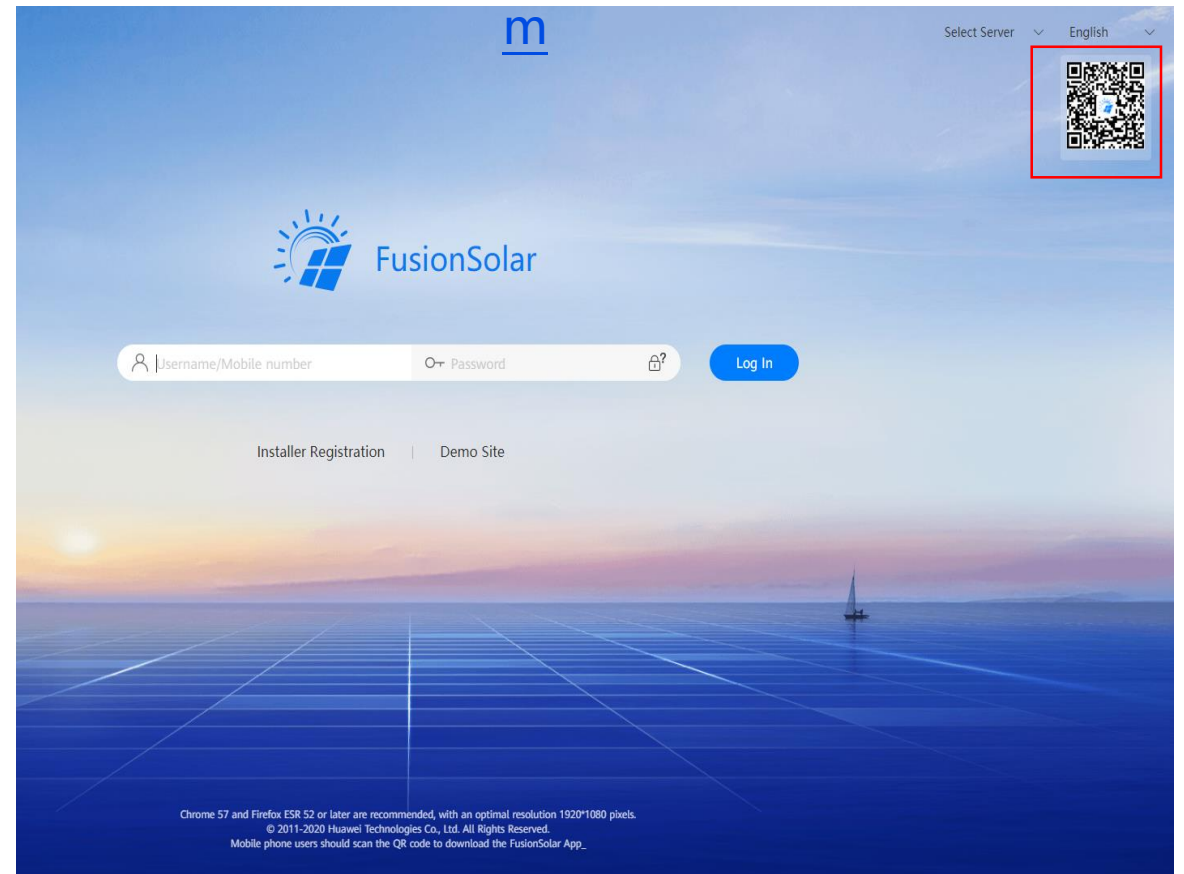
Method 3: Scan the QR code to download and install the app.



FusionSolar APP

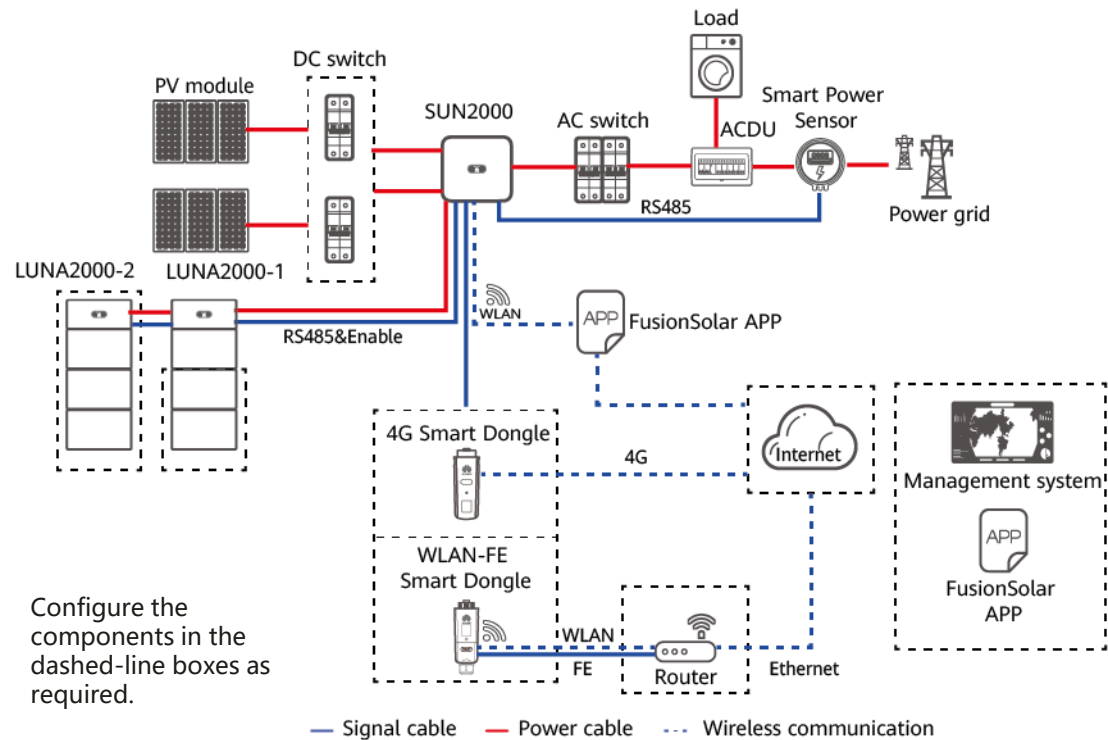
QR code link:
<https://intl.fusionsolar.huawei.com/pvmswebsite/nologin/assets/build/index.html#/jumppage>

<https://intl.fusionsolar.huawei.com>



1.9 Grid-tied ESS Networking 1

Compatible Optimizer	Inverter	Smart Power Sensor	Battery	Number of Cascaded Inverters	Backup Box	Communication	Management System
SUN2000-450W-P (Optional)	SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 or SUN2000 3/4/5/6/8/10KTL-M1	<ul style="list-style-type: none"> • DDSU666-H (single-phase) • DTSU666-H 250 A/100 A (three-phase) 	<ul style="list-style-type: none"> • HUAWEI LUNA2000-(5-30)-S0 	N/A	No	<ul style="list-style-type: none"> • Local commissioning: built-in WLAN of the inverter • (Standard configuration) WLAN communication: built-in WLAN of the inverter • (Optional) Ethernet communication: Smart Dongle-WLAN-FE • (Optional) 4G communication: Smart Dongle-4G 	FusionSolar



Optimizer (optional):

The optimizer for the SUN2000-450W-P is installed at the rear of PV modules.

Commissioning:

- **Local commissioning:** The inverter communicates with the FusionSolar app over the built-in WLAN.
- **Remote management:**
 - Built-in WLAN of the inverter (standard configuration)
 - Smart Dongle-WLAN-FE (optional)
 - Smart Dongle-4G (optional)

Communicates with the FusionSolar smart PV management system to register and manage PV plants.

Supported inverter:

SUN2000-(2KTL-6KTL)-L1 or SUN2000-(3KTL-10KTL)-M1

Smart Power Sensor (optional):

- DDSU666-H (single-phase)
- DTSU666-H 250 A/50 mA (three-phase)

Connects to inverters over RS485 for output power management and export limitation.

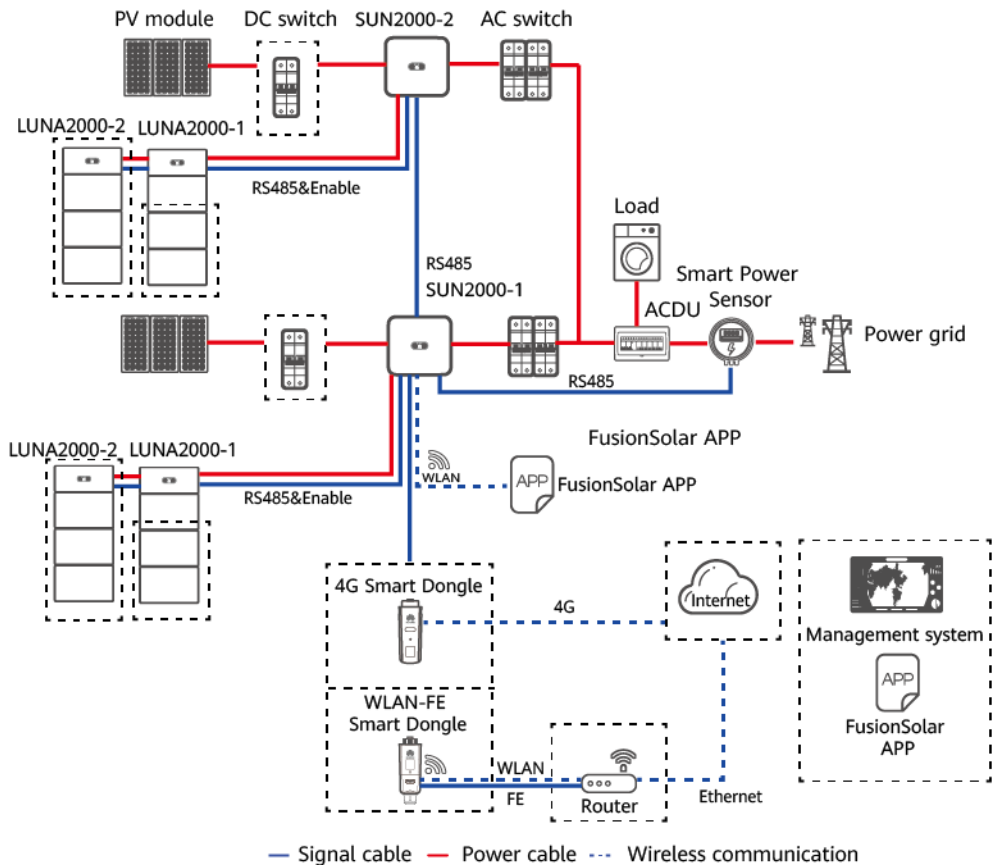
Battery working mode:

Supports the maximum self-consumption, time-of-use, and fully fed to the grid modes.

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1.9 Grid-tied ESS Networking 2

Compatible Optimizer	Inverter	Smart Power Sensor	Battery	Number of Cascaded	Smart Backup Box	Communication	Management System
SUN2000-450W-P (Optional)	SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 or SUN2000 3/4/5/6/8/10KTL-M1	<ul style="list-style-type: none"> • DDSU666-H (single-phase) • DTSU666-H 250 A/100 A (three-phase) 	<ul style="list-style-type: none"> • HUAWEI LUNA2000-(5-30)-S0 	≤ 3 (If the cascading system has batteries or single-phase inverters, only three inverters can be cascaded.)	No	<ul style="list-style-type: none"> • Local commissioning: built-in WLAN of the inverter • (Standard configuration) WLAN communication: built-in WLAN of the inverter • (Optional) Ethernet communication: Smart Dongle-WLAN-FE • (Optional) 4G communication: Smart Dongle-4G 	FusionSolar



Optimizer (optional):

The optimizer for the SUN2000-450W-P is installed at the rear of PV modules.

Commissioning:

- **Local commissioning:** The inverter communicates with the FusionSolar app over the built-in WLAN.
- **Remote management:**
 - Built-in WLAN of the inverter (standard configuration)
 - Smart Dongle-WLAN-FE (optional)
 - Smart Dongle-4G (optional)

Communicates with the FusionSolar smart PV management system to register and manage PV plants.

Supported inverter:

SUN2000-(2KTL-6KTL)-L1 or SUN2000-(3KTL-10KTL)-M1. Single-phase and three-phase inverters can be cascaded.

Smart Power Sensor (optional):

- DDSU666-H (single-phase)
- DTSU666-H 250 A/50 mA (three-phase)

Connects to inverters over RS485 for output power management and export limitation.

Battery working mode:

Supports the maximum self-consumption, time-of-use, and fully fed to the grid modes. When **the grid charging function is enabled**, the surplus PV power can be converted to AC output through the inverter and then charged to other batteries in grid reverse charging mode.

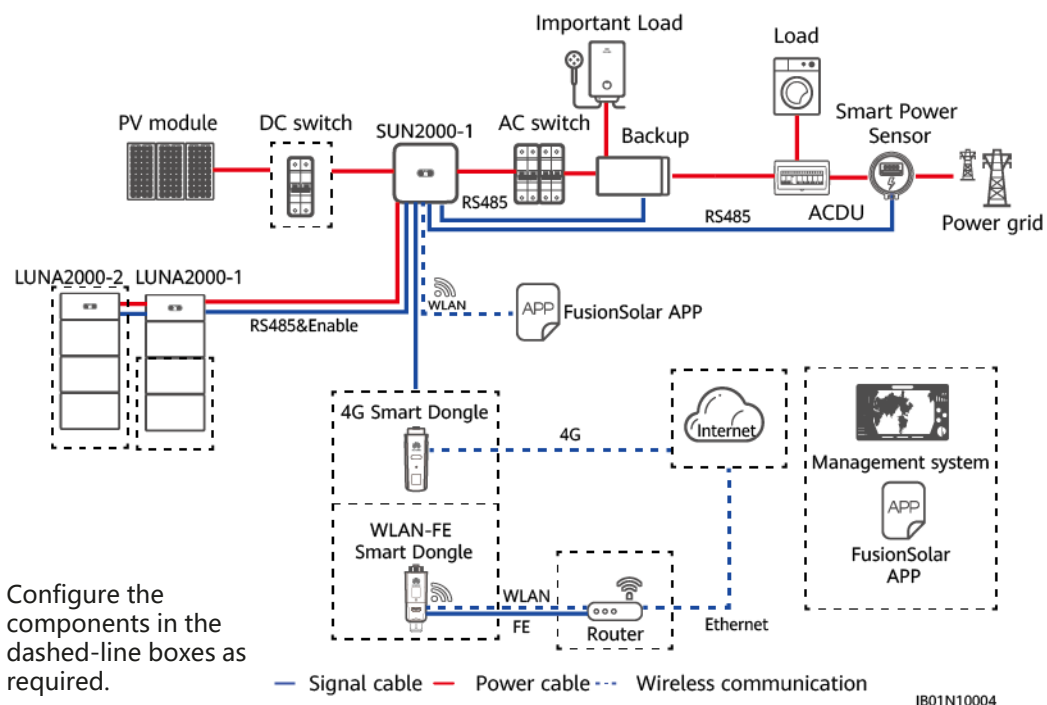
Note:

1. The parameters for the battery and Backup Box of each inverter need to be set separately.
2. The battery, power meter, and Smart Dongle must be connected to the same inverter.

1.10 Grid-tied and Off-grid ESS Networking 1

Compatible Optimizer	Inverter	Smart Power	Battery	Number of Inverters	Backup Box	Communication	Management System
SUN2000-450W-P (Optional)	SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 or SUN2000 3/4/5/6/8/10K TL-M1	<ul style="list-style-type: none"> DDSU666-H (single-phase) DTSU666-H 250 A/100 A (three-phase) 	<ul style="list-style-type: none"> HUAWEI LUNA2000-(5-30)-S0 	≤ 3 (If the cascading system has batteries or single-phase inverters, only three inverters can be cascaded.)	BackupBox-B0 (works with single-phase inverters) BackupBox-B1 (works with three-phase inverters; off-grid output single-phase voltage)	<ul style="list-style-type: none"> Local commissioning: built-in WLAN of the inverter (Standard configuration) WLAN communication: built-in WLAN of the inverter (Optional) Ethernet communication: Smart Dongle-WLAN-FE (Optional) 4G communication: Smart Dongle-4G 	FusionSolar

Applies to areas where the grid is unstable. When the grid fails, batteries discharge to supply power to primary loads.



Optimizer (optional):

The optimizer for the SUN2000-450W-P is installed at the rear of PV modules.

Commissioning:

- **Local commissioning:** The inverter communicates with the FusionSolar app over the built-in WLAN.
- **Remote management:**
 - Built-in WLAN of the inverter (standard configuration)
 - Smart Dongle-WLAN-FE (optional)
 - Smart Dongle-4G (optional)

Communicates with the FusionSolar smart PV management system to register and manage PV plants.

Supported inverter:

SUN2000-(2KTL-6KTL)-L1 or SUN2000-(3KTL-10KTL)-M1.

Smart Power Sensor (optional):

- DDSU666-H (single-phase)
- DTSU666-H 250 A/50 mA (three-phase)

Connects to inverters over RS485 for output power management and export limitation.

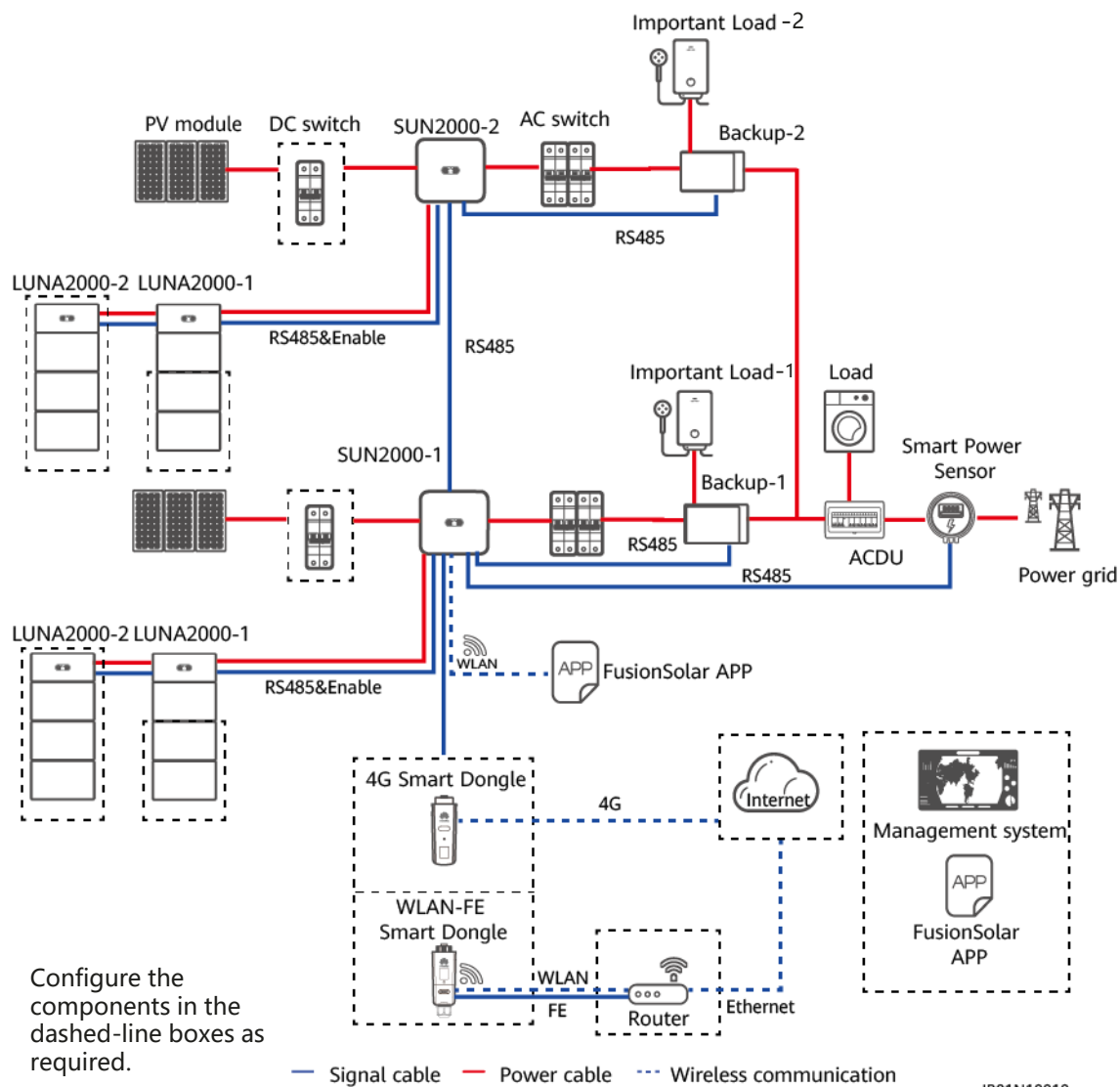
Battery working mode:

Supports the maximum self-consumption, time-of-use, and fully fed to the grid modes.

Note:

1. The power of primary loads does not exceed the maximum off-grid output power of the inverter. **The SUN2000 2-6KTL L1 output capacity does not exceed the rated output power of the inverter, and the SUN2000 3-10KTL M1 does not exceed 3.3 KVA for all modules.**
2. The parameters for the battery and Backup Box of each inverter need to be set separately.

1.11 Grid-tied and Off-grid ESS Networking 2



Inverter	Smart Power	Battery	Number of Inverters	Backup Box
SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 or SUN2000 3/4/5/6/8/10KT L-M1	<ul style="list-style-type: none"> DDSU666-H (single-phase) DTSU666-H 250 A/100 A (three-phase) 	<ul style="list-style-type: none"> HUAWEI LUNA2000-(5-30)-S0 	≤ 3 (If the cascading system has batteries or single-phase inverters, only three inverters can be cascaded.)	BackupBox-B0 (works with single-phase inverters) BackupBox-B1 (works with three-phase inverters; off-grid output single-phase voltage)

Supported inverter:

SUN2000-(2KTL-6KTL)-L1 or SUN2000-(3KTL-10KTL)-M1.

Smart Power Sensor (optional):

- DDSU666-H (single-phase)
- DTSU666-H 250 A/50 mA (three-phase)

Connects to inverters over RS485 for output power management and export limitation.

Battery working mode:

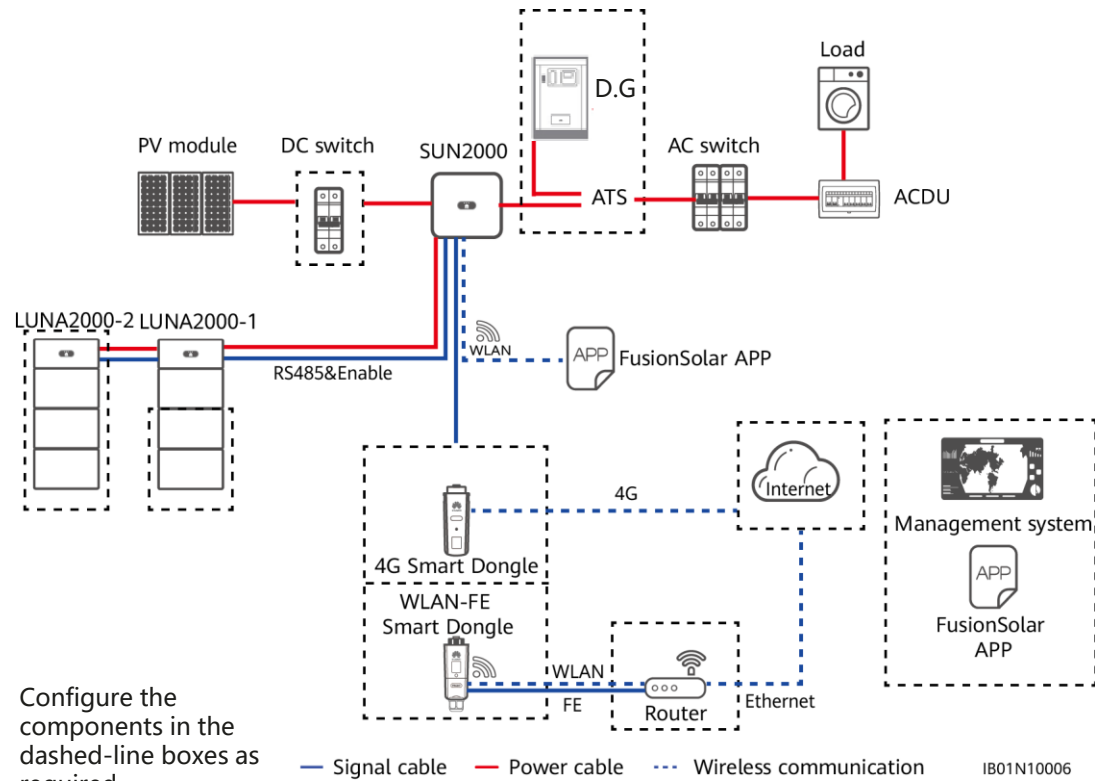
Supports the maximum self-consumption, time-of-use, and fully fed to the grid modes.

Note:

- When the grid charging function is enabled, the surplus power generated by the inverter without batteries can be used to charge the inverter connected to the batteries.
- The power of primary loads does not exceed the maximum off-grid output power of the inverter. The single-phase load does not exceed the rated output power of the inverter, and the three-phase load does not exceed 1/3 of the rated output power of the inverter.
- When inverters are connected in parallel, the phase and frequency of the output voltage of cascaded inverters are not synchronized in off-grid state. Therefore, the primary load output side of the Backup Boxes connected to each inverter does not support parallel connection.
- The parameters for the battery and Backup Box of each inverter need to be set separately.

1.12 Pure Off-grid ESS Networking

Compatible Optimizer	Inverter	Smart Sensor	Battery	Number of Inverters	Backup Box	Communication	Management System
Not Supported	SUN2000-2/3/3.68/4/4.6/5/6KTL-L1	N/A	HUAWEI LUNA2000-(5-30)-S0	N/A	N/A	<ul style="list-style-type: none"> Local commissioning: built-in WLAN of the inverter (Standard configuration) WLAN communication: built-in WLAN of the inverter (Optional) Ethernet communication: Smart Dongle-WLAN-FE (Optional) 4G communication: Smart Dongle-4G 	FusionSolar



Supported inverter:

SUN2000-(2KTL-6KTL)-L1. (The SUN2000-(3KTL-10KTL)-M1 does not support the Pure Off-grid mode.)

Black start:

For a pure off-grid system, after the system stops working, the energy storage system (ESS) supports black start to resume the power supply. The inverter works in off-grid mode.

ATS and DG (optional):

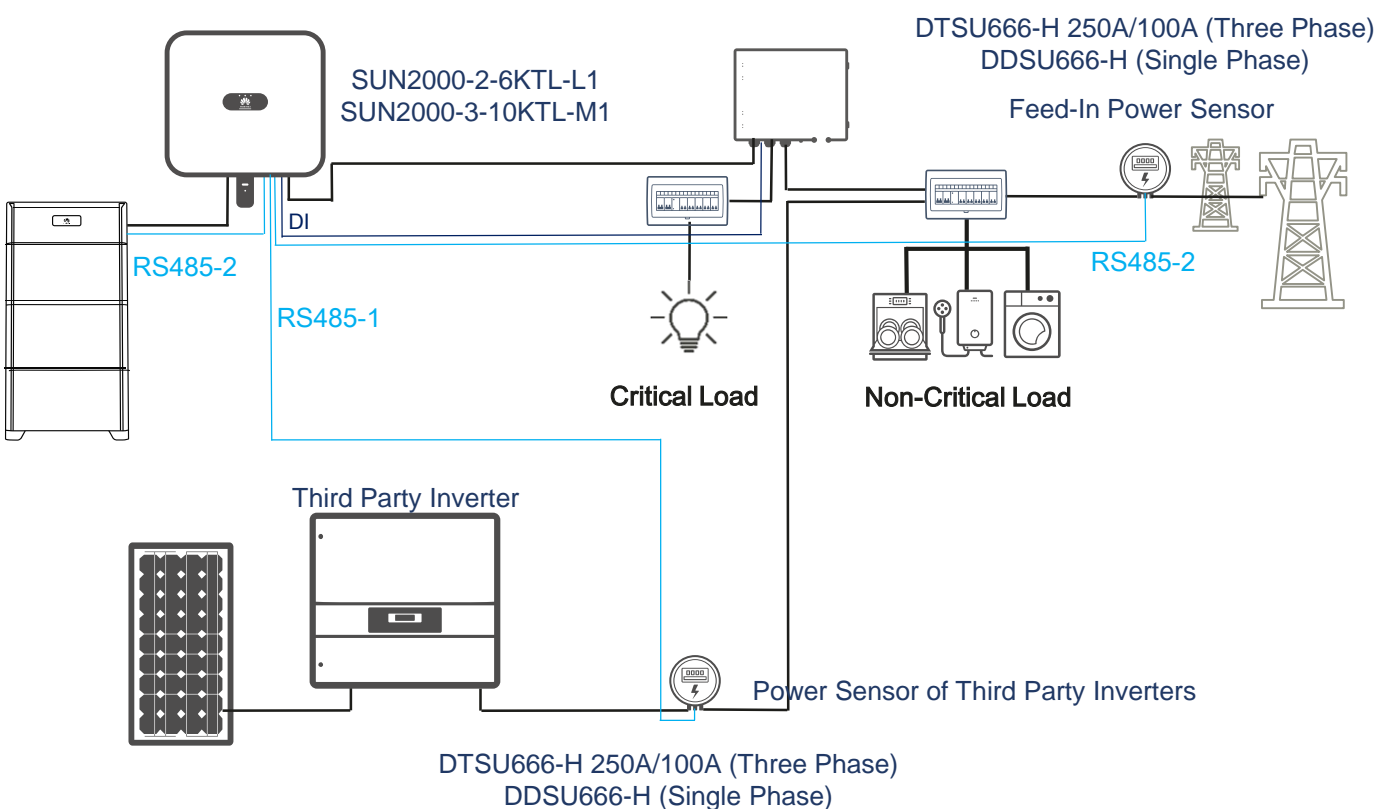
When the installed PV + battery capacity does not meet the requirements for stable power supply to loads, a DG is required for auxiliary power supply. When batteries are overdischarged or the system is faulty, the ATS switches to the DG for power supply. After the system recovers, the ATS switches to the inverter to supply power to loads and shuts down the DG.

Note:

1. The off-grid function can be enabled only when batteries are configured. If no battery is configured, the off-grid code cannot be set.
2. In the pure off-grid scenario, the phase and frequency of the output voltages of different inverters are not synchronized, and inverters cannot be cascaded for output.
3. During site deployment, you need to set the pure off-grid grid code, and off-grid output voltage/frequency (based on the load working voltage and frequency). You do not need to set the battery working mode.
4. The batteries shut down after discharging to the end-of-discharge SOC. When there is sunlight the next day, the batteries are charged to a certain amount of power and then start to supply power to loads.
5. In the off-grid scenario, it's not supported to configure optimizers. When LUNA2000 discharge finished and switched off, there is no power to activate optimizers, and the inverter can't be power on automatically.

1.13 Compatibility with third-party inverters

Compatible Optimizer	Inverter	Smart Power	Battery	Number of Inverters	Backup Box	Communication	Management System
SUN2000-450W-P (Optional)	SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 or SUN2000 3/4/5/6/8/10K TL-M1	<ul style="list-style-type: none"> • DDSU666-H (single-phase) • DTSU666-H 250 A/100 A (three-phase) 	<ul style="list-style-type: none"> • HUAWEI LUNA2000-(5-30)-S0 	Not Supported	BackupBox-B0 (works with single-phase inverters) BackupBox-B1 (works with three-phase inverters; off-grid output single-phase voltage)	<ul style="list-style-type: none"> • Local commissioning: built-in WLAN of the inverter • (Standard configuration) WLAN communication: built-in WLAN of the inverter • (Optional) Ethernet communication: Smart Dongle-WLAN-FE • (Optional) 4G communication: Smart Dongle-4G 	FusionSolar



Supported inverter:

Only single inverter support to compatible with third-party inverter as per below firmware requirements, cascading inverters don't support currently.
 SUN2000-(2KTL-6KTL)-L1 (V200R001C00SPC109 or later versions)
 The SUN2000-(3KTL-10KTL)-M1 (V100R001C00SPC134 or later versions)

Battery working mode:

Supports the maximum self-consumption, TOU working mode. When the grid charging function is enabled, the surplus PV power can be converted to AC output through the third party inverters and then charged to batteries in grid reverse charging mode.

Feed-In Power Sensor (mandatory):

The feed-in power sensor is used to measure the power of the feed-in point and reversely charge the battery by using the extra power generated by the third-party inverters.

Power Sensor of Third Party Inverters (optional):

The second power sensor needs to be installed at the output of third party inverter for power measurement. The communication shall be established between this smart power sensor and Huawei inverter via Northbound RS485, which is connected to RS485-1 of Huawei inverter. It is used for display of third party inverters output power and load consumption in FusionSolar smart PV management system, and this feature is still under development, not support currently.

Note:

1. The second power sensor does not affect power control, but only affects KPI data such as energy yield and load power consumption of the plant.