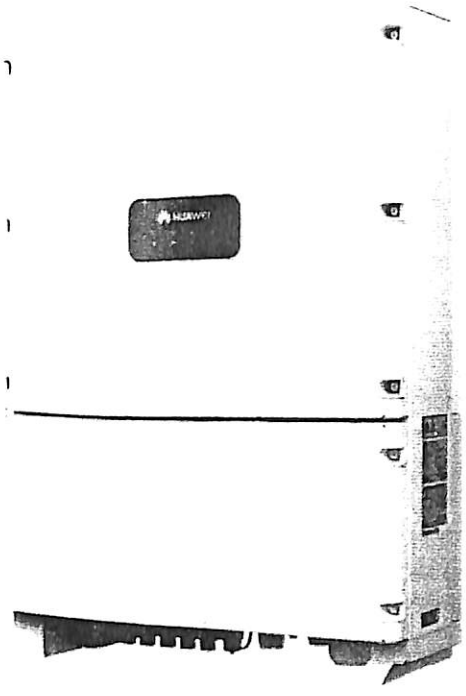
# ภาคผนวก

# String Inverter (SUN2000-25KTL-US)



## Smart

- 6 strings intelligent monitoring and 80% time saving for fault detection
- Real-time operation monitoring
- Adaptive Edge MPPT for fast tracking

## Efficient

- Max. efficiency 98.6%, CEC efficiency 98.0%
- Saving AC cable investment up to 20% without N-Line

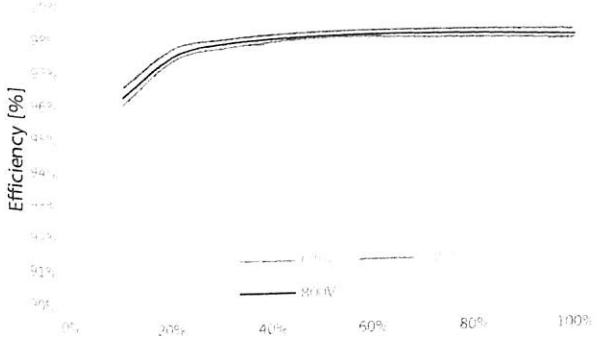
## Safe

- DC AFCI compliant to UL 1699B
- DC disconnect Integrated, safe and convenient for maintenance
- Ground fault protection
- Category C surge arresters for both DC and AC

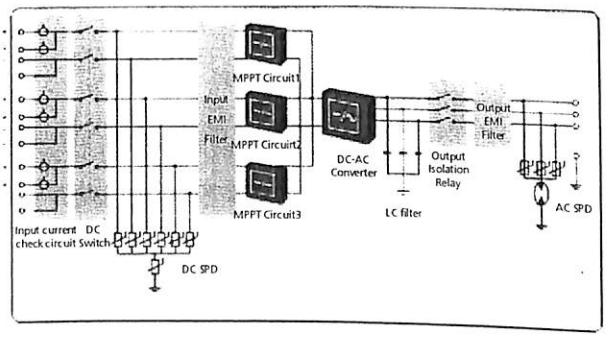
## Reliable

- No need for external fans with natural cooling technology
- Outdoor application of NEMA 4X

### Efficiency Curve




### Circuit Diagram




SUN2000-25KTL-US

HUAWEI TECHNOLOGIES USA Inc.
5700 Tennyson PKWY, Plano, Tx 75024
Tel.: 214-919-6000
TAC Line: 1-877.4HUAWEI (1-877-448-2934) (7*24)
www.huawei.com/us

Inverter@Huawei.com

# String Inverter (SUN2000-25KTL-US)

| Technical Specifications | SUN2000-25KTL-US |
|---|---|
| | **Efficiency** |
| Max. Efficiency | 98.6% |
| CEC Efficiency | 98.0% |
| | **Input** |
| Max. DC Voltage | 1,000 V |
| Max. Current per MPPT | 25A |
| Min. Operating Voltage | 200 V |
| Full Power MPPT Voltage Range | 560 V~850 V |
| MPPT Operating Voltage Range | 200 V~950 V |
| Rated Input Voltage | 730 V |
| Max. Number of Inputs | 6 |
| Number of MPP Trackers | 3 |
| | **Output** |
| Rated AC Power | 25,000 W |
| Max. AC Apparent Power | 27,500 VA |
| Max. AC Active Power (cosϕ=1) | 25,000 W |
| Rated Output Voltage | 277V/480V, 3W+PE/3W+N+PE |
| Rated AC Grid Frequency | 60 Hz |
| Max. Output Current | 33 A |
| Adjustable Power Factor | 0.8 LG ... 0.8 LD |
| Max. Total Harmonic Distortion | < 3% |
| | **Protection** |
| DC AFCI Compliant to UL 1699B | Yes |
| Input-side Disconnection Device | Yes |
| Anti-Islanding Protection | Yes |
| AC Overcurrent Protection | Yes |
| DC Overcurrent Protection | Fuseless |
| DC Reverse-Polarity Protection | Yes |
| PV-array String Fault Monitoring | Yes |
| DC Surge Arrester | Category C |
| AC Surge Arrester | Category C |
| Insulation Monitoring | Yes |
| Residual Current Detection | Yes |
| | **Communication** |
| RS485 | Yes |
| USB | Yes |
| | **General** |
| Dimensions ( W×H×D ) | 550×770×270 mm (21.7×30.3×10.6 inch) |
| Weight | 55 kg (121 lb) |
| Operation Temperature Range | -25 °C ~ 60 °C (-13°F - 140°F) |
| Cooling | Natural Convection |
| Operating Altitude | 4,000 m (13,123 ft) |
| Relative Humidity | 0~100% |
| DC Connector | Amphenol H4 |
| AC Connector | Waterproof PG Terminal + OT Connector |
| Protection Rating | NEMA 4X |
| Internal Consumption at Night | < 1 W |
| Topology | Transformerless |
| Noise Emission (Typical) | <33 dB |
| | **Standards Compliance** |
| Safety/EMC | UL 1741, UL 1699B, UL 1998, IEEE 1547, CSA C22.2 #107.1-01, FCC Part 15 |
| Grid Code | IEEE 1547, IEEE 1547.1 |

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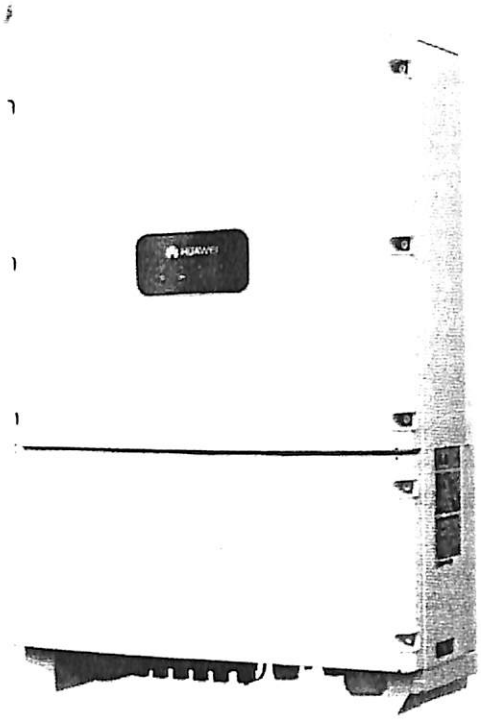
# String Inverter (SUN2000-30KTL-US)



## Smart

- 6 strings intelligent monitoring and 80% time saving for fault detection
- Real-time operation monitoring
- Adaptive Edge MPPT for fast tracking

## Efficient

- Max. efficiency 98.6%, CEC efficiency 98.0%
- Saving AC cable investment up to 20% without N-Line

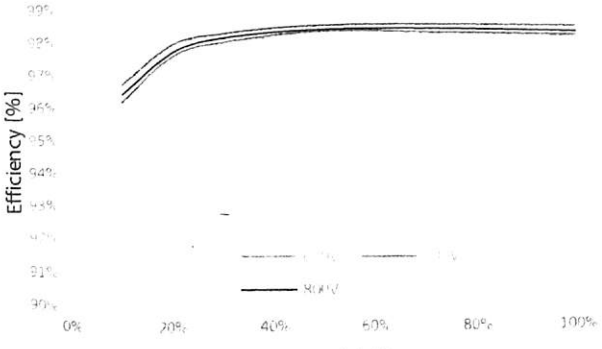
## Safe

- DC AFCI compliant to UL 1699B
- DC disconnect Integrated, safe and convenient for maintenance
- Ground fault protection
- Category C surge arresters for both DC and AC

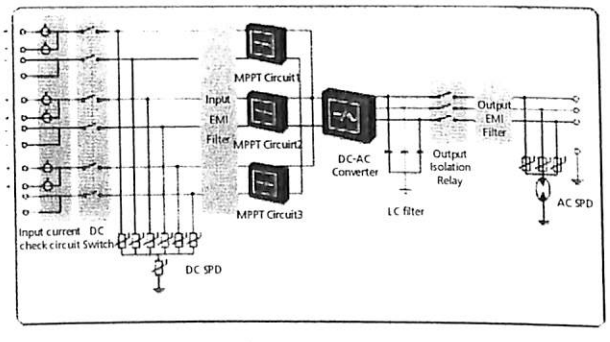
## Reliable

- No need for external fans with natural cooling technology
- Outdoor application of NEMA 4X

### Efficiency Curve




### Circuit Diagram




SUN2000-30KTL-US

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# String Inverter (SUN2000-30KTL-US)

| Technical Specifications | SUN2000-30KTL-US |
|---|---|
| | **Efficiency** |
| Max. Efficiency | 98.6% |
| CEC Efficiency | 98.0% |
| | **Input** |
| Max. DC Voltage | 1,000 V |
| Max. Current per MPPT | 25A |
| Min. Operating Voltage | 200 V |
| Full Power MPPT Voltage Range | 560 V~850 V |
| MPPT Operating Voltage Range | 200 V~950 V |
| Rated Input Voltage | 730 V |
| Max. Number of Inputs | 6 |
| Number of MPP Trackers | 3 |
| | **Output** |
| Rated AC Power | 30,000 W |
| Max. AC Apparent Power | 33,000 VA |
| Max. AC Active Power (cosϕ=1) | 30,000 W |
| Rated Output Voltage | 277V/480V, 3W+PE/3W+N+PE |
| Rated AC Grid Frequency | 60 Hz |
| Max. Output Current | 40 A |
| Adjustable Power Factor | 0.8 LG ... 0.8 LD |
| Max. Total Harmonic Distortion | < 3% |
| | **Protection** |
| DC AFCI Compliant to UL 1699B | Yes |
| Input-side Disconnection Device | Yes |
| Anti-Islanding Protection | Yes |
| AC Overcurrent Protection | Yes |
| DC Overcurrent Protection | Fuseless |
| DC Reverse-Polarity Protection | Yes |
| PV-array String Fault Monitoring | Yes |
| DC Surge Arrester | Category C |
| AC Surge Arrester | Category C |
| Insulation Monitoring | Yes |
| Residual Current Detection | Yes |
| | **Communication** |
| RS485 | Yes |
| USB | Yes |
| | **General** |
| Dimensions ( W×H×D ) | 550×770×270 mm (21.7×30.3×10.6 inch) |
| Weight | 55 kg (121 lb) |
| Operation Temperature Range | -25 °C ~ 60 °C (-13°F - 140°F) |
| Cooling | Natural Convection |
| Operating Altitude | 4,000 m (13,123 ft) |
| Relative Humidity | 0~100% |
| DC Connector | Amphenol H4 |
| AC Connector | Waterproof PG Terminal + OT Connector |
| Protection Rating | NEMA 4X |
| Internal Consumption at Night | < 1 W |
| Topology | Transformerless |
| Noise Emission (Typical) | <33 dB |
| | **Standards Compliance** |
| Safety/EMC | UL 1741, UL 1699B, UL 1998, IEEE 1547, CSA C22.2 #107.1-01, FCC Part 15 |
| Grid Code | IEEE 1547, IEEE 1547.1 |

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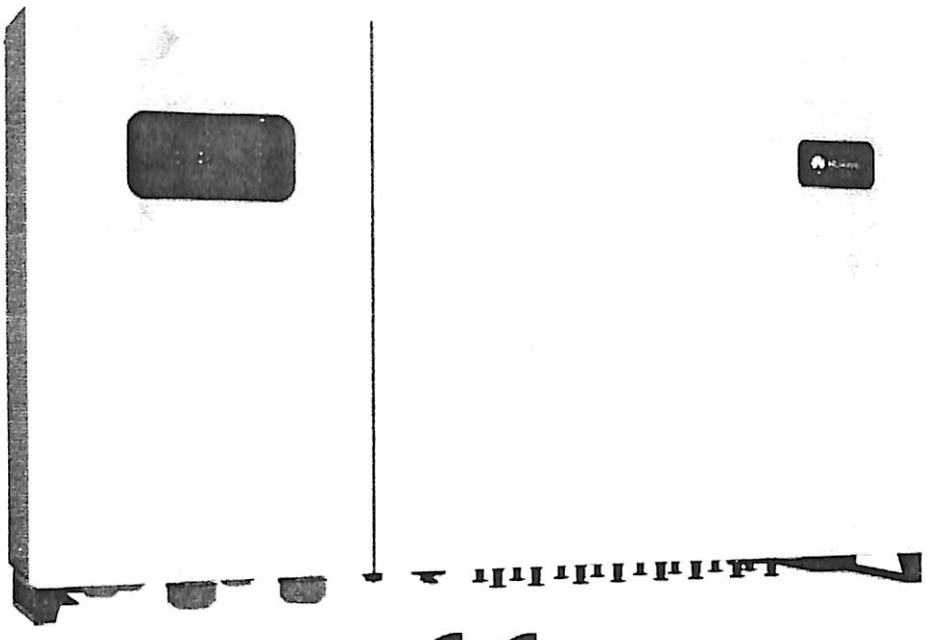
# String Inverter (SUN2000-36KTL)



## Smart

- 4 MPPTs for versatile adaptions to different layouts
- 8 strings intelligent monitoring and 80% time saved for fault detection
- Power Line Communication (PLC) supported

## Efficient

- Max. efficiency 98.6%, European efficiency 98.3%
- Hand-in-hand design supported for flexible layouts

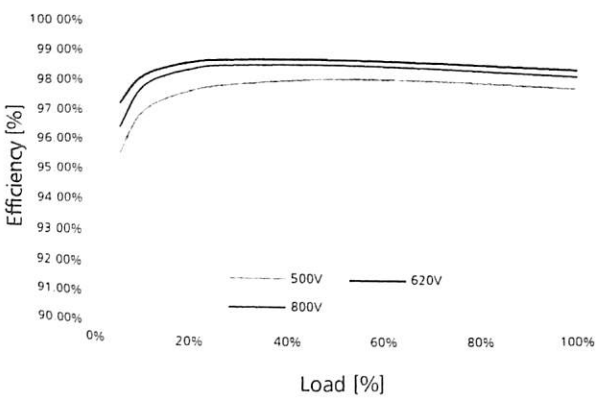
## Safe

- DC disconnect integrated, safe and convenient for maintenance
- Type II surge arresters for both DC and AC
- Ground fault protection
- Residual Current Detection (RCD) protection

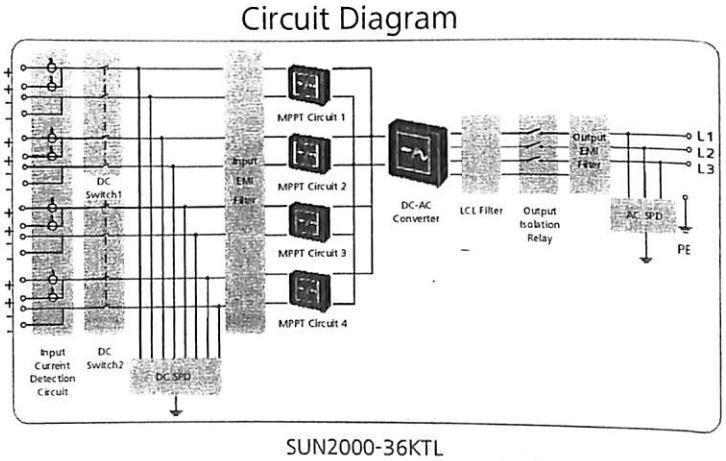
## Reliable

- No need for external fans with natural cooling technology
- Protection rating of IP65

### Efficiency Curve




### Circuit Diagram




SUN2000-36KTL

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# String Inverter (SUN2000-36KTL)

## Technical Specifications

| | SUN2000-36KTL |
|---|---|
| **Efficiency** | |
| Max. Efficiency | 98.6% |
| European Efficiency | 98.3% |
| **Input** | |
| Max. DC Usable Power | 40,800 W |
| Max. Input Voltage | 1,100 V |
| Max. Current per MPPT | 22 A |
| Max. Short Circuit Current per MPPT | 30 A |
| Min. Operating Voltage / Start Input Voltage | 200 V / 250 V |
| Full Power MPPT Voltage Range | 480 V ~ 850 V |
| MPPT Operating Voltage Range | 200 V ~ 1000 V |
| Rated Input Voltage | 620 V |
| Max. Number of Inputs | 8 |
| Number of MPP Trackers | 4 |
| **Output** | |
| Rated AC Active Power | 36,000 W |
| Max. AC Apparent Power | 40,000 VA |
| Max. AC Active Power (cosφ=1) | 40,000 W[1] |
| Rated Output Voltage | 220V / 380V, 230V / 400V, 3W+(N)+PE[2] |
| Rated AC Grid Frequency | 50 Hz / 60 Hz |
| Max. Output Current | 57.8 A |
| Adjustable Power Factor | 0.8 LG ... 0.8 LD |
| Max. Total Harmonic Distortion | < 3% |
| **Protection** | |
| Input-side Disconnection Device | Yes |
| Anti-Islanding Protection | Yes |
| DC Reverse-Polarity Protection | Yes |
| PV-array String Fault Monitoring | Yes |
| DC Surge Arrester | Type II |
| AC Surge Arrester | Type II |
| Insulation Monitoring | Yes |
| Residual Current Detection | Yes |
| **Communication** | |
| Display | LED Indicators |
| USB / Bluetooth +APP | Yes |
| RS485 | Yes |
| PLC | Yes |
| Fast Ethernet | Optional |
| **General** | |
| Dimensions ( W×H×D ) | 930 × 550 × 260 mm (36.6 x 21.7 x 10.2 inch) |
| Weight | 55 kg (121 lb.) |
| Operation Temperature Range | -25 °C ~ 60 °C (-13°F ~ 140°F) |
| Cooling | Natural Convection |
| Operating Altitude | 0 ~ 4,000 m (13,123 ft.) |
| Relative Humidity | 4 ~ 100% |
| DC Connector | Amphenol H4 |
| AC Connector | Waterproof PG Terminal + OT Connector |
| Protection Rating | IP65 |
| Internal Consumption at Night | < 1 W |
| Topology | Transformerless |
| **Standards Compliance** | |
| Safety/EMC | EN/IEC 61000-1, EN/IEC 61000-2, EN/IEC 61000-3, EN/IEC 61000-4, EN/IEC 62109-1, EN/IEC 62109-2 |
| Grid Code | VDE-AR-N4105, VDE0126-1-1, BDEW 2008, G59/3, UTE C 15-712-1 |

[1] 36.00W optional in settings
[2] 3W+PE optional in settings for IT network

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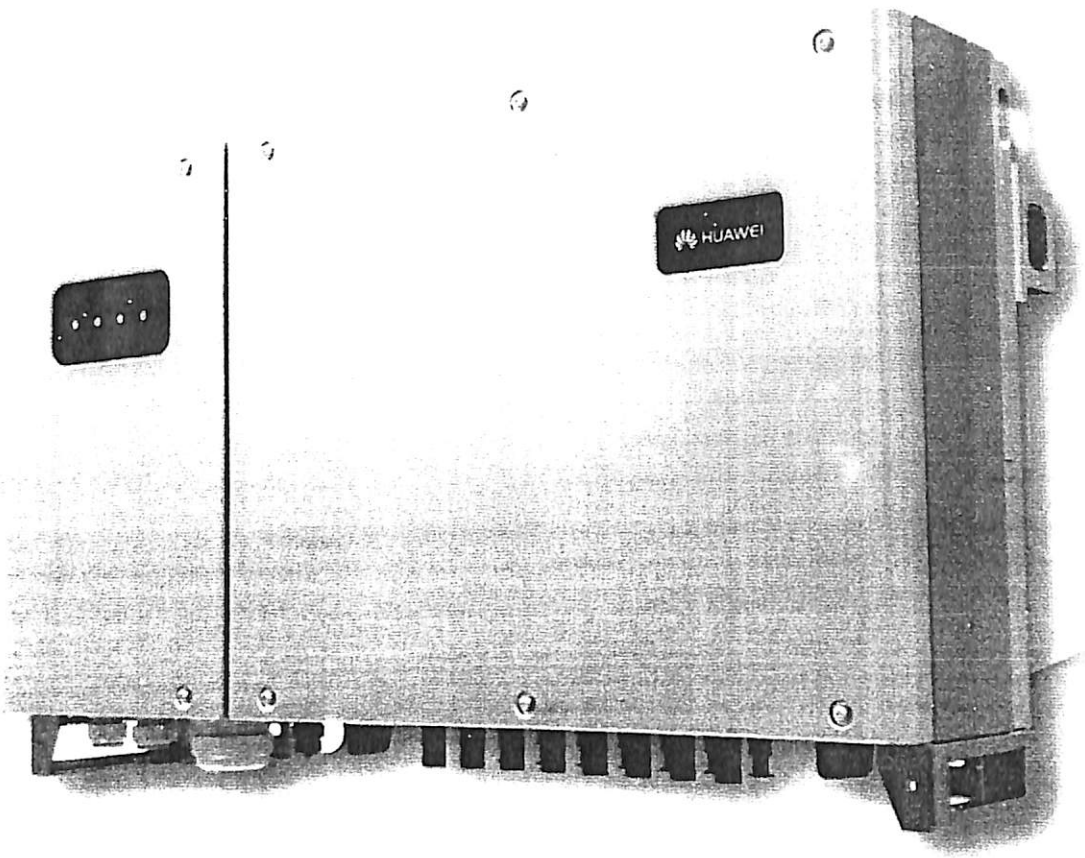
# Smart String Inverter

## SUN2000-33/36/40KTL-US




### Smart

- 8 strings intelligent monitoring and fast trouble-shooting
- Power Line Communication (PLC) supported
- Smart I-V Curve Diagnosis supported

### Efficient

- Max. efficiency 98.9%, CEC. efficiency 98.5%
- 4 MPPTs for versatile adaptions to different layouts

### Safe

- DC AFCI compliant to UL 1699B Type I
- Type II surge arresters for both DC and AC
- Residual Current Monitoring Unit (RCMU) integrated inside
- Fuse free design

### Reliable

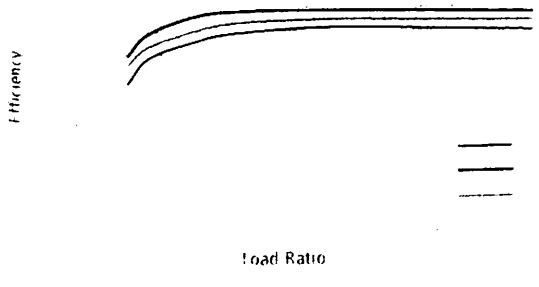
- Natural cooling technology
- Protection rating of NEMA Type 4X

# Smart String Inverter (SUN2000-33/36/40KTL-US)

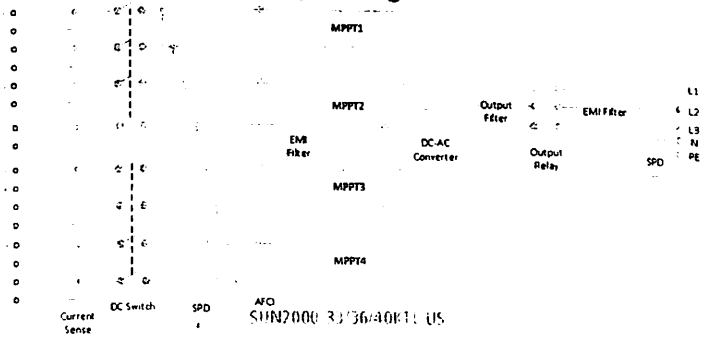
| Technical Specifications | SUN2000-33KTL-US | SUN2000-36KTL-US | SUN2000-40KTL-US |
|---|---|---|---|
| | | Efficiency | |
| Max. Efficiency | 98.9% | 98.9% | 98.9% |
| CEC. Efficiency | 98.5% | 98.5% | 98.5% |
| | | Input | |
| Max. Input Voltage | 1,000 V | 1,000 V | 1,000 V |
| Max. Current per MPPT | 22 A | 22 A | 22 A |
| Max. Short Circuit Current per MPPT | 30 A | 30 A | 30 A |
| Start Voltage | 250 V | 250 V | 250 V |
| MPPT Operating Voltage Range | 200 V ~ 1,000 V | 200 V ~ 1,000 V | 200 V ~ 1,000 V |
| Max. Number of Inputs | 8 | 8 | 8 |
| Number of MPP Trackers | 4 | 4 | 4 |
| | | Output | |
| Rated AC Active Power | 33,300 W | 36,000 W | 40,000 W |
| Max. AC Apparent Power | 36,600 VA | 40,000 VA | 44,000 VA |
| Max. AC Active Power (cosφ=1) | 36,600 W | 40,000 W | 44,000 W |
| Rated Output Voltage | 277 V/480 V, 3W+PE / 3W+N+PE | 277 V/480 V, 3W+PE / 3W+N+PE | 277 V/480 V, 3W+PE / 3W+N+PE |
| Rated AC Grid Frequency | 60 Hz | 60 Hz | 60 Hz |
| Rated Output Current | 40.1 A | 43.4 A | 48.2 A |
| Max. Output Current | 44.1 A | 48.2 A | 53 A |
| Adjustable Power Factor | 0.8 LG ... 0.8 LD | 0.8 LG ... 0.8 LD | 0.8 LG ... 0.8 LD |
| Max. Total Harmonic Distortion | < 3% | < 3% | < 3% |
| | | Protection | |
| DC Arc Fault Circuit Interrupter | | Yes, compliant to UL 1699B Type I | |
| Input-side Disconnection Device | | Yes | |
| Anti-islanding Protection | | Yes | |
| DC Reverse-polarity Protection | | Yes | |
| AC Overcurrent Protection | | Yes | |
| PV-array String Fault Monitoring | | Yes | |
| DC Surge Arrester | | Type II | |
| AC Surge Arrester | | Type II | |
| DC Insulation Detection | | Yes | |
| Residual Current Monitoring Unit | | Yes | |
| | | Communication | |
| Display | | LED Indicators, Bluetooth + APP | |
| USB | | Yes | |
| RS485 | | Yes | |
| Power Line Communication (PLC) | | Yes | |
| | | General | |
| Dimensions (W x H x D, with mounting plate) | | 930 x 550 x 283 mm (36.6 x 21.7 x 11.1 inch) | |
| Weight (with mounting plate) | | 62 kg (137 lb.) | |
| Operation Temperature Range | | -25 °C ~ 60 °C (-13 °F ~ 140 °F) | |
| Cooling | | Natural Convection | |
| Relative Humidity | | 0 ~ 100% | |
| DC Connector | | Amphenol Helios H4 or MC4 | |
| AC Connector | | Waterproof PG Terminal + OT Connector | |
| Protection Rating | | NEMA Type 4X | |
| Topology | | Transformerless | |
| | | Standards Compliance | |
| Safety / EMC | | UL 1741, UL 1699B, CSA C22.2 #107.1-01, FCC Part 15 | |
| Grid Code | | IEEE 1547, IEEE 1547a, UL 1741 SA | |

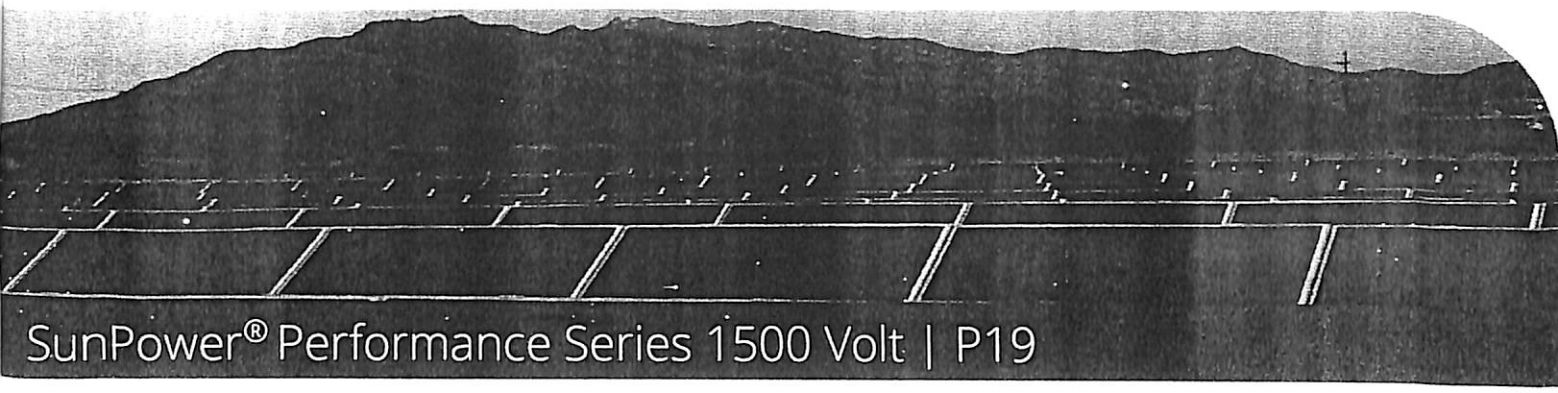
## Efficiency Curve

SUN2000-33KTL-US




## Circuit Diagram





# SunPower® Performance Series 1500 Volt | P19

*SunPower® Performance Series 1500 Volt panels are designed to deliver consistent performance for many decades in advanced 1500 Volt power plant applications.*

## Increased Energy Production

The Performance Series modules' linear shading response enables true-tracking in single-axis tracking systems, generating more energy than conventional systems that require backtracking.[1]

***Design Tip:*** *When modeling P-Series energy performance be sure to use linear shading losses. For more detailed guidance please visit https://us.sunpower.com/sites/sunpower/files/media-library/manuals/mn-sunpower-p-series-modeling-guide.pdf*

## Higher Efficiency

The Performance Series design minimizes white space between solar cells, eliminates reflective metal lines on the cells, and lowers electrical resistance between cells, increasing efficiency compared to Conventional Commercial Panels.[2]

## Optimized for the Oasis Power Plant

From the mounting hardware, to the electrical design within the panel, to the connectors and the 1500 V rating, everything is designed as an integral part of the Oasis Power Plant.

## High Reliability

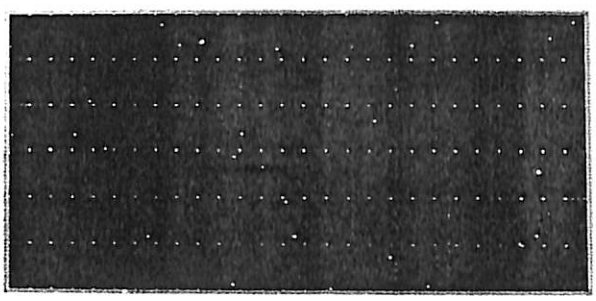
Innovative panel design uses flexible and redundant electrical connections between solar cells to deliver enhanced reliability.

## SunPower Quality

Tested to SunPower's rigorous quality standards, and backed by the industry's best Combined Power and Product Warranty.

## High Performance & Excellent Reliability

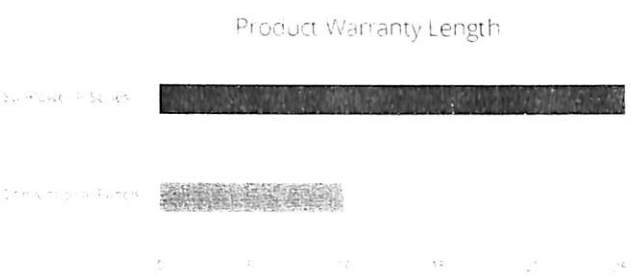
P19



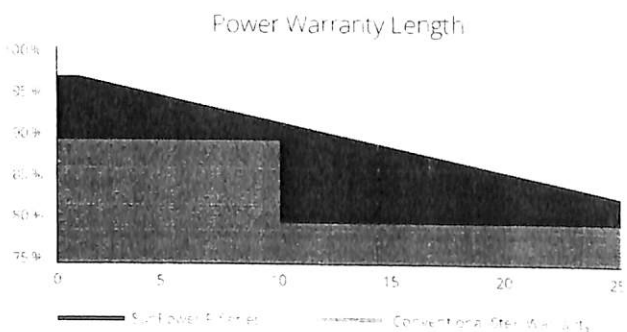
SPR-P19-405-COM

## 25 Year Combined Warranty

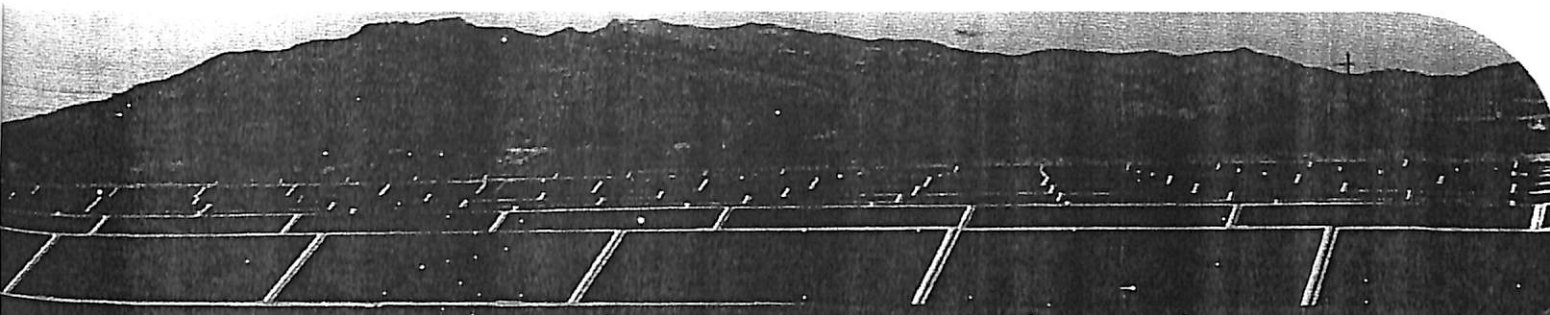
**Protect your investment**




SunPower provides the best 25 year Combined Power and Product warranty in the industry, providing coverage regardless of product defect or power loss.




SunPower's Performance Series is warranted to produce more than 97% power in the first year, then declining by 0.6% per year, ending at 82.6% power after 25 years.

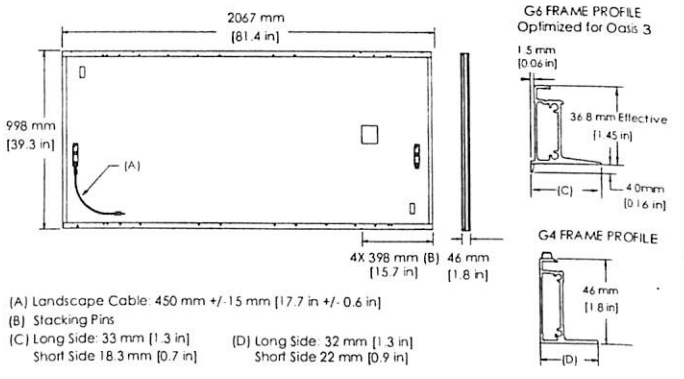


# SunPower® Performance Series 1500 Volt | P19

| Electrical Data, STC[3] | | | | | |
|---|---|---|---|---|---|
| Model | SPR-P19-405-COM | SPR-P19-400-COM | SPR-P19-395-COM | SPR-P18-390-COM | SPR-P18-385-COM |
| Nominal Power (Pnom) | 405 W | 400 W | 395 W | 390 W | 385 W |
| Power Tolerance | +5/-0 W | +5/-0 W | +5/-0 W | +5/-0 W | +5/-0 W |
| Efficiency | 19.6% | 19.4% | 19.1% | 18.9% | 18.7% |
| Rated Voltage (Vmpp) | 43.9 V | 43.7 V | 43.5 V | 43.2 V | 43.0 V |
| Rated Current (Impp) | 9.22 A | 9.15 A | 9.17 A | 9.10 A | 9.03 A |
| Open-Circuit Voltage (Voc) | 52.9 V | 52.7 V | 52.5 V | 52.3 V | 52.0 V |
| Short-Circuit Current (Isc) | 9.97 A | 9.79 A | 9.72 A | 9.64 A | 9.57 A |
| Power Temp. Coef. | -0.37% / °C | | | | |
| Voltage Temp. Coef. | -0.29% / °C | | | | |
| Current Temp. Coef. | 0.05% / °C | | | | |
| Maximum System Voltage | 1500 V UL & 1500 V IEC | | | | |
| Maximum Series Fuse | 15 A | | | | |

| Operating Condition And Mechanical Data | |
|---|---|
| Temperature | -40° F to +185° F (-40° C to +85° C) |
| Impact Resistance | 1 inch (25 mm) diameter hail at 52 mph (23 m/s) |
| Appearance | Class B |
| Solar Cells | Monocrystalline |
| Tempered Glass | High transmission tempered anti-reflective |
| Junction Box | IP-67 for ocsane and contrant cable options<br>MC4 compatible |
| Weight | 51 lbs (23.1 kg) |
| Max. Load | G6 Frame: Wind: 50 psf, 2400 Pa front & back<br>Snow: 75 psf, 3600 Pa front<br>G4 Frame: Wind: 50 psf, 2400 Pa front & back<br>Snow: 112 psf, 5400 Pa front |
| Frame | Class 2 silver anodized, stacking pins |

| Tests And Certifications | |
|---|---|
| Standard Tests | UL1703 (Type 2 Fire Rating), IEC 61215, IEC 61730 Rated to 1500 V |
| Quality Certs | ISO 9001:2008, ISO 14001:2004 |
| EHS Compliance | OHSAS 18001:2007, PV Cycle |
| Ammonia Test | IEC 62716 |
| Desert Test | 10.1109/PVSC.2013.6744437 |
| Salt Spray Test | IEC 61701 (maximum severity) |
| PID Test | Potential-Induced Degradation free: 1500 V |
| Available Listings | UL, CEC, TUV, FSEC |




(A) Landscape Cable: 450 mm +/-15 mm [17.7 in +/- 0.6 in]
(B) Stacking Pins
(C) Long Side: 33 mm [1.3 in]
Short Side 18.3 mm [0.7 in]
(D) Long Side: 32 mm [1.3 in]
Short Side 22 mm [0.9 in]

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