2.1 Installation Videos

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

Website:

https://support.huawei.com/enterprise/zh/doc/EDOC1100148147?idPath=22892350|21439560|7921563|21102413|22027611

QR Code:

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

Website:

https://support.huawei.com/enterprise/zh/doc/EDOC1100066770

QR Code:

LUNA2000-(5-30)-S0

Website:

https://support.huawei.com/enterprise/zh/doc/EDOC1100182358?idPath=22892350%7C21439560%7C7921563%7C21102413%7C23448309

QR Code:

FusionSolar

FusionSolar APP

Website:

https://support.huawei.com/enterprise/zh/doc/EDOC1100165057

QR Code:

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Documentation Links

Category	Document	Link (Support-E)								
Installation Video	(Video) SUN2000-(2KTL-6KTL)-L1 Installation Video	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	
	(Video) SUN2000-(3KTL-10KTL)-M Installation Video	Chinese	English	German	French	Dutch	Italian		Spanish	Polish
	(Video) SUN2000-450W-P Smart PV Optimizer Installation Video	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	
	(Video) LUNA2000-(5-30)-S0 Installation Video	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	
	(Video) BackupBox-(B0, B1) Installation Video	Chinese	English							
User Manual	SUN2000-(2KTL-6KTL)-L1 User Manual	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	
	SUN2000-(3KTL-10KTL)-M0 User Manual	Chinese	English	German	French	Dutch	Italian		Spanish	Polish
	SUN2000-(3KTL-10KTL)-M1 User Manual	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	Polish
	LUNA2000-(5-30)-S0 User Manual	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	Polish
Quick Guide	SUN2000-(2KTL-6KTL)-L1 Quick Guide	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	
	SUN2000-(3KTL-10KTL)-M0 Quick Guide	Chinese	English	German	French	Dutch	Italian		Spanish	Polish
	SUN2000-(3KTL-10KTL)-M1 Quick Guide Guide	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	Polish
	SUN2000-450W-P Smart PV Optimizer Quick Guide	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	
	LUNA2000-(5-30)-S0 Quick Guide	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	Polish
	BackupBox-(B0, B1) Quick Guide	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	Polish

Category	Document	Link (Support-E)								
Commissioning Video	(Video) FusionSolar App Commissioning Video	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	
User Manual	FusionSolar App and SUN2000 App User Manual	Chinese	English							
	DDSU666-H Smart Power Sensor User Manual		English							
	DTSU666-H and DTSU666-H 250 A (50 mA) Smart Power Sensor User Manual		English							
Quick Guide	SDongleA-03 Quick Guide (4G)	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	Polish
	SDongleA-05 Quick Guide (WLAN-FE)	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	Polish
	FusionSolar App Quick Guide	Chinese	English	German	French	Dutch	Italian	Portuguese	Spanish	Polish
	SUN2000L-(2KTL-5KTL) and SUN2000-(2KTL-6KTL)-L1 Battery & Smart Power Sensor Quick Guide		English	German	French	Dutch	Italian	Portuguese	Spanish	

HiKnow App

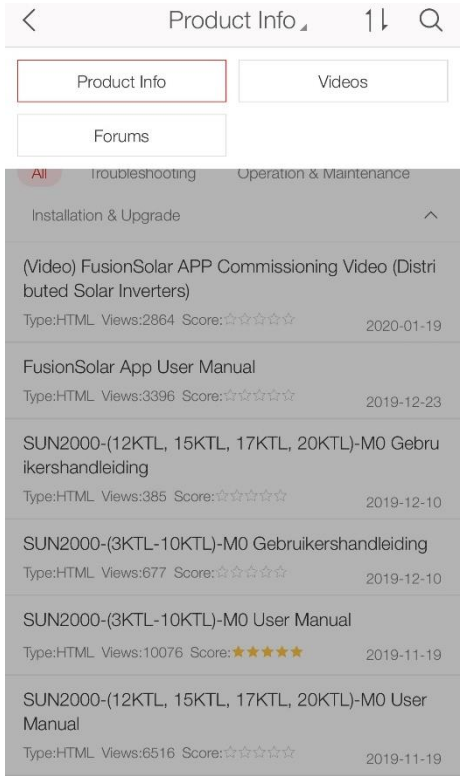
1. Download the **HiKnow** app.

Method 1: Scan the QR code.

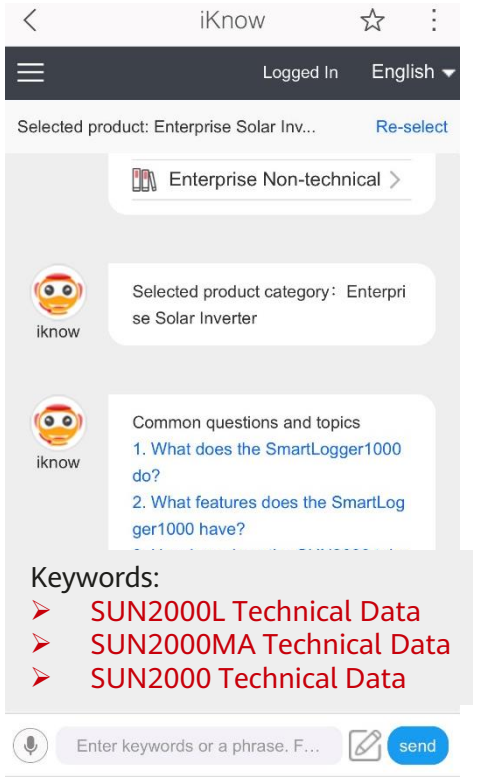
Method 2: Search for **Enterprise Support** on the following platforms:

- ✓ **Android:** Huawei AppGallery (or https://appstore.huawei.com); Google Play (or https://play.google.com)
- ✓ **iOS:** App Store

2. Choose **Products** > **Network Energy** > **FusionSolar PV** > **SUN2000/SUN2000MA/...** > **Product Info** to obtain the required documents.

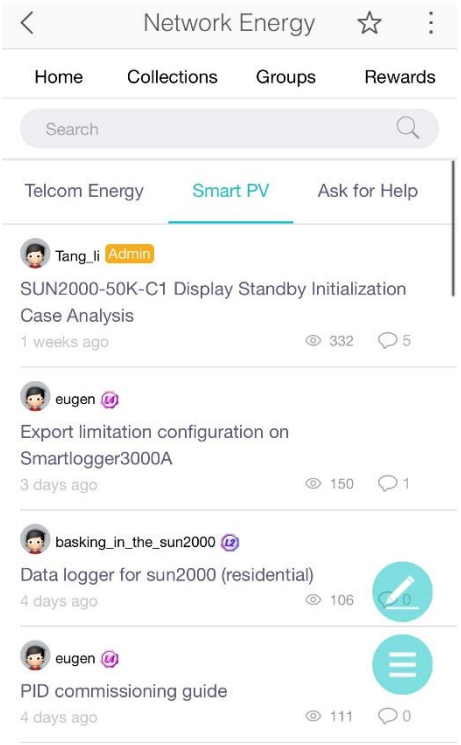


3. Choose **iKnow** > **Enterprise Network Energy** > **Enterprise Solar Inverter** and use keywords to quickly search for required information.



Keywords:
- SUN2000L Technical Data
- SUN2000MA Technical Data
- SUN2000 Technical Data

4. Choose **Forums** > **Enterprise Network Energy** > **Network Energy** > **Smart PV** to participate in the discussion.



Web link for iKnow: https://support.huawei.com/iknow/?source=SupportE
Web link for the forum: https://forum.huawei.com/enterprise/en/Network-Energy/forum/100027?typeid=2313

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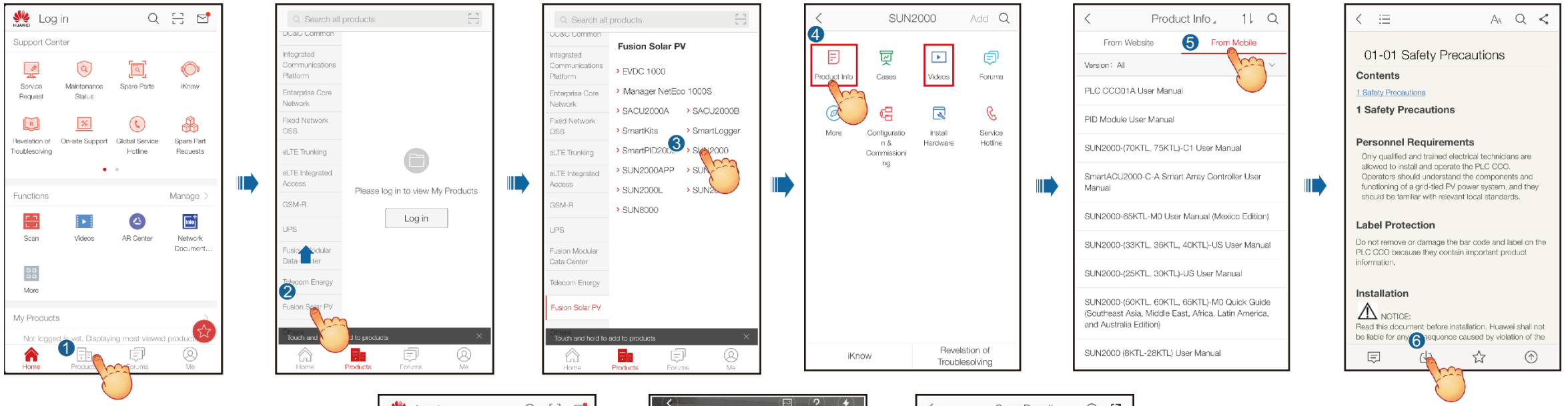
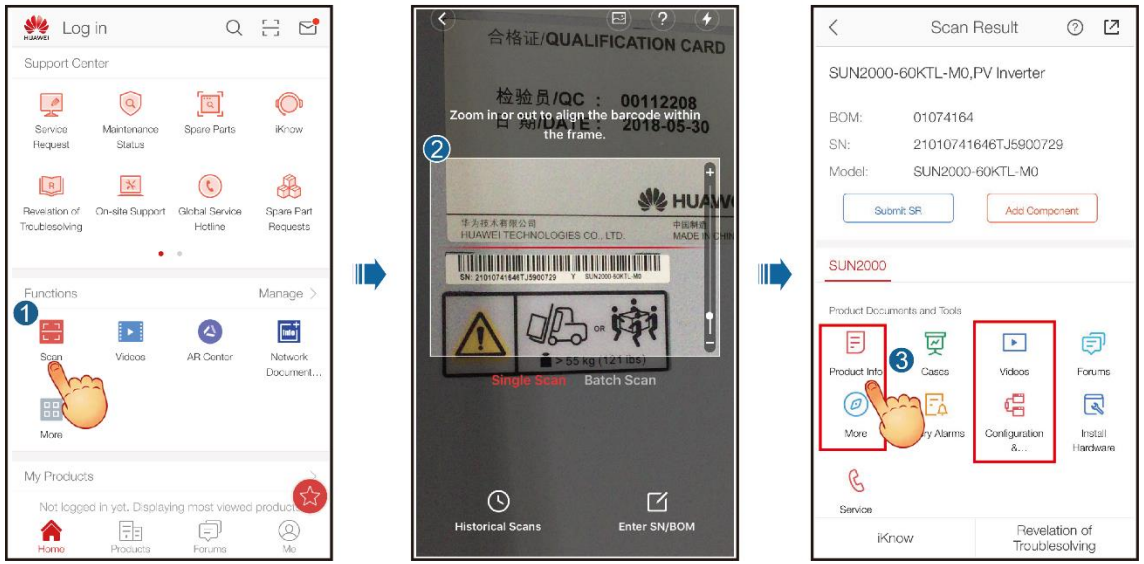
HiKnow App – How to Obtain Documents

Method 1: Tap **Fusion Solar PV**, select a product, and query documents.



Method 2: Scan the SN.



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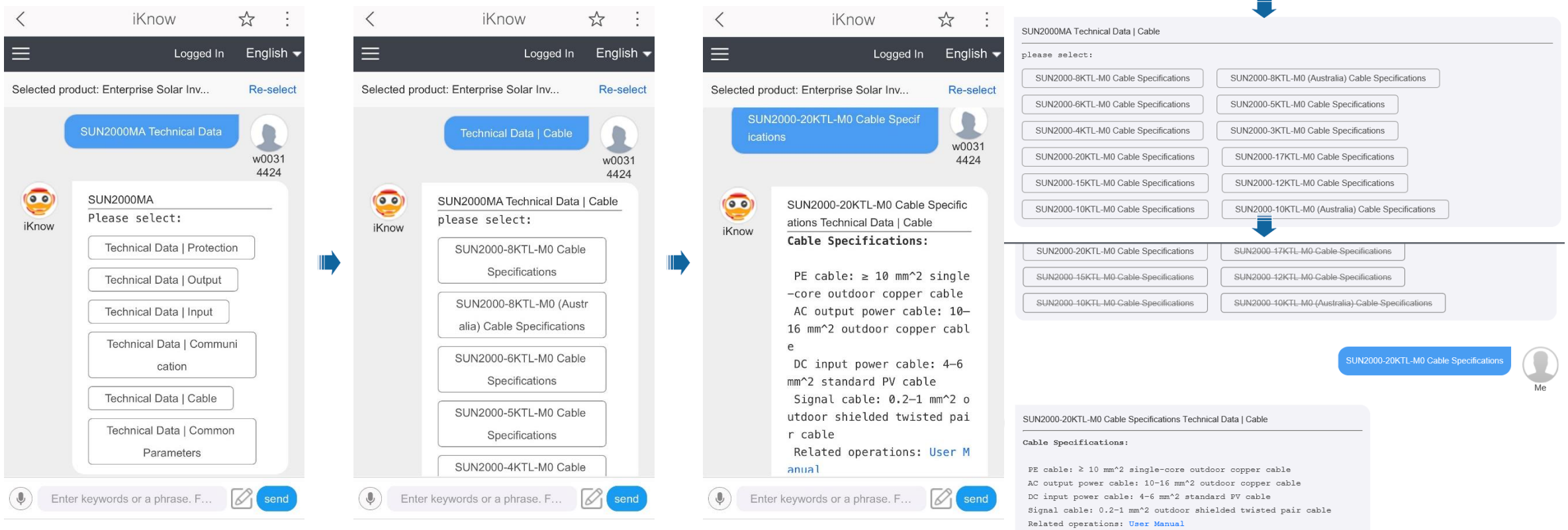
HiKnow App – How to Use iKnow

Keywords:

- SUN2000L Technical Data
- SUN2000MA Technical Data
- SUN2000 Technical Data

App



Web

2.3 Comparison Between Normal and Long String Design

PV String Design in the Scenario Without Optimizers

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]
Input (PV)							
Recommended max. PV power[2]	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 none battery / 495V@LG battery						
Start-up voltage	100 V						

Refer to JKM300M-60/1000V datasheet

Maximum System Voltage	1000VDC (UL and IEC)

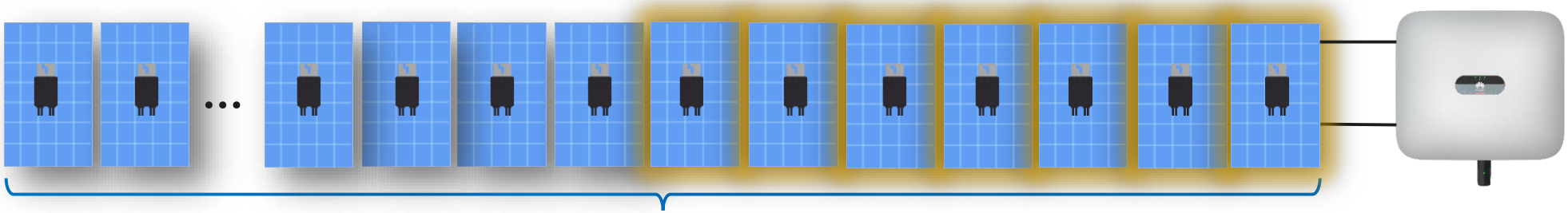
13 PV modules in each PV string

Maximum number of PV modules in each PV string:
Single-phase scenario with Huawei batteries or without batteries: 600 V/(39.1 V x K) ≈ 13
Single-phase scenario with LG batteries: 495 V/(39.1 V x K) ≈ 10
Three-phase scenario: 1000 V/(39.1 V x K) ≈ 21
Use the JKM300M-60/1000 V as an example. K is the ambient temperature correction factor.
K = 1 + (Local lowest temperature – 25°C) x PV module temperature correction factor
Local lowest temperature = –20°C; PV module temperature correction coefficient = –0.38%

PV String Design in the Scenario with Full Configuration of Optimizers

For details, see the SUN2000-450W-P brochure.

Long String Design [2]	SUN2000L-2-6KTL-L1	SUN2000-3-10KTL-M1	SUN2000-12-20KTL-M2
Minimum optimizer number per string	4	6	6
Maximum optimizer number per string	25	50	50
Maximum DC power per string	5,000 W	10,000 W	10,000 W



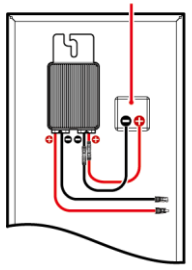
16 PV modules in each PV string

Maximum number of PV modules in each PV string:
Single-phase: 5,000 W/300 W ≈ 16
Three-phase: 10000 W/300 W ≈ 33
Use the JKM300M-60/1000 V as an example.

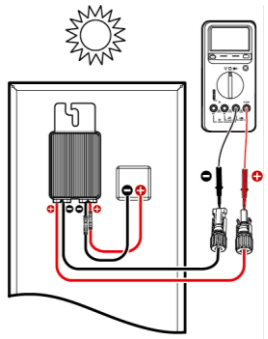
2.4 Connecting the Optimizer

1. Connect the optimizer input power cables.

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.

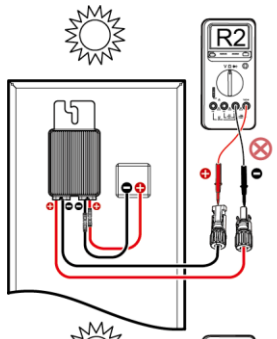


- The voltage V1 is 0 V.
- The resistance R1 is 1 kΩ (±10%).

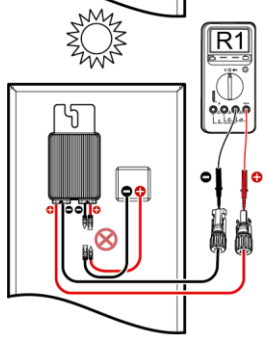
If the probes are reversely connected, the measured resistance is smaller than the resistance measured when the probes are correctly connected, which may be less than 0.9 kΩ.

Resistance	Cause	Troubleshooting
0.9 kΩ ≤ R1 ≤ 1.1 kΩ	The optimizer is normal.	N/A
R1 < 0.9 kΩ	If the probes of the multimeter are correctly connected, the optimizer is faulty.	Replace the optimizer.
1.1 kΩ < R1	• The sunlight is weak. • The optimizer input is not connected. • The optimizer output is connected to the PV module output. • The optimizer is faulty.	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 PV module output cables. 4. If the resistance is still abnormal, replace the optimizer.

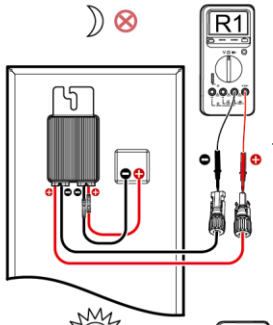
Common exception scenarios



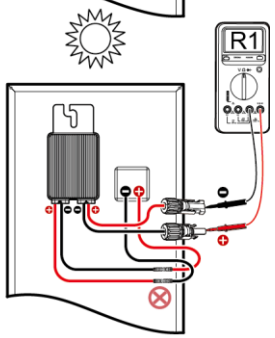
The probes are reversely connected. The measured resistance R2 is less than the value measured when the probes are correctly connected.



The optimizer input is not connected: 1.1 kΩ < R1



The sunlight is weak: 1.1 kΩ < R1

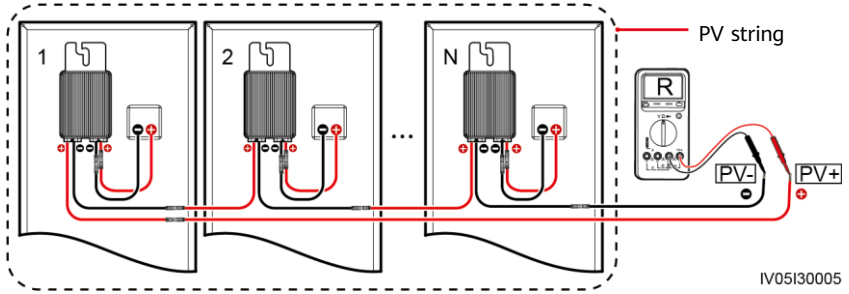


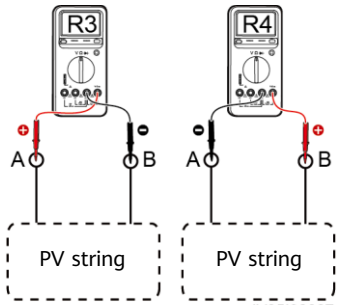
The optimizer output is connected to the PV module output: 1.1 kΩ < R1

The resistance measurement range of the multimeter affects the measured string output resistance. If the resistance measurement range of the multimeter is too large, the measured string output resistance may be greater than N x 1.1 kilohms. Select the minimum resistance measurement range that meets the measurement requirements of the multimeter.

3. Check that the optimizer is normal, and connect the output power cables to the optimizer. Measure the PV string resistance when the sunlight is sufficient.

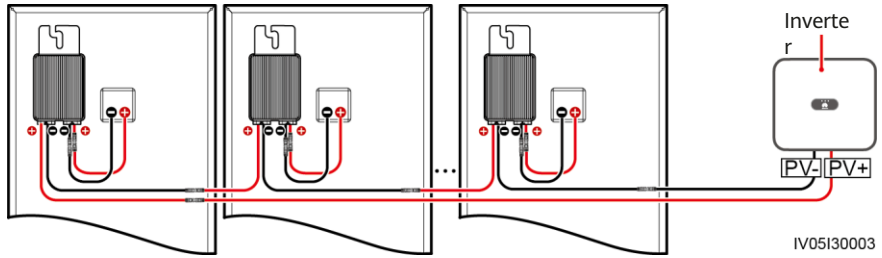
Full configuration of optimizers





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.

4. Connect cables between the PV string and the inverter.



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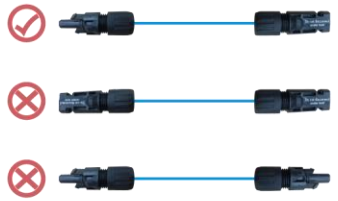
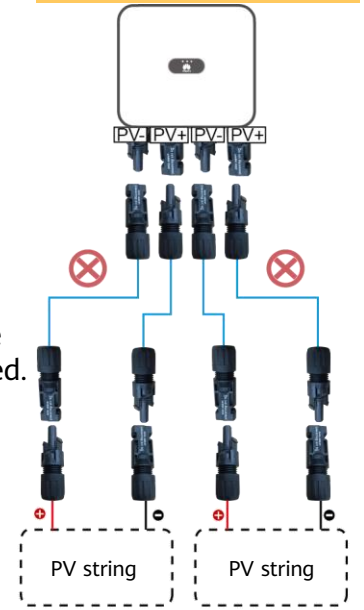
(Full configuration of optimizers) PV string reverse connection

Fault Mode	Symptom	Alarm
All PV strings are reversely connected.	The networking is normal. Voltages of all PV strings are low and cannot be adjusted. The inverter is in the irradiation detection state.	Inverter alarm: Abnormal PV Module Configuration (ID = 3)
Some PV strings are reversely connected.	The networking is normal, with a backfeed current from the faulty PV string to the inverter.	Inverter alarm: PV string reversed (ID = PV string number)
Some optimizers of PV strings are reversely connected: Voltage during correct connection – Voltage during reserve connection > Minimum voltage for inverter startup	The networking is normal. After the inverter is connected to the power grid, the abnormal PV strings can output power.	Optimizer alarm: Abnormal output voltage
Some optimizers of PV strings are reversely connected: Voltage during correct connection – Voltage during reserve connection < Minimum voltage for inverter startup	The networking is normal. After the inverter is connected to the power grid, the abnormal PV strings can not work.	Optimizer alarm: Abnormal output voltage

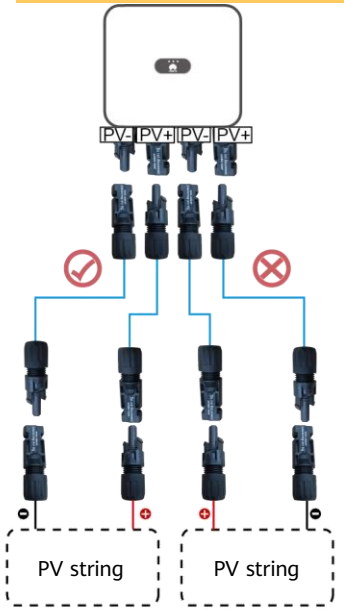


The extension cables with the same connectors at both ends are connected.

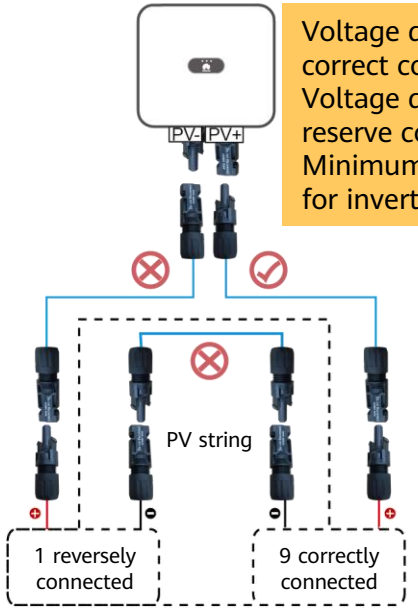
All PV strings are reversely connected.



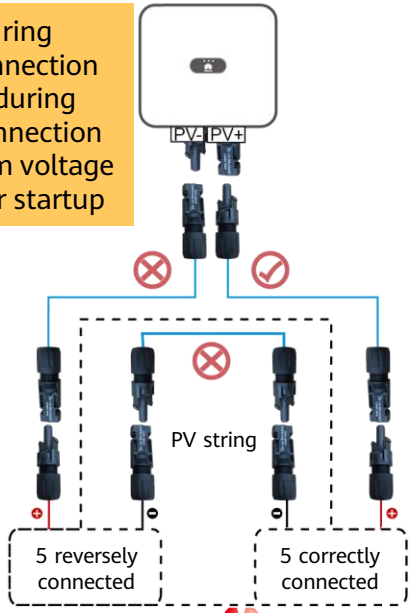
Some PV strings are reversely connected.



Voltage during correct connection – Voltage during reserve connection > Minimum voltage for inverter startup



Voltage during correct connection – Voltage during reserve connection < Minimum voltage for inverter startup



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PV string resistance exception

The resistance of PV strings configured with optimizers is infinite.

Causes:

- There is a disconnected point in the PV string.
- Optimizer installation is optional.

Troubleshooting:

1. Set the multimeter to the voltage mode and measure the PV string voltage. The PV string voltage should be 0 V. If the PV string voltage is not 0 V, some PV modules are not connected to optimizers. Check the PV string cable connections.
2. If the voltage is 0 V, then the cables are not in the same PV string, the optimizer cables in the PV string are not properly connected, or there is a disconnected point in the PV string.
3. Check that the two cables to be tested are in the same PV string.
4. PV string cable connection detection method: Disconnect PV strings from the middle, measure the resistance after disconnection, and repeat this step to narrow down the fault scope.
5. Narrow down the fault scope to the last optimizer and rectify the fault based on the measured resistance of the optimizer.

The resistance of PV strings configured with optimizers is not infinite but is greater than 100 kΩ.

Causes:

Some optimizers in the PV string are not connected to PV modules, or the input and output of some optimizers are reversely connected.

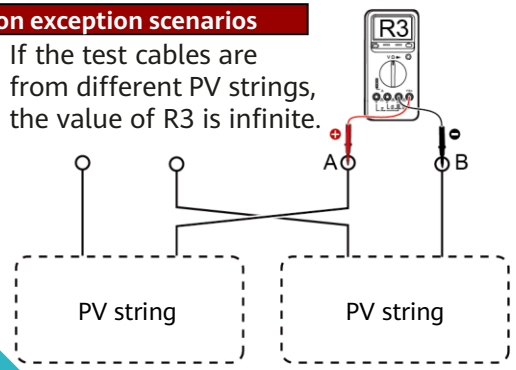
Troubleshooting:

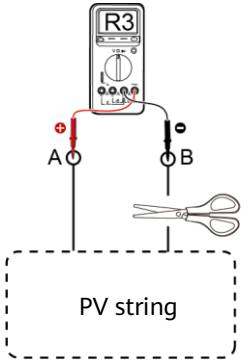
1. PV string cable connection detection method: Disconnect PV strings from the middle, measure the resistance after disconnection, and repeat this step to narrow down the fault scope.
2. Narrow down the fault scope to the last optimizer and rectify the fault based on the measured resistance of the optimizer.

Video of a case:
http://3ms.huawei.com/documents/docinfo/4729780449112350 72?l=en

Common exception scenarios

If the test cables are from different PV strings, the value of R3 is infinite.





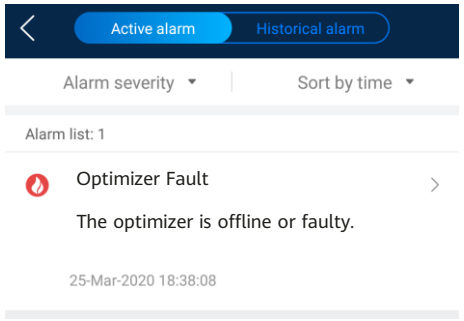
If there is a disconnected point in the PV string, the measured value R3 is infinite.

Optimizer-related alarms

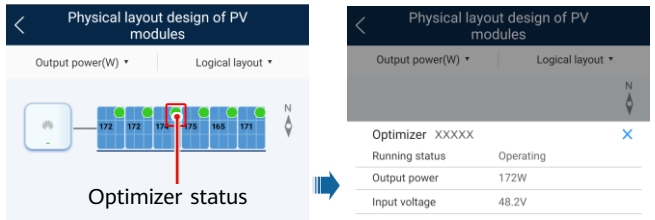
Alarm ID	Alarm Name	Alarm Severity	Cause	Troubleshooting
2011	String Reversed	Major	The PV string is reversely connected. Cause ID = 1, 2 • 1: String 1 connected reversely • 2: String 2 connected reversely	Check whether the PV string is reversely connected to the inverter. If so, wait until the PV string current decreases to below 0.5 A. Then, turn off the DC switch and correct the PV string polarity.
2065	Upgrade Failed or Version Mismatch	Minor	The upgrade does not complete normally. • Cause ID = 7: Optimizer upgrade failure	1. Perform an upgrade again. 2. If the upgrade fails several times, contact your supplier or Huawei technical support.
2080	Abnormal PV Module Configuration	Major	ID1: The total number of optimizers exceeds the maximum number of optimizers allowed by the inverter. ID2: The PV string power exceeds the specifications or the number of PV string optimizers connected in series exceeds the specifications. ID3: The number of PV string optimizers connected in series is less than the upper limit, the PV string output is reversely connected, or some optimizers in the PV string output are reversely connected. ID4: The number of PV strings exceeds the maximum number allowed by the inverter. ID5: The PV string output is reversely connected or short-circuited. ID6: Under the same MPPT circuit, the number of parallel PV string optimizers connected in series is different, or some PV string optimizers are reversely connected. ID7: The optimizer installation position is changed, or PV strings are combined or switched. ID8: The light is weak or abnormal. ID9: In the optional scenario, the PV string voltage exceeds the inverter input voltage specifications.	<ID1:>Check whether the total number of optimizers exceeds the upper limit. <ID2:> Check whether the PV string power exceeds the upper limit or the number of PV modules connected in series exceeds the upper limit. <ID3:> 1. Check whether the number of PV string optimizers connected in series is less than the lower limit. 2. Check whether the PV string output is reversely connected. 3. Check whether the PV string output is disconnected. 4. Use an extension cable for the optimizer output. Check that the extension cable is correctly prepared (one end is a positive connector and the other end is a negative connector). <ID4:> Check whether the number of PV strings exceeds the upper limit. <ID5:> Check whether the PV string output is reversely connected or short-circuited. <ID6:> 1. Check whether the number of parallel PV string optimizers connected in series under the same MPPT circuit is the same. 2. Use an extension cable for the optimizer output. Check that the extension cable is correctly prepared (one end is a positive connector and the other end is a negative connector). <ID7:> When the light is normal, perform the optimizer search function again. <ID8:> When the light is normal, perform the optimizer search function again. <ID9:> Calculate the string voltage based on the number of PV modules in the string. Check whether the string voltage exceeds the upper input voltage threshold of the inverter.
2081	Optimizer Fault	Warning	Cause ID = 1 The optimizer is offline or faulty.	Contact your dealer or Huawei technical support for optimizer replacement.

Optimizer fault alarm

When the inverter generates an optimizer fault alarm, perform the following steps to view the optimizer status to obtain the fault alarm information:



1. 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 inverter.
2. Select **installer**, enter the login password, and tap **Log In**. The device commissioning page is displayed.
3. Choose **Device Monitoring**, select the PV string, and check the optimizer status.

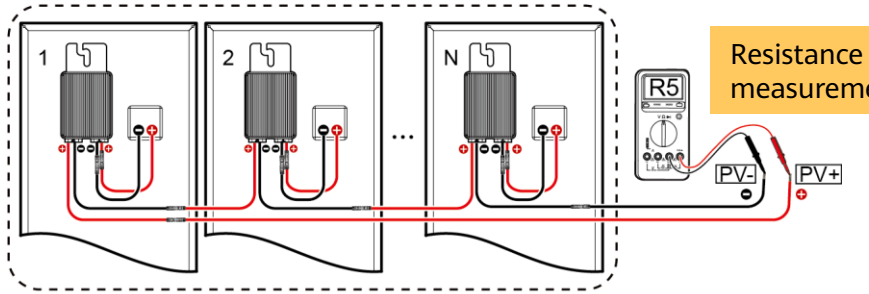


Status	Description
Green	The optimizer is running properly.
Gray	The optimizer is offline. Check that the SN and location information are correct and search for the device again.
Red	The optimizer is faulty.

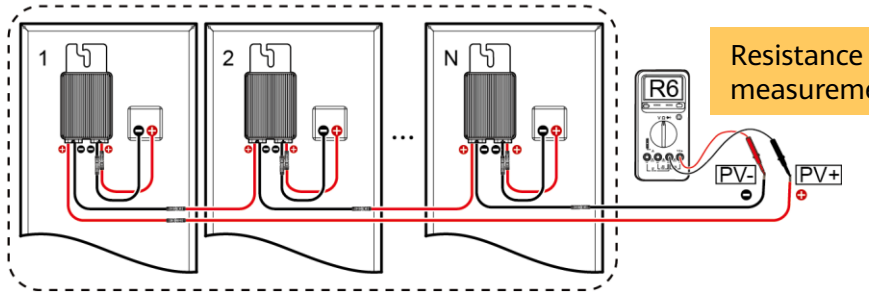
Fault Alarm	Cause	Suggestion
Input overvoltage	Optimizer input overvoltage.	Check whether the open-circuit voltage of the PV module connected to the optimizer exceeds 80 V.
Over temperature	The internal temperature of the optimizer is too high.	1. Check the ventilation and ambient temperature at the 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	The optimizer is faulty.	Contact the installation contractor.
Output backfeed	The optimizer outputs backfeed.	1. Check whether PV modules are seriously shaded when PV modules are connected in parallel. 2. If the fault persists, contact the installation supplier.
Abnormal output voltage	The optimizer output voltage is abnormal.	1. When the illumination is normal, perform the optimizer search function again. 2. Use an extension cable for the optimizer output. Check that the extension cable is correctly prepared (one end is a positive connector and the other end is a negative connector). 3. Check whether the PV string is correctly connected to the inverter or whether there is a break point in the PV string. 4. If the fault persists, contact the installation supplier.
Upgrade Failed	The optimizer fails to upgrade the software.	1. When the illumination is normal, perform the optimizer upgrade again. 2. If the fault persists, contact the installation supplier.

Resistance measurement example

The positive and negative polarities of a PV string configured with optimizers are determined based on the ratio of the resistance by common measurement to the resistance by reverse measurement.



Resistance by common measurement R5 (kΩ)



Resistance by reverse measurement R6 (kΩ)

Resistance by common measurement/Resistance by reverse measurement = R5/R6
Precision = (R5/Number of optimizers – 1 kΩ)/1 kΩ x 100%

Measurement result analysis:

- The precision is related to the multimeter model.
- The precision is related to the number of optimizers.
- The resistance by common measurement is greater than the resistance by reverse measurement.

Note: The ratio on rainy days changes slightly, yet without affecting the measurement result.

Quantity	FLUKE 87 (60k)		FLUKE 375 (Auto)		FLUKE 17B+ (100k)		EM33D (200k)	
	Common Measurement	Reverse Measurement	Common Measurement	Reverse Measurement	Common Measurement	Reverse Measurement	Common Measurement	Reverse Measurement
	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)	Resistance (kΩ)
4	3.93	3.26	3.694	3.36	3.72	3.43	3.7	3.4
5	4.97	4.03	4.616	4.174	5.3	3.6	4.6	4.2
10	9.85	8.13	10.05	7.93	10.8	7.2	9.3	8.5
15	14.79	12.19	15.08	11.89	14.21	12.77	14	12.7
20	19.7	16.27	20.09	15.89	19.07	16.93	18.7	17
25	24.64	20.37	25.12	19.88	24.04	21.08	23.4	21.2
30	29.6	24.43	30.18	23.83	29.08	25.11	28.1	25.5
35	34.53	28.48	35.23	27.75	34.5	29.08	32.8	29.8
40	39.5	32.52	40.28	31.69	39.4	32.94	37.5	34
44	43.46	35.73	44.35	34.8	43.73	36.01	41.4	37.4
50	49.48	40.53	50.49	39.54	49.4	40.7	47.1	42.4

Quantity	Precision	Common Measurement/Reverse Measurement	Precision	Common Measurement/Reverse Measurement	Precision	Common Measurement/Reverse Measurement	Precision	Common Measurement/Reverse Measurement
4	-1.75%	1.21	-7.65%	1.10	-7.00%	1.08	-7.50%	1.09
5	-0.60%	1.23	-7.68%	1.11	6.00%	1.47	-8.00%	1.10
10	-1.50%	1.21	0.50%	1.27	8.00%	1.50	-7.00%	1.09
15	-1.40%	1.21	0.53%	1.27	-5.27%	1.11	-6.67%	1.10
20	-1.50%	1.21	0.45%	1.26	-4.65%	1.13	-6.50%	1.10
25	-1.44%	1.21	0.48%	1.26	-3.84%	1.14	-6.40%	1.10
30	-1.33%	1.21	0.60%	1.27	-3.07%	1.16	-6.33%	1.10
35	-1.34%	1.21	0.66%	1.27	-1.43%	1.19	-6.29%	1.10
40	-1.25%	1.21	0.70%	1.27	-1.50%	1.20	-6.25%	1.10
44	-1.23%	1.22	0.80%	1.27	-0.61%	1.21	-5.91%	1.11
50	-1.04%	1.22	0.98%	1.28	-1.20%	1.21	-5.80%	1.11

The resistance measurement range of the multimeter affects the measured string output resistance. If the resistance measurement range of the multimeter is too large, the measured string output resistance may be greater than N x 1.1 kilohms. Select the minimum resistance measurement range that meets the measurement requirements of the multimeter.

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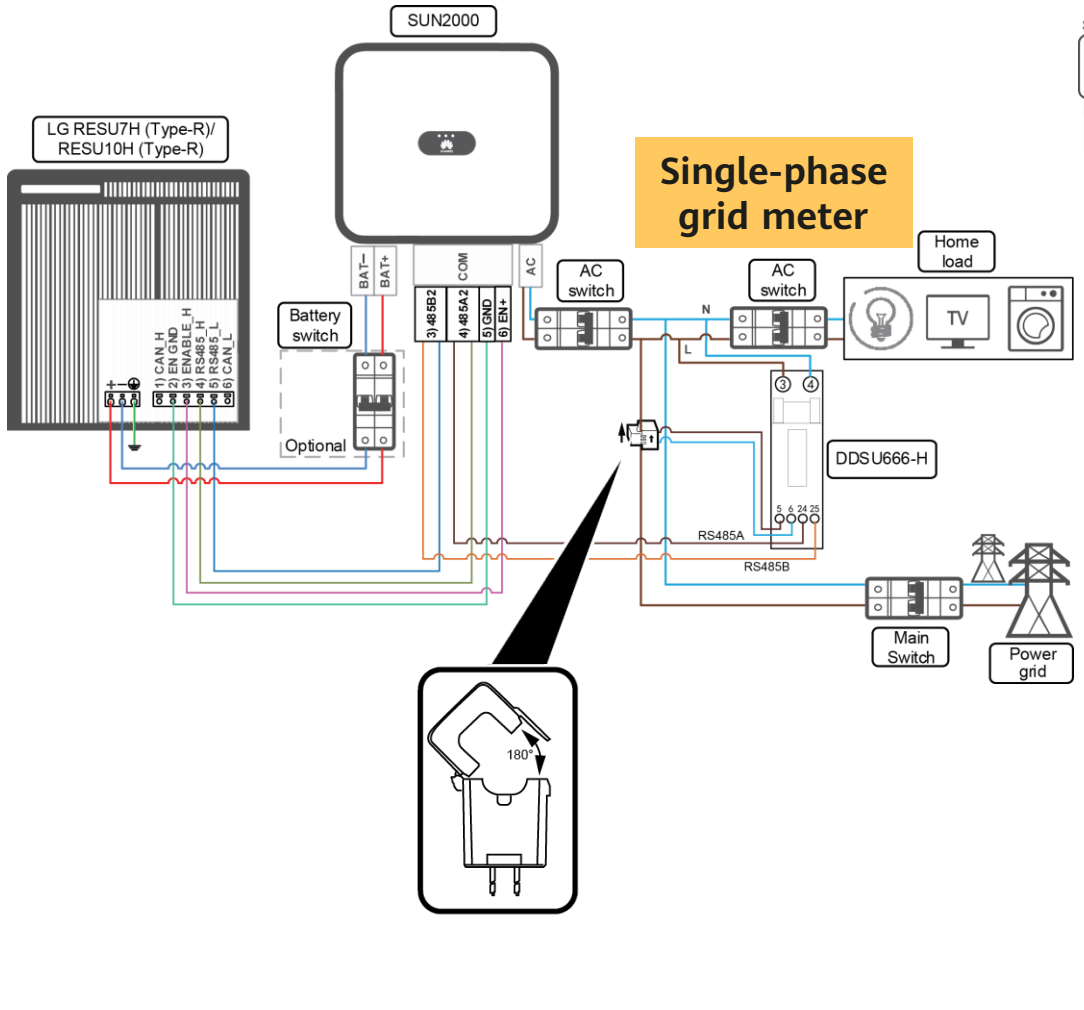
2.5 Connecting a Battery and Grid Meter

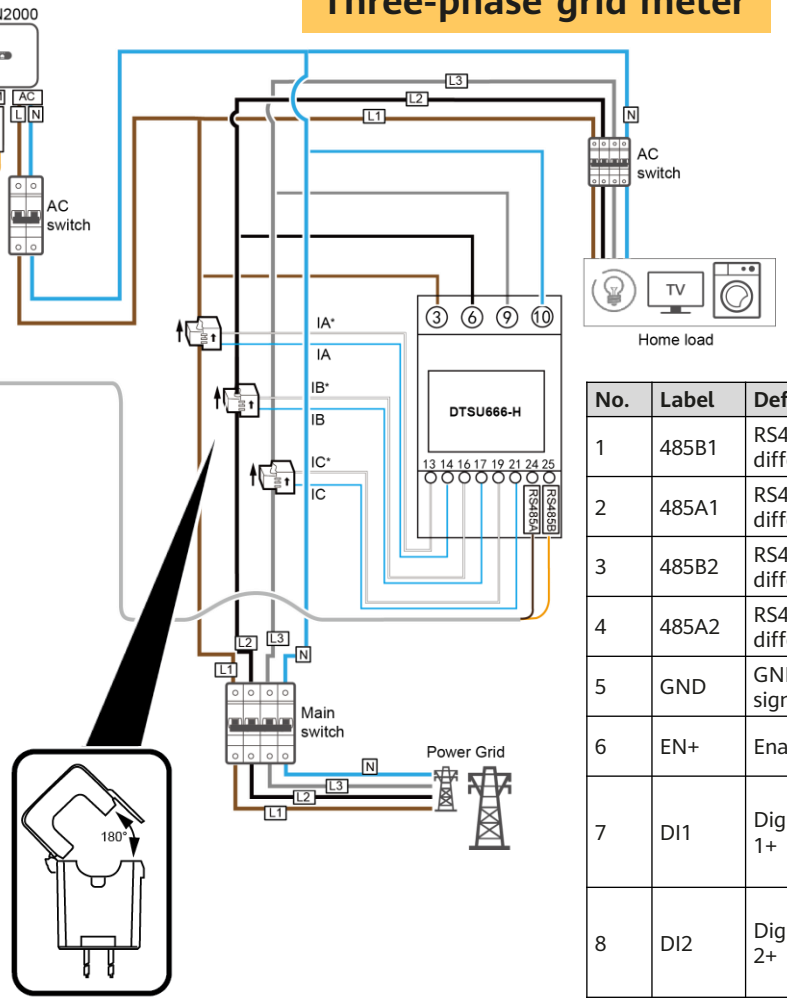
SUN2000-2-6KTL-L1

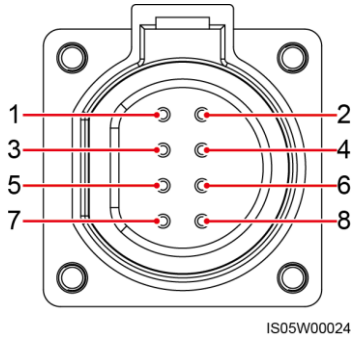
- If an LG battery is configured, the PV string input voltage cannot exceed 495 V.
- The CAN_H and CAN_L ports of the battery are not used currently.
- The cable colors are for reference only.

Single-phase grid meter



Three-phase grid meter

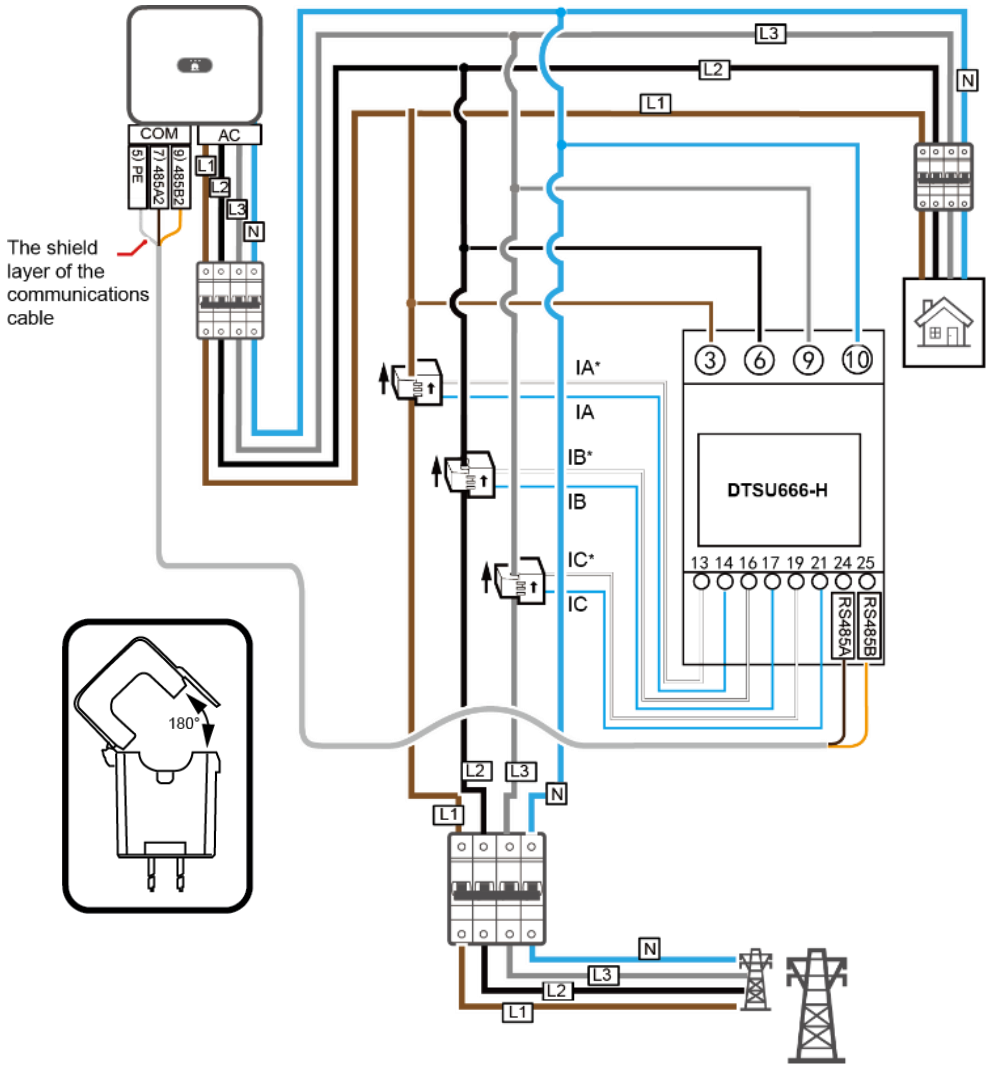




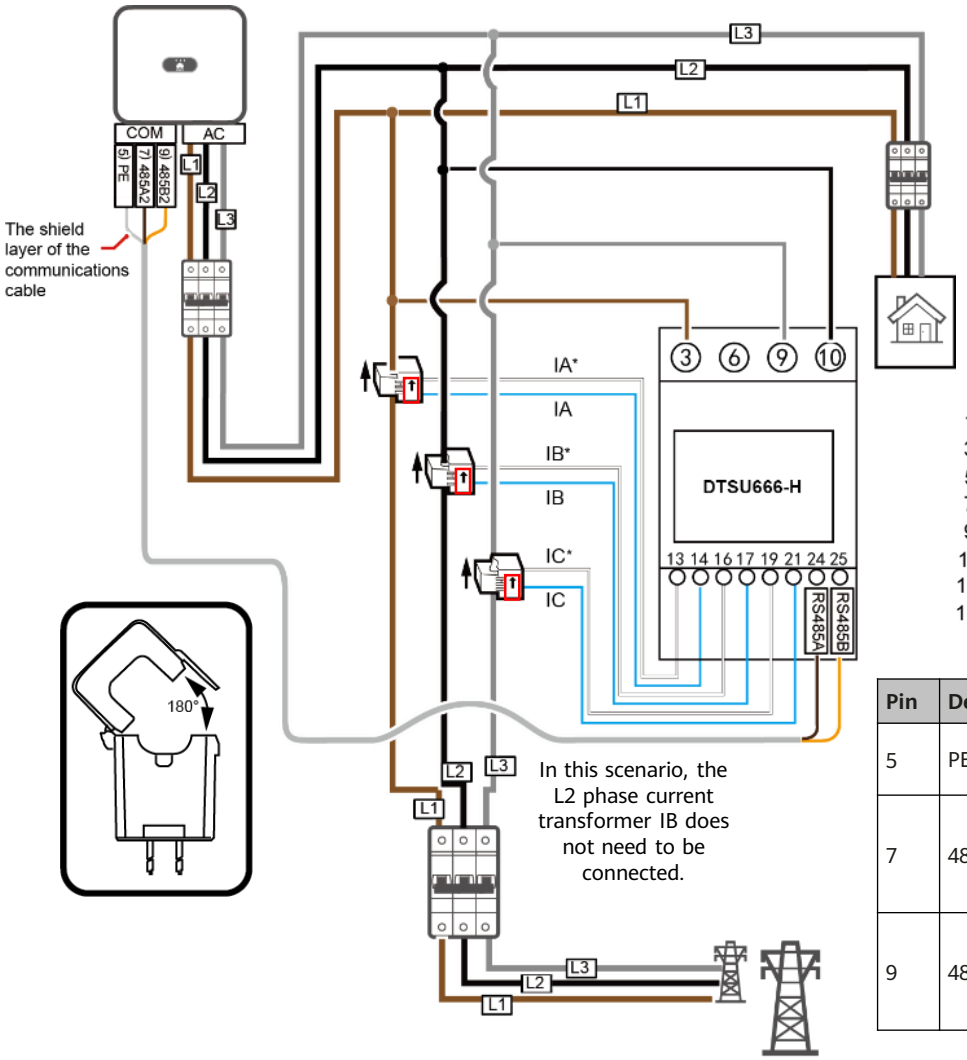
No.	Label	Definition	Description
1	485B1	RS485B, RS485 differential signal–	Connects to an inverter in the inverter cascading scenario.
2	485A1	RS485A, RS485 differential signal+	
3	485B2	RS485B, RS485 differential signal–	Connects to the RS485 signal port of the battery or power meter. When batteries and power meters coexist, they share the 485B2 and 485A2 ports.
4	485A2	RS485A, RS485 differential signal+	
5	GND	GND of the enable signal/12V/DI1/DI2	Connects to GND of the enable signal/12V/DI1/DI2 for the battery.
6	EN+	Enable signal+/12V+	Connects to the enable signal of the battery or the 12V positive signal.
7	DI1	Digital input signal 1+	Connects to the positive terminal of DI1. Connects to the DRM0 scheduling signal or serves as a reserved port for the rapid shutdown signal.
8	DI2	Digital input signal 2+	Connects to the positive terminal of DI2 and serves as a reserved port for feedback signals of the Smart Backup Box.

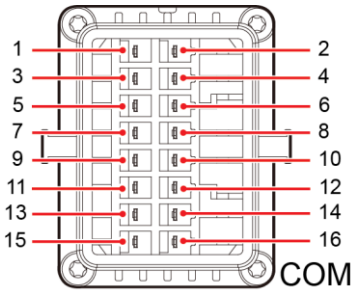
Three-phase inverter

Three-phase four-wire



Three-phase three-wire





Pin	Definition	Function	Description
5	PE	Shield layer grounding	N/A
7	485A2	RS485A, RS485 differential signal+	Used for connecting to the RS485 signal port on the Smart Power Sensor to limit grid connection.
9	485B2	RS485B, RS485 differential signal–	

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2.6 Verifying the Installation

If the DC input power cable is reversely connected and the DC switch is turned on, do not perform operations 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 or service agreement. 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.