Test Report issued under the responsibility of:

TEST REPORT
EN 61851-23
Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station

Report Number. ..... :	ABBQ-19OC2721ETSHP
Date of issue ..... :	2021.12.15
Total number of pages ..... :	45
Applicant's name ..... :	Autel Intelligent Technology Corp., Ltd.
Address ..... :	8th Floor, Building B1, Zhiyuan, Xueyuan Rd.1001, Shenzhen
Test specification:	
Standard ..... :	EN 61851-1:2011 EN 61851-23:2014/AC:2016 EN 61851-24:2014/AC:2015
Test procedure ..... :	CE-LVD, CE-EMC
Test item description .....:	DC electric vehicle charging station
Trade Mark.....:	Logo of Autel
Manufacturer .....:	Autel Intelligent Technology Corp., Ltd.
Model/Type reference.....:	MaxiCharger DC High Power 360 kW/480 kW
Ratings.....:	See page 2
Conclusion .....:	**The products comply with the standard examined.**

Tested by (name, signature) ..... :	Jimmy Zhang
Approved by (name, signature) ..... :	Stone Shi

LCIE CHINA COMPANY LIMITED

List of Attachments (including a total number of pages in each attachment):

Totally 45 pages

Annex A - page 28, Annex AA – page 28, Annex BB – page 28
Annex CC – page 28 to page 32
Annex 1 – page 41
Annex 2 – page 42 to page 45

General product information:

Model	MaxiCharger DC High Power 480kW	MaxiCharger DC High Power 360 kW
AC input	400V~(±20%), 50/60Hz	400V~(±20%), 50/60Hz
DC output	Single output: DC200-850V, 0-200A; Dual output: DC200-850V, 0-400A(total)	Single output: DC200-850V, 0-200A; Dual output: DC200-850V, 0-400A(total)
Rated power	480kW	360kW
IP degree	IP54	IP54

Summary of testing:

Tests performed (name of test and test clause):

Note:

1. Model No. MaxiCharger DC High Power 480kW and MaxiCharger DC High Power 480kW have the same enclosure, electrical diagram and construction, with the only difference on output power.
2. These DC charging stations can realize both single output and dual output; for dual output, the output power is evenly distributed.
3. These DC charging stations have separated construction, power supply unit + charging output unit

Copy of marking plate:

DC Electric Vehicle charging station

Model No. MaxiCharger High Power 360 kW/480 kW

Serial No.1809000085

Input: 400V~(±20%), 50/60Hz, 3 phases

1. Single output: 200-850VDC, 0-200A
2. Dual output: 200-850VDC, 0-400A(total)

IP54

Operating temperature: -40°C to 50°C

Date of manufacture: 20180805

Manufacturer: Autel Intelligent Technology Corp., Ltd.

Critical component list:

Component	Trademark	Model	Conformity
vehicle connector*	PHOENIX	EV-T2M4CC-DC200A-7	VDE license No.40040872
circuit breaker	ABB	T5	CE license No. 1SDL000165R0005
MCCB	ABB	S20x series	CE license No. CE180303005788
MCB	ABB	S202	CE license No. CE170314005500
Fuse	Cfriend	FDJ-350A	CE license No. CE-170508-05
Contactor	ABB	AX300-30	CE license No. CE170302005350
Electrical energy meter	Zhejiang Reallin	D3001	MID license No.DE MTP 14 B 007 MI-003
Power supply	OMRON	S8VK-C48024	CE license No. OMSQ-G05130203C
SPD	PHOENIX	VAL-MS series	CE license No. 83156207.10

*NOTE: vehicle connector complies with IEC 62196-1:2014, IEC 62196-3:2014

Test item particulars.....:	-
Equipment mobility .....:	[] movable [] hand-held [] transportable [X] stationary [] for building-in [] direct plug-in
Connection to the mains .....:	[] pluggable equipment [] type A [] type B [X] permanent connection [] detachable power supply cord [] non-detachable power supply cord [] not directly connected to the mains
Access location .....:	[] operator accessible [X] service access area [] restricted access location
Over voltage category (OVC) .....:	[] OVC I [] OVC II [X] OVC III [] OVC IV [] other:
Class of equipment .....:	[X] Class I [] Class II [] Class III [] Not classified
Mains supply tolerance (%) or absolute mains supply values .....:	±20%
Considered current rating (A) .....:	See page 2
Pollution degree (PD) .....:	[] PD 1 [] PD 2 []X PD 3
IP protection class .....:	IP54
Altitude during operation (m) .....:	2000m
Output Connector Interface Type.....:	IEC 62196-3, configuration FF
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☒ comma / ☒ point is used as the decimal separator.

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
5	**RATING OF THE SUPPLY VOLTAGE**		P
	Equipment operates as intended within a supply voltage tolerance of ±10%	Verified by ±20% based on manufacturer's information	P
	Equipment operates as intended within a frequency tolerance of ±1%		P
6	**GENERAL SYSTEM REQUIREMENTS AND INTERFACE**		**P**
6.1	**General Description**		**P**
	Method of charging uses an on-board charger		N/A
	Method of charging uses an off-board charger		P
6.2	**EV Charging Modes**		**P**
	EV charging mode is Mode 4, utilizing a d.c. EV charging station (e.g. off-board charger) where the control pilot function extends to the d.c. EV charging station.		P
	Pluggable d.c. EV charging stations, which are intended to be connected to the a.c. supply network (mains) using standard plugs and socket outlets, shall be compatible with residual current device with characteristics of type A.		N/A
	The pluggable d.c. EV charging station shall be provided with an RCD, and may be equipped with an overcurrent protection device.		N/A
6.3	**Types of EV Connection**		**P**
6.3.1	General description		P
	The connection of EVs using cables shall be carried out in case of C connection		P
6.3.2	Cord extension sets not provided		P
	Vehicle instructions indicate no cord extensions		P
	Cable assembly provided cannot be used as a cord extension		P
6.3.3	Adaptors shall not be used to connect a vehicle connector to a vehicle inlet.		P
6.4	**Functions provided in each charging mode**		**P**
	The d.c. EV charging station shall supply a d.c. current or voltage to the vehicle battery in accordance with a VCCF request.		P
6.4.1	Mode 4 charging functions		P
	- verification that the vehicle is properly connected;		P
	- protective conductor continuity checking (6.4.3.2);		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	- energization of the system;		P
	- de-energization of the system (6.4.3.4);		P
	- d.c supply for EV (6.4.3.101);		P
	- measuring current and voltage (6.4.3.102);		P
	- retaining / releasing coupler (6.4.3.103);		P
	- locking of the coupler (6.4.3.104);		P
	- compatibility assessment (6.4.3.105)		P
	- insulation test before charging (6.4.3.106)		P
	- protection against overvoltage at the battery (6.4.3.107);		P
	- verification of vehicle connector voltage (6.4.3.108);		P
	- control circuit supply integrity (6.4.3.109);		P
	- short circuit test before charging (6.4.3.110);		P
	- user initiated shutdown (6.4.3.111);		P
	- overload protection for parallel conductors (conditional function) (6.4.3.112);		P
	- protection against temporary overvoltage (6.4.3.113).		P
	- emergency shutdown (6.4.3.114)		P
6.4.2	Optional function		P
	- determination of ventilation requirements of the charging area;		P
	- detection/adjustment of the real time available load current of the DC charger;		P
	- selection of charging current;		N/A
	- wake up of d.c. EV charging station by EV (6.4.4.101);		P
	- indicating means to notify users of locked status of vehicle coupler.		P
	Other additional functions may be provided.		N/A
6.4.3	Details of functions for DC charging		P
6.4.3.1	Verification that the vehicle is properly connected		P
	The EVSE are able to determine that the connector is properly inserted in the vehicle inlet and properly connected to the EVSE.		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	Vehicle movement by its own propulsion system is impossible as long as the vehicle is physically connected to the EVSE as required in ISO 6469-2.		P
6.4.3.2	Protective conductor continuity checking		P
	For isolated systems, protective conductor continuity between the d.c. EV charging station and the vehicle shall be monitored.		P
	For the rated voltage of d.c. 60 V or higher, the d.c. EV charging station shall perform an emergency shutdown (see 6.4.3.114) within 10 s after a loss of electrical continuity of the protective conductor between d.c. EV charging station and EV (emergency shutdown).		P
	For non-isolated systems, in case of loss of earthing conductor continuity, the non-isolated d.c. EV charging station shall be disconnected from a.c supply network (mains).		N/A
	Earthing conductor continuity between the d.c. EV charging station and the vehicle shall be monitored. For the rated voltage of d.c. 60 V or higher, the d.c. EV charging station shall perform an emergency shutdown within 5 s after a loss of electrical continuity of the protective conductor between d.c. EV charging station and EV.		N/A
6.4.3.3	Energization of the system		P
	Energization of the system did not performed until the pilot function between EVSE and EV has been established correctly.		P
	Energization may also be subject to other conditions being fulfilled.		P
6.4.3.4	De-energization of the system		P
	If the pilot function is interrupted, the power supply to the cable assembly is interrupted but the control circuit may remain energized.		P
	In the case of failure in control circuit of d.c. EV charging station, such as short-circuit, earth leakage, CPU failure or excess temperature, the d.c. EV charging station shall terminate the supply of charging current, and disconnect the supply of control circuit.		P
	In addition, the conductor, in which earth fault or overcurrent is detected, shall be disconnected from its supply.		P
	Requirement for disconnection of EV is defined in 7.2.3.1.		---

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
6.4.3.101	DC supply for EV		P
	The d.c. EV charging station shall supply d.c. voltage and current to the vehicle battery in accordance with VCCF's controlling.		P
	For regulated systems, the d.c. EV charging station shall supply regulated d.c. voltage or current to the vehicle battery in accordance with VCCF's controlling.		P
	Requirements for charging performance of regulated d.c. current / voltage are given in 101.2.1.1, 101.2.1.2 and 101.2.1.3 and 101.2.1.4.		---
	In either case mentioned above, the maximum ratings of the d.c EV charging station shall not be exceeded.		P
	The vehicle can change the requested current and/or requested voltage.		P
6.4.3.102	Measuring current and voltage		P
	The d.c. EV charging station shall measure the output current and output voltage. The accuracy of output measurement is defined for each system in Annexes AA, BB and CC.		P
6.4.3.103	Retaining/releasing coupler		P
	A means shall be provided to retain and release the vehicle coupler. Such means may be mechanical, electrical interlock, or combination of interlock and latch.		P
6.4.3.104	Locking of the coupler		P
	A vehicle connector used for d.c. charging shall be locked on a vehicle inlet if the voltage is higher than 60 V d.c.		P
	The vehicle connector shall not be unlocked (if the locking mechanism is engaged) when hazardous voltage is detected through charging process including after the end of charging. In case of charging system malfunction, a means for safe disconnection may be provided.		P
	The d.c. EV charging station shall have the following functions in case the locking is done by the d.c. EV charging station:		P
	– electrical or mechanical locking function to retain the locked status, and		P
	– function to detect the disconnection of the electrical circuits for the locking function.		P
6.4.3.105	Compatibility assessment		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	Compatibility of EV and d.c. EV charging station shall be checked with the information exchanged at the initialization phase as specified in 102.5.1.		P
6.4.3.106	Insulation test before charging		P
	The d.c. EV charging station shall confirm the insulation resistance between its d.c. output circuit and protective conductor to the vehicle chassis, including the charging station enclosure, before the EV contactors are allowed to close.		P
	If the required value is not met, the d.c. EV charging station shall send the signal to the vehicle that the charging is not allowed.		P
	Conformance is determined by measuring the insulation resistance as follows:		P
	Any relays in the d.c. output circuit of the d.c. EV charging station shall be closed during the test.		P
	The required value of insulation resistance R shall be: R ≥100 Ω/V x U U is rated output voltage of the d.c. EV charging station.		P
6.4.3.107	Protection against overvoltage at the battery		P
	The d.c. EV charging station shall perform an emergency shutdown and disconnect its supply to prevent overvoltage at the battery, if output voltage exceeds maximum voltage limit sent by the vehicle. In case of vehicle failure, disconnection from a.c. mains may not be necessary.		P
	Specific requirement for detection and shutdown are defined in Annexes AA, BB and CC.		---
	The vehicle can change the maximum voltage limit during charging process.		P
	Compliance is checked according to the following test.		P
	The d.c. EV charging station is connected to a d.c. voltage source or artificial load.		P
	The voltage of the d.c. voltage source or artificial load should be within the operating range of the charging station.		P
	The d.c. EV charging station is set to charge the d.c. voltage source at a current of more than 10 % of the maximum rated current of d.c. EV charging station.		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	A maximum voltage limit command lower than the voltage of the voltage source shall be sent to the d.c. EV charging station.		P
	Both the time between when the command is sent and the beginning of charging current reduction, and the rate of reduction shall be measured.		P
	The voltage of the voltage source, the way the command voltage limit is sent and the value of the voltage limit may be chosen freely to comply with this test.		P
6.4.3.108	Verification of vehicle connector voltage		P
	This clause is only applicable for charging stations which are responsible for locking of vehicle connector, such as system A and system B.		P
	The d.c. EV charging station shall not energize the charging cable when the vehicle connector is unlocked. The voltage at which the vehicle connector unlocks shall be lower than 60 V.		P
6.4.3.109	Control circuit supply integrity		P
	If an earth fault, short circuit or overcurrent is detected in output circuit of d.c. EV charging station, the power circuit shall be disconnected from its supply, but the power supply for control circuit shall not be interrupted unless the power circuit interruption is due to a loss of a.c. supply network (mains).		P
6.4.3.110	Short circuit test before charging		P
	With the EV connected to the d.c. EV charging station and before the EV contactor is closed, the d.c. EV charging station shall have a means to check for a short circuit between d.c. output circuit positive and negative for the cable and vehicle coupler.		P
6.4.3.111	User initiated shutdown		P
	The d.c. EV charging station shall have a means to allow the user to shut down the charging process.		P
6.4.3.112	Overload protection for parallel conductors (conditional function)		P
	If more than one conductor or wire and/or vehicle connector contact is used in parallel for d.c. current supply to the vehicle, the d.c. EV charging station shall have a mean to ensure, that none of the conductors or wires will be overloaded.		P
6.4.3.113	Protection against temporary overvoltage		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	For stations serving a maximum output voltage up to 500 V, no voltage higher than 550 V shall occur for more than 5 s at the output between DC+ and PE or between DC- and PE.		P
	For stations serving a maximum output voltage above 500 V and up to 1 000 V, no voltage higher than 110 % of d.c. output voltage shall occur for more than 5 s at the output between DC+ and PE or between DC- and PE.		P
	The d.c. EV charging station shall terminate the supply of charging current and disconnect the d.c. power circuit from its supply within 5 s, to remove the source of overvoltage. This shall also apply in case of a first earth fault within the isolated output part of the d.c. EV charging station.		P
	For Un, as the minimum DC charger output voltage, the d.c. EV charging station shall limit the voltage between DC+/- and PE at: - (2Un + 1 000) x 1,41 V or; - (Un + 1 200) x 1,41 V.		P
6.4.3.114	Emergency shutdown		P
	When the d.c. EV charging station detects an abnormality in the station and/or the vehicle, the safety shall be ensured by the emergency shutdown. Stop charging by:		P
	a) controlled expedited interruption of charging current or voltage to the vehicle, where d.c. current descends with a controlled slope, and appropriate signalling to the vehicle, or		P
	b) uncontrolled abrupt termination of charging under specific fault conditions, where there is no control of current, and the vehicle may not be informed in time.		P
	Under specific conditions, the following disconnection, for example, is required according to the risk assessment of the abnormality in the station or the vehicle:		P
	– disconnection of the supply to the conductor in which an earth leakage is detected;		P
	– disconnection of the conductor in which an overcurrent is detected;		P
	– disconnection of the d.c. power circuit from the supply if an insulation failure is detected.		P
	General procedure of shutdown in the charging control process is given in 102.5.3.		---

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
6.4.4	Details of Optional Functions		P
6.4.4.1	Determination of ventilation requirements during charging		P
	If additional ventilation is required during charging, charging is only allowed if such ventilation is provided.		P
6.4.4.2	Detection/adjustment of the real time available load current of the supply equipment		P
	Means is provided to ensure that the charging rate did not exceed the real time available load current of the EVSE and its power supply.		P
6.4.4.4	Selection of charging rate		P
	A manual or automatic means is provided to ensure that the charging rate does not exceed the rated capacity of the a.c. supply network (mains), vehicle or battery capabilities.		P
6.4.4.101	Wake up of d.c. EV charging station by EV		P
	The charging station may support a standby mode to minimize power consumption. In this case, the station shall be able to be woken up by the EV.		P
6.4.5	Details of Pilot Function		P
	Control pilot function is mandatory. The control pilot function shall be capable of performing at least the mandatory functions described in 6.4.3.1, 6.4.3.2, 6.4.3.3 and 6.4.3.4, and may also be capable of contributing to optional functions described in 6.4.4.		P
6.5	**Serial data communication**		**P**
	Serial data communication exchange shall be provided		P
	Serial communication shielded or earthed twisted pair..... :	shielded	P
6.101	**Classification**		**P**
6.101.1	Category		---
6.101.1.1	According to system structure:		---
	- isolated d.c. EV charging station, according to the type of insulation between input and output:	☐ basic insulation ☒ reinforced insulation ☐ double insulation	P
	- non-isolated d.c. EV charging station.		N/A
6.101.1.2	According to system control ..... :		---

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	- regulated d.c. EV charging station ..... :	☐ controlled current charging ☐ controlled voltage charging ☒ combination of controlled current and voltage charging	P
	- non-regulated d.c. EV charging station.		N/A
6.101.1.3	According to power receiving ..... :	☒ d.c. EV charging station connected to a.c. mains ☐ d.c. EV charging station connected to d.c. mains	---
6.101.1.4	According to environmental conditions ..... :	☒ outdoor use ☐ indoor use	---
6.101.1.5	According to the system used ..... :	☐ system A (see Annex AA), ☐ system B (see Annex BB), ☒ system C (see Annex CC)	---
6.101.2	Rating	200-850VDC	P
	According to d.c. output voltage l..... :	☐ up to and including 60 V, ☒ over 60 V up to and including 1 500 V.	---

7	**PROTECTION AGAINST ELECTRIC SHOCK**		**P**
7.1	**General Requirements**		**P**
	Hazardous live parts are not accessible		P
	Exposed conductive parts not live under normal conditions		P
	Exposed conductive parts not live under single fault conditions		P
7.2	**Protection against direct contact**		**P**
7.2.1	One or more provisions prevent contact..... :		P
7.2.2	Accessibility of live parts		P
	Hazardous live parts are not accessible before or after removal of parts not requiring a tool for removal		P
	Accessibility with finger probe does not allow contact with hazardous live parts		P
7.2.3	Stored energy – discharge of capacitors		P
7.2.3.1	Disconnection of EV		P
	Voltage after 1 second shall be less than 60V ..... :	0V	P
	Stored energy available shall be less than 20J ..... :	0J	P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	Warning label provided		P
7.2.3.2	Disconnection of d.c. EV charging station		P
	Voltage after 1 second shall be less than 60V .....:	0V	P
	Stored energy available shall be less than 20J .....:	0J	P
	Warning label provided		P
7.3	**Fault Protection**		**P**
	One or more provisions prevent indirect contact....:		P
7.4	**Supplementary Measures**		**N/A**
	Only applicable to mobile d.c. EV charging station		N/A
	An RCD (I∆n ≤ 30 mA) shall be provided as a part of the EV conductive supply equipment for earthed systems. The RCD shall have a performance at least equal to Type A and be in conformity with standard IEC 60364-4-4.		N/A
	Where power supply circuits that are galvanically separated from mains and are galvanically isolated from earth, electrical isolation between the isolated circuits and earth, and between the isolated circuits and exposed conductive parts of vehicle and EVSE shall be monitored. When a fault condition related to the electrical isolation is detected, the power supply circuits shall be automatically de-energized or disconnected by the EVSE.		N/A
7.5	**Protective measures for d.c. EV charging stations**		**P**
	The types of d.c. EV charging stations covered by these requirements, including all accessible conductive parts on the equipment shall have the following protective measures.		P
	– protective measures by automatic disconnection of supply by connecting all exposed conductive-parts to a protective conductor during battery charging, unless protective measure by reinforced or double insulation or protective measure by electrical separation is used for the d.c. EV charging stations.		P
7.5.101	Requirements of the isolated d.c. EV charging station		P
	Requirements for the isolated d.c. EV charging station for protection against electric shock are defined for each system in AA.3.1, BB.2 or CC.4.1.		---

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	In addition, if the d.c. EV charging station has multiple d.c. outputs designed for simultaneous operation, each output circuit shall be isolated from each other by basic insulation or reinforced insulation.		P
7.5.102	Requirements of the non-isolated d.c. EV charging station		N/A
	under consideration.		N/A
7.5.103	Protective conductor dimension cross-sectional area		P
	Protective conductor shall be of sufficient cross-sectional area to satisfy the requirements of IEC 60364-5-54.		P
7.6	**Additional requirements**		**P**
	The d.c. EV charging station shall be compatible with RCD Type A in the installation, i.e. a.c. supply network (mains).		P
	Class II chargers may have a lead- through protective conductor for earthing the EV chassis.		N/A
8	**CONNECTION BETWEEN THE POWER SUPPLY AND THE EV**		**P**
8.1	**General**		**P**
	Type of interface being used ..... :	IEC 62196-3 configuration FF	P
8.2	**Contact Sequencing**		**P**
	For all d.c. interfaces, the contact sequence during the connection process shall be: – Protective Earth (if any) – d.c. power contacts – Isolation monitor contacts – Proximity detection or connection switch contact – Control pilot contact During disconnection the order shall be reversed.		P
8.3	**Functional description of a standard interface**		---
	Not applicable.		---
8.4	**Functional description of a basic interface**		---
	Not applicable.		---
8.5	**Functional description of a universal interface**		**N/A**
	Universal interface intermateable with either high power ac or high power dc connector		N/A

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	Means provided to ensure dc power connector cannot be mated with ac inlet and vice versa		N/A
	Electrical ratings comply with level 1		N/A

9	**SPECIFIC REQUIREMENTS FOR VEHICLE COUPLER**		**P**
9.1	**General requirements**		**P**
	The construction and performance requirements of vehicle coupler are specified in IEC 62196-1.		P
	The requirements for the d.c. interfaces are specified in IEC 62196-3.		P
9.2	**Operating temperature**		**P**
	Operating temperature .....:	Max.90°C	P
9.3	**Service life of vehicle coupler**		**P**
	Service life of vehicle coupler.....:	10000	P
9.4	**Breaking Capacity**		**P**
	For d.c. charging, the vehicle couplers are rated "not for current interruption." A disconnection shall not take place under load.		P
	In the case of disconnection under d.c. load due to a fault, no hazardous condition shall occur.		P
	Avoidance of breaking under load can be achieved by a specific means on the vehicle connector or a system with interlock.		P
	In addition to locking mechanism defined in 6.4.3.104, in case of unintended disconnection of the vehicle coupler, the output current of the d.c. EV charging station shall be turned off within a defined time to contain a possible arc within the vehicle coupler housing. This turn-off time shall comply with the value specified in Annexes AA, BB and CC, using a speed of separation of the vehicle connector of (0,8 ± 0,1) m/s according to IEC 60309-1.		P
	Disconnection of vehicle coupler can be detected when one of the following occurs:		-
	– loss of digital communication; – interruption of interlock circuit(s), e.g. control pilot, proximity circuit, to mitigate electrical arcing and shock hazards.		P
	The system specific requirement for breaking capacity and system redundancy are defined in Annexes AA, BB and CC.		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
9.5	**IP Degrees**		**P**
	Complies with 11.3		P
9.6	**Insertion and Extraction Forces**		**P**
	Complies with IEC 62196-1		P
9.7	**Latching of the retaining device**		**P**
	Latching or retaining if required may be a function of the complete system or the connector.		P
10	**CHARGING CABLE ASSEMBLY REQUIREMENTS**		**P**
10.1	**Electrical Rating**		**P**
	The rated voltage and current of each conductor shall correspond to the rated voltage and current of the d.c. output of the d.c. EV charging station.		P
10.2	**Electrical characteristics**		**P**
	Voltage and current ratings of the cable are compatible with the ratings of the EVSE..... :		P
	Cable insulation is wear resistant and maintains flexibility over the full ambient range		P
10.3	**Dielectric Withstand Characteristics**		**P**
	Complies with 11.4		P
10.4	**Mechanical Characteristics**		**P**
	Meets or exceeds the characteristics specified in IEC 60245-6		P
	Cable is fire resistant		P
	Cable withstands chemical exposure		P
	Cable is rated for UV exposure		P
10.5	**Functional characteristics**		**N/A**
	The maximum cord length may be specified by national codes		N/A
11	**EVSE REQUIREMENTS**		**P**
11.1	**General Test Requirements**		**P**
	Tests performed in an ambient of 20°C ± 5°C unless otherwise specified		P
11.2	**Classification**		**P**
	EVSE is considered indoor use only		N/A
	EVSE is considered indoor/outdoor use		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
11.3	**IP Degrees for basic and universal interfaces**		**P**
11.3.1	IP Degrees for ingress of objects		P
	Indoor Use (IP)..... :		—
	Vehicle inlet mated with connector is IP 21		N/A
	Connector for Case “C” when not connected is IP 21		N/A
	Outdoor Use (IP)..... :	IP44	—
	Vehicle inlet mated with connector is IP 44		P
	All Cable Assemblies..... :		—
	Inlet in “road” position is IP 55 with or without assistance from vehicle design……..:		N/A
	Connector when not mated is IP 24		P
11.3.2	Protection against electric shock		P
	Vehicle inlet mated with connector is IP XXD		P
	Connector for Mode 1 not connected is IP XXD		N/A
	Connector for Mode 2 an Mode 3 not connected is IP XXB		N/A
11.4	**Dielectric Withstand Characteristics**		**P**
11.4.1	Dielectric Withstand Voltage		P
	No breakdown indicated		P
11.4.2	Impulse dielectric withstand		P
	No breakdown indicated		P
11.4.101	Suppression of overvoltage category		P
	The isolated d.c. EV charging station shall reduce overvoltage to the EV to the rated impulse voltage of 2 500 V.		P
	Primary circuit of d.c. charging station in outdoor is overvoltage category (OVC) III according to Part 1.		P
11.5	**Insulation Resistance**		**P**
	Insulation resistance measurement is greater than 1 MΩ		P
11.6	**Clearance and Creepage Distances**		**P**
	Clearance and Creepage Distances meet the minimum values		P
11.7	**Leakage – Touch Current**		**P**
11.7.101-11.7.105	Leakage current		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
11.7.106	Protection measures for the touch current exceeding 3.5 mA		P
	For Class I d.c. EV charging station, if the test touch current exceeds 3.5 mA r.m.s, any of the following requirements shall be met:		P
	a) The protective conductor shall have a cross-sectional area of at least 10mm² Cu or 16 mm² Al, through its total run.		P
	b) Where the protective conductor has a cross-sectional area of less than 10 mm² Cu or 16 mm² Al, a second protective conductor of at least the same cross-sectional area shall be provided up to a point where the protective conductor has a cross-sectional area not less than 10 mm² Cu or 16 mm² Al.		P
	c) Automatic disconnection of the supply in case of loss of continuity of the protective conductor.		P
	A caution symbol ⚠ shall be placed on the outside of the d.c. EV charging station, visible to the user.		P
	The minimum size of the protective earthing conductor shall comply with the local safety regulations, and shall be indicated in the installation manual.		P
11.8	**Environmental Tests**		**P**
11.8.1	General		P
	Equipment meets the original requirements after each test		P
11.8.2	Ambient air temperature		P
	Manufacturer's rated ambient temperature range (°C)……..:		P
	Equipment operates as intended within full range of ambient temperatures		P
11.8.3	Ambient Humidity		P
	Test in accordance with IEC 60068-2-78, test Ca, at 40°C ± 2°C and 93% relative humidity for four days:		P
	Test in accordance with IEC 60068-2-30, test Db, at 40°C ± 2°C for 6 cycles ..... :		P
11.8.4	Ambient Air Pressure		P
	Designed for operation between 860 hPa and 1060 hPa		P
11.9	**Permissible Surface Temperature**		**P**

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	Temperature limits on surfaces are not exceeded		P
11.10	**Environmental Conditions**		**P**
	The EVSE is designed to resist the effect of normal automotive solvents and fluids, vibration and shock, material flammability standards and other conditions appropriate to the application.		P
11.11	**Mechanical Environmental Tests**		**P**
11.11.2	Mechanical Impact		P
	No damage to the enclosure, and no access to internal live parts after impact		P
11.12	**Electromagnetic Compatibility tests**		**P**
	The EMC requirements for d.c. EV charging stations are defined in IEC 61851-21-2.	See Annex 1	P
11.13	**Latching of the retaining device**		**P**
	Latching device used to prevent disconnection under load		P
11.14	**Service**		**P**
	Parts are designed such that they can be removed, serviced and replaced when necessary		P
11.15	**Marking and Instructions**		**P**
11.15.1	Connection Instructions		P
	Instructions for proper connection of the vehicle to the EVSE shall appear in the vehicle manual		P
	Instructions for proper connection of the vehicle to the EVSE shall appear in the owner's manual		P
	Instructions for proper connection of the vehicle to the EVSE shall appear on the EVSE product		P
11.15.2	All marking comply with the legibility requirements after the rub tests		P
11.15.3	Marking of Electric Vehicle Charging Station		P
	The EVSE product is marked with all relevant information		P
	Name of manufacturer ..... :	Dalian LUOBINSEN power supply Co.,Ltd.	P
	Model number ..... :	See page 2	P
	Serial number ..... :	1809000085	P
	Date of manufacturer ..... :	20180805	P
	Rated voltage (V) ..... :	400V~	P
	Rated frequency (Hz) ..... :	50/60Hz	P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	Rated current (A) ..... :	See page 2	P
	Number of phases ..... :	3 phases	P
	IP Degrees ..... :	54	P
	“Indoor use Only” if the product is intended for indoor use only		N/A
	Class II stations marked with Class II symbol		N/A
11.16	**Telecommunication Network**		**P**
	Telecommunication networks comply with IEC 60950-1		P
11.101	**Metering**		**P**
	If electric metering is provided, it shall comply with IEC 62052-11 and IEC 62053-21.	MID certified	P
101	**SPECIFIC REQUIREMENTS FOR D.C. EV CHARGING STATION**		**P**
101.1	**General Requirements**		**P**
101.1.1	Emergency switching		P
	An emergency disconnection device may be installed to isolate the a.c. supply network (mains) from the d.c. electric vehicle charging station in case of risk of electric shock, fire or explosion.		P
	The disconnection device may be provided with a means to prevent accidental operation.		P
101.1.2	IP degrees for ingress of objects		P
	The minimum IP degrees shall be as specified: - indoor: IP21 - outdoor: IP44		P
101.1.3	Storage means of the cable assembly and vehicle connector		P
	For d.c. EV charging stations, a storage means shall be provided for the cable assembly and vehicle connector when not in use.		P
	The storage means provided for the vehicle connector shall be located at a height between 0.4m and 1.5m above ground level.		P
101.1.4	Stability		P
	The d.c. electric vehicle charging station shall be installed as intended by the manufacturer's installation instructions.		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	A force of 500 N shall be applied for 5 min in the horizontal direction to the top of the d.c. electric vehicle charging station in each of the four directions or in the worst possible horizontal direction.		P
	There shall be neither deterioration of the d.c. electric vehicle charging station nor deformation at its summit greater than: – 50 mm during the load application; – 10 mm after the load application.		P
101.1.5	Protection against uncontrolled reverse power flow from vehicle		P
	The d.c. EV charging station shall be equipped with a protective device against the uncontrolled reverse power flow from vehicle.		P
101.2	**Specific requirements for isolated systems**		**P**
101.2.1	DC output		P
101.2.1.1	Rated outputs and maximum output power		P
	The d.c. EV charging station may limit its maximum current under the given condition independent of the rated and demanded power.		P
	The d.c. EV charging station shall be able to deliver d.c. power in the voltage range [Vmin, Vmax] and the regulated current range [Imin, Imax] within the limit of its maximum rated power [Pmax] at the ambient temperature –5 °C to 40 °C below 1 000 m above sea level.		P
	The d.c. EV charging station shall not exceed its maximum rated power, even if the maximum power requested by the EV is beyond the rated maximum power of DC charger. Outside this operating range the DC charger is allowed to de-rate the power or the current.		P
101.2.1.2	Output voltage and current tolerance		P
101.2.1.2.1	Output current regulation in CCC		P
	The tolerance between the output current of the d.c. EV charging station compared to the required value sent by the electric vehicle shall be ± 2,5 A for the requirement below 50 A, and ± 5 % of the required value for 50 A or more.		P
101.2.1.2.2	Output voltage regulation in CVC		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	The tolerance between the output voltages of the d.c. EV charging station compared to the required value sent by the electric vehicle in steady state operation shall not be greater than 2 % for the maximum rated voltage of the d.c. EV charging station.		P
101.2.1.3	Control delay of charging current in CCC		P
	The d.c. EV charging station shall control the output current within 1 s after the request from vehicle, with a current control accuracy specified in 101.2.1.2.1, and with a changing rate dI_{min} of 20 A/s or more.		P
	If target current I_N deviated from base current I_0 lower than or equal to 20A, control delay should be <1s		P
	If target current I_N deviated from base current I_0 higher than 20A, control delay T_d should be $T_d \leq \frac{\lvert I_N - I_0 \rvert}{dI_{min}}$		P
101.2.1.4	Descending rate of charging current		P
	The d.c. EV charging station shall be able to reduce current with the descending rate of 100 A/s or more in normal operation.		P
	For emergency shutdown and for fulfilling general requirements in 9.4, even much higher descending rates are necessary. For detailed values refer to Annexes AA, BB and CC.		P
101.2.1.5	Periodic and random deviation (current ripple)		P
	Current ripple of d.c. EV charging station during current regulation shall not exceed the limit.		P
101.2.1.6	Periodic and random deviation (voltage ripple in CVC)		P
	For CVC, the maximum voltage deviation during pre-charge state and during charging of the vehicle/traction battery shall not exceed ±5 % of the requested voltage.		P
	The maximum voltage ripple in normal operation shall not exceed ±5 V.		P
101.2.1.7	Load dump		P
	In any case of load dump, voltage overshoot shall not exceed the limit specified for each system in Annexes AA, BB or CC.		P
	Maximum slew rate of output voltage in case of load dump shall not exceed 250 V/ms.		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
101.2.2	Effective earth continuity between the enclosure and the external protective circuit		P
	Exposed conductive part of d.c. EV charging station shall be connected to the terminal for the external protective conductor.		P
	The test shall be conducted in accordance with 10.5.2 in IEC 61439-1:2011 unless otherwise specified by national regulations.		P
102	**COMMUNICATION BETWEEN EV AND D.C. EV CHARGING STATION**		**P**
102.1	**General**		**P**
	This clause provides the general requirements for the control communication function and the system between EV and d.c. EV charging station. The specific requirements of digital communication of charging control between off-board d.c. charging system and electric road vehicle are defined in IEC 61851-24.		P
102.2	**System configuration**		**P**
	The communication between the d.c. EV charging station and the vehicle can be established via basic communication and high level communications.		P
	Key steps in the charging control process, such as start of charging and normal/emergency shutdown, shall be managed through the basic communication with signal exchange via the control pilot lines in d.c. EV charging system.		P
	In addition to the basic communication, the d.c. EV charging station shall be equipped with digital communication means in order to exchange the control parameters for d.c. charging between the d.c. EV charging station and the vehicle through the high level communication.		P
	Digital communication means used:	PLC	P
102.3	**Basic communication**		**P**
102.3.1	Interface		P
	Typical interfaces of control pilot function on d.c. EV charging systems are specified in Annexes AA, BB and CC. Each system shall carry out control pilot function through the control pilot conductors and terminals specified in IEC 62196-3.		P
102.3.2	Charging state		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	The charging states show physical status of d.c. EV charging system. The d.c. EV charging station and the vehicle can exchange their charging state through the signal communication and the digital communication.		P
102.4	**Digital communication**		**P**
	Digital communication is specified in IEC 61851-24.		P
102.5	**Charging control process and state**		**P**
102.5.1	General		P
	Charging control process of general-purpose d.c. EV charging stations shall consist of the following three stages: - process before the start of charging (initialization); - process during charging (energy transfer); - process of shutdown (shutdown).		P
	The d.c. EV charging station and the vehicle shall synchronize control process with each other. The following signals and information shall be used for the synchronization: - signals through the pilot wire circuit; - parameters through the digital communication circuit; - measurement values such as voltage and current level of the d.c. charging circuit.		P
	The d.c. EV charging station and the vehicle shall preserve specified time constraints and control timings for ensuring smooth charging control and operation.		P
	Charging control process as system action level is shown in Table 103. General sequence diagrams are specified in Annex AA, Annex BB, and Annex CC. Digital communication parameters, formats, and other communication requirements are specified in IEC 61851-24.		P
102.5.2	Description of the process before the start of charging (initialization)		P
	In this process, the vehicle and the d.c. EV charging station exchange their operational limitations and relevant parameters for charging control.		P
102.5.3	Description of the process during charging (energy transfer)		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	In this process, the vehicle continues to send a setting value of charging current or voltage to the d.c. EV charging station throughout the charging process.		P
	Either of the following two algorithms shall be taken: a) CCC b) CVC		P
102.5.4	Description of process of shutdown		P
	Normal shutdown shall occur when the vehicle battery capacity reaches a certain limit, or when the charging process is stopped by the user with a normal stop means.		P
	Emergency shutdown shall occur under a fault condition.		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
A	**ANNEX A (NORMATIVE), PILOT FUNCTION THROUGH A CONTROL PILOT CIRCUIT USING PWM MODULATION AND A CONTROL PILOT WIRE**		**N/A**
Annex AA	**DC EV CHARGING STATION OF SYSTEM A**		**N/A**
Annex BB	**DC EV CHARGING STATION OF SYSTEM B**		**N/A**
Annex CC	**DC EV CHARGING STATION OF SYSTEM C (COMBINED CHARGING SYSTEM)**		**P**
CC.2	**Communication**		**P**
CC.2.1	The general definitions and functions of the Proximity (PP) and Pilot (CP) – signals / contacts are according to IEC 61851-1 (including detailed resistor definitions in Clause B.5) and SAE J1772™ with specific resistor values for configurations DD and FF given in Table CC.2. A CP duty cycle of 5% shall be used according Annex A of IEC 61851-1:2010.		P
CC.2.2	Charge control communications between the d.c. supply and the EV are specified in IEC 61851-24		P
	The physical layer for charge control communications shall comply with ISO/IEC 15118-3. Equivalent requirements for the physical layer of communications are in SAE J2931/4.		P
	Communication is achieved by PLC on CP and PE/ground contacts. Contact assignments of the different connectors are in IEC 62196-3.		P
	Charge control communications shall comply with DIN SPEC 70121. Charge control communications shall also comply with ISO/IEC 15118-2. Equivalent requirements for charge control communications are in SAE J2836/2™, SAE J2847/2 and SAE J2931/1.		P
CC.3	**Process of energy supply**		**P**
	The process of supplying energy to the EV by the d.c. supply is initiated and controlled by the messages sent over PLC and shall follow the sequences shown in Figures CC.1 to CC.4.		P
CC.3.2	Normal start up		P
	Sequence diagram for normal start up shall follow Figure CC.1 and Table CC.3.		P
CC.3.3	Normal shutdown		P
	Sequence diagram for normal shutdown shall follow Figure CC.2 and Table CC.4.		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
CC.3.4	DC supply initiated emergency shutdown		P
	An emergency shutdown of the output current to less than 5 A within 1s with a current descending rate of 200 A/s or more shall be applied by the d.c. supply.		P
	DC supply shall indicate supply initiated emergency shutdown by turning off CP oscillator.		P
CC.3.5	EV initiated emergency shutdown		P
	EV triggers emergency shutdown by opening S2 and changing CP state from C/D to B.		P
	DC supply shall acknowledge emergency shutdown request from the EV by performing emergency shutdown according to CC.3.3.		P
CC.4	**Safety measures**		**P**
CC.4.1	IT (isolated terra) system requirements		P
	The secondary circuit (output side) of the d.c. supply shall be designed as an IT system and protection measures in accordance with 411 of IEC 60364-4-41:2005 shall be applied.		P
	In case of using an insulation monitoring device (IMD), it shall comply with IEC 61557-8 or equivalent. The d.c. supply shall perform insulation monitoring between DC+ and PE and DC and PE during the supply process and communicate the current state (Invalid, Valid, Warning, Fault) of the system periodically to the EV.		P
	Prior to each supply cycle the following tests shall be performed. During these tests the d.c. output voltage shall not exceed 500 V at vehicle connector.		P
	a) A self-test of the insulation monitoring function of the d.c. supply shall be done by applying a defined fault resistor between d.c. output rail and equipotential bonding (e.g. PE). At least one of the following three possibilities for time management of self-test shall be applied:		P
	1) directly prior to supply cycle with vehicle connector plugged into vehicle inlet; 2) at regular intervals with maximum period of 1 h; 3) after self-test has successfully been performed the station may stay in Valid state for a maximum time of 1 h and during supply session under normal conditions.		P
	b) An insulation check of the system according to 6.4.3.106, e.g. by IMD shall be performed:		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	1) vehicle connector not plugged into vehicle inlet: system comprises station, cable and vehicle connector, or		N/A
	2) vehicle connector plugged into vehicle inlet: system comprises station, charging cable, vehicle connector, vehicle inlet and vehicle cables.		P
	The insulation states of the system are defined as follows: invalid state, valid state, warning state, fault state, no IMD state.		P
CC.4.2	Temperature monitoring		P
	Temperature monitoring of the vehicle connector is required and shall be done by the d.c. supply to avoid overheating of vehicle connector.		P
	The station shall shutdown when the lower of the following 2 limits is exceeded: – the vehicle connector contact temperature limit is exceeded; or – the vehicle connector cable temperature rating is exceeded.		P
CC.4.3	Combined coupler lock function		P
	For all types of d.c. connectors according to Table CC.1, the vehicle inlet shall provide a locking function to mitigate unintentional disconnecting of the vehicle connector from the vehicle inlet during energy supply.		P
CC.4.4	CP lost shutdown (for all connectors of configuration CC)		P
	Fast emergency shutdown of the output current to less than 5 A within 30 ms shall be applied by the d.c. supply.		P
	Shutdown is initiated by direct change of pilot from state C to state A due to interruption of the CP line. If an interruption of the pilot occurs the station shall latch the fault, which will prevent the station from going into ready mode until the station is serviced.		P
	De-energization of the system shall be done within 100 ms according to Table A.7 in Part 1.		P
CC.4.5	PP lost shutdown (additionally with using connector configurations CC and EE)		P
	Fast emergency shutdown of the output current by the d.c. supply within 30 ms shall be applied. Shutdown is initiated by the EVSE and vehicle detecting the Proximity Circuit transitioning from no Proximity Circuit fault detected, S3 closed, to any other state.		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
CC.4.6	Voltage check at initialization		P
	At beginning of supply session, with CP state A or B, the d.c. supply shall check if voltage on the cable is less than 60 V and shall terminate supply session if 60 V is exceeded.		P
CC.4.7	DC EV charging station maximum output Y capacitance		P
	The maximum total parallel Y capacitance shall not exceed 1 µF. This implies Y capacitance ≤500 nF across each d.c. rail and ground for a d.c. EV charging station with Y capacitance equally distributed between each d.c. rail and ground.		P
CC.5	**Additional functions**		**P**
CC.5.1	Pre-charging		P
	Pre-charging for voltage matching shall be done by d.c. EV charging station according to the requirements given in 101.2.1.6.		P
CC.5.2	Wake up of d.c. supply by EV		P
	The d.c. supply may support a standby mode to minimize power consumption as described as optional function in 6.4.4.101.		P
	In this case it is mandatory for the d.c. supply to wake up and resume energy supply according to the following method.		P
	If the vehicle attached to the d.c. supply has not changed the control pilot from state B2 to C2 or D2 for more than 2 min, the station may go to sleep.		P
	The control pilot signal B1 shall be supplied continuously by the d.c. supply to enable a wake up of the station triggered by the EV changing into state C1 or D1.		P
CC.5.3	Provision for manual unlocking of vehicle connector		P
	A means may be provided by the EV to manually unlock the vehicle connector even in case the voltage at the output stays higher than 60 V after the termination of the energy supply.		P
CC.5.4	Configuration CC connector latch position switch (S3) activation		P
	Latch position switch (S3) of the configuration CC connector shall not be able to be actuated when the vehicle connector is locked to the vehicle inlet.		P
CC.5.5	Configuration CC connector latch and latch position switch (S3) verification		P

EN 61851-23			
Clause	Requirement + Test	Result - Remark	Verdict
	A supply cycle shall only be allowed once the d.c. EV charging station checks for the existence of the configuration CC connector latch and the function of the latch position switch (S3) prior to connecting the vehicle connector to the vehicle inlet.		P
CC.6	**Specific requirements**		**P**
CC.6.1	Turn on inrush current (d.c. side)		P
	Any inrush current on d.c. side in both directions when closing of EV disconnection device and station contactors, if any, shall not exceed 2 A. DC supply shall be responsible for limiting the inrush current, e.g. by applying a pre-charging circuit as shown in Figure CC.3.		P
CC.6.2	Protection against overvoltage of battery		P
	The d.c. supply shall trigger a d.c. supply initiated emergency shutdown according to CC.3.4 in order to prevent overvoltage at the battery, if output voltage exceeds maximum voltage limit sent by the vehicle for 400 ms.		P
CC.6.3	Requirements for load dump		P
	In any case of load dump, voltage overshoot shall not exceed 110 % of the maximum voltage limit requested by the vehicle.		P
	Maximum slew rate of output voltage in case of load dump shall not exceed 250 V/ms.		P
CC.6.4	DC output current regulation		P
	When in current regulation mode, the DC charger shall provide direct current to the vehicle.		P
	The maximum allowable error between the actual average d.c. current value and the vehicle commanded current value is: – ±150 mA when the commanded current value is less than or equal to 5 A; – ±1.5 A when the commanded current value is greater than 5 A but less than or equal to 50A; – ±3 % of the DC charger's maximum current output when the commanded current value is greater than 50 A.		P
CC.6.5	Measuring current and voltage		P
	The accuracy of output measurement of system C shall be within the following values: – voltage: ±10 V		P
	The measured current reported shall be within ±1,5% of reading, but not better than ± 0,5 A.		P

EN 61851-24			
Clause	Requirement + Test	Result - Remark	Verdict
4	**SYSTEM CONFIGURATION**		P
	The system configuration is in accordance with 102.2 of IEC 61851-23.		P
5	**DIGITAL COMMUNICATION ARCHITECTURE**		P
	Two digital communication architectures are used:		-
	– one, 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; and		N/A
	– the other, based on Homeplug Green PHY™[1] over the control pilot line; refer to Annex C for specific implementation details.		P
6	**CHARGING CONTROL PROCESS**		P
	The charging control process is in accordance with 102.5 of IEC 61851-23.		P
7	**OVERVIEW OF CHARGING CONTROL**		P
	The digital communication of d.c. charging control covered by this standard is as shown in Figure 1.		P
8	**EXCHANGED INFORMATION FOR D.C. CHARGING CONTROL**		P
	Information which is exchanged between a d.c. EV charging station and a vehicle during the charging process according to IEC 61851-23.	(see appended Table 1)	P
	The information in Table 1 is common to all systems described in Annexes A, B and C.		P
	Each information listed in Table 1 is defined as a parameter in each annex.		P
	Each system may need additional parameters, and these parameters are defined in each annex.		P
ANNEX A	**DIGITAL COMMUNICATION FOR CONTROL OF D.C. EV CHARGING SYSTEM A**		N/A
A.1	**General**		N/A
	The specification of digital communication for control of the d.c EV charging station of system A (in this annex, referred to as "system A station" or "station") as specified in Annex AA of IEC 61851-23. More detailed information on system A is defined in JIS/TSD0007.		N/A
A.2	**Digital communication actions during charging control process**		N/A
	The communication actions and parameters according to the charging control process as defined in Table 103 of IEC 61851-23 are shown in Table A.1.		N/A

EN 61851-24			
Clause	Requirement + Test	Result - Remark	Verdict
A.3	**Digital communication of d.c. charging control**		N/A
	The parameters for digital communication of d.c. charging control are exchanged according to the sequence diagram as shown in Figure A.1.		N/A
A.4	**Parameter definition**		N/A
	The definition of parameters during d.c. charging control process are shown in Table A.2.		N/A
A.5	**Physical/data link layer**		N/A
A.5.1	Specifications		N/A
	The physical/data link layer specifications are shown in Table A.3.		N/A
A.5.2	Communication circuit		N/A
	The CAN communication circuit is established to exchange parameters, i.e. voltage, current, status flags, and fault flags, which are necessary for the charging control.		N/A
	– Terminating resistor 1:1 communication is assumed.		N/A
	The vehicle and the d.c. EV charging station are equipped with terminating resistors.		N/A
	– Noise filter The vehicle and the d.c. EV charging station are equipped with noise filters to reduce the conducted noise of the common mode and differential mode.		N/A
	– Twisted-pair line Twisted pair line are utilized as the communication line that links the d.c. EV charging station with the vehicle so as to reduce differential mode noise.		N/A
	– CAN transceiver CAN transceiver is equipped to send and receive CAN communication data.		N/A
	The CAN-bus circuit is established independently for d.c. charging, as shown in Figure A.2.		N/A
A.5.3	Transmission		N/A
	Data frames are transmitted in ascending order of ID number specified in Table A.2.		N/A
	The data frames are continuously transmitted at 100 ms (± 10 %) interval through the charging process.		N/A
	Interval duration (ms)……..:		--
A.5.4	Reception		N/A

EN 61851-24			
Clause	Requirement + Test	Result - Remark	Verdict
	When the vehicle or the d.c. EV charging station receives data frames from the other party, the received frames are echoed.		N/A
	Furthermore, the received error frames are destroyed.		N/A
A.5.5	CAN communication		N/A
	Figure A.3 shows the basic specifications related to the dedicated CAN communication between the vehicle and the d.c. EV charging station.		N/A
ANNEX B	**DIGITAL COMMUNICATION FOR CONTROL OF D.C. EV CHARGING SYSTEM B**		N/A
B.1	**General**		N/A
	The specification of d.c. charging control digital communication for the d.c EV charging station of system B (in this annex, referred to as "System B station" or "charger") as specified in Annex BB of IEC 61851-23.		N/A
B.2	**Digital communication of d.c. charging control**		N/A
	The parameters for digital communication of d.c. charging control are exchanged according to the sequence diagram as shown in Figure B.1.		N/A
B.3	**Digital communication actions during charging control process**		N/A
	The communication actions and parameters during d.c. charging control process are shown in Table B.1.		N/A
B.4	**Parameter definition**		N/A
	The definition of parameters during d.c. charging control process are shown in Tables B.2, B.3, B.4, B.5 and B.6.		N/A
B.5	**Physical/data link layer**		N/A
	The physical/data link layer specifications are shown in Table B.7.		N/A
	The physical/data link layer refers to SAE J1939-11 and SAE J1939-21.		N/A
	The application layer refers to GB/T 27930.		N/A
ANNEX C	**DIGITAL COMMUNICATION FOR CONTROL OF D.C. CHARGING SYSTEM C (COMBINED SYSTEM)**		**P**
C.1	**General**		P
	The digital communication for the d.c EV charging station of system C as specified in Annex CC of IEC 61851-23 is defined in the following standards: DIN SPEC 70121, ISO/IEC 15118-1, ISO/IEC 15118-2 and ISO/IEC 15118-3.		P

EN 61851-24			
Clause	Requirement + Test	Result - Remark	Verdict
	The following SAE specifications can also be used as information: SAE J2836/2™, SAE J2847/2, SAE J2931/1 and SAE J2931/4.		N/A
	Systems implementing these specifications incorporate the following features:		-
	• security concept including encryption, signing, key management, etc.		P
	• robust PLC-based communications,		P
	• automatic address assigning and association,		P
	• IPv6-based communications,		P
	• compressed XML messages,		P
	• client-server approach,		P
	• safety concept including cable check, welding detection, etc.		P
	• extension concept for added-value services.		P
C.2	**Required exchange parameters**		P
	The parameters to be exchanged for d.c. charging control are shown in Table C.1, corresponding to Table 1.		P
	Additional parameters can be found in DIN SPEC 70121 and ISO/IEC 15118-2.		P

8	TABLE 1: Exchanged information for d.c. charging control				P
No.	**Information**	**Description**	**Relevant requirement in IEC 61851-23 (unless specified as IEC 61851-1)**	**Other remarks**	**Verdict**
a-1	Current request for the controlled current charging (CCC) system	Exchange of current value requested by EV	6.4.3.101, DC supply		P
a-2	Voltage request for the controlled voltage charging (CVC) system	Exchange of voltage value requested by EV	6.4.3.101, DC supply		P
a-3	Maximum rated voltage of d.c. EV charging station	Exchange of maximum rated voltage value of d.c. EV charging station	6.4.3.101, DC supply		P
			6.4.3.105, Compatibility assessment		P
			6.4.3.107, Protection against overvoltage at the battery		P
a-4	Maximum rated current of d.c. EV charging station	Exchange of maximum rated current value of d.c. EV charging station	6.4.3.101, DC supply for EV		P
			6.4.3.105, Compatibility assessment		P
b-1	Communication protocol	Exchange of software version of a charging system	6.4.3.105, Compatibility assessment		P
b-2	Maximum voltage limit of EV	Exchange of maximum voltage limit value of vehicle.	6.4.3.105, Compatibility assessment		P
b-3	EV minimum current limit, only for the controlled voltage charging (CVC) system	not defined yet	6.4.3.105, Compatibility assessment		N/A
c	Insulation test result	Exchange of the result of insulation test before charging	6.4.3.106, Insulation test before charging		P
		- If insulation test fails, a signal is sent that charging is not allowed.	6.4.3.106, Insulation test before charging		P

d	Short circuit test before charging	Exchange of information on short circuit test before charging	6.4.3.110, Short circuit test before charging		P
e	Charging stopped by user	Exchange of information on charge stop command by the user of d.c. EV charging station	6.4.3.111, User initiated shutdown		P
f	EVSE real time available load current (optional)	Exchange of EVSE real time available load current for demand management. Required for system providing that function.	6.4.4.2 (of IEC 61851-1), Detection/adjustment of the real time available load current of EVSE		P
g	Loss of digital communication	Detection of loss of digital communication	9.4, Breaking capacity		P
		- If a receiver does not get information expected to receive within time out period, it is considered as loss of digital communication.	9.4, Breaking capacity		P
h-1	Zero current confirmed	Notification of zero current confirmed	102.5, Charging control process and state		P
		- Station informs EV that low current condition has been met (to allow connector unlocking)	102.5, Charging control process and state		P

ANNEX C.2	TABLE C.1 – Required exchanged parameters for d.c. charging control for system C			P
Item in Table 1	**Information**	**Parameter name (ISO/IEC 15118-2)**	**Other remarks**	**Verdict**
a-1	Current request for the controlled current charging (CCC) system	CurrentDemandReq/EVTargetCurrent		P
a-2	Voltage request for the controlled voltage charging (CVC) system	CurrentDemandReq/EVTargetVoltage		P
a-3	Maximum rated voltage of d.c. EV charging station	CurrentDemandRes/EVSEMaximumVoltageLimit		P
a-4	Maximum rated current of d.c. EV charging station	CurrentDemandRes/EVSEMaximumCurrentLimit		P
b-1	Communication protocol	supportedAppProtocol{Req,Res}		P
b-2	Maximum voltage limit of EV	CurrentDemandReq/EVMaximumVoltageLimit		P
b-3	EV minimum current limit, only for the controlled voltage charging (CVC) system	ChargeParameterDiscoveryRes / DC_EVSEChargeParameter / EVSEMinimumCurrentLimit		P
c	Insulation test result	{PowerDeliveryRes, CableCheckRes, PreChargeRes, CurrentDemandRes, WeldingDetectionRes} / DC_EVSEStatus / EVSEIsolationStatus		P
d	Short circuit test before charging	CableCheck{Req,Res}		P
e	Charging stopped by user	{ChargeParameterDiscoveryRes,PowerDeliveryR es, CableCheckRes, PreChargeRes, CurrentDemandRes, WeldingDetectionRes} / DC_EVSEStatus / EVSEStatusCode / EVSE_Shutdown {ChargeParameterDiscoveryRes, PowerDeliveryRes, CableCheckRes, PreChargeRes, CurrentDemandRes, WeldingDetectionRes} / DC_EVSEStatus / EVSENotification / StopCharging		P

f	EVSE real time available load current (optional)	CurrentDemandRes/EVSEMaximumCurrentLimit		N/A
g	Loss of digital communication	Message timers Control pilot state		P
h-1	Zero current confirmed	PowerDeliveryRes/ResponseCode CurrentDemandRes/EVSEPresentCurrent		P
h-2	Welding detection	WeldingDetection{Req, Res}		P

Annex 1 Summary of EMC test

Immunity test

Test item	Test applicability	Port	Basic standard	Performance criteria
Electrostatic Discharge (ESD)	Waiting and charge mode	Enclosure	IEC 61000-4-2:2008	B
Radiated RF fields	Waiting and charge mode	Enclosure	IEC 61000-4-3:2006 and IEC 61000-4-3:2006/AMD1:2007 and IEC 61000-4-3:2006/AMD2:2010	A
Magnetic fields	Charge mode	Enclosure	IEC 61000-4-8:2009	A
Electrical fast transients/bursts	Waiting and charge mode	Power input (AC)	IEC 61000-4-4:2012	B
		Wired Network and signal/control		
		CPT		
Conducted RF fields	Waiting and charge mode	Power input (AC)	IEC 61000-4-6:2013	A
		Wired Network and signal/control		
		CPT		
Voltage surges	Waiting and charge mode	Power input (AC)	IEC 61000-4-5:2014	B
Voltage dips and interruptions	Waiting and charge mode	Power input (AC)	IEC 61000-4-34:2005 and IEC 61000-4-34:2005/AMD1:2009	B

Emission test

Test item	Test applicability	Port	Basic standard	Performance criteria
Harmonic currents	charge mode	Power input(AC)	IEC 61000-3-12:2011	A
Voltage fluctuations and flicker	charge mode	Power input(AC)	IEC 61000-3-11:2017	A
Conducted disturbances	charge mode	Power input	CISPR 32:2015	A
		CPT		
		Wired network and signal/control		
Radiated disturbances	charge mode	Enclosure	CISPR 16-1-4:2010 and CISPR 16-1-4:2010/AMD1:2012	A
Transient emissions	charge mode	CPT	/	A

Annex 2
Photos

Front View

Front View

Side View

Side View

Detail View

Detail View