DRAFT INTERNATIONAL STANDARD ISO/DIS 15118-1

ISO/TC **22**/SC **3** Secretariat: **DIN**

Voting begins on **2012-01-19** Voting terminates on **2012-06-19**

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

ICS 43.120

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

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO/IEC 15118-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

ISO/IEC 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: Technical protocol description and open systems interconnections (OSI) requirements*

— *Part 3 Physical and data link layer requirements*

Introduction

The pending energy crisis and the necessity to reduce greenhouse gas emissions has 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 information transfer between the vehicle, the local installation and the grid has not been treated sufficiently.

Such communication is beneficial for the optimisation 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 stabilisation 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/IEC 15118 specifies the communication between electric vehicles (EV), (this term includes Battery Electric Vehicles as well as Plug-In Hybrid Electric Vehicles) and the electric vehicle supply equipment (EVSE). The communication parts of this generic equipment are the electric vehicle communication controller (EVCC) and the supply equipment communication controller (SECC). ISO/IEC 15118 is oriented to the charging of electric road vehicles. However, this standard is open for other vehicles as well. The purpose of this part of ISO/IEC 15118 is the description of terms and definitions, general requirements and use cases as the basis for the other parts of ISO/IEC 15118. ISO/IEC 15118-1 provides a general overview and a common understanding of aspects influencing the charge process, payment and load levelling. It furthermore specifies safety issues for charging.

ISO/IEC 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 messages 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). This does not prevent vehicles in other categories from adopting this standard as well.'

NOTE 2 Vehicle internal communication and communication from the SECC to other actors beside the vehicle may act as triggers in the use cases or as actors in the safety requirements. Related hardware issues such as plugs and cables are out of scope of this standard.

2 Normative references

The following referenced documents are required for the application 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 60050 - *International electrotechnical vocabulary*

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

ISO 8713 - *Electric road vehicles – Vocabulary*

IEC 62052-11 *Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 11: Metering equipment*

IEC 62053-21 *Electricity metering equipment (a.c.) – Particular requirements – Part 21: Static meters for active energy (classes 1 and 2)*

IEC 62053-52 *Electricity metering equipment (AC) - Particular requirements – Part 52: Symbols*

3 Terms and definitions

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

3.1
Actor
specifies a role played by an user or any other system that interacts with the subject

3.2
Basic Signalling
physical signalling according to the pilot function provided by IEC 61851-1 Annex A.

3.3
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

3.4
Certificate
certificate which contains the contract id

3.5
Charging control
confirms the maximum charge current that is allowed to be withdrawn from EVSE based on charge schedule

NOTE Actual charge current to the battery should be controlled by BMS. It is not in scope of this standard.

3.6
Charging schedule
maximum charging current vs. time information, which the EV will not exceed while charging the battery. It shall be calculated based on target setting, sales tariff table and grid schedule information, respecting the corresponding current limitations, i.e. using the lowest current value

3.7
Charging session
time between the beginning (connection of the cable) and the end (disconnection of the cable) of a charging process

NOTE During a charging session the EV may have none, one, or many periods of charging the battery, doing pre-conditioning or post-conditioning.

3.8
Contactor
electrically controlled switch used for switching a power circuit

NOTE 1 Unlike a circuit breaker, a contactor is not intended to interrupt a short circuit current.

NOTE 2 As far as communication is concerned the contactor occurs as a trigger for the power supply.

3.9
Contract ID
identification of the contract that is used by the SECC to enable charging and related services (incl. billing)

NOTE 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 or an E-mobility operator.

3.10
Demand Clearing House (DCH)
entity for grid negotiation that provides information on the load of the grid

NOTE 1 The demand clearing house mediates between two clearing partners – a SECC and the part of the power grid connected to this SECC.

- 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 (incl. renewable energies), and predicted charging profiles submitted by EVCCs.
- Consolidate the collected grid information to a “grid profile” and offer it to SECCs / EVCCs.
- Provide charging profile 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 charging profile if the grid profile has changed.
- On the contrary, the SECC will inform the demand clearing house if the EV's charging profile has changed.

NOTE 2 Demand clearing house and meter operator may exchange information with each other as well as with other actors.

3.11
Distribution System Operator (DSO)
item responsible for the voltage stability in the distribution grid (medium and low-voltage power grid)

NOTE 1 Electricity distribution is the final stage in the physical delivery of electricity to the delivery point (e.g. end user, EVSE or parking operator).

NOTE 2 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).

3.12
E-Mobility Operator
entity with which the customer has a contract for all services related to the EV operation

NOTE 1 Typically the E-mobility operator will include some of the other actors, like spot operator or energy provider, and has a close relationship with the distribution system operator and meter operator. An OEM or utility could also fulfil such a role.

NOTE 2 The E-mobility operator authenticates contract IDs from his customers received either from the E-Mobility operator clearing house, other E-mobility operators or spot operators he is in relation with.

3.13
E-Mobility Operator ID
unique identification related to the contract between the vehicle user or the vehicle itself and the E-mobility operator, which identifies the issuer of the contract ID

NOTE E-Mobility Operator ID may be used for roaming services

3.14
E-Mobility Operator Clearing House (EMOCH)
entity mediating between two clearing partners to provide validation services for roaming regarding contracts of different E-Mobility Operators for the purpose of:

- collecting all necessary contract information like Contract ID, E-Mobility Operator, communication path to E-Mobility Operator, roaming fees, begin and end date of contract, etc.
- provide SECC with confirmation that an E-Mobility Operator will pay for a given Contract ID (authentication of valid contract) transfer a Service Detail Record (SDR) after each charging session to the electricity provider of the identified contract

NOTE E-Mobility operator clearing house, E-Mobility Operator and meter operator may exchange information with each other as well as other actors.

3.15
Electric Energy Meter (EEM)
equipment for measuring electrical energy by integrating power with respect to time, which complies with IEC 62052-11 and IEC 62053-21, IEC 62053-52 NOTE Some use cases need the amount of electric energy measured by the electric energy meter and communicated through the SECC to the EVCC, while other scenarios do not need a separate electric energy meter. The EV may get this information and use it according to the OEM's intentions

3.16
Electricity Provider (EP)
body of secondary actor to provide electricity

3.17
Electric Vehicle (EV)
any vehicle propelled by an electric motor drawing current from a rechargeable storage battery or from other portable energy storage devices (rechargeable, using energy from a source off the vehicle such as a residential or public electric service), which is manufactured primarily for use on public streets, roads or highways

3.18
Electric Vehicle Charger
power converter that performs the necessary functions for charging a battery

3.19
Electric Vehicle Communication Controller (EVCC)
embedded system, within the vehicle, that implements the communication between the vehicle and the SECC in order to support specific functions

NOTE Such specific functions could be e.g. controlling input and output channels, encryption, or data transfer between vehicle and SECC.

3.20
Electric Vehicle Supply Equipment (EVSE)
conductors, including the phase(s), neutral and protective earth conductors, the EV couplers, attached plugs, and all other accessories, devices, power outlets or apparatuses installed specifically for the purpose of delivering energy from the premises wiring to the EV and allowing communication between them as necessary

3.21
Electronic Control Unit (ECU)
unit providing information regarding the vehicle

3.22
EVSE ID
unique identification of the charging spot

3.23
EVSE operator
actor for managing and maintaining the charging spot

3.24
EVSE operator ID
unique identification of the EVSE operator which provides the EV with energy

NOTE SECC provides the EVSE operator ID together with the EVSE ID uniquely identify the spot. The EVSE operator will fix the power outlet ID.

3.25
External Identification Means (EIM)
any external means that enable the user to identify his contract or the car

EXAMPLE NFC, RFID, SMS

3.26
Fleet operator (FO)
a person or legal entity operating several EVs and may have the contracts with the E-Mobility Operator

3.27
Grid Schedule
maximum charging current vs. time information, which is possible at the current outlet based on the local grid situation

NOTE Parameters to calculate grid schedule are e.g. local grid demand and supply situation, actual and forecast.

3.28
High Level Communication
bidirectional digital communication using protocol and messages specified in ISO/IEC 15118-2 and physical and data link layer specified in ISO/IEC 15118-3.

NOTE High-level communication in ISO/IEC 15118 is compliant with the term digital communication in SAE J1772/2836/2847/2931.

3.29
Human Machine Interface (HMI)
interface allowing the vehicle user to receive information relative to the charging process and provide input to the charging system

NOTE 1 All information from a user (input) or displayed to a user (output) will be performed through an HMI.

NOTE 2 The HMI could be implemented as a function of the EV, EVSE, mobile phone etc.

3.30
Interlock
safety function using a mechanical lock, either electrically or manually controlled. This prevents the contacts of a socket outlet or inlet from becoming live before it is properly engaged with a plug, and which either prevents the plug from being withdrawn, while its contacts are live, or makes the contacts dead before separation

3.31
Level selector
function to select the lowest value among the Sales tariff table, Grid schedule and Local physical limit, and feeds to scheduling function

NOTE This function may be implemented in EV or EVSE.

3.32
Meter Operator (MO)
body having the legal responsibility for the installation and maintenance of the electric energy meter

3.33
Original Equipment Manufacturer (OEM)
an original equipment manufacturer, or OEM, manufactures products or components that are purchased by a company and retailed under that purchasing company's brand name. OEM refers to the company that originally manufactured the product. When referring to automotive parts, OEM designates a replacement part made by the manufacturer of the original part

3.34
Paying Unit (PU)
device on EVSE side that offers payment methods

EXAMPLE payment methods: EIM, cash, credit cards, etc.

NOTE If the EVCC normally chooses a payment method then the paying unit indicates to the SECC whether the customer is authorised or not.

3.35
Payment Data Container
container, which can carry payment definitions and is thus not directly bound to a message structure encapsulating the payment information

3.36
Pilot function
any means, electronic or mechanical, that insures the conditions related to the safety, or the transmission, of data required for the mode of operation, compliant with IEC 61851-1

3.37
Plug and Charge
scenario where the customer just has to plug his vehicle into the EVSE and all aspects of charging are automatically taken care of with no further intervention from the driver, this may include, load control, authentication, authorisation and billing

3.38
Power Outlet
part of a plug and socket outlet intended to be installed with the fixed wiring. All power outlets shall have the pilot function

3.39
Power Outlet ID
unique identification of the power outlet to the vehicle

3.40
Primary actor
role involved directly in the charging process.

3.41
Pulse Width Modulation (PWM)
pulse control in which the pulse width or frequency, or both, are modulated within each fundamental period to produce a certain output waveform (IEC 60050; IEV 551-16-30).

3.42
Residual Current Device (RCD)
mechanical switch device designed to make, carry and break currents under normal service conditions and to cause the opening of the contacts when the residual current attains a given value under specified conditions

NOTE 1 A residual current device can be a combination of various separate elements designed to detect and evaluate the residual current and to make and break current.

NOTE 2 In the following countries, an RCD may be either electrical, electronic, mechanical or a combination thereof: US, JP, UK.

3.43
Sales tariff table
time table of energy price or percentage of green energy and optional current vs. time information

NOTE - Sales tariff table provides input for calculating a charging schedule.

- Sales tariff table shall be issued by a secondary actor, e.g. energy provider or mobility operator.

- Sales tariff table should reflect “supply and demand balance of the energy provider” and “usage of green energy” (e.g. wind mill, photovoltaic).

- Information of the chosen tariff should be included in service detail record.

- Sales tariff table can be updated periodically. It may differ by country or energy provider.

- There may be multiple Sales tariff tables existing for one customer.

- Sales tariff table information should be constructed in such a way that normal fluctuations on the grid side will not lead to an insufficiently charged EV or cost increase.

- The contract-based current limitation might vary over time, e.g. lower value during daytime and higher value during the night.

3.44
Secondary actor
role involved indirectly in the charging process

NOTE 1 Secondary actors may exchange information between each other.

NOTE 2 Secondary actors could also be a single entity.

3.45
Semi online
status, where the SECC or any other device in general has the ability to go online, but being online is not required synchronously to the referring use case(s)

NOTE The SECC may decide to go online, if required.

3.46
Service Detail Record (SDR)
data package of a charge or service related session with all necessary information that an E-Mobility Operator needs for billing or for informing the customer about the session

NOTE Some data may be sent from EVSE. Some data originally owned by E-Mobility Operator Clearing House. Some data may be created at E-Mobility Operator Clearing House. Some records to be sent to E-Mobility Operator for billing or informing their customers.

3.47
Service provider
body of secondary actor to offer value-added services to customers throughout the EVSE operator

NOTE Contract ID may be used for activation.

3.48
Supply Equipment Communication Controller (SECC)
entity which implements the communication to one or multiple EVCCs according to ISO/IEC 15118-2 and which may be able to interact with secondary actors

NOTE 1 Further details regarding possible architectures are given in Annex A.