

FusionSolar **Utility Smart PV Solution**

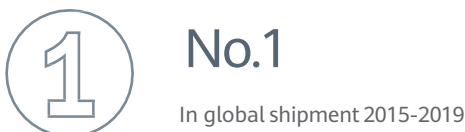
SOLAR.HUAWEI.COM



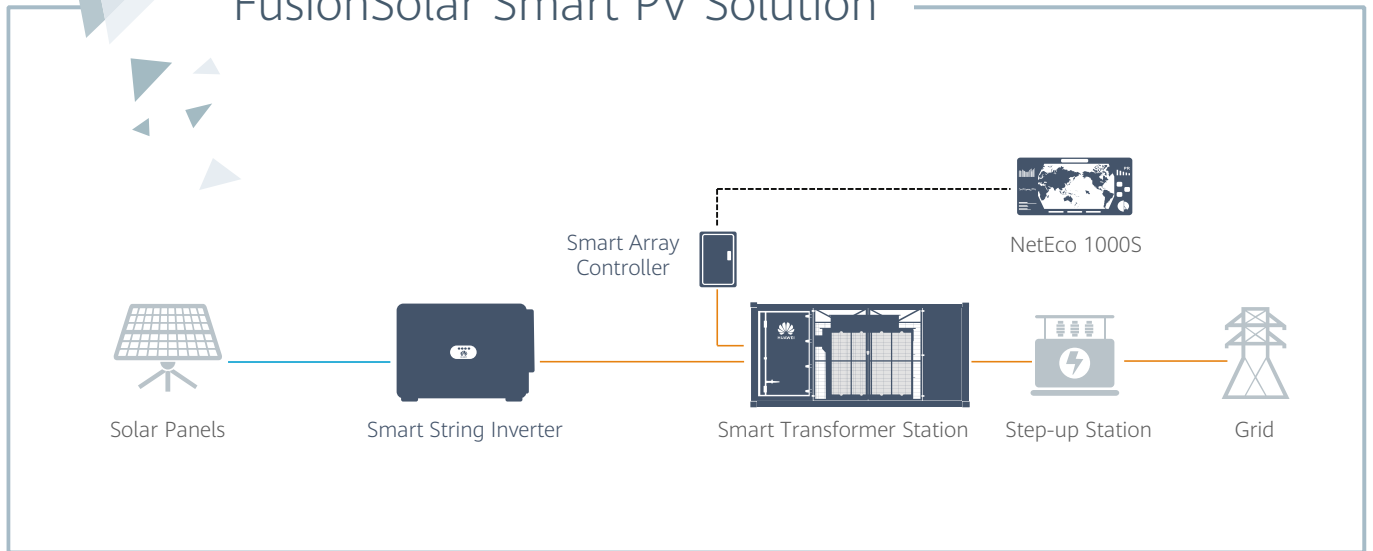


About Huawei

Huawei is a leading global provider of information and communications technology (ICT) infrastructure and smart devices. With integrated solutions across four key domains – telecom networks, IT, smart devices, and cloud services – we are committed to bringing digital to every person, home and organization for a fully connected, intelligent world. Huawei's end-to-end portfolio of products, solutions and services are both competitive and secure. Through open collaboration with ecosystem partners, we create lasting value for our customers, working to empower people, enrich home life, and inspire innovation in organizations of all shapes and sizes. At Huawei, innovation focuses on customer needs. We invest heavily in basic research, concentrating on technological breakthroughs that drive the world forward. In 2019, our sales revenue rounded off at 122.9 USD billion.



FusionSolar Smart PV Solution



Higher Yields

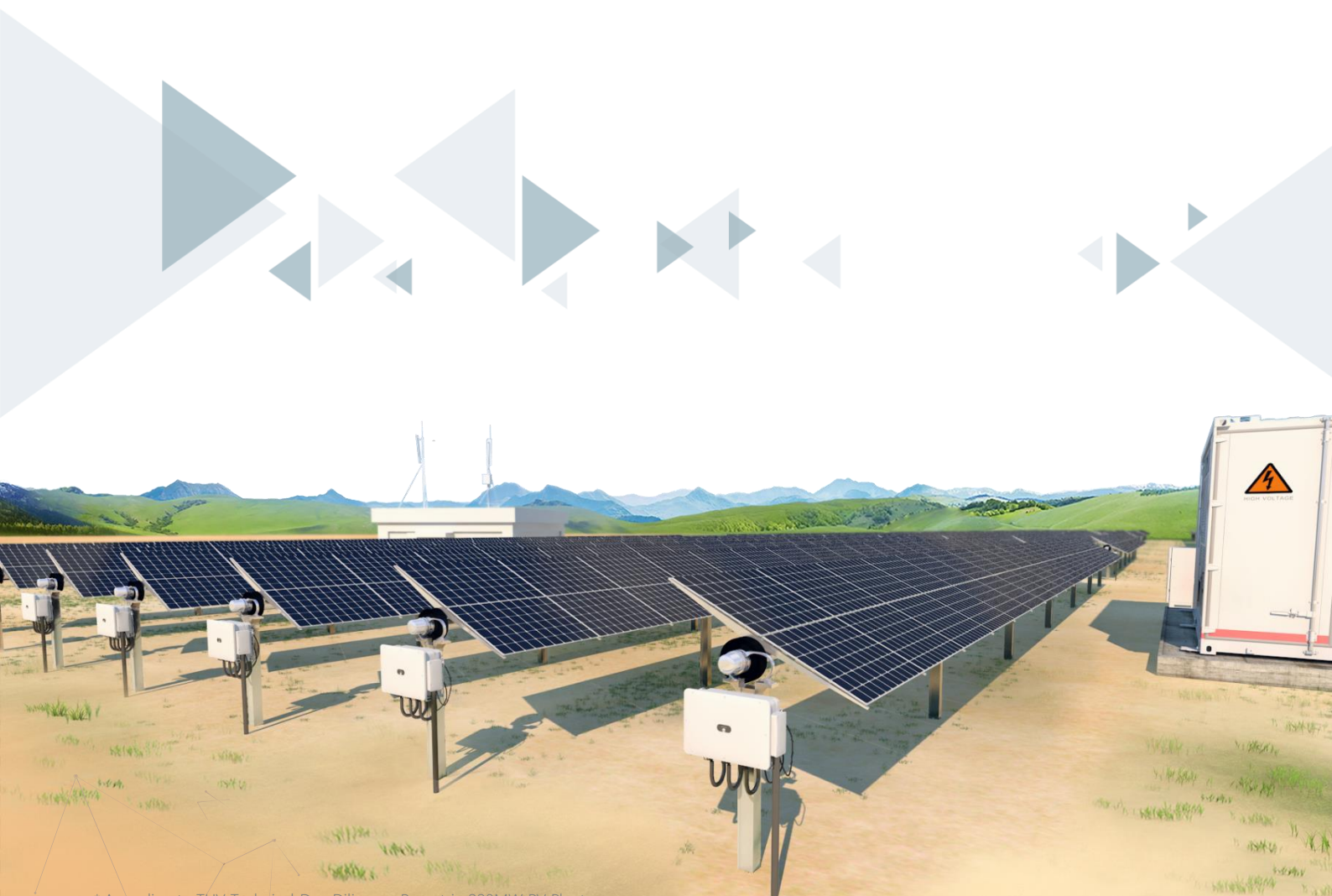
>2% Higher *

Smart O&M

Lower OPEX

Safe & Reliable

25-year's Reliability



* According to TUV Technical Due Diligence Report in 220MW PV Plant

SUN2000-185KTL-H1

Smart String Inverter



9
MPP Trackers



99.0%
Max. Efficiency



String-level
Management



Smart I-V Curve
Diagnosis Supported



MBUS
Supported



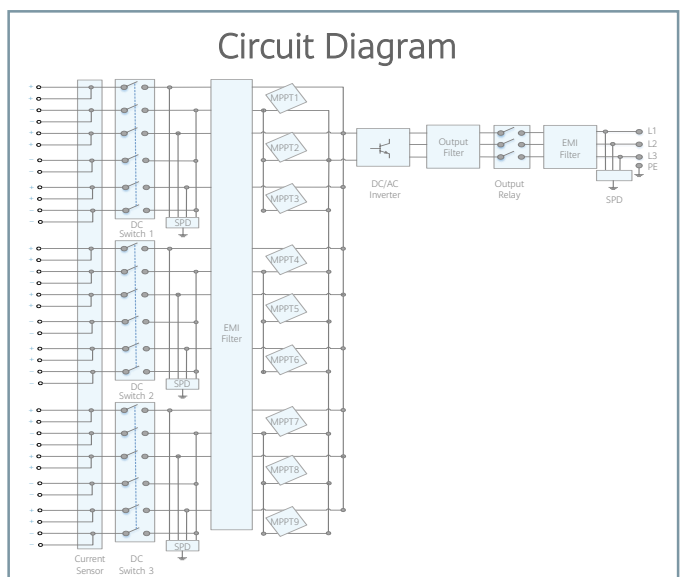
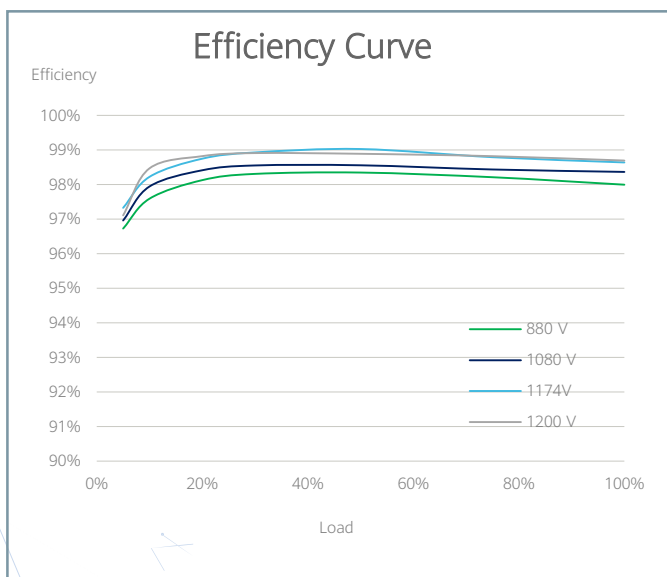
Fuse Free
Design



Surge Arresters for
DC & AC



IP66
Protection



Technical Specifications

Efficiency	
Max. Efficiency	99.03%
European Efficiency	98.69%
Input	
Max. Input Voltage	1,500 V
Max. Current per MPPT	26 A
Max. Short Circuit Current per MPPT	40 A
Start Voltage	550 V
MPPT Operating Voltage Range	500 V ~ 1,500 V
Nominal Input Voltage	1,080 V
Number of Inputs	18
Number of MPP Trackers	9
Output	
Nominal AC Active Power	175,000 W @40°C, 168,000 W @45°C, 160,000 W @50°C
Max. AC Apparent Power	185,000 VA
Max. AC Active Power (cosΦ=1)	185,000 W
Nominal Output Voltage	800 V, 3W + PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Nominal Output Current	126.3 A @40°C, 121.3 A @45°C, 115.5 A @50°C
Max. Output Current	134.9 A
Adjustable Power Factor Range	0.8 LG ... 0.8 LD
Max. Total Harmonic Distortion	< 3%
Protection	
Input-side Disconnection Device	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
Residual Current Monitoring Unit	Yes
Communication	
Display	LED Indicators, Bluetooth/WLAN + APP
USB	Yes
MBUS	Yes
RS485	Yes
General	
Dimensions (W x H x D)	1,035 x 700 x 365 mm (40.7 x 27.6 x 14.4 inch)
Weight (with mounting plate)	84 kg (185.2 lb.)
Operating Temperature Range	-25°C ~ 60°C (-13°F ~ 140°F)
Cooling Method	Smart Air Cooling
Max. Operating Altitude without Derating	4,000 m (13,123 ft.)
Relative Humidity	0 ~ 100%
DC Connector	Staubli MC4 EVO2
AC Connector	Waterproof Connector + OT/DT Terminal
Protection Degree	IP66
Topology	Transformerless
Standard Compliance (more available upon request)	
Certificates	EN 62109-1/-2, IEC 62109-1/-2, EN 50530, IEC 62116, IEC 60068, IEC 61683, IEC 61727, DEWA, IEC 62910, IRR-DCC, IRR-TIC, IEEE 1547, G99, CEI 0-16

STS-6000K-H1

Smart Transformer Station



Simple

Prefabricated and Pre-tested, No Internal Cabling Needed Onsite
Compact 20' HC Container Design for Easy Transportation



Efficient

Eco-design Transformer Suitable for All
Lower Self-consumption for Higher Yields



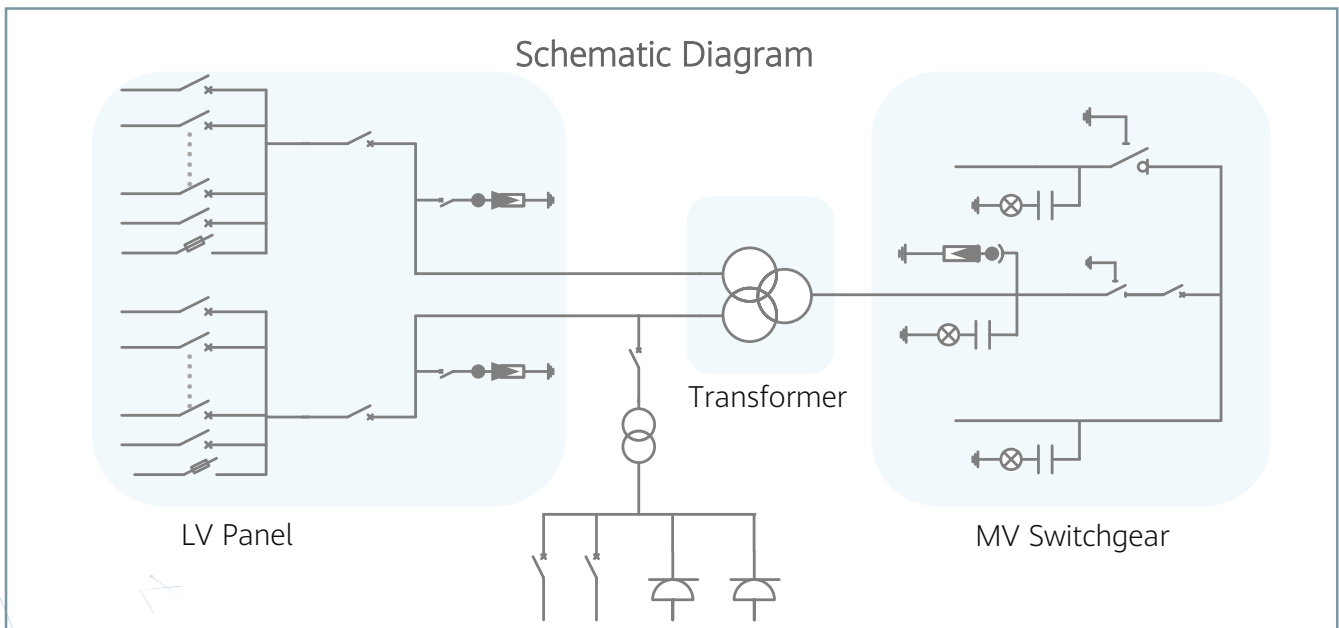
Smart

Real-time Monitoring of Transformer, LV Panel and MV Switchgear
0.2% High Precision Sensor of LV Electricity Parameters
Remote Control of ACB and MV Circuit Breaker



Reliable

Robust Design against Harsh Environments
Optimal Cooling Design for High Availability and Easy O&M
Comprehensive Tests from Components, Device to Solution



Technical Specifications

Input		
Available Inverters	SUN2000-185KTL-H1	
AC Power	6,300 kVA @40°C / 5,760 kVA @50°C ¹	
Max. Inverters Quantity	36	
Rated Input Voltage	800 V	
Max. Input Current at Nominal Voltage	2,428 A x 2	
LV Main Switches	ACB (2500 A / 800 V / 3P, 2 x 1 pcs), MCCB (250 A / 800 V / 3P, 2 x 18 pcs)	
Output		
Rated Output Voltage	10 kV, 11 kV, 15 kV, 20 kV, 22 kV, 23 kV, 30 kV, 33 kV, 35 kV ²	13.8 kV, 34.5 kV ²
Frequency	50 Hz	60 Hz
Transformer Type	Oil-immersed, Conservator Type	
Transformer Tappings	± 2 x 2.5%	
Transformer Oil Type	Mineral Oil (PCB Free)	
Transformer Vector Group	Dy11-y11	
Minimum Peak Efficiency Index	In Accordance with EN 50588-1	
Transformer Load Losses	49.7 kW	41 kW
Transformer No-load Losses	4.8 kW	5.8 kW
Impedance (HV-LV1, LV2)	7.5% (0 ~ +10%) @6,300 kVA	
MV Switchgear Type	SF6 Gas Insulated, 3 Units	
MV Switchgear Configuration	1 Transformer Unit with Circuit Breaker 1 Cable Unit with Load Breaker Switch 1 Cable Direct Connection Unit	
Auxiliary Transformer	Dry Type Transformer, 5 kVA, Dyn11	
Output Voltage of Auxiliary Transformer	400 / 230 Vac	220 / 127 Vac
Protection		
Transformer Monitoring & Protection	Oil Level, Oil Temperature, Oil Pressure and Buchholz	
Protection Degree of MV & LV Room	IP 54	
Internal Arcing Fault MV Switchgear	IAC A 20 kA 1s	
MV Relay Protection	50/51, 50N/51N	
MV Surge Arrester	Equipped	
LV Overvoltage Protection	Type I+II	
General		
Dimensions (W x H x D)	6,058 x 2,896 x 2,438 mm (20' HC Container)	
Weight	< 22 t (48,502 lb.)	
Operating Temperature Range	-25°C ~ 60°C ³ (-13°F ~ 140°F)	
Relative Humidity	0% ~ 95%	
Max. Operating Altitude	2,000 m (6,562 ft.)	2,500 m (8,202 ft.)
Enclosure Color	RAL 9003	
Communication	Modbus-RTU, Preconfigured with Smartlogger3000B	
Applicable Standards	IEC 62271-202, EN 50588-1, IEC 60076, IEC 62271-200, IEC 61439-1	
Features		
Auxiliary Transformer (50 kVA, Dyn11)	Optional ⁴	
1.5 kVA UPS	Optional ⁴	
MV Switchgear Updated to: 1 transformer unit with circuit breaker 2 cable units with load breaker switch	Optional ⁴	
Updated to 25kA 1s MV Switchgear	Optional ⁴	
IMD	Optional ⁴	
STS Interlocking	Optional ⁴	

- 1 - More detailed AC power of STS, please refer to the de-rating curve.
2 - Rated output voltage from 10 kV to 35 kV, more available upon request
3 - When ambient temperature ≥55°C, awning shall be equipped for STS on site by customer.
4 - Extra expense needed for optional features which standard product doesn't contain.

STS-3000K-H1

Smart Transformer Station



Simple

Prefabricated and Pre-tested, No Internal Cabling Needed Onsite
Compact 20' HC Container Design for Easy Transportation



Efficient

Eco-design Transformer Suitable for All
Lower Self-consumption for Higher Yields



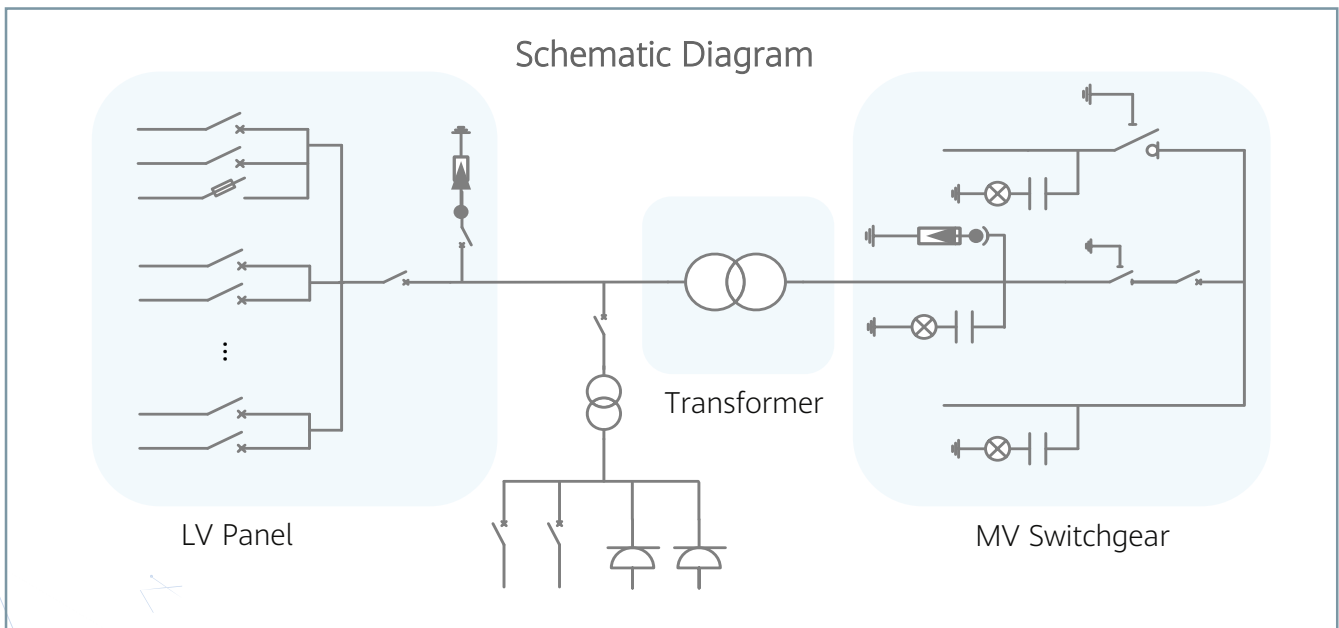
Smart

Real-time Monitoring of Transformer, LV Panel and MV Switchgear
0.2% High Precision Sensor of LV Electricity Parameters
Remote Control of ACB and MV Circuit Breaker



Reliable

Robust Design against Harsh Environments
Optimal Cooling Design for High Availability and Easy O&M
Comprehensive Tests from Components, Device to Solution



Technical Specifications

Input			
Available Inverters	SUN2000-185KTL-H1		
AC Power	3,150 kVA @40°C / 2,880 kVA @50°C ¹		
Max. Inverters Quantity	18		
Rated Input Voltage	800 V		
Max. Input Current at Nominal Voltage	2,428 A		
LV Main Switches	ACB (2500 A / 800 V / 3P, 1 pcs), MCCB (250 A / 800 V / 3P, 18 pcs)		
Output			
Rated Output Voltage	10 kV, 11 kV, 15 kV, 20 kV, 22 kV, 23 kV ²	30 kV, 33 kV, 35 kV ²	13.8 kV, 34.5 kV ²
Frequency	50 Hz	50 Hz	60 Hz
Transformer Type	Oil-immersed, Conservator Type		
Transformer Tappings	± 2 x 2.5%		
Transformer Oil Type	Mineral Oil (PCB Free)		
Transformer Vector Group	Dy11		
Minimum Peak Efficiency Index	In Accordance with EN 50588-1		
Transformer Load Losses	27.5 kW	30.25 kW	30.25 kW
Transformer No-load Losses	2.2 kW	2.53 kW	2.53 kW
Impedance	7% (0 ~ +10%) @3,150 kVA		
MV Switchgear Type	SF6 Gas Insulated, 3 Units		
MV Switchgear Configuration	1 Transformer Unit with Circuit Breaker 1 Cable Unit with Load Breaker Switch 1 Cable Direct Connection Unit		
Auxiliary Transformer	Dry Type Transformer, 5 kVA, Dyn11		
Output Voltage of Auxiliary Transformer	400 / 230 Vac		220 / 127 Vac
Protection			
Transformer Monitoring & Protection	Oil Level, Oil Temperature, Oil Pressure and Buchholz		
Protection Degree of MV & LV Room	IP 54		
Internal Arcing Fault MV Switchgear	IAC A 20 kA 1s		
MV Relay Protection	50/51, 50N/51N		
MV Surge Arrester	Equipped		
LV Overvoltage Protection	Type I+II		
General			
Dimensions (W x H x D)	6,058 x 2,896 x 2,438 mm (20' HC Container)		
Weight	< 15 t (33,069 lb.)		
Operating Temperature Range	-25°C ~ 60°C ³ (-13°F ~ 140°F)		
Relative Humidity	0% ~ 95%		
Max. Operating Altitude	2,000 m (6,562 ft.)	2,500 m (8,202 ft.)	
Enclosure Color	RAL 9003		
Communication	Modbus-RTU, Preconfigured with Smartlogger3000B		
Applicable Standards	IEC 62271-202, EN 50588-1, IEC 60076, IEC 62271-200, IEC 61439-1		
Features			
Auxiliary Transformer (50 kVA, Dyn11)	Optional ⁴		
1.5 kVA UPS	Optional ⁴		
MV Switchgear Updated to: 1 transformer unit with circuit breaker 2 cable units with load breaker switch	Optional ⁴		
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IMD	Optional ⁴		
STS Interlocking	Optional ⁴		

- 1 - More detailed AC power of STS, please refer to the de-rating curve.
2 - Rated output voltage from 10 kV to 35 kV, more available upon request
3 - When ambient temperature $\geq 55^{\circ}\text{C}$, awning shall be equipped for STS on site by customer.
4 - Extra expense needed for optional features which standard product doesn't contain.

SmartACU2000D

Smart Array Controller



With SmartPID2000 Module



Without SmartPID2000 Module



Smart

Support one-click commissioning
Patented anti-PID module



Simple

SmartPID2000 & Smartlogger3000B
pre-installed with multiple interfaces



Reliable

Industrial-level application
and high reliability

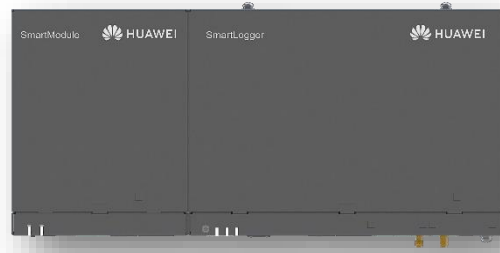
Technical Specification	SmartACU2000D-D-00	SmartACU2000D-D-02	SmartACU2000D-D-01	SmartACU2000D-D-03
Configuration				
Smart Logger	SmartLogger3000B x 1			
SmartModule1000A	Optional			Standard with SmartModule1000A x 1
RS485	Supported			
No. of MBUS ¹	1	2	1	2
No. of SmartPID2000	0	0	1	2
Environment				
Operating Temperature Range	-40°C ~ 60°C (-40°F ~ 140°F)			
Relative Humidity	4% ~ 100%			
Max. Operating Altitude	4,000 m (13,123 ft.)			
Electrical				
AC Input Voltage for SACU	100 V ~ 240 V, L / N (L)+ PE			
AC Input Voltage for MBUS	380 V ~ 800 V, 3Ph			
AC Input Voltage for PID	380 V ~ 800 V, 3Ph + FE (Functional Earth)			
AC Input Frequency	50 / 60 Hz			
Power Supply	Standard: 12 V DC Optional: 24 V DC ²			
Mechanical				
Cable Entries	Bottom in & out			
Maintenance	Front			
Dimensions (W x H x D)	640 x 770 x 315 mm (25.2 x 30.3 x 12.4 inch)		880 x 770 x 369 mm (34.6 x 30.3 x 14.5 inch)	
Weight	29 kg (63.9 lb.)	32 kg (70.5 lb.)	49 kg (108.0 lb.)	61 kg (134.5 lb.)
Protection Degree	IP65			
Installation Options	Wall Mounting, Rack Mounting, Pole Mounting			

1. Compatible with communication mode of PLC (Power Line Communication).
2. 24V DC power supply is optional to power devices that require 24Vdc input and output.

SmartLogger3000B



Without SmartModule1000A



With SmartModule1000A



Smart

Connecting up to 150 inverters
One-click commissioning



Simple

Deployment wizard allowed, including
parameters configuration, devices connection



Reliable

Safety improvement
by lightning protection module

Technical Specifications	SmartLogger3000B	SmartLogger3000B with SmartModule1000A
Device Management		
Max. Number of Manageable Devices	200	
Max. Number of Manageable Inverters	150	
Communication Interface		
WAN	WAN x 1, 10 / 100 / 1,000 Mbps	
LAN	LAN x 1, 10 / 100 / 1,000 Mbps	LAN x 3, 10 / 100 / 1,000 Mbps
Optical Ethernet	SFP x 2, 100 / 1,000 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 / Output	DI x 4, DO x 2, AI x 4	DI x 8, DO x 2, AI x 7
PT100 / PT1000	0	2
Active DO	12 V, 100 mA (connection with relay, sensor)	
Communication Protocol		
Ethernet	Modbus-TCP, IEC 60870-5-104	
RS485	Modbus-RTU, IEC 60870-5-103 (standard), DL / T645	
Interaction		
LED	LED Indicator x 3 - RUN, ALM, 4G	LED Indicator x 5 - RUN, ALM, 4G (Smartlogger3000B) & RUN, ALM (SmartModule1000A)
WEB	Embedded Web	
USB	USB 2.0 x 1	
APP	Communication by WLAN for commissioning	
Environment		
Operating Temperature Range	-40°C ~ 60°C (-40°F ~ 140°F)	
Storage Temperature Range	-40°C ~ 70°C (-40°F ~ 158°F)	
Relative Humidity (Non-condensing)	5% ~ 95%	
Max. Operating Altitude	4,000 m (13,123 ft.)	
Electrical		
Power Adaptor	AC input: 100 V ~ 240 V, 50 Hz / 60 Hz; DC output: 12 V, 2 A	
DC Power Supply	24 V, 0.8 A	
Power Consumption	Typical 9 W, Max. 15 W	Typical 10 W, Max. 18 W
Mechanical		
Dimensions (W x H x D, without mounting ears)	225 x 160 x 44 mm (8.9 x 6.3 x 1.7 inch)	350 x 160 x 44 mm (13.8 x 6.3 x 1.7 inch)
Weight	2 kg (4.4 lb.)	3 kg (6.6 lb.)
Protection Degree	IP20	
Installation Options	Wall Mounting, DIN Rail Mounting, Tabletop Mounting	

SmartPID2000 Module

Inside Smart Array Controller



The SmartPID2000 Module is installed in the SmartACU2000B cabinet to reduce the negative effect of the Potential Induced Degradation (PID), and support 1000 V / 1100 V / 1500 V DC system.



Smart

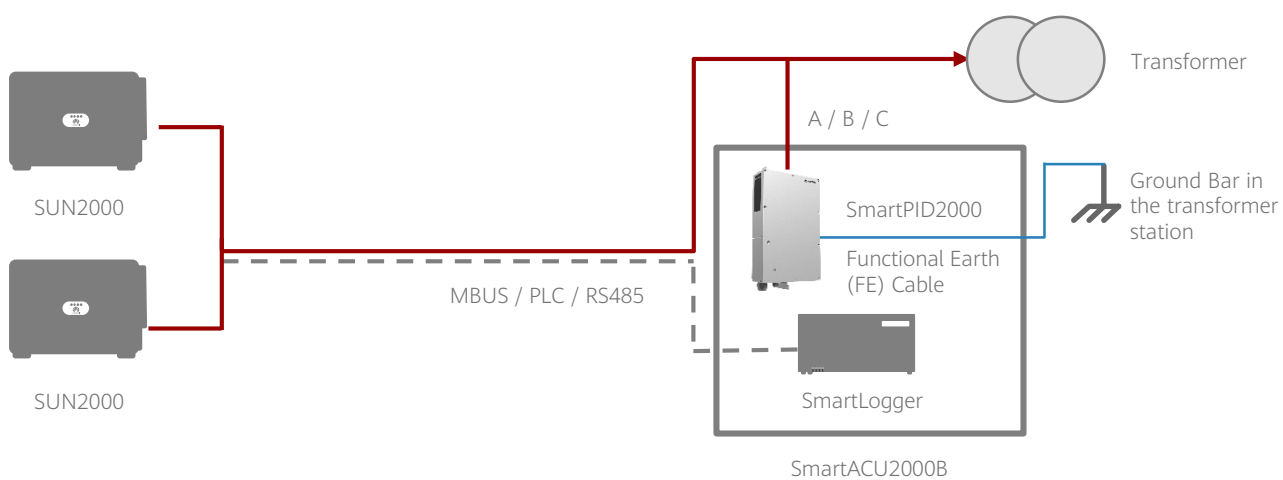
Data read and software upgrade through USB or the embedded Web



Reliable

Protection degree of IP65

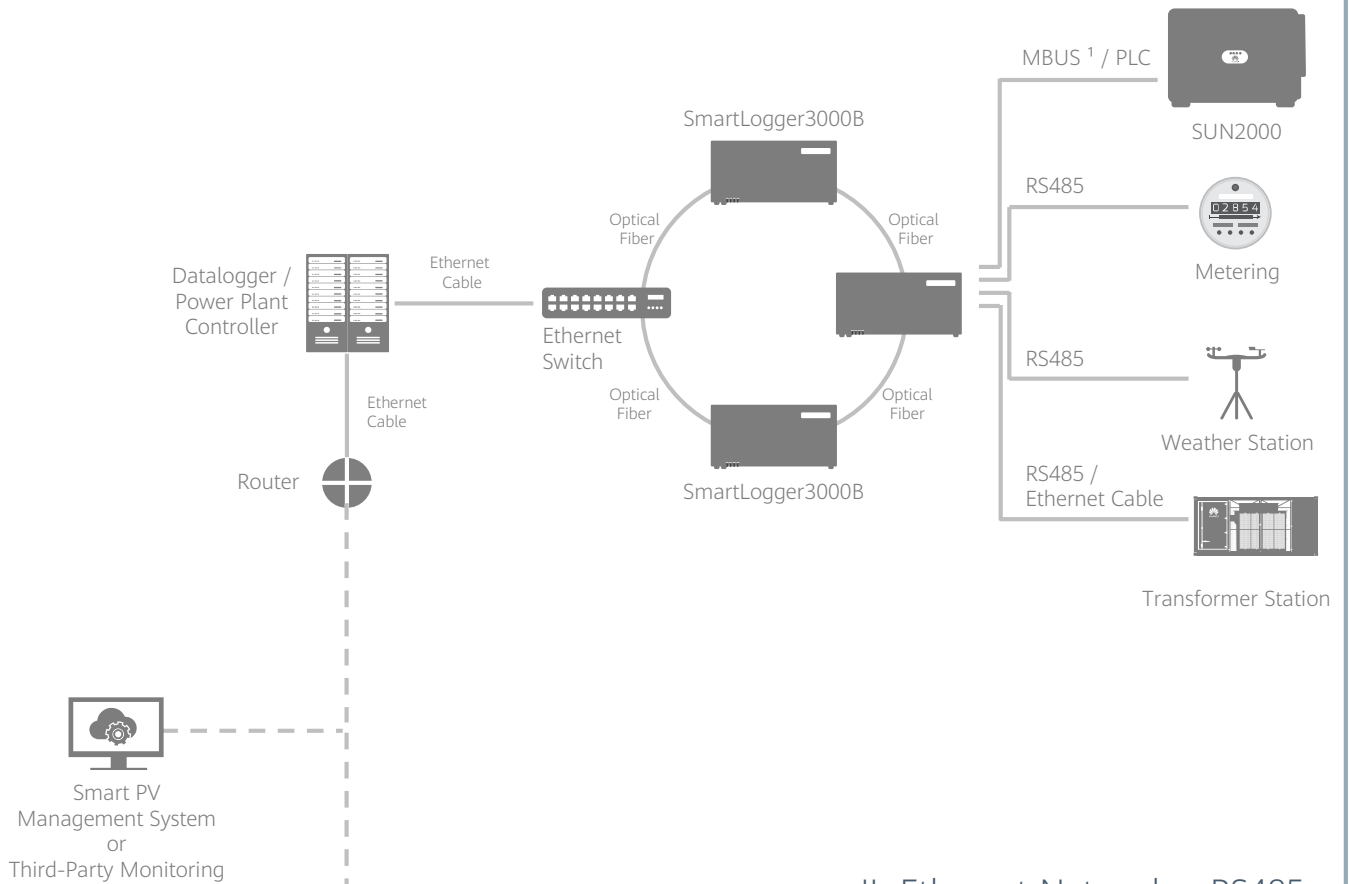
SmartPID2000 Solution Diagram



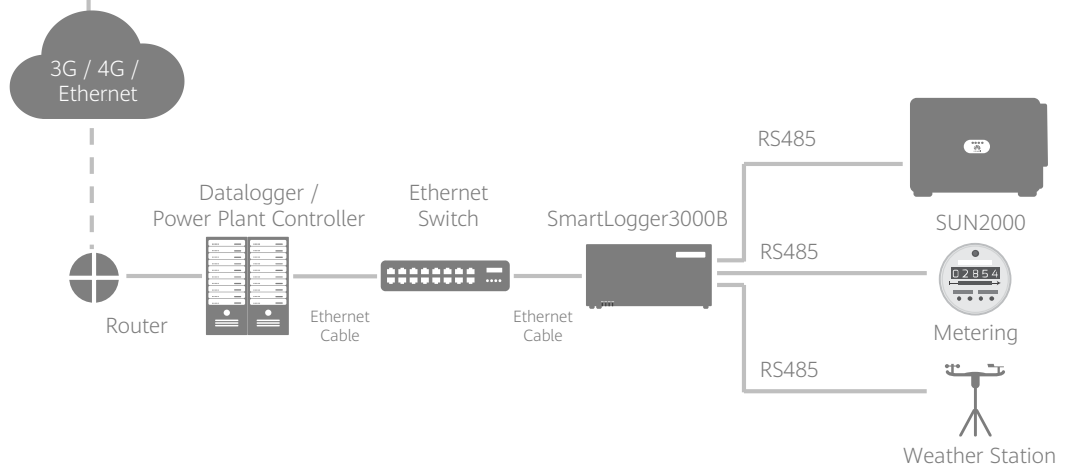
- Note:
1. The Anti-PID solution could ONLY be deployed in utility installations which are normally connected to the medium voltage (MV) grid running WITHOUT neutral line.
 2. The Anti-PID module must work with Huawei SmartLoggers and Huawei inverters.

Network Applications

I Optical Fiber Ring Network + MBUS / PLC



II Ethernet Network + RS485



1 - Compatible with communication mode of PLC (Power Line Communication).

NetEco1000S



Smart

Auto faults alarming and reports issuing
Smart I-V Curve Diagnosis supported



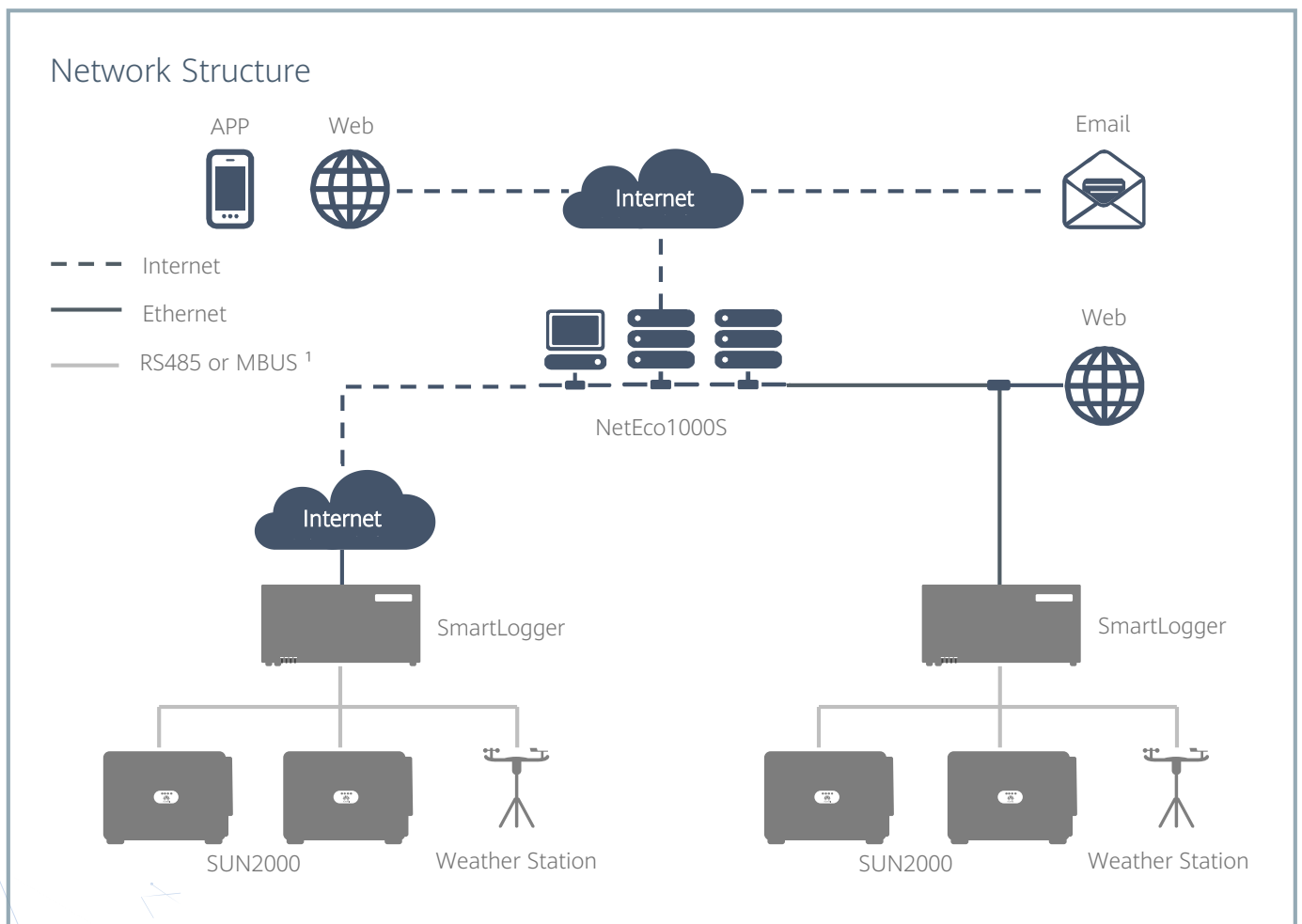
Simple

One-click installation on PC
Fault alarms via SMS and E-mail



Reliable

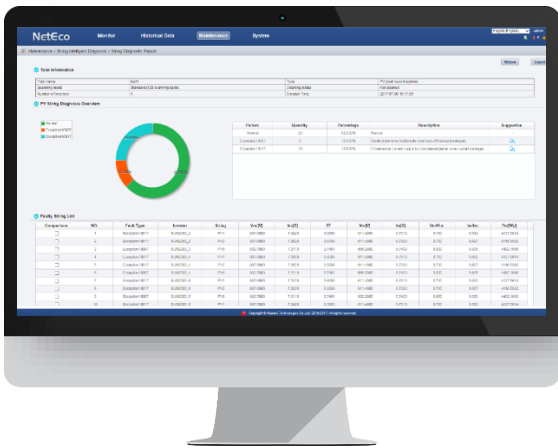
Hierarchical management
Up to 25 years data storage



1 - Compatible with communication mode of PLC (Power Line Communication).

Smart I-V Curve Diagnosis

Smart I-V Curve Diagnosis is able to carry out online I-V curve analysis on entire strings with advanced diagnosis algorithm. The scanning would help to find out and identify the strings with low performance or malfunction, which would help to achieve proactive maintenance, higher O&M efficiency and lower operation cost.



Smart

Support plant-level, array-level and inverter-level analysis and diagnosis

Automatically identify different failure types and provide recovery suggestion

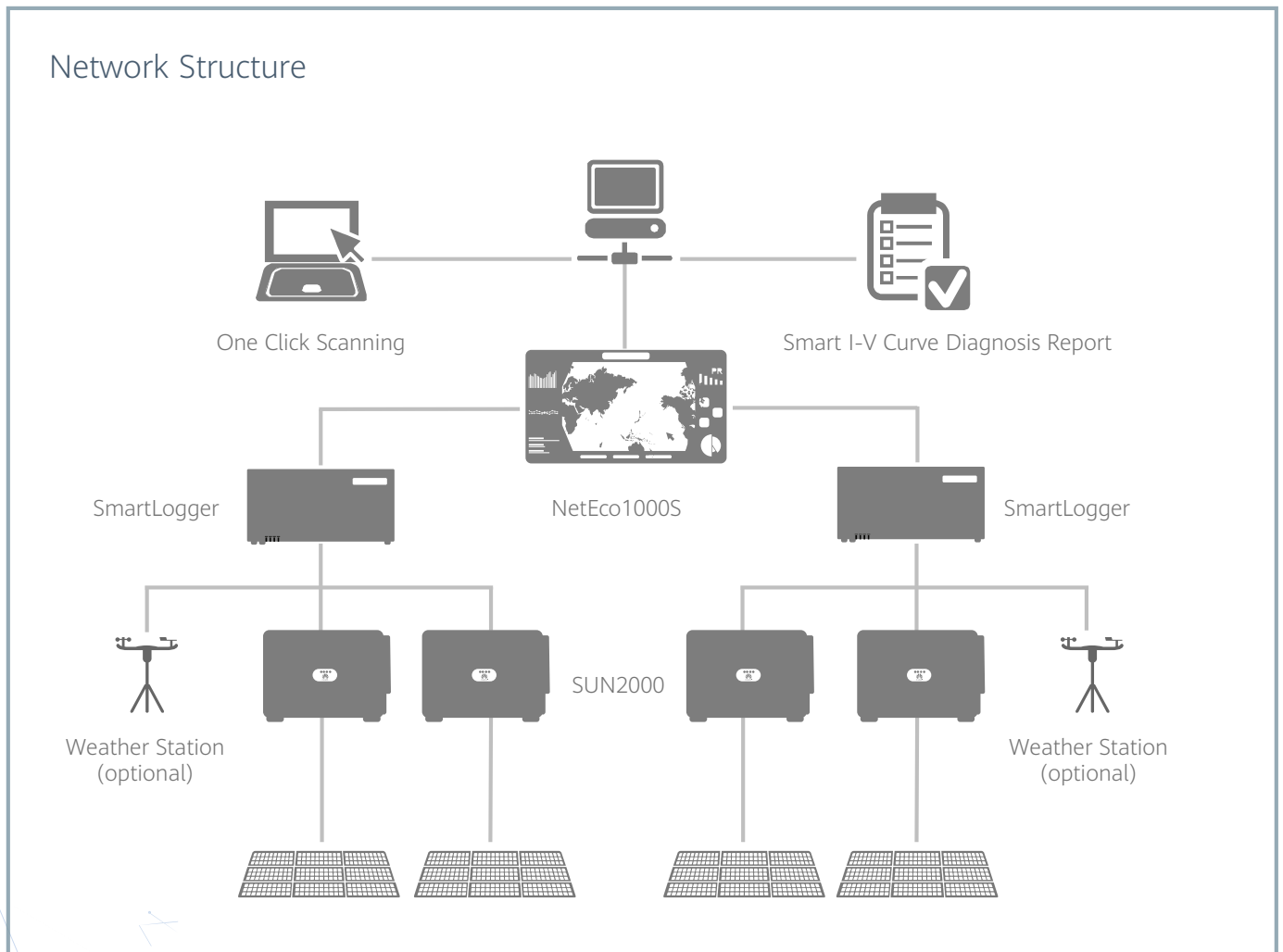


Efficient

One-click scanning without onsite experts or equipment

Completing online I-V curve scanning on all strings of 100 MW plant within 15 minutes

Network Structure

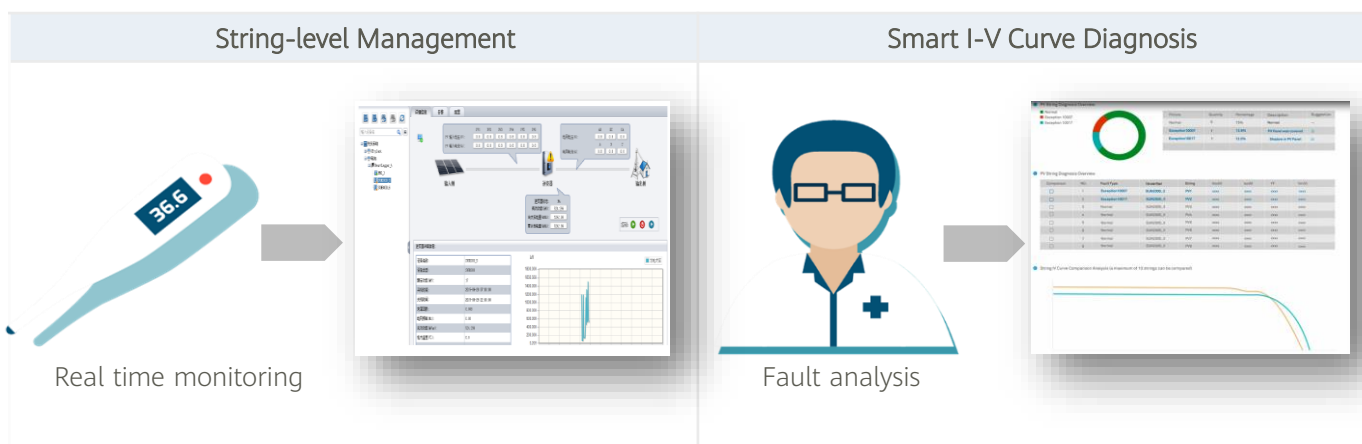


Smart I-V Curve Diagnosis

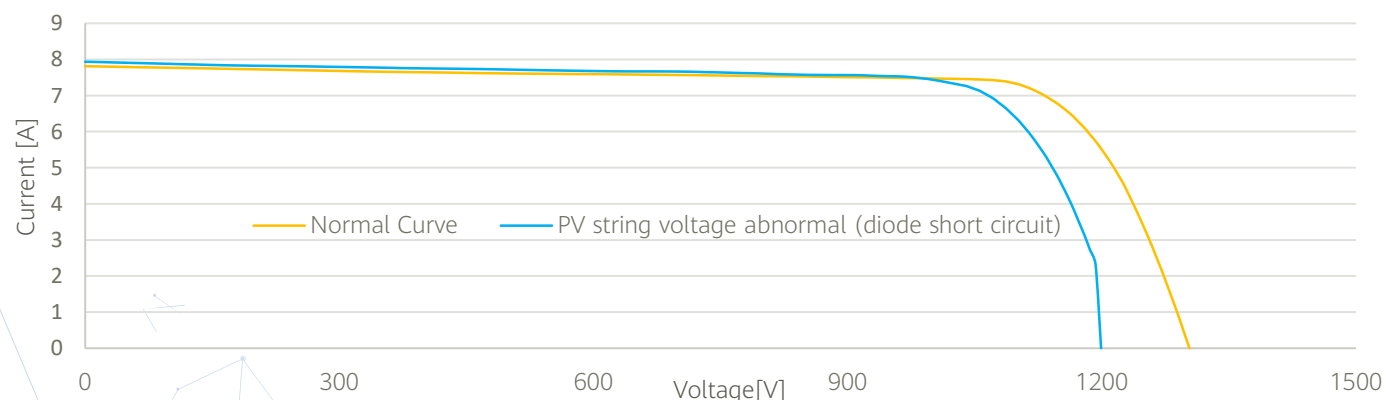
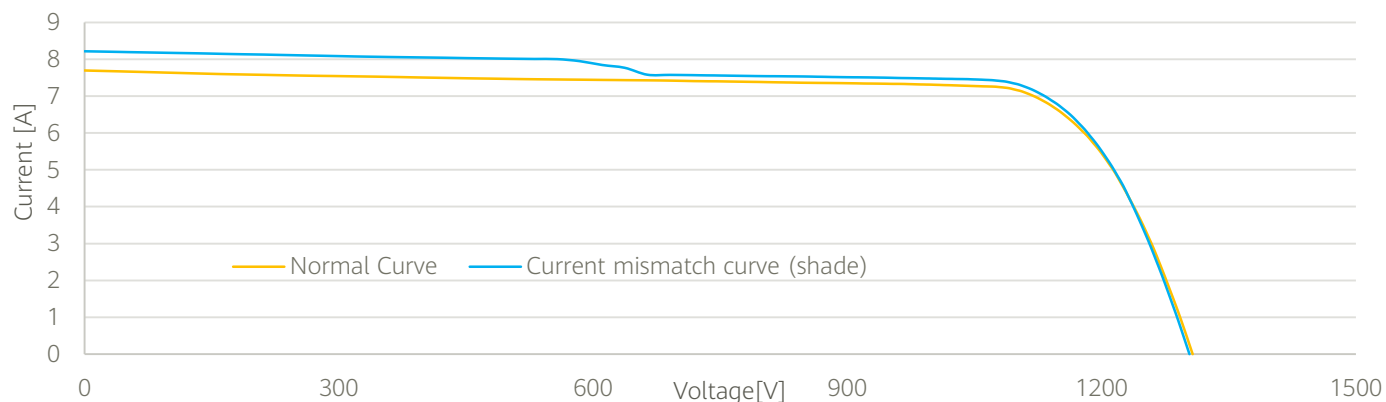
Technical Specifications	
Smart String inverter	SUN2000-185KTL-H1
Data logger	SmartLogger3000B, SmartLogger2000
Management System	NetEco1000s
Scanning Time	< 1s
Sampling Points per I-V Curve	128
Voltage Accuracy	0.5%rdg. + 1dgt. (rdg.>5, dgt.=0.3)
Current Accuracy	0.5%rdg. + 2dgt. (rdg.>0.3, dgt.=0.006)



Smart I-V Curve Diagnosis is TUV verified



String I-V Curve Comparison



Smart PV Solution Reference



SAKAKA, Saudi Arabia
Ground-mounted Smart PV Plant

Capacity
300 MW

Inverter Model
SUN2000-90KTL



Jinjia, Uganda
Ground-Mounted Smart PV Plant

Capacity
10 MW

Inverter Model
SUN2000-90KTL



Lusaka, Zambia
Ground-Mounted Smart PV Plant

Capacity
54 MW

Inverter Model
SUN2000-42KTL

Smart PV Solution Reference



Garissa, Kenya
Ground-Mounted Smart PV Plant

Capacity
50 MW

Inverter Model
SUN2000-42KTL



Weniba, Ghana
Ground-Mounted Smart PV Plant

Capacity
20 MW

Inverter Model
SUN2000-42KTL



Dubai, UAE
Ground-Mounted Smart PV Plant

Capacity
1.2 MW

Inverter Model
SUN2000-42KTL

Smart PV Solution Reference



Yanchi, Ningxia, China
Largest Single PV Plant Worldwide

Capacity
1 GW

Inverter Model
SUN2000-40KTL



Hongdunzi, Ningxia, China
Largest Tracking System PV Plant Worldwide

Capacity
700 MW

Inverter Model
SUN2000-50KTL



Haining, Zhejiang, China
Largest Rooftop-mounted PV Plant Worldwide

Capacity
300 MW

Inverter Model
SUN2000-28KTL,36KTL,50KTL

Smart PV Solution Reference



Delingha, Qinghai, China
Ground-mounted Smart PV Plant

Capacity
200 MW

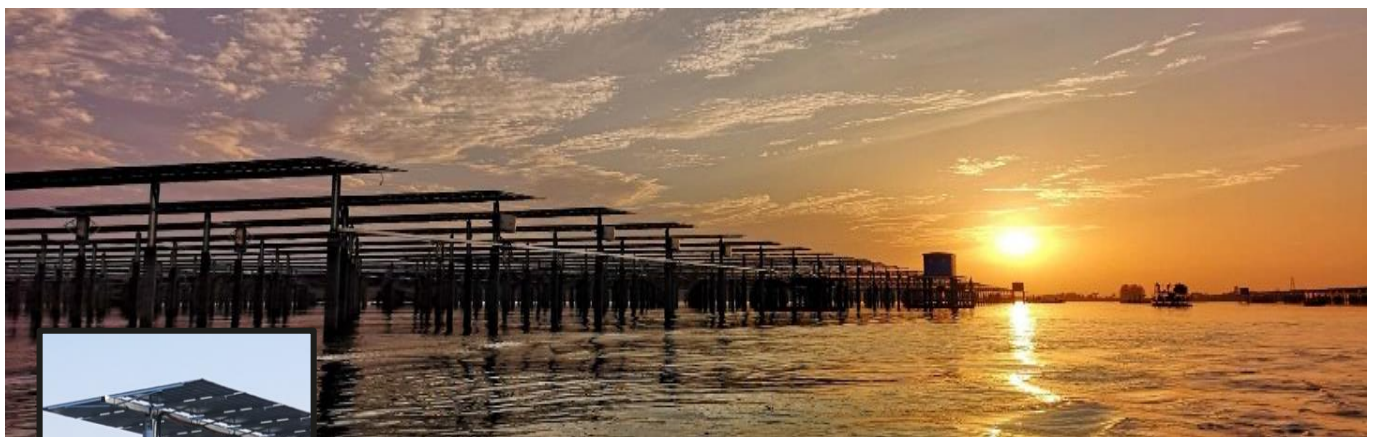
Inverter Model
SUN2000-100KTL



Haixing, Hebei, China
Ground-mounted Smart PV Plant

Capacity
62 MW

Inverter Model
SUN2000-100KTL



Sihong, Jiangsu, China
Water Surface Smart PV Plant

Capacity
100 MW

Inverter Model
SUN2000-100KTL

Smart PV Solution Reference



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Seville, Spain
Ground-mounted Smart PV Plant

Capacity
175 MW

Inverter Model
SUN2000-100KTL, 60KTL-HV



Milton Keynes, UK
Ground-mounted Smart PV Plant

Capacity
10 MW

Inverter Model
SUN2000-60KTL-HV



Viborillas, Mexico
Ground-mounted Smart PV Plant

Capacity
100 MW

Inverter Model
SUN2000-60KTL-HV

Smart PV Solution Reference



Ghani, India
Ground-Mounted Smart PV Plant

Capacity
50 MW

Inverter Model
SUN2000-43KTL-IN



Krependorf, Germany
Ground-mounted Smart PV Plant

Capacity
20 MW

Inverter Model
SUN2000-28KTL



Miyako-jima, Japan
Seashore Smart PV Plant



Capacity
2 MW

Inverter Model
SUN2000-28KTL

Smart PV Solution Reference



Chihuahua, Mexico Ground-mounted Smart PV Plant	Capacity 120 MW	Inverter Model SUN2000-100KTL
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Phnom Penh, Cambodia Ground-mounted Smart PV Plant	Capacity 60 MW	Inverter Model SUN2000-65KTL-M0
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Sabah, Malaysia Mountain-mounted Smart PV Plant	Capacity 49 MW	Inverter Model SUN2000-42KTL
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