

ISO/TC 22/SC 37

Secretariat: DIN

Voting begins on:  
2023-03-06

Voting terminates on:  
2023-05-01

---

---

## Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer —

### Part 5: Automated conductive power transfer

*Véhicules routiers à propulsion électrique - Exigences fonctionnelles et  
exigences de sécurité pour le transfert de puissance —*

*Partie 5: Transfert d'énergie par conduction automatisé*

[ISO/DTS 5474-5](https://standards.iteh.ai/catalog/standards/sist/541af027-4c94-4171-92b5-b9621306e2fb/iso-dts-5474-5)

[https://standards.iteh.ai/catalog/standards/sist/541af027-4c94-4171-92b5-  
b9621306e2fb/iso-dts-5474-5](https://standards.iteh.ai/catalog/standards/sist/541af027-4c94-4171-92b5-b9621306e2fb/iso-dts-5474-5)

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.



Reference number  
ISO/DTS 5474-5:2023(E)

# iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO/DTS 5474-5

<https://standards.iteh.ai/catalog/standards/sist/541af027-4c94-4171-92b5-b9621306e2fb/iso-dts-5474-5>



## **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>2</b>
<b>3 Terms and definitions</b> .....	<b>2</b>
<b>4 System architecture</b> .....	<b>5</b>
4.1 General.....	5
4.2 Compatibility of EV with ACD offboard subsystem.....	6
<b>5 Environmental and operational conditions</b> .....	<b>6</b>
<b>6 General safety requirements</b> .....	<b>6</b>
6.1 General.....	6
6.2 Disconnection requirements.....	6
6.2.1 Manipulator on EVSE side (case D):.....	6
6.2.2 Manipulator on EV side (case E).....	6
6.3 Protection against mechanically caused injury.....	6
<b>7 Functional requirements</b> .....	<b>7</b>
7.1 Vehicle localization.....	7
7.2 Vehicle coupler localization and positioning.....	7
7.3 Manipulator requirements.....	7
7.3.1 Manipulator requirements for case D systems.....	7
7.3.2 Manipulator requirements for case E systems.....	7
7.3.3 Manipulator timing consideration.....	8
7.4 Mating space and clearance space.....	8
7.4.1 General.....	8
7.4.2 Clearance space dimensions.....	8
7.5 ACD operation process and communication.....	8
7.6 Mechanical operational requirements.....	8
7.6.1 Mounting position.....	8
7.6.2 Geometrical requirements.....	8
7.6.3 Connection force.....	9
7.6.4 Movement/displacement of immobilized vehicle.....	9
7.6.5 Disconnection and manipulator operation in case of failure of automatic disconnection.....	10
<b>8 Additional requirements for reverse power transfer</b> .....	<b>10</b>
<b>9 Owner's manual and markings and instructions</b> .....	<b>10</b>
<b>10 Test procedure</b> .....	<b>10</b>
<b>Bibliography</b> .....	<b>11</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 37, *Electrically propelled vehicles*.

A list of all parts in the ISO 5474 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

This document specifies requirements for the onboard side of an automated connection system to charge electric vehicles. It gives guidance in terms of safety and compatibility with offboard sides.

Technological maturity:

It is pointed out, this document has been established in parallel to the technological development of automated connection systems. Due to the fact that the experience with the technology is very limited, the requirements given in this document do not comprehensively cover all aspects/requirements for an interoperable operation at this stage. Current and future product developments will continuously prove, disprove and refine the requirements of this document.

Furthermore, it is worthwhile to mention that at the date of publication of this document no standard for a vehicle coupler of category 3 (at the underbody of the vehicle) is available.

Relation to other parts of ISO 5474-series

There is no direct relation of content or structure of this document to any other part of the ISO 5474-series (including part 1). Wherever needed, other parts of the series are specifically referenced.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

[ISO/DTS 5474-5](https://standards.iteh.ai/catalog/standards/sist/541af027-4c94-4171-92b5-b9621306e2fb/iso-dts-5474-5)

<https://standards.iteh.ai/catalog/standards/sist/541af027-4c94-4171-92b5-b9621306e2fb/iso-dts-5474-5>



# Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer —

## Part 5: Automated conductive power transfer

### 1 Scope

This document defines requirements for automated connection for conductive alternative current (AC) and/or direct current (DC) power transfer between electrically propelled road vehicles (EVs) and external electric circuits. This document addresses the following aspects of the automated connection device (ACD) onboard subsystem:

- electrical and mechanical safety requirements;
- interoperability requirements;
- environmental conditions;
- vehicle position requirements;
- requirements for localization of vehicle coupler (case D), and plug and socket-outlet (case E) location requirements of onboard part of the automated vehicle coupler;
- functionality requirements;
- test procedures.

This document applies to:

- EVs supporting automated connection of a vehicle inlet (case D) according to IEC 62196-2, IEC 62196-3, IEC TS 62196-3-1 or IEC TS 63379 (category 1) and
- EVs supporting automated connection of a vehicle inlet (case D) or plug (case E) of category 3 (typically at the underbody of the vehicle). This does not include automated connection of vehicle inlets or plugs of category 1 and category 2, that can also be mounted at the underbody of the vehicle.

Requirements for EVs equipped with an ACD or ACD counterpart of category 2 are specified in EN 50696.

Requirements for simultaneous operation of multiple power transfer interfaces is under consideration and not covered in this document.

NOTE 1 Requirements for ACD infrastructure, communication sequence and communication interface are specified in IEC 61851-23-1, IEC TS 61851-26 and IEC TS 61851-27.

NOTE 2 EMC requirements for vehicles conductively connected to the supply network are defined in IEC 61851-21-1.

## 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.

ISO 5474-1,<sup>1)</sup> *Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer — Part 1: General requirements for conductive power transfer*

ISO 5474-2,<sup>2)</sup> *Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer — Part 2: AC power transfer*

ISO 5474-3,<sup>3)</sup> *Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer — Part 3: DC power transfer*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5474-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

**3.1**  
**ACD control communication**  
communication session established between the *automated connection device (ACD)* (3.6) offboard subsystem and onboard subsystem, used for coupler positioning control

**3.2**  
**ACD ground clearance**  
vertical distance between the ground surface and the lowest point of the onboard *automated connection device (ACD)* (3.6) subsystem including the housing.

Note 1 to entry: The lower surface does not need to be planar or parallel to the ground surface.

**3.3**  
**ACD offboard subsystem**  
device installed in the *automated connection device (ACD)* (3.6) station and used in combination with an *ACD onboard subsystem* (3.4) to make and break the physical connection between an electrical vehicle (EV) supply equipment and the vehicle

**3.4**  
**ACD onboard subsystem**  
device installed in a vehicle and used in combination with an *automated connection device (ACD)* (3.6) offboard subsystem to automatically make and break the physical connection between an electric vehicle (EV) supply equipment and the vehicle

Note 1 to entry: An ACD onboard subsystem can feature movable parts for mating support in addition to the *manipulator* (3.13) of the ACD.

Note 2 to entry: An ACD onboard subsystem can feature mechanical means for locking and unlocking the ACD.

- 
- 1) Under preparation. Stage at the time of publication: ISO/DIS 5474-1:2023.
  - 2) Under preparation. Stage at the time of publication: ISO/DIS 5474-2:2023.
  - 3) Under preparation. Stage at the time of publication: ISO/DIS 5474-3:2023.



**3.5****ACD station**

electric vehicle (EV) supply equipment with automatic charging function

**3.6****ACD****automated connection device**

active device where the physical connection between an electric vehicle (EV) supply equipment and vehicle is made without user interaction providing an electromechanical interface

[SOURCE: IEC 61851-23-1:—<sup>4</sup>), 3.1.203]

**3.7****case D**

connection of an electric vehicle (EV) to an EV supply equipment utilizing a *manipulator* (3.13) permanently attached to the EV supply equipment

Note 1 to entry: A manipulator can be:

- ground (in-ground or on-ground) mounted;
- wall mounted;
- above-roof mounted.

Note 2 to entry: A vehicle connector is operated by the manipulator, the vehicle inlet is permanently attached to the EV.

Note 3 to entry: The cable assembly is part of the EV supply equipment and integral part of the manipulator.

**3.8****case E**

connection of an electric vehicle (EV) to an EV supply equipment utilizing a *manipulator* (3.13) permanently attached to the EV

Note 1 to entry: A manipulator can be:

- under-body mounted;
- side (front, rear or side) mounted;
- on/in-roof mounted.

Note 2 to entry: A vehicle inlet is operated by the manipulator, the vehicle connector is permanently attached to the EV supply equipment.

Note 3 to entry: The cable assembly is part of the EV and integral part of the manipulator.

**3.9****charging communication**

communication session established between the *supply equipment communication controller (SECC)* (3.17) and the *electric vehicle communication controller (EVCC)* (3.11), used for charging control

**3.10****clearance space**

space that is kept free of obstacles

Note 1 to entry: In IEC 62196-2 this space is called packaging room.

Note 2 to entry: In this document this term is used to specify the space around the vehicle inlet [*case D* (3.7)] or socket outlet [*case E* (3.8)], where no obstacles are allowed.

---

4) Under preparation. Stage at the time of publication: IEC/CDV 61851-23-1:2023.

### 3.11

#### EVCC

##### EV communication controller

embedded system, within the electric vehicle (EV), that implements the communication between the EV and the *supply equipment communication controller (SECC)* (3.17) in order to support specific functions

Note 1 to entry: Such specific functions could be, e.g. controlling input and output channels, encryption, or data transfer between EV and SECC.

[SOURCE: ISO 15118-1:2019, 3.1.31, modified — “vehicle” was replaced by “electric vehicle”.]

### 3.12

#### immobilization

inhibition of vehicle movement by its own propulsion system

### 3.13

#### manipulator

mechanism consisting of an arrangement of segments, jointed or sliding relative to one another

[SOURCE: ISO 8373:2021, 4.14, modified — Notes to entry deleted.]

### 3.14

#### mating space

spatial envelope of points where mating of the vehicle coupler is possible

### 3.15

#### operating space

space which can be swept by the *manipulator* (3.13), plus the space which can be swept by the connector or plug

Note 1 to entry: This space can be restricted by limiting devices that establish limits which will not be exceeded.

### 3.16

#### P2PS

##### point to point signal

unidirectional wireless link between the electric vehicle (EV) and EV supply equipment

Note 1 to entry: The P2PS is used for signalling in the context of positioning or pairing functionalities.

[SOURCE: ISO 61980-2:2021, 3.17, modified — “EV device” changed to “EV”, “supply device” changed to “EV supply equipment” and Note 1 to entry added.]

### 3.17

#### supply equipment communication controller

##### SECC

entity which implements the communication to one or multiple *electric vehicle communication controller(s) (EVCC (s))* (3.11)

Note 1 to entry: Further details regarding possible architectures are given in ISO 15118-1:2019, Annex A.

Note 2 to entry: Functions of a supply equipment communication controller may control input and output channels, data encryption, or data transfer between the EVCC and SECC.

[SOURCE: ISO 15118-1:2019, 3.1.68, modified — “and which may be able to interact with secondary actors” is deleted, Note 1 to entry is deleted and in Note 3 to entry “vehicle” is replaced by “EVCC”.]