

BS EN ISO 15118-1:2015

Incorporating corrigendum March 2014



BSI Standards Publication

Road vehicles — Vehicle to grid communication interface

Part 1: General information and use-case definition

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National foreword

This British Standard is the UK implementation of EN ISO 15118-1:2015. It is identical to ISO 15118-1:2013. It supersedes BS ISO 15118-1:2013 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/69, Electric vehicles.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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31 March 2014	Implementation of ISO corrected text 01 October 2013: See ISO foreword for details
31 August 2015	This corrigendum renumbers BS ISO 15118-1:2013 as BS EN ISO 15118-1:2015

English Version

Road vehicles - Vehicle to grid communication interface - Part 1:
General information and use-case definition (ISO 15118-1:2013)

Véhicules routiers - Interface de communication entre
véhicule et réseau électrique - Partie 1: Informations
générales et définition de cas d'utilisation (ISO 15118-
1:2013)

Straßenfahrzeuge - Kommunikationsschnittstelle zwischen
Fahrzeug und Ladestation - Teil 1: Allgemeine
Informationen und Festlegungen der Anwendungsfälle (ISO
15118-1:2013)

This European Standard was approved by CEN on 30 July 2015.

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European foreword

The text of ISO 15118-1:2013 has been prepared by Technical Committee ISO/TC 22 “Road vehicles” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 15118-1:2015 by Technical Committee CEN/TC 301 “Road vehicles” the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2016, and conflicting national standards shall be withdrawn at the latest by February 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of ISO 15118-1:2013 has been approved by CEN as EN ISO 15118-1:2015 without any modification.

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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 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 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, 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 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.

- Inform the SECC as to the necessity for an updated charging schedule if the grid profile has changed.
- On the contrary, the SECC will inform the demand clearing house if the EV's charging schedule has changed.

3.18

departure time

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

3.19

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, EVSE 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).

3.20

E-Mobility Operator

entity with which the customer has a contract for all services related to the EV operation

Note 1 to entry: Typically the E-Mobility Operator will include some of the other actors, like spot operator or Electricity 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 to entry: The E-Mobility Operator validates contract IDs from his customers, which were received either from the E-Mobility Operator Clearing House, other E-Mobility Operators or spot operators he is in relation with.

Note 3 to entry: The E-Mobility Operator issues contract IDs to his customers.

3.21

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.,
- providing SECC with confirmation that an E-Mobility Operator will pay for a given contract ID (authorization of valid contract),
- transferring a Service Detail Record (SDR) after each charging session to correct E-Mobility Operator and Electricity Provider of the identified contract.

Note 1 to entry: E-Mobility Operator Clearing House, E-Mobility Operator and meter operator may exchange information with each other as well as other actors.

3.22

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 1 to entry: 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

3.23

Electricity Provider

EP

body of secondary actor to provide electricity

3.24

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

3.25

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

3.26

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

3.27

Electronic Control Unit

ECU

unit providing information regarding the vehicle

3.28

energy transfer type

element which allows the EV to select its desired energy transfer type in case both the EVSE and EV support multiple charging types and different plugs and sockets according to IEC 62196

3.29

EVSE ID

unique identification of the charging spot

Note 1 to entry: The SECC provides the EVSE ID. This ID includes the EVSE operator ID and the power outlet ID, issued by the EVSE operator.

3.30

EVSE operator

actor for managing and maintaining the charging spot

3.31

External Identification Means

EIM

any external means that enable the user to identify his contract or the car

EXAMPLE NFC, RFID, SMS.

3.32

Fleet Operator

FO

person or legal entity operating several EVs and who may have the contracts with the E-Mobility Operator

3.33

grid schedule

function which sets the power level at a specific time based on the local grid situation

Note 1 to entry: Parameters to calculate grid schedule are e.g. local grid demand and supply situation, actual and forecast.

3.34

High Level Communication

HLC

bi-directional digital communication using protocol and messages and physical and data link layers specified in ISO 15118 series

Note 1 to entry: High Level Communication in ISO 15118 is compliant with the term digital communication in SAE J1772/2836/2847/2931.

3.35

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

Note 2 to entry: The HMI could be implemented as a function of the EV, EVSE, mobile phone, etc.

3.36

identification

procedure for EVCC or USER to provide its identifying information for the purpose of authorization, mostly to provide its capability for payments, such as Contract Certificate, credit card number, etc. and/or procedure for SECC to provide EVSE ID to EVCC

Note 1 to entry: For simplicity reasons, within the ISO 15118 series the term identification includes also the authentication of the provided identifying information, i.e. this information is correct, or it belongs to the EVCC, the USER or the SECC.

3.37

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 1 to entry: This function may be implemented in EV or EVSE.

3.38

Meter Operator

MO

body having the legal responsibility for the installation and maintenance of the Electric Energy Meter (EEM)

3.39

Original Equipment Manufacturer

OEM

producer who manufactures products or components that are purchased by a company and retailed under that purchasing company's brand name

Note 1 to entry: OEM refers to the company that originally manufactured the product.

Note 2 to entry: When referring to automotive parts, OEM designates a replacement part made by the manufacturer of the original part.

3.40
paying unit
PU

device on EVSE side that offers payment methods

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

Note 1 to entry: If the EVCC normally chooses a payment method, then the paying unit indicates to the SECC whether the customer is authorized or not.

3.41
pilot function

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

3.42
Plug and Charge
PnC

identification mode where the customer just has to plug their vehicle into the EVSE and all aspects of charging are automatically taken care of with no further intervention from the driver

Note 1 to entry: The aspects of charging may include load control, authorization and billing.

3.43
power outlet

socket outlet or, in the case of a fixed cable, connector, that provides power to the EV, typically to be installed with the fixed wiring

3.44
power outlet ID

unique identification of the power outlet to the vehicle

3.45
primary actor

entity involved directly in the charging process

3.46
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

3.47
sales tariff table

function of price related information over time

- Sales tariff table provides input for calculating a charging schedule.
- Sales tariff table shall be issued by a secondary actor, e.g. Electricity Provider or mobility operator.
- Sales tariff table should reflect “supply and demand balance of the Electricity 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 Electricity 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.

3.48

secondary actor

entity involved indirectly in the charging process

Note 1 to entry: Secondary actors may exchange information between each other.

Note 2 to entry: Secondary actors could also be a single entity.

3.49

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)

3.50

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 1 to entry: 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.

3.51

service provider

secondary actor which offers value-added services to customers throughout the EVSE operator

Note 1 to entry: Contract ID may be used for activation.

3.52

Supply Equipment Communication Controller

SECC

entity which implements the communication to one or multiple EVCCs according to ISO 15118-2 and which may be able to interact with secondary actors

Note 1 to entry: Further details regarding possible architectures are given in [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 vehicle and SECC.

3.53

target setting

function which covers the following user demand-related information:

- departure time;
- amount of energy required for charging or available for discharging;
- charging schedule;
- energy transfer type

3.54

trigger

event that will start or be a condition in the use case

3.55

use case

description of a system's behaviour as it responds to a request that originates from outside that system

Note 1 to entry: In systems engineering, a use case describes "who" can do "what" with the system in question. The use case technique is used to capture a system's behavioural requirements by detailing scenario-driven threads through functional requirements.

Note 2 to entry: The term charging scenario is used simultaneously to the term use case within this document.

3.56

Value-Added Services

VAS

elements not directly needed for the pure charging of the EV

3.57

vehicle coupler

means of enabling the manual connection of a flexible cable to an EV for the purpose of charging the traction batteries, consisting of two parts: a vehicle connector and a vehicle inlet

3.58

Vehicle to Grid

V2G

plug-in electric vehicle interaction with the electric grid, including charging as well as discharging and bi-directional communication interface

Note 1 to entry: The first part of this definition is excerpted from the scope of the V2G Domain Expert Working Group, SGIP, NIST.

3.59

vehicle user

person or legal entity using the vehicle and providing information about driving needs and consequently influencing charging patterns

Note 1 to entry: Driving needs, such as range and time of availability, are necessary to achieve the most appropriate charging scenario.

4 Symbols and abbreviated terms

BMS	Battery Management System
DCH	Demand Clearing House
ECU	Electronic Control Unit
EEM	Electric Energy Meter
EIM	External Identification Means
EMOCH	E-Mobility Operator Clearing House
EP	Electricity Provider
EV	Electric Vehicle
EVCC	Electric Vehicle Communication Controller
EVSE	Electric Vehicle Supply Equipment
FO	Fleet Operator

GW	Gateway
HAN	Home Area Network
HLC	High Level Communication
HMI	Human Machine Interface
LAN	Local Area Network
MO	Meter Operator
OEM	Original Equipment Manufacturer
PLC	Power Line Communication
PnC	Plug and Charge
PU	Paying Unit
PWM	Pulse Width Modulation
RCD	Residual Current Device
SDR	Service Detail Record
SECC	Supply Equipment Communication Controller
USER	Vehicle User
VAS	Value-Added Services
V2G	Vehicle to Grid

5 Requirements

5.1 Communication concept

The requirements of ISO 15118-1 form the basic framework for all use cases descriptions and related documents in the ISO 15118 series. Communication in the context of this standard could be differentiated into two concepts called 'basic signalling' and High Level Communication. ISO 15118-1 and ISO 15118-2 specify High Level Communication. High Level Communication shall be used to enable features like identification, payment, load levelling and value-added services. The relations between these two concepts are specified in ISO 15118-2 and ISO 15118-3. In the context of 'Basic signalling' items such as vehicle states, control pilot handling for safety and initialization of the charging process are defined (see also subclause [3.25](#)).

In case of AC charging, the EV performs the charging control itself. In case of DC charging, the charger located in the EVSE performs the charging control.

Information exchange with High Level Communication only occurs if both EV and EVSE are equipped with a High Level Communication device.

Several options shall be considered. The interoperability between EVs and EVSEs that implement the different options is described in subclause [7.3](#):

- On the EVSE side:
 - EVSE does not support High Level Communication;
 - EVSE supports High Level Communication;

- EVSE requires High Level Communication.
- On the EV side:
 - EV does not have any High Level Communication means;
 - EV supports High Level Communication;
 - EV requires High Level Communication.

There are some combinations requiring timeout handling due to the initial mismatch of communication capabilities. This timeout duration ensures that the overall initialization duration does not exceed a user-acceptable period of time. Timeouts are defined in ISO 15118-2 and ISO 15118-3.

5.2 General considerations

The following general requirements build the basis for defining the use cases elements described in [clause 7](#):

- The mechanisms defined in ISO 15118-3 shall be used for associating each EVCC to its corresponding SECC.
- Some data communication between EV and the secondary actor is confidential. Appropriate cryptography has to be applied to protect the data exchanged between the EV and the secondary actor.
- Communication data shall be protected against modification or imitation (hacking).
- Electric energy offered by the spot operator shall either be measured specifically in the EVSE (if separate billing is required) or shall be part of the overall energy consumption.

The billing principles, e.g. per hour, are defined by the E-Mobility Operator and will be included in the contractual agreement between Operator and customer.

NOTE 1 ISO 15118-2 describes the security threats scenarios against which protective measures are implemented.

NOTE 2 The electric energy offered may also be included in other fees (e.g. a parking fee).

NOTE 3 National regulations require the usage of a certified meter for the measurement of the supplied energy in kWh.

NOTE 4 There is no direct communication from the EVCC to a smart meter defined within this standard. Meter data will be exchanged between the EVCC and the SECC depending on the Use Case. The communication between SECC and the smart meter is outside the scope of this standard.

5.3 User-specific requirements

5.3.1 Reliability, availability, error handling and error reporting

The charging shall

- be completed by a predetermined point in time;
- in the case of any exceptional circumstances, i.e. if the charging schedule cannot be met and the EV cannot be recharged by the announced point in time, a specified error reporting procedure to inform the user should be triggered as soon as possible (see ISO 15118-2);

If there is a negotiation process for the charging schedule e.g. because of the load levelling needs of the electrical grid, the protocol shall implement methods to indicate whether the target setting values could be fulfilled or not.

In the event that the requested charging schedule can't be fulfilled, a re-negotiation of the charging schedule shall be initiated for alternatives.

EV manufacturers or E-Mobility Operators can choose suitable methods to inform their customers about unexpected differences from the negotiated charging schedule.

Any error should be detected and controlled either by the EVSE or the EV. Error handling is performed according to ISO 15118 and IEC 61851-1.

5.3.2 Protection of privacy

Private information and user data shall only be readable by the intended addressees.

Private information shall be transferred only when necessary.

5.4 OEM-specific requirements

A charging schedule is calculated either by a secondary actor, the EVSE or the EV, based on information from the user, charging spot and energy grid and is transferred back to the grid to allow the planning of other EVs.

EVCC and SECC shall provide the possibility to adapt the charging schedule from either side if required.

NOTE 1 It is possible to divide the charging schedule into different phases like charging postponement, charging process interruption and charging in progress.

NOTE 2 Electrical or physical limits of the installation (EVSE and electrical wiring) have higher priority than the requested charging schedule.

To store certificates or other user-/customer-specific information related to the charging process in the EV, the following requirements shall be fulfilled (for additional information see [Annex B](#)):

- a) It shall be possible over the lifetime of the EV to change customer-specific information under the following circumstances:
 - at EV production;
 - at EV delivery to customer resp. start of EV usage;
 - when energy contract is changed by the customer;
 - when certificate expires;
 - if EVCC or the component which stores the user-/customer-specific data will be replaced in a workshop;
 - when vehicle is discarded;
 - when vehicle is stolen.
- b) the following requirements and process boundary conditions need to be fulfilled by any type of customer-related data:
 - Limited storage and processing capacity available at a control unit for EV-specific data or certificates.
 - Since the production of the EV may happen months before delivery to a customer, no data specific to the future customer nor contract can be written at production time.
 - Installing of an OEM provisioning certificate at production time is possible.
 - EVs may be used for more than 20 years.
 - Maintenance of an EV at independent workshops should be possible.

5.5 Utility-specific requirements

5.5.1 Power limiting for grid control or local energy control

The SECC shall inform the EVCC of the maximum available power level to optimize local grid energy usage. The EVCC shall also signal the maximum power level required to the SECC.

The support of ISO 15118 by EVs shall not prevent the usage of basic signalling in case the charging spot does not support High Level Communication (see [Table 2](#) for details).

NOTE For optimized grid usage, an EVCC may offer information about the estimated required energy and the available time. This information allows scheduling for an optimal charging schedule, as well as the possibility of re-scheduling.

5.5.2 Current limiting for EVSE protection

The maximum nominal current provided by the EVSE shall not exceed the ratings of the spot, the supply rating and the ratings of the attached cable assembly.

The SECC shall indicate to the EVCC the maximum nominal current that can be supplied to the EV. The current indication shall correspond to the current that can be supplied without overloading the local installation.

If the EV permanently exceeds the limits indicated by the EVSE during the charging process, the EVSE shall interrupt the charging process using predefined routines of ISO 15118-2 and, in case of an emergency, basic signalling routines.

5.5.3 Authorization of charging services

The EVSE identifies itself to the EV and performs authorization to check if the EV is allowed to be charged. Typically, EVSE allows charging if EV or USER provides the mechanism for payment. For this purpose, EVCC may present Contract Certificate, or USER present some credit card/debit card, or deposit some cash at EVSE.

In case of authorization using Contract Certificate, the protocol shall allow the exchange of contract relevant information between EVCC and SECC.

The validation of the contract relevant information shall be achieved by an indication of acceptance or non-acceptance between the vehicle, the EVSE and, if needed, the user. It shall be managed in a way that misuses are prevented.

In case of USER presenting payment relevant information at the EVSE such an exchange of information is not applicable.

EXAMPLES Parking information (to integrate charge into parking fees), EIM, debit/credit card, cash, mobile payment.

5.5.4 Retrofitting

In order to allow the upgrading of existing charging stations (EVSEs) by adding a component, the High Level Communication systems shall be defined in a way that an upgrade of existing infrastructure in compliance with ISO 15118 is possible.

Furthermore, in case the new component does not fully integrate the existing components in the EVSE (separated Control Pilot / SECC architecture), the newly installed SECC shall know and process the physical limits of the EVSE as well.

6 Actors

6.1 General

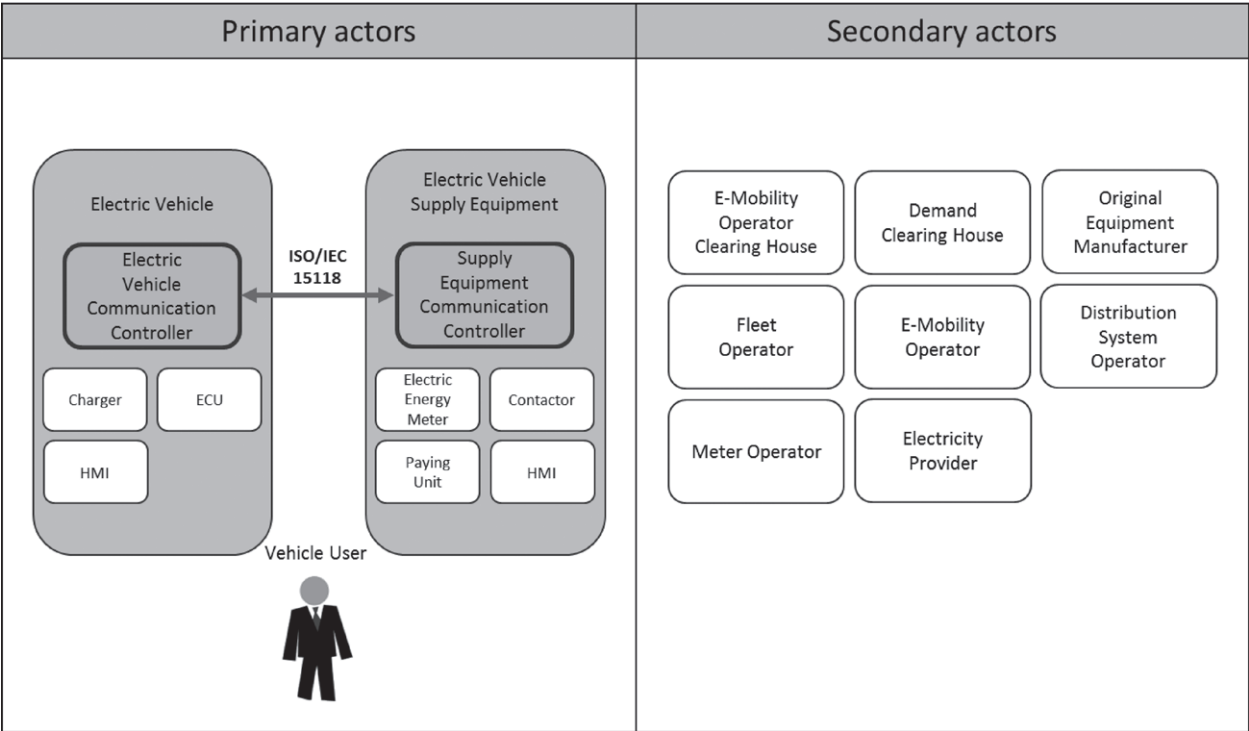


Figure 1 — Overview with examples of participating actors in the overall scenario

Figure 1 shows all primary and secondary actors as well as their trigger functions that may be involved directly or indirectly in the charging procedure of ISO 15118. The use case element descriptions in clause 7 will incorporate, where applicable, those actors and functions.

Primary actors are directly involved in the charging process. The information flow between EVCC and the SECC shall be specified according to all layers of the Open Systems Interconnection (OSI) reference model in accordance with ISO 7498.

The vehicle user (USER) plays an important role in the full context of charging EVs using the charging infrastructure. For implementing EVSE's it is crucial to understand this role and the interactions between the charging system and the vehicle USER. However, this standard is not intended to establish requirements relative to USER behaviour. Whenever the term 'USER' is used in this standard as the subject of a requirement this is rather meant to provide guidance for the implementer of the standard how a USER can behave and how a user should be guided by any means than defining the exact behaviour of the USER.

Although this standard does not specify the protocol between the primary actors and a secondary actor, there are messages defined in ISO 15118-2, which include elements to exchange data between these actors.

NOTE 1 Secondary actors may be involved in the charging process due to supplying information to the EVCC needed for the charging process. Depending on the use case element, they may be involved but a specific relation is not described in ISO 15118. Due to country-specific characteristics, the supply of information to the SECC may be done by centralised actors such as financial and Demand Clearing House and Meter Operator, or directly by secondary actors i.e. Electricity Provider or Distribution System Operator.

NOTE 2 Not all primary actors are necessarily located within the EVSE.

7 Use Case Elements

7.1 General

This clause classifies the elementary use cases for the communication system between EVCC and SECC. The communication to accomplish the identified use cases is defined in ISO 15118-2 and ISO 15118-3. If neither EV nor EVSE have any High Level Communication device, basic signalling applies.

The charging process is separated into eight functional groups to allow the classification of the elementary use cases (see [Figure 2](#)). For each functional group, several elementary use cases are possible. Each use case should be a combination of elementary use cases (see [Annex C](#)).

All possible elementary use cases are mentioned in the document:

- a) Start of the charging process: initiation of the process between vehicle and EVSE after the physical plug-in of the vehicle. It sets the basis for the on-going charging process e.g. availability of PWM, High Level Communication etc.;
- b) Communication setup: establishes the association and relevant connection between EVCC and SECC;
- c) Certificate Handling: everything related to certificates;
- d) Identification and Authorization: methods for identification and authorization;
- e) Target setting and charging scheduling: information needed from the EV as well as from SECC and the secondary actor to start the charging process and charging;
- f) Charging controlling and re-scheduling: elements during the charging process;
- g) Value-added services: elements not needed for pure charging of electric vehicles;
- h) End-of-charging process: Triggers for signalling the end of the charging process.

Variations of use case implementations exist, depending on the EVSE, the EV or the business case used for the charging process. [Figure 2](#) provides an overview of all use case elements grouped by function. Examples are listed in [Annex C](#)

NOTE The groups do not specify the order in which the use case elements will be implemented, or which elements are required or optional.