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Road vehicles - Vehicle to grid communication interface - Part 1: General information and use-case definition (ISO/DIS 15118-1:2017)

Straßenfahrzeuge - Kommunikationsschnittstelle zwischen Fahrzeug und Ladestation - Teil 1: Allgemeine Informationen und Festlegungen der Anwendungsfälle (ISO/DIS 15118-1:2017)

Véhicules routiers - Interface de communication entre véhicule et réseau électrique - Partie 1: Informations générales et définition de cas d'utilisation (ISO/DIS 15118-1:2017)

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Road vehicles — Vehicle to grid communication interface —

Part 1: General information and use-case definition

Véhicules routiers — Interface de communication entre véhicule et réseau électrique —

Partie 1: Informations générales et définition de cas d'utilisation

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This document is circulated as received from the committee secretariat.

This draft is submitted to a parallel vote in ISO and in IEC.

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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).

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).

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 22/SC 31.

This second edition cancels and replaces the first edition. The content of ISO 15118-6 has been merged into this document.

ISO 15118 consists of the following parts

- *Part 1: General information and use-case definition*
- *Part 2: Network and application protocol requirements*
- *Part 3: Physical and data link layer requirements*
- *Part 4: Network and application protocol conformance tests*
- *Part 5: Physical and data link layer conformance tests*
- *Part 8: Physical and data link layer requirements for wireless communication*

ISO/DIS 15118-1:2017(E)**Introduction**

The pending energy crisis and the necessity to reduce greenhouse gas emissions have led vehicle manufacturers to make a very significant effort to reduce the energy consumption of their vehicles. They are presently developing vehicles partly or completely propelled by electric energy. Those vehicles will reduce the dependency on oil, improve global energy efficiency and reduce the total CO₂ emissions for road transportation if the electricity is produced from renewable sources. To charge the batteries of such vehicles, specific charging infrastructure is required.

Much of the standardisation work on dimensional and electrical specifications of the charging infrastructure and the vehicle interface is already treated in the relevant ISO or IEC groups. However, the question of the interoperability of information transfer between the vehicle, the local installation and the grid is also of the utmost importance.

Such communication is beneficial for the optimisation of energy resources and energy production systems as vehicles can charge or discharge at the most economic or most energy-efficient instants. It is also required to develop efficient and convenient payment systems in order to cover the resulting micro-payments. The necessary communication channel may serve in the future to contribute to the stabilisation of the electrical grid as well as to support additional information services required to operate electric vehicles efficiently.

The requirements of this document form the basic framework for all use cases descriptions and related documents in the **ISO 15118** series. This document is the result of a large consensus among all the actors of the electro mobility and is a guideline for implementers of the standard.

This edition 2 of ISO 15118-1 adds new use cases and requirements for Wireless communication, Wireless Power Transfer, Automatic Connection Devices and Bidirectional Power Transfer. As usage of private data and cyber security are becoming an important concern for users, requirements for more traceability and data privacy have also being added.

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Road vehicles — Vehicle to grid communication interface —

Part 1: General information and use-case definition

1 Scope

This document, as a basis for the other parts of ISO 15118, specifies terms and definitions, general requirements and use cases for conductive and wireless High Level Communication between Electric Vehicle Communication Controller (EVCC) and the Supply Equipment Communication Controller (SECC).

This standard is applicable to High Level Communication involved in conductive and wireless power transfer technologies in the context of manual or automatic connection devices.

This standard is also applicable to energy transfer either from EV supply equipment to charge the EV battery or from EV battery to EV supply equipment in order to supply energy to home, to loads or to the grid.

This document provides a general overview and a common understanding of aspects influencing identification, association, charge or discharge control and optimisation, payment, load levelling, cybersecurity and privacy. It offers an interoperable EV-EV supply equipment interface to all e-mobility actors beyond SECC.

ISO 15118 does not specify the vehicle internal communication between battery and other internal equipment (beside some dedicated message elements related to the energy transfer).

NOTE 1 Electric road vehicles specifically are vehicles in categories M (used for carriage of passengers) and N (used for carriage of goods) (compare ECE/TR ANS/WP.29/78 ev.2). This does not prevent vehicles in other categories from adopting ISO 15118 as well.

NOTE 2 This document is destined to orientate the message set of ISO 15118-2. The absence of any particular use case in this part of ISO 15118 does not imply that it shall not be put into practice, with the required messages.

NOTE 3 This document and ISO 15118-2 are designed to work independent of data transfer medium used. However, this series of documents are made for fitting the specified data link layers in the corresponding documents in this series.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050, *International electrotechnical vocabulary*

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

IEC 61851-23, *Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station*

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IEC 61851-24, Electric vehicle conductive charging system – Part 24: Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging

ISO/TR 8713, *Electrically propelled road vehicles — Vocabulary*

ISO 15118-2, *Road vehicles — Vehicle to grid communication interface — Part 2: Network and application protocol requirements*

ISO 15118-3, *Road Vehicles — Vehicle to grid communication interface — Part 3: Physical and data link layer requirements*

ISO 15118-4, *Road vehicles — Vehicle to grid communication interface — Part 4: Network and application protocol conformance test*

ISO 15118-5, *Road vehicles — Vehicle to grid communication interface — Part 5: Physical layer and data link layer conformance test*

ISO 15118-8, *Road vehicles — Vehicle to grid communication — Part 8: Physical layer and data link layer requirements for wireless communication*

IEC 61980-1, *Electric vehicle wireless power transfer (WPT) systems — Part 1 General Requirements*

IEC 61980-2, *Electric vehicle wireless power transfer (WPT) systems - Part 2 specific requirements for communication between electric road vehicle (EV) and infrastructure with respect to wireless power transfer (WPT) systems*

IEC 61980-3, *Electric vehicle wireless power transfer (WPT) systems — Part 3: Specific requirements for the magnetic field wireless power transfer systems*

ISO 19363, *Electrically propelled vehicles — Magnetic field wireless power transfer — Safety and interoperability requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 8713 and the following apply.

3.1

actor

entity which characterizes a role played by a user or any other system that interacts with the subject

3.2

ancillary services

services necessary for the operation of an electric power system provided by the system operator and/or by power system users

[SOURCE: IEC 62913-2-3]

3.3

association

procedure to establish the wireless communication between the SECC controlling the charging infrastructure (e.g. coils for WPT) and the EVCC

3.4**authentication**

procedure between EVCC and SECC or between USER and EV supply equipment or SA, to prove that the provided information (see identification) is either correct, valid, or it belongs to the EVCC, the USER or the SECC

3.5**authorization**

procedure for EV supply equipment to verify if EV is allowed to charge or discharge

3.6**Automatic Connection Device (ACD)**

components supporting the automatic connection and disconnection process for conductive energy transfer between an EV and EV supply equipment

3.7**basic signalling**

physical signalling according to the pilot function

Note 1 to entry: Provided by IEC 61851-1, Annex A

3.8**Battery Management System****BMS**

electronic device that controls or manages the electric and thermal functions of the battery system and that provides communication between the battery system and other vehicle controllers

3.9**bidirectional power converter****BPC**

a kind of stabilized power supply device, which delivers BPT functions

3.10**bidirectional power transfer****BPT**

combination of forward or reverse power transfer sequences

3.11**certificate**

electronic document which uses a digital signature to bind a public key with an identity

Note 1 to entry: ISO 15118 describes several certificates covering different purposes (e.g. Contract Certificate including the contract ID and OEM Provisioning Certificates)

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3.12

charge

store electrical energy in the vehicle battery

NOTE 1 to entry: In edition 1 the words “charge” or “charging” was used intensively as a generic term. In this edition, in order to be more precise and to cover with one word Forward and Reverse Power Transfer the terms “charge” and its declinations have been replaced by “Energy transfer” when appropriate. When energy transfer is used in a sentence this means that both directions of power flow are possible.

NOTE 2 to entry: The term “charge” (and the associated verb) has in this text a precise definition in relation to the amount of energy stored in the EV battery which can be different than the total energy transferred to the EV.

NOTE 3 to entry: In some sentence the word “charging” is still used. For example, the words “charging site” are still used.

3.13

charger

power converter that performs the necessary functions for charging a battery

3.14

Charging Service Operator**CSO**

secondary actor responsible for the installation and operation of a charging infrastructure (including charging sites), and the management of electricity sourcing to provide the requested energy transfer services

Note 1 to entry: The term CPO for Charge Point Operator is also used in ISO 15118 documents. We don't recommend this term for trademark reasons.

3.15

communication session

sequence of time where EVCC and SECC interactively exchange digital information in order to manage charging or discharging the EV battery

Note 1 to entry: A communication session can be paused and resumed later several times. The communication session encapsulates zero or more energy transfer periods.

3.16

contactor

electrically controlled switch used for switching a power circuit

Note 1 to entry: Unlike a circuit breaker, a contactor is not intended to interrupt a short circuit current.

Note 2 to entry: As far as communication is concerned the contactor occurs as a trigger for the power supply.

3.17

contract ID

contract Identification of the contract that is used by the SECC or secondary actor to enable energy transfer and related services (including billing)

Note 1 to entry: The contract ID is associated with the electricity consumer and may be vehicle-specific or customer-specific. The customer can e.g. be the driver, the owner of the vehicle.

3.18 Control modes

3.18.1

scheduled mode:

a control mode where the EVCC and SECC have negotiated a power profile fulfilling user's mobility needs and based on energy target, power and tariff information.

3.18.2

dynamic mode:

a control mode, without negotiation, where a secondary actor system controls the power flow fulfilling user's mobility needs and its own constraints.

3.18.3

flexible mode:

a control mode with a simplified negotiation where the SECC sends to the EVCC a unique power profile compliant with user's mobility needs.

3.19

credential

document attesting the permission of the EV to be charged or to discharge

3.20

demand and prognosis

function that covers the collection of grid and local installation conditions which applies to the actual energy transfer process

EXAMPLE Sales tariff table containing a price, CO₂ content and percentage of renewable energy information vs. time based on grid, energy production, energy demand and customer contract information, along with an optional contract-based current limitation. Grid schedule containing a current vs. time limitation at the specific EV supply equipment due to local installation and local electricity demand situation.

3.21

Demand Clearing House

DCH

entity for grid negotiation that provides information on the load of the grid

Note 1 to entry: The demand clearing house mediates between two clearing partners: a SECC and the part of the power grid connected to this SECC. Most likely this function will be served by a system operator.

Note 2 to entry: Demand clearing house and meter operator may exchange information with each other as well as with other actors.

EXAMPLE A DCH typically fulfils following tasks:

- Collect all necessary information from all parts of the power grid, e.g. current or forecasted load of local transformers, distribution grid, power substation, transmission grid, transmission substation, power plants (including renewable energies), and predicted energy transfer schedules submitted by EVCCs.
- Consolidate the collected grid information to a "grid profile" and offer it to SECCs/EVCCs.
- Provide energy transfer schedule proposal for the connected EV to the requesting SECC based on the collected grid profile.
- Inform the SECC as to the necessity for an updated energy transfer schedule if the grid profile has changed.

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- On the contrary, the SECC will inform the demand clearing house if the EV's energy transfer schedule has changed.

3.22**Distributed Energy Resources****DER**

a distributed set of one or more energy service resources, including generators, energy storage, controllable load, that can be used to deliver ancillary services

[SOURCE: IEC 62913-2-3]

3.23**departure time**

point in time when the user intends to unplug the car and/or leave the charging site

3.24**discharge**

release the electric charge of the vehicle battery

3.25**discovery**

the phase in which an EV obtains a list of available SECCs in its wireless communication range

3.26**Distribution System Operator****DSO**

entity responsible for the voltage stability in the distribution grid (medium- and low-voltage power grid)

Note 1 to entry: Electricity distribution is the final stage in the physical delivery of electricity to the delivery point (e.g. end user, EV supply equipment or parking operator).

Note 2 to entry: A distribution system network carries electricity from the transmission grid and delivers it to consumers. Typically, the network would include medium-voltage power lines, electrical substations and low-voltage distribution wiring networks with associated equipment. Depending on national distribution regulations, the DSO may also be responsible for metering the energy (MO).

3.27**E-mobility needs**

mobility needs expressed by the EV user in terms of departure time, minimum and maximum energy request and target energy request