

## STANDARD INFORMATION

**Standard:** UL 2251 / CSA C22.2 No. 282

**Standard ID:**

Plugs, Receptacles, and Couplers for Electric Vehicles [UL 2251:2017 Ed.4+R:15Dec2022]

Plugs, Receptacles, and Couplers for Electric Vehicles [CSA C22.2#282:2017 Ed.2+U1]

**Previous Standard ID:**

Plugs, Receptacles, And Couplers For Electric Vehicles [UL 2251:2017 Ed.4]

Plugs, Receptacles, and Couplers for Electric Vehicles [CSA C22.2#282:2017 Ed.2]

## EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

**Effective Date:** **March 1, 2025**

## IMPACT, OVERVIEW, AND ACTION REQUIRED

**Impact Statement:** Per our accreditation, Intertek is required to review reports against the standard revisions to confirm compliance. Once compliance is confirmed, the standard reference in the report is updated to show continued compliance to the technical requirements of the standard. Reports not updated to this version by the effective date above will be withdrawn.

**Overview of Changes:**

- Addition of option for active cooling and dynamic control of output current
- Harmonization with the IEC thermal cycling tests
- Revision to the overload test

Specific details of new/ revised requirements are found in table below

***Current Listings Not Active? – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records. We will do this at no charge as long as Intertek is notified in writing prior to the review of your reports.***



## STANDARD INFORMATION

| CLAUSE | VERDICT | COMMENT  |
|--------|---------|--|
|        |         | <i>Additions to existing requirements are <u>underlined</u> and deletions are shown <del>lined-out</del> below.</i>  |
|        | Info    | <b>CONSTRUCTION</b>  |
| 6      | Info    | <b>General</b>   |
| 6.1    |         | <p>The ratings mentioned throughout this Standard represent maximum ampacity and voltage for a device <u>under its conditions of expected use. Expected use considered the operational mode for which it is specified by manufacturer. This may include continuous use with no added features for control, active cooling as described in 6.2, or dynamic control as described in 6.3. A device is considered to be intended for use on alternating or direct current as indicated in its marked rating. See 56.5.</u></p>   |
|        |         | <b><i>New clause added;</i></b>  |
| 6.2    |         | <p>Active cooling is an operational mode in which a liquid is used to cool the cable and contacts during use while a maximum current is passed through the device, with that maximum current being in excess of the device rating. A device intended for use in a charging system that incorporates active cooling shall be provided with a means to monitor the temperature of each DC power contact, both DC+ and DC-. The leads from this monitoring means shall be passed through the cable and be available to the charger manufacturer. The device shall be provided with a non-cooled current rating, which is the rating of the maximum current in the non-cooled operation mode as assigned by the manufacturer. This rating will correlate to the sizing of the conductors in the cable.</p>   |
|        |         | <b><i>New clause added;</i></b>  |
| 6.3    |         | <p>Dynamic current control is an operational mode in which the charger actively controls the output current of the charger. In this mode, a maximum current in excess of the device ratings is passed through the device. As temperatures on the contacts approach the maximum limit, the charger reduces the output current to maintain contact temperatures below the limit. A device intended for use in a charging system with dynamic current control shall be provided with a means to monitor the temperature of each DC power contact, both DC+ and DC-. The leads from this monitoring means shall be passed through the cable and be available to the charger manufacturer. The device shall be provided with a non-cooled current rating, which is the rating of the maximum current in the non-cooled operation mode as assigned by the manufacturer. This rating will correlate to the sizing of the conductors in the cable.</p> |



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|        |         | <b><i>New clause added;</i></b>   |
| 6.4    |         | The devices in all cases will be tested as the maximum normal current rating as assigned by the manufacturer during testing to this standard. Current ratings associated with active cooling cannot be tested as part of the device as the controls are associated with the charging system. Ratings associated with dynamic current control shall be tested based on a manufacturer's rated duty cycle indicating the time at high current and the time off (or at maximum normal current).  |
| 18     | Info    | <b>Contacts</b>   |
|        |         | <b><i>New clause added;</i></b>   |
| 18.3   |         | Contacts shall be designed such that they exert adequate contact pressure when completely engaged with the corresponding accessory. Contacts are subjected to the Temperature rise test, Section 45, the Thermal cycling test, Section 54A, the Misalignment test, Section 54C, and by the applicable Endurance test in Section 41 or 42.   |
|        |         | <b><i>New clause added;</i></b>   |
| 18.4   |         | The contacts shall be plated with silver or a silver alloy and shall have a minimum thickness of 5 µm. The plating shall be measured in accordance with Annex B of ISO 4521. For any contacts that are not provided with silver or silver alloy, or are not provided with a silver or silver alloy plating at minimum 5 µm thickness, the device shall be subjected to the Humidity exposure test, Section 54B, and the Contact endurance test, Section 54D.  |
| 43     | Info    | <b>Overload Test</b>  |
|        |         | <b><i>New clause added;</i></b>   |
| 43.4A  |         | DC rated devices, and the DC power contacts portion of an AC/DC rated device, are not required to be subjected to this test.  |
|        |         | <b><i>New clause added;</i></b>   |
| 43.5A  |         | An additional material that is provided with the intent to reduce or confine the arcing in the contact chamber of a device and that decomposes or is otherwise affected by the arcing shall be removed for all of the overload tests.   |
| 45     | Info    | <b>Temperature Rise Test</b>  |
| 45.2   |         | The temperature rise of each of three devices measured at the points described in 45.3 shall not exceed the limits for <u>maximum temperature rise applicable for the cable temperature ratings</u> in Table 45.2 when the device is carrying its maximum rated current. The maximum rated current is defined by the manufacturer. <del>The maximum rated current for factory assemblies is in accordance with end product standards.</del> <u>For devices that are intended to be provided in a charging system with dynamic current control, the manufacturer's specified duty cycle shall be implemented for this test, including all rise and fall times, current levels and durations.</u> |



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| Table 45.1 |         | <p><i>Table 45.1 has been modified to show maximum temperature instead of maximum temperature rise.</i></p> <p>See standard for details.</p>  |
| 45.3       |         | <p>The temperatures shall be monitored on the components or locations indicated in Table 45.2 and the maximum temperature observed shall not exceed the indicated limits <u>under any features of control identified in Section 6. Temperature rise shall be measured at the points T1, T2, and T3 as shown in Figure 45.1. The surrounding components or enclosing parts may be modified in order to provide access to the measuring point locations. Alternatively, the manufacturer may submit samples that are preassembled with thermocouples. If other components exist in the connector, and those components have temperature ratings, then they shall also be monitored to ensure that those temperature ratings are not exceeded.</u></p> |
|            |         | <p><b><i>New section added;</i></b></p> <p><b>Thermal Cycling</b></p>   |
| 54A        |         | <p>Devices shall be constructed such that relaxation of the electrical contact pressure and terminations do not result in excessive increases in temperature. The following test sequence in 54A.2 – 54A.4 shall be performed on a new set of three samples.</p> <p>See standard for details.</p>   |
|            |         | <p><b><i>New section added;</i></b></p> <p><b>Humidity Exposure</b></p>   |
| 54B        |         | <p>Devices shall be constructed such that oxidation of contact surfaces does not result in excessive increases in temperature. The following test sequence in 54B.2 – 54B.4 shall be performed on a new set of three samples.</p> <p>See standard for details.</p>  |
|            |         | <p><b><i>New section added;</i></b></p> <p><b>Misalignment</b></p>  |
| 54C        |         | <p>Devices shall be constructed such that mechanical degradation of electrical contacts that results in excessive increases in temperature does not occur when the device is subjected to mechanical loads. The following test sequence in 54C.2 – 54C.4 shall be performed on a new set of three samples.</p> <p>See standard for details.</p>   |



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|        |         | <b><i>New section added;</i></b>   |
|        |         | <b>Contact Endurance</b>   |
| 54D    |         | Mating parts that do not employ contacts plated with silver or silver alloy shall be subjected to this test. Devices are considered to comply if:<br><br>See standard for details.   |
|        | Info    | <b>MARKINGS</b>  |
| 56     | Info    | <b>General</b>   |
| 56.1   | Info    | <b>Company name, catalog designation, electrical rating</b>  |
|        |         | A device shall be legibly and permanently marked, where readily visible after installation, with:  |
| 56.1.1 |         | c) The electrical rating in both volts and amperes. <u>The current rating is the maximum normal current rating. For products with active cooling or dynamic current control, the corresponding cooled or upper current levels, along with any other specifications, duty cycles, and the like, shall be included in the specification sheet for the product and provided with each device;</u> |
|        |         | g) Ambient temperature rating, if higher than 40°C (104°F). <u>Each ambient temperature above 40°C (104°F) shall be declared by the manufacturer in 5°C (9°F) increments;</u>  |