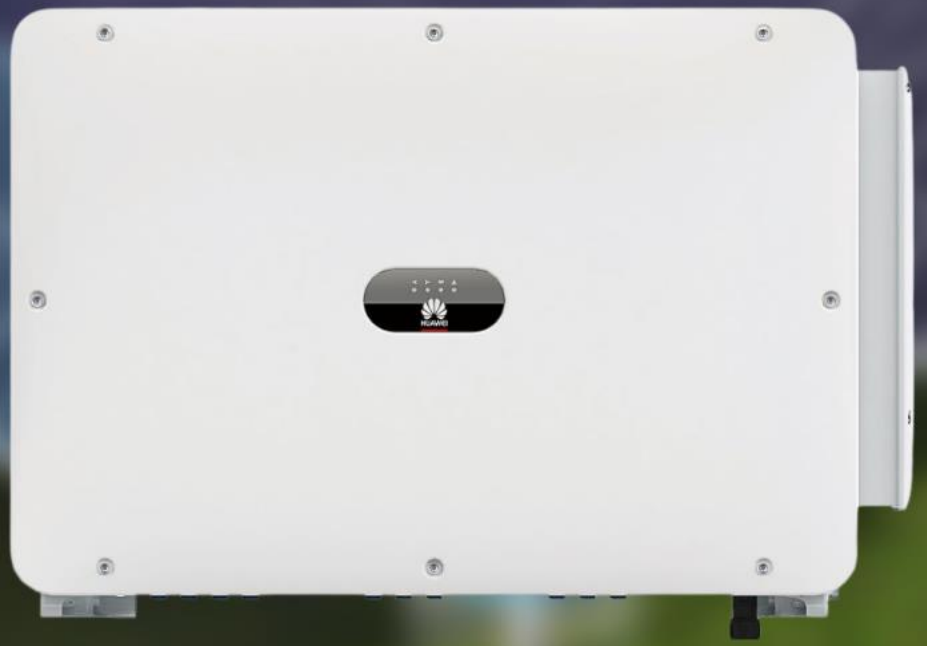
EMAT
Materiales Fotovoltaicos

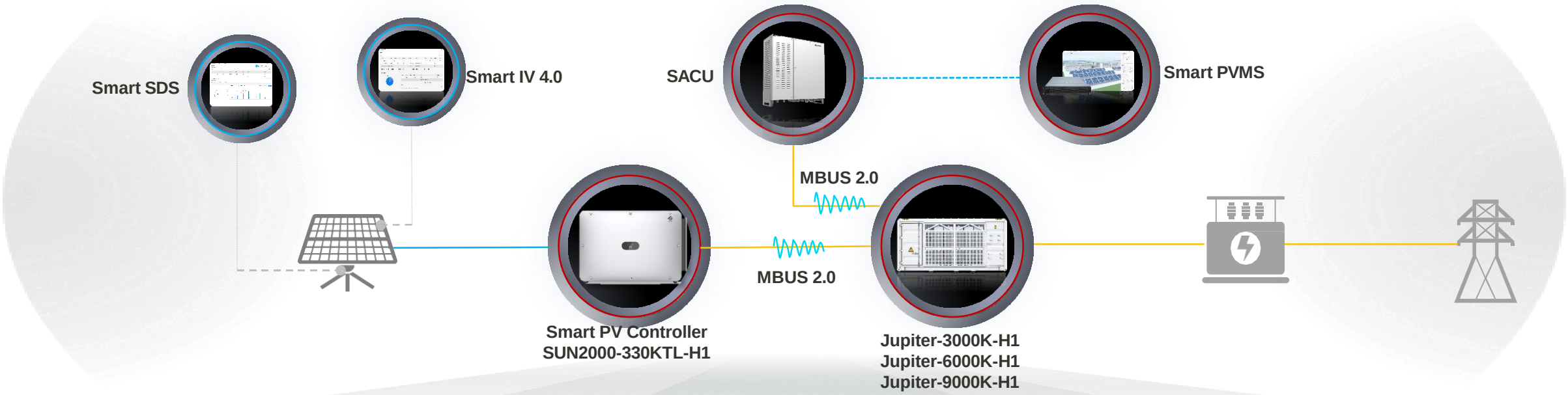
HUAWEI
Enterprise Partner
Gold

PRESENTACIÓN DEL INVERSOR HUAWEI

SUN2000-330KTL-H1



FusionSolar 8.0： Higher Yields, Smart O&M, Safe & Reliable and Grid Forming



Higher yields

Higher availability & low failure
Yields improved by 1%

Smart SDS
Yields improved by 1%

Smart O&M

Smart PV Solution
Save operation time 26.6%

Smart IV,
save 2000 hour/30 MW

Safe&Reliable

Higher availability，99.999%

Smart string level Disconnector (SSLD)
Smart connector temperature Detection（SCTD）

Grid Forming

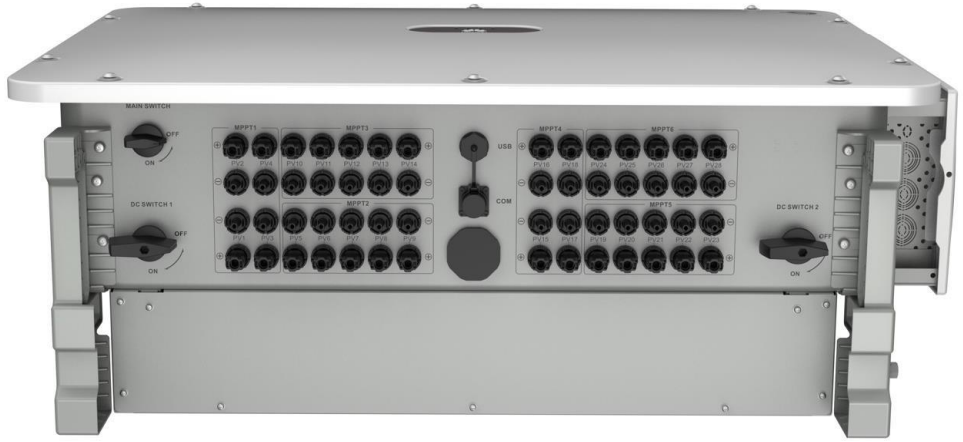
SCR =1.1 (100% operation)
SCCR = 0.7
THDi ≤ 1%
Support Goose+MBUS

Summary

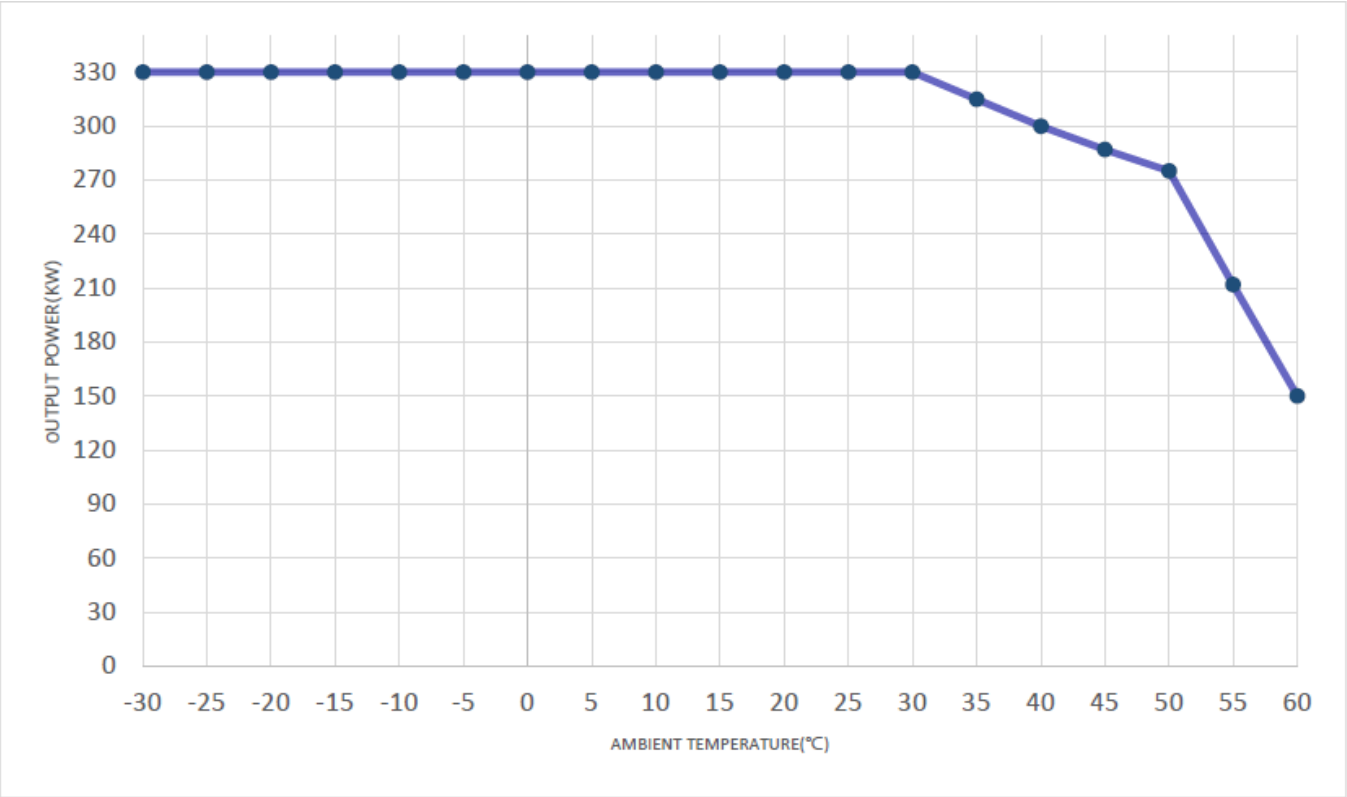
SUN2000-330KTL-H1	
Efficiency	
Max. Efficiency	99.00%
European Efficiency	98.80%
Input	
Max. Input Voltage	1,500 V
Number of Inputs	28
Number of MPP Trackers	6
Max. Current per MPPT	65A
Max. PV Inputs per MPPT	4/5/5/4/5/5
Max. Short Circuit Current per MPPT	115A
Start Voltage	550 V
MPPT Operating Voltage Range	500 V ~ 1,500 V
Nominal Input Voltage	1,080 V
Output	
Nominal AC Active Power	300,000 W @40°C
Max. AC Apparent Power	330,000 VA @30°C
Max. AC Active Power (cosφ=1)	330,000 W @30°C
Nominal Output Voltage	800 V, 3W + PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Nominal Output Current	216.6 A @40°C
Max. Output Current	238.2 A
Adjustable Power Factor Range	0.8 LG ... 0.8 LD
Max. Total Harmonic Distortion	< 1%

Protection	
Smart String-Level Disconnector (SSLD)	Yes
Anti-islanding Protection	Yes
AC Overcurrent Protection	Yes
DC Reverse-polarity Protection	Yes
PV-array String Fault Monitoring	Yes
DC Surge Arrester	Type II
AC Surge Arrester	Type II
DC Insulation Resistance Detection	Yes
AC Grounding Fault Protection	Yes
Residual Current Monitoring Unit	Yes
Communication	
Display	LED Indicators, WLAN + APP
USB	Yes
MBUS	Yes
RS485	Yes
General	
Dimensions (W x H x D)	1,048 x 750 x 395 mm
Weight (with mounting plate)	112 kg
Operating Temperature Range	-25°C ~ 60°C
Cooling Method	Smart Air Cooling
Max. Operating Altitude without Derating	4,000 m
Relative Humidity	0 ~ 100%
DC Connector	Staubli MC4 EVO2
AC Connector	Waterproof Connector + OT/DT Terminal
Protection Degree	IP66
Topology	Transformerless
Self power consumption at night (sleep mode)	4.8 W

Views



Temperature Derating Curve

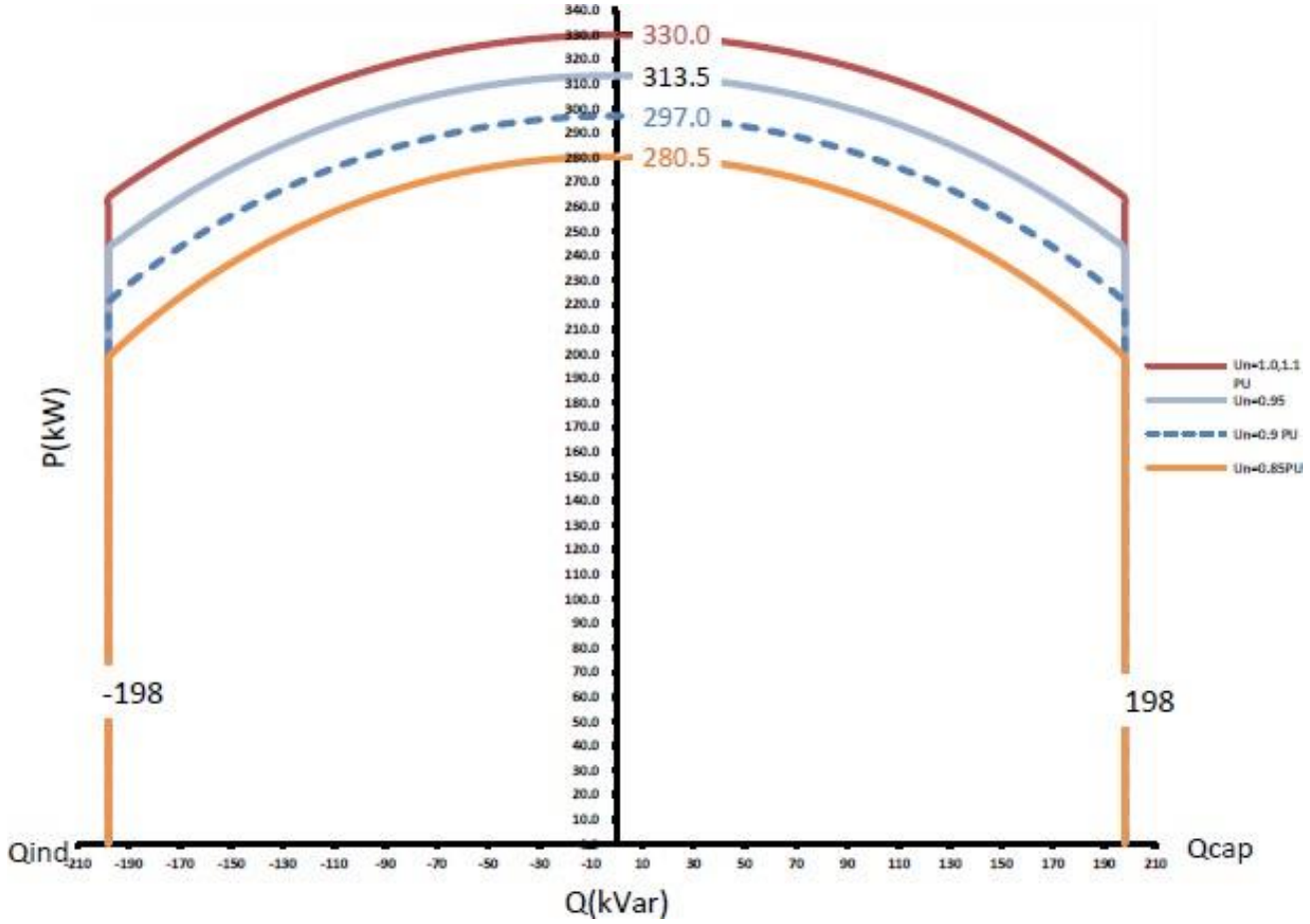


Grid Voltage:800Vac,PF=1

Model	-30°C	-25°C	-20°C	-15°C	-10°C	-5°C	0°C	5°C	10°C	15°C
SUN2000-330KTL-H1	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW	330 kW
	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C	
	330 kW	330 kW	330 kW	315 kW	300 kW	287 kW	275 kW	212 kW	150 kW	

PQ Curve

- ✓ Maximum reactive power range is -198kVar +198kVar.
- ✓ When SUN2000-330KTL-H1 operates at grid voltage 1.0/1.1 p.u., the output power can reach 330kW (when PF=1) or 330kVA.
- ✓ When SUN2000-330KTL-H1 operates at grid voltage 0.9 p.u., the output power can reach 297.05kW (when PF=1) or 297.05kVA.
- ✓ When SUN2000-330KTL-H1 operates at grid voltage 0.85 p.u., the output power can reach 280.50kW (when PF=1) or 250.50kVA.



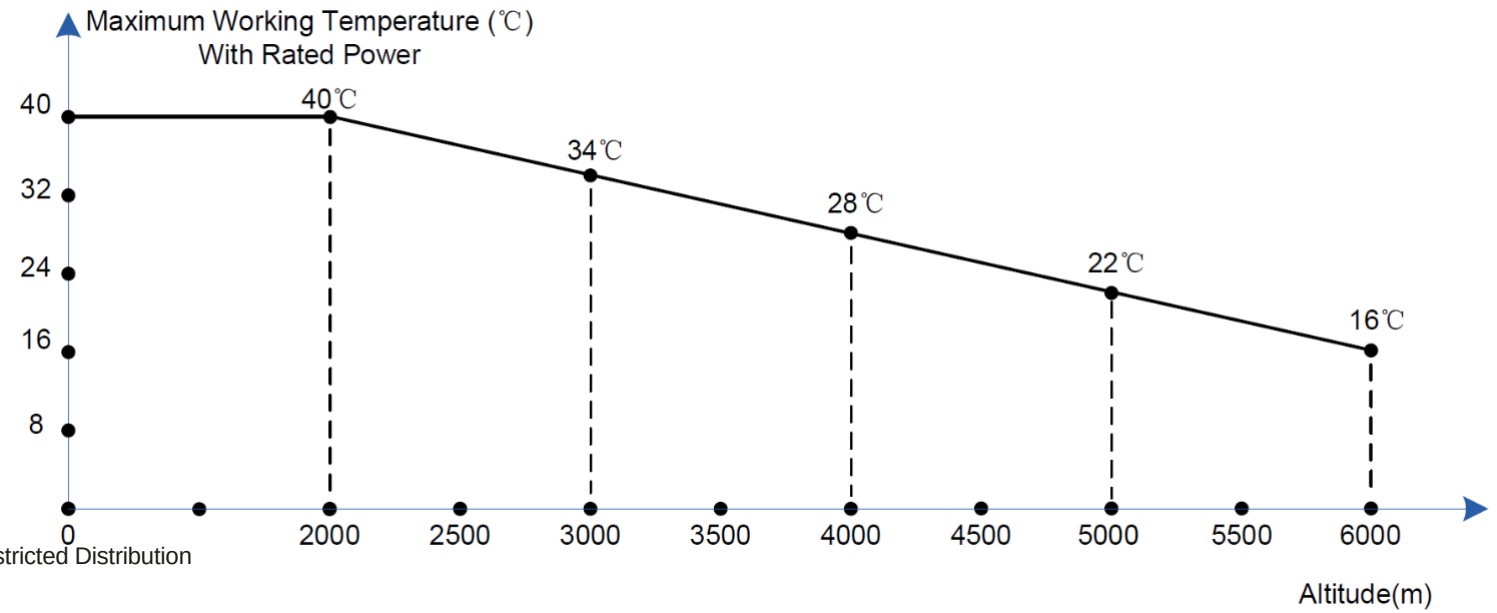
Max. Output Current = 238.2A

$$P(0.90\ p.u.) = \sqrt{3}\ x\ 0.90\ x\ 800V\ x\ 238.2A = 297.05\text{kW}$$

$$P(0.85\ p.u.) = \sqrt{3}\ x\ 0.85\ x\ 800V\ x\ 238.2A = 280.50\text{kW}$$

Altitude Derating

- ✓ The maximum working temperature is the ambient temperature below which SUN2000 can output rated power without derating.
- ✓ When the altitude rises, the cooling capacity of the inverters derates. So the internal temperature of inverters in the high altitude area will be higher and severer than that in the low altitude area.
- ✓ When altitude > 2000m, the maximum working temperature of SUN2000 should derate by altitude, **and it derates in accordance with 6 ℃/1000m.**

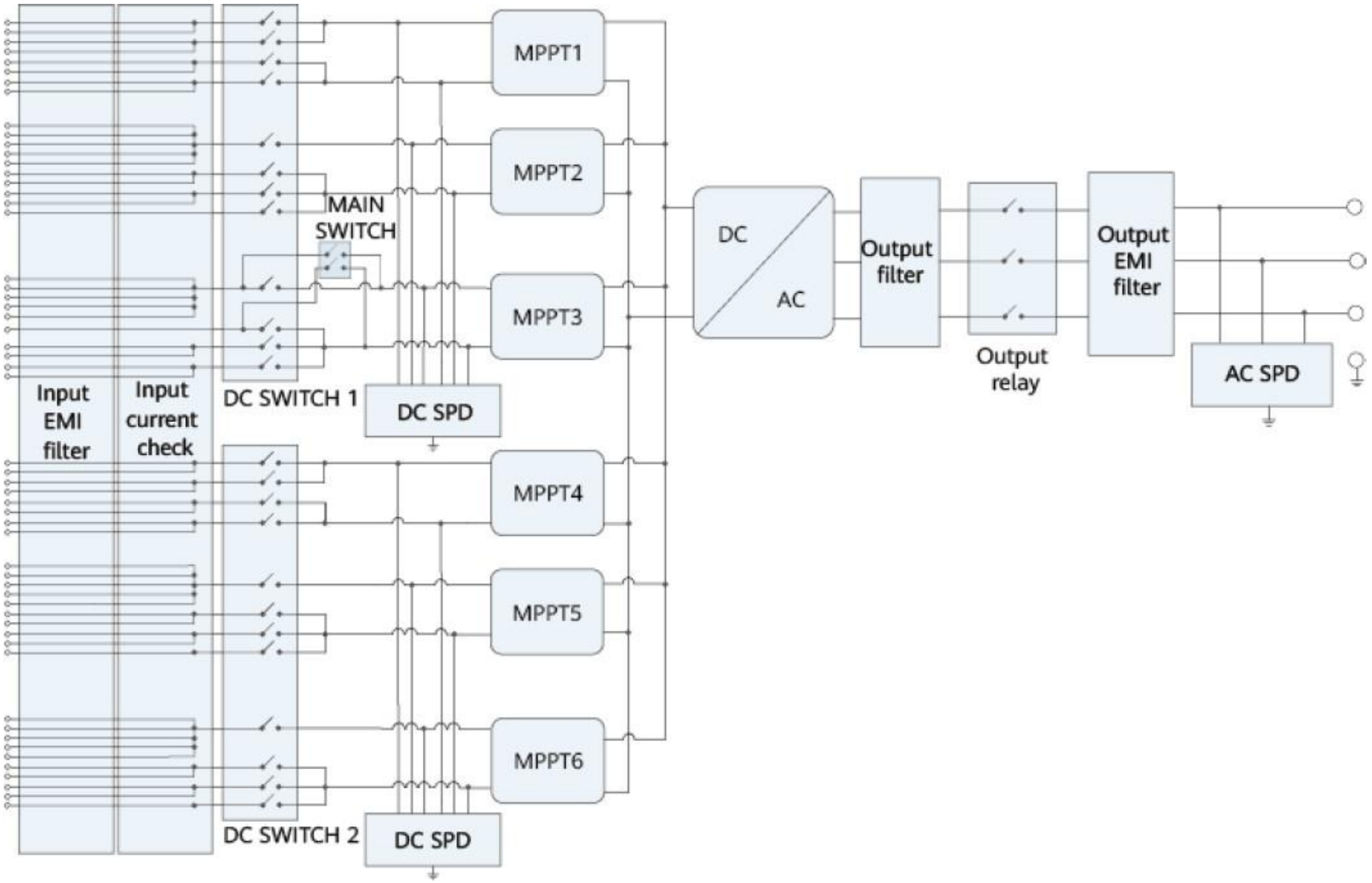


Certificates

- ✓ IEC 61000 EMC.
- ✓ IEC 62109 Safety.
- ✓ IEC 62116 Anti-island.
- ✓ IEC 61727 Utility PV systems.
- ✓ IEC 50530 Overall efficiency of grid connected photovoltaics inverters.
- ✓ IEC 60529 IP protection.
- ✓ IEC 60068 Environmental Testing.
- ✓ IEC 61683 Procedure for measuring efficiency.

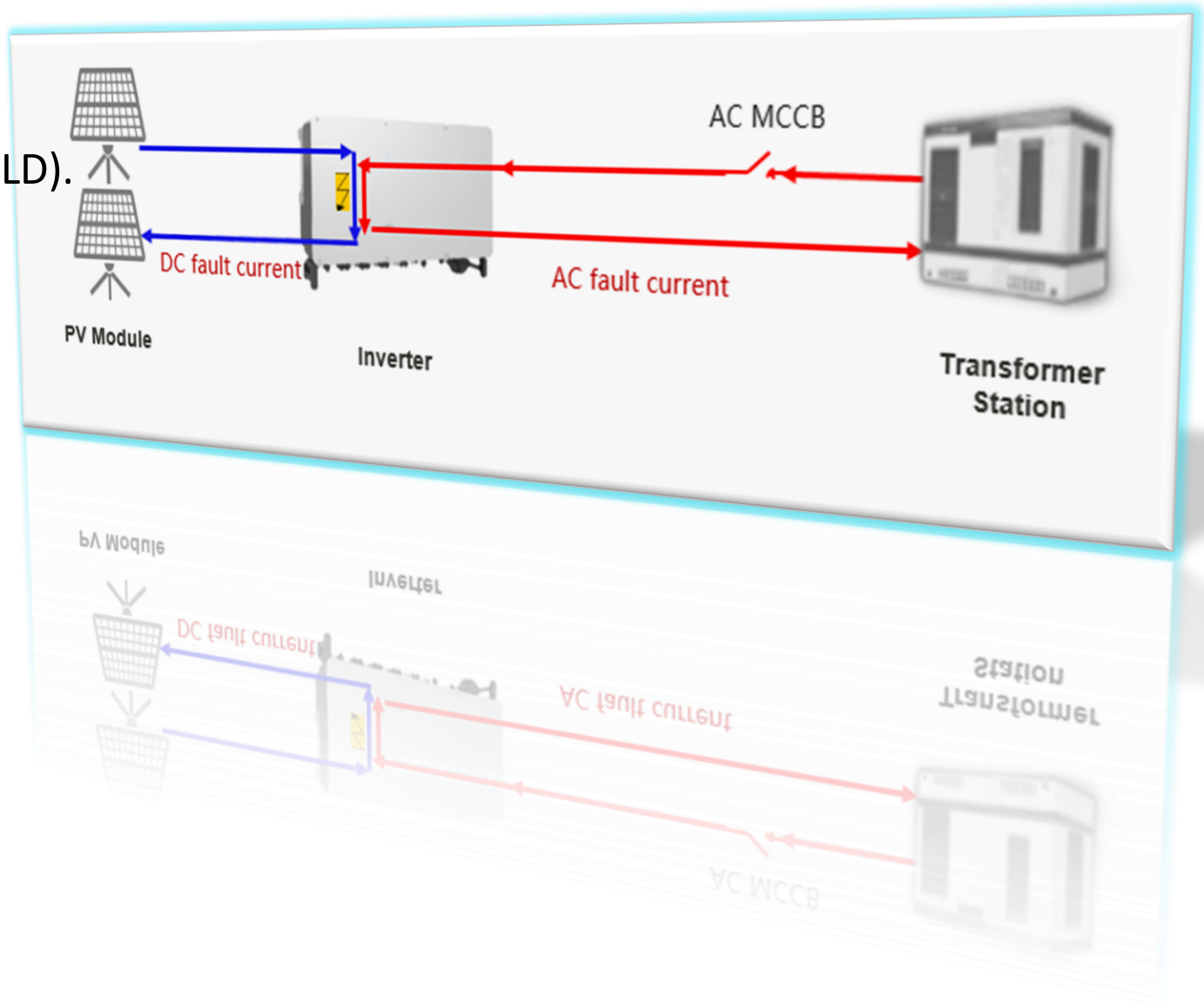
HUAWEI

SLD



Protections

- ✓ Smart String-Level Disconnector (SSLD).
- ✓ Anti-islanding.
- ✓ AC overcurrent.
- ✓ DC reverse-polarity.
- ✓ PV string fault detection.
- ✓ DC surge arrester.
- ✓ AC surge arrester.
- ✓ DC Insulation Resistance Detection.
- ✓ AC Grounding Fault Protection.
- ✓ Residue Current Monitoring Unit.

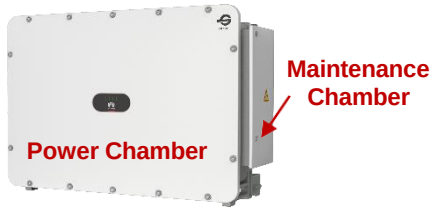


IP66 & separate chamber design : improvement of product reliability

Structure Optimization


广东苏试广博测试技术有限公司
Guangdong Sushi Guangbo Testing Technology Co., Ltd.
试 验 报 告

SUN2000 IP66 Test Report



SUN2000-330KTL-H1/H2

IP66 Protection Grade
Separate chambers design, free from foreign objects

- ✓ One-piece stretching aluminum panels to reduce splicing gaps
- ✓ High weather resistant coating material

Harsh Environment Test

Industry ś first open-ended Wind-blown & rain test chamber

Test chamber with built-in super fan and water spray device. Simulates 12 Typhoon or other Severe Weather

Salt spray test chamber

Salt spray test chamber, produces 5% salinity, 30*24h uninterrupted test. Simulates coastal high salt spray scenario

HUAWEI

SSCF-TECH: Active dust removal in harsh application scenarios

High Reliability Design

- IP68 Protection
- Aluminum Frame Design
- Stainless Steel Bearings
- High Temperature Resistant Grease
- Smart Speed Control

Design life time
200,000h @ 40℃
135,000h @ 50℃

\+

Annual failure rate
<0.5%

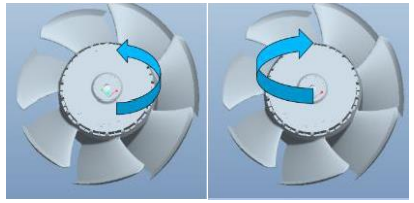
\+

40℃ operation time
>31y

SSCF-TECH (Smart Self-Clean Fan)

Ventilation Panel blocked by dust

In harsh scenarios such as sandy wind and willow, the fan ventilation panel is easily blocked, the whole machine dissipates heat poorly and the inverter runs at reduced capacity



Forward Turn Reverse Turn

SSCF-TECH

The inverter automatically reverses the dust according to the temperature, light and other conditions without affecting the power generation to avoid the air ducts being blocked

Smart Grid-connection

Supporting Stable Operation In All Grid Scenarios

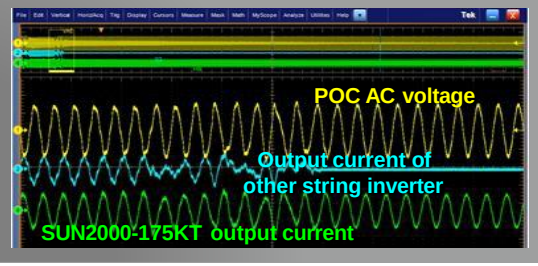
Robust Operation under All Grid Scenario

Accurate Grid Sensing + **Advanced Control**

Full power operation (SCR 1.1~3)

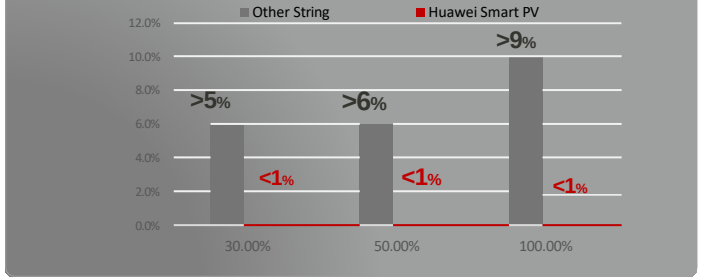
Operation Stability in weak grid

Smart PV Controller maintains stable operation,
Other inverter **shuts down for protection due to oscillation**

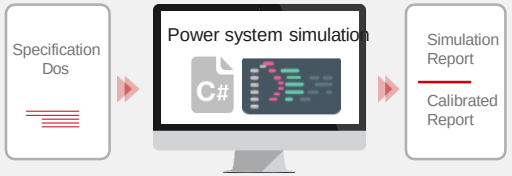


Active THD suppression THDi<1%

Harmonic injection in weak grid



Digital Simulation
Grid code simulation modeling



Semi-physical Simulation
'Hardware in the Loop'

DSP control circuits

Real Testing
Grid simulation test in the lab, Onsite testing

HUAWEI

TÜV certification，availability> 99.999%

Qinghai 2.2GW ultra-high voltage project

TUV Report

Fuse Free

No Manual O&M

NO. of Inverter	COD	Altitude	Total Available Time	Availability
9216 pcs	Sep. 2020	3100m	20,000,000 hours+	**99.9990%**

HUAWEI

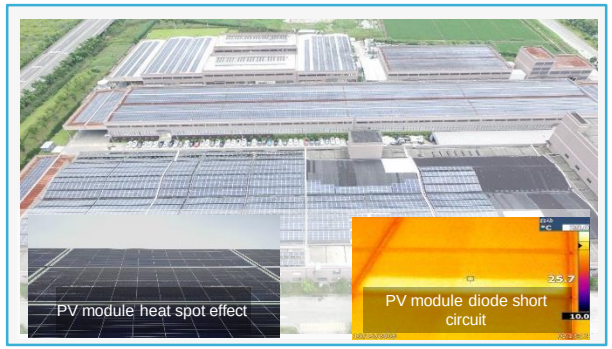
Smart I-V Curve Diagnosis 4.0: Online and Full Detection, Reducing O&M Costs

Authentication: L4 - highest level in the industry

Performance Level	I-V Curve Scanning		Abnormality Identification			Fault Diagnosis
	Measurement Precision	Scanning Precision Rate	Recognition Rate[1]		Recurrence Rate[2]	Root Cause Analysis Accuracy[3]
			Class I defect	Class II defect		
L1	Voltage and current ≤ 1.0%	≥ 70%	≥ 75%	≥ 70%	≥ 70%	≥ 70%
L2	Voltage and current ≤ 1.0%	≥ 80%	≥ 85%	≥ 80%	≥ 80%	≥ 80%
L3	Voltage and current ≤ 0.5%	≥ 85%	≥ 90%	≥ 85%	≥ 85%	≥ 85%
L4	**Voltage and current ≤ 0.5%**	**≥ 95%**	**≥ 95%**	**≥ 90%**	**≥ 90%**	**≥ 90%**
Actual test result	**≤ 0.5%**	**97.5%**	**100%**	**96.4%**	**96.2%**	**96.8%**

Widely used in plants around the world (> 15 GW) to improve plant O&M efficiency

Project: XX rooftop PV plant in Ningbo, Zhejiang



528 Diagnosed strings | **62** Faulty strings | **11.7%** String failure rate

Project: XX PV plant in a coal mining subsidence area of Yangquan, Shanxi

3960 Diagnosed strings | **188** Faulty strings | **4.7%** String failure rate

Huawei Smart I-V Curve Diagnosis VS **I-V curve scanning of other vendors**

Multi-scenario adaptability

- Applicable to large-scale ground-mounted and mountainous scenarios
- Compatible with mainstream modules: half-cell/shingled/166/182/210 mm

Energy yield loss assessment

- Quantifying the energy yield loss of faulty strings
- Precise guidance for PV plant O&M

Scheduled scanning

- Periodic diagnosis and email notification ensuring user experience

ISV integration

- Supporting northbound interfaces
- Can be integrated by ISV

Refined data management

- The inverter automatically obtains irradiance data.
- Parameters of PV strings can be configured.

High availability of diagnostic reports

- Provide diagnosis overview report, diagnosis report, and fault O&M report.
- Provide raw data for the customer.

Limited adaptability

- PV string-based diagnosis
- Hard to apply in various scenarios

No energy yield loss assessment

- Not supported

No scheduled scanning

- Not supported

No ISV integration

- Not supported

Obtaining unrefined data from the EMIs

- Obtaining data from the EMIs
- Parameters can be configured only for inverters.

Poor availability of diagnostic reports

- No fault cause analysis and low availability
- Raw data cannot be exported.

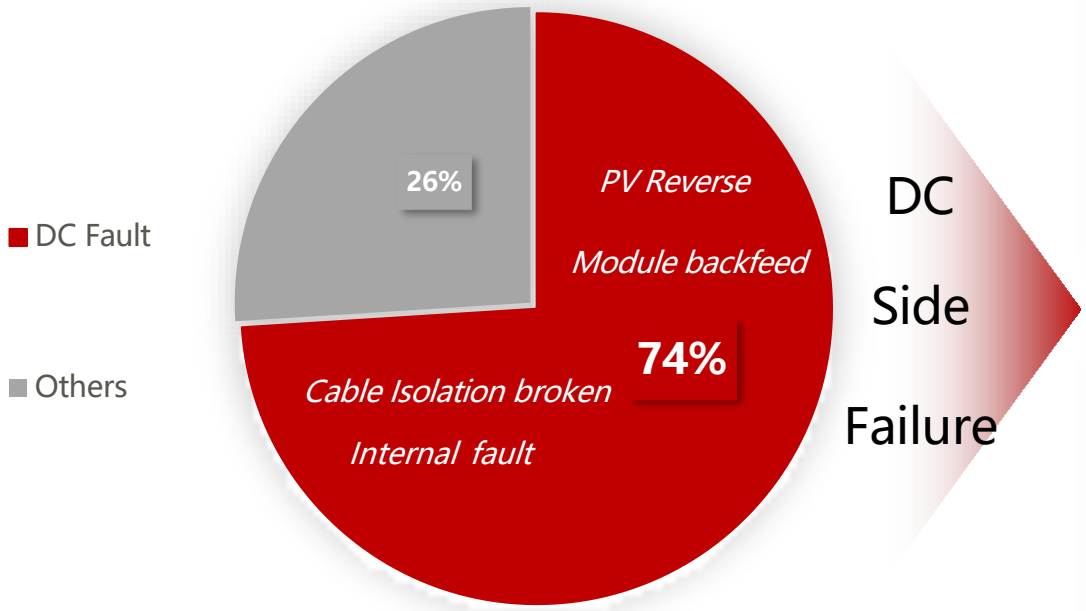
HUAWEI

Smart String-Level Disconnector (SSLD)

DC-side failure is the biggest threat for PV Plant safety

Safety protection measures urgently need to improve for PV Plant

Root Cause Analysis: 74% failure from DC side



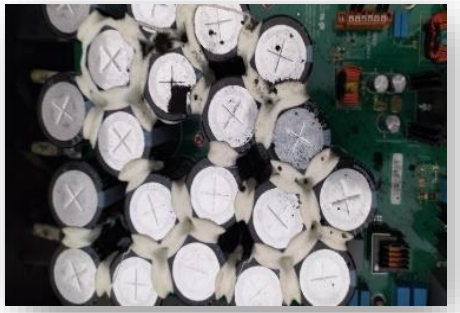
*Source: Statistics based on Huawei 175GW operation data

DC-side failure is the biggest safety hazard in PV plants


DC cable breakage

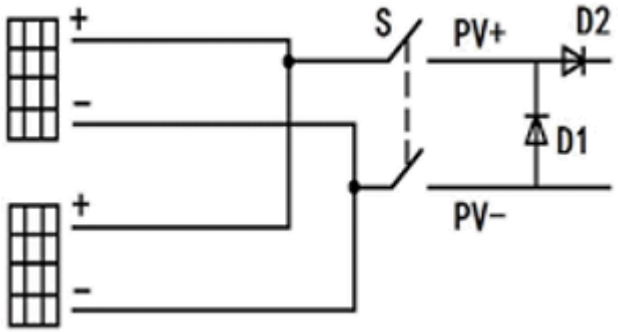
DC disconnector broken


MC4 burned out


DC Capacitor damage

HUAWEI

Typical DC faults



Polarity of DC side is correct.

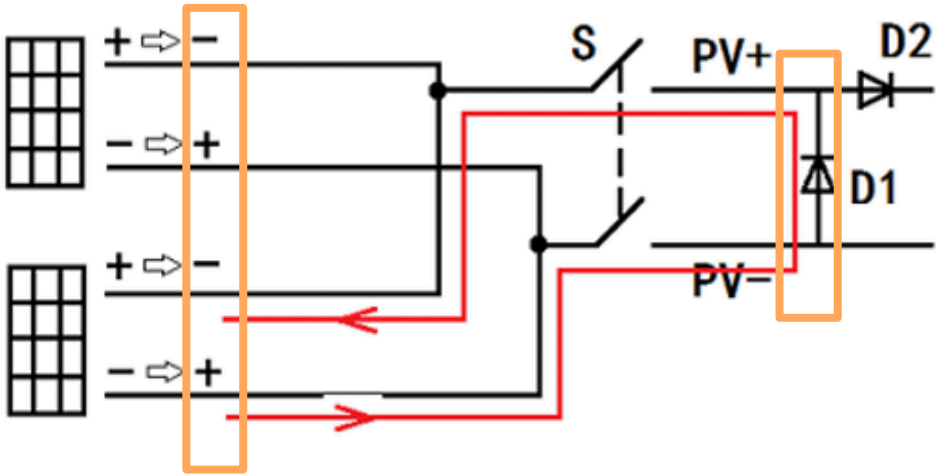
Positive terminal of PV string is connected to the positive terminal of SUN2000 input terminal.

Negative terminal of PV string is connected to the negative terminal of SUN2000 input terminal.

Positive and negative terminals of 2 strings are connected in parallel before the DC switch.

D1 is the anti-parallel diode of the boost circuit.

D2 is the isolation diode between MPPTs, that is, the isolation diode between PV strings and the bus.



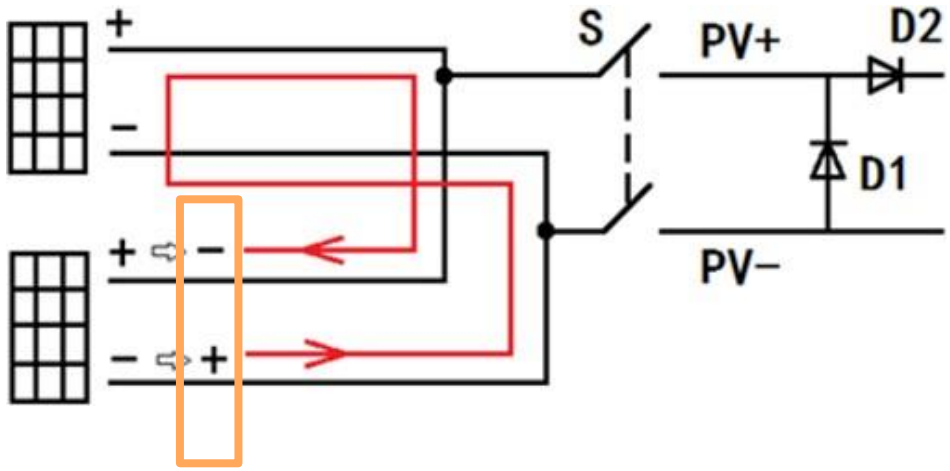
Two PV strings connected to the same MPPT are reverse.

After the DC switch is turned on, each PV string forms a short-circuit loop with the IGBT inverted diode of the BOOST circuit through the DC switch, as shown by the red solid line in the figure.

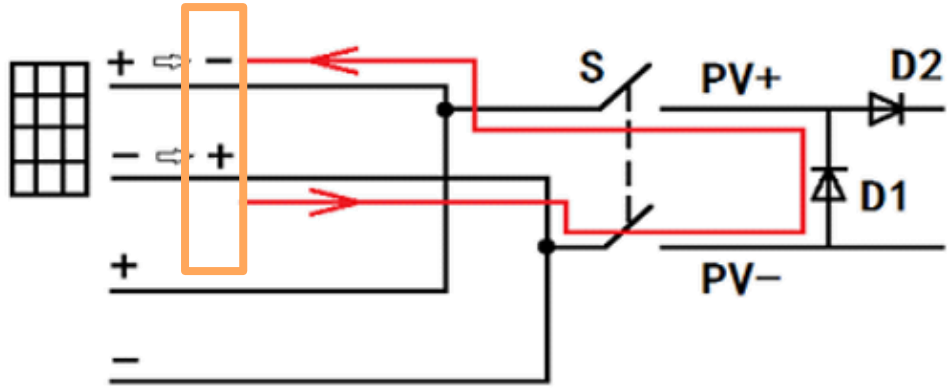
If the DC switch is turned off, as a result, the DC switch is arced and damaged, and the MPPT cannot work properly.

In this scenario, if the DC terminal is directly removed and inserted, arcing occurs.

Typical DC faults



Two PV strings are connected to the same MPPT.
One is correct and the other is reverse.
The two PV strings are short-circuited without passing through the DC switch, as shown by the red solid line in the figure.
In this case, the input voltage is 0, the PV string current is the short-circuit current of the PV module, it has no damage to the inverter and damage to the PV module.
In this scenario, because the two strings are directly short-circuited. If the DC terminals are directly removed and inserted, it will cause arcing and cause electric shock. However, operating the DC switch has no effect.

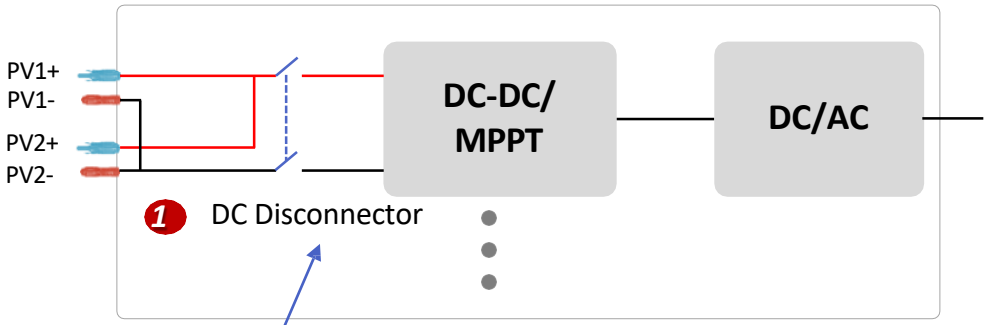


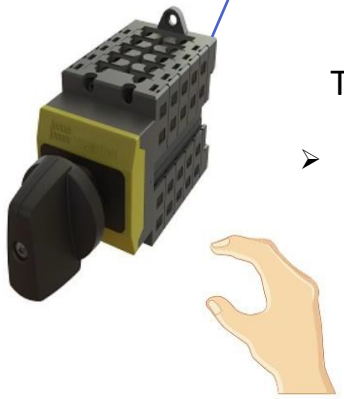
One MPPT circuit is connected to only one string in the reverse direction.
After the DC switch is turned on, the string and the IGBT diode of the BOOST circuit form a short-circuit loop through the DC switch, as shown by the red solid line in the figure.
In this case, if the DC switch is turned off, the DC switch is arced and damaged, and the MPPT cannot work properly.
In this scenario, if the DC terminal is directly removed and inserted, arcing will occur.

Smart String-Level Disconnector (SSLD)

Integrate DC breaker into inverter to realize fast breaking and improve system safety

Traditional: DC Disconnector



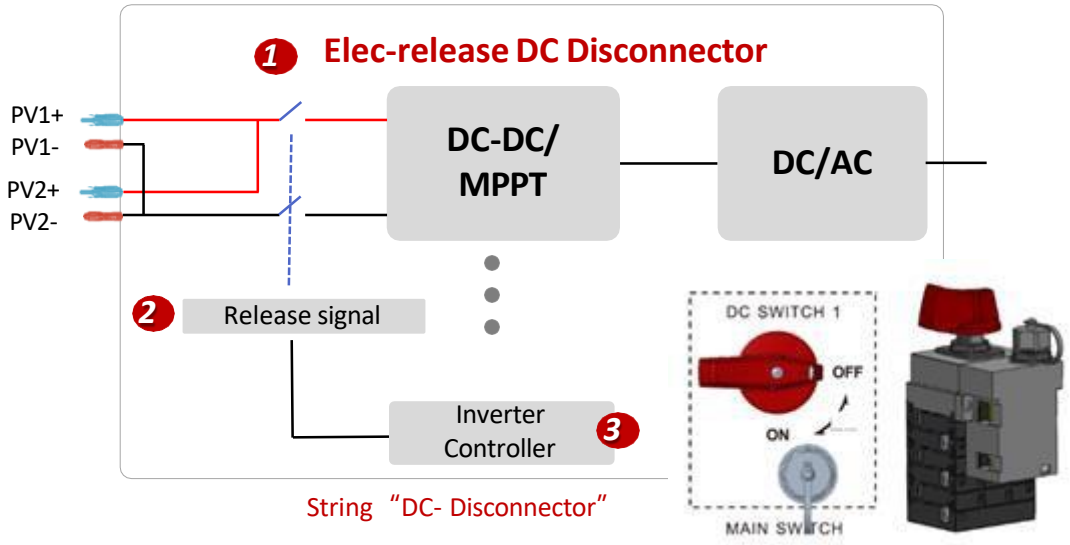


Traditional： DC Disconnector：

- Traditional disconnector only supports manual breaking, for internal equipment failure or component failure it can not protect.

VS

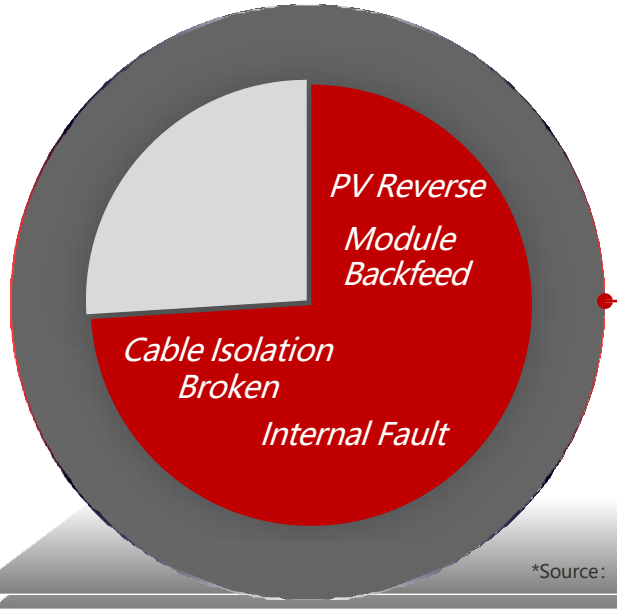
SSLD: String level fast breaking



String “DC- Disconnector”

- Real-time detect current, bus voltage, **when internal short circuit occur, inverter quickly cut off the fault current.**
- Compared with the traditional disconnector, Disconnector has the function of detection and breaking.
- Compared with fuse protection： fuse free.
- Meet the requirements of IEC 62548 and IEC60947-2.

SSLD-TECH：Precise fault detection, rapidly disconnect DC system faults



74% failure from DC

Root Cause Analysis

DC-side failure is the biggest safety hazard in PV plants

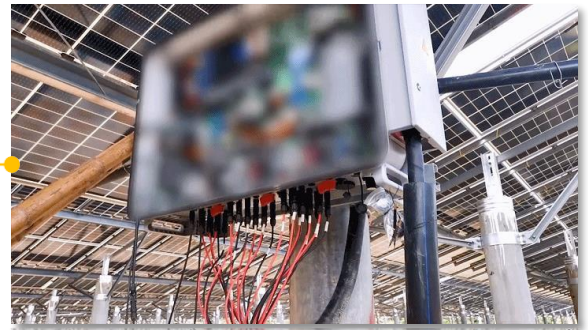
- DC cable breakage
- DC disconnector unbroken
- MC4 burned out
- DC Capacitor damage

*Source：Statistics based on Huawei 210GW operation data

SSLD-TECH

All-scenario, high-precision, and fast response

String fault connection	DC input current reverse-flow	Inverter internal short circuit
Disconnect time≤250ms	**Disconnect time ≤250ms**	**Disconnect time ≤16ms**

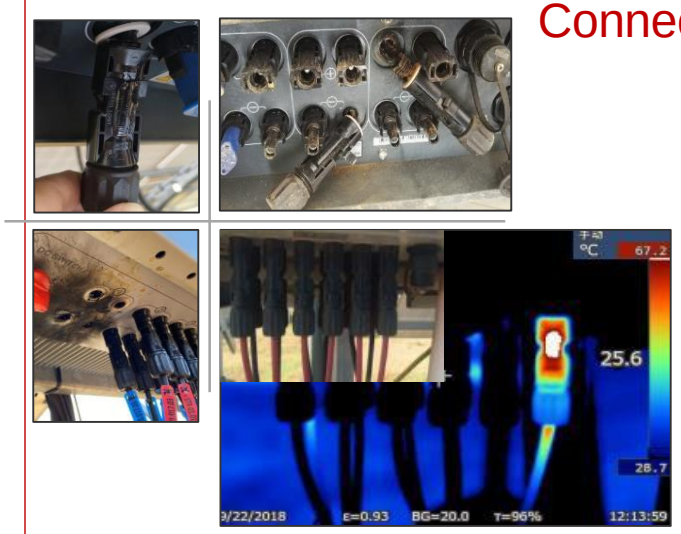


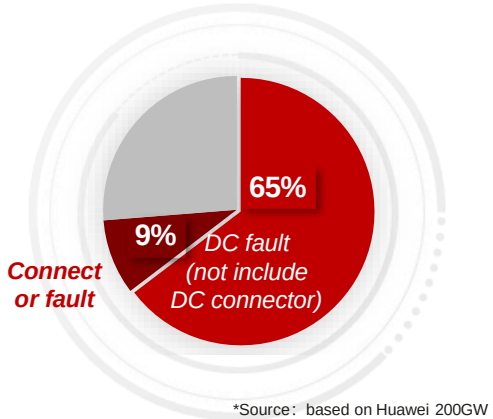
HUAWEI

Smart Connector Temperature Detector (SCTD)

Improving DC connector reliability|

High failure rate for DC Connector

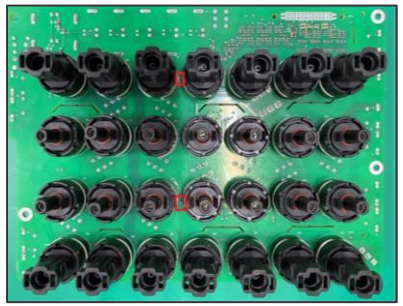




*Source：based on Huawei 200GW operation data analysis result

- Connector plugging is not in place
- Poor metal core contact
- Poor contact due to external force
- Chemical contamination

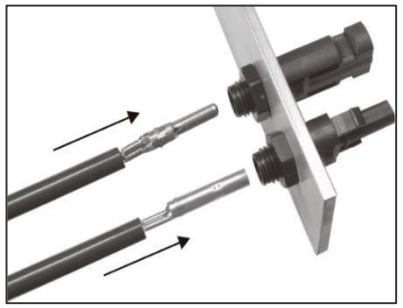
SCTD-TECH



DC Connector mounted on PCB

Automated production, can reduce the probability of internal PV terminals not inserted in place

Add terminal temperature detection, when the terminal temperature is abnormal, the inverter can be shut down to avoid the spread of fault



One-time piercing of terminal PIN

Automated assembly before shipment, high efficiency, effectively solve the problem of difficult and error-prone traditional terminal assembly

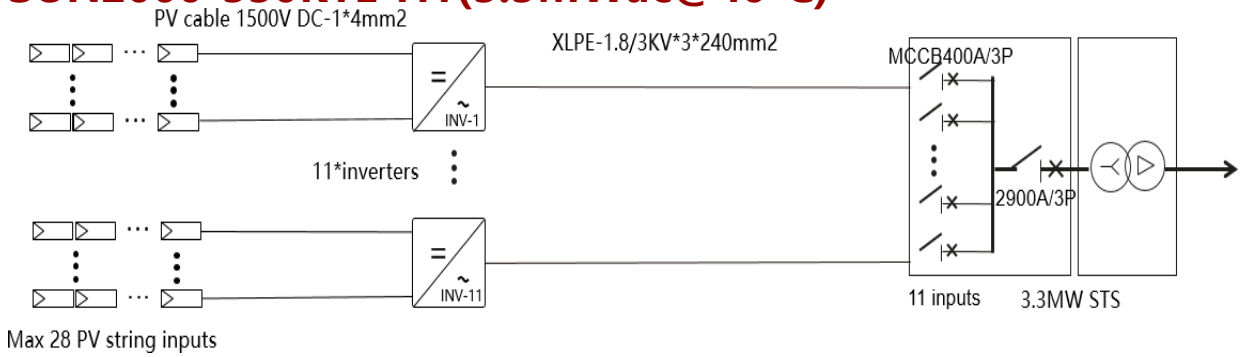
HUAWEI

Smart Transformer Station

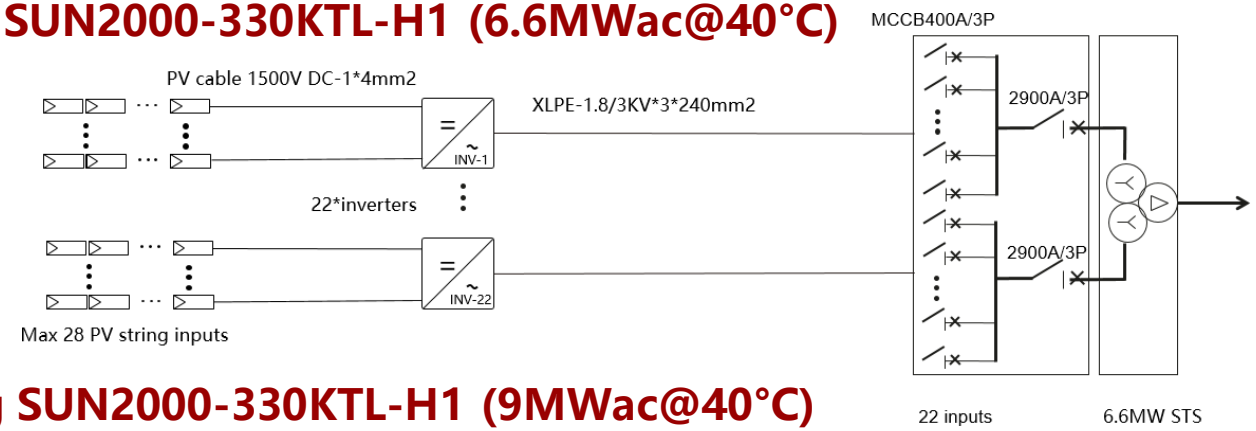
JUPITER-3000/6000/9000K-H1

Input			**Input**		**Input**	
Available Inverters / PCS	SUN2000-330KTL-H1/ SUN2000-330KTL-H2		SUN2000-330KTL-H1/ SUN2000-330KTL-H2		SUN2000-330KTL-H1/ SUN2000-330KTL-H2	
Maximum LV AC Inputs	11		22		30	
AC Power	3,300 kVA @40℃ / 2,970 kVA @50℃ [1]		6,600 kVA @40℃ / 5,940 kVA @50℃ [1]		9,000 kVA @40℃ / 8,250 kVA @50℃ [1]	
Rated Input Voltage	800 V		800 V		800 V	
LV Main Switches	ACB (2,900 A / 800 V / 3P, 1 x 1 pcs), MCCB (400 A / 800 V / 3P, 11 pcs)		ACB (2,900 A / 800 V / 3P, 2 x 1 pcs), MCCB (400 A / 800 V / 3P, 2 x 11 pcs)		ACB (4,000 A / 800 V / 3P, 2 x 1 pcs), MCCB (400 A / 800 V / 3P, 2 x 15 pcs)	
Output			**Output**		**Output**	
Rated Output Voltage	11 kV, 15 kV, 20 kV, 22 kV, 30 kV, 33 kV, 35 kV [2]	13.8 kV, 34.5 kV [2]	11 kV, 15 kV, 20 kV, 22 kV, 30 kV, 33 kV, 35 kV [2]	13.8 kV, 34.5 kV [2]	22 kV, 30 kV, 33 kV, 35 kV [2]	34.5 kV [2]
Frequency	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
Transformer Type	Oil-immersed, Conservator Type		Oil-immersed, Conservator Type		Oil-immersed, Conservator Type	
Transformer Cooling Type	ONAN		ONAN		ONAN	
Transformer Tappings	± 2 x 2.5%		± 2 x 2.5%		± 2 x 2.5%	
Transformer Oil Type	Mineral Oil (PCB Free)		Mineral Oil (PCB Free)		Mineral Oil (PCB Free)	
Transformer Vector Group	Dy11		Dy11-y11		Dy11-y11	
Transformer Min. Peak Efficiency Index	Tier 1 or Tier 2 In Accordance with EN 50588-1		Tier 1 or Tier 2 In Accordance with EN 50588-1		Tier 1 or Tier 2 In Accordance with EN 50588-1	
RMU Type	SF_6 Gas Insulated		SF_6 Gas Insulated		SF_6 Gas Insulated	
RMU Transformer Protection Unit	MV Vacuum Circuit Breaker Unit		MV Vacuum Circuit Breaker Unit		MV Vacuum Circuit Breaker Unit	
RMU Cable Incoming / Outgoing Unit	Direct Cable Unit or Cable Load Break Switch Unit		Direct Cable Unit or Cable Load Break Switch Unit		Direct Cable Unit or Cable Load Break Switch Unit	
Auxiliary Transformer	Dry Type Transformer, 5 kVA		Dry Type Transformer, 5 kVA		Dry Type Transformer, 5 kVA	
Protection			**Protection**		**Protection**	
Transformer Monitoring & Protection	Oil Level, Oil Temperature, Oil Pressure and Buchholz		Oil Level, Oil Temperature, Oil Pressure and Buchholz		Oil Level, Oil Temperature, Oil Pressure and Buchholz	
Protection Degree of MV & LV Room	IP 54		IP 54		IP 54	
Internal Arcing Fault Classification of STS	IAC A 20 kA 1s		IAC A 20 kA 1s		IAC A 20 kA 1s	
MV Relay Protection	50/51, 50N/51N		50/51, 50N/51N		50/51, 50N/51N	
LV Overvoltage Protection	Type I+II		Type I+II		Type I+II	
Anti-rodent Protection	C5 in accordance with ISO 12944		C5 in accordance with ISO 12944		C5 in accordance with ISO 12944	
Features			**Features**		**Features**	
2 kVA UPS	Optional [3]		Optional [3]		Optional [3]	
MV Surge Arrester for MV VCB	Optional [3]		Optional [3]		Optional [3]	
General			**General**		**General**	
Dimensions (W x H x D)	6,058 x 2,896 x 2,438 mm (20′ HC Container)		6,058 x 2,896 x 2,438 mm (20′ HC Container)		6,058 x 2,896 x 2,438 mm (20′ HC Container)	
Weight	< 15 t		< 22 t		< 28 t	
Operating Temperature Range	-25℃ ~ 60℃ [4] (-13°F ~ 140°F)		-25℃ ~ 60℃ [4] (-13°F ~ 140°F)		-25℃ ~ 60℃ [4] (-13°F ~ 140°F)	
Relative Humidity	0% ~ 95%		0% ~ 95%		0% ~ 95%	
Max. Operating Altitude	1,000 m [5]	1,500 m [5]	1,000 m [5]	1,500 m [5]	1,000 m [5]	1,500 m [5]
MV-LV AC Connections	Prewired and Pretested, No Internal Cabling Onsite		Prewired and Pretested, No Internal Cabling Onsite		Prewired and Pretested, No Internal Cabling Onsite	
LV & MV Room Cooling	Smart Cooling without Air-across for Higher Availability		Smart Cooling without Air-across for Higher Availability		Smart Cooling without Air-across for Higher Availability	
Communication	Modbus-RTU, Preconfigured with Smartlogger3000B		Modbus-RTU, Preconfigured with Smartlogger3000B		Modbus TCP, Preconfigured with SmartACU2000D	
Applicable Standards	IEC 62271-202, EN 50588-1, IEC 60076, IEC 62271-200, IEC 61439-1		IEC 62271-202, EN 50588-1, IEC 60076, IEC 62271-200, IEC 61439-1		IEC 62271-202, EN 50588-1, IEC 60076, IEC 62271-200, IEC 61439-1	

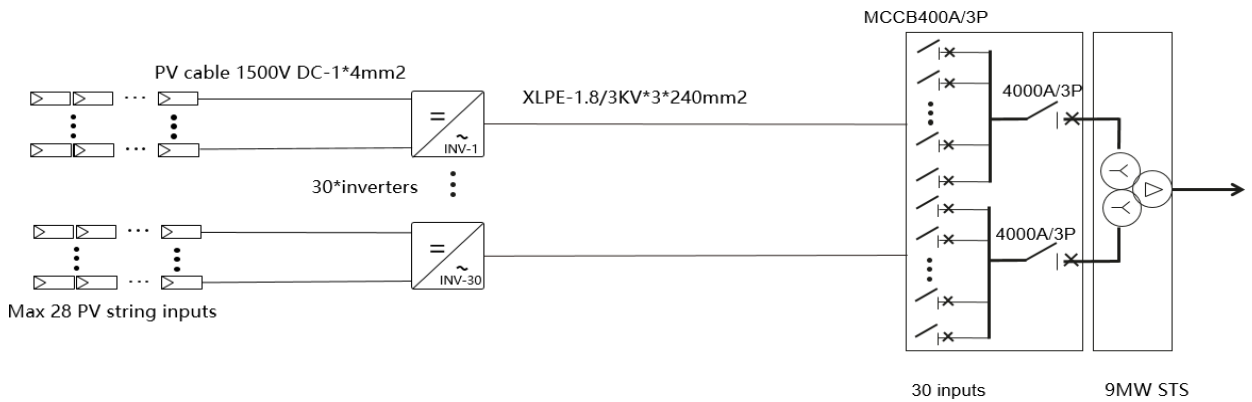
SLD for a PV system using SUN2000-330KTL-H1(3.3MWac@40°C)



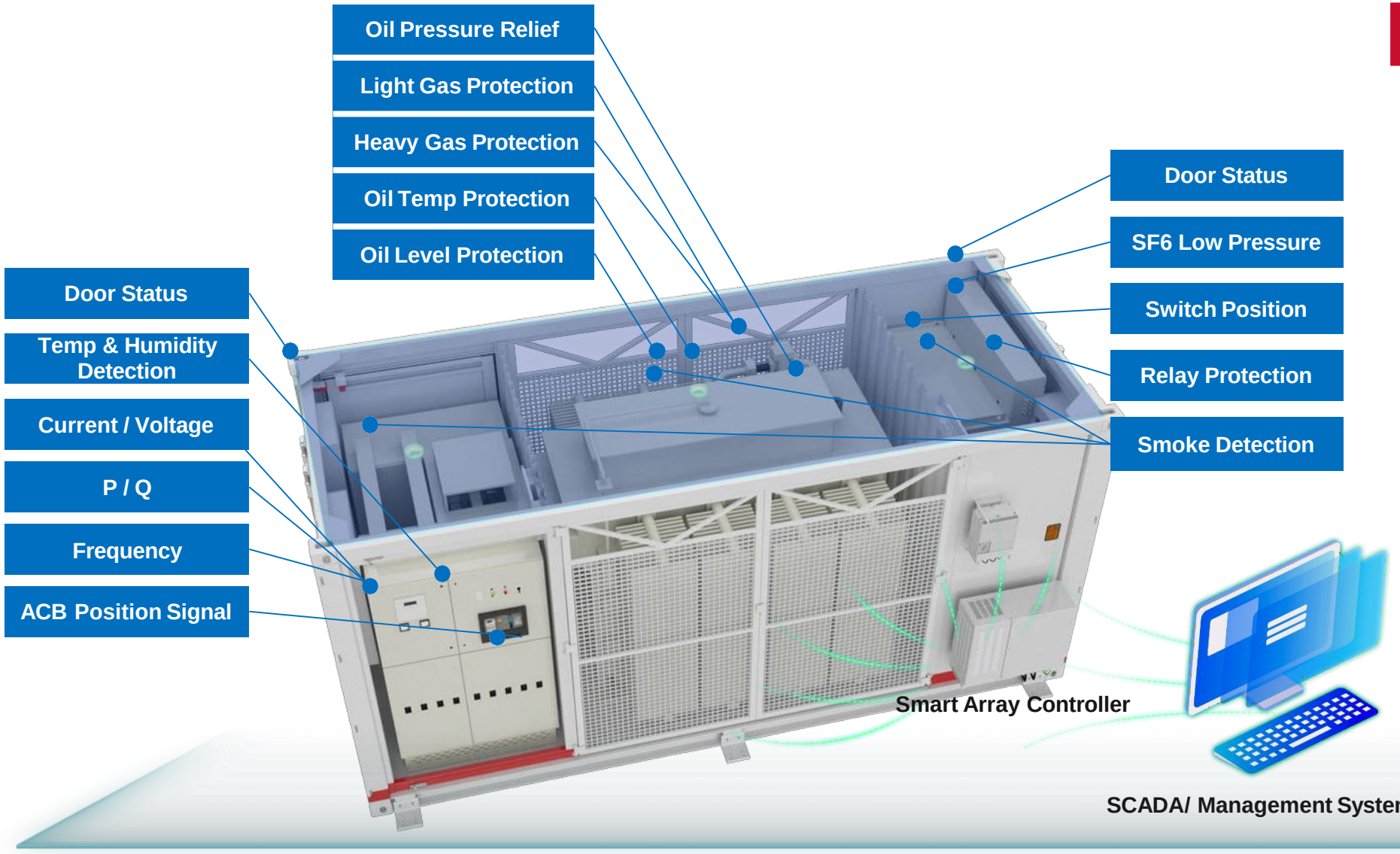
SLD for a PV system using SUN2000-330KTL-H1 (6.6MWac@40°C)



SLD for a PV system using SUN2000-330KTL-H1 (9MWac@40°C)



Integrated communication with SACU



Smart Design

- Real time status monitoring and solution level data transmission
- 0.2% high precision online collection of electricity parameters
- Remote control of MV circuit breakers and LV ACB

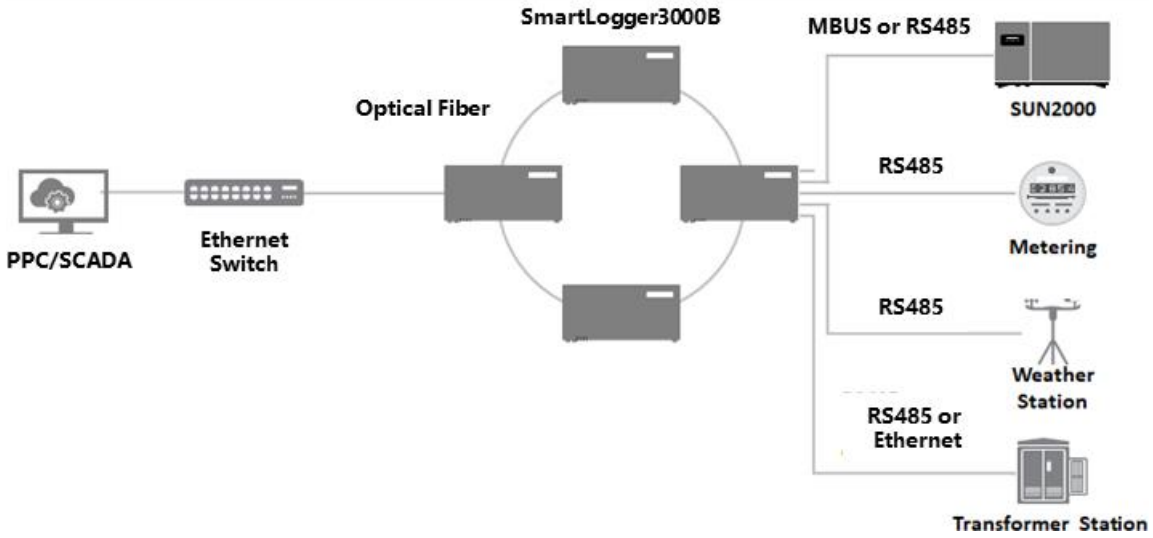
HUAWEI

SACU & MBUS

Key Communication

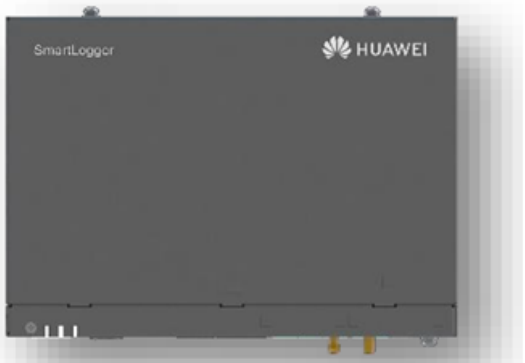
Features

SmartACU2000D



- Incorporates:
  - **Smartlogger3000B**
  - **SmartPID2000**
  - **MBUS Communications**
  - Comm. Interfaces (RS485, Fast ETH, and SFP)
- IP65 Protection
- Temperature Range: -40ºC to 60ºC
- Dimensions: 880 x 700 x 330
- Weight: 49 ~ 61kg

SmartLogger3000B



Without SmartModule1000A

With SmartModule1000A

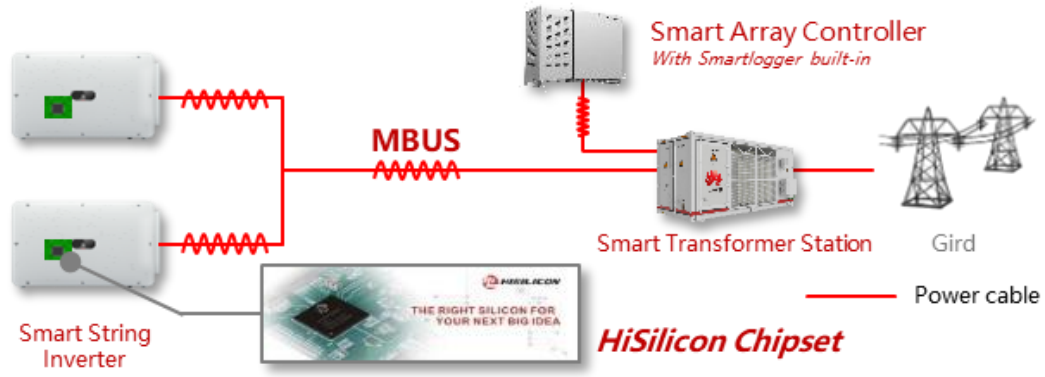
	Without SmartModule1000A	With SmartModule1000A
Device Management		
Max. Number of Manageable Devices	200	
Max. Number of Manageable Devices	150	
Communication Interface		
WAN	WAN x 1, 10 / 100 / 1000 Mbps	
LAN	LAN x 1, 10 / 100 / 1000 Mbps	LAN x 3, 10 / 100 / 1000 Mbps
Optical Ethernet	SFP x 2, 100 / 1000 Mbps	
MBUS	MBUS x 1, 115.2 kbps, Compatible with PLC	
RS485	COM x 3 1,200 / 2,400 / 4,800 / 9,600 / 19,200 / 115,200 bps	COM x 6 1,200 / 2,400 / 4,800 / 9,600 / 19,200 / 115,200 bps
Digital / Analog Input / Outputs	DI x 4, DO x 2, AI x 4	DI x 8, DO x 2, AI x 7
PT100 / PT1000	0	2
Active DO	12V, 100mA (connection with relay, sensor)	
Communication Protocol		
Ethernet	Modbus-TCP, IEC 60870-5-104	
RS485	Modbus-RTU, IEC 60870-5-103 (standard), DL / T645	
Electrical		
Power Adapter	AC input: 100 ~ 240V, 50/60Hz; DC output: 12V, 2A	
DC Power Supply	24V, 0.8A	
Power Consumption	Typical 9W, Max. 15W	Typical 10W, Max. 18W
Mechanical		
Dimensions (W x H x D)	225 x 160 x 44 mm	350 x 160 x 44 mm
Weight	2 kg	3 kg
Protection Degree	IP20	

Safe & Reliable – Faster, Robust & Reliable MBUS Solution (vs. RS485)

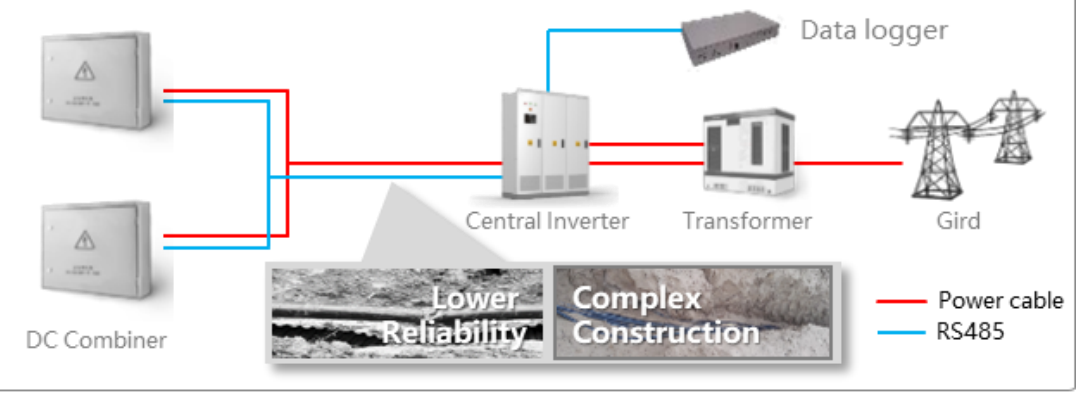
New-Gen Hisilicon Chipset + LiteOS Huawei Lite OS

Features	HUAWEI MBUS	RS485
Transmission Rate	**115.2** kbps	9.6 kbps
Construction	Data transmission via Power lines **without physical cables**	Complicated, trench laying the communication cable
Reliability	**Robust & High reliability**	Very easy to make mistake in construction, affect part of the communication when chain is broke down
Maintenance	**Zero-maintenance**	Hard to maintenance, especially when the physical cables are broken

Smart PV Solution



Central Solution

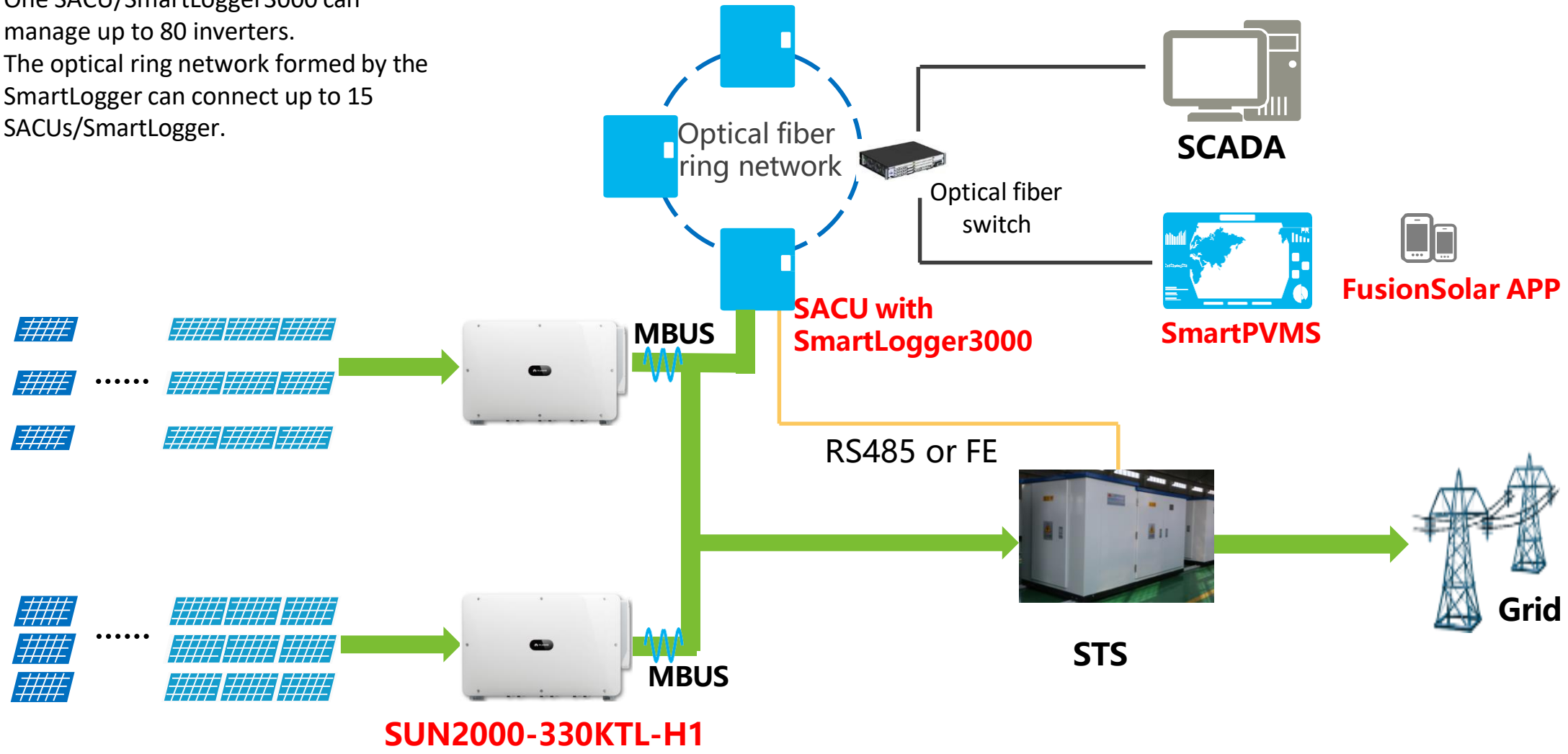


- ✓ Max standard distance for single core AC cable is **400m** (MBUS 1.0)
- ✓ It can be expanded up to **700m**. (MBUS 2.0)

HUAWEI

Communication and Monitoring System Network

- ✓ One SACU/SmartLogger3000 can manage up to 80 inverters.
- ✓ The optical ring network formed by the SmartLogger can connect up to 15 SACUs/SmartLogger.



HUAWEI

Maintenance

Shutdown and Power-Off

⚠ WARNING

After the system is powered off, the SUN2000 is still energized and hot, which may cause electric shocks or burns. Therefore, wait for at least 15 minutes wear PPE, and then operate the SUN2000.

Step 1 Send a shutdown command on the app, SmartLogger, or management system.

For details, see the user manual of the corresponding product.

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

Step 3 Set the two **DC SWITCH** to **OFF**.

Replacing a Fan

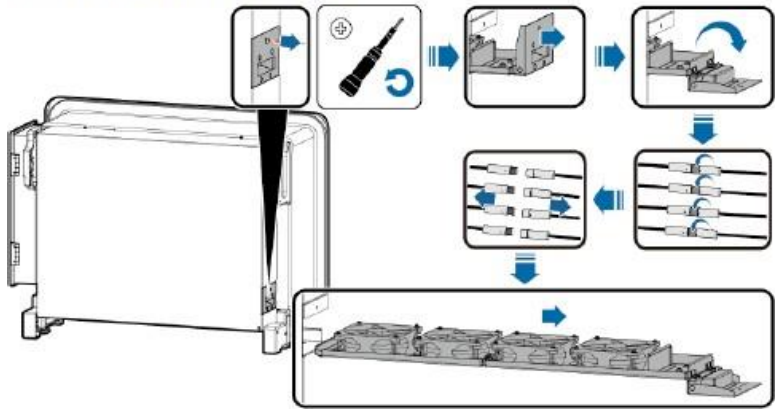
CAUTION

- Before replacing a fan, power off the SUN2000.
- When replacing a fan, use insulated tools and wear PPE.

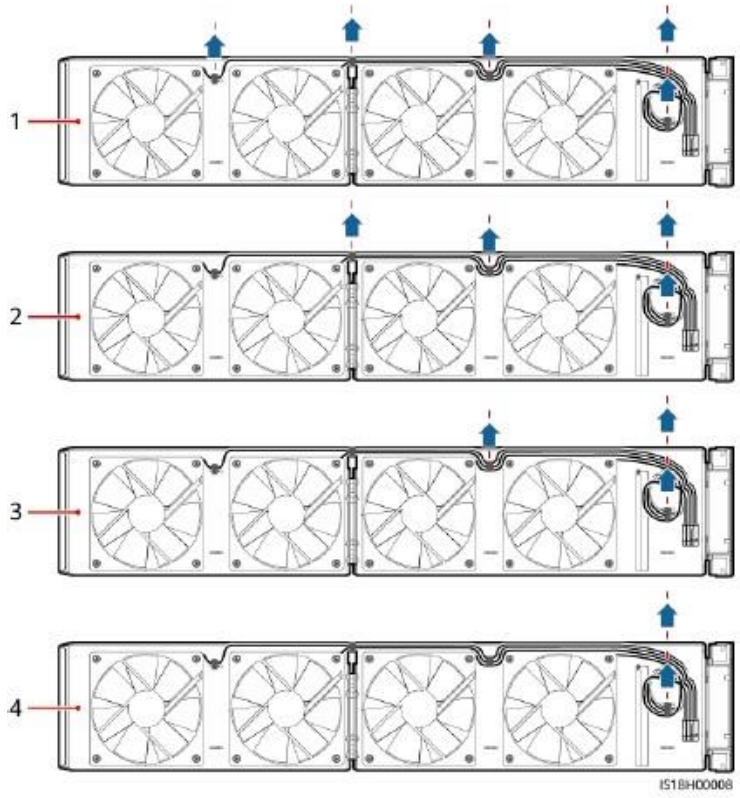
Step 1 Remove the fan tray.

1. Remove the screws from the fan tray and store them properly.
2. Pull out the fan tray until the fan baffle plate aligns with the SUN2000 enclosure.
3. Place down the handle.
4. Unscrew the connectors.
5. Disconnect the cables.
6. Pull out the fan tray.

Figure 8-3 Pulling out the fan tray



Step 2 Remove the cable ties from the faulty fan.



(1) Remove cable ties from FAN 1.

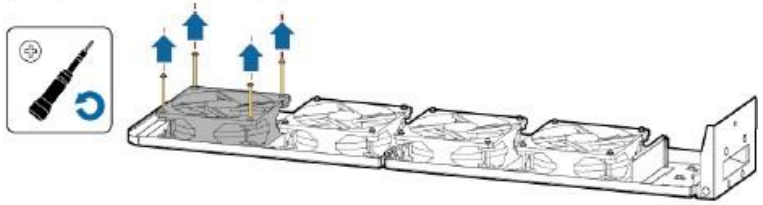
(2) Remove cable ties from FAN 2.

(3) Remove cable ties from FAN 3.

(4) Remove cable ties from FAN 4.

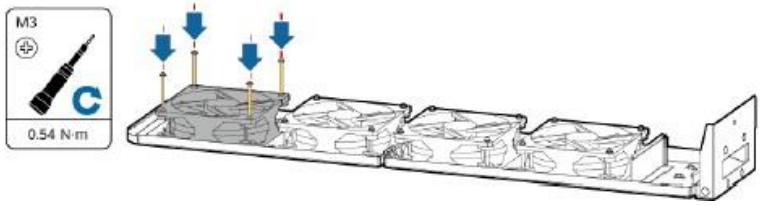
Step 3 Remove the faulty fan.

(using FAN 1 as an example)



Step 4 Install a new fan.

(using FAN 1 as an example)



HUAWEI

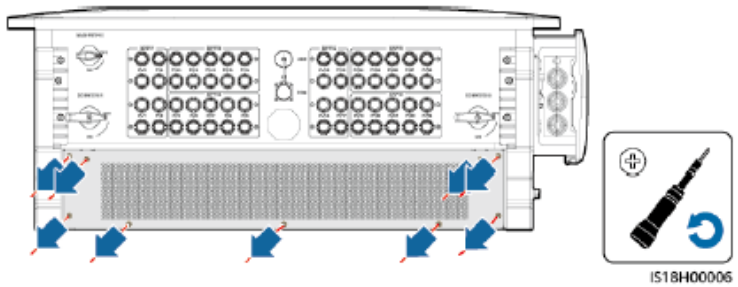
Routine Maintenance

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 section.

⚠ CAUTION

- Before cleaning the SUN2000, connecting cables, and maintaining the grounding reliability, power off the SUN2000 and ensure that the **MAIN SWITCH** and all **DC SWITCH** of the SUN2000 are **OFF**.
- Do not open the maintenance compartment door on rainy or snowy days. If you need to, take protective measures to prevent rain or snow from entering the maintenance compartment. If protective measures cannot be taken, do not open the maintenance compartment door.

Removing the baffle of the air intake vent



NOTICE

After the cleaning is complete, reinstall the baffle plate. Tighten the M4 screws with a torque of 1.2 N·m.

Maintenance checklist

Check Item	Criteria	Maintenance Interval
Cleanness of air inlet and outlet	There is no dust on the air intake and exhaust vents. If necessary, remove the baffle of the air intake vent and clean the dust.	Once every 6 to 12 months
Fan	The fans do not produce abnormal sounds during operation.	Once every 6 to 12 months
System running status	• The SUN2000 is not damaged or deformed. • The SUN2000 does not generate abnormal sounds during operation. • All SUN2000 parameters are correctly set during operation.	Once every 6 months
Electrical connection	• Cables are securely connected. • Cables are intact. In particular, the parts in contact with metallic surfaces are not damaged. • The sealing plugs of unused DC input terminals are secured. • The unused COM and USB ports are locked by waterproof caps.	6 months after the first commissioning and once every 6 to 12 months after that
Grounding reliability	Ground cables are securely connected.	6 months after the first commissioning and once every 6 to 12 months after that
Vegetation around the SUN2000	• Perform inspection and weeding as required. • Clean the site promptly after weeding.	Based on the local wilting season

HUAWEI

Thank you.

把数字世界带入每个人、每个家庭、
每个组织，构建万物互联的智能世界。

Bring digital to every person, home and organization for a fully connected, intelligent world.

HUAWEI

Troubleshooting for common faults.

Troubleshooting

Alarm severities are defined as follows:

- Major: The inverter is faulty or the external environment is abnormal. As a result, the output power decreases or the inverter stops feeding into the grid.
- Minor alarm: Some components of the inverter are faulty but the inverter can still connect to the grid and generate power.
- Warning: The inverter works properly. The output power decreases or some authorization functions fail due to external factors.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2001	High String Voltage	Major	The PV array is not properly configured. Excessive PV modules are connected in series in the PV string, and therefore the PV string open-circuit voltage exceeds the maximum operating voltage of the device. • Cause ID = 1: PV1, PV2, PV3, and PV4. • Cause ID = 2: PV5, PV6, PV7, PV8, and PV9. • Cause ID = 3: PV10, PV11, PV12, PV13, and PV14. • Cause ID = 4: PV15, PV16, PV17, and PV18. • Cause ID = 5: PV19, PV20, PV21, PV22, and PV23. • Cause ID = 6: PV24, PV25, PV26, PV27, and PV28.	Check the serial connection configuration of the PV strings in the array and ensure that the PV string open-circuit voltage is not greater than the maximum operating voltage of the device. After the PV array configuration is corrected, the alarm will be automatically cleared.
2003	DC Arc Fault	Major	Cause ID = 1–28, corresponding to PV1–PV28 respectively. The PV string power cables arced or are in poor contact.	Check whether the string cables arced or are in poor contact.
2010	Abnormal DC Input	Major	Cause ID = 1 Strings PV1 to PV9 are not connected. Cause ID = 2 The DC SWITCH is OFF.	Cause ID = 1 At least one PV string from PV1 to PV9 is connected. Cause ID = 2 1. Turn on the MAIN SWITCH manually. 2. Turn on all DC SWITCH manually. 3. Turn off the MAIN SWITCH manually. 4. If the fault persists, contact your dealer or technical support.

Troubleshooting

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2011	String Reverse Connection	Major	Cause ID = 1–28, corresponding to PV1–PV28 respectively. The PV string is reversely connected.	1. Check whether the PV string is connected to the device in reverse polarity. If yes, wait until the PV string current decreases to below 0.5 A, set **DC SWITCH** to **OFF**, and adjust the PV string polarity. 2. If the fault persists, reset the device on the local maintenance app or WebUI of the upper-layer controller. Alternatively, you can turn off the AC and DC switches, wait for 5 minutes, and then turn on the AC and DC switches.
2012	String Current Backfeed	Warning	Cause ID = 1–28, corresponding to PV1–PV28 respectively. Only a few PV modules are connected in series in the PV string. Therefore, the terminal voltage is lower than that of other PV strings.	1. Check whether the number of PV modules connected in series in this PV string is less than the number of PV modules connected in series in the other PV strings connected in parallel with this PV string. If yes, wait until the PV string current drops to below 0.5 A, set **DC SWITCH** to **OFF**, 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 normal.
2013	Abnormal String Power	Warning	Cause ID = 1–28, corresponding to PV1–PV28 respectively. • The PV string is shaded for a long time. • The PV string has aged abnormally.	1. Check whether the PV string current is obviously lower than the currents of other PV strings. 2. If yes, check whether the PV string is shaded. 3. If the PV string is clean and not shaded, check whether any PV module is faulty.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2014	High String Voltage to Ground	Major	Cause ID = 1 The string-to-ground voltage is abnormal, which may cause power degradation risks.	1. If no PID compensation device is deployed in the system, disable the PID protection function. Note: If the PID protection function is disabled but the nighttime reactive power compensation is enabled, PV module degradation may occur. 2. If there is a PID compensation device in the system, check whether it is faulty. If yes, rectify the fault. 3. Check whether the device and PID compensation device have consistent compensation direction settings. If not, adjust the settings based on the PV module model. (Note: If the PV– is set to positive offset, the voltage between the PV– of the device and the ground should be greater than 0 V to clear the alarm; if the PV+ is set to negative offset, the voltage between the PV+ of the device and the ground should be less than 0 V to clear the alarm.) 4. If the alarm occurs repeatedly, contact your dealer or technical support.
2015	PV String Loss	Warning	Cause ID = 1–28, corresponding to PV1–PV28 respectively. • A single string is lost. • Both 2-in-1 PV strings are lost. • Either of the 2-in-1 PV strings is lost.	1. Check whether cables are properly connected to the inverter terminals. 2. Check whether cables are properly connected to the PV string terminals. 3. If a 2-in-1 terminal is used, check whether it is normal. 4. If the string connection status is manually configured, check whether the configured status is consistent with the actual connection status.
2031	Phase Wire Short-Circuited to PE	Major	Cause ID = 1 The phase wire is short-circuited to PE or its impedance to PE is low.	Check the impedance of the phase wire to PE, locate the position with low impedance, and rectify the fault.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2032	Grid Loss	Major	Cause ID = 1 • The power grid experiences an outage. • The AC circuit is disconnected or the AC circuit breaker is OFF.	1. Check whether the AC voltage is normal. 2. Check whether the AC circuit is disconnected or the AC circuit breaker is OFF.
2033	Grid Undervoltage	Major	Cause ID = 1 The grid voltage is below the lower threshold or the undervoltage duration exceeds the time that triggers low voltage ride-through (LVRT).	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The device automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid voltage is within the allowed range. If no, contact the local power operator. If yes, modify the power grid undervoltage protection threshold after obtaining the consent of the local power operator. 3. If the fault persists for a long time, check the connection between the AC switch and power cables.
2034	Grid Overvoltage	Major	Cause ID = 1 The grid voltage exceeds the higher threshold or the high voltage has lasted for more than the value specified by high voltage ride-through (HVRT).	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The device automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid voltage is within the allowed range. If no, contact the local power operator. If yes, modify the power grid overvoltage protection threshold after obtaining the consent of the local power operator. 3. Check whether the peak voltage of the power grid is too high. If the fault occurs frequently and persists for a long time, contact the local power operator.

Troubleshooting

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2035	Grid Voltage Imbalance	Major	Cause ID = 1 The difference between grid phase voltages exceeds the upper threshold.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The device automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid voltage is within the normal range. If no, contact the local power operator. 3. If the fault persists for a long time, check the connection of the AC cables. 4. If the AC cables are correctly connected and the alarm persists and affects the operation of the plant, contact the local power operator.
2036	Grid Overfrequency	Major	Cause ID = 1 Power grid exception: The power grid frequency is higher than the frequency required in the local standard.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The device automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the allowed range. If not, contact the local power operator. If yes, modify the power grid overfrequency protection threshold after obtaining the consent of the local power operator.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2037	Grid Underfrequency	Major	Cause ID = 1 Power grid exception: The actual power grid frequency is lower than the standard requirement for the local power grid.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The device automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the allowed range. If not, contact the local power operator. If yes, modify the power grid underfrequency protection threshold after obtaining the consent of the local power operator.
2038	Unstable Grid Frequency	Major	Cause ID = 1 Power grid exception: The actual grid frequency change rate does not comply with the local power grid standard.	1. If the alarm occurs occasionally, the power grid may be abnormal temporarily. The device automatically recovers after detecting that the power grid becomes normal. 2. If the alarm occurs frequently, check whether the power grid frequency is within the allowed range. If not, contact the local power operator.
2039	AC Overcurrent	Major	Cause ID = 1 The grid experiences a dramatic voltage drop or is short-circuited. As a result, the transient AC current of the device exceeds the upper threshold and triggers protection.	1. The device detects its external working conditions in real time. After the fault is rectified, the device automatically recovers. 2. If the alarm occurs frequently and affects the operation of the power plant, check whether AC short circuit exists. If the fault persists, contact your dealer or technical support.
2040	DC Component Overhigh	Major	Cause ID = 1 The DC component in the AC current exceeds the upper threshold.	1. The device detects its external working conditions in real time. After the fault is rectified, the device automatically recovers. 2. If the alarm occurs frequently, contact your dealer or technical support.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2051	Abnormal Residual Current	Major	Cause ID = 1 The ground insulation resistance decreases during device operation.	1. If the alarm occurs occasionally, the external circuit may be abnormal temporarily. The device will automatically recover after the fault is rectified. 2. If the alarm occurs frequently or persists, check whether the DC-to-ground impedance is too low.
2062	Low Insulation Resistance	Major	Cause ID = 1 • 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.	1. Set **Insulation resistance protection** to the minimum value and restart the inverter. 2. Check that the PE cable of the device is correctly connected. 3. Check the output impedance of the PV array to ground. If there is a short circuit or lack of insulation, rectify it.
2063	Overtemperature	Minor	Cause ID = 1 • The device is installed in a place with poor ventilation. • The ambient temperature is higher than the upper threshold. • The device is faulty.	1. Check the ventilation and ambient temperature of the device installation position. 2. If the ventilation is poor or the ambient temperature exceeds the upper threshold, improve the ventilation and heat dissipation. 3. If the ventilation and ambient temperature meet requirements, contact your dealer or technical support.
2064	Device Fault	Major	Cause ID = 1–12, 20 A major fault has occurred on a circuit inside the device.	Cause ID = 1–12 Turn off the AC and DC switches, wait for 5 minutes, and then turn on the AC and DC switches. If the fault persists, contact your dealer or technical support. Cause ID = 20 Do not turn off the AC output switch or DC input switch. Contact your dealer or technical support.
2065	Upgrade Failed or Version Mismatch	Minor	Cause ID = 1–4, 7 The upgrade ends abnormally.	1. Perform an upgrade again. 2. If the upgrade fails for multiple times, contact your dealer or technical support.

Troubleshooting

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2066	License Expired	Warning	Cause ID = 1 1. The license has entered the grace period. 2. The license is about to expire.	1. Apply for a new license certificate. 2. Load the new license certificate.
2086	Abnormal External Fan	Major	Cause ID = 1–4, corresponding to external fans FAN1–FAN4. The external fan is short-circuited, the power supply is insufficient, or the air channel is blocked.	1. Turn off the AC and DC switches, check whether the fan blades are damaged, and clear the foreign matter around the fan. 2. Reinstall the fan and turn on the AC and DC switches. If the fault persists after the device runs for 15 minutes, replace the external fan.
2087	Abnormal Internal Fan	Major	Cause ID = 1 and 2, corresponding to internal fans FAN1 and FAN2. The internal fan is short-circuited, the power supply is insufficient, or the fan is damaged.	Turn off the AC and DC switches, wait for 5 minutes, and then turn on the AC and DC switches. If the fault persists after the device runs for 5 minutes, contact your dealer or technical support to replace the device.
2088	Abnormal DC Protection Unit	Major	Cause ID = 3 The contact points of the DC switches are stuck.	1. If the DC indicator on the panel is off, contact your dealer or technical support to replace the device. 2. If the DC indicator on the panel is on, wait until the PV string current decreases to below 0.5 A, turn off the AC switch and DC switch, wait for 5 minutes, and then turn on the AC switch and DC switch. If the fault persists after the device runs for 5 minutes, contact your dealer or technical support.
2093	Abnormal DC Switches	Minor	Cause ID = 1 The DC switch is not in the **ON** position, or the DC switch reset button is not pressed down to the bottom.	Check whether all DC switches are in the **ON** position. If not, turn the switches to the **ON** position (you can rotate the switches with force to ensure that they are in position). If the switches still cannot be turned to the **ON** position, press the reset buttons of all DC switches inwards until they cannot go further, and then turn on the DC switches again.

Alarm ID	Alarm Name	Alarm Severity	Possible Cause	Suggestion
2099	Local Access Certificate Invalid	Warning	Cause ID = 1 The digital signature certificate is invalid.	Check the time or replace the digital signature certificate.
2100	Local Access Certificate About to Expire	Warning	Cause ID = 1 The digital signature certificate is about to expire.	Replace the digital signature certificate in time.
2101	Local Access Certificate Expired	Major	Cause ID = 1 The digital signature certificate has expired.	Replace the digital signature certificate immediately.
2102	Protection upon Communication Failure	Warning	Cause ID = 1 When the communication disconnection duration exceeds the specified threshold, the device starts the protection function.	1. If the fault occurs occasionally, the device recovers to the normal state after receiving a scheduling command. No manual intervention is required. 2. Manually deliver a power scheduling command. 3. If the **Protection upon Communication Failure** function is not required, disable it.
61440	Monitoring Unit Faulty	Minor	Cause ID = 1 • The flash memory is insufficient. • The flash memory has bad sectors.	Turn off the AC and DC switches, wait for 5 minutes, and then turn on the AC and DC switches. If the fault persists, replace the monitoring board or contact your dealer or technical support.