

Huawei C&I Smart PV Solution Technical Training

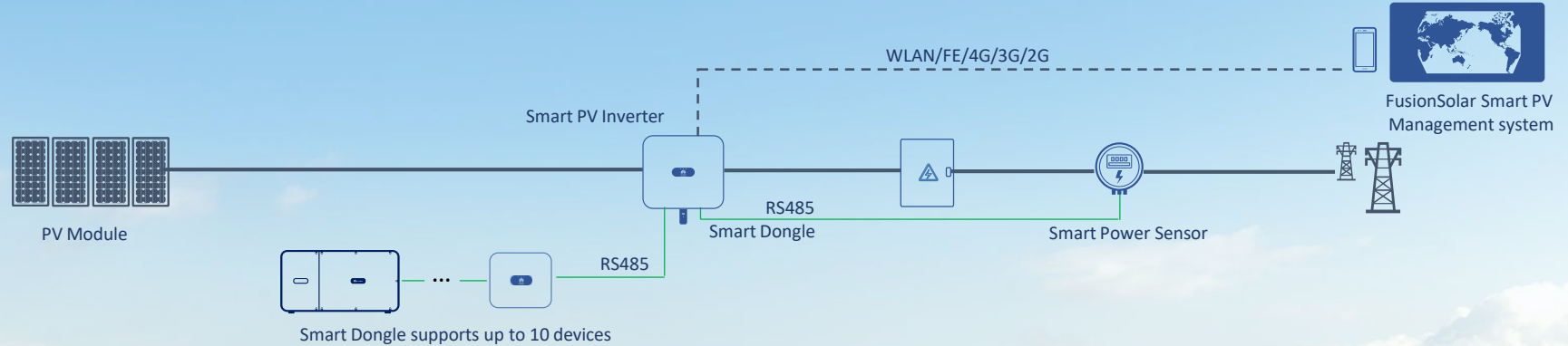
Philippines Digital Power
Smart PV Team

An aerial photograph of a dense green forest. In the upper right quadrant, a white outline of a house is visible, with a semi-circular shape above it representing a sun or moon. Below the house, there is a grid pattern representing solar panels. At the bottom of the image, the word "FUSIONSOLAR" is written in a white, blocky font.

FUSIONSOLAR

FusionSolar Commercial & Industrial Smart PV Solution Overview

C&I
(Smart Dongle)



Smart PV Inverter

SUN2000-12/15/17/20/25KTL-M5



Smart PV Inverter

SUN2000-20/30/40KTL-M3



Smart Dongle

Smart Dongle WLAN-FE (Optional)
Smart Dongle 4G (Optional)



Monitoring Portal

SmartPVMS Cloud & APP



Smart PV Inverter

SUN2000-50KTL-M3



Smart Power Sensor

DTSU666-H 250A (Three Phase)
DTSU666-HW (Three Phase)



Smart PV Inverter

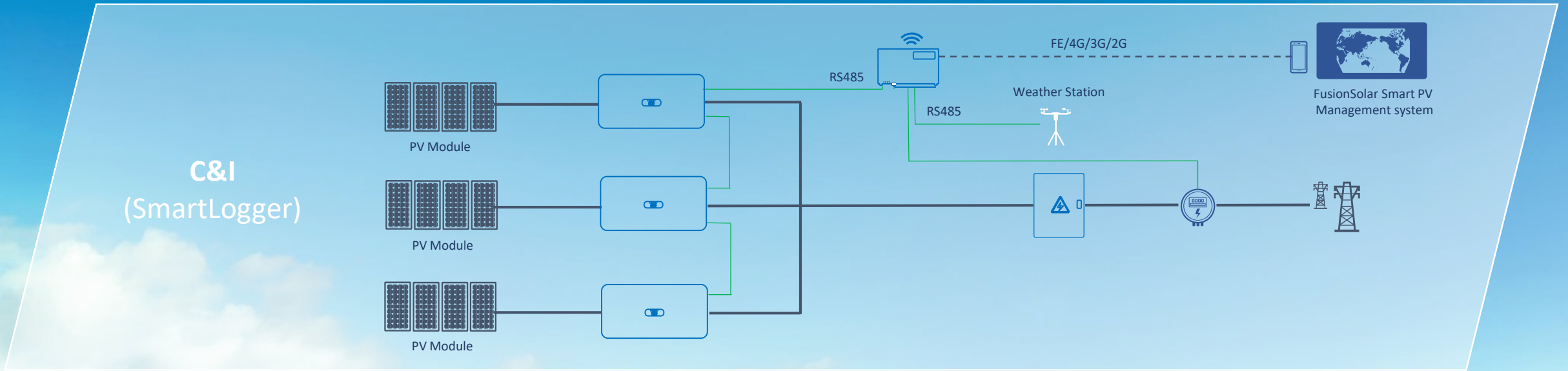
SUN2000-100/115KTL-M2



Smart PV Optimizer

SUN2000-450W-P2
SUN2000-600W-P
MERC-1100/1300W

FusionSolar Commercial & Industrial Smart PV Solution Overview



Smart PV Inverter

SUN2000-12/15/17/20/25KTL-M5



Smart PV Inverter

SUN2000-20/30/40KTL-M3



SmartLogger

SmartLogger3000A



Monitoring Portal

SmartPVMS Cloud & APP



Smart PV Inverter

SUN2000-50KTL-M3



Smart PV Optimizer

SUN2000-450W-P2
SUN2000-600W-P
MERC-1100/1300W



Smart PV Inverter

SUN2000-100/115KTL-M2

Content



Products



Installation

EHS (Environment, Safety & Health)

EHS Management - Definition

- EHS stands for environment, occupational health, and safety.

E —Environment → **ISO 14001**
H —Health ↘
S —Safety ↙ → **OHSAS 18001**

- **Environment (ISO 14001)**

The external existence of an organization's operational activities, including air, water, land, natural resources, plants, animals, people, and their interrelationships.

- **Occupational Health and Safety (OHSAS 18001)**

Conditions and factors that affect or may affect the health and safety of employees, temporary staff, contractor personnel, visitors, and other personnel in the workplace.









Smart PV EHS Requirement - PPE + Professional Tools

PPE

Name`	Insulation Gloves	Insulated Safety Shoes (Anti-Smashing)	Protective Clothes	Protective Gloves	Goggles	Safety Helmets	Safety Body Harnesses and Belts
Image							
Function	Prevent electric shocks during power-on tests.	Prevent electric shocks during power-on tests.	Cotton materials with reflective strips	Prevent cuts during transportation and removal.	Protect eyes from foreign objects during cutting work.	Protect head from falling objects during equipment room construction.	Prevent falling during equipment room construction.

Professional Tools

Name	Clamp Multimeter (F319)	Common Tool Kit	Torque Wrench	Flashlight	Tool Set	Infrared Thermometer	Ladder
Image							
Function	Professional measurement tools can insulate the probes to prevent electric shocks.	Take insulation measures.	Test bolt torques.	With high brightness and long range, the flashlight helps view devices in a cabinet.	Tools are insulated to prevent electric shocks.	Check temperature.	Prevent falling when climbing.

Onsite EHS Management Requirements - Electrical Safety



HIGH
VOLTAGE

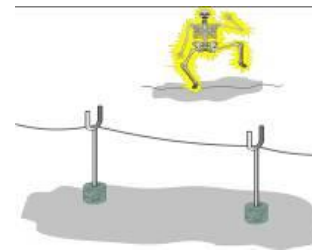
- Only professional electricians are allowed to install and connect electrical devices.
- The construction of electrical equipment should be carried out in strict accordance with the requirements of the design document. The construction should be supervised by the supervision personnel.
- Before the construction of electrical equipment, ensure that all switches of the equipment are turned off. Put on warning signs at the switches, such as **Do not switch on under maintenance**, and at the entrances, exits, and doors of the site. Personnel must be assigned to monitor the site.
- Strictly follow the engineering interface instructions specified in the contract to operate the power supply equipment on the customer side.
- Before using the customer's power supply, submit a power-on application to the customer and obtain the customer's approval.
- Before powering on the equipment, use a measuring instrument to check whether the power supply connection meets the safety requirements
- Check electrical equipment and power cables before use.
- Ensure that electrical devices and power cables are labeled.
- Use protective equipment such as insulation gloves and shoes.
- Check the power supply operation tools and replace any risky or damaged tool.
- Ensure guaranteed capacity. Do not change the capacity randomly.
- Do not use metal ladders when working in the power supply area.
- Only qualified power supply operators are allowed to operate the power supply.



Prevent electrical overload.



Do not use damaged power components and replace them in a timely manner.



Do not place the power cables on the ground.



FusionSolar C&I Inverters



SUN2000-12/15/17/20/25KTL-M5
(Three-phase inverter)

MPPT/Inputs: 2/4

Local commissioning:

- Built-in WLAN

Communication:

- Smart Dongle-WLAN-FE (optional)
- Smart Dongle-4G (optional)
- SmartLogger3000A (optional)

AFCI: Yes

PID Recovery: Yes



SUN2000-20/30/40/50KTL-M3
(Three-phase inverter)

MPPT/Inputs: 4/8

Local commissioning:

- Built-in WLAN

Communication:

- Smart Dongle-WLAN-FE (optional)
- Smart Dongle-4G (optional)
- SmartLogger3000A (optional)

AFCI: Yes

PID Recovery: Yes



SUN2000-100/115KTL-M2
(Three-phase inverter)

MPPT/Inputs: 10/20

Local commissioning:

- USB WLAN adapter

Communication:

- SmartLogger3000A (RS485/AC MBUS)
- Smart Dongle-4G (optional)

AFCI: only for 100KTL-M2 model

SSLD: Yes

Communication Modules



Smart Dongle-WLAN-FE

- Supports a maximum of **10** devices
- Provides a plug & play USB interface for connecting to inverters for monitoring through WLAN or Fast Ethernet

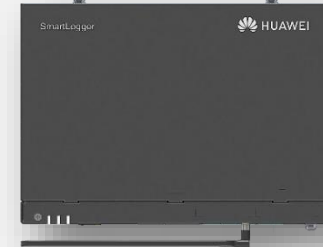
Compatible with SUN2000-12-25KTL-M5 and SUN2000-20-50KTL-M3 inverters



Smart Dongle-4G

- Supports a maximum of **10** devices
- Provides a plug & play USB interface for connecting to inverters for monitoring through 4G

Compatible with SUN2000-12-25KTL-M5, SUN2000-20-50KTL-M3 and 100/115KTL-M2 inverters



SmartLogger3000A

- Supports a maximum of **80** inverters
- Communication with inverters:
 - ✓ RS485
 - ✓ AC MBUS (isolation transformer)
- Communication with the cloud:
 - ✓ Ethernet
 - ✓ 4G via built-in 4G module
- Local commissioning:
 - ✓ WebUI via Ethernet
 - ✓ App via built-in WLAN
- Power reduction interface for inverter power control
- Digital & Analog IO for EMI integration

1.3 Smart Power Sensor/ Power Meter



Smart Power Sensor
DTSU666-H 250 A/50 mA (Three-Phase)
DTSU666-HW

- Connects to an inverter over RS485
- Class 1 high accuracy meter readings for production/consumption monitoring
- Import/Export of meter readings for export limitation functionality
- Current transformer included (DTSU666-H only)

Compatible with SUN2000-12-25KTL-M5, 20-50KTL-M3, 100/115KTL-M2 inverters



Third-Party Power Meters

- Compatible power meters for SmartLogger3000A

Management System



FusionSolar

FusionSolar App (Local & Remote)

- 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



WebUI

- Local commissioning of SmartLogger3000A
- Ethernet connection between SmartLogger3000A and PC



FusionSolar Smart PV Management System

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

FusionSolar Smart PV Solution



	Residential		Commercial and Industrial						Utility
	(2-6)-L1	(5-10)-M1	(12-25)-M5	20-M3	(30-40)-M3	50-M3	100-M2	115-M2	330-H1
# of phases	1	3	3	3	3	3	3	3	3
voltage output (L-L)	220-240	380-400	380-415	220-240	380-480	380-480	380-480	380-480	800
# of MPPTs	2	2	2	4	4	4	10	10	6
# of inputs	2 (1 per MPPT)	2 (1 per MPPT)	4 (2 per MPPT)	8 (2 per MPPT)	8 (2 per MPPT)	8 (2 per MPPT)	20 (2 per MPPT)	20 (2 per MPPT)	28 (4,5,5,4,5,5)
max V_{in}	600	1100	1100	800	1100	1100	1100	1100	1500
max I_{sc} (per MPPT)	18 (PV) 15 (hybrid)	19.5 (PV) 16.7 (hybrid)	40	40	40	40	40	40	115
max THDi	≤ 3%	≤ 3%	≤ 3%	≤ 3%	≤ 3%	≤ 3%	≤ 3%	≤ 3%	≤ 1%
hybrid ready	Yes	Yes	No	No	No	No	No	No	No
AFCI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
PID recovery	No	No	Yes	Yes	Yes	Yes	No	No	No
Degree of protection	IP65	IP65	IP66	IP66	IP66	IP66	IP66	IP66	IP66
Optimizer	450/600	450/600	450/600 1100/1300	450/600 1100/1300	450/600 1100/1300	1100/1300	-	-	-

Content



Products



Installation

Inverter Installation Videos



SUN2000-12/15/17/20/25KTL-M5
(Three-phase inverter)

Website:

<https://support.huawei.com/enterprise/en/doc/EDOC1100317850>

QR Code:



SUN2000-20/30/40KTL-M3
(Three-phase inverter)

Website:

<https://support.huawei.com/enterprise/en/doc/EDOC1100177966?idPath=258788303%7C254827209%7C258792409%7C22755755>

QR Code:



SUN2000-100/115KTL-M2
(Three-phase inverter)

Website:

<https://support.huawei.com/enterprise/en/doc/EDOC1100111807>

QR Code:



Communication Modules Quick Guide

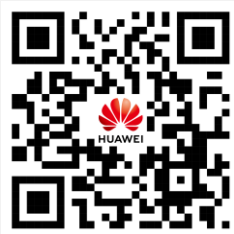


Smart Dongle-WLAN-FE

Website:

<https://support.huawei.com/enterprise/en/doc/EDOC1100102027?idPath=258788303%7C258788489%7C258789981%7C21102413%7C23826585>

QR code:



Smart Dongle-4G

Website:

<https://support.huawei.com/enterprise/en/doc/EDOC1100253102?idPath=258788303%7C258788489%7C258789981%7C21102413%7C23826585>

QR code:



SmartLogger3000A

Website:

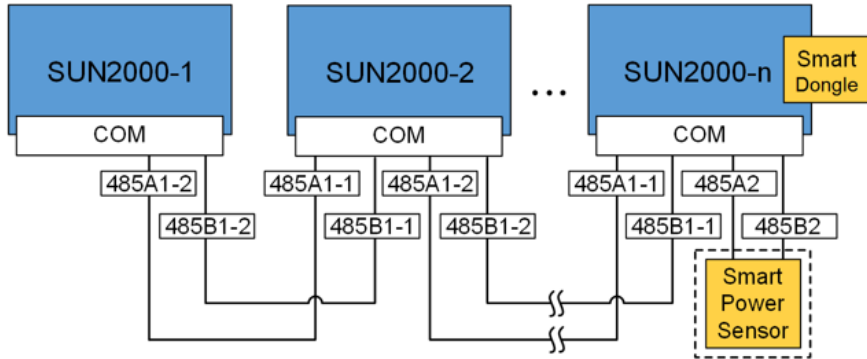
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Installation for Networking Devices

Smart Dongle Networking Scenario



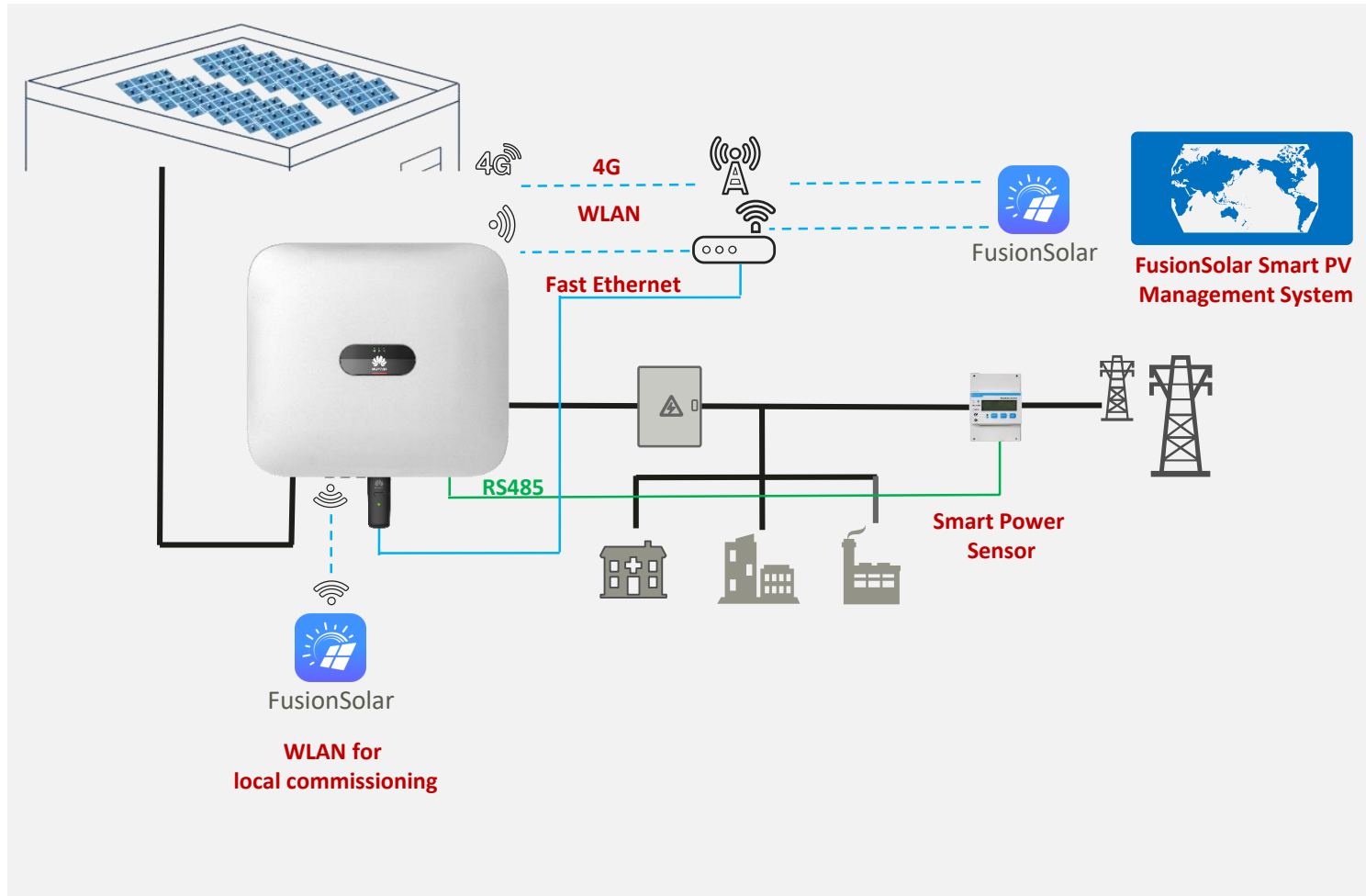
NOTE

- In the Smart Dongle networking scenario, the SmartLogger cannot be connected.
- The smart power sensor is necessary for export limitation.
- The Smart Dongle and smart power sensor must be connected to the same inverter. The inverter can be any inverter in the network and its model can be SUN2000-12/15/17/20/25KTL-M5, 20/30/40/50KTL-M3, or 100/115KTL-M2.

Port Pin Definition			Function	Description
(12KTL-25KTL)-M5	20KTL-50KTL-M3	100/115KTL-M2		
9: 485A1	1: 485A1-1	1: RS485A IN (RS485-1)	RS485 differential signal+	Used to cascade inverters.
10: 485B1	3: 485B1-1	3: RS485B IN (RS485-1)	RS485 differential signal-	
	2: 485A1-2	2: RS485A OUT (RS485-1)	RS485 differential signal+	
	4: 485B1-2	4: RS485B OUT (RS485-1)	RS485 differential signal-	
11: 485A2	7: 485A2	7: RS485A IN (RS485-2)	RS485 differential signal+	Used to connect to an RS485 signal port on a smart power sensor for export limitation.
12: 485B2	9: 485B2	8: RS485B IN (RS485-2)	RS485 differential signal-	

Small Scale C&I Application with Optimizers

SUN2000-12/15/17/20/25KTL-M5 – Single Inverter with SDongle-WLAN/FE



Local Commissioning: Inverter built-in WLAN communicates to FusionSolar App.

Remote Monitoring

- Optional WLAN or Ethernet communication to FusionSolar Smart PV Management System via Smart Dongle WLAN-FE.
- Optional 4G communication to FusionSolar Smart PV Management System via Smart Dongle 4G.

DTSU666-H 250A/50mA three phase smart power sensor connects to inverter via RS485 for power output monitoring or control.

Built-in RRCR (Radio Ripple Control Receiver) interface allows to control the inverter's power production through 4 digital inputs.

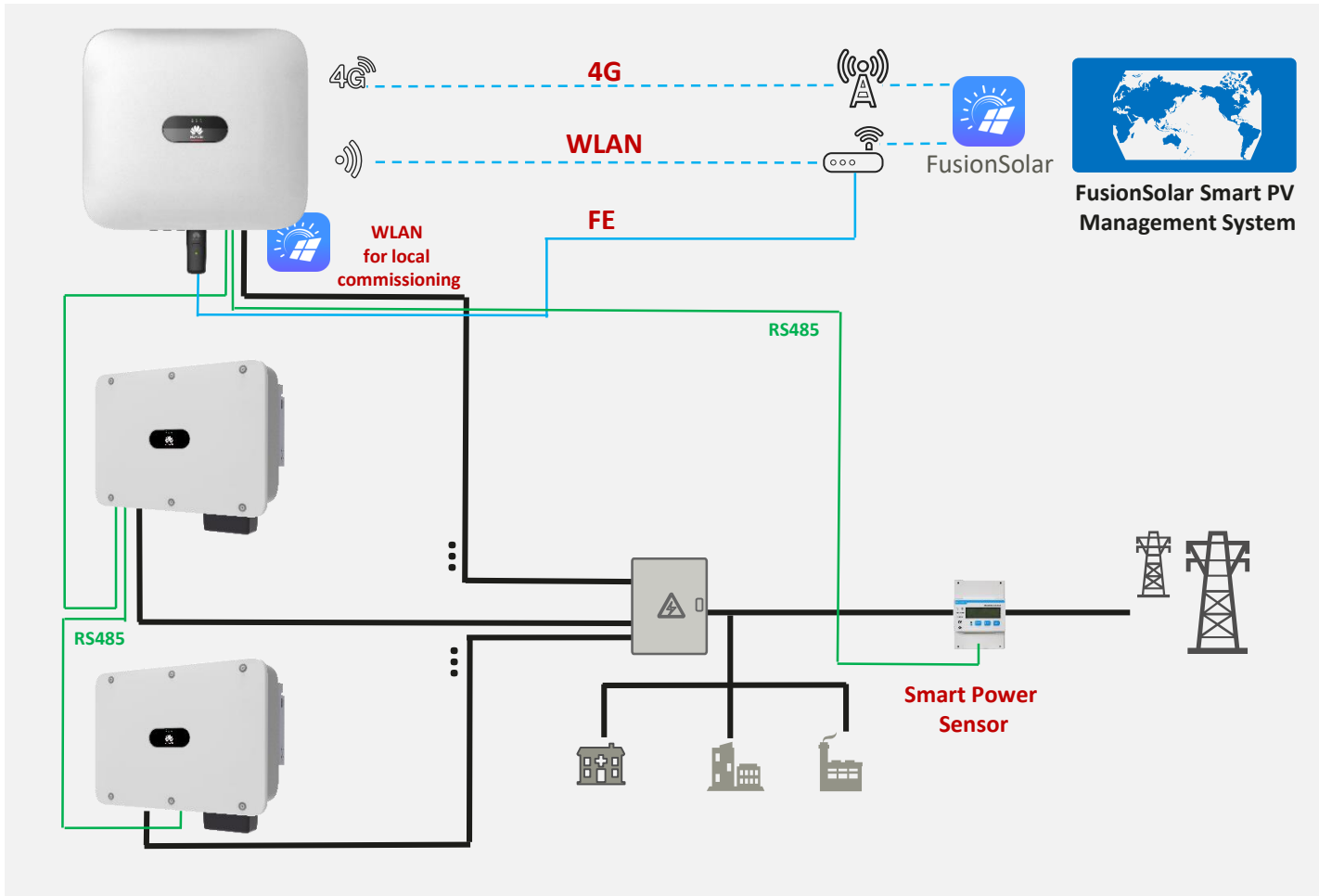
AFCI function to mitigate fire risk.

PID recovery for better module performance.

Full optimizers supported for higher yields, 0V voltage quick shutdown & module level monitoring

Medium Scale C&I Application

SUN2000-12-25KTL-M5 as master inverter – Less than or equal to 10 Inverters



Master inverter: SUN2000-12-25KTL-M5

Slave inverters: max **10** inverters can be connected.

Local Commissioning: FusionSolar App connects to master inverter via built-in WLAN and all slave inverter settings will be synchronized.

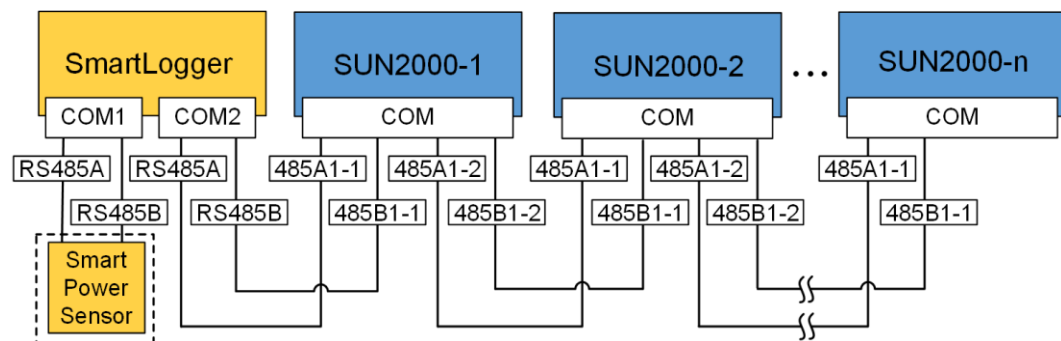
Remote Monitoring:

- Optional WLAN or Ethernet communication to FusionSolar Smart PV Management System via Smart Dongle WLAN-FE.
- Optional 4G communication to FusionSolar Smart PV Management System via Smart Dongle 4G.

DTSU666-H 250A/50mA three phase smart power sensor connects to master inverter via RS485 for power output monitoring or control.

System power capacity shall not be higher than 170KW due to the power measurement limit of DTSU666-H 250A/50mA smart power sensor. Future white list power meter will be available 2020.06 without this restriction.

SmartLogger Networking Scenario



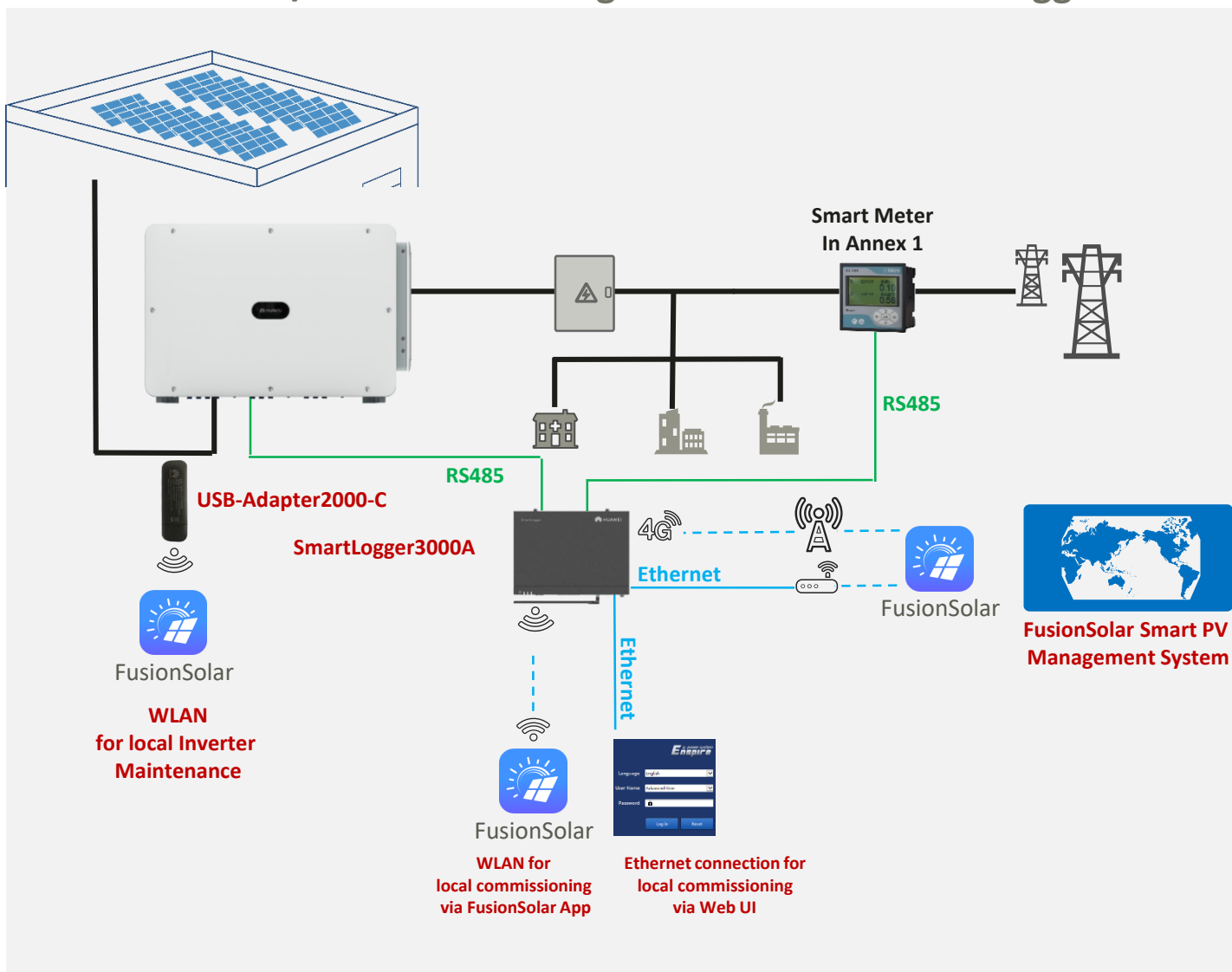
NOTE

- In the SmartLogger networking scenario, the Smart Dongle cannot be connected.
- A maximum of 80 inverters can be connected to a single SmartLogger. You are advised to connect fewer than 30 devices to each RS485 route.
- The smart power sensor is necessary for export limitation. Select a smart power sensor according to the project requirements.
- To ensure the system response speed, it is recommended that the smart power sensor be connected to a COM port other than the inverter COM port.

Port Pin Definition			Function	Description
(12KTL-25KTL)-M5	20-50KTL-M3	100/115KTL-M2		
9: 485A1	1: 485A1-1	1: RS485A IN (RS485-1)	RS485 differential signal+	Used to cascade inverters or connect to the RS485 signal port on the SmartLogger.
10: 485B1	3: 485B1-1	3: RS485B IN (RS485-1)	RS485 differential signal-	
	2: 485A1-2	2: RS485A OUT (RS485-1)	RS485 differential signal+	
	4: 485B1-2	4: RS485B OUT (RS485-1)	RS485 differential signal-	

Small-Medium Scale C&I Application

SUN2000-100/115KTL-M2 – Single Inverter with SmartLogger3000A



Local Commissioning:

- Web UI installed laptop connecting to SmartLogger3000A via its Ethernet port.

- FusionSolar App connecting to SmartLogger3000A via its built-in WLAN communication.

Remote Monitoring:

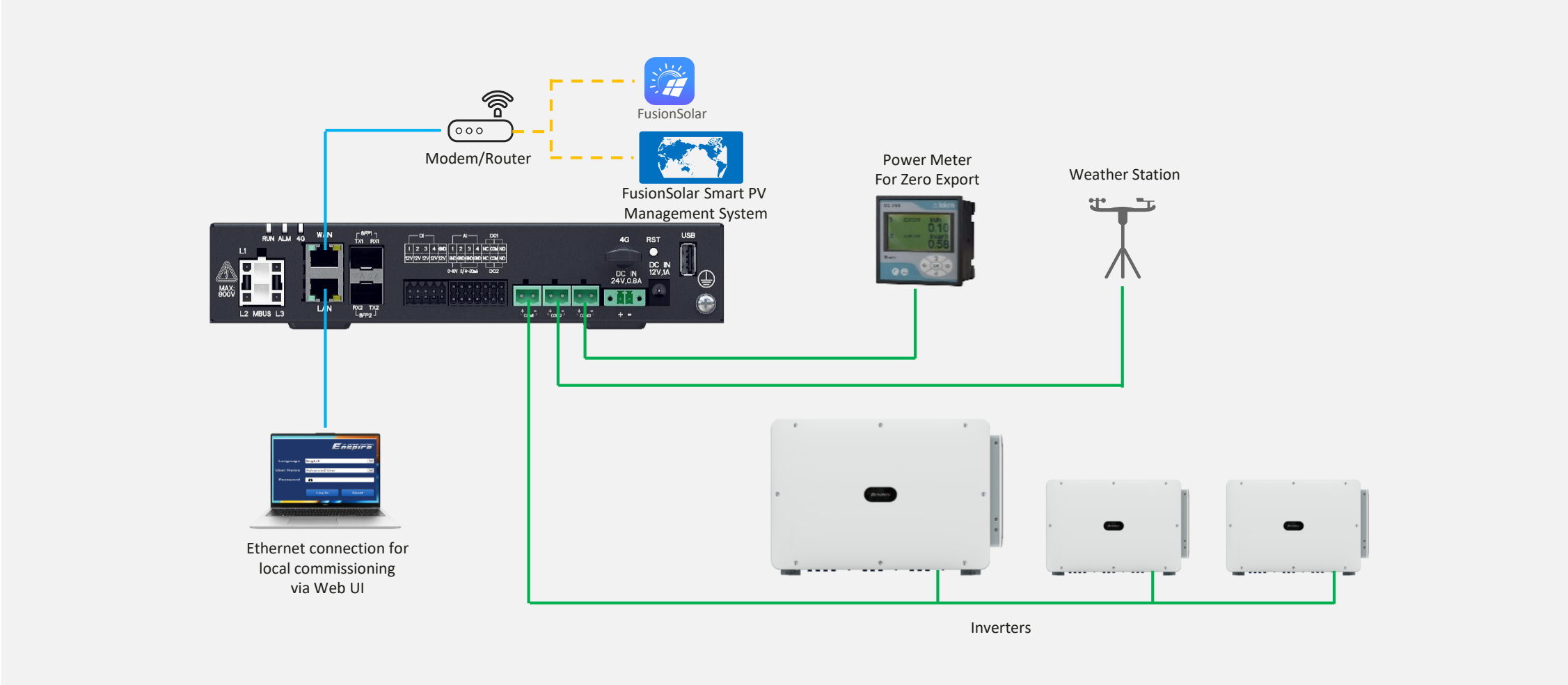
- SmartLogger3000A communicates to FusionSolar smart PV management system via Ethernet.
- SmartLogger3000A communicates to FusionSolar smart PV management system via built-in 4G.

Smart meter (Listed in Annex 1) connects to SmartLogger3000A via RS485 for power output monitoring or control.

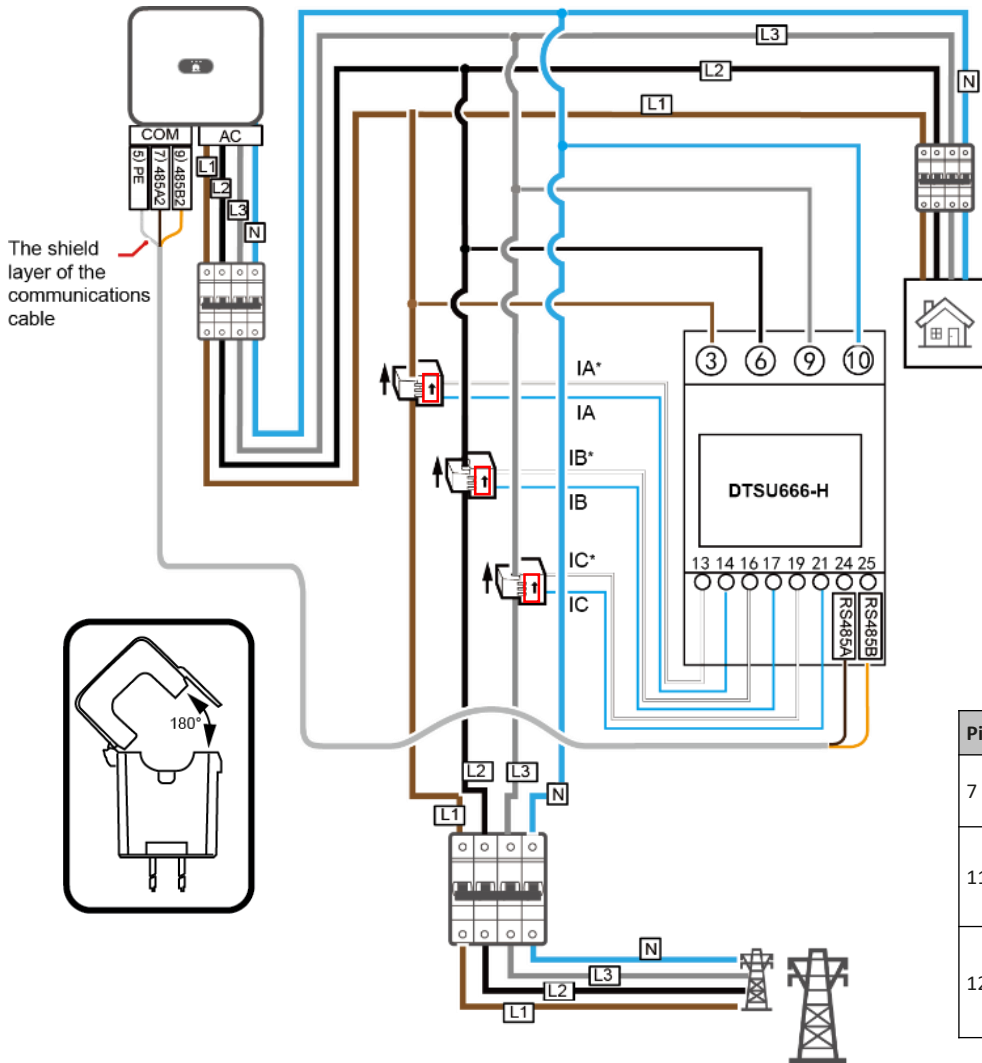
SmartLogger3000A has built-in RRCR (Radio Ripple Control Receiver) interface allows to control the inverter's power production through 4 digital inputs. Ripple control receiver will be provided by 3rd party.

FusionSolar App can be connected to inverter USB port onsite for maintenance.

SmartLogger Connection



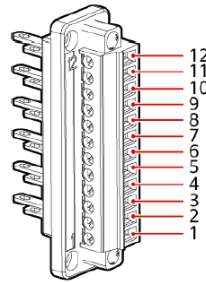
Installation of Smart Power Sensor (Three-phase Four-wire)



1. Connect the L1, L2, L3, N voltage lines to the 3, 6, 9 and 10 terminals of the connector respectively. Connect current transformer outlets IA*, IA, IB*, IB, IC*, IC to terminals 13, 14, 16, 17, 19, 21 of the connector respectively.
2. Connect RS485A and RS485B to the communication host.

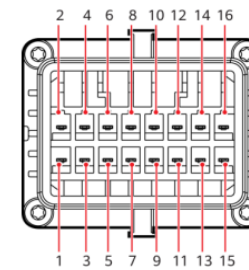
Note: The CT direction must be consistent with the arrow direction shown in the figure on the left.

SUN2000-(12KTL-25KTL)-M5



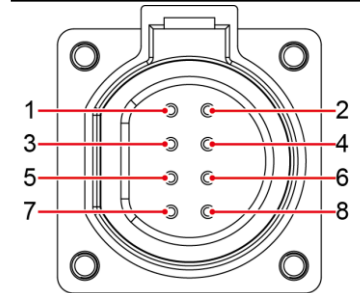
Pin	Definition	Function	Description
7	PE	Shielding ground	N/A
11	485A2	RS485 differential signal+	Used to connect to an RS485 signal port on a smart power sensor for export limitation.
12	485B2	RS485 differential signal-	Used to connect to an RS485 signal port on a smart power sensor for export limitation.

SUN2000-20-50KTL-M3



Pin	Definition	Function	Description
7	485A2	RS485 differential signal+	Used to connect to an RS485 signal port on a smart power sensor for export limitation.
9	485B2	RS485 differential signal-	
13	GND	Shielding ground	N/A

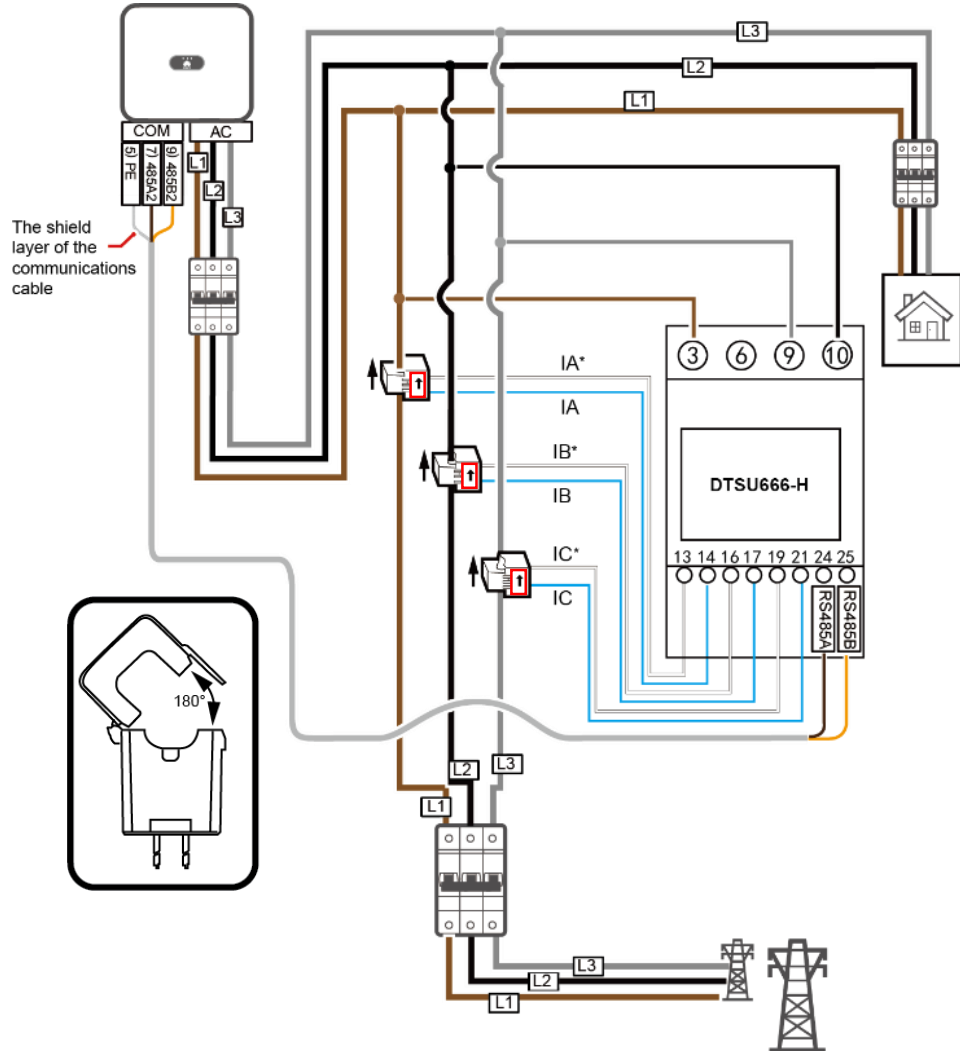
SUN2000-100/115KTL-M2



Pin	Definition	Function	Description
6	PE	Shielding ground	N/A
7	RS485-2: RS485A	RS485 differential signal+	Used to connect to an RS485 signal port on a smart power sensor for export limitation.
8	RS485-2: RS485B	RS485 differential signal-	

IH05N00001

Installation of Smart Power Sensor (Three-phase Three-wire)

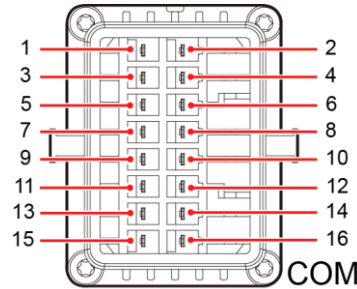


1. Connect the L1, L3, L2 voltage lines to the 3, 9 and 10 terminals of the connector respectively. Connect current transformer outlets IA*, IA, IB*, IB, IC*, IC to terminals 13, 14, 16, 17, 19, 21 of the collector.
2. Connect RS485A and RS485B to the communication host.

Note a: The CT direction must be consistent with the arrow direction shown in the figure on the left.

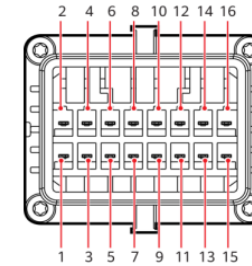
Note b: When the DTSU666-H 250 A/50 mA smart power sensor is connected to the inverter in three-phase, three-wire mode, one phase line needs to be connected to the Ub (10) interface of the smart power sensor.

SUN2000-(12KTL-20KTL)-M0



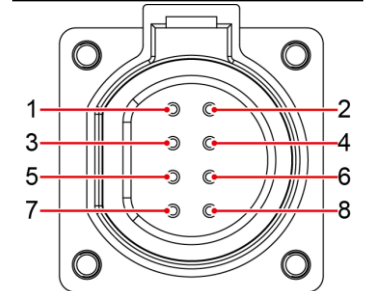
Pin	Definition	Function	Description
5	PE	Shielding ground	N/A
7	485A2	RS485 differential signal+	Used to connect to an RS485 signal port on a smart power sensor for export limitation.
9	485B2	RS485 differential signal-	

SUN2000-20-50KTL-M3



Pin	Definition	Function	Description
7	485A2	RS485 differential signal+	Used to connect to an RS485 signal port on a smart power sensor for export limitation.
9	485B2	RS485 differential signal-	
13	GND	Shielding ground	N/A

SUN2000-100KTL-M1

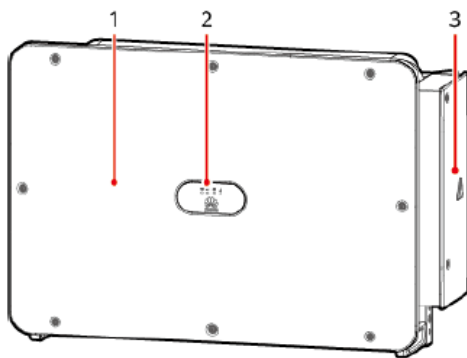


Pin	Definition	Function	Description
6	PE	Shielding ground	N/A
7	RS485-2: RS485A	RS485 differential signal+	Used to connect to an RS485 signal port on a smart power sensor for export limitation.
8	RS485-2: RS485B	RS485 differential signal-	

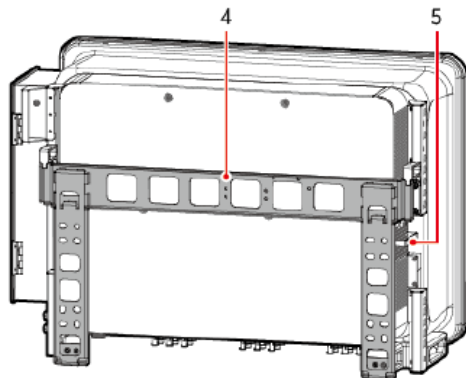
Determining the Installation Position

Front View

Figure 2-5 Front view



- (1) Panel
- (3) Maintenance compartment door
- (5) External fan tray

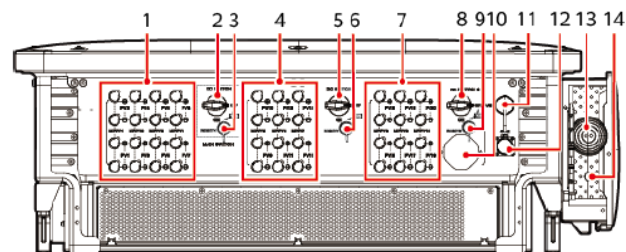


- (2) LED indicators
- (4) Mounting bracket

IS12W00038

Bottom View





Figure 2-6 Port description

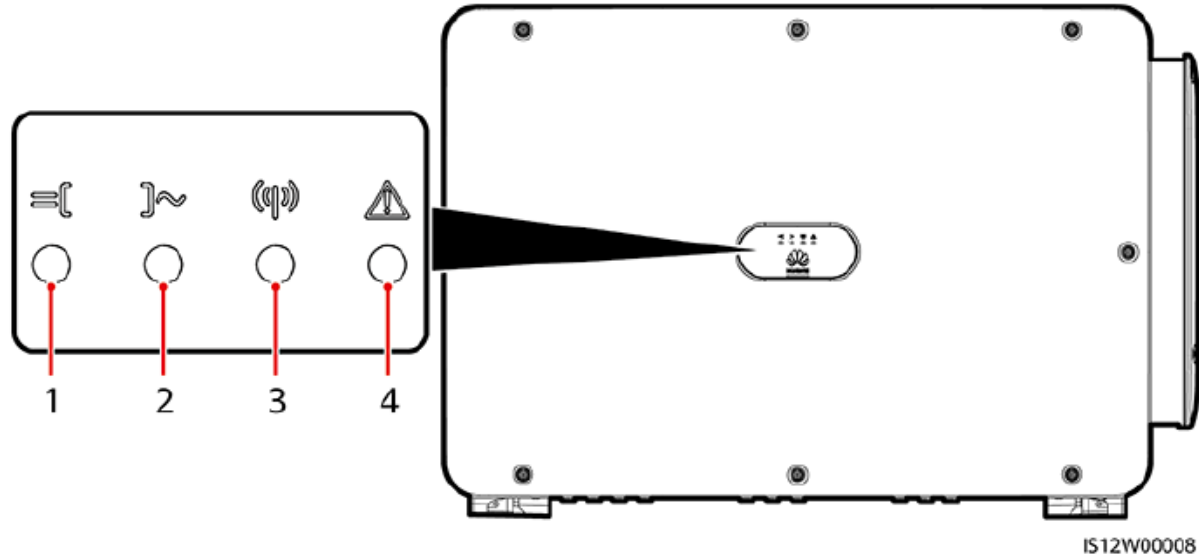


IS12W00048

- | | |
|--|---|
| (1) DC input terminal group 1 (PV1–PV8, controlled by DC SWITCH 1) | (2) DC switch 1 (DC SWITCH 1) |
| (3) Reset button 1 (RESET 1) | (4) DC input terminal group 2 (PV9–PV14, controlled by DC SWITCH 2) |
| (5) DC switch 2 (DC SWITCH 2) | (6) Reset button 2 (RESET 2) |
| (7) DC input terminal group 3 (PV15–PV20, controlled by DC SWITCH 3) | (8) DC switch 3 (DC SWITCH 3) |
| (9) Reset button 3 (RESET 3) | (10) Ventilation valve |
| (11) USB port | (12) Communications port (COM) |
| (13) Hole for the AC output power cable | (14) Hole for the tracking system power cable |

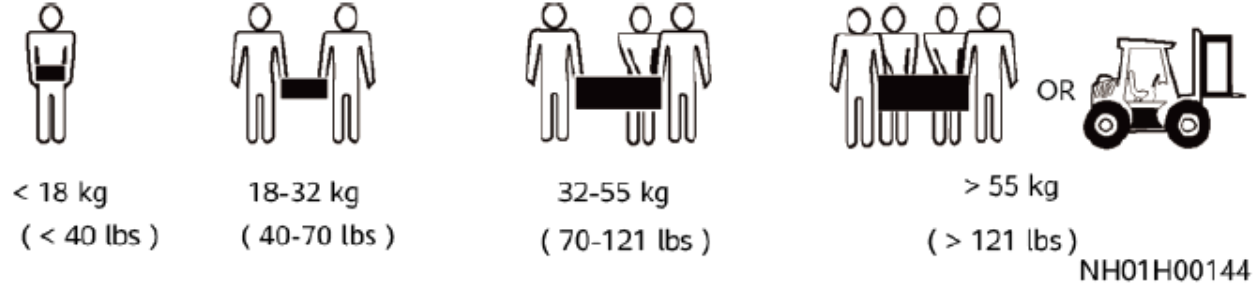
Indicator Status

1	PV connection indicator 
2	Grid connection indicator 
3	Communications indicator 
4	Alarm/ Maintenance indicator 



Moving Heavy Objects

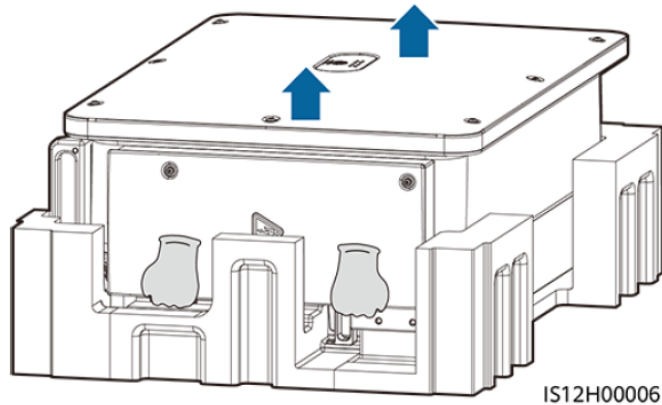
- Be cautious to avoid injury when moving heavy objects.



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

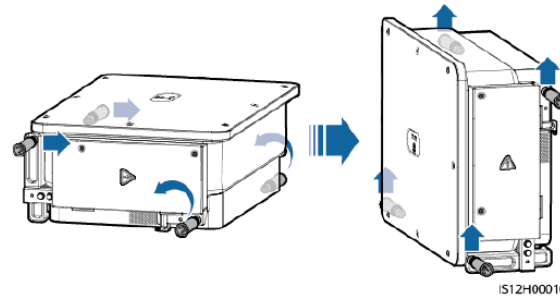
- Step 1** Lift the solar inverter from the packing case and move it to the installation position.

Figure 4-13 Taking out the solar inverter



- Step 2** Lift the solar inverter and keep it upright.

Figure 4-14 Lifting the solar inverter and keeping it upright

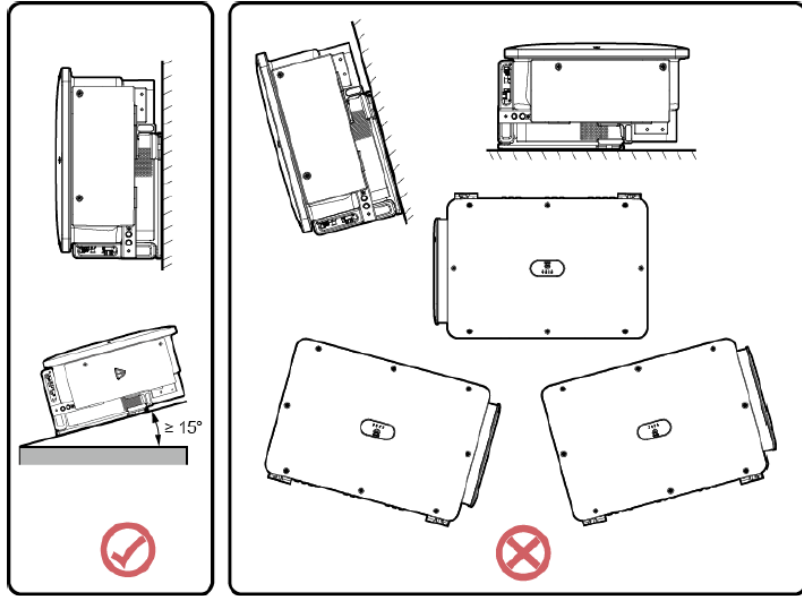


- Step 3** If the installation position is too high to install the solar inverter on the mounting bracket, run a rope that is strong enough to bear the solar inverter through the two lifting eyes, and hoist the solar inverter.

NOTICE

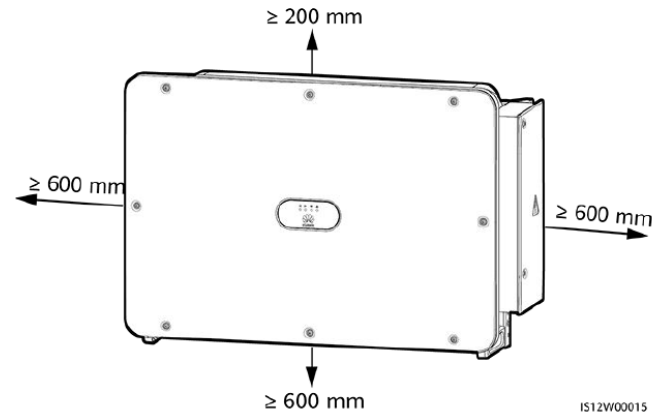
Hoist the solar inverter with care to protect it from colliding with the wall or other objects.

Installation Angle Requirements



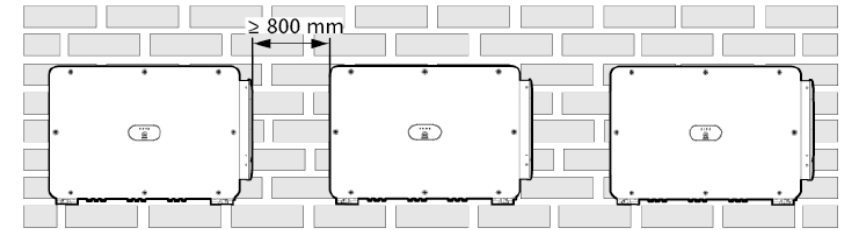
IS12W00014

Installation Clearance



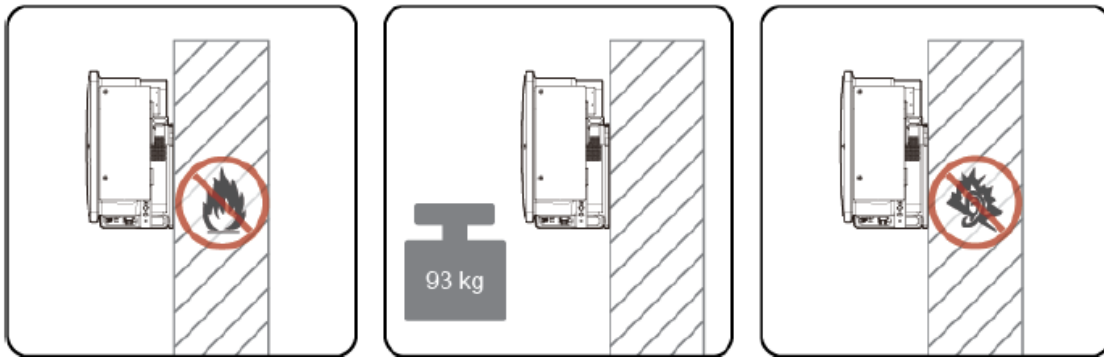
IS12W00015

Horizontal installation mode (recommended)

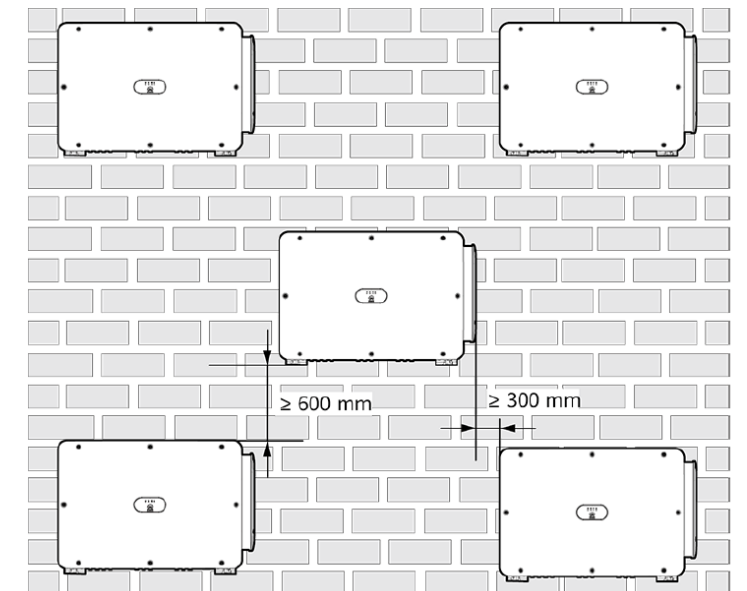


IS06W00046

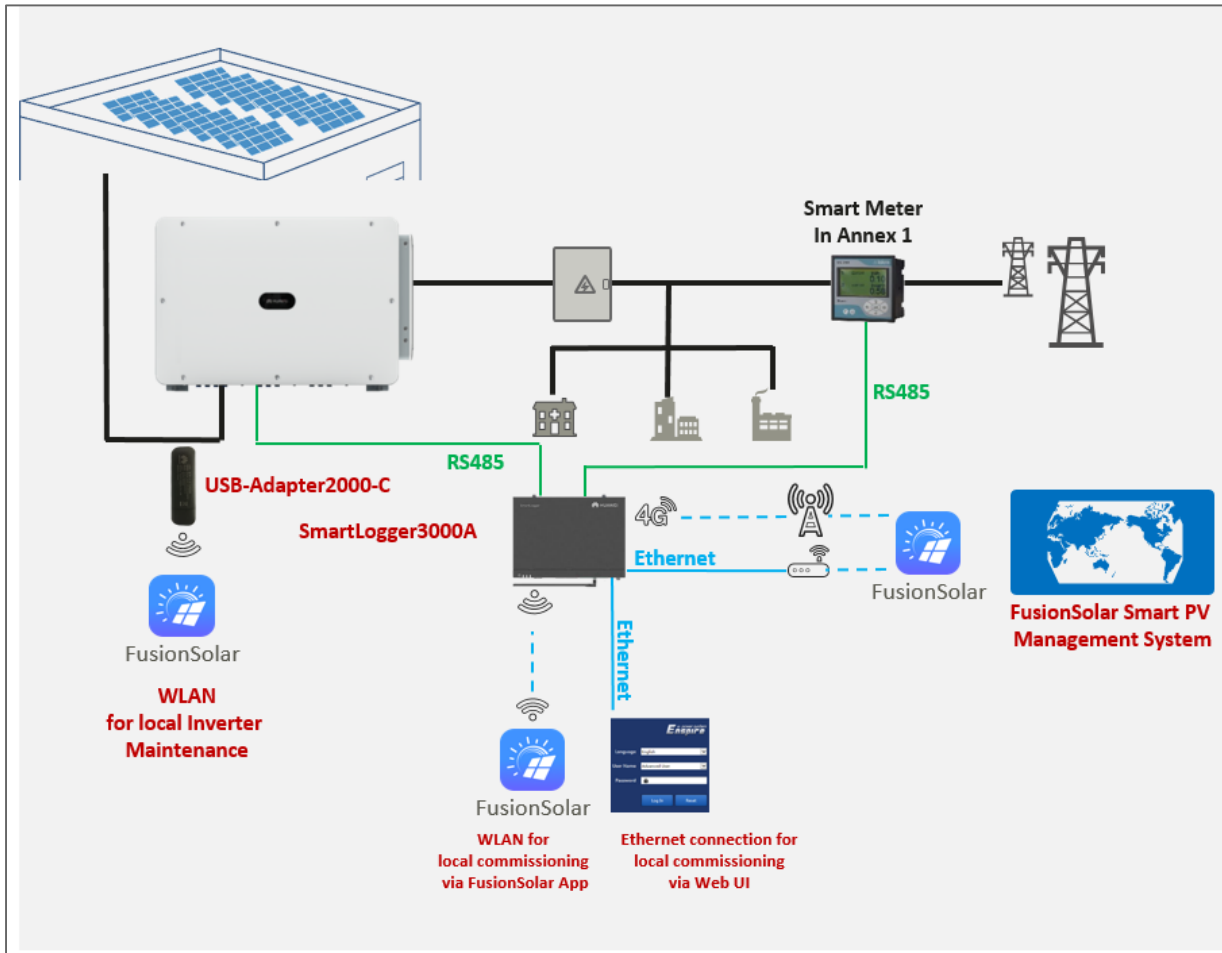
Mounting Structure Requirements



Triangle installation mode (recommended)



Verifying the Installation



Checkpoints before Energization	
Inverter Mounting	Secure the brackets that inverter was mounted
Ground Connection	Grounding Cable is a must
PV Connection of Each String	Polarity Check Pull Test Cable Management Megger Test / Insulation Test Measurement of Voltage MC4's provided should be use Suggested Torch measurement should implement
SmartLogger	LED lights was lit and secured power supply
Smart PVMS Connection	Internet Connection
Switches	When testing – AC/DC Switches and Breaker was on OFF position
Electrical Labels	

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