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Crimp Tools for Use with Connecting Devices

June 24, 2024

Approved American National Standard

ANSI/UL 1976-2024

Standard for Safety for Crimp Tools for Use with Connecting Devices

First Edition, Dated June 24, 2024

Summary of Topics

This is the First Edition of Crimp Tools for Use with Connecting Devices, dated June 24, 2024

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Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as “CSA Group”) and ULSE Inc. (ULSE). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or ULSE at anytime. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and ULSE. CSA Group and ULSE will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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This Standard is subject to review within five years from the date of publication, and 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: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the First Edition. The most recent designation of ANSI/UL 1976 as an American National Standard (ANSI) occurred on June 24, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

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Preface

This is the harmonized CSA Group and ULSE standard for Crimp Tools for Use with Connecting Devices. It is the first edition of CSA C22.2 No. 352 and the first edition of UL 1976.

This harmonized standard was prepared by CSA Group and ULSE. The efforts and support of the Technical Harmonization Subcommittee, CANENA Technical Harmonization Committee 99 – Electrical Connectors of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA), are gratefully acknowledged.

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

This standard was reviewed by the CSA Integrated Committee on Electrical Connectors, under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Steering Committee on requirements for electrical safety, and has been formally approved by the CSA Technical Committee. This standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: 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.

Level of harmonization

This standard is published as an equivalent standard for CSA Group and ULSE.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Reasons for differences from IEC

The THC investigated and found no existing IEC standards or work programs covering the scope of the products in this Standard.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

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CRIMP TOOLS FOR USE WITH CONNECTING DEVICES

1 Scope

1.1 These requirements cover Original Equipment Manufacturer (OEM) and non-OEM crimp tools that have been evaluated for use with the following types of specified connecting devices:

a) Grounding and bonding equipment;

b) Electrical quick-connect terminals;

c) Wire connectors;

d) Wire-connector adapters;

e) Ferrules; and

f) Lightning protection components.

These crimp tools are intended for use in accordance with the Canadian Electrical Code, Part I, C22.1, in Canada, and the National Electrical Code, NFPA 70, in the United States of America.

1.2 These specified connecting devices comply with the requirements in:

a) The Standard for Grounding and Bonding Equipment, CSA C22.2 No. 41/UL 467;

b) The Standard for Electrical Quick-Connect Terminals, CSA C22.2 No. 153/UL 310;

c) The Standard for Wire Connectors, CSA C22.2 No. 65/UL 486A-486B;

d) The Standard for Splicing Wire Connectors, CSA C22.2 No. 188/UL 486C;

e) The Standard for Bare and Covered Ferrules, CSA C22.2 No. 291/UL 486F; or

f) The Standard of Lightning Projection Components, UL 96.

1.3 Crimp tools covered by this Standard are:

a) Investigated to all ratings and uses identified by the OEM of the specific connecting device; and

NOTE: Variances to the identified ratings (such as voltage rating, conductor stranding type or conductor range (AWG)) or uses of the connecting device are not covered by the scope of this Standard.

b) Limited for use with connecting devices where the ratings noted in (a) have been validated by the same accredited testing and certification laboratory evaluating the crimp tool for compliance with this Standard.

1.4 In Canada, general requirements applicable to this standard are given in CSA C22.2 No. 0.

2 Reference Publications

2.1 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.

2.2 The following publications are referenced in this Standard:

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

CSA C22.2 No. 0.15, *Adhesive Labels*

CSA C22.1, *Canadian Electrical Code, Part I (CE Code)*

CSA C22.2 No. 41, *Grounding and Bonding Equipment*

CSA C22.2 No. 65, *Wire Connectors*

CSA C22.2 No. 153, *Electrical Quick-Connect Terminals*

CSA C22.2 No. 188, *Splicing Wire Connectors*

CSA C22.2 No. 291, *Bare and Covered Ferrules*

IEEE 837, *Qualifying Permanent Connections Use in Substation Grounding*

NFPA 70, *National Electrical Code (NEC)*

UL 96, *Lightning Protection Components*

UL 310, *Electrical Quick-Connect Terminals*

UL 467, *Grounding and Bonding Equipment*

UL 486A-486B, *Wire Connectors*

UL 486C, *Splicing Wire Connectors*

UL 486F, *Bare and Covered Ferrules*

UL 969, *Marking and Labeling Systems*

3 Glossary

3.1 For the purpose of this Standard the following definitions apply.

3.2 CRIMP – The deformation of a connecting device in order to join a connecting device to the conductor using a special tool.

3.3 CRIMP FORCE – Crimping Pressure x Surface area of Crimp Profile.

Note: May be referred to as Tonnage.

3.4 CRIMP TOOL – A device that applies the crimp.

3.5 CROSS-MEDIA – The technology that supports electronic labeling. Examples include:

a) BARCODE – A method of representing data in a one-dimensional visual, machine-readable form;

b) NEAR FIELD COMMUNICATIONS (NFC) – A set of communication protocols that enables communication between two electronic devices over a distance of 4 cm (1.5 in) or less;

c) QUICK RESPONSE (QR) CODE – A type of matrix barcode (or two-dimensional barcode) provided with a machine-readable optical label that can contain information about the item to which it is attached;

d) QR CODE NOTES – Readable text that is embedded within a QR code; and

e) UNIFORM RESOURCE LOCATOR (URL) – A reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it.

3.6 DIE INSERTS (DIE) – The removable part of a crimping tool that determines the crimp profile on the connector.

3.7 DIELESS TOOL – The tool employing variable crimping shapes and/or forces to complete the compression operation without the use of die inserts.

3.8 FIXED DIE TOOL – The crimp profile is integral to the tool and is not user-determined.

3.9 NON-OEM – A manufacturer other than the OEM.

3.10 OEM – Original equipment manufacturer of the connectors.

3.11 SPECIFIED CONNECTING DEVICE – The connecting device with which a crimp tool is intended to be used. This connecting device is identified by the crimp tool manufacturer. The connecting device may be intended for grounding and bonding equipment, electrical quick-connect terminals, wire connectors, wire-connector adapters, ferrules, or lightning protection components.

4 Units of Measurement

4.1 The values given in SI (metric) units shall be normative, except for AWG/kcmil conductor sizes. Any other values are for information purposes only.

5 Symbols and Abbreviations

5.1 AWG – American Wire Gage/gauge

5.2 kcmil – Thousand circular mil

5.3 m – Meter

6 Construction Requirements

6.1 Non-OEM crimp tools shall be evaluated for all ratings (including conductor classes) and uses identified by the OEM of the connecting device, and limited for use with connecting devices where the ratings have been validated by the same laboratory evaluating the crimp tool for compliance with the requirements of this standard. Variances to the identified ratings, such as voltage rating, conductor stranding type or conductor range (AWG), uses of the connecting device, or applications to different standards shall not be permitted.

6.2 Non-OEM crimp tools shall use OEM die inserts, exert the equivalent crimp force, and follow instructions specified by the OEM, unless evaluated in accordance with 7.1.2.

6.3 Non-OEM crimp tools that meet the following requirements shall be additionally tested in accordance with 7.1.2:

a) Specify OEM die inserts, but do not exert the equivalent crimp force and follow OEM instructions; or

b) Do not use OEM die inserts (e.g., Non-OEM crimp tools with non-OEM die inserts, Non-OEM fixed die tools, and Non-OEM dieless tool).

7 Test Requirements

7.1 General

7.1.1 As a result of the tests, there shall be no breakage of the conductor or any strand of a stranded conductor, stripping of threads, shearing of parts, tearing, or other damage to the connector unless specifically permitted in the requirements referenced for the specific application.

7.1.2 Non-OEM crimp tool manufacturers may specify installation with non-OEM crimp tools in accordance with the provisions in 6.3 if the assembled connection with the non-OEM crimp tool specifications has an average force required to pull the wire from the connector that is equal to (with a tolerance of minus 5%) or greater than the average force required to pull the same type wire from the connector when terminated using the OEM-specified crimp tool specifications. Testing shall be conducted in accordance with 9.2.

7.2 Grounding and bonding equipment

7.2.1 Each specified connecting device intended for use with grounding and bonding equipment shall comply with the requirements specified in 7.2.2.

7.2.2 The crimp tool shall be used to assemble the specified connecting device in the intended manner to the recommended size, strip length, and type of wire (class and material) in accordance with CSA C22.2 No. 65/UL 486A-486B; or CSA C22.2 No. 188/UL 486C. Family considerations contained in these Standards may be applied. The assembled connector shall then be subjected to the:

a) Mechanical sequence as specified in CSA C22.2 No. 65/UL 486A-486B; or CSA C22.2 No. 188/UL 486C; and

b) Short-time current as specified in CSA C22.2 No. 41/UL 467.

7.3 Electrical quick-connect terminals

7.3.1 Each specified connecting device shall comply with the requirements in CSA C22.2 No. 153/UL 310, when tested in accordance with 7.3.2.

7.3.2 The crimp tool shall be used to assemble the specified connecting device in the intended manner to the recommended size, strip length, and type of wire (class and material) in accordance with CSA C22.2 No. 153/UL 310. Family considerations contained in this Standard may be applied. The assembled connector shall then be subjected to the:

a) Crimp pull-out test;

b) Temperature test and current cycling tests; and

c) Dielectric withstand test.