IEC 61851-24

Edition 2.0 2023-12

INTERNATIONAL STANDARD

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Electric vehicle conductive charging system –
Part 24: Digital communication between a DC EV supply equipment and an electric vehicle for control of DC charging

Système de charge conductive pour véhicules électriques –
Partie 24: Communication numérique entre le système d'alimentation à courant continu et le véhicule électrique pour le contrôle de la charge à courant continu

IEC 61851-24:2023-12(en-fr)

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ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –

Part 24: Digital communication between a DC EV supply equipment and an electric vehicle for control of DC charging

FOREWORD

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IEC 61851-24 has been prepared by IEC technical committee 69: Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks. It is an International Standard.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Annex A and Annex B have been updated in line with IEC 61851-23:2023 and relevant standards.

The text of this International Standard is based on the following documents:

Draft	Report on voting
69/909/FDIS	69/914/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 61851 series, published under the general title *Electric vehicle conductive charging system*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –

Part 24: Digital communication between a DC EV supply equipment and an electric vehicle for control of DC charging

1 Scope

This part of IEC 61851, together with IEC 61851-23, applies to digital communication between a DC EV supply equipment and an electric road vehicle (EV) for control of conductive DC power transfer, with a rated supply voltage up to 1 000 V AC or up to 1 500 V DC and a rated output voltage up to 1 500 V DC.

This document also applies to digital communication between the DC EV charging/discharging station and the EV for system A, as specified in Annex A.

The EV charging mode is mode 4, according to IEC 61851-23.

Annex A, Annex B, and Annex C give descriptions of digital communications for control of DC charging specific to DC EV charging systems A, B and C as defined in IEC 61851-23.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 61851-23:2023, *Electric vehicle conductive charging system – Part 23: DC electric vehicle supply equipment*

ISO TR 8713, *Electrically propelled road vehicles – Vocabulary*

ISO 11898-1:2015, *Road vehicles – Controller area network (CAN) – Part 1: Data link layer and physical signalling*

ISO 11898-2:2016, *Road vehicles – Controller area network (CAN) – Part 2: High-speed medium access unit*

ISO 15118-2:2014, *Road vehicles – Vehicle-to-grid communication interface – Part 2: Network and application protocol requirements*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

This clause of IEC 61851-23:2023 is applicable except as follows:

Additional terms and definitions:

3.1
parameter
single piece of information relevant to charging control, and that is exchanged between a DC EV supply equipment and an EV using a form of digital communication

3.2
signal
data element that is communicated between a DC EV supply equipment and an EV using any means other than digital communication

4 System configuration

The system configuration shall be in accordance with GG.2 of IEC 61851-23:20—.

5 Digital communication architecture

In this document, two digital communication architectures are used:

- based on CAN using a dedicated data communication circuit; CAN protocol is given in ISO 11898-1. Refer to Annex A and Annex B for specific implementation details.
- based on Homeplug® Green PHY™[1] (see IEEE 1901) over the control pilot line; refer to Annex C for specific implementation details.

6 Charging control process

GG.3 of IEC 61851-23:2023 provides general information on the charging process and the state of DC EV supply equipment.

Specific requirements of charging process are given in AA.4 and AA.6.3 for system A, BB.4 and BB.6 for system B, and CC.3 for system C in IEC 61851-23:2023 respectively.

7 Overview of charging control

The digital communication of DC charging control covered by this document is as shown in Figure 1, identifying the SECC (supply equipment communication controller) and EVCC (EV communication controller), as defined in IEC 61851-23. This document does not cover the control protocol internal to the DC EV supply equipment, nor the vehicle, such as power control protocol for AC/DC inverter of DC EV supply equipment and battery management control in the vehicle.

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[1] Homeplug® and Green PHY™ are examples of suitable products available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of these products.

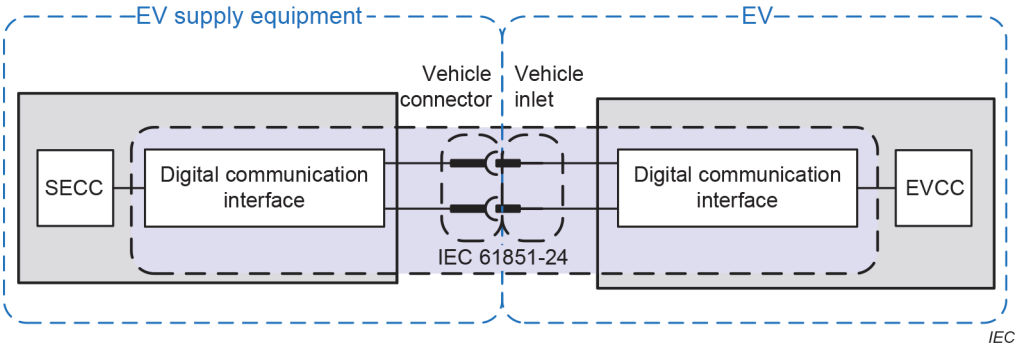

Figure 1 – Digital communication between a DC EV supply equipment and an electric vehicle for control of DC charging

8 Exchanged information for DC charging control

This clause describes information which shall be exchanged between a DC EV supply equipment and a vehicle during the charging process according to IEC 61851-23. The information in Table 1 is common to all systems described in Annex A, Annex B and Annex C. Each information listed in Table 1 is defined as a parameter in each annex. Each system can have additional parameters, and these parameters are defined in each annex.

Table 1 – Exchanged information for DC charging control

No.	Information	Description	Relevant requirement in IEC 61851-23:2023
a-1	Current request for the controlled current charging (CCC) system	Exchange of current value requested by EV	6.3.1.101
a-2	Voltage request for the controlled voltage charging (CVC) system	Exchange of voltage value requested by EV	
a-3	Maximum rated voltage of DC EV supply equipment	Exchange of maximum rated voltage value of DC EV supply equipment	6.3.1.101 6.3.1.104
a-4	Maximum rated current of DC EV supply equipment	Exchange of maximum rated current value of DC EV supply equipment	6.3.1.101 6.3.1.104
b-1	Communication protocol	Exchange of software version of a charging system	6.3.1.104 6.3.1.106
b-2	Maximum voltage limit of EV	Exchange of maximum voltage limit value of vehicle.	
b-3	EV minimum current limit, only for the controlled voltage charging (CVC) system	Under consideration	
b-4	Implementation of optional control function	Exchange information about available optional function, such as high current control and dynamic control.	6.3.1.104 6.3.2.102
c	Insulation check result	Exchange of the result of insulation check before charging – If insulation check fails, a signal is sent that charging is not allowed.	6.3.1.105
d	Short circuit test before charging	Exchange of information on short circuit test before charging	6.3.1.109
e	Charging stopped by user	Exchange of information on charge stop command by the user of DC EV supply equipment	6.3.1.110

No.	Information	Description	Relevant requirement in IEC 61851-23:2023
f	EV supply equipment real time available load current (optional)	Exchange of EV supply equipment real time available load current for demand management. Required for system providing that function.	6.3.2.102
g	Loss of digital communication	Detection of loss of digital communication – If a receiver does not get information expected to receive within time out period, it is considered as loss of digital communication.	6.3.1.5
h-1	Zero current confirmed	Notification of zero current confirmed – Station informs EV that low current condition has been met (to allow the opening and welding check of EV contactors by EV)	6.3.1.113 G.3.4
h-2	Welding detection	Exchange of information on the whole process of welding detection	
i-1	Normal shutdown	Termination of the charging process not caused by a failure	6.3.1.113.2
i-2	Error shutdown	Termination of the charging process caused by a failure	6.3.1.113.3

Annex A
(normative)

Digital communication for control of DC EV charging system A

A.1 General

This annex shows the specification of digital communication for control of the DC EV supply equipment of system A (in this annex, referred to as "System A station" or "station") as specified in Annex AA of IEC 61851-23:2023. More detailed information on System A is defined in IEEE 2030.1.1.

This annex is also applicable to the DC EV charging/discharging station of system A.

NOTE Technical Specifications of CHAdeMO 2.0.1, Amendment 1 2020, provides additional information on system A. Available at https://www.chademo.com.

A.2 Digital communication actions during charging control process

The communication actions and parameters according to the charging control process as defined in Table AA.15 of IEC 61851-23:2023 are shown in Table A.1.

Table A.1 – Communication actions and parameters during DC charging control process between system A station and vehicle

Charging control stage		State	High level action at system level [a]	Digital communication action	Parameter	
					From DC EV supply equipment	From vehicle
Initialization	Handshaking	DC-A	Vehicle unconnected	None	N/A	N/A
		DC-B1	Connector plugged in	None	N/A	N/A
		DC-B1	Wake up of DCCCF and VCCF	None	None	(default CAN)
			Communication data initialization	Preparation for digital communication	(default CAN)	(default CAN)
		DC-B1→ DC-B2	Communication established, parameters exchanged, and compatibility checked	Exchange of charging control parameters	– Control protocol number – Available output voltage – Available output current – Battery incompatibility – Energizing state – Identifier of welding detection – Threshold voltage – Charging stop control	– Control protocol number – Total capacity of battery – Maximum battery voltage – Maximum charging time – Target battery voltage – Vehicle charging enabled – Minimum charge current – Estimated charging time – Vehicle status – Charged rate
	Charge preparation	DC-B2 →DC-B3	Connector latched	Notification of state of charging progress	– Energizing state	None
		DC-B3	Insulation resistance check for DC power line	None	– Charging system error	None
		DC-B3	Pre-charge (depending on the system architecture)	N/A	N/A	N/A

Charging control stage	State	High level action at system level [a]	Digital communication action	Parameter	
				From DC EV supply equipment	From vehicle
Energy transfer	DC-C or DC-D	Vehicle side contactors closed	Notification of vehicle main contactor closed status	None	– Vehicle status
	DC-C or DC-D	Charging by current demand (for CCC)	Notification of request value of charging current (or voltage)	– Station status – Output voltage – Output current – Remaining charging time – Station error – Charging system error – Charging stop control	– Charging current request – Charging system error – Parking status of the vehicle
	DC-C or DC-D	Charging by voltage demand (for CVC)	N/A	N/A	N/A
	DC-C,(D) →DC-B'1	Current suppression	Request of energy transfer shut-off	– Station status – Charging stop control – Output voltage – Output current	– Vehicle charging enabled
Shutdown (case 1)	DC-B'1	Zero current confirmed	Notification of energy transfer shut-off	– Station status – Charging system error	
	DC-B'1→ DC-B'2	Welding detection (by vehicle)		None	None
	DC-B'2	Vehicle side contactors open	None	None	– Vehicle status
	DC-B'2	DC power line voltage verification	Notification of present voltage	– Output voltage – Energizing state	None
	DC-B'3	Connector unlatched	Notification of connector unlatch status	None	None
	DC-B'4	End of charge at communication level	Terminate the digital communication	None	None
	DC-A	Connector unplugged		N/A	N/A