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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

Reference number
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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. www.iso.org/directives

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The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO 15118-1 was developed in cooperation with IEC TC 69, *Electric road vehicles and electric industrial trucks*.

ISO 15118 consists of the following parts, under the general title *Road vehicles — Vehicle to grid communication interface*:

— *Part 1: General information and use-case definition*

— *Part 2: Network and application protocol requirements*

— *Part 3: Physical and data link layer requirements*

The following parts are under preparation:

— *Part 4: Network and application protocol conformance test*

— *Part 5: Physical layer and data link layer conformance test*

This corrected version of ISO 15118-1:2013 incorporates the following correction:

— The ISO/IEC double logo was added to the cover page.

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 standardization 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 information transfer between the vehicle, the local installation and the grid has not been treated sufficiently.

Such communication is beneficial for the optimization of energy resources and energy production systems as vehicles can recharge 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 stabilization of the electrical grid as well as to support additional information services required to operate electric vehicles efficiently.

Road vehicles — Vehicle to grid communication interface —

Part 1:
General information and use-case definition

1 Scope

ISO 15118 specifies the communication between Electric Vehicles (EV), including Battery Electric Vehicles and Plug-In Hybrid Electric Vehicles, and the Electric Vehicle Supply Equipment (EVSE). As the communication parts of this generic equipment are the Electric Vehicle Communication Controller (EVCC) and the Supply Equipment Communication Controller (SECC), ISO 15118 describes the communication between these components. Although ISO 15118 is oriented to the charging of electric road vehicles, it is open for other vehicles as well.

This part of ISO 15118 specifies terms and definitions, general requirements and use cases as the basis for the other parts of ISO 15118. It provides a general overview and a common understanding of aspects influencing the charge process, payment and load levelling.

ISO 15118 does not specify the vehicle internal communication between battery and charging equipment and the communication of the SECC to other actors and equipment (beside some dedicated message elements related to the charging). All connections beyond the SECC, and the method of message exchanging are considered to be out of the scope as specific use cases.

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 part of ISO 15118 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 put into practice, with the required messages.

NOTE 3 This part of ISO 15118 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*

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*

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
amount of energy for charging
energy required by the EV until the departure time has been reached or the battery's SOC is at 100 %

Note 1 to entry: This might include the amount of energy the EV consumes for other vehicle features than solely charging the battery.

3.3
authentication
procedure between EVCC and SECC or between USER and EVSE 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

3.4
authorization
procedure for EVSE to verify if EV is allowed to be charged

3.5
basic signalling
physical signalling according to the pilot function provided by IEC 61851-1, Annex A

3.6
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

3.7
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)

3.8
charger
power converter that performs the necessary functions for charging a battery

3.9
charging control
function that confirms the maximum charge current which is allowed to be drawn from EVSE based on charging schedule

Note 1 to entry: Actual charge current to the battery should be controlled by BMS. It is not in scope of ISO 15118.

3.10
charging scenario
combination of use case elements to fulfil a specific charging use case

3.11
charging schedule
scheme which contains the power limits for charging the EV for a specific time

Note 1 to entry: The EV should apply the negotiated limits as close as possible, to allow power balancing for the DSO

EXAMPLE The schedule is calculated based on target setting, sales tariff table and grid schedule information, respecting the corresponding current limitations, i.e. using the lowest current value.

3.12
charging session
time between the beginning (connection of the cable) and the end (disconnection of the cable) of a charging process

Note 1 to entry: During a charging session the EV may have none, one, or many periods of charging the battery, doing pre-conditioning or post-conditioning.

3.13
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.

3.14
contract ID
contract IDentification of the contract that is used by the SECC or secondary actor to enable charging 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.

3.15
credential
document attesting the permission of the EV to be charged

3.16
demand and prognosis
function that covers the collection of grid and local installation limits which applies to the actual charging process

EXAMPLE Sales tariff table 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. Grid schedule containing a current vs. time limitation at the specific EVSE due to local installation and local electricity demand situation.

3.17
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 charging schedules submitted by EVCCs.

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

— Provide charging schedule proposal for the connected EV to the requesting SECC based on the collected grid profile.