

# AC MODULE, AC MODULE IMPOSTERS, AND OTHER ACPV SYSTEM COMPONENTS



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## AC MODULES

AC Modules are defined in the U.S. National Electric Code (NEC) as “a complete, environmentally protected unit consisting of solar cells, optics, inverter, and other components, exclusive of tracker, designed to generate ac power when exposed to sunlight. A true AC module will be designated as an AC module by a Nationally Recognized Test Laboratory (NRTL).

This complete unit (the AC Module) – consisting of PV module and pre-integrated microinverter--is constructed in the factory and specific tests are conducted before it can be certified as an AC module. These tests draw from both Underwriter’s Laboratory (UL) 1741 standards for inverters and UL 1703 standards for PV modules. For example, the SolarBridge Pantheon microinverter meets C22.2, No. 107.1-01 and UL 1741 2nd Edition Standards and is certified by CSA as a component. Additionally, the SolarBridge Pantheon microinverter is tested to the UL 1703 Standard as part of an AC module and subjected to the following tests:

- Humidity Freeze 10 (HF10) including wet insulation resistance
- Thermal Cycle 200 (TC200) including wet insulation resistance
- Dielectric Withstand and Ground Continuity Test
- Rain / Sprinkler Test

Factory assembly with dedicated quality control is critical to ACPV reliability and allows for the ACPV Module to obtain UL1741 regulatory certification. This is a major advantage to field assembled ACPV systems which cannot be certified and the burden of inspector approval falls completely on the installer.

## AC Module Cables

SolarBridge-enabled AC modules include SolarBridge special-use AC cables evaluated to various parts of UL’s AC Connector Standards and UL 1703 for use in outdoor PV applications. Connectors are rated for current interruption (i.e. disconnect under load per NEC 690.6). These evaluations also apply to SolarBridge Accessory Component Cables. Cables are designated as Tray Cable - Extended Run (“TC-ER”) type and designed for wiring in free air and/or for management within standard AC wiring components such as exterior wire tray. Connectors are locking type and designed to withstand extreme conditions. They will not deform at high temperatures, can tolerate complete immersion in water without failure and will withstand UL standard impact tests at temperatures as low as -35C.

## ACPV Systems

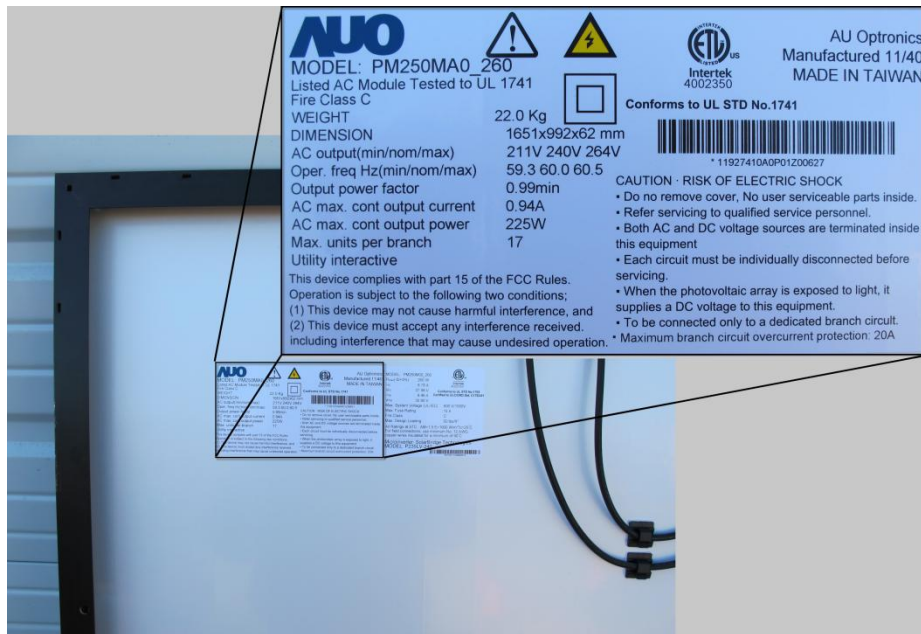
AC Modules are part of an ACPV system. And if the ACPV system is constructed using a certified AC module, installers can look to Section 690.6 of the U.S. National Electric Code for guidance on the construction of the ACPV system utilizing AC modules. However, there are other installation designs that can be called ACPV systems. These include designs where the microinverter is installed near the PV module (a “detached” microinverter) or in some cases bolted to the frame of the PV module at some assembly location off site, or on site just before installation.

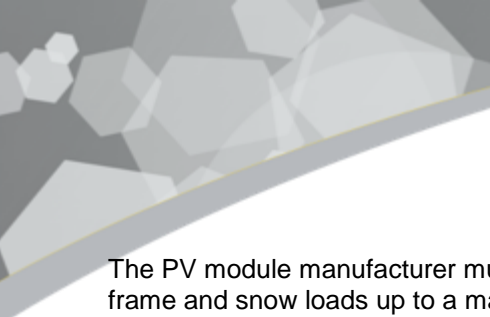
Section 690.6 (A) states “the requirements of Article 690 pertaining to PV source circuits (i.e. DC circuits) shall not apply to AC modules.” However, installers must follow ALL guidance provided throughout Article 690 when installing ACPV systems utilizing detached microinverters or assemblies where the microinverter is bolted onto the PV module frame on site or at some facility unassociated with the PV module manufacturer. Article 690 will

require the installer to consider DC ground fault detection and interrupt, DC cable management, DC disconnecting means, external inverter chassis grounding, etc. when installing PV systems utilizing detached / site-mounted microinverters and PV modules.

### Not Quite AC Modules

Installers should be especially cautious with imposter AC modules without any certification to support the assembled product. The AC module certification is obtained by the PV module manufacturer and the entire assembly (PV module, microinverter and cables) are supported under one warranty. Uncertified assemblies will be installed and maintained in the field as two separate products lines. If the assembly is constructed outside the PV module factory and not tested as a unit by an NRTL, installers could be liable for installing an un-warranted product and/or a product that does not qualify for State or Federal rebate/incentive programs. Installers and inspectors should always check the manufacturer’s product documentation and look for the AC module label on the back of the unit.





The PV module manufacturer must ensure that their product will withstand certain levels of impact on the module frame and snow loads up to a maximum of 5400 Pasqual. Drilling holes in the PV module frame after the PV module has been constructed may weaken the PV module frame and improper drilling technique threatens the integrity of back sheet materials. If the frame is weakened and flexes beyond acceptable tolerances as defined by the PV module manufacturer (e.g. during installation or under extreme snow load), the microinverter can come in contact with the back sheet and possibly damage the back sheet. This would not be covered under the manufacturer's warranty and may present a safety issue for the system owner.

