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Conductive charging of electric vehicles - Contact interface for automated connection device (ACD)

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Conductive charging of electric vehicles - Contact interface for automated connection device (ACD)

FOREWORD

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IEC 63407 has been prepared by subcommittee 23H: Plugs, socket-outlets and couplers for industrial and similar applications, and for electric vehicles, of IEC technical committee 23: Electrical accessories. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
23H/614/FDIS	23H/624/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

The electrical interface for charging electrically propelled vehicles with plugs, socket-outlets, vehicle connectors and vehicle inlets is described in the IEC 62196 series and in IEC 61851-23. For heavier vehicles such as buses and trucks, requirements of short charging times with high energy present a problem of handling, and safety with hand-held connecting devices. For these high current charging applications, an automated connection device (ACD) is of interest.

An automatic coupler consists of a mobile assembly with electrical contacts, called "ACD", and fixed electrical contacts, called "ACD counterpart". Automatic couplers allow an unmanned connection of high-current, signal, and control contacts.

This document contains requirements for all type of ACDs. Annex A, Annex B, Annex C and Annex D describe specific implementations and specific requirements.

1 Scope

This document is applicable to automatic couplers, consisting of an automated connection device (ACD) and an ACD counterpart, of standardized configuration, intended for use in electric vehicle conductive charging systems which incorporate control means, with rated operating voltage up to 1 500 V DC. This document applies to high power DC interfaces intended for use in isolated conductive charging systems, for circuits specified in IEC 61851-23-1.

The requirements of this document apply only to automatic couplers defined in Annex A, Annex B, Annex C and Annex D of this document.

The ACDs covered by this document are used only in charging mode 4, according to case D (IEC 61851-23-1:2026, 3.1.201) or case E (IEC 61851-23-1:2026, 3.1.202).

This document describes the requirements for automatic couplers in regard of safety, function and testing. This document describes basic parameters that can be standardized for different automatic couplers. Automatic couplers following these standardized parameters will have the benefit of being compatible, even if they are based on different technologies.

This document does not apply to solutions based on a vehicle connector described in IEC 62196-3 or in IEC TS 63379 driven by an automatic mechanism, as, for instance, a robotic arm.

This document does not apply to ACD systems described in IEC TS 61851-26.

This document does not cover all safety aspects related to maintenance.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-11:2021, *Environmental testing - Part 2-11: Tests - Test Ka: Salt mist*

IEC 60309-1:2021, *Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes - Part 1: General requirements*

IEC 60364-5-54:2011, *Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements and protective conductors*

IEC 60512-2-2:2003, *Connectors for electronic equipment - Tests and measurements - Part 2-2: Electrical continuity and contact resistance tests - Test 2b: Contact resistance - Specified test current method*

IEC 60512-5-1:2002, *Connectors for electronic equipment - Tests and measurements - Part 5-1: Current-carrying capacity tests - Test 5a: Temperature rise*

IEC 60512-5-2:2002, *Connectors for electronic equipment - Tests and measurements - Part 5-2: Current-carrying capacity tests - Test 5b: Current-temperature derating*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 61851-1:2017, *Electric vehicle conductive charging system - Part 1: General requirements*

IEC 61851-23-1:2026, *Electric vehicle conductive charging system - Part 23-1: DC electric vehicle supply equipment - Automated connection device*

IEC 61984:2008, *Connectors - Safety requirements and tests*

IEC 62477-1:2022*, Safety requirements for power electronic converter systems and equipment - Part 1: General*

IEC 62497-1:2010*, Railway applications - Insulation coordination - Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment*
IEC 62497-1:2010/AMD1:2013

ISO 5474-3:2024, *Electrically propelled road vehicles - Functional and safety requirements for power transfer between vehicle and external electric circuit - Part 3: DC power transfer*

EN 1652:1998, *Copper and copper alloys - Plate, sheet, strip and circles for general purposes*

EN 12163:2024, *Copper and copper alloys - Rod for general purposes*

EN 12167:2024, *Copper and copper alloys - Profiles and bars for general purposes*

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IEC 60309 (all parts), *Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes*

IEC 61439-1:2020, *Low-voltage switchgear and controlgear assemblies - Part 1: General rules*

IEC 61851-23, *Electric vehicle conductive charging system - Part 23: DC electric vehicle supply equipment*

IEC TS 61851-26:2025, *Electric vehicle conductive charging system - Part 26: EV supply equipment with automatic docking of a vehicle coupler located at the underbody of an electric vehicle*

IEC 62196 (all parts), *Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles*

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 63379, *Plugs, socket-outlets, vehicle connectors and vehicle inlets - conductive charging of electric vehicles - Vehicle connector, vehicle inlet and cable assembly for Megawatt DC charging*

ISO 8855:2011, *Road vehicles - Vehicle dynamics and road-holding ability - Vocabulary*

ISO 13849-1:2023, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design*

ISO 15118 (all parts), *Road vehicles - Vehicle to grid communication interface*

ISO 17409:2015, *Electrically propelled road vehicles - Connection to an external electric power supply - Safety requirements*[2]

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[2] This publication has been withdrawn.