

# FusionSolar **Utility Smart PV Solution**

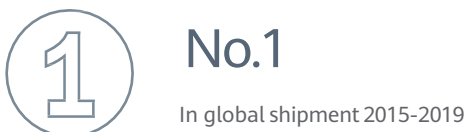
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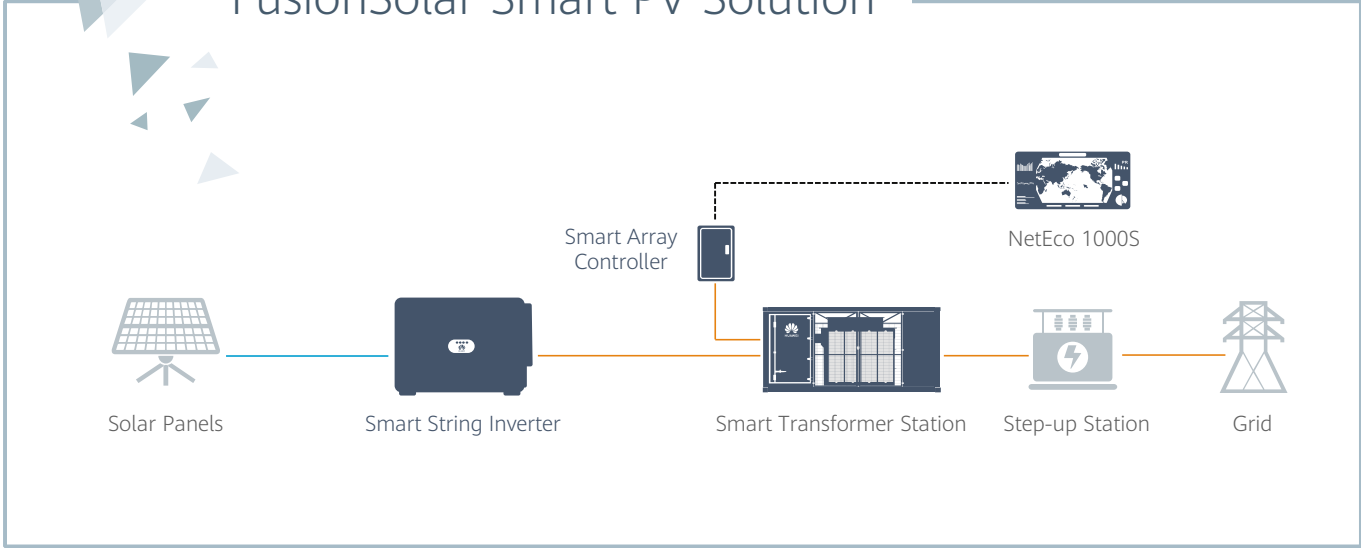


## About Huawei

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.



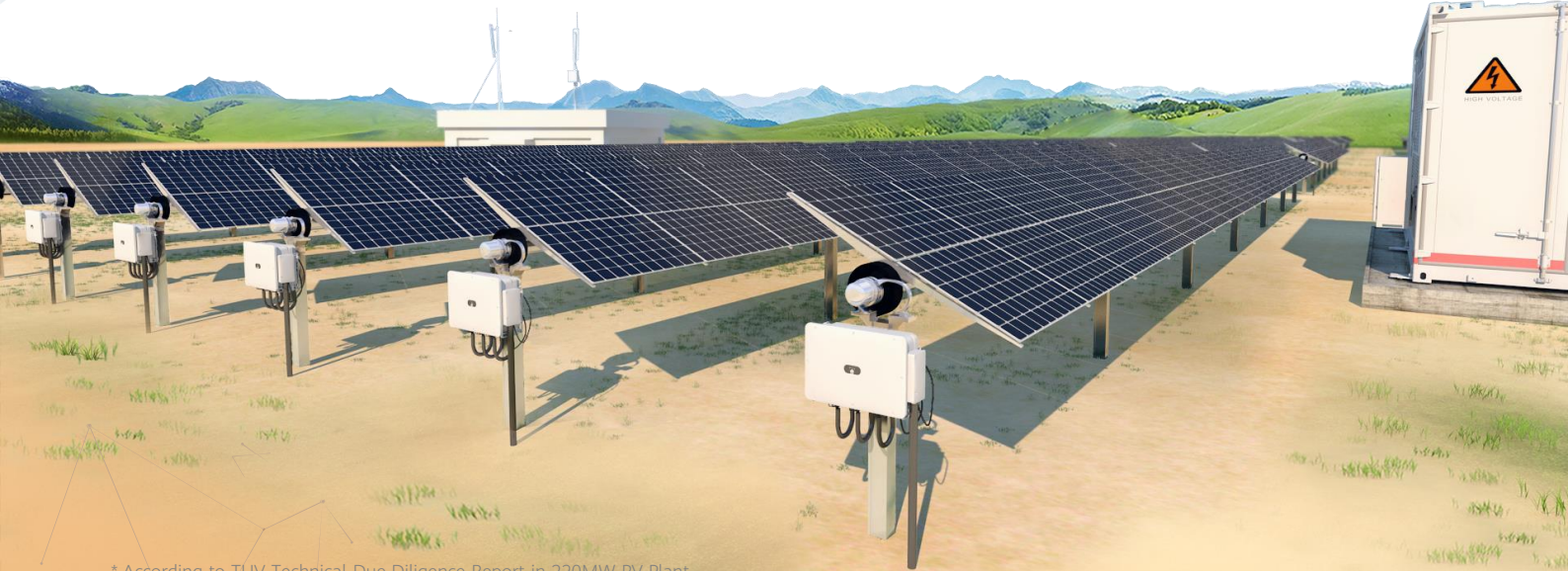
# FusionSolar Smart PV Solution



**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



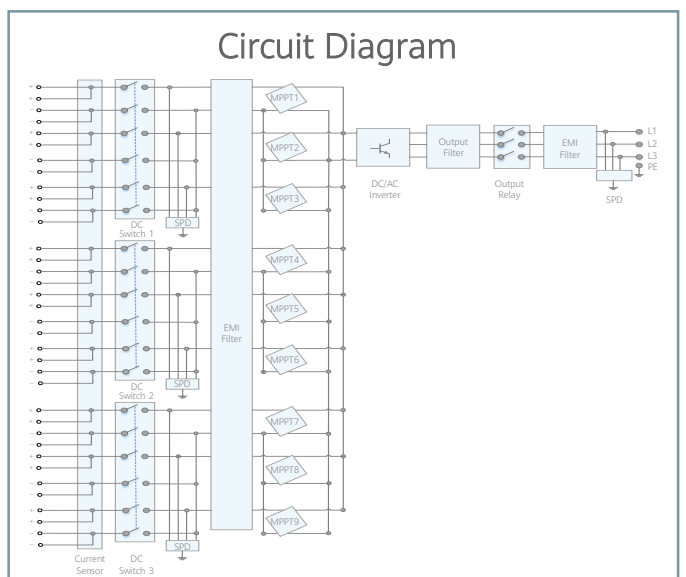
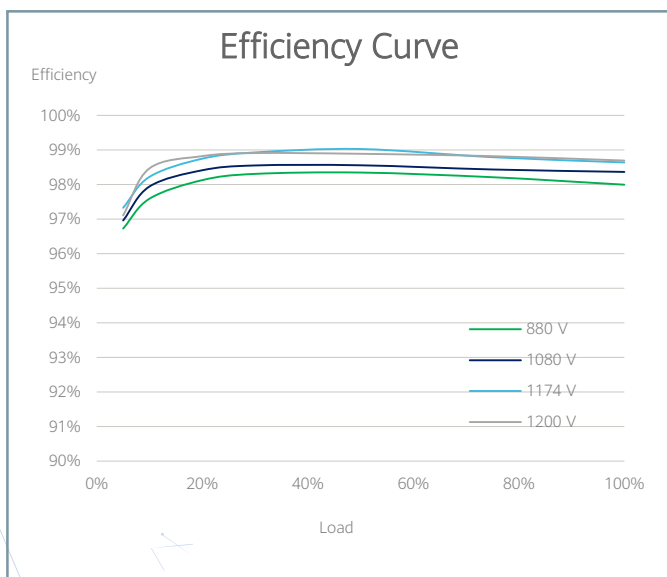
Fuse Free  
Design



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
Max. AC Apparent Power	185,000 VA
Nominal Output Voltage	800 V, 3W + PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Nominal Output Current	126.3 A @40°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, IEC 62910, P.O. 12.3, RD 1699, RD 661, RD 413, RD 1565, RD 1663, ABNT NBR 16149, ABNT NBR 16150, ABNT NBR IEC 62116

# SUN2000-100KTL-M1

## Smart String Inverter



10  
MPP Trackers



98.8% (@480V)  
Max. Efficiency



String-level  
Management



Smart I-V Curve  
Diagnosis Supported



MBUS  
Supported



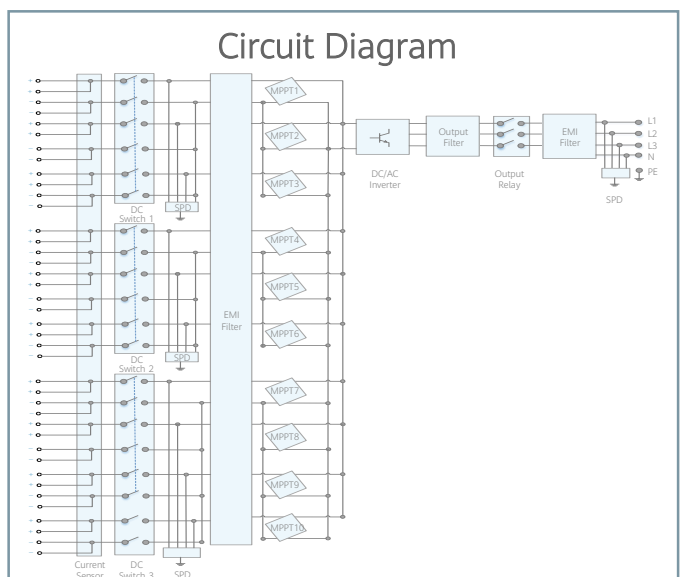
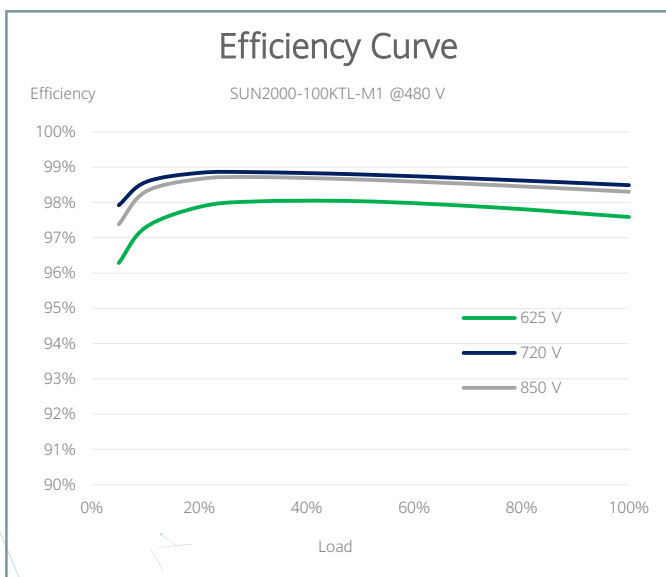
Fuse Free  
Design



AFCI & PID Recovery  
Optional



IP66  
Protection



# Technical Specifications

Efficiency	
Max. Efficiency	98.8% @480 V, 98.6% @380 V / 400 V
European Efficiency	98.6% @480 V, 98.4% @380 V / 400 V
Input	
Max. Input Voltage	1,100 V
Max. Current per MPPT	26 A
Max. Short Circuit Current per MPPT	40 A
Start Voltage	200 V
MPPT Operating Voltage Range	200 V ~ 1,000 V
Nominal Input Voltage	720 V @480 Vac, 600 V @400 Vac, 570 V @380 Vac
Number of Inputs	20
Number of MPP Trackers	10
Output	
Nominal AC Active Power	100,000 W
Max. AC Apparent Power	110,000 VA
Max. AC Active Power (cosφ=1)	110,000 W
Nominal Output Voltage	480 V/ 400 V/ 380 V, 3W+(N)+PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Nominal Output Current	120.3 A @480 V, 144.4 A @400 V, 152.0 A @380 V
Max. Output Current	133.7 A @480 V, 160.4 A @400 V, 168.8 A @380 V
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 Protection <sup>1</sup>	Yes
AC Surge Protection <sup>1</sup>	Yes
DC Insulation Resistance Detection	Yes
Residual Current Monitoring Unit	Yes
PID Recovery	Optional
Arc Fault Protection	Optional
Communication	
Display	LED Indicators, WLAN + APP
USB	Yes
MBUS	Yes (isolation transformer required)
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)	90 kg (198.4 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
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 61727, IEC 60068, IEC 61683

1- Compatible Type II protection class according to IEC / EN 61643-11

# SUN2000-60KTL-M0

## Smart String Inverter



6  
MPP Trackers



98.9% (@480V)  
Max. Efficiency



String-level  
Management



Smart I-V Curve  
Diagnosis Supported



Residual Current  
Monitoring Integrated



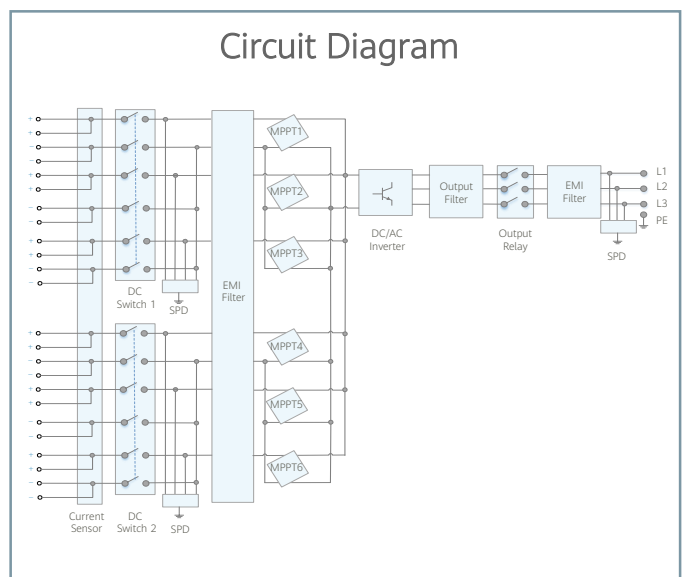
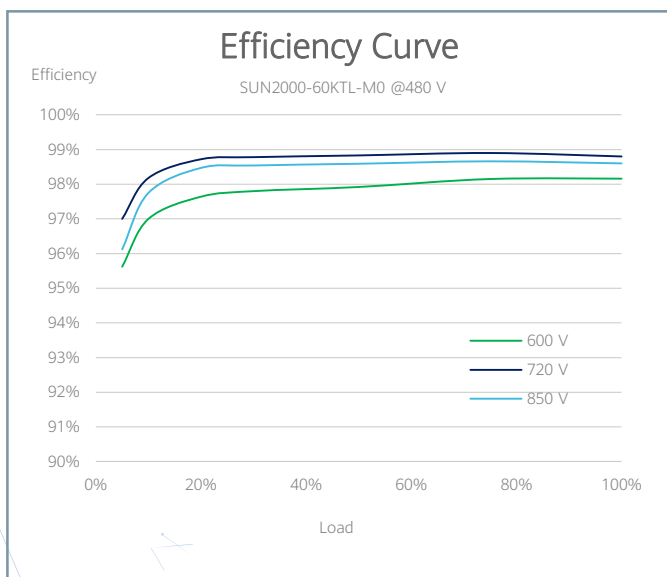
Fuse Free  
Design



Surge Arresters for  
DC & AC



IP65  
Protection





# Technical Specifications

Efficiency	
Max. Efficiency	98.9% @480 V, 98.7% @380 V / 400 V
European Efficiency	98.7% @480 V, 98.5% @380 V / 400 V
Input	
Max. Input Voltage	1,100 V
Max. Current per MPPT	22 A
Max. Short Circuit Current per MPPT	30 A
Start Voltage	200 V
MPPT Operating Voltage Range	200 V ~ 1,000 V
Rated Input Voltage	720 V @480 Vac, 600 V @380 Vac / 400 Vac
Number of Inputs	12
Number of MPP Trackers	6
Output	
Rated AC Active Power	60,000 W
Max. AC Apparent Power	66,000 VA
Max. AC Active Power (cosφ=1)	66,000 W
Rated Output Voltage	480 V/ 400 V/ 380 V, 3W+(N)+PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Rated Output Current	72.2 A @480 V, 86.7 A @400 V, 91.2 A @380 V
Max. Output Current	79.4 A @480 V, 95.3 A @400 V, 100 A @380 V
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
RS485	Yes
MBUS	Yes
General	
Dimensions (W x H x D)	1,075 x 555 x 300 mm (42.3 x 21.9 x 11.8 inch)
Weight (with mounting plate)	74 kg (163.1 lb.)
Operating Temperature Range	-25°C ~ 60°C (-13°F ~ 140°F)
Cooling Method	Natural Convection
Max. Operating Altitude	4,000 m (13,123 ft.)
Relative Humidity	0 ~ 100%
DC Connector	Amphenol Helios H4
AC Connector	Waterproof PG Connector + OT Terminal
Protection Degree	IP65
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, ABNT NBR 16149, ABNT NBR 16150, ABNT NBR IEC 62116

# SUN2000-60KTL-M0 (Mexico) Smart String Inverter



6  
MPP Trackers



98.9%  
Max. Efficiency



String-level  
Management



Smart I-V Curve  
Diagnosis Supported



Residual Current  
Monitoring Integrated



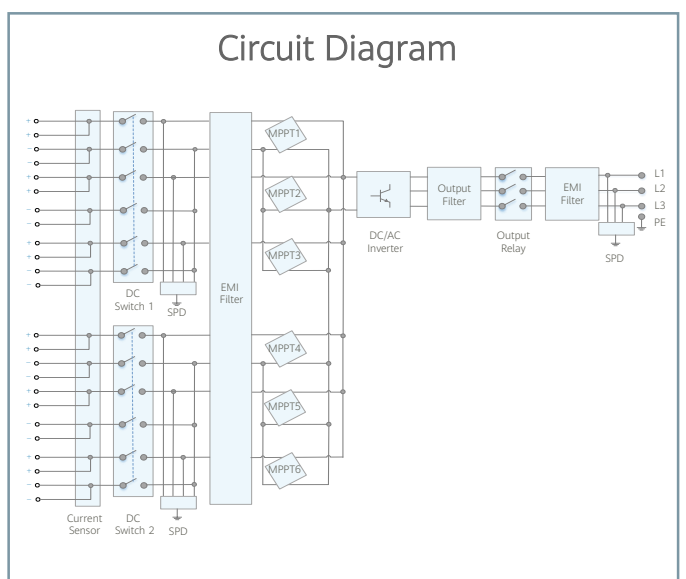
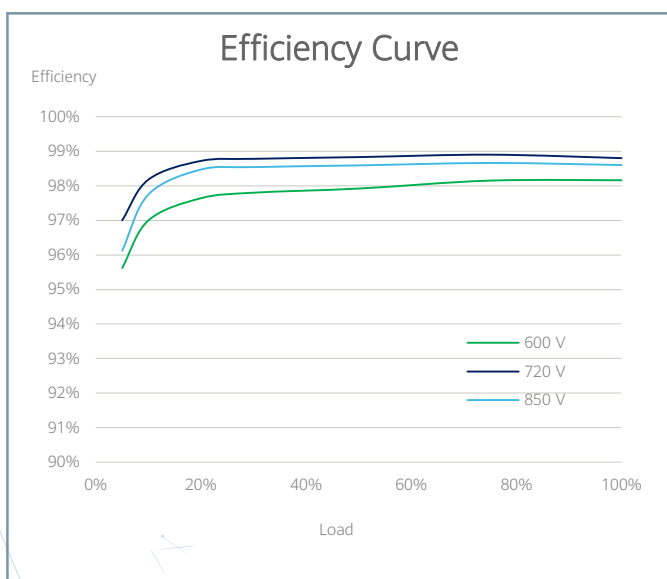
Fuse Free  
Design



Surge Arresters for  
DC & AC



IP65  
Protection



# Technical Specifications

Efficiency	
Max. Efficiency	98.9%
European Efficiency	98.7%
Input	
Max. Input Voltage	1,100 V
Max. Current per MPPT	22 A
Max. Short Circuit Current per MPPT	30 A
Start Voltage	200 V
MPPT Operating Voltage Range	200 V ~ 1,000 V
Rated Input Voltage	720 V
Number of Inputs	12
Number of MPP Trackers	6
Output	
Rated AC Active Power	60,000 W
Max. AC Apparent Power	66,000 VA
Max. AC Active Power (cosφ=1)	66,000 W
Rated Output Voltage	480 V, 3W + PE
Output Voltage Range	384 V ~ 576 V
Rated AC Grid Frequency	50 Hz / 60 Hz
Rated Output Current	72.2 A
Max. Output Current	79.4 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
RS485	Yes
MBUS	Yes
General	
Dimensions (W x H x D)	1,075 x 555 x 300 mm (42.3 x 21.9 x 11.8 inch)
Weight (with mounting plate)	74 kg (163.1 lb.)
Operating Temperature Range	-25°C ~ 60°C (-13°F ~ 140°F)
Cooling Method	Natural Convection
Max. Operating Altitude	4,000 m (13,123 ft.)
Relative Humidity	0 ~ 100%
DC Connector	Amphenol Helios H4
AC Connector	Waterproof PG Connector + OT Terminal
Protection Degree	IP65
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

# 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

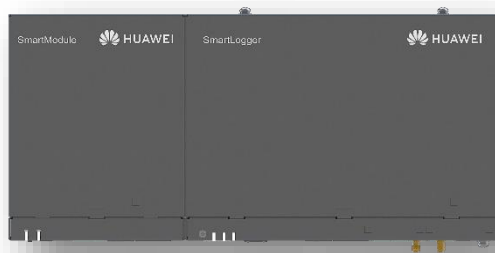
Technical Specifications	SmartACU2000D-D-00	SmartACU2000D-D-02	SmartACU2000D-D-01	SmartACU2000D-D-03
<b>Configuration</b>				
SmartLogger	SmartLogger3000B x 1			
SmartModule1000A	Optional			Standard with SmartModule1000A x 1
RS485	Supported			
Number of MBUS Module <sup>1</sup>	1	2	1	2
Number of SmartPID2000 Module	0	0	1	2
<b>Environment</b>				
Operating Temperature Range	-40°C ~ 60°C (-40°F ~ 140°F)			
Relative Humidity	4% ~ 100%			
Max. Operating Altitude	4,000 m (13,123 ft.)			
<b>Electrical</b>				
AC Input Voltage for Cabinet	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 Hz / 60 Hz			
Power Supply	Standard: 12 V DC, Optional: 24 V DC <sup>2</sup>			
<b>Mechanical</b>				
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
<b>Device Management</b>		
Max. Number of Manageable Devices	200	
Max. Number of Manageable Inverters	150	
<b>Communication Interface</b>		
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)	
<b>Communication Protocol</b>		
Ethernet	Modbus-TCP, IEC 60870-5-104	
RS485	Modbus-RTU, IEC 60870-5-103 (standard), DL / T645	
<b>Interaction</b>		
LED	LED Indicator x 3 - RUN, ALM, 4G	LED Indicator x 5 - RUN, ALM, 4G (Smartlogger3000B) & RUN, ALM (SmarModule1000A)
WEB	Embedded Web	
USB	USB 2.0 x 1	
APP	Communication by WLAN for commissioning	
<b>Environment</b>		
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.)	
<b>Electrical</b>		
Power Adapter	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
<b>Mechanical</b>		
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 SmartACU2000D cabinet to reduce the negative effect of the Potential Induced Degradation (PID), and support 1000 V / 1100 V / 1500 V DC system.



## Smart

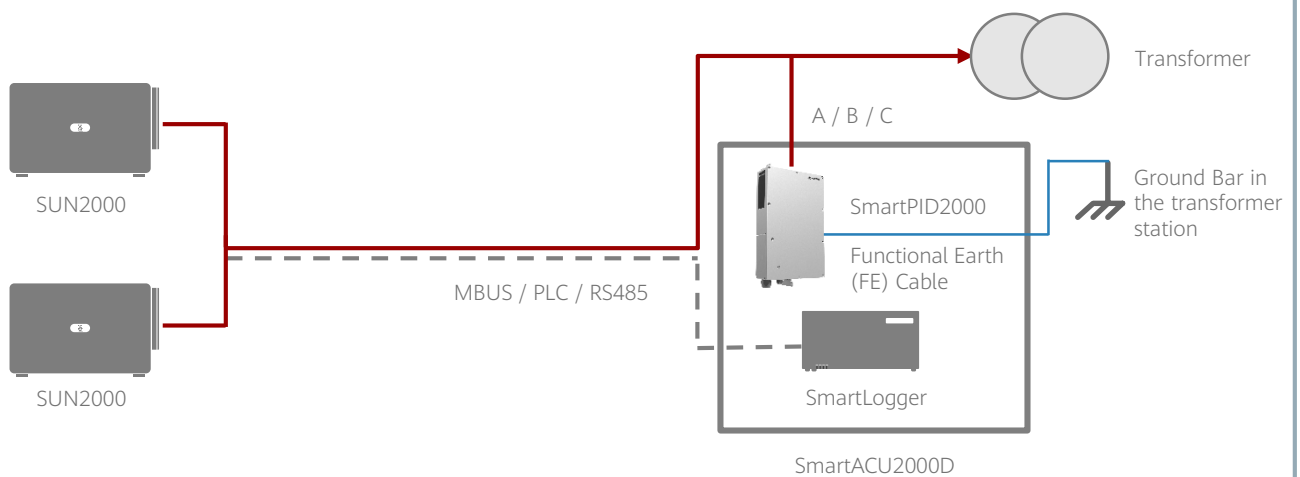
Data read and software upgrade through USB or the embedded Web



## Reliable

Protection degree of IP65

## SmartPID2000 Solution Diagram

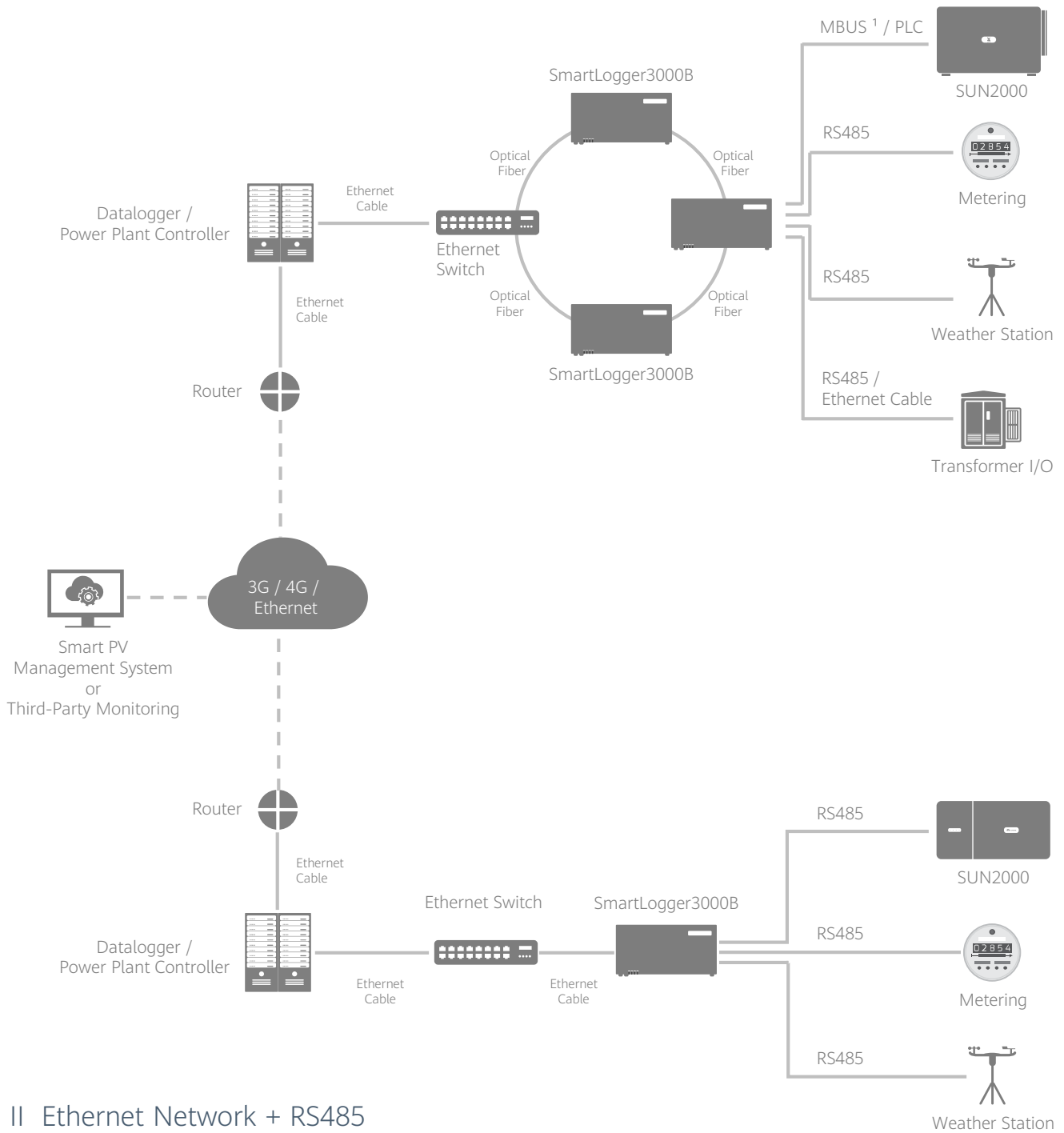


### Note:

- 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



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

# NetEco1000S



**Smart**

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



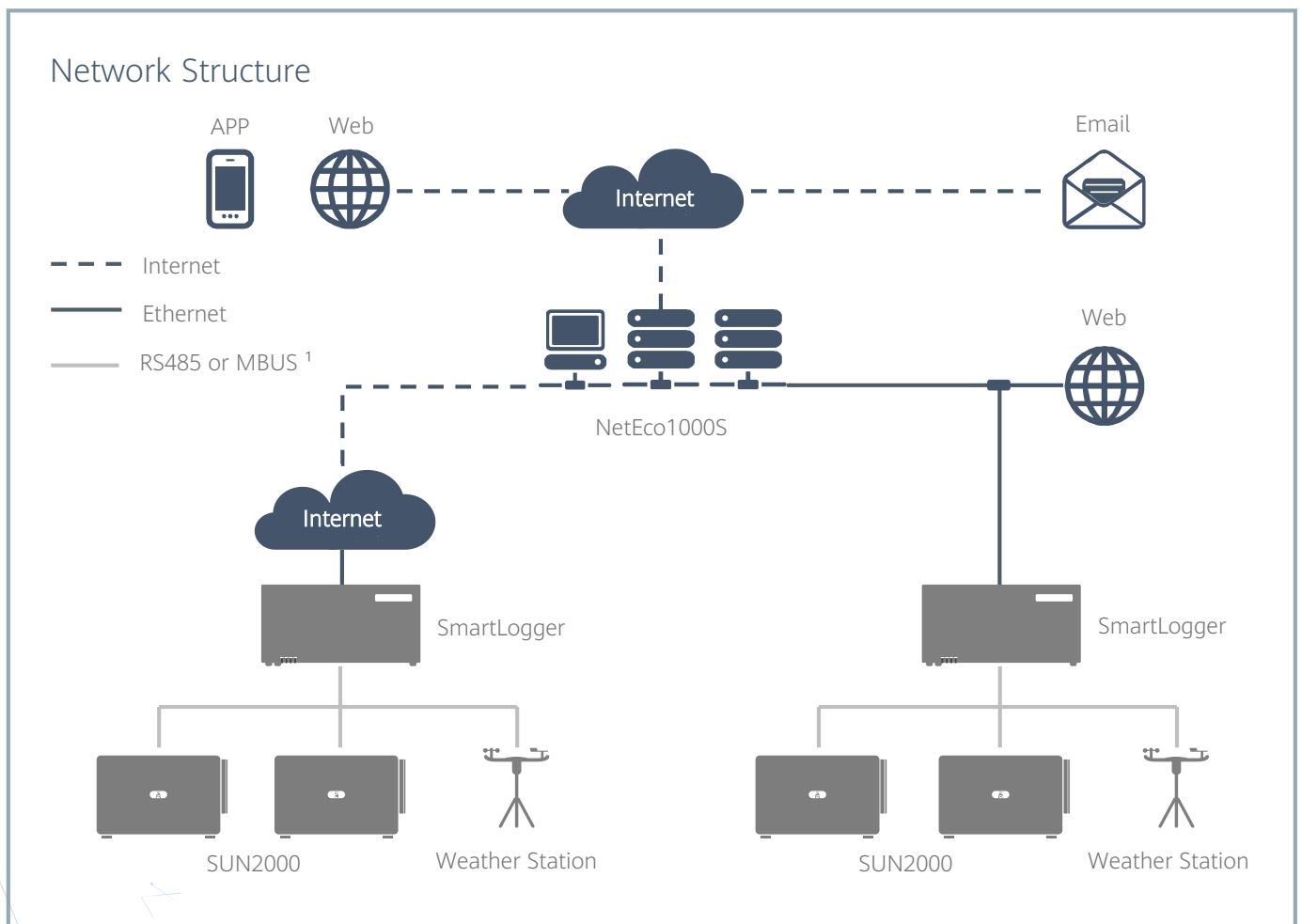
**Simple**

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



**Reliable**

Hierarchical management  
Up to 25 years data storage

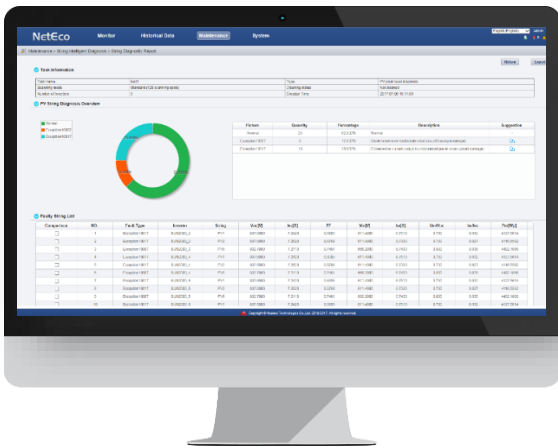


1 - Compatible with communication mode of PLC (Power Line Communication).



# 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

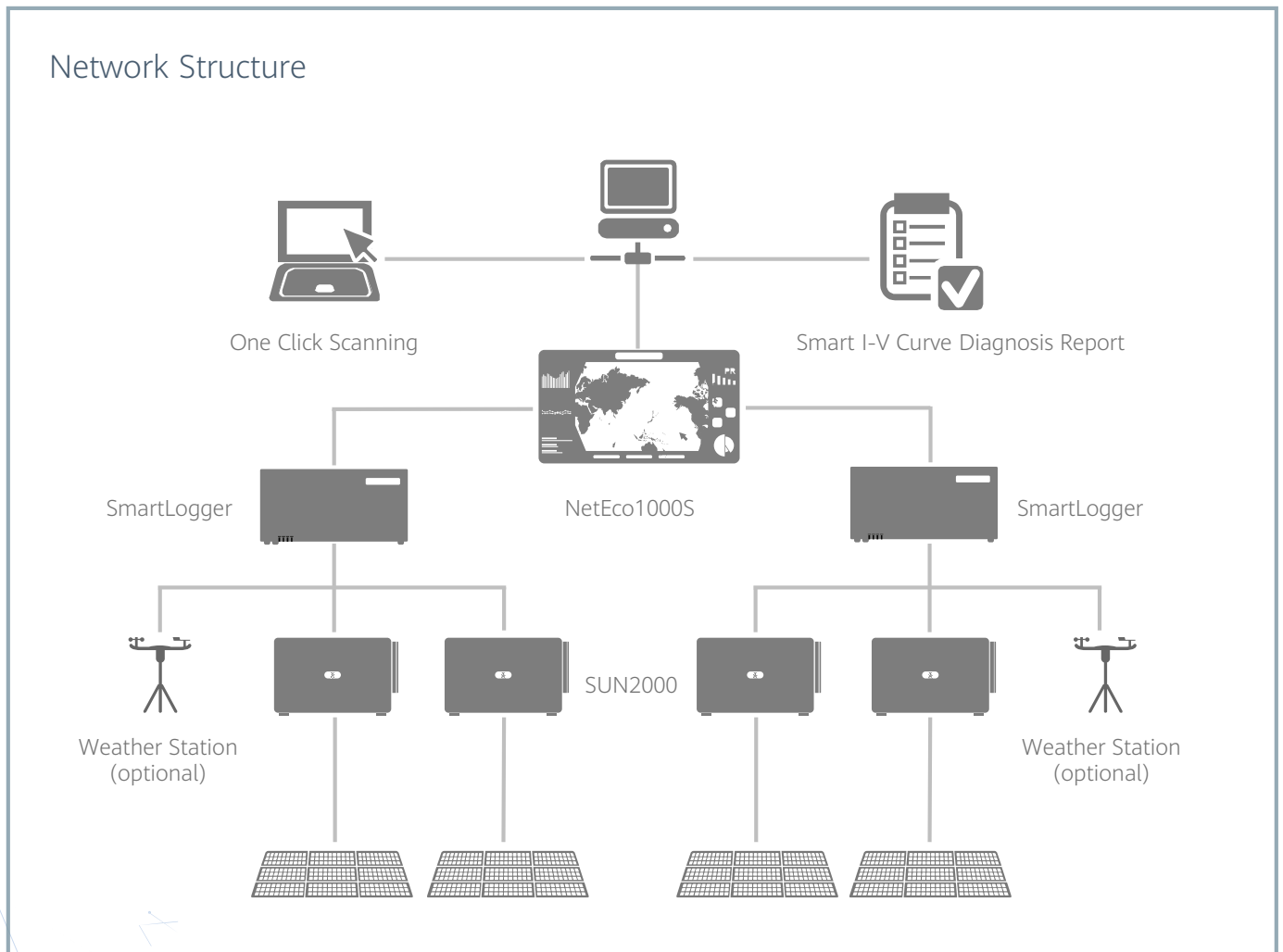


## Efficient

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

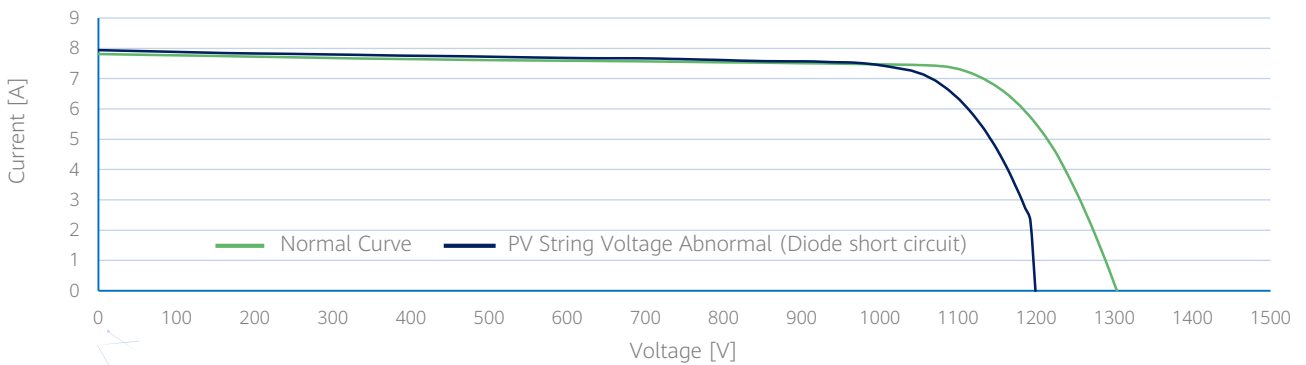
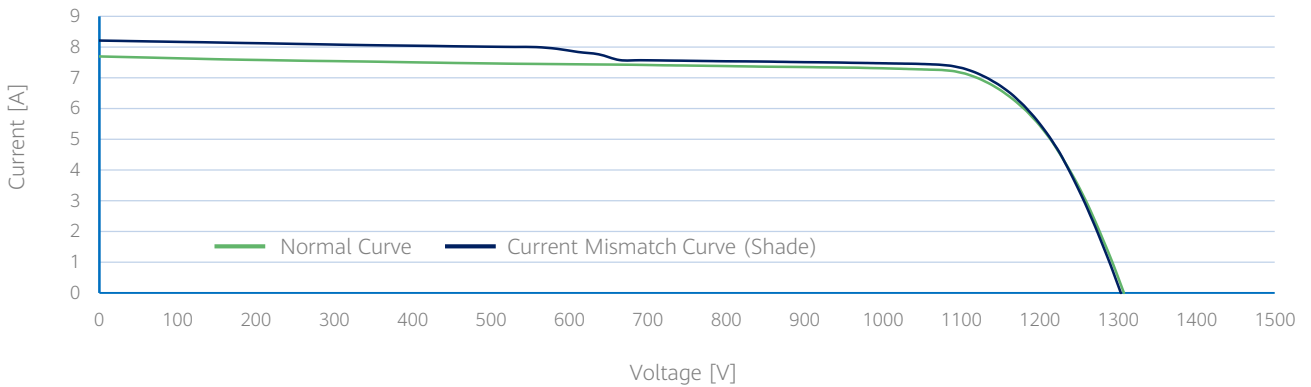
Technical Specifications	
Smart String Inverter	SUN2000-60KTL-M0, SUN2000-105KTL-H1, SUN2000-100KTL-M1, SUN2000-185KTL-H1
Data Logger	SmartLogger2000, SmartLogger3000B
Management System	NetEco1000S
Scanning Time	< 1s per string
Sampling Points per I-V Curve	128
Voltage Accuracy	0.5%rdg. + 1dgt. (rdg.>5, dgt.= 0.3)
Current Accuracy	0.5%rdg. + 2dgt. (rdg.>0.3, dgt.= 0.006)



Smart I-V Curve Diagnosis is TUV Verified

String-level Management	Smart I-V Curve Diagnosis
<p>Real time monitoring</p>	<p>Fault Analysis</p>

## String I-V Curve Comparison



# Smart PV Solution Reference



Tlaxcala, Mexico  
Ground-mounted Smart PV Plant

Capacity  
220 MW

Inverter Model  
SUN2000-100KTL



La Paz, Mexico  
Ground-mounted Smart PV Plant

Capacity  
25 MW

Inverter Model  
SUN2000-45KTL-US-HV



Jalisco, Mexico  
Ground-mounted Smart PV Plant

Capacity  
100 MW

Inverter Model  
SUN2000-60KTL-HV

# Smart PV Solution Reference



Jujuy, Argentina  
Ground-mounted Smart PV Plant

Capacity  
315 MW

Inverter Model  
SUN2000-50KTL



San Juan, Argentina  
Ground-mounted Smart PV Plant

Capacity  
80 MW

Inverter Model  
SUN2000-42KTL



Monte Plata, Dominican Republic  
Ground-mounted Smart PV Plant

Capacity  
66 MW

Inverter Model  
SUN2000-30KTL

# 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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# Smart PV Solution Reference



Santiago, Chile  
Portfolio of PMGD Smart PV Plant

Capacity  
30 MW

Inverter Model  
SUN2000-36KTL



Aulander, NC, USA  
Ground-mounted Smart PV Plant

Capacity  
120 MW

Inverter Model  
SUN2000-45KTL-US-HV



Cuyama, CA, USA  
Ground-mounted Smart PV Plant

Capacity  
43 MW

Inverter Model  
SUN2000-45KTL-US-HV

# 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



Golmud, Qinghai, China  
Ground-mounted Smart PV Plant

Capacity  
590 MW

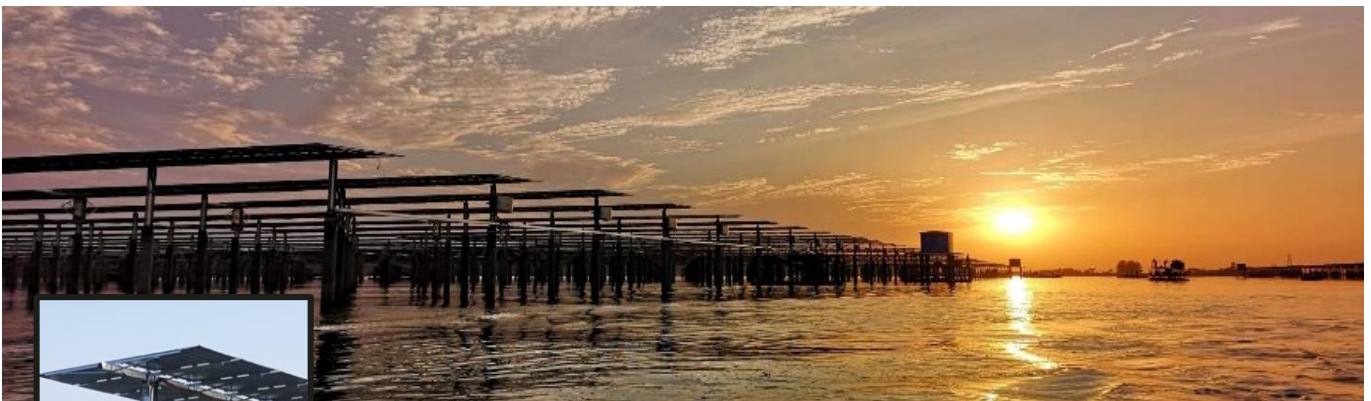
Inverter Model  
SUN2000-20KTL,28KTL,40KTL



Datong, Shanxi, China  
Mountain-mounted Smart PV Plant

Capacity  
100 MW

Inverter Model  
SUN2000-40KTL



Sihong, Jiangsu, China  
Water Surface Smart PV Plant

Capacity  
100 MW

Inverter Model  
SUN2000-100KTL



# Smart PV Solution Reference



©BayWa r.e.

Seville, Spain  
Ground-mounted Smart PV Plant

Capacity  
175 MW

Inverter Model  
SUN2000-100KTL, 60KTL-HV



Karaganda, Kazakhstan  
Ground-mounted Smart PV Plant

Capacity  
40 MW

Inverter Model  
SUN2000-60KTL-HV



Requena, Valencia, Spain  
Ground-mounted Smart PV Plant

Capacity  
12 MW

Inverter Model  
SUN2000-60KTL-HV

# 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



Baicheng, Jilin, China  
Ground-mounted Smart PV Plant

Capacity  
26 MW

Inverter Model  
SUN2000-100KTL

# Smart PV Solution Reference



Pavagada, India  
Ground-mounted Smart PV Plant

Capacity  
300 MW

Inverter Model  
SUN2000-95KTL-INH0



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



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