

Pairing 72-Cell Modules with Enphase Microinverters

Enphase 72-cell compatible M250 and C250 Microinverters pair with higher-powered PV modules and deliver increased energy harvest and reduced design and installation complexity.

PV Module Compatibility

The versatile Enphase M250-72 and C250 Microinverters™ perform in both residential and commercial solar PV installations and are compatible with both 60-cell and 72-cell modules.

Enphase has updated the online [Module Compatibility Calculator](#) to include the newest Enphase Microinverters. The calculator shows which solar modules work with Enphase Microinverters and how climate affects their performance.

A module is compatible with an inverter if the voltage and current coming from the module remain within range for the inverter to perform safely and convert power at industry-leading efficiencies. The Enphase Module Compatibility Calculator looks at open-circuit voltage (V_{OC}), voltage at maximum power (V_{MP}), short-circuit current (I_{SC}), the temperature in the location, and the temperature coefficient of the V_{OC} .

The online [Module Compatibility Calculator](#) uses the following values and calculations to determine compatibility:

1. The maximum voltage

If a module's rated maximum voltage (which corresponds to V_{OC}) exceeds a microinverter's maximum voltage, this may damage the microinverter. To demonstrate this calculation, we will use a 300 watt, 72-cell module to find out if it is compatible with the Enphase M250-72 Microinverter when installed in Honolulu, Hawaii. We start by looking at the module data sheet and recording the module's V_{OC} . In this case, V_{OC} is 45.1V.

2. The relevant temperature range

Module voltage has an inverse relationship with module temperature. When the temperature drops, the voltage goes up. The National Electrical Code tells us to take V_{OC} and adjust for the lowest expected ambient temperature when determining a solar PV system's maximum voltage.¹ For this calculation, use the extreme minimum temperature found in the interactive reference map on the Solar American Board for Codes and Standards website.² A search for Honolulu, Hawaii yields three results. We choose Honolulu International Airport and note a minimum temperature of 14°C (57°F). Also, note that the temperature at Standard Test Conditions (STC) is 25°C (77°F). Minimum temperature and STC temperature are both part of the module compatibility calculation.

3. The effect of temperature range on voltage

We now have the relevant information about temperatures the module will be exposed to, but we still need to know how changes in temperature affect the module. This effect is known as the temperature coefficient, and it can be found with other reference points on the PV module data sheet. For our selected module, the temperature coefficient V_{OC} is -0.321%.

¹ See NEC 690.7

² Accessed Nov. 20, 2013, at <http://www.solarabcs.org/about/publications/reports/expedited-permit/map/index.html>

4. Comparison of the Open Circuit Voltage

The following formula tests if the module's V_{OC} is within the range of the Enphase Microinverter. The maximum DC input voltage is 60V for the M250-72 and C250, and it is 48V for the S230, S280, and M215.

$$V_{OC} + [V_{OC} * (\text{min temp} - \text{STC temp}) * (\text{temp coefficient})] \leq \text{microinverter max voltage}$$

$$45.1 + [45.1 * (14 - 25) * (-0.00321)] \leq \text{maximum DC input voltage}$$

$$46.69 \leq \text{maximum DC input voltage}$$

The following table lists the maximum DC input voltage for various Enphase Microinverters.

Microinverter Model	Maximum DC Input Voltage
M215	48
M250-72	62
S230	48
S280	48
C250	60

As the equation shows, the module's V_{OC} of 45.1 will not exceed the Enphase Microinverter's maximum voltage. The Module Compatibility Calculator uses the same formula to determine if the V_{MP} at the highest expected temperature and the I_{SC} at the highest expected temperature also stay within range for the microinverter. If they do, the module is compatible with the microinverter.

Please note the following:

- Pairing a 72-cell module with an M215, M250, S230, S280 or C250 Enphase Microinverter will not void the inverter's warranty. However, exceeding maximum voltage or current inputs can damage the microinverter, and these actions will void the warranty.
- Modules paired with the Enphase Microinverters with integrated ground must use "PV Wire" or "PV Cable" to be compliant with NEC 690.35(D) for Ungrounded PV Power Systems.