C22.2 No. 330-17

CSA Group

Photovoltaic rapid shutdown systems

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CSA Group

Standards Update Service

C22.2 No. 330-17
May 2017

Title: *Photovoltaic rapid shutdown systems*

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C22.2 No. 330-17
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Published in May 2017 by CSA Group
A not-for-profit private sector organization
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3

*To purchase standards and related publications, visit our Online Store at **shop.csa.ca***
or call toll-free 1-800-463-6727 or 416-747-4044.

ISBN 978-1-4883-0826-0

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Preface

This is the first edition of CSA C22.2 No. 330, *Photovoltaic rapid shutdown systems,* one of a series of Standards issued by CSA Group under Part II of the *Canadian Electrical Code*.

This Standard sets out provisions for photovoltaic (PV) rapid shutdown systems and is intended to be used in conjunction with CSA C22.2 No. 107.1. PV rapid shutdown equipment is designed to protect emergency personnel by limiting the conductors it controls to not more than 30 V dc or 15 V ac (rms), 8 A and 240 V•A.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Subcommittee on Photovoltaic Rapid Shutdown Systems under the jurisdiction of the Technical Committee on Industrial Products and the Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the Technical Committee.

Interpretations: The Strategic Steering Committee on Requirements for Electrical Safety has provided the following direction for the interpretation of standards under its jurisdiction: "The literal text shall be used in judging compliance of products with the safety requirements of this Standard. When the literal text cannot be applied to the product, such as for new materials or construction, and when a relevant CSA committee interpretation has not already been published, CSA Group's procedures for interpretation shall be followed to determine the intended safety principle."

Notes:

1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
3) *This Standard was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is inconsistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
4) *To submit a request for interpretation of this Standard, please send the following information to* ***inquiries@csagroup.org*** *and include "Request for interpretation" in the subject line:*
   a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
   b) *provide an explanation of circumstances surrounding the actual field condition; and*
   c) *where possible, phrase the request in such a way that a specific "yes" or "no" answer will address the issue.*

   Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are available on the* Current Standards Activities *page at standardsactivities.csa.ca.*
5) *This Standard is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to* ***inquiries@csagroup.org*** *and include "Proposal for change" in the subject line:*
   a) *Standard designation (number);*
   b) *relevant clause, table, and/or figure number;*
   c) *wording of the proposed change; and*
   d) *rationale for the change.*

C22.2 No. 330-17
Photovoltaic rapid shutdown systems

1 Scope

1.1
This Standard specifies requirements for photovoltaic (PV) rapid shutdown systems (PVRSS) and PV rapid shutdown equipment (PVRSE) intended to be used in ordinary locations in accordance with CSA C22.1, *Canadian Electrical Code, Part I* (*CE Code, Part I*) and rated 1500 V or less. A PVRSS is an integrated set of discrete components that work together to shut down one or more PV arrays installed on a building or structure.

1.2
In this Standard, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the Standard; “should” is used to express a recommendation or that which is advised but not required; and “may” is used to express an option or that which is permissible within the limits of the standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

2 Reference publications
This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below.

CSA Group

C22.1-15
Canadian Electrical Code, Part I

CAN/CSA-C22.2 No. 0-10 (R2015)
General requirements — Canadian Electrical Code, Part II

C22.2 No. 0.8-12 (R2016)
Safety functions incorporating electronic technology

C22.2 No. 4-16
Enclosed and dead-front switches

C22.2 No. 5-16
Molded-case circuit breakers, molded-case switches and circuit-breaker enclosures

C22.2 No. 55-15
Special use switches

C22.2 No. 107.1-16
Power conversion equipment

C22.2 No. 111-10 (R2015)
General-use snap switches

C22.2 No. 304-14
Enclosed and dead-front switches for photovoltaic applications

CAN/CSA-C61000-6-1:09 (R2014)
Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments

CAN/CSA-IEC 61000-6-2:08 (R2013)
Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments

3 Definitions

The following definitions shall apply in this Standard:

Controlled state — the state of conductors of a PV system, including PV source and PV output conductors and conductors that are directly connected to a PV dc source circuit, when a PVRSS or PVRSE is activated. In the controlled state, each conductor is limited to not more than 30 V dc or 15 V ac (rms), 8 A and 240 V▪A between any two conductors or between any conductor and ground.

Control power — the voltage and current source used to provide power to control circuits and/or electromagnetic devices in a PVRSS or PVRSE. This includes batteries used for any PVRSS or PVRSE functions.

Initiator — a switching device that activates a PVRSS or PVRSE to put all controlled conductors into the controlled state.

Photovoltaic (PV) array — a mechanical integrated assembly of PV modules with a support structure and foundation, tracking, and other components as required to form a power-producing unit.
[Source: *CE Code, Part I*]

Photovoltaic (PV) circuit —

Photovoltaic (PV) output circuit — circuit conductors between the PV source circuit(s) and the power conditioning unit or dc utilization equipment.
[Source: *CE Code, Part I*]

Photovoltaic (PV) source circuit — conductors between PV modules and from PV modules to the common connection point(s) of the dc system.
[Source: *CE Code, Part I*]

Photovoltaic (PV) rapid shutdown equipment (PVRSE) — equipment used in a photovoltaic (PV) rapid shutdown system (PVRSS) to initiate the disconnection, isolation, or attenuation of the PV source or PV output circuits of a PV system.

Photovoltaic (PV) rapid shutdown system (PVRSS) — a set of photovoltaic rapid shutdown equipment (PVRSE) used to initiate the disconnection, isolation, or attenuation of the PV source or PV output circuits of a PV system.

RS1 equipment — a PVRSS or PVRSE that is electromechanical and does not use electronic controls, communication, and/or firmware in its operation.

RS2 equipment — a PVRSS or PVRSE that uses electronic controls, communication, and/or firmware in its operation.

Status indicator — a device that provides a visual indication that controlled conductors are in the controlled state. This device may be the initiator itself.

Visual status indication — a status light or permanent marking on a switch to identify its current position.

4 General

4.1 General requirements

4.1.1

General requirements applicable to this Standard are provided in CAN/CSA-C22.2 No. 0.

4.1.2

To address protection against fire and electric shock hazard, all requirements applicable to the design and construction of PVRSSs and PVRSE shall be assessed in accordance with Clause 4 of CSA C22.2 No. 107.1.

4.2 System description

4.2.1 General

Figure 1 is a functional block diagram showing the component parts and interfaces of a rapid shutdown system. The operation of a PVRSS or PVRSE controlling the shutdown function can be described as follows: The system receives a signal from the initiator (A), causing each conductor switch (SW) to activate a mechanism that limits each PV source to the specified controlled state. The initiator (A) is manually activated by an operator to start the shutdown process. One or more switching components (SW) limits the dc voltage and current to the specified controlled state. A shutdown system may control multiple PV array output conductors. The status indicator (D) indicates to the operator that the PVRSS or PVRSE has been initiated successfully.