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UL 9703

Outline of Investigation for Distributed Generation Wiring Harnesses

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Summary of Topics

This is the third issue of the Outline of Investigation for Distributed Generation Wiring Harnesses, UL 9703.

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INTRODUCTION

1 Scope

1.1 These requirements cover wiring harnesses intended to interconnect distributed generation system devices.

1.2 These requirements cover distributed generation wiring harnesses intended for factory and field wiring and may include assemblies of cables intended for interconnection of PV modules, solar collectors, and other distributed generation sources, interconnection of inverters, converters, controllers, and chargers as well as distributed generation system communication harnesses and system output harnesses.

1.3 The products covered by these requirements are intended to be installed in accordance with the National Electrical Code, ANSI/NFPA 70.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this Outline of Investigation shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this Outline of Investigation.

2.1.2 A component need not comply with a specific requirement that:

- a) Involves a feature or characteristic not needed in the application of the component in the product covered by this Outline of Investigation, or
- b) Is superseded by a requirement in this Outline of Investigation.

2.1.3 A component shall be used in accordance with its recognized rating established for the intended conditions of use.

2.1.4 Specific components are recognized as being incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions for which they have been recognized.

2.2 Units of measurement

2.2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.3 References

2.3.1 Any undated reference to a code or standard appearing in the requirements of this Outline of Investigation shall be interpreted as referring to the latest edition of that code or standard.

3 Glossary

3.1 In the text of this outline, the term "unit" refers to any product covered by this outline. For the purpose of this outline, the definitions in 3.2 – 3.18 apply.

3.2 AC MODULE – The smallest complete unit that includes solar cells, optics, inverters, and other components, excluding tracking devices, intended to generate ac power from sunlight.

3.3 BARRIER – A part inside an enclosure that reduces access to a part that involves a risk of fire, electric shock, injury to persons, or electrical energy-high current levels.

3.4 ENCLOSURE – A surrounding case constructed to provide a degree of protection against:

- a) The accessibility of a part that potentially involves a risk of fire, electric shock or injury to persons, or
- b) The risk of propagation of flame, sparks, and molten metal initiated by an electrical disturbance occurring within.

3.5 FIELD-WIRING LEAD – A lead to which a supply, load, or other wire is intended to be connected by an installer.

3.6 FIELD-WIRING TERMINAL – A terminal to which a supply, load, or other wire is intended to be connected by an installer.

3.7 FIXED UNIT – A unit that is intended to be permanently connected mechanically and electrically and only able to be detached by the use of a tool.

3.8 GROUNDED CONDUCTOR – A system or circuit conductor that is intentionally grounded.

3.9 KNOCKOUT – A portion of the wall of an enclosure so fashioned that it is capable of being readily removed by a hammer, screwdriver, and pliers at the time of installation in order to provide an opening or hole for the attachment of an auxiliary device, raceway, cable, or fitting.

3.10 LIVE PART – An electrically conductive part within a unit that during intended use has a potential difference with respect to earth ground.

3.11 MAXIMUM SYSTEM VOLTAGE – The sum of the maximum open-circuit voltages of the maximum number of modules or panels to be connected in series in a system.

3.12 OPEN-CIRCUIT VOLTAGE (Voc) – The maximum no load output voltage of a photovoltaic module or panel at standard test conditions (STC).

3.13 PERMANENTLY CONNECTED UNIT – A unit connected to the electrical supply by means other than a supply cord and an attachment plug.

3.14 PRESSURE TERMINAL CONNECTOR – A terminal that accomplishes the connection of one or more conductors by means of pressure without the use of solder. Examples of pressure terminal connectors are:

- a) Barrel and setscrew type,
- b) Crimp-type barrel, or
- c) Clamping plate and screw type.

3.15 SERVICE PERSONNEL – Trained persons having familiarity with the construction and operation of the equipment and the risks involved.

3.16 STANDARD TEST CONDITIONS (STC) – Test conditions consisting of:

- a) 1000 W/m² irradiance,
- b) AM 1.5 spectrum, and
- c) 25°C (77°F) cell temperature.

3.17 TOOL – A screwdriver, coin, key, or any other object that is usable to operate a screw, latch, or similar fastening means.

3.18 SEALED WIRE HARNESS – A unit with factory connected wires and molded insulations without field service openings. The field interconnection shall only be made on the free end of wires, such as mating connectors, which are not covered by this Outline Of Investigation.

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CONSTRUCTION

4 Enclosure

4.1 An enclosure as defined in 3.5 and any part of an enclosure shall comply with Section 4, Enclosure, and Section 5, Protection Against Corrosion, in the Standard for Photovoltaic Junction Boxes, UL 3730, except as noted in 4.2 of this Outline of Investigation.

4.2 Polymeric materials making up the surface or part of the surface of an enclosure, such as an overmolded wire interconnection enclosure and similar devices, that are in-line with the wire or cable and having a total surface area of less than 200 cm² shall have a minimum flame rating of 94-V0.

4.3 A sealed wire harness can also be used as direct burial if it complies with Section 37, Direct Burial Test Sequence, and meets all the requirements.

5 Protection of Users - Accessibility of Uninsulated Live Parts

5.1 Distributed generation wiring harnesses shall comply with Section 15, Accessibility of Uninsulated Live Parts, in the Standard for Flat-Plate Photovoltaic Modules and Panels, UL 1703.

6 Electric Shock

6.1 A live part does not involve a risk of electric shock when the maximum voltage of the part to ground does not exceed 30 Vdc.

7 Wiring Terminals

7.1 Wiring terminals shall comply with Section 7, Wiring Terminals, in the Standard for Photovoltaic Junction Boxes, UL 3730.

8 Wire and Cable

8.1 Wire shall be PV, USE-2, Tray Cable, or other wire style suitable for the intended use.

8.2 A field-wiring lead shall not be less than 152.4 mm (6 in) long.

Exception: Leads exiting the enclosure terminating with a PV Connector may be less than 152.4 mm (6 in) long.

8.3 All wiring leads exiting the enclosure shall comply with Strain Relief Test, Section 22, both in as-received condition and following the Mold Stress-Relief Distortion, Section 21.