



CAN/UL 2735C:2022

STANDARD FOR SAFETY

Electric Utility Meters for Canada

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UL Standard for Safety for Electric Utility Meters for Canada, CAN/UL 2735C

First Edition, Dated July 15, 2022

Summary of Topics

This is the First Edition of the Standard for Electric Utility Meters for Canada, CAN/UL 2735C dated July 15, 2022, which covers the electrical safety of electricity meters rated up to 600 VAC, which measure, monitor, record, transmit, or receive electrical energy generation or consumption information.

The requirements are substantially in accordance with Proposal(s) on this subject dated December 3, 2021 and March 3, 2022.

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JULY 15, 2022



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CAN/UL 2735C:2022

Standard for Electric Utility Meters for Canada

First Edition

July 15, 2022

This CAN/UL Safety Standard consists of the First Edition.

This standard has been designated as a National Standard of Canada (NSC) on July 15, 2022.

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Preface

This is the First Edition of the Standard for Electric Utility Meters for Canada, CAN/UL 2735C.

UL is accredited by the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of SCC for accreditation of a Standards Development Organization.

Annexes [A](#) and [B](#), identified as normative, form a mandatory part of this Standard.

This CAN/UL 2735C Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

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This Edition of the Standard has been formally approved by the STP on Electric Utility Meters for Canada, STP 2735C.

This list represents the STP 2735C membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

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This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

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INTRODUCTION

1 Scope

1.1 This Standard covers the electrical safety of electricity meters rated up to 600 VAC, which measure, monitor, record, transmit, or receive electrical energy generation or consumption information.

1.2 Meters covered by this Standard may be provided with one or two-way communication capabilities, by means of carrier signals, telephone, cable, wireless communication, or other methods.

1.3 Meters covered by this Standard may additionally provide signals, either by direct connection or wirelessly, for the control of electrical loads or electrical power generation equipment in response to signals received from the utility or local communication networks.

1.4 This Standard applies to detachable meters (Type “S” meters or “S-base” meters), and bottom-connected meters (Type “A” meters or “A-base” meters), intended for installation in ordinary (non-classified) locations. These may or may not be intended to be under the exclusive control of the serving utility.

1.5 This Standard does not apply to equipment intended as test equipment or equipment intended to make measurements for analysis in a laboratory or industrial setting.

2 Definitions

2.1 For the purpose of this Standard, the following definitions apply.

2.2 ACCESS PANEL – A panel or door that may be opened or removed to provide access to a portion of the meter interior.

2.3 ACCESSIBLE (part) – A meter part, conductive or non-conductive, which may be touched in normal use when the meter is installed as specified by the manufacturer, with the meter cover in place.

2.4 AUXILIARY (control) POWER SUPPLY – An electrical power supply of the meter, provided via dedicated terminal(s) in addition to the measurement terminals.

NOTE: The auxiliary power supply terminals of the meter are intended for connection to a power source separate from the measured circuit(s). For example, this type of power supply is used in applications where a meter is expected to operate when the measured circuits may be de-energized or function outside of the normal operating range of parameters (e.g. power quality monitoring).

2.5 AUXILIARY WIRING LEADS (of the meter) – Connections of meter communication ports, input/output ports, auxiliary power supply or other auxiliary ports provided on cables leaving the meter enclosure through an opening in the meter base.

2.6 BASE – The back portion of a meter that mates with the meter cover to form a complete enclosure, which supports the terminals, a hanger if provided, and provides support for sealing to the cover.

2.7 BOTTOM-CONNECTED METER (Type “A” meter or “A-BASE” meter) – A non-detachable meter that is connected using wiring terminals on the bottom of the meter.

2.8 CLEARANCE DISTANCE – The shortest distance in air between two conductive parts.

2.9 COVER – A lid or equipment covering used to protect the measurement components of a meter from external elements while allowing the viewing of the dials and nameplate information. A cover may contain other components which may be required for resetting demand and electronically reading the meter.

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NOTE: The use of the term "dials" throughout this Standard also includes electronic displays.

2.10 CREEPAGE DISTANCE – The shortest distance along the surface of a solid insulating material between two conductive parts.

2.11 DETACHABLE METER (Type “S” Meter) – A socket type meter, intended to plug into a meter socket or similar equipment.

2.12 ENCLOSURE – The exterior portion of a meter that prevents access to live parts when the meter is properly installed. For example, the enclosure of a typical Type S meter consists of the meter cover and the meter base.

2.13 GROUND TERMINAL (Functional Earth Terminal) – An equipment terminal connecting to earth ground. The ground terminal is not considered a mains terminal.

2.14 ISOLATED SECONDARY CIRCUIT – A circuit derived from an isolating source (such as a transformer, optical isolator, limiting impedance, electromechanical relay, or a battery) and having no other connection to the mains terminals. A ground terminal connection may be present.

2.15 MAINS – The electrical network supplying energy to the premises which consist of phase conductor(s) and neutral conductor(s). Neutral is considered a mains conductor.

2.16 MAINS CIRCUIT – Any circuit directly connected to the mains terminals. A circuit having direct connection to a neutral terminal is also considered a mains circuit.

2.17 MAINS TERMINALS – The equipment terminals used for connection to the mains which consist of potential (voltage) terminal(s), input current terminal(s), output current terminal(s) and neutral terminal(s). In some meter forms input current terminals also connect potential circuitry. Output current terminals may also connect to potential circuitry. Some meter forms do not have neutral terminals.

2.18 MATERIAL GROUPS – Related to the CTI performance level category values of insulating materials that are specified in Insulation coordination, CSA C22.2 No. 0.2, to be included in the group, as follows:

- a) I – $CTI \geq 600$ (PLC = 0)
- b) II – $400 \leq CTI < 600$ (PLC = 1)
- c) IIIa – $175 \leq CTI < 400$ (PLC = 2 or 3)
- d) IIIb – $100 \leq CTI < 175$ (PLC = 4)

NOTE: PLC stands for Performance Level Category, and CTI stands for Comparative Tracking Index.

2.19 METER – A device intended to measure electrical energy usage for billing. It may include energy consumption of individual loads and appliances.

2.20 MICRO-ENVIRONMENT – The conditions that immediately surround the clearance or creepage distance under consideration. It includes all factors influencing the insulation, such as climatic, electromagnetic, and generation of pollution.

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NOTE: The micro-environment of the creepage distance or clearance and not the general environment of the equipment determines the effect on the insulation. The micro-environment might be less severe or more severe than the general environment that the equipment is in.

2.21 NORMAL USE – Operation, including stand-by, according to the instructions for use or for the obvious intended purpose.

2.22 NOMINAL DISCHARGE CURRENT (I_n) – Peak value of the current, selected by the manufacturer, through the voltage-dependent resistor (VDR) having a current waveshape of 8/20 where the VDR remains functional after 15 surges. See also CSA C22.2 No. 269.5.

2.23 OPERATING TEMPERATURE RANGE – The temperature range specified by the manufacturer over which the meter will continue to function per the manufacturer's specifications.

2.24 POLLUTION DEGREES – Based on the presence of contaminants and possibility of condensation or moisture at the creepage distance and defined as follows:

- a) POLLUTION DEGREE 1 – No pollution or only dry, nonconductive pollution. The pollution has no influence.
- b) POLLUTION DEGREE 2 – Normally, only nonconductive pollution. However, a temporary conductivity caused by condensation may be expected.
- c) POLLUTION DEGREE 3 – Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation that is expected.
- d) POLLUTION DEGREE 4 – Pollution that generates persistent conductivity through conductive dust or rain and snow.

2.25 PRINTED WIRING BOARD – Printed Circuit Board.

2.26 RATED AMBIENT TEMPERATURE – The maximum temperature surrounding the meter at which the meter complies with all of the requirements of this Standard.

2.27 RATED VOLTAGE (of a meter) – The voltage provided by the manufacturer on the product nameplate excluding any additional tolerance.

2.28 RISK OF ELECTRIC SHOCK – A risk of electric shock is considered to exist at any accessible part if:

- a) The potential between the part and earth ground or any other accessible part is more than 30 V rms (42.4 V peak) or 60 V dc; and
- b) The continuous current flow through a 2000 Ω resistor connected across the potential exceeds 0.5 mA rms ac or 2 mA dc.

2.29 RISK OF FIRE – A risk of fire is considered to exist at any two points in a circuit where:

- a) The open circuit voltage is more than 30 Vrms (42.4 V peak) and the energy available to the circuit under any condition of load including short circuit, results in a current of 8 A or more after 1 minute of operation; or
- b) A power of more than 15 watts can be delivered into an external resistor connected between the two points.

2.30 SELF CONTAINED METER (directly connected meter) – A meter in which the terminals are arranged for connection to the circuit being measured without using external instrument transformers[§].

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2.31 SERVICE SWITCH – A device internal to the meter that is intended to energize or de-energize the load terminals of the meter.

2.32 SINGLE FAULT CONDITION – A condition in which one method for protection against a risk of fire or risk of electric shock is defective or one fault is present which could cause a risk of fire or risk of electric shock.

2.33 SOLID INSULATION – Solid non-conductive material interposed between two conductive parts.

NOTE: Solid insulation refers to many different types of construction, including monolithic blocks of insulating material and insulation subsystems composed of multiple insulating materials, organized in layers or otherwise.

2.34 TRANSFORMER RATED METER – A meter in which the terminals are arranged for connection to the circuit being measured using external instrument transformers. Instrument transformers may be required for the connection of meter's voltage measurement terminals, or current measurement terminals, or both[§].

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3 Units of Measurement

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

4 Components

4.1 A component of a product covered by this Standard shall:

- a) Comply with the requirements for that component as specified in this Standard;
- b) Be used in accordance with its rating(s) established for the intended conditions of use; and
- c) Be used within its established use limitations or conditions of acceptability.

4.2 A component of a product covered by this Standard is not required to comply with a specific component requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product;
- b) Is superseded by a requirement in this Standard; or
- c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.

4.3 Specific components are 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.

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4.4 Except as noted in 4.2(b), a component that is also intended to perform other functions such as overcurrent protection, ground-fault circuit-interruption, surge suppression, any other similar functions, or any combination thereof, shall comply additionally with the requirements of the applicable standard(s) that cover devices that provide those functions.

5 Normative References

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

5.2 Products covered by this Standard shall comply with the referenced installation codes and standards noted in this Section as appropriate for the country where the product is to be used. When the product is intended for use in more than one country, the product shall comply with the installation codes and standards for all countries where it is intended to be used.

ANSI C12.1, *Electric Meters Code for Electricity Metering*

ANSI C12.10, *Physical Aspects of Watthour Meters – Safety Standard*

ASTM D3195, *Standard Practice of Rotameter Calibration*

ASTM D5025, *Standard Specification for a Laboratory Burner Used for Small-Scale Burning Tests on Plastic Materials*

ASTM D5207, *Standard Practice for Confirmation of 20-mm (50-W) and 125-mm (500-W) Test Flames for Small-Scale Burning Tests on Plastic Materials*

CSA C22.1, *Canadian Electrical Code, Part I*

CAN/CSA-C22.2 No. 0, *General Requirements – Canadian Electrical Code, Part II*

CAN/CSA C22.2 No. 0.2, *Insulation Coordination*

CAN/CSA-C22.2 No. 0.17, *Evaluation of Properties of Polymeric Materials*

CSA C22.2 No. 14, *Industrial Control Equipment*

CAN/CSA C22.2 No. 94.1, *Enclosures for Electrical Equipment, Non-Environmental Considerations*

CAN/CSA C22.2 No. 94.2, *Enclosures for Electrical Equipment, Environmental Considerations*

CAN/CSA C22.2 No. 115, *Meter-Mounting Devices*

CSA C22.2 No. 269.5, *Surge protective devices – Type 5 – Components*

CAN/CSA E60384-14, *Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains*

CAN/CSA C22.2 No. 60950-1, *Information Technology Equipment – Safety – Part 1: General Requirements*

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IEC 60529, *Degrees of Protection Provided by Enclosures (IP Code)*

UL 1577, *Optical Isolators*

CONSTRUCTION

6 General

6.1 Other than as noted in 6.2, a detachable meter or bottom-connected meter shall be of one of the form designations and current classes described in ANSI C12.10 and shall comply with all the requirements of ANSI C12.10.

6.2 When intended for installation by a specific utility and when agreeable to all parties concerned, special form designations and current classes not listed in ANSI C12.10 are allowed. When special forms are utilized the meter shall:

- a) Be provided with a wiring diagram on a label affixed to the product;
- b) Be evaluated in combination with an appropriately rated mounting socket (if socket mounted); and
- c) Comply with all other requirements of ANSI C12.10.

6.3 Terminals shall be arranged to reduce the possibility of short circuits during meter connection, adjustment of the meter, or removal or replacement of the cover. The blades or terminals of a meter having a standard configuration as described in ANSI C12.10 are considered to meet this requirement.

6.4 Terminals for connection to isolated secondary circuits shall be located such that the wiring connected to these terminals may be reliably routed away from live parts of the mains circuit, such that the creepage distance and clearance distance requirements between mains and isolated secondary circuits are maintained.

6.5 Meters provided with auxiliary wiring leads for connection of isolated secondary circuits or auxiliary power supply shall comply with the following:

- a) Auxiliary wiring leads shall be insulated for the highest rated voltage of the meter, or shall be routed and secured away from live parts of the mains circuit internal to the meter, such that the creepage distance and clearance distance requirements between mains and isolated secondary circuits are maintained. When the insulation voltage rating of the auxiliary wiring leads is lower than the highest rated voltage of the meter, the creepage distance and clearance distance requirements shall be evaluated as if there were no insulation on the auxiliary wiring leads;
- b) Auxiliary wiring leads shall be protected against abrasion and sharp bends at the point where the conductors enter the meter and the meter-mounting equipment, by an inlet or bushing with a smoothly rounded opening;
- c) Auxiliary wiring leads shall be protected against being pushed into the meter enclosure through the auxiliary wiring leads opening when such displacement results in any of the following:
 - 1) Mechanical damage to the auxiliary wiring leads;
 - 2) Exposure of the auxiliary wiring leads to a temperature higher than that for which they are rated;
 - 3) Reduction of creepage or clearance distance (such as to a metal strain-relief clamp) below the minimum required values; or

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4) Damage to internal meter connections or components.

Compliance shall be determined by the Push Back Relief Test, Section [24](#).

6.6 Auxiliary wiring leads shall be secured to relieve the conductors from strain, including twisting, where they are connected within the meter. Knots in conductors shall not be used as strain relief. Compliance shall be determined by the Strain Relief Test, Section [23](#).

6.7 A meter may have provision for adjustments during use. Such adjustments shall be accessible without disassembly of the meter or removal of the cover.

6.8 Polymeric materials in contact with uninsulated live parts shall comply with Annex [B](#).

7 Enclosure

7.1 Meters shall comply with the performance requirements of IEC 60529 for the IP Codes designated in [Table 7.1](#) as demonstrated by the tests in enclosure tests, Section [21](#).

Table 7.1
IP Code Requirements

	Indoor only ^a	Outdoors ^b
IP Code	51	55
^a Protected against dust infiltration and dripping water.		
^b Protected against moderate volume hose directed water and dust infiltration.		

7.2 Meter enclosures incorporating polymeric materials shall comply with the requirements for polymeric materials in CAN/CSA-C22.2 No. 94.1. Additionally, if the meter is intended for outdoor use, polymeric materials used for the enclosure shall comply with the Weatherometer Test of CAN/CSA C22.2 No. 0.17.

7.3 A meter marked with additional enclosure type designations that are in addition to those in [Table 7.1](#) shall also comply with the performance requirements for those enclosure type designations.

7.4 If an enclosure has a door or access panel, a means for firmly securing it in place shall be provided.

7.5 If a protective ground terminal is provided, it shall comply with the requirements for grounding terminals in ANSI C12.10.

8 Clearance and Creepage Distances

8.1 A risk of electric shock shall not exist on any accessible parts of the meter both in normal use and in single fault conditions.

8.2 Data communication terminals such as KYZ, data I/O, terminals of serial communication ports, and ethernet ports, operating at voltages less than or equal to those given in [2.28\(a\)](#), shall be considered accessible parts for the purpose of determining the clearance and creepage distances.

8.3 Clearance and creepage distances may be made up of composite spacings that add up to meet the required dimensions. Conformity is checked by inspection and measurement or, in the case of clearance distances, by the requirements of CAN/CSA C22.2 No. 0.2.

8.4 Clearance and creepage distances in [Table 8.1](#) shall apply between (reference Safety Insulation 'SI' in [Figure 8.1](#) – [Figure 8.4](#)):

- a) Mains circuits and accessible parts – For non-conductive accessible parts, the clearance and creepage distances shall apply to any accessible surface of the part;
- b) Mains circuits and isolated secondary circuits;
- c) Different phases of the mains, including neutral; and
- d) Voltage and current terminals for meters where current terminals and voltage terminals are isolated, such as for transformer rated meters.

NOTE: Internal meter circuits are either mains circuits or isolated secondary circuits as described in the meter construction examples illustrated in [Figure 8.1](#) – [Figure 8.4](#).

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