## Paul Foley

**From:** David Smith [dsmith@fullersenergy.com]
**Sent:** Monday, September 12, 2016 1:57 PM
**To:** Paul Foley
**Subject:** Vineyard Decorators Solar
**Attachments:** VD layout.pdf; Enphase_M250_Data_Sheet.pdf; sunmodule-solar-panel-285-mono-ds.pdf; SnapNrack_Series_100_Brochure.pdf

Paul,
Please find attached the layout drawing and equipment specifications for our proposed solar array on the existing roof of Vineyard Decorators. This phase of the project consists of 87 panels which are situated on the existing roof. The array will sit approximately 4.5" above the existing roof. We are not altering the pre- existing roof other than the addition of solar. We are also looking in the near future of adding phase 2, which again is only situated on the existing roof structure and if it is best to review that section at this time also, can we do that? If you require further information please let me know.
Thank you for all your guidance with this process,

David Smith
Sales and Project Manager

FULLERS ENERGY
SUN, EARTH, WIND, WATER

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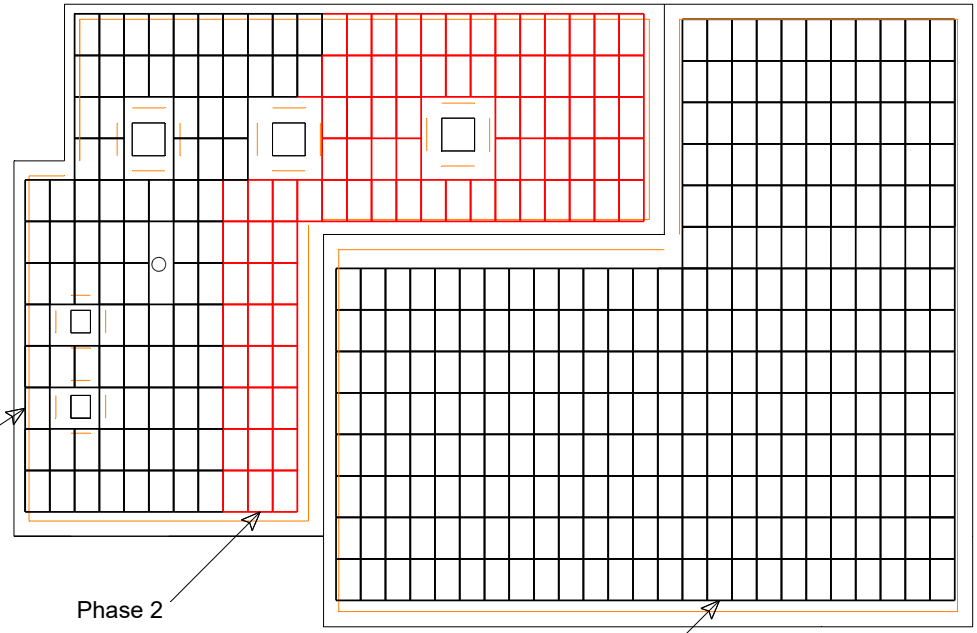


Phase 1

(87) SolarWorld 285w Solar Modules
(85) Enphase M250 Microinverters
to be located beneath each module

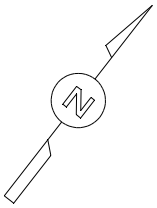
Breaker Panel (point of connection with utility)
Lockable Disconnect Switch
Existing Utility Meter

Phase 2

(85) SolarWorld 285w Solar Modules
(85) Enphase M250 Microinverters
to be located beneath each module

Phase 3

(226) SolarWorld 285w Solar Modules
(266) Enphase M250 Microinverters
to be located beneath each module



Module Azimuth = 150 Degrees True

**Unless Otherwise Specified:**
Dimensions in Inches
Tolerances: Fractional ± .001
Angular: Mach ± .001

**Site Notes:**
Conditions as shown, based on Field
Survey performed on

| | Name | Date |
|---|---|---|
| Surveyed | | |
| Drawn | OM | 5/3/16 |
| ENG Appr. | | |
| MFR Appr. | | |
| QA | | |
| Revision B | DS | 5/12/16 |
| Revision C | DS | 5/12/16 |

**Material**
(438) SolarWorld 285w Modules
(438) Enphase M250 Microinverters

Do Not Scale Drawing

HIC# 170677

**FULLERS ENERGY, LLC**

Phone# 508-696-3006

**Project: Vineyard Decorators: 835 Airport rd, Edgartown, MA**

Description: Roof Mounted 124.83 kW (438) Module System

Utility Acct# 1528 342 0014

| Size | Drawing No. | Rev |
|---|---|---|
| A4 | 0001 | C |

Scale 1 Cad = 10'
.1 scale

CAD File: .vc2

Sheet 1 of 1

# Sunmodule® Plus
## SW 285 MONO

SOLARWORLD
REAL VALUE

TUV Power controlled:
Lowest measuring tolerance in industry

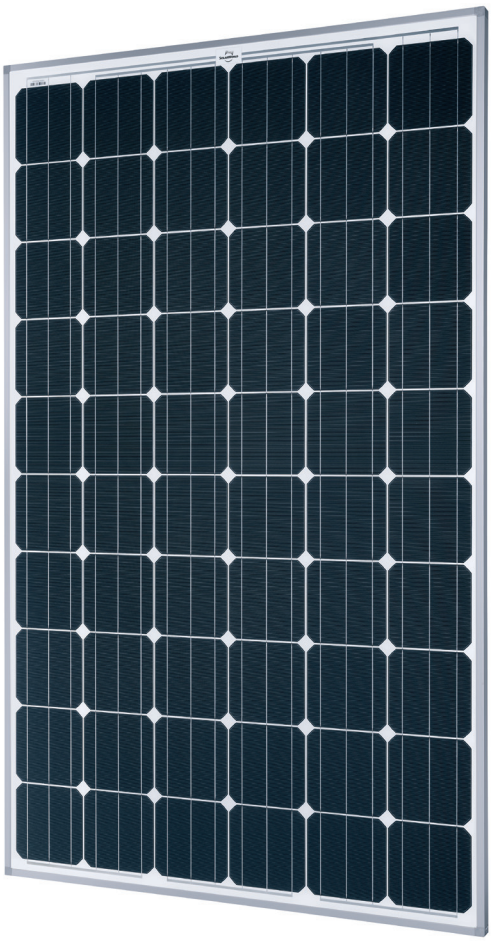
Every component is tested to meet
3 times IEC requirements

Designed to withstand heavy
accumulations of snow and ice

Sunmodule Plus:
Positive performance tolerance

25-year linear performance warranty
and 10-year product warranty

Glass with anti-reflective coating



**World-class quality**
Fully-automated production lines and seamless monitoring of the process and material ensure the quality that the company sets as its benchmark for its sites worldwide.

**SolarWorld Plus-Sorting**
Plus-Sorting guarantees highest system efficiency. SolarWorld only delivers modules that have greater than or equal to the nameplate rated power.

**25-year linear performance guarantee and extension of product warranty to 10 years**
SolarWorld guarantees a maximum performance digression of 0.7% p.a. in the course of 25 years, a significant added value compared to the two-phase warranties common in the industry. In addition, SolarWorld is offering a product warranty, which has been extended to 10 years.*

*in accordance with the applicable SolarWorld Limited Warranty at purchase.
www.solarworld.com/warranty

• Qualified, IEC 61215
• Safety tested, IEC 61730
• Periodic Inspection
• Blowing sand resistant

• Ammonia resistance tested
• Periodic Inspection
• Power Controlled

PERFORMANCE TESTED
SALT MIST RESISTANT
PHOTOVOLTAIC PRODUCT

UL 1703

ISO 9001
ISO 14001
Certified

Home Innovation
NGBS GREEN CERTIFIED

MADE IN USA OF US
AND IMPORTED PARTS

solarworld.com

# Sunmodule® Plus
# SW 285 MONO

SOLARWORLD
REAL VALUE

## PERFORMANCE UNDER STANDARD TEST CONDITIONS (STC)*

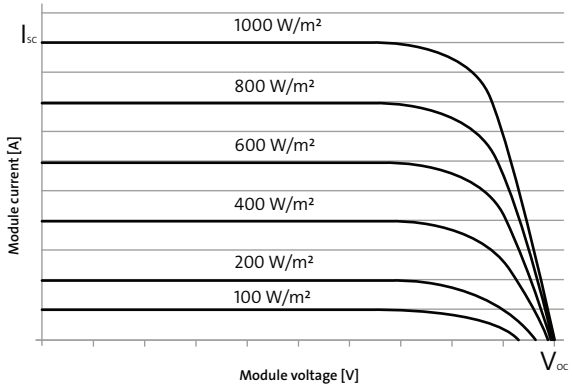
| | | |
|---|---|---|
| *Maximum power* | $P_{max}$ | 285 Wp |
| *Open circuit voltage* | $V_{oc}$ | 39.7 V |
| *Maximum power point voltage* | $V_{mpp}$ | 31.3 V |
| *Short circuit current* | $I_{sc}$ | 9.84 A |
| *Maximum power point current* | $I_{mpp}$ | 9.20 A |
| *Module efficiency* | $\eta_m$ | 17.0 % |

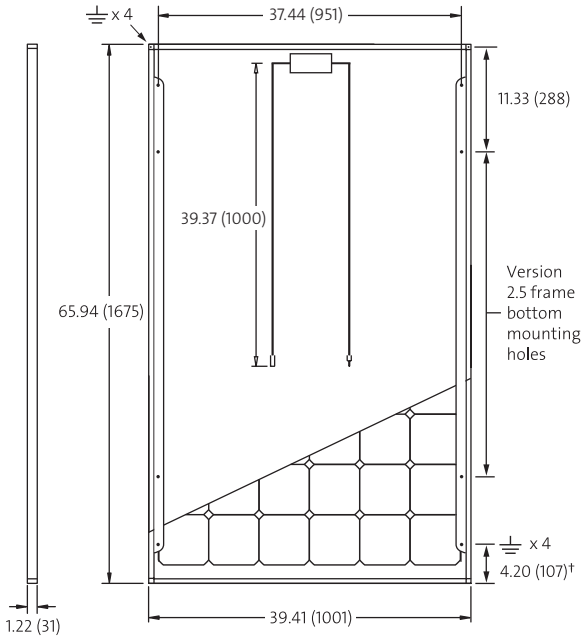
*STC: 1000 W/m², 25°C, AM 1.5

1) Measuring tolerance ($P_{max}$) traceable to TUV Rheinland: +/- 2% (TUV Power Controlled).

## THERMAL CHARACTERISTICS

| | |
|---|---|
| *NOCT* | 46 °C |
| *TC $I_{sc}$* | 0.04 %/°C |
| *TC $V_{oc}$* | -0.30 %/°C |
| *TC $P_{mpp}$* | -0.41 %/°C |
| *Operating temperature* | -40°C to 85°C |




## PERFORMANCE AT 800 W/m², NOCT, AM 1.5

| | | |
|---|---|---|
| *Maximum power* | $P_{max}$ | 213.1 Wp |
| *Open circuit voltage* | $V_{oc}$ | 36.4 V |
| *Maximum power point voltage* | $V_{mpp}$ | 28.7 V |
| *Short circuit current* | $I_{sc}$ | 7.96 A |
| *Maximum power point current* | $I_{mpp}$ | 7.43 A |

Minor reduction in efficiency under partial load conditions at 25°C: at 200 W/m², 100% (+/-2%) of the STC efficiency (1000 W/m²) is achieved.

## COMPONENT MATERIALS

| | |
|---|---|
| *Cells per module* | 60 |
| *Cell type* | Mono crystalline |
| *Cell dimensions* | 6.17 in x 6.17 in (156.75 x 156.75 mm) |
| *Front* | Tempered glass (EN 12150) |
| *Frame* | Clear anodized aluminum |
| *Weight* | 39.5 lbs (17.9 kg) |

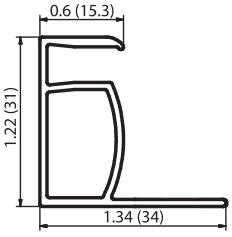
## SYSTEM INTEGRATION PARAMETERS

| | | |
|---|---|---|
| *Maximum system voltage SC II / NEC* | | 1000 V |
| *Maximum reverse current* | | 25 A |
| *Number of bypass diodes* | | 3 |
| *Design Loads** | *Two rail system* | 113 psf downward<br>64 psf upward |
| *Design Loads** | *Three rail system* | 170 psf downward<br>71 psf upward |
| *Design Loads** | *Edge mounting* | 30 psf downward<br>30 psf upward |

* Please refer to the Sunmodule installation instructions for the details associated with these load cases.

## ADDITIONAL DATA

| | |
|---|---|
| *Power sorting¹* | -0 Wp / +5 Wp |
| *J-Box* | IP65 |
| *Module leads* | PV wire per UL4703 with H4 connectors |
| *Module type (UL 1703)* | 1 |
| *Glass* | Low iron tempered with ARC |




**VERSION 2.5 FRAME**

- Compatible with both "Top-Down" and "Bottom" mounting methods
- ⏚ Grounding Locations:
  - 4 corners of the frame
  - 4 locations along the length of the module in the extended flange†

All units provided are imperial. SI units provided in parentheses.
SolarWorld AG reserves the right to make specification changes without notice.

SnapNrack™
Solar Mounting Solutions

snapnrack.com

# Series 100 Residential Roof Mount System

The SnapNrack Series 100 UL Roof Mount System is an efficient, visually appealing, photovoltaic (PV) module installation system. Series 100 UL is listed to the UL 2703 for grounding/bonding and fire classification. The System's components provide an adequate bonding path which has eliminated the need for grounding lugs and washers at each module, and bonding jumpers between splices. In addition to grounding and bonding, the roof mount system, Series 100 UL, is Class A Fire Rated when installed with Type I and Type II Modules. SnapNrack's UL 2703 Certification and Compliance ensures that SnapNrack installers can continue to provide the best in class installations in quality, safety and efficiency.

- Appealing design with built-in aesthetics
- No grounding lugs required for modules
- All bonding hardware is fully integrated into the components
- Rail splices bond rails together, no rail jumpers required
- Proprietary SnapNrack grounding lug snaps in the rail channel
- No drilling of rail or reaching for other tools required
- Class A Fire Rating for Type 1 and 2 modules

## System Features Include

Snap in Hardware

Single Tool Installation

Easy Leveling

No Cutting or Drilling

Integrated Wire Management

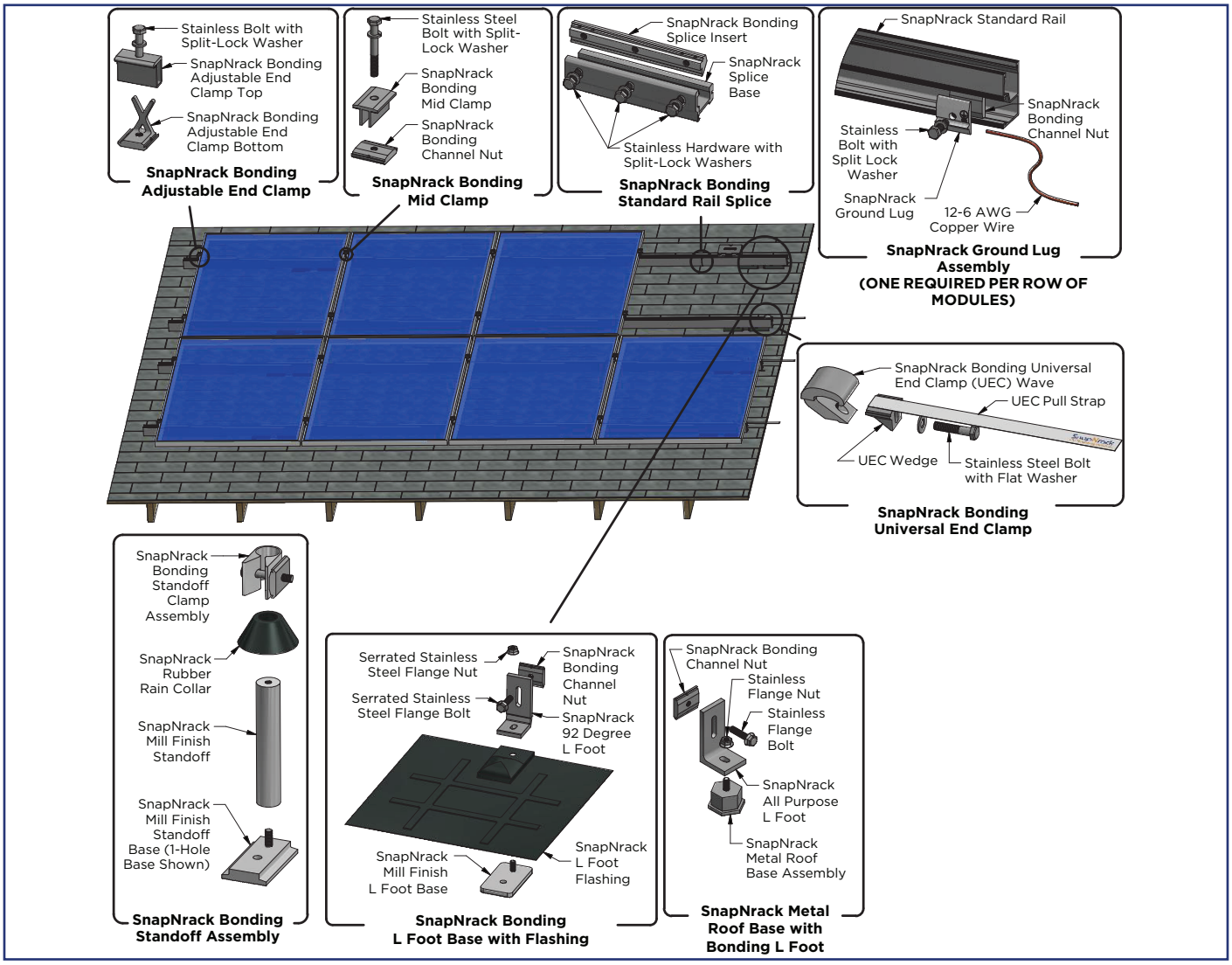
Preassembled hardware

Integrated bonding

UL 2703 Certified

SnapNrack™
Solar Mounting Solutions

snapnrack.com



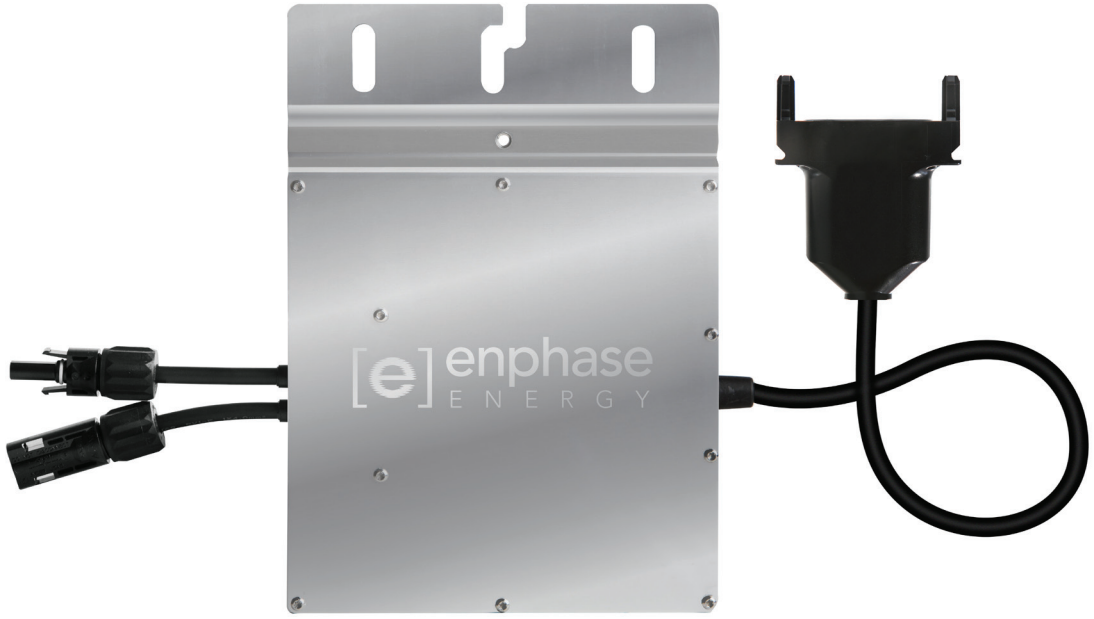

## SERIES 100 TECHNICAL DATA

| | |
|---|---|
| **Materials** | • 6000 Series aluminum<br>• Stainless steel<br>• Galvanized steel and aluminum flashing |
| **Material Finish** | • Clear and black anodized aluminum<br>• Mill finish on select components |
| **Calcs. & Certifications** | • Listed to UL Standard 2703 for Grounding/Bonding and Fire Classification<br>• Class A Fire Rating Type 1 and Type 2 modules<br>• Stamped Structural Engineering Reports for all 50 States |
| **Grounding** | • SnapNrack Grounding Lug (One lug per individual row of modules)<br>• Integrated bonding components |
| **Warranty** | 10 year limited product warranty; 5 year limited finish warranty |

**877-732-2860** | **www.snapnrack.com** | **contact@snapnrack.com**

Enphase® **Microinverters**

# Enphase® **M250**




The **Enphase® M250 Microinverter** delivers increased energy harvest and reduces design and installation complexity with its all-AC approach. With the M250, the DC circuit is isolated and insulated from ground, so **no Ground Electrode Conductor (GEC) is required for the microinverter.** This further simplifies installation, enhances safety, and saves on labor and materials costs.

The Enphase M250 integrates seamlessly with the Engage® Cable, the Envoy® Communications Gateway™, and Enlighten®, Enphase's monitoring and analysis software.

## PRODUCTIVE

- Optimized for higher-power modules
- Maximizes energy production
- Minimizes impact of shading, dust, and debris

## SIMPLE

- No GEC needed for microinverter
- No DC design or string calculation required
- Easy installation with Engage Cable

## RELIABLE

- 4th-generation product
- More than 1 million hours of testing and 3 million units shipped
- Industry-leading warranty, up to 25 years

enphase® ENERGY

C US

| **INPUT DATA (DC)** | **M250-60-2LL-S22/S23/S24** | |
|---|---|---|
| Recommended input power (STC) | 210 - 300 W | |
| Maximum input DC voltage | 48 V | |
| Peak power tracking voltage | 27 V - 39 V | |
| Operating range | 16 V - 48 V | |
| Min/Max start voltage | 22 V / 48 V | |
| Max DC short circuit current | 15 A | |
| Max input current | 9.8 A | |
| **OUTPUT DATA (AC)** | **@208 VAC** | **@240 VAC** |
| Peak output power | 250 W | 250 W |
| Rated (continuous) output power | 240 W | 240 W |
| Nominal output current | 1.15 A (A rms at nominal duration) | 1.0 A (A rms at nominal duration) |
| Nominal voltage/range | 208 V / 183-229 V | 240 V / 211-264 V |
| Nominal frequency/range | 60.0 / 57-61 Hz | 60.0 / 57-61 Hz |
| Extended frequency range* | 57-62.5 Hz | 57-62.5 Hz |
| Power factor | >0.95 | >0.95 |
| Maximum units per 20 A branch circuit | 24 (three phase) | 16 (single phase) |
| Maximum output fault current | 850 mA rms for 6 cycles | 850 mA rms for 6 cycles |
| **EFFICIENCY** | | |
| CEC weighted efficiency, 240 VAC | 96.5% | |
| CEC weighted efficiency, 208 VAC | 96.0% | |
| Peak inverter efficiency | 96.5% | |
| Static MPPT efficiency (weighted, reference EN50530) | 99.4 % | |
| Night time power consumption | 65 mW max | |
| **MECHANICAL DATA** | | |
| Ambient temperature range | -40°C to +65°C | |
| Operating temperature range (internal) | -40°C to +85°C | |
| Dimensions (WxHxD) | 171 mm x 173 mm x 30 mm (without mounting bracket) | |
| Weight | 2.0 kg | |
| Cooling | Natural convection - No fans | |
| Enclosure environmental rating | Outdoor - NEMA 6 | |
| **FEATURES** | | |
| Compatibility | Compatible with 60-cell PV modules. | |
| Communication | Power line | |
| Integrated ground | The DC circuit meets the requirements for ungrounded PV arrays in NEC 690.35. Equipment ground is provided in the Engage Cable. No additional GEC or ground is required. | |
| Monitoring | Free lifetime monitoring via Enlighten software | |
| Compliance | UL1741/IEEE1547, FCC Part 15 Class B, CAN/CSA-C22.2 NO. 0-M91, 0.4-04, and 107.1-01 | |

* Frequency ranges can be extended beyond nominal if required by the utility

To learn more about Enphase Microinverter technology,
visit **enphase.com**

enphase® ENERGY