

## **International Electrotechnical Commission (IEC)**

### **IEC 15118-1 Vehicle to Grid Communication Interface – Part 1: General Information and Use-case Definition**

This International Standard specifies the communication between battery electric vehicles (BEV) or plug-in hybrid electric vehicles (PHEV) and the Electric Vehicle Supply Equipment. The application layer message set defined in this Part of ISO/IEC 15118 is designed to support the energy transfer from an EVSE to an EV. Part 1 contains additional use case elements (Part 1 Use Case Element IDs: F4 and F5) describing the bidirectional energy transfer. The implementation of these use cases requires enhancements of the application layer message set defined herein. The definitions of these additional requirements will be subject of the next revision of this standard.

The purpose of this Part of ISO/IEC 15118 is to detail the communication between an EV (BEV or a PHEV) and an EVSE. Aspects are specified to detect a vehicle in a communication network and enable an Internet Protocol (IP) based communication between EVCC and SECC.

**\*\*See SAE-J2836**

### **IEC 15118 -2 Vehicle to Grid Communication Interface – Part 2: Technical Protocol Description and Open Systems Interconnections (OSI) Layer Requirements**

This International Standard specifies the communication between battery electric vehicles (BEV) or plug-in hybrid electric vehicles (PHEV) and the Electric Vehicle Supply Equipment. The application layer message set defined in this Part of ISO/IEC 15118 is designed to support the energy transfer from an EVSE to an EV. Part 1 contains additional use case elements (Part 1 Use Case Element IDs: F4 and F5) describing the bidirectional energy transfer. The implementation of these use cases requires enhancements of the application layer message set defined herein. The definitions of these additional requirements will be subject of the next revision of this standard. The purpose of this Part of ISO/IEC 15118 is to detail the communication between an EV (BEV or a PHEV) and an EVSE. Aspects are specified to detect a vehicle in a communication network and enable an Internet Protocol (IP) based communication between EVCC and SECC.

**\*\*See SAE-J2847**

### **IEC 15118-3 Vehicle to Grid Communication Interface – Part 3: Wired Physical and Data Link Layer Requirements**

Standard Pending Agency Approval

**\*\*See SAE-J2931**

### **IEC 60068-1 Environmental Testing – Part 1 General and Guidance**

IEC 60068 includes a series of methods of environmental test and their appropriate severities, and prescribes various atmospheric conditions for measurements and tests designed to assess the ability of specimens to perform under expected conditions of transportation, storage and all aspects of operational use. Although primarily intended for Electrotechnical products this publication is not restricted to them and may be used in other fields where desired. Other methods of environmental test, specific to the individual types of specimen, may be included in the relevant specifications. The framework of environmental test tailoring process is given in order to assist the production of test specifications with appropriate tests and test severities.

### **IEC 60950-1 – Information Technology Equipment – Safety – Part 1: General Requirements**

Applicable to mains-powered or battery-powered information technology equipment, including electrical business equipment and associated equipment, with a RATED VOLTAGE not exceeding 600 V. Also applicable are components and subassemblies intended for incorporation in information technology equipment. It is not expected that such components and subassemblies comply with every aspect of the standard, provided that the complete information technology equipment, incorporating such components and subassemblies, does comply.

**IEC 61000-3-2 – Electromagnetic Compatibility (EMC) – Part 3-2: Limits – Limits for Harmonic Current Emissions (equipment input current ≤16 A per phase)**

Deals with the limitation of harmonic currents injected into the public supply system. Specifies limits of harmonic components of the input current which may be produced by equipment tested under specified conditions. Harmonic components are measured according to Annexes A and B. This part of IEC 61000 is applicable to electrical and electronic equipment having an input current up to and including 16 A per phase, and intended to be connected to public low voltage distribution systems. Arc welding equipment which is not professional equipment, with input current up to and including 16 A per phase, is included in this standard. Arc welding equipment intended for professional use, as specified in IEC 60974-1, is excluded from this standard and may be subject to installation restrictions as indicated in IEC 61000-3-4 or IEC 61000-3-12. The tests according to this standard are type tests. Test conditions for particular equipment are given in Annex C.

**IEC 61000-4-2 – Electromagnetic Compatibility (EMC) – Part 4-2: Testing and Measurement Techniques – Electrostatic Discharge Immunity Test**

Relates to the immunity requirements and test methods for electrical and electronic equipment subjected to static electricity discharges, from operators directly, and from personnel to adjacent objects. It additionally defines ranges of test levels which relate to different environmental and installation conditions and establishes test procedures. The object of IEC 61000-4-2:2008 is to establish a common and reproducible basis for evaluating the performance of electrical and electronic equipment when subjected to electrostatic discharges. In addition, it includes electrostatic discharges which may occur from personnel to objects near vital equipment. IEC 61000-4-2:2008 defines typical waveform of the discharge current, range of test levels, test equipment, test setup, test procedure, calibration procedure and measurement uncertainty. IEC 61000-4-2:2008 gives specifications for test performed in "laboratories" and "post-installation tests" performed on equipment in the final installation. This second edition cancels and replaces the first edition published in 1995, its amendment 1 (1998) and its amendment 2 (2000) and constitutes a technical revision. It has the status of a basic EMC publication in accordance with IEC Guide 107. The main changes with respect to the first edition of this standard and its amendments are the following:

- the specifications of the target have been extended up to 4 GHz. An example of target matching these requirements is also provided;
- information on radiated fields from human-metal discharge and from ESD generators is provided;
- measurement uncertainty considerations with examples of uncertainty budgets are given too.

**IEC 61000-4-3 – Electromagnetic Compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio frequency, electromagnetic field immunity test**

This part of IEC 61000 is applicable to the immunity requirements of electrical and electronic equipment to radiated electromagnetic energy. It establishes test levels and the required test procedures. The object of this standard is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to radiated, radio-frequency electromagnetic fields. The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of an equipment or system against a defined phenomenon.

NOTE 1 As described in IEC Guide 107, this is a basic EMC publication for use by product committees of the IEC. As also stated in Guide 107, the IEC product committees are responsible for determining whether this immunity test standard should be applied or not, and if applied, they are responsible for determining the appropriate test levels and performance criteria. TC 77 and its sub-committees are prepared to co-operate with product committees in the evaluation of the value of particular immunity tests for their products.

This part deals with immunity tests related to the protection against RF electromagnetic fields from any source. Particular considerations are devoted to the protection against radio-frequency emissions from digital radiotelephones and other RF emitting devices.

NOTE 2 Test methods are defined in this part for evaluating the effect that electromagnetic radiation has on the equipment concerned. The simulation and measurement of electromagnetic radiation is not adequately exact for quantitative determination of effects. The test methods defined are structured for the primary objective of establishing adequate repeatability of results at various test facilities for qualitative analysis of effects. This standard is an independent test method. Other test methods may not be used as substitutes for claiming compliance with this standard.



**IEC 61000-4-6 – Electromagnetic Compatibility (EMC) – Part 4-6: Testing and Measurement Techniques – Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields**

Relates to the conducted immunity requirements of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 9 kHz up to 80 MHz. Equipment not having at least one conducting cable (such as mains supply, signal line or earth connection) which can couple the equipment to the disturbing RF fields is excluded. The object of IEC 61000-4-6:2008 is to establish a common reference for evaluating the functional immunity of electrical and electronic equipment when subjected to conducted disturbances induced by radio-frequency fields. The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of an equipment or system against a defined phenomenon. IEC 61000-4-6:2008 has the status of a basic EMC publication in accordance with IEC Guide 107. This third edition of IEC 61000-4-6:2008 cancels and replaces the second edition published in 2003, Amendment 1 (2004) and Amendment 2 (2006). This edition constitutes a technical revision.

**IEC 61000-4-11 – Electromagnetic Compatibility (EMC) – Part 4-11: Testing and Measurement Techniques – Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests**

Defines the immunity test methods and range of preferred test levels for electrical and electronic equipment connected to low-voltage power supply networks for voltage dips, short interruptions, and voltage variations. This standard applies to electrical and electronic equipment having a rated input current not exceeding 16 A per phase, for connection to 50 Hz or 60 Hz a.c. networks. It does not apply to electrical and electronic equipment for connection to 400 Hz a.c. networks. Tests for these networks will be covered by future IEC standards. The object of this standard is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to voltage dips, short interruptions and voltage variations. This second edition cancels and replaces the first edition published in 1994 and its amendment 1 (2000). This second edition constitutes a technical revision in which 1) preferred test values and durations have been added for the different environment classes; 2) the tests for the three-phase systems have been specified. It has the status of a Basic EMC Publication in accordance with IEC Guide 107.

**IEC 61000-6-3 – Electromagnetic Compatibility (EMC) – Part 6-3: Generic Standards – Emission Standard for Residential, Commercial and Light-Industrial Environments**

Applies to electrical and electronic apparatus intended for use in residential, commercial and light-industrial environments. Emission requirements in the frequency range 0 Hz to 400 GHz are covered. No measurement needs to be performed at frequencies where no requirement is specified. This generic EMC emission standard is applicable if no relevant dedicated product or product-family EMC emission standard exists. This standard applies to apparatus intended to be directly connected to a low-voltage public mains network or connected to a dedicated DC source, which is intended to interface between the apparatus and the low-voltage public mains network. This standard applies also to apparatus which is battery operated or is powered by a non-public, but non-industrial, low-voltage power distribution system if this apparatus is intended to be used in the locations described below. The environments encompassed by this standard are residential, commercial and light-industrial locations, both indoor and outdoor. The following list, although not comprehensive, gives an indication of locations that are included: - residential properties, for example houses, apartments; - retail outlets, for example shops, supermarkets; - business premises, for example offices, banks; - areas of public entertainment, for example cinemas, public bars, dance halls; - outdoor locations, for example petrol stations, car parks, amusement and sports centres; - light-industrial locations, for example workshops, laboratories, service centres. Locations that are characterized by being supplied directly at low voltage from the public mains network are considered to be residential, commercial or light-industrial. The object of this standard is to define the emission test requirements for apparatus defined in the scope in relation to continuous and transient conducted and radiated disturbances. The emission requirements have been selected so as to ensure that disturbances generated by apparatus operating normally in residential, commercial and light-industrial locations do not exceed a level which could prevent other apparatus from operating as intended. Fault conditions of apparatus are not taken into account. Not all disturbance phenomena have been included for testing purposes in this standard but only those considered as relevant for the equipment covered by this standard. These requirements represent essential electromagnetic compatibility emission requirements. Requirements are specified for each port considered.

**IEC 61851-1 – Electric Vehicle Conductive Charging System – Part 1: General Requirements**

Applies to on-board and off-board equipment for charging electric road vehicles at standard a.c. supply voltages (as per IEC 60038) up to 1 000 V and at d.c. voltages up to 1 500 V, and for providing electrical power for any additional services on the vehicle if required when connected to the supply network. It includes characteristics and operating conditions of the supply device and the connection to the vehicle; operators and third party electrical safety, and the characteristics to be complied with by the vehicle with respect to the a.c./d.c. EVSE, only when the EV is earthed. This second edition cancels and replaces the first edition published in 2001. It constitutes a technical revision. The main changes with respect to the first edition of this standard are:

- revision of connector definitions and current levels (Clause 8);
- modification definition of pilot wire to pilot function;
- division of Clause 9 to create Clauses 9 and 11;
- Clause 9: specific requirements for inlet, plug and socket-outlet;
- Clause 11: EVSE requirements: the basic generic requirements for charging stations;
- renumbering of annexes;
- deletion of previous Annex A and integration of charging cable requirements into new Clause 10;
- Annex B becomes Annex A and is normative for all systems using a PWM pilot function with a pilot wire; Annex C becomes Annex B;
- replacement of previous Annex D (coding tables for power indicator) with B.4 in Annex B using new values;
- new informative Annex C describing an alternative pilot function system.

**IEC 62196-1 – Plugs, Socket-outlets, Vehicle Connectors and Vehicle Inlets – Conductive Charging of Electric Vehicles – Part 1: General Requirements**

Applicable to plugs, socket-outlets, connectors, inlets and cable assemblies for electric vehicles (EV), herein referred to as "accessories", intended for use in conductive charging systems which incorporate control means, with a rated operating voltage not exceeding:

- 690 V a.c. 50 Hz - 60 Hz, at a rated current not exceeding 250 A,
- 1 500 V d.c. at a rated current not exceeding 400 A. This second edition cancels and replaces the first edition published in 2003 and constitutes a technical revision. The main changes from the previous edition are as follows:
- increase in d.c.voltage for accessories;
- permitted use of accessories with vehicles complying with Subclause 7.2.3.1 of 61851-1:2010;
- minor changes to definitions; - additional voltage and current ratings (Clause 5) and test values (Clause 12, 13,);
- removal of markings to identify generic types of vehicle inlets and connectors;
- addition of a "high power d.c." to the type of accessories covered by the Standard;
- modification of the description of "universal" and "basic" interfaces based on changes to 61851-1:2010;
- simplification of the marking requirements (Clause 8);
- additional requirements for accessories with shutters;
- division of Clause 9 to create Clauses 9 and 11;
- Clause 9: specific requirements for inlet, plug and socket-outlet;
- Clause 11: EVSE (Electric Vehicle Supply Equipment) requirements: the basic generic requirements for charging stations;
- renumbering of annexes.

**IEC 62196-2 – Plugs, Socket-outlets, Vehicle Connectors and Vehicle Inlets – Conductive Charging of Electric Vehicles – Part 2: Dimensional Compatibility and Interchangeability Requirements for a.c. Pin and Contact-tube Accessories**

Applies to plugs, socket-outlets, vehicle connectors and vehicle inlets with pins and contact-tubes of standardized configurations, herein referred to as accessories. They have a nominal rated operating voltage not exceeding 500 V a.c., 50 to 60 Hz, and a rated current not exceeding 63 A three-phase or 70 A single phase, for use in conductive charging of electric vehicles. This standard covers the basic interface accessories for vehicle supply as specified in IEC 62196-1, and intended for use in conductive charging systems for circuits specified in IEC 61851-1:2010.



**IEC 61851-21 – Electric Vehicle Conductive Charging System – Part 21: Electric Vehicle Requirements for Conductive Connection to an a.c./d.c Supply**

This part of IEC 61851 together with part 1 gives the electric vehicle requirements for conductive connection to an a.c. or d.c. supply, for a.c. voltages according to IEC 60038 up to 690 V and for d.c. voltages up to 1 000 V, when the electric vehicle is connected to the supply network.

**IEC 61851-22 – Electric Vehicle Conductive Charging System – Part 22: AC Electric Vehicle Charging Station**

This part of IEC 61851, together with part 1, gives the requirements for a.c. electric vehicle charging stations for conductive connection to an electric vehicle, with a.c. supply voltages according to IEC 60038 up to 690 V.