INTERNATIONAL STANDARD

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Second edition
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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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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 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.

This document was prepared jointly by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*, and Technical Committee IEC/TC 69, *Electric road vehicles and electric industrial trucks.* The draft was circulated for voting to the national bodies of both ISO and IEC.

This second edition cancels and replaces the first edition (ISO 15118-1:2013) which has been technically revised. The main changes compared to the previous edition are as follows:

— new use cases and requirements for wireless communication, wireless power transfer, automatic connection devices and bidirectional power transfer have been added; and

— as usage of private data and cyber security are becoming an important concern for users, requirements for more traceability and data privacy have also been added.

A list of all parts in the ISO 15118 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.

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 CO_2 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 upmost 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 can 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 ISO 15118 series.

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 the ISO 15118 series, specifies terms and definitions, general requirements and use cases for conductive and wireless HLC between the EVCC and the SECC.

This document is applicable to HLC involved in conductive and wireless power transfer technologies in the context of manual or automatic connection devices.

This document 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.

The ISO 15118 series 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 the ISO 15118 series as well.

NOTE 2 This document is destined to orientate the message set of ISO 15118-2 and ISO 15118-20[1)]. The absence of any particular use case in this document does not imply that it will not be put into practice, with the required messages.

NOTE 3 This document, ISO 15118-2 and ISO 15118-20 are designed to work independent of data transfer medium used. However, the ISO 15118 series is made for fitting the specified data link layers in the corresponding documents in this series.

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/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*

1) Under preparation. Stage at the time on publication: ISO/DIS 15118-20:2019.

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

ISO 15118-20[2)], *Road vehicles — Vehicle to grid communication interface — Part 20: 2nd generation network and application protocol requirements*

EN 50549-1, *Requirements for generating plants to be connected in parallel with distribution networks — Part 1: Connection to a LV distribution network — Generating plants up to and including Type B*

IEC 61851-1, *Electric vehicle conductive charging system — 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*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1 General terms

3.1.1
actor
entity which characterizes a role played by a user or any other system that interacts with the subject

3.1.2
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 IEV Electropedia, 617-3-9, modified — The Note has been removed.]

3.1.3
association
procedure to establish the wireless communication between the *SECC* (3.1.68) controlling the charging infrastructure [e.g. coils for *WPT* (3.1.76)] and the *EVCC* (3.1.31)

3.1.4
authentication
procedure between the *EVCC* (3.1.31) and the *SECC* (3.1.68) or between the USER and the *EV* (3.1.30) supply equipment or the SA, to prove that the provided information [see *identification* (3.1.49)] is either correct, valid, or it belongs to the EVCC, the USER or the SECC

3.1.5
authorization
procedure to verify if an *EV* (3.1.30) is allowed to *charge* (3.1.12) or *discharge* (3.1.22)

3.1.6
automatic connection device
ACD
components supporting the automatic connection and disconnection process for conductive energy transfer between an *EV* (3.1.30) and the *EV supply equipment* (3.1.33 and 3.1.34)

2) Under preparation. Stage at the time of publication: ISO/DIS 15118-20:2019.

3.1.7
basic signalling
physical signalling according to the *pilot function* (3.1.55)

Note 1 to entry: This definition is provided by IEC 61851-1:2017, Annex A.

3.1.8
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

3.1.9
bidirectional power converter
BPC
stabilized power supply device which delivers *BPT* (3.1.10) functions

3.1.10
bidirectional power transfer
BPT
combination of forward or reverse power transfer sequences

3.1.11
certificate
electronic document which uses a digital signature to bind a public key with an identity

Note 1 to entry: The ISO 15118 series describes several certificates covering different purposes, e.g. the contract certificate including the EMAID and *OEM* (3.1.52) provisioning certificates.

3.1.12
charge
store electrical energy in the vehicle battery

Note 1 to entry: In the first edition of this document, the words “charge” or “charging” were used intensively as a generic term. In this edition, in order to be more precise and to cover with one word *forward* (3.4.1) and *Reverse Power Transfer* (3.4.2) 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* (3.1.30) battery which can be different than the total energy transferred to the EV.

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

3.1.13
charger
power converter that performs the necessary functions for charging a battery

3.1.14
charging station operator
CSO
EV supply equipment operator
secondary actor (3.1.64) responsible for the installation and operation of a charging infrastructure (including charging sites) and the management of electricity to provide the requested energy transfer services

Note 1 to entry: The term CPO (Charge Point Operator) is also used in the ISO 15118 series. This term is not recommended for trademark reasons.

3.1.15
communication session
sequence of time where the *EVCC* (3.1.31) and the *SECC* (3.1.68) interactively exchange digital information in order to manage charging or discharging the *EV* (3.1.30) 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* (3.1.37).

3.1.16
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* (3.1.70) for the power supply.

3.1.17
credential
document attesting the permission of the *EV* (3.1.30) to be *charged* (3.1.12) or to *discharge* (3.1.22)

3.1.18
demand and prognosis
function that covers the collection of grid and local installation conditions which applies to the actual energy transfer process

EXAMPLE The *sales tariff table* (3.1.63) containing a price, CO_2 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. The *grid schedule* (3.1.46) containing a current vs. time limitation at the specific *EV* (3.1.30) supply equipment due to local installation and local electricity demand situation.

3.1.19
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: an *SECC* (3.1.68) 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* (3.1.51) may exchange information with each other as well as with other *actors* (3.1.1).

EXAMPLE A DCH typically fulfils the 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* (3.1.39) submitted by *EVCCs* (3.1.31).

— Consolidate the collected grid information to a “grid profile” and offer it to SECCs/EVCCs.

— Provide energy transfer schedule proposal for the connected *EV* (3.1.30) 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.

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

3.1.20
distributed energy resources
DER
distributed set of one or more energy service resources, including generators, energy storage and controllable load, that can be used to deliver *ancillary services* (3.1.2)

3.1.21
departure time
point in time when the user intends to unplug the car and/or leave the charging site

3.1.22
discharge
release the electric charge of the vehicle battery

3.1.23
discovery
phase in which an *EV* (3.1.30) obtains a list of available *SECCs* (3.1.68) in its wireless communication range

3.1.24
distribution system operator
DSO
entity responsible for the voltage stability in the distribution 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 (3.1.33 and 3.1.34) 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.

3.1.25
e-mobility needs
mobility needs expressed by the *EV* (3.1.30) user in terms of *departure time* (3.1.21), *minimum* (3.5.1) and *maximum energy request* (3.5.2) and target energy request

3.1.26
e-mobility operator clearing house
EMOCH
entity mediating between two clearing partners to provide validation services for roaming regarding contracts of different *EMSPs* (3.1.27)

Note 1 to entry: EMOCH mediates for the purpose of:

— collecting all necessary contract information like the EMAID, the EMSP, the communication path to the EMSP, roaming fees, begin and end dates of the contract, etc.;

— providing the *SECC* (3.1.68) with confirmation that an EMSP will pay for a given EMAID [*authorization* (3.1.5) of valid contract]; and

— transferring an *SDR* (3.1.66) after each *energy transfer period* (3.1.37) to connect the EMSP and the *EP* (3.1.29) of the identified contract.

Note 2 to entry: The EMOCH, EMSP and *meter operator* (3.1.51) may exchange information with each other as well as other *actors* (3.1.1).

3.1.27
e-mobility service provider
EMSP
entity with which the customer has a contract for all services related to the *EV* (3.1.30) operation

Note 1 to entry: Typically, the EMSP will include some of the other *actors* (3.1.1), like the spot operator or *EP* (3.1.29), and has a close relationship with the *distribution system operator* (3.1.24) and *meter operator* (3.1.51). An *OEM* (3.1.52) or utility could also fulfil such a role.

Note 2 to entry: The EMSP validates EMAIDs from his customers, which were received either from the *EMOCH* (3.1.26), other EMSPs or spot operators the customer is in relation with.

Note 3 to entry: The EMSP issues EMAIDs to his customers.