



EXPERT WORKSHOP

# Mapping standards for low- and zero-emission electric heavy duty vehicles

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## Overview of existing standards

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# E-mobility standardization in the IEC

- **Several Technical Committees and Sub-Committees already involved**
  - **TC 20** - Electric cables
  - **TC 21** - Secondary cells and batteries
  - **SC 23E** - Circuit-breakers and similar equipment for household use
  - **SC 23H** - Plugs, Socket-outlets and Couplers for industrial and similar applications, and for Electric Vehicles
  - **TC 57** - Power systems management and associated information exchange
  - **TC 64** - Electrical installations and protection against electric shock
  - **TC 69**
  - **SC 121B** - Low-voltage switchgear and controlgear assemblies
  - **System Committee** - Smart Energy

# TC 69 presentation

- Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks
- Scope: To prepare publications on electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks (hereafter EV) drawing current from a rechargeable energy storage system (RESS). Possibilities to transfer power/energy include conductive power/energy transfer, wireless power/energy transfer and battery swap.  
...
- EV include but are not limited to passenger cars and buses, two and three-wheel and light four-wheel vehicles, trucks and goods vehicles, trailers and special and industrial trucks.
- Trains, trams and trolleybuses are out of scope of TC69.

# TC 69 presentation

## Figures

- 329 experts in 14 groups
- 23 publications
- 29 projects

# TC 69 publications

- **IEC 61851-1 Edition 3 – February 2017**  
**Electric vehicle conductive charging system – Part 1:**  
**General requirements**
  - It applies to EV supply equipment for charging electric road vehicles, with a rated supply voltage up to 1000 V AC or up to 1500 V DC. and a rated output voltage up to 1000 V AC. or up to 1500 V DC
  - It gives the characteristics and operating conditions of the EV supply equipment, the specification of its connection to the EV, the requirements for its electrical safety; additional requirements for specific environments or installation conditions are given too
  - It gives the connection cases (A, B & C) amongst many definitions, specifies the charging modes (Modes 1 to 4) as well as the Control Pilot function based on a PWM signal

*It is considered as the reference standard and the maintenance work has just started.*

# TC 69 publications

- **IEC 61851-21-1 Edition 1 - June 2017**  
**Electric vehicle conductive charging system – Part 21-1: Electric vehicle on-board charger EMC requirements for conductive connection to an AC/DC supply**
  - It applies only to on-board charging units either tested on the complete vehicle or tested on the charging system component level
- **IEC 61851-21-2 Edition 1 – April 2018**  
**Electric vehicle conductive charging system – Part 21-2: Electric vehicle requirements for conductive connection to an AC/DC supply – EMC requirements for off-board electric vehicle charging systems**
  - It applies to any off-board components or equipment of such systems used to supply or charge electric vehicles with electric power by conductive power transfer
  - It covers off-board charging equipment for modes 1 to 4 charging as defined in IEC 61851-1

# TC 69 publications

- **IEC 61851-23 Edition 1 – March 2014**  
**Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station**
  - Together with IEC 61851-1:2010, it gives the requirements for d.c. EV charging stations
  - It specifies the d.c. charging systems A, B and C in 3 different normative annexes
  - It provides the general requirements for the control communication between a d.c. EV charging station and an EV

*The maintenance of this standard is well advanced (next edition end 2020).*

*There will be changes on the electrical safety requirements, additions of specific requirements on the bi-directional power flow control, on multiple DC outputs, on communication and charging process and on charging with thermal management system.*

*High power transfer as high as 350 kW is covered.*

# TC 69 publications

- **IEC 61851-24 Edition 1 – March 2014**  
**Electric vehicle conductive charging system – Part 24:**  
**Digital communication between a d.c. EV charging station**  
**and an electric vehicle for control of d.c. charging**
  - Together with IEC 61851-23 it applies to the digital communication between a d.c. EV charging station and an EV for control of d.c. charging
  - Three annexes give the descriptions of the digital communications for control of d.c. charging specific to d.c. EV charging systems A, B and C as defined in IEC 61851-23

*The maintenance of this standard is well advanced (next edition 2021).*



# TC 69 publications

- **IEC 61980 series on Wireless power transfer systems**
  - **IEC 61980-1 Edition 1 – July 2015:** General requirements
  - **IEC TS 61980-2 Edition 1 – June 2019:** Specific requirements for communication between electric road vehicle (EV) and infrastructure
  - **IEC TS 61980-3 Edition 1 – June 2019:** Specific requirements for the magnetic field wireless power transfer systems

*The maintenance of Part 1 is well advanced (next edition 2020), that of the other 2 parts (standards will replace the current technical specifications) has started.*

# TC 69 publications

- **IEC 62840 series on Electric vehicle battery swap system**
  - **IEC TS 62840-1 – July 2016:** General and Guidance
  - **IEC 62840-2 – October 2016:** Safety requirements
  - The purpose of the battery swap system is to provide energy partly or in total to electric road vehicles through fast replacement of their removable battery packs

*The maintenance of Part 1 has started and the next publication will be an international standard.*

# TC 69 publications

- **IEC 63119-1 Edition 1 – June 2019**

Information exchange for electric vehicle charging roaming service - Part 1: General

- It establishes a basis for the other parts of IEC 63119, specifying the terms and definitions, general description of the system model, classification, information exchange and security mechanisms for roaming between EV charge service providers, charging station operators and clearing house platforms through roaming endpoints

*Three other projects on Information exchange for Electric Vehicle charging roaming service are planned but not started yet, these are the future IEC 63119-2: Use cases, IEC 63119-3: Message structure and IEC 63119-4: Cyber security and information privacy*

# ISO TC 22 in cooperation with TC 69

- **ISO 15118 series “Road vehicles – Vehicle to grid interface” address the High Level Communication between the EV and the EV supply equipment**
  - The different parts are:
    - -1: General information and use case definition
    - -2: Network and application protocol requirements
    - -3: Physical and data link layer requirements
    - -4: Network and application protocol conformance tests
    - -5: Physical and data link layer conformance tests
    - -8: Physical layer and data link layer requirements for wireless communication

*Four projects are ongoing or planned (2 on maintenance of existing standards and 2 on new projects)*

# Prospects

- **Publications are under preparation on:**
  - DC electric vehicle charging station with an automated connection device (*Future IEC 61851-23-1*)
  - Particular requirements for EV supply equipment where protection relies on double or reinforced insulation (*a series of 6 technical specifications IEC TS 61851-3-x is almost completed*)
  - DC EV supply equipment where protection relies on electrical separation (*Future IEC 61851-25*)
  - Protocol for Management of Electric Vehicles charging and discharging infrastructures (*Future IEC 63110-x; 3 parts are planned, Part1 is well advanced*)
  - Interoperability and safety of dynamic wireless power transfer (WPT) for electric vehicles (*Future IEC 63243*)
- **Future works**
  - EV charging system cyber security framework setting forth end-to-end cyber security principles, requirements and conformance criteria
  - Management of Distributed Energy Storage Systems (DESS) based on Electrical Vehicles capable to perform Smart Charging and Vehicle to Grid (V2G) functions, managed by a common aggregator

**Thank you!**

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