UL 2252

Outline of Investigation for Adapters for use with Electric Vehicle Couplers

Issue Number: 1

July 28, 2023

Summary of Topics

This first issue of the Outline of Investigation for Adapters for use with Electric Vehicle Couplers, UL 2252, dated July 28, 2023, covers adapters for conductive EV power transfer.

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INTRODUCTION

1 Scope

1.1 This outline covers adapters for conductive EV power transfer to the vehicle. The adapters are not used to convert voltages. These adapters are only used to convert the physical configuration of the interfaces and provide for continued communication protocols. The adapters covered by this outline are detailed in 1.2.

1.2 Adapters covered by this outline include:

a) Adapters converting from one configuration to another where the communication protocol is the same between the infrastructure and the electric vehicle and additional functions may be provided;

b) Adapters converting from one configuration to another where the communication protocol is different between the infrastructure and the vehicle and the adapter provides a translation function and additional functions may be provided; and

c) Adapters that do not convert the configuration but provide additional functions that the infrastructure does not provide.

1.3 This outline does not cover adapters that are used for any other purpose than as defined in 1.1 and 1.2. Adapters for use in power export from the vehicle are not included in the purposes defined in 1.1 and 1.2.

1.4 In relation to 1.2(b), the translation function for the communication protocol is not covered by this outline.

1.5 This outline does not cover Vehicle Connectors or Vehicle Inlets which are covered under UL 2251, the Standard for Plugs, Receptacles, and Couplers for Electric Vehicles.

2 Components

2.1 A component of a product covered by this Outline shall:

a) Comply with the requirements for that component as specified in this Outline;

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.

2.2 A component of a product covered by this Outline 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b) Is superseded by a requirement in this Outline; or

c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.

2.3 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.

2.4 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 outline(s) that cover devices that provide those functions.

3 Units of Measurement

3.1 The values given in SI (metric) units shall be normative. Any other values given shall be for information purposes only.

4 Referenced Publications

4.1 Where reference is made to any standards, such reference shall be considered to refer to the latest editions and revisions thereto available at the time of printing, unless otherwise specified.

4.2 Products covered by this outline shall comply with the referenced installation codes and standards noted below as appropriate.

ASTM Standards

ASTM D412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension*

IEC Standards

IEC 61508-1, *Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems – Part 1: General Requirements*

IEC 62196-2, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 2: Dimensional compatibility requirements for AC pin and contact-tube accessories*

IEC 62196-3, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 3: Dimensional compatibility requirements for DC and AC/DC pin and contact-tube vehicle couplers*

IEC TS 62196-3-1, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 3-1: Vehicle connector, vehicle inlet and cable assembly for DC charging intended to be used with a thermal management system*

IEEE Standards

IEEE C37.09, *Test Procedures for AC High-Voltage Circuit Breakers with Rated Maximum Voltage Above 1000 V*

ISO Standards

ISO 13849-1, *Safety of Machinery – Safety-Related Parts of Control Systems – Part 1: General Principles for Design*

ISO 13849-2, *Safety of Machinery – Safety-Related Parts of Control Systems – Part 2: Validation*

ISO 26262, *Road Vehicles – Functional Safety*

ISO 4521, *Metallic and other inorganic coatings – Electrodeposited silver and silver alloy coatings for engineering purposes – Specification and test methods*

NEMA Standards

NEMA ICS 2, *Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts*

NFPA Standards

NFPA 70, *National Electrical Code*

SAE Standards

SAE J1772 ™, *SAE Electric Vehicle and Plug-In Hybrid Electric Vehicle Conductive Charge Coupler*

UL Standards

UL 50E, *Enclosures for Electrical Equipment, Environmental Considerations*

UL 94, *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*

UL 486E, *Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors*

UL 508, *Industrial Control Equipment*

UL 746A, *Polymeric Materials – Short Term Property Evaluations*

UL 746B, *Polymeric Materials – Long Term Property Evaluations*

UL 746C, *Polymeric Materials – Use in Electrical Equipment Evaluations*

UL 840, *Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment*

UL 969, *Marking and Labeling Systems*

UL 969A, *Marking and Labeling Systems – Flag Labels, Flag Tags, Wrap-Around Labels and Related Products*

UL 991, *Tests for Safety-Related Controls Employing Solid-State Devices*

UL 1998, *Software in Programmable Components*

UL 2202, *DC Charging Equipment for Electric Vehicles*

UL 2251, *Plugs, Receptacles, and Couplers for Electric Vehicles*

UL 2263, *Electric Vehicle Cable*

UL 2594, *Electric Vehicle Supply Equipment*

5 Glossary

5.1 INFRASTRUCTURE INTERFACE – The portion of the adapter that mates with the vehicle connector.

5.2 VEHICLE INTERFACE – The portion of the adapter that mates with the vehicle inlet.

CONSTRUCTION

6 General

6.1 Adapters shall be so constructed as to meet all requirements of this outline. All adapters shall be subjected to the applicable tests in this outline based on the configurations included and the intended functionality. All adapters are complete products and shall not require wiring, or any other modification, in the field.

6.2 This outline addresses adapters that contain the following configurations:

a) Type 1 – As described in SAE J1772 and IEC 62196-2;
b) Type 2 – As described in IEC 62196-2;
c) North American Charging Standard (NACS) – As described in the Technical Specification designated TS-0023666 from Tesla;
d) CHAdeMO – Configuration AA as described in IEC 62196-3;
e) CCS1 – Configuration EE as described in IEC 62196-3;
f) CCS2 – Configuration FF as described in IEC 62196-3; and