

Bijlage 12.c

Omvormer

Sinnefjild Leeuwarderstraatweg

De omvormers worden op dit zonnepark gemonteerd aan de onderconstructie van de zonnepanelen. De kleur van een omvormer is wit of (licht)grijs. De initiatiefnemer maakt gebruik van omvormers die geschikt zijn voor grondgebonden zonneparken. Op de volgende pagina's ziet u voorbeelden van omvormers van verschillende fabrikanten. Deze typen omvormers zouden technisch gezien toegepast kunnen worden. Het uiterlijk en de maatvoering kan wat afwijken; dit is afhankelijk van het type omvormer, de producent en voortschrijdende techniek. Hierbij moet worden opgemerkt dat het gaat om ondergeschikte eigenschappen. Het gaat in beginsel voor niet-deskundigen om nauwelijks waarneembare afwijkingen. De (internationale) markt voor omvormers is volop in ontwikkeling. De keuze voor het type omvormer hangt o.a. af van de beschikbaarheid op de (internationale) markt, de prijs en de technische specificaties. De definitieve keuze kan daarom pas worden gemaakt als de bouw van het zonnepark in zicht is. De fabrikant en het type omvormer worden ruim voor de start van de bouwwerkzaamheden door initiatiefnemer aangeleverd bij het bevoegd gezag.

Productbladen voorbeelden omvormers:

Aangehecht op de volgende pagina's.

Referentiebeeld:



Figuur 1 Voorbeeld omvormer op een ander zonnepark

SUN2000-185KTL-H1

Smart String Inverter



**9
MPP Trackers**



**99.0%
Max. Efficiency**



**String-level
Management**



**Smart I-V Curve
Diagnosis Supported**



**MBUS
Supported**



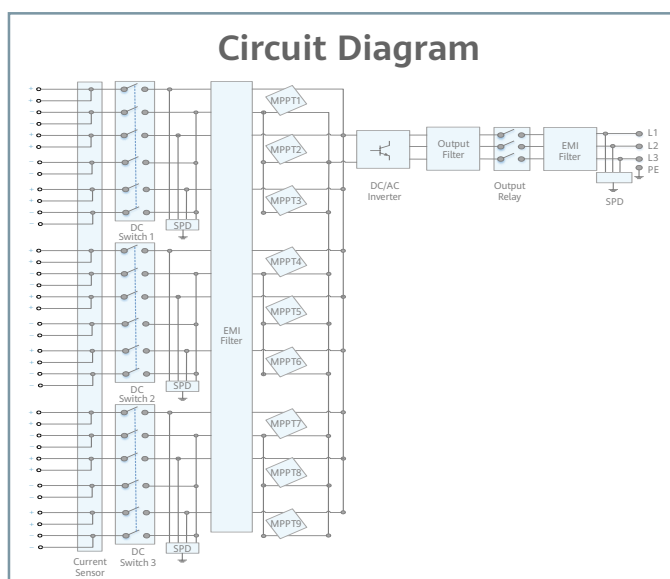
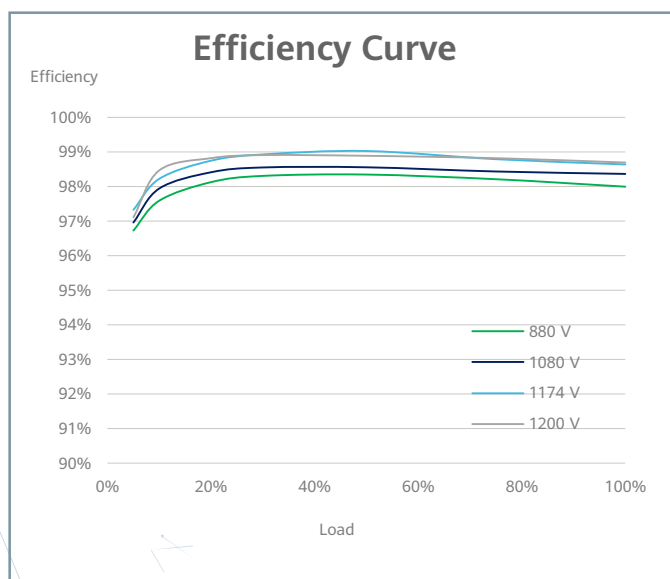
**Fuse Free
Design**



**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, 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, P.O. 12.3, RD 1699, RD 661, RD 413, RD 1565, RD 1663, UNE 206007-1, UNE 206006

Reduced LCOE for large PV power plants

- ✓ Lower project LCOE
- ✓ All-in-One components solution
- ✓ Highest safety standards & grid support
- ✓ Vertically integrated technical support

An ideal choice for large utility-scale, ground mounted PV plants, the UT inverter was designed to support PV investments, facilitate bankability and increase project lifetime. By maximizing energy yield and ensuring continuous high performance even under extreme environmental conditions, it delivers the best value for money. Combined with the GoodWe Solar Communication Unit SCU3000A, the UT inverter provides reliable remote monitoring and control via High-speed Power Line Communication (HPLC).

-  Full-load operation at 40°C
-  Two strings per MPPT
-  Flexible DC and AC cabling options



Technical Data	GW320K-UT	GW320KH-UT	GW350K-UT	GW350KH-UT
Input				
Max. Input Voltage (V)		1500		
MPPT Operating Voltage Range (V)		480 ~ 1500		
Start-up Voltage (V)		500		
Nominal Input Voltage (V)		1160		
Max. Input Current per MPPT (A)	30	40	30	40
Max. Short Circuit Current per MPPT (A)	50	60	50	60
Number of MPP Trackers	15	12	15	12
Number of Strings per MPPT		2		
Output				
Nominal Output Power (kW)	320	320	352	352
Nominal Output Apparent Power (kVA)	320	320	352	352
Max. AC Active Power (kW)	352	352	352	352
Max. AC Apparent Power (kVA)	352	352	352	352
Nominal Output Voltage (V)		800, 3L / PE		
Output Voltage Range (V)		640 ~ 920		
Nominal AC Grid Frequency (Hz)		50 / 60		
AC Grid Frequency Range (Hz)		45 ~ 55 / 55 ~ 65		
Max. Output Current (A)		254		
Power Factor		~1 (Adjustable from 0.8 leading to 0.8 lagging)		
Max. Total Harmonic Distortion		<3%		
Efficiency				
Max. Efficiency		99.01%		
European Efficiency		98.80%		
Protection				
PV String Current Monitoring		Integrated		
Internal Humidity Monitoring		Integrated		
PV Insulation Resistance Detection		Integrated		
Residual Current Monitoring		Integrated		
PV Reverse Polarity Protection		Integrated		
Anti-islanding Protection		Integrated		
AC Overcurrent Protection		Integrated		
AC Short Circuit Protection		Integrated		
AC Overvoltage Protection		Integrated		
DC Switch		Integrated		
DC Surge Protection		Type II		
AC Surge Protection		Type II		
AFCI		Optional		
Anti-PID		Integrated		
PID Recovery		Integrated		
Reactive Power Compensation at Night		Integrated		
Power Supply at Night		Integrated		
I-V Curve Scan		Optional		
General Data				
Operating Temperature Range (°C)		-35 ~ +60		
Relative Humidity		0 ~ 100%		
Max. Operating Altitude (m)		5000 (>4000 derating)		
Cooling Method		Smart Fan Cooling		
User Interface		LED, LCD (Optional), WLAN + APP		
Communication		RS485 or HPLC		
Communication Protocols		Modbus RTU		
Weight (kg)		124.0		
Dimension (W x H x D mm)		1120 x 810 x 368		
Topology		Non-isolated		
Self-consumption at Night (W)		<3		
Ingress Protection Rating		IP66		
DC Connector ^{*1}		MC4 (4 ~ 10mm ²)		
AC Connector		OT / DT terminal (Max. 400mm ²)		

^{*1}: DC-strings connectors supplied by GoodWe 4-6mm²; 10mm² must be purchased separately.

*: Please visit GoodWe website for the latest certificates.



/ SHP 100-21 / SHP 150-21 / SHP 172-21 / SHP 180-21



Sunny Highpower PEAK3

Customized for tomorrow today

25 YEAR
DESIGN LIFE



Efficient

- High power density with 180 kW thanks to its compact structure
- Max. yield due to possible DC/AC ratio of up to 200%
- No derating up to 50°C

Reliable

- Superior PV system availability with 180 kW units
- Innovative digital features aligned with the energy management platform ennexOS

Flexible

- For DC input voltages up to 1500 V
- Flexible DC solutions with customer-specific PV array junction boxes

Easy to install

- Ergonomic handling and simple connection for quick installation
- Centralized commissioning and control of the PV power plant via SMA Data Manager

The Sunny Highpower PEAK3 is the central component of the SMA solution for PV power plants with a decentralized architecture and system voltages of 1500 V DC.

This compact string inverter enables cost-optimized solutions for industrial PV applications thanks to its high power density. It also provides a simple way of transport and allows for quick installation and commissioning. This string inverter with 180 kW of power is equipped with the automatic SMA Smart Connected service for proactive servicing that facilitates operation and maintenance and reduces service costs throughout the entire project lifetime.

Technical Data	Sunny Highpower 100-21	Sunny Highpower 150-21
Input (DC)		
Max. PV array power	200 kWp	300 kWp
Max. input voltage	1100 V	1500 V
MPP voltage range / rated input voltage	590 V to 1000 V / 590 V	880 V to 1450 V / 880 V
Min. DC voltage / start voltage	570 V / 625 V	855 V / 940 V
Max. usable input current / max. short-circuit current	180 A / 325 A	
Number of independent MPP trackers	1	
Number of inputs	1 or 2 (optional) for external PV array junction boxes	
Output (AC)		
Rated power at nominal voltage	100 kW	150 kW
Max. apparent power	100 kVA	150 kVA
Nominal AC voltage / AC voltage range	400 V / 177 V to 477 V	600 V / 480 V to 690 V
AC grid frequency / range	50 Hz / 44 Hz to 55 Hz 60 Hz / 54 Hz to 66 Hz	
Rated grid frequency	50 Hz	
Max. output current	151 A	
Power factor at rated power / displacement power factor adjustable	1 / 0 overexcited to 0 underexcited	
Harmonic (THD)	< 0.5%	
Feed-in phases / AC connection	3 / 3-PE	
Efficiency		
Max. efficiency / European efficiency	98.8% / 98.5%	99.1% / 98.8%
Protective devices		
Ground fault monitoring / grid monitoring / DC reverse polarity protection	● / ● / ●	
AC short-circuit current capability / galvanically isolated	● / –	
All-pole-sensitive residual-current monitoring unit	●	
Monitored surge arrester (type II) AC / DC	● / ●	
Protection class (according to IEC 62109-1) / overvoltage category (as per IEC 62109-1)	I / AC: III; DC: II	
General Data		
Dimensions (W / H / D)	770mm / 830 mm / 462 mm (30.3 in / 32.7 in / 18.2 in)	
Weight	99 kg (218 lb)	
Operating temperature range	–25 °C to +60 °C (–13 °F to +140 °F)	
Noise emission (typical)	69 dB(A)	
Self-consumption (at night)	< 5 W	
Topology	transformerless	
Cooling method	OptiCool, active cooling, speed-controlled fan	
Degree of protection (according to IEC 60529)	IP65	
Max. permissible value for relative humidity (non-condensing)	100%	
Features / function / accessories		
DC connection / AC connection	Terminal lug (up to 300 mm²) / Screw terminal (up to 150 mm²)	
LED indicators (Status / Fault / Communication)	●	
Ethernet interface	● (2 ports)	
Data interface: SMA Modbus / SunSpec Modbus / Speedwire	● / ● / ●	
Mounting type	Rack mounting	
OptiTrac / Integrated Plant Control / Q on Demand 24/7	● / ● / ●	
Off-grid capable / SMA Fuel Save Controller compatible	● / ●	
Warranty: 5 / 10 / 15 / 20 / 25 years	● / ○ / ○ / ○ / ○	
Certificates and approvals (pending)	IEC/EN 62109-1/-2, VDE-AR-N 4110/4120, IEC 62116, IEC 61727, EN 50549, C10/11, CEI 0-16, G99/1 (>16A), PO 12.3, ABNT NBR 16149	
Type designation	SHP 100-21	SHP 150-21

● Standard features ○ Optional features – Not available Data at nominal conditions Status: 03/2023

Technical Data	Sunny Highpower 172-21	Sunny Highpower 180-21
Input (DC)		
Max. PV array power	344 kWp	360 kWp
Max. input voltage	1500 V	1500 V
MPP voltage range / rated input voltage	968 V bis 1450 V / 968 V	1012 V bis 1450 V / 1012 V
Min. DC voltage / start voltage	939 V / 1032 V	982 V / 1079 V
Max. usable input current / max. short-circuit current	180 A / 325 A	
Number of independent MPP trackers	1	
Number of inputs	1 or 2 (optional) for external PV array junction boxes	
Output (AC)		
Rated power at nominal voltage	172 kW	180 kW
Max. apparent power	172 kVA	180 kVA
Nominal AC voltage / AC voltage range	660 V / 528 V to 759 V	690 V / 552 V to 793 V
AC grid frequency / range	50 Hz / 44 Hz to 55 Hz 60 Hz / 54 Hz to 66 Hz	
Rated grid frequency	50 Hz	
Max. output current	151 A	
Power factor at rated power / displacement power factor adjustable	1 / 0 overexcited to 0 underexcited	
Harmonic (THD)	< 0.5%	
Feed-in phases / AC connection	3 / 3-PE	
Efficiency		
Max. efficiency / European efficiency	99.2% / 98.9%	99.2% / 98.9%
Protective devices		
Ground fault monitoring / grid monitoring / DC reverse polarity protection	● / ● / ●	
AC short-circuit current capability / galvanically isolated	● / –	
All-pole-sensitive residual-current monitoring unit	●	
Monitored surge arrester (type II) AC / DC	● / ●	
Protection class (according to IEC 62109-1) / overvoltage category (as per IEC 62109-1)	I / AC: III; DC: II	
General Data		
Dimensions (W / H / D)	770mm / 830 mm / 462 mm (30.3 in / 32.7 in / 18.2 in)	
Weight	99 kg (218 lb)	
Operating temperature range	–25°C to +60°C (–13°F to +140°F)	
Noise emission (typical)	69 dB(A)	
Self-consumption (at night)	< 5 W	
Topology	transformerless	
Cooling method	OptiCool, active cooling, speed-controlled fan	
Degree of protection (according to IEC 60529)	IP65	
Max. permissible value for relative humidity (non-condensing)	100%	
Features / function / accessories		
DC connection / AC connection	Terminal lug (up to 300 mm²) / Screw terminal (up to 150 mm²)	
LED indicators (Status / Fault / Communication)	●	
Ethernet interface	● (2 ports)	
Data interface: SMA Modbus / SunSpec Modbus / Speedwire	● / ● / ●	
Mounting type	Rack mounting	
OptiTrac / Integrated Plant Control / Q on Demand 24/7	● / ● / ●	
Off-grid capable / SMA Fuel Save Controller compatible	● / ●	
Warranty: 5 / 10 / 15 / 20 / 25 years	● / ○ / ○ / ○ / ○	
Certificates and approvals (pending)	IEC/EN 62109-1/-2, VDE-AR-N 4110/4120, IEC 62116, IEC 61727, EN 50549, C10/11, CEI 0-16, G99/1 (>16A), PO 12.3, ABNT NBR 16149	
Type designation	SHP 172-21	SHP 180-21

● Standard features ○ Optional features – Not available Data at nominal conditions Status: 03/2023

