AB-0114-T
LVD-2023305
18.03.2024

TEST REPORT / *DENEY RAPORU*
IEC 61851-1
Electric vehicle conductive charging system
Part 1: General requirements

Elektrikli taşıtların iletken şarj sistemleri - Bölüm 1: Genel özellikler

Report No./ *Rapor No* ....:	LVD-2023305
Tested by (name + signature) / *Test eden (isim + imza)*...........................:	Esat KÖSELER (**Expert Test Engineer** / *Uzman Test Mühendisi*)
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Date of issue / *Yayın Tarih*..............:	18-03-2024
Total number of pages / *Toplam sayfa sayısı*.......................................:	57 **Pages** / Sayfa
Testing Laboratory / *Test Laboratuvarı*...:	Esim Test Hizmetleri San. ve Tic. A.Ş.
Address / *Adres*...:	TOSB Otomotiv Yan Sanayi İhtisas O.S.B. 2.Cad. 17.Sok. No:2/5 41420 Şekerpınar – Çayırova, Kocaeli / Türkiye
Applicant's name / *Başvuran*..........:	Hera Charge Elektronik A.Ş.
Address / *Adres*...............................:	Güllübağlar Mah. Firketeci Sokak No: 2 34906 Pendik – İstanbul / Türkiye
Standard / *Standart* ....:	*IEC 61851-1:2017
Test procedure / *Test prosedürü* .....:	**Standard** / *Standart*
Non-standard test method / *Standart olmayan test methodu*......:	**N/A** / *Uygulanmaz*
Test Report Form No. / *Test Rapor Form No.*...:	ESIM61851_1B
TRF Originator / *Duzenleyen* ....:	ESIM
Master TRF / *Asıl TRF* ....:	Dated 2018-02-19

The clause 7.2 of the standard which indicate with "*"in this test report are out of scope of the accreditation. / *Bu deney raporu içerisinde "* " ile belirtilen standardın 7.2 maddesi akreditasyon kapsamına dahil değildir.*

Test item description / *Test ögesi tanımı*.....:	**Electric Vehicle AC Charge Station** / *Elektrikli Araç AC Şarj Ünitesi*
Trademark / Ticari marka .....:	HERA
Manufacturer / *Üretici*.....:	HERA CHARGE ELEKTRONİK A.Ş.
Manufacturer address *(Üretici adresi)* .....:	Gullubağlar Mah. Firketeci Sk. No: 2 34906 Pendik / Istanbul / Türkiye
Model and/or type reference / *Model ve/veya tip referansı* .....:	ChargePack Series **Tested model** / *Test edilen model:* HC022303312 **See Table in page 4 for the covered sub models.** *Kapsanan alt modeller için sayfa 4'deki Tablo'ya bakınız.*
Ratings / *Beyan değerleri*.....:	LN:230 VAC / LL:400 VAC ±15%, 50/60 Hz, 22 kW

General disclaimers / *Genel feragatnameler :*

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Esim
Test Hizmetleri Sanayi ve Ticaret A.Ş.

List of Attachments (including a total number of pages in each attachment) / *Eklerin Listesi (her ekdeki toplam sayfa sayısı dahil):*

APPENDIX 1 : Critical components information, pages 44 and 45. / *EK 1 : Kritik bileşen bilgisi, sayfa 44 ve 45'de*

APPENDIX 2 : Heating test results, pages 45 and 46. / *EK 2 : Isıl test sonuçları, sayfa 45 ve 46'da.*

APPENDIX 3 : List of test equipments used, pages 47 and 48. / *EK 3 : Kullanılan test ekipmanlarının listesi sayfa 47 ve 48'de.*

APPENDIX 4 : Photos of products, pages 49 to 57 / *EK 4 : Ürünlerin fotoğrafları sayfa 49'dan 57'ye kadar.*

Summary of testing / *Testin özeti:*

Tests performed (name of test and test clause) / *Yapılan testler (test adı ve maddesi)* **:**

All tests for relevant clauses of this standard has been performed. *Bu standardın ilgili maddelerindeki tüm testler yapılmıştır.*

*** : Clause 7.2 is outside the scope of accreditation for the standard of IEC/EN IEC 61851-1** */ 7.2 maddesi IEC/EN IEC 61851-1 standardı akreditasyon kapsamı dışındadır.*

Testing location / *Test yeri* **:**

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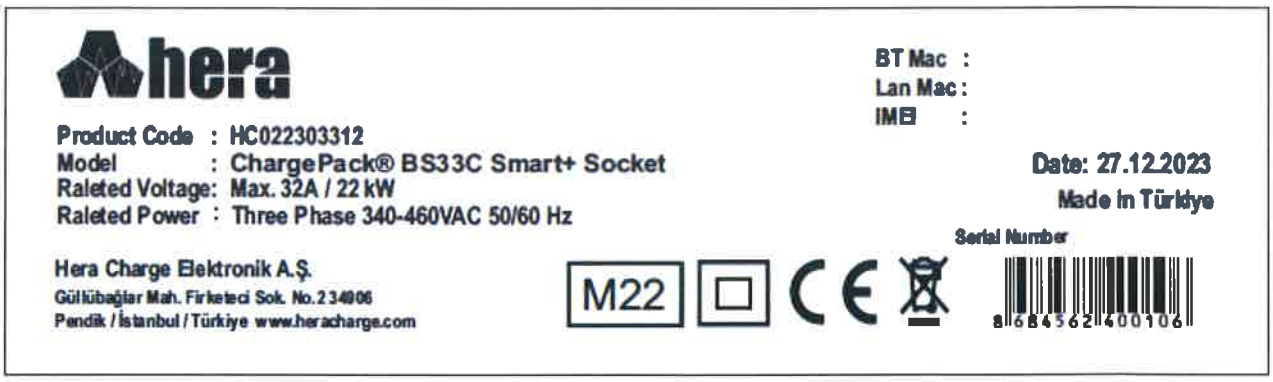
TOSB Otomotiv Yan San. İhtisas O.S.B. 2.Cad. 17.Sok. No:2/5

41420 Şekerpınar – Çayırova, Kocaeli / **Türkiye** / *Türkiye*

The product fulfils the requirements of the *IEC 61851-1:2017 and *EN IEC 61851-1:2019 standards. / *Ürün, *IEC 61851-1:2017 ve *EN IEC 61851-1:2019 standartlarındaki tüm gereklikleri yerine getirmektedir.*

Copy of marking plate / *İşaretleme etiketinin kopyası:*



Esim Test Hizmetleri Sanayi ve Ticaret A.S.

Test item particulars / *Test numunesi özellikleri*	**Electric Vehicle AC Charge Station** / *Elektrikli Araç AC Şarj Ünitesi*
Equipment mobility / *Cihaz hareketliliği*	☐ **movable** / *hareket edebilen* ☐ **hand-held** / *elde kullanılan* ☐ **transportable** / *taşınabilir* ☒ **stationary** / *sabit* ☐ **for building-in** / *bina içi* ☐ **direct plug-in** / *doğrudan takılan*
Connection to the mains / *Şebeke bağlantısı*	☐ **pluggable equipment** / *fişli cihaz* ☐ type A ☐ type B ☒ **permanent connection** / *kalıcı bağlantı* ☐ **detachable power supply cord** / *çıkarılabilir güç kaynağı kablosu* ☐ **non-detachable power supply cord** ☐ **not directly connected to the mains**
EV charging modes / *EV şarj modları*	☐ **Mode 1 charging** / *Mod 1 şarj* ☐ **Mode 2 charging** / *Mod 2 şarj* ☒ **Mode 3 charging** / *Mod 3 şarj* ☐ **Mode 4 charging** / *Mod 4 şarj*
Type of EV connection / *EV bağlantısının türü*	☐ **Case A** / Durum *A* ☒ **Case B** / Durum *B* ☒ **Case C** / Durum *C*
Access location / *Erişim yeri*	☒ **operator accessible** / *operatör tarafından erişilebilir* ☐ **service access area** / *servis erişim alanı* ☐ **restricted access location** / *sınırlı erişim yeri*
Over voltage category (OVC) / *Aşırı gerilim kategorisi*	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV ☐ **other** / *diğer:*
Mains supply tolerance (%) or absolute mains supply values / *Şebeke arz toleransı (%) veya mutlak şebeke arz değerleri*	230/ 400 Vac (±15%)
Tested for IT power systems / *IT güç sistemleri için test edildi*	☐ Yes ☒ No
IT testing, phase-phase voltage (V) / *IT testi, faz-faz gerilimi (V)*	N/A
Class of equipment / *Cihaz sınıfı*	☐ **Class** / *Sınıf* I ☒ **Class** / *Sınıf* II ☐ **Class** / *Sınıf* III ☐ **Not classified** / *Sınıflandırılmamış*
Considered current rating (A) / *Düşünülen akım değeri*	1 x 32 A, 3 x 32 A
Pollution degree (PD) / *Kirlilik derecesi*	☐ PD 1 ☒ PD 2 ☒ PD 3
IP protection class / *IP koruma sınıfı*	ChargePack Series Cable: IP56 ChargePack Series Socket: IP55
Altitude during operation (m) / *İşlem sırasındaki irtifa*	<2000
Altitude of test laboratory (m) / *Test laboratuvarı rakımı*	<2000
Mass of equipment (kg) / *Cihaz kütlesi*	4,65 kg

Possible test case verdicts / *Test durum karaları*.....:	
- **test case does not apply to the test object** / *Bu ürüne uygulanmaz*.....:	**N/A** / *Uygulanmaz*
- **test object does meet the requirement** / *test edilen ürünü kuralları karşılıyor*.....:	**P(Pass)** / *Karşılıyor*
- **test object does not meet the requirement** / *test edilen ürün kuralları karşılamıyor*.....:	**F(Fail)** / *Karşılamıyor*
Testing / *Test*.....:	
Date of receipt of test item / *Ürünün geliş tarihi*.....:	26-12-2023
Date (s) of performance of tests / *Ürün testlerinin yapılş tarihleri*.....:	27-12-2023 – 15-03-2024

General remarks / *Genel uyarılar* :

"(see Enclosure #)" refers to additional information appended to the report. / *(ilişikteki # bakınız) rapora eklenmiş ilave bilgilere başvurur.*

"(see appended table)" refers to a table appended to the report. / *(eklenmiş tabloya bakınız) rapora eklenmiş tabloya başvurur.*

Throughout this report a comma (point) is used as the decimal separator. / *Bu raporda ondalık ayırıcı olarak virgül (nokta) kullanılmıştır.*

The Decision Rule / *Karar Kuralı*:

Regardless of the confidence level and uncertainty of measurement, the conformity is assessed on the basis of whether the test result is within the relevant limits, regardless of the proximity to the limits specified in the relevant specification or standard. In case the result of the measurement is equal to the limit value, the conformity assessment is carried out in favor of the product. / *Güven düzeyini ve ölçme belirsizliğini göz önünde bulundurmaksızın, elde edilen deney sonucunun, ilgili şartname veya standartta belirtilmiş sınırlara yakınlık oranı gözetilmeksizin, ilgili sınırlar içinde olup olmadığına dayanarak uygunluğun değerlendirmesi yapılır. Alınan ölçüm sonucunun sınır değere eş olduğu durumda uygunluk değerlendirmesi ürün lehine yapılır.*

General product information / *Genel ürün bilgisi*:

The apparatus as supplied for the test is a *HC022303312 Model* Electric Vehicle AC Charge Station. / *Test edilen ürün HC022303312 model Elektrikli Araç AC Şarj Ünitesidir.*
Trademark / *Ticari marka* : HERA
Full tested model / *Tam test edilen model* HC022303312
Partial testel model / *Kısmi test edilen model*: HC021303322 (**only IP testing and component evaluation were performed** / *sadece IP testi ve bileşen değerlendirilmesi gerçekleştirildi*)
Covered models / *Kapsanan modeller*: **See table 1** / *Tablo 1'e bakınız.*
Tested product size / *Test edilen ürün boyutu*: 290x420x180 mm(WxHxD)

The manufacturer declares that the tested ChargePack® HC022303312 model is electrically and mechanically similar to the products listed in the table below. / *Üretici, test edilen ChargePack® HC022303312 modeli elektriksel ve mekanik olarak aşağıdaki tabloda belirtilen ürünlerle benzer olduğunu beyan etmektedir.*

All electronic circuits are mounted in the internal enclosure which is a pollution degree 2 environment. / *Tüm elektronik devreler kirlilik derecesi 2 olan iç mahfazaya monte edilmiştir.*

Table / *Tablo* -1

Product Code Description / *Ürün Kod Tanımı*																	
Case Definition / *Case Tanımı*	**Case Code** / *Case Kodu*		**Connector** / *Konnnektör*		**Outside type** / *Çıkış tipi*		**Colour Code** / *Renk kodu*		**System type** / *Sistem tipi*		**Energy meter** / *Enerji metre*		**Emergency stop switch** / *Acil durdurma butonu*	
	XX		Y		Z		AA		B		C		D	
HC	2	**Case type** / *Case tipi*	1	**Cable model** / *Kablolu model*	1	7,4 kW **Monofaze** / *Tek fazlı*	1	**White** / *Beyaz*	1	RFID	1	**MID meter available** / *MID metre var*	2	**Emergency stop switch not available** / *Acil durdurma butonu yok*
			2	**Socket model** / *Soketli model*	3	22 kW **Trifaze** / *Üç fazlı*	2	**Grey** / *Gri*	2	RFID Wifi Ethernet, Bluetooth	2	**MID meter not available** / *MID metre yok*		
									3	RFID, Wifi, Ethernet, Bluetooth, 4G				

Report revision history / *Rapor düzeltme geçmişi*:

Edition / *Baskı*	Date / *Tarih*	Description / *Açıklama*
1	18-03-2024	**First release** / *İlk yayın*

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
4	**GENERAL REQUIREMENTS**		—
	The EV supply equipment shall be so constructed that an EV can be connected to the EV supply equipment so that in normal conditions of use, the energy transfer operates safely, and its performance is reliable and minimises the risk of danger to the user or surroundings.		P
	Unless otherwise stated all tests indicated in this document are type tests.		P
	Unless otherwise stated, all tests required by this standard may be conducted on separate samples.		P
	Unless otherwise stated, each test is conducted once.		P
	Unless otherwise specified, all tests shall be carried out in a draught-free location and at an ambient temperature of 20°± 5 °C.		P
	The EV supply equipment shall be rated for one or more of standard nominal voltages and frequencies as given in IEC 60038.	400 V (±15%)	P
	Assemblies for EV supply equipment shall comply with IEC TS 61439-7 with the exceptions or additions as indicated in Clause 13.		N/A
	The standard applies to equipment that is designed to be used at an altitude up to 2 000 m.		P
	For equipment designed to be used at altitudes above 2 000 m, it is necessary to take into account the reduction of the dielectric strength and the cooling effect of the air.		N/A
5	**CLASSIFICATION**		—
5.1.1	**Characteristics of power supply input**		P
	The EV supply equipment shall be classified according to the supply network system that it is intended to be connected to:		—
	– EV supply equipment connected to AC supply network;		P
	– EV supply equipment connected to DC supply network.		N/A
	The EV supply equipment shall be classified according to the electric connection method:		—
	– Plug and cable connected;		N/A
	– Permanently connected.		P
5.1.2	**Characteristics of power supply output**		P

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The EV supply equipment shall be classified according to the type of current the EV supply equipment delivers:		—
	– AC EV supply equipment;		P
	– DC EV supply equipment;		N/A
	– AC and/or DC EV supply equipment.		N/A
5.2	**Normal environmental conditions**		—
	The EV supply equipment shall be classified according to the environmental conditions and use:		—
	– indoor use;	Case B: IP55 Case C: IP56	P
	– outdoor use.	Case B: IP55 Case C: IP56	P
5.3	**Special environmental conditions**		—
	The EV supply equipment may be classified according to their suitability for use in special environmental conditions other than those specified in this document, if declared so by the manufacturer.		N/A
5.4	**Access**		—
	The EV supply equipment shall be classified according to the location they are intended for:		—
	– equipment for locations with restricted access;		P
	– equipment for locations with non-restricted access.		N/A
5.5	**Mounting method**		—
	The EV supply equipment shall be classified according to the type of mounting:		—
	a) stationary equipment;		P
	– mounted on walls, poles or equivalent positions:		—
	•flush mounted;		N/A
	•surface mounted.	Surface mounted on walls	P
	– pole/column/pipe-mounted		P
	– floor mounted		N/A
	– ground mounted.		N/A
	b) non stationary equipment		N/A
	– portable equipment;		N/A
	– mobile equipment.		N/A
5.6	**Protection against electric shock**		—

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The equipment shall be classified according to the protection against electric shock:		—
	– class I equipment;		N/A
	– class II equipment;	Case B: protective earthing conductor used to only the EV socket-outlet Case C: protective earthing conductor used to only the EV plug The body of the tested devices is plastic.	P
	– class III equipment.		N/A
5.7	**Charging modes**		—
	The EV supply equipment shall be classified according to 6.2:		P
	Mode 1, Mode 2, Mode 3 or Mode 4	Mode 3	P
6	**CHARGING MODES AND FUNCTIONS**		**P**
6.1	**General**		—
	Clause 6 describes the different charging modes and functions for energy transfer to EVs.		P
6.2	**Charging Modes**		—
	Mode 1		N/A
	Mode 1 is a method for the connection of an EV to a standard socket-outlet of an AC supply network, utilizing a cable and plug, both of which are not fitted with any supplementary pilot or auxiliary contacts.		N/A
	The rated values for current and voltage shall not exceed:		—
	– 16 A and 250 V AC, single-phase,		N/A
	– 16 A and 480 V AC, three-phase.		N/A
	EV supply equipment intended for Mode 1 charging shall provide a protective earthing conductor from the standard plug to the vehicle connector.		N/A
6.2.2	**Mode 2**		N/A
	Mode 2 is a method for the connection of an EV to a standard socket-outlet of an AC supply network utilizing an AC EV supply equipment with a cable and plug, with a control pilot function and system for personal protection against electric shock placed between the standard plug and the EV.		N/A

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The rated values for current and voltage shall not exceed:		—
	– 32 A and 250 V AC single-phase;		N/A
	– 32 A and 480 V AC three-phase.		N/A
	Current limitations are also subject to the standard socket-outlet ratings described in 9.2.		N/A
	EV supply equipment intended for Mode 2 charging shall provide a protective earthing conductor from the standard plug to the vehicle connector		N/A
	Mode 2 equipment that is destined to be mounted on a wall but is detachable by the user, or to be used in a shock resistant enclosure shall use protection equipment as required by IEC 62752.		N/A
6.2.3	**Mode 3**		P
	Mode 3 is a method for the connection of an EV to an AC EV supply equipment permanently connected to an AC supply network, with a control pilot function that extends from the AC EV supply equipment to the EV.		P
	EV supply equipment intended for Mode 3 charging shall provide a protective earthing conductor to the EV socket-outlet and/or to the vehicle connector.		P
6.2.4	**Mode 4**		N/A
	Mode 4 is a method for the connection of an EV to an AC or DC supply network utilizing a DC EV supply equipment, with a control pilot function that extends from the DC EV supply equipment to the EV.		N/A
	Mode 4 equipment may be either permanently connected or connected by a cable and plug to the supply network.		N/A
	EV supply equipment intended for Mode 4 charging shall provide a protective earthing conductor or protective conductor to the vehicle connector.		N/A
6.3	**Functions provided in Mode 2, 3 and 4**		—
6.3.1	**Mandatory functions in Modes 2, 3, and 4**		P
6.3.1.1	**General**		P
	The following control pilot functions shall be provided by the EV supply equipment:		—
	•Continuous continuity checking of the protective conductor according to 6.3.1.2;		P

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	•Verification that the EV is properly connected to the EV supply equipment according to 6.3.1.3;		P
	•Energization of the power supply to the EV according to 6.3.1.4;		P
	•De-energization of the power supply to the EV according to 6.3.1.5;		P
	•Maximum allowable current according to 6.3.1.6.	3 x 32 A	P
	If EV supply equipment can supply more than one vehicle simultaneously, it shall ensure that the control pilot function performs the above functions independently at each connecting point.		N/A
	EV supply equipment designed for Mode 2 or Mode 3, using the control pilot conductor and utilizing accessories according to IEC 62196-2, shall be provided with control pilot function according to Annex A.		P
6.3.1.2	**Continuous continuity checking of the protective conductor**		P
	While charging in Mode 2, the electrical continuity of the protective earthing conductor between the ICCB and the respective EV contact shall be continuously monitored by the ICCB.		N/A
	While charging in Mode 3, the electrical continuity of the protective earthing conductor between the EV charging station and the respective EV contact shall be continuously monitored by the EV supply equipment.		P
	While charging in Mode 4, the electrical continuity of the protective conductor between the EV charging station and the respective EV contact shall be continuously monitored by the EV supply equipment.		N/A
	The EV supply equipment shall disconnect the supply to the EV in case of:		P
	•loss of electrical continuity of the protective conductor (i.e. open control pilot circuit), within 100 ms.	It was observed that the output voltage cut off in 4,6 ms. The device indicator light switched to red indicating fault status.	P
	•incapacity to verify the continuity of the protective conductor (e.g. short circuit between pilot wire and protective conductor), within 3 s.	It was observed that the output voltage cut off in 21,6 ms. The device indicator light switched to red indicating fault status.	P

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.3.1.3	**Verification that the EV is properly connected to the EV supply equipment**		P
	The EV supply equipment shall be able to determine that the EV is properly connected to the EV supply equipment.		P
6.3.1.4	**Energization of the power supply to the EV**		P
	The EV socket-outlet or the vehicle connector shall not be energized unless the control pilot function between EV supply equipment and EV has been established correctly with signal states allowing energization.		P
	The presence of such states does not imply that energy will be transferred between the EV supply equipment and the EV as this may be subject to other external conditions, e.g. energy management system.		P
	If the EV requests ventilation, the EV supply equipment shall only energize the system if such ventilation is provided by the installation or the premises.		N/A
6.3.1.5	**De-energization of the power supply to the EV**		P
	If the control pilot signal is interrupted the power supply to the EV shall be interrupted according to 6.3.1.2.		P
	If the control pilot signal status no longer allows energization, the power supply to the EV shall be interrupted but the control pilot signalling may remain in operation.		N/A
6.3.1.6	**Maximum allowable current**		P
	A means shall be provided to inform the EV of the value of the maximum current it is allowed to draw. The value of the maximum current permitted shall be transmitted and shall not exceed any of the following:		—
	•the rated output current of the EV supply equipment,		P
	•the rated current of the cable assembly.		P
	The transmitted value may change, without exceeding the maximum allowed current, to adapt to power limitations, e.g. for load management.		P
	The EV supply equipment may interrupt the energy supply if the current drawn by the EV exceeds the transmitted value.		P
6.3.2	**Optional functions for Modes 2, 3 and 4**		P
6.3.2.1	**General**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The optional functions that are implemented shall be indicated in the manual and shall fulfil the requirements of 6.3.2.		P
6.3.2.2	**Ventilation during supply of energy**		N/A
	EV supply equipment can exchange information with installation regarding the request and presence for ventilation.		N/A
6.3.2.3	**Intentional and unintentional disconnection of the vehicle connector and/or the EV plug**		N/A
	A mechanical or electromechanical means shall be provided to prevent intentional and unintentional disconnection under load of the vehicle connector and/or plug according to IEC 62196-1.		P
6.3.2.4	**Mode 4 using the combined charging system**		N/A
	The combined charging system as described in Annex CC of IEC 61851-23:2014 and ISO 17409 shall be so designed that:		—
	•AC chargeable EVs with a basic vehicle inlet do not require any means to protect the EV against DC voltage at the inlet.		N/A
	•AC EV supply equipment does not require any means to be self-protected against DC voltage coming from the EV.		N/A
	For DC charging, digital communication shall be established between the vehicle and the DC EV charging station that validates the DC energy transfer.		N/A
	The DC supply to the vehicle shall not be connected until such complete validation from the vehicle is achieved.		N/A
	A combined interface extends the use of a basic interface for AC and DC charging.		N/A
	DC charging can be achieved by using separate and additional DC power contacts to supply DC energy to the EV or by using power contacts placed at the position of the AC power contacts of a basic interface, if the vehicle connector and the vehicle inlet are both suitable for DC.		N/A
	The basic portion of the combined vehicle inlet can be used with a basic connector for AC charging only or with a combined connector having separate contacts for AC or DC charging.		N/A
	AC and DC power transfer shall not occur through the combined interface at the same time.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Analysis and design of the EV supply equipment using a basic interface for DC shall apply a risk analysis according to IEC 61508 (all parts) applying a severity level of at least S2 for the function preventing the risk of unintended DC voltage output.		N/A
7	**COMMUNICATIONS**		—
7.1	**Digital communication between the EV supply equipment and the EV**		—
	Digital communication is optional for Modes 1, 2 and 3		N/A
	For Mode 4 the digital communication as described in IEC 61851-24 shall be provided to allow the EV to control the EV supply equipment.		N/A
*7.2	**Digital communication between the EV supply equipment and the management system**		—
	Telecommunication network or telecommunication port of the EV supply equipment, connected to the telecommunication network, if any, shall comply with the requirements for connection to telecommunication networks according to Clause 6 of IEC 60950-1:2005.	* This article of standard has been evaluated outside the scope of accreditation.	N/A
8	**PROTECTION AGAINST ELECTRIC SHOCK**		—
8.1	**Degrees of protection against access to hazardous-live-parts**		—
	The different parts of the EV supply equipment as mentioned shall fulfil the following requirements:		—
	•IP ratings for enclosures shall be at least IPXXC;	Case B: IP55 Case C: IP56	P
	•vehicle connector when mated with vehicle inlet: IPXXD;	Case B: IP54 according to Tüv Rheinland. Report No.: R 50592210	P
	•plug mated with socket-outlet: IPXXD;	Case C: IP54 according to DEKRA. Report No.6055789.63	P
	•vehicle connector intended for Mode 1 use, not mated: IPXXD;		N/A
	•vehicle connector intended for Mode 2 use, not mated: IPXXB and fulfilling the following:		N/A
	Minimum opening of the contact equal to the clearance according to IEC 60664-1 considering overvoltage category 2 (e.g. the value given in IEC 60664-1 for 230 V/400 V is 2,5 kV rated impulse voltage withstand that implies 1,5 mm separation of contacts) and inhibits the charging and warns the user in case of welded contact.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	•vehicle connector and EV socket-outlet intended for Mode 3 use, not mated: IPXXB provided it is associated directly upstream with a mechanical switching device (see also 12.3) and fulfilling one of the following:		P
	a) minimum opening of the contact equal to the clearance according to IEC 60664-1 considering overvoltage category 3 (e.g. the value given in IEC 60664-1 for 230 V/400 V is 4 kV rated impulse voltage withstand that implies at least 3 mm separation of contacts);	Impulse voltage withstand: 4 kV, separation of contacts: ≥3 mm	P
	b) presence of monitoring of the switching contacts associated with a means to operate another mechanical switching device providing isolating function upstream the above in case of fault of operation of the switching device upstream the accessory;		P
	c) presence of shutters on live entry hole of the socket-outlets or connectors for case C.		P
8.2	**Stored energy**		—
8.2.1	**Disconnection of plug connected EV supply equipment Disconnection of plug connected EV supply equipment**		N/A
	For plug connected EV supply equipment, where the connection pins are accessible after unplugging, one second after disconnecting the standard plug from the standard socket-outlet, the voltage between any combination of accessible contacts of the standard plug shall be less than or equal to 60 V DC or the stored charge available shall be less than 50 µC.		N/A
8.2.2	**Loss of supply voltage to permanently connected EV supply equipment**		P
	The voltage between power lines or power lines and protective earthing conductor, when measured at the input supply terminals of the EV supply equipment, shall be less than or equal to 60 V DC or the stored energy shall be less than or equal to 0,2 J within 5 seconds after disconnecting the power supply voltage to the EV supply equipment.	It measured 0 V within 100 ms at the input supply terminals.	P
8.3	**Fault protection**		—
	Fault protection shall consist of one or more protective measures as permitted according to IEC 60364-4-41:		—
	•automatic disconnection of supply;		P
	•double or reinforced insulation;		P

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Clause	Requirement + Test	Result - Remark	Verdict
	•electrical separation if limited to the supply of one item of current-using equipment;		N/A
	•extra low-voltage (SELV and PELV)		P
	Electric separation is fulfilled if there is one electrically separated circuit for each EV.		N/A
8.4	**Protective conductor**		—
	The protective earthing conductor and the protective conductor shall be of sufficient rating in accordance with requirements of IEC TS 61439-7.		P
	For Modes 1, 2 and 3, a protective earthing conductor shall be provided between the AC supply input earthing terminal of the EV supply equipment and the EV.	Mod 3	P
	Mode 4 EV supply equipment shall provide either:		—
	a) a protective earthing conductor from the input earthing terminal of the AC supply network to the EV or		N/A
	b) a protective conductor from the EV supply equipment to the EV if fault protection is based on electric separation.		N/A
	For Modes 3 and 4 permanently connected EV supply equipment, protective earthing conductors shall not be switched.		N/A
8.5	**Residual current protective devices**		—
	EV supply equipment can have one or more connecting points to supply energy to EVs.		P
	Where connecting points can be used simultaneously and are connected to a common input terminal of the EV supply equipment, they shall have individual protection incorporated in the EV supply equipment.		P
	If the EV supply equipment has more than one connecting point that cannot be used simultaneously then such connecting points can have common protection devices.		P
	EV supply equipment that includes an RCD and that does not use the protective measure of electrical separation shall comply with the following:		—
	•The connecting point of the EV supply equipment shall be protected by an RCD having a rated residual operating current not exceeding 30 mA;		P
	•RCD(s) protecting connecting points shall be at least type A;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	•RCDs shall comply with one of the following standards: IEC 61008-1, IEC 61009-1, IEC 60947-2 and IEC 62423;	RCD comply with IEC 62423	P
	•RCDs shall disconnect all live conductors.		P
	Where the EV supply equipment is equipped with a socket-outlet or vehicle connector for AC use in accordance with IEC 62196 (all parts), protective measures against DC fault current shall be taken. The appropriate measures shall be:		—
	•RCD type B or	MC003E1-B3 HFCA-F22/S5	P
	•RCD Type A and appropriate equipment that ensures the disconnection of the supply in case of DC fault current above 6 mA.		N/A
8.6	**Safety requirements for signalling circuits between the EV supply equipment and the EV**		—
	Any circuit for signalling, which extends beyond the EV supply equipment enclosure for connection with the EV (e.g. control pilot circuit), shall be extra low voltage (SELV or PELV) according to IEC 60364-4-41.		P
8.7	**Isolating transformers**		—
	Isolating transformers (excluding safety isolating transformers used for signalling) shall comply with the requirements of IEC 61558-1 and IEC 61558-2-4.		N/A
9	**CONDUCTIVE ELECTRICAL INTERFACE REQUIREMENTS**		
9.1	**General**		—
	Clause 9 provides a description of the conductive electrical interface requirements.		P
9.2	**Functional description of standard accessories**		—
	Standard accessories used for EV supply equipment shall be in accordance with IEC 60309-1, IEC 60309-2 or IEC 60884-1 or the national standard.		N/A
	Standard accessories that are intermateable with interfaces described in the IEC 60320 series shall not be used for EV supply equipment.		N/A
	Socket-outlets and plugs designed for household and similar use might not be designed for extended current draw or continuous use at maximum rated currents and might be subject to national regulations and standards for supply of energy to an EV.		P

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Clause	Requirement + Test	Result - Remark	Verdict
9.3	**Functional description of the basic interface**		—
	General requirements and ratings shall be in accordance with the requirements specified in IEC 62196-1. The basic interface is specified in 6.5 of IEC 62196-1:2014.	See appendix 1	P
	The following contacts are indicated:		—
	•up to three phases (L1, L2, L3);		P
	•neutral (N);		P
	•protective conductor (PE);		P
	•control pilot (CP);		P
	•proximity contact (PP).		P
	It may be used either for single-phase or for three-phase or both.		P
	Ratings and requirements for the use of the basic interface shall be in accordance with the requirements specified in IEC 62196-2.		P
9.4	**Functional description of the universal interface**		—
	General requirements and ratings shall be in accordance with the requirements specified in IEC 62196-1. The universal interface is specified in 6.4 and Table 2 of IEC 62196-1:2014.		P
9.5	**Functional description of the DC interface**		—
	General requirements and ratings shall be in accordance with the requirements specified in IEC 62196-1. The DC interface, configurations and ratings are specified in 6.6 and Table 4 of IEC 62196-1:2014. Ratings and requirements for the use of DC interface shall be in accordance with the requirements specified in IEC 62196-3.		N/A
9.6	**Functional description of the combined interface**		—
	The combined interface is specified in 6.7 and Table 5 of IEC 62196-1:2014. General requirements and ratings shall be in accordance with the requirements specified in IEC 62196-1. Ratings and requirements for the use of the combined interface with alternating current shall be in accordance with the requirements specified in IEC 62196-2. Ratings and requirements for the use of the combined interface with direct current shall be in accordance with the requirements specified in IEC 62196-3.	IEC 62196-1 and IEC 62196-2 (See appendix 1)	P
9.7	**Wiring of the neutral conductor**		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Where accessories according to IEC 62196 are used for three phase supply the neutral conductor shall always be wired to the accessories.		P
	Where accessories according to IEC 62196 are used for single phase supply, the terminals L (L1) and N (Neutral) shall always be wired.		P
10	**REQUIREMENTS FOR ADAPTORS**		—
	Vehicle adaptors shall not be used to connect a vehicle connector to a vehicle inlet.		N/A
	Adaptors between the EV socket-outlet and the EV plug shall only be used if specifically designated and approved by the vehicle manufacturer or by the EV supply equipment manufacturer and in accordance with national requirements, if any (see 16.2).		N/A
	Such adaptors shall comply with the requirements of this standard, and the other relevant standards governing either the EV plug or EV socket-outlet portions of the adaptor.		N/A
	The adaptors shall be marked to indicate the specific conditions of use allowed by the manufacturer, e.g. IEC 62196 series.		N/A
	Such adaptors shall not allow transitions from one mode to another.		N/A
11	**CABLE ASSEMBLY REQUIREMENTS**		—
11.1	**General**		—
	The cable assembly shall be provided with a cable that is suitable for the application.	Only for Case C	P
	Cable assemblies shall not allow transitions from one mode to another. This does not concern Mode 2 cable assembles that are constructed according to IEC 62752.		N/A
11.2	**Electrical rating**		—
	For case C, the voltage and current ratings of the cable assembly shall be compatible with the rating of the EV supply equipment.	Only for Case C	P

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Clause	Requirement + Test	Result - Remark	Verdict
	For accessories requiring current coding according to Annex B and IEC 62196-2, the maximum value of the current coding as indicated in Clause B.2 shall be in accordance with the current rating of the cable assembly.	Case B according to EN 62196-1 and EN 62196-2 approved by DEKRA. Report No.6055789.63 Case C according to EN IEC 62196-1 and EN IEC 62196-2 approved by Tüv Rheinland. Report No.:R 50592210	P
	Cables used with accessories according to IEC 62196-2 for Mode 3 case B, shall have a minimum withstand I^2t value of 75 000 A^2s.	Case B according to EN 62196-1 and EN 62196-2 approved by DEKRA Report No.6055789.63	P
11.3	**Dielectric withstand characteristics**		—
	Dielectric withstand characteristics of the cable assembly shall be as indicated for the EV supply equipment in 12.7.	Only for Case C	P
	For Class I equipment: between live part and earth with test voltage for Class I equipment;		N/A
	For Class II equipment: between live part and exposed conductive parts with test voltage for Class II equipment.		P
11.4	**Construction requirements**		—
	A cable assembly shall be so constructed that it cannot be used as a cord extension set.	Only for Case C	P
	A cable assembly may include one or more cables, which may be in a flexible tube, conduit or wire way.		P
	The cable may be fitted with an earth-connected metal shielding.		P
	The cable insulation shall be wear resistant and maintain flexibility over the full temperature range required by the classification of the EV supply equipment.		P
11.5	**Cable dimensions**		—
	The maximum cable length shall be in accordance with the national codes if any.		N/A
11.6	**Strain relief**		—
	The strain relief of the cable in the vehicle connector, EV plug or in the standard plug shall be as specified in the relevant product standard (e.g. IEC 62196-1, IEC 60309-1 or IEC 60884-1).		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For case C the strain relief at the EV supply equipment shall be in accordance with the requirements in IEC 62196-1.	Case C according to EN IEC 62196-1 and EN IEC 62196-2 approved by Tüv Rheinland. Report No.:R 50592210	P
11.7	**Cable management and storage means for cables assemblies**		—
	For case C EV supply equipment, a storage means shall be provided for the vehicle connector when not in use.	Only for Case C	P
	For case C EV supply equipment the lowest point of the vehicle connector when stored shall be located at a height between 0,5 m and 1,5 m above ground level.		P
	For case C EV charging stations with cables of more than 7,5 m, a cable management system shall be provided. The free cable length shall not exceed 7,5 m when not in use.	≤7,5 m	N/A
	Prevention of overheating of cables or cable assemblies used in stored or partially stored position shall be ensured.	Not used in stored or partially stored position	N/A
12	**EV SUPPLY EQUIPMENT CONSTRUCTIONAL REQUIREMENTS AND TESTS**		—
12.1	**General**		—
	The control means and the protection means in Mode 2 EV supply equipment that is intended to be used both as stationary equipment and as portable equipment shall comply with IEC 61851-1 and with IEC 62752.		N/A
	For case C EV supply equipment, the output cable assembly is considered part of the assembly for testing purpose.		P
	Electric devices and components of EV supply equipment shall comply with their relevant standards. The tests of devices and components shall be carried out with the specimen, or any movable part of it, placed in the most unfavourable position that can occur in normal use.	See appendix 1	P
	For extreme environment or other special service conditions, see IEC TS 61439-7.		P
12.2	**Characteristics of mechanical switching devices**		—
12.2.1	**General**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Switching devices within EV supply equipment intended to supply the connecting points shall comply with their relevant standards, with at least the characteristics as given in 12.2.		P
12.2.2	**Switch and switch-disconnector**		N/A
	Switches and switch-disconnectors shall comply with IEC 60947-3.		N/A
	For AC applications, switches and switch-disconnectors shall have a rated current, at a utilization category of at least AC-22A, not less than the rated current of the circuit that they are intended to operate in.		N/A
	For DC applications, switches and switch-disconnectors shall have a rated current, at a utilization category of at least DC-21A, not less than the rated current of the circuit that they are intended to operate in.		N/A
12.2.3	**Contactor**		N/A
	Contactors shall comply with IEC 60947-4-1.		N/A
	For AC applications, contactors shall have a rated current, at a utilization category of at least AC-1, not less than the rated current of the circuit that they are intended to operate in.		N/A
	For DC applications, contactors shall have a rated current, at a utilization category of at least DC-1, not less than the rated current of the circuit that they are intended to operate in.		N/A
12.2.4	**Circuit-breaker**		N/A
	Circuit breakers, if any, shall comply with IEC 60898-1 or IEC 60947-2 or IEC 61009-1.		N/A
12.2.5	**Relays**	See appendix 1	P
	Relays used to switch the main current path shall comply with IEC 61810-1 with the following minimum characteristics:		—
	•50 000 cycles,		P
	•contact category: CC 2.		P
12.2.6	**Inrush current**		P
	AC EV supply equipment shall withstand the inrush current according to 8.2.2 of ISO 17409:2015.		P
	The following values are specified in ISO 17409:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	•After closing the contactor in the EV supply equipment at the peak value of the supply voltage, the EV supply equipment shall be able to withstand 230 A peak within the duration of 100 µs.		P
	•During the next second the EV supply equipment shall be able to withstand 30 A (rms).		P
	The protection means shall be selected not to trip for inrush current.		P
12.2.7	**Residual direct current monitoring device (RDC MD)**		P
	This will be covered in the future IEC 62955 (under consideration).	See appendix 1	P
12.3	**Clearances and creepage distances**		—
	The clearances and creepage distances in the EV supply equipment, installed as intended by the manufacturer, shall be in accordance with the requirements specified in IEC 60664-1.		P
	Parts of the EV supply equipment directly connected to the public AC supply network shall be designed according to overvoltage category IV.		N/A
	Permanently connected EV supply equipment shall be designed according to a minimum overvoltage category III except for the socket-outlet or the vehicle connector in case C where a minimum overvoltage category II applies.		P
	EV supply equipment supplied through a cable and plug shall be designed according to a minimum overvoltage category II.		P
	Equipment that is intended to be used under the conditions of a higher overvoltage category shall include appropriate overvoltage protective device (see 4.3.3.6 of IEC 60664-1:2007).		N/A
12.4	**IP degrees**		—
12.4.1	**Degrees of protection against solid foreign objects and water for the enclosures**		P
	Enclosures of the EV supply equipment shall have an IP degree, according to IEC 60529 as follows:		—
	•indoor use: at least IP41;	Case B: IP56 Case C: IP55	P
	•outdoor use: at least IP44.	Case B: IP56 Case C: IP55	P

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Clause	Requirement + Test	Result - Remark	Verdict
	The minimum IP degree for socket-outlets and the vehicle connectors shall be in accordance with their appropriate standards.	Socket outlet: approved IP55 Vehicle connector: approved IP54 See appendix 1	P
	IPX4 may be obtained by the combination of the socket-outlet or connector and the lid or cap, EV supply equipment enclosure or EV enclosure.		N/A
12.2.4	**Degrees of protection against solid foreign objects and water for basic, universal and combined and DC interfaces**		P
	The minimum IP degrees for ingress of objects and liquids shall be:		—
	•Indoor use:		—
	– vehicle connector when mated with vehicle inlet: IP21;		N/A
	– EV plug mated with EV socket-outlet: IP21;		N/A
	– vehicle connector for case C when not mated: IP21;		N/A
	– vehicle connector for case B when not mated: IP24.		N/A
	•Outdoor use:		—
	– vehicle connector when mated with vehicle inlet: IP44;		N/A
	– EV plug mated with EV socket-outlet: IP44;		N/A
	– vehicle connector when not mated: IP24;		N/A
	– vehicle connector for case B when not mated: IP24;		N/A
	– socket-outlet when not mated: IP24.		N/A
	IPX4 may be obtained by the combination of the socket-outlet or connector and the lid or cap, EV supply equipment enclosure or EV enclosure.		N/A
12.5	**Insulation resistance**		—
	The insulation resistance measured with a 500 V DC voltage applied between all inputs/outputs connected together (power source included) and the accessible parts shall be:		—
	•for a class I EV supply equipment: R > 1 MΩ;		N/A
	•for a class II EV supply equipment: R > 7 MΩ.		P
	For this test all extra low voltage (ELV) circuits shall be connected to the accessible parts during the test.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The measurement of insulation resistance shall be carried out with the protective impedances disconnected, and after applying the test voltage for the duration of 1 min and immediately after the damp heat continuous test of IEC 60068-2-78, test Ca, at 40 °C ± 2 °C and 93 % relative humidity for four days.		P
	The conditioning test for the insulation test and the touch current can be avoided if the conditioning for test of 12.9 followed by test of 12.5, 12.6 and final test of 12.9, are conducted sequentially in that order.		P
12.6	**Touch current**		—
	The touch current between any AC supply network poles and the accessible metal parts connected with each other, and with a metal foil covering insulated external parts, is measured in accordance with IEC 60990 and shall not exceed the values indicated in Table 1.		P
	The touch current shall be measured within one hour after the damp heat continuous test of IEC 60068-2-78, test Ca, at 40 °C± 2 °C and 93 % relative humidity for four days, with the electric vehicle charging station connected to AC supply network in accordance with IEC 60990.		P
	The test voltage shall be 1,1 times the maximum rated voltage.	440 V	P
	Table 1 – Touch current limits		P
	Between any network poles and the accessible metal parts connected with each other and a metal foil covering insulated external parts:		—
	Class I 3,5 mA		N/A
	Class II 0,25 mA	0,0156 mA	P
	Between any network poles and the metal inaccessible parts normally non-activated (in the case of double insulation):		—
	Class I N/A		N/A
	Class II 3,5 mA	0,7 mA	P
	Between inaccessible and accessible parts connected with each other and a metal foil covering insulated external parts (additional insulation):		—
	Class I N/A		N/A
	Class II 0,5 mA	0,11 mA	P
	This test shall be made when the EV supply equipment is functioning with a resistive load at rated output power.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Circuitry that is connected through a fixed resistance or referenced to earth (for example, proximity function and control pilot function) are disconnected before this test.		P
	The equipment is fed through an isolating transformer or installed in such a manner that it is isolated from the earth.		P
12.7	**Dielectric withstand voltage**		—
12.7.1	**AC withstand voltage**		P
	The dielectric withstand voltage, at power frequency of 50 Hz or 60 Hz, shall be applied for 1 min as follows:		—
	1) For a class I EV supply equipment. (Un + 1 200 V) (r.m s.) in common mode (all circuits in relation to the exposed conductive parts) and differential mode (between each electrically independent circuit and all other exposed conductive parts or circuits) as specified in 5.3.3.2 of IEC 60664-1:2007.		N/A
	2) For a class II EV supply equipment. 2 times (Un +1 200 V) (r.m.s). in common mode (all circuits in relation to the exposed conductive parts) and differential mode (between each electrically independent circuit and all other exposed conductive parts or circuits) as specified in 5.3.3.2.3 of IEC 60664-1:2007.	2 x (230+1200): 2860 VAC 2860 VAC x 1,41: 4032 VDC	P
	3) For both class I and class II AC EV supply equipment where the insulation between the AC supply network and the extra low voltage circuit is double or reinforced insulation, 2 times (Un + 1 200 V) (r.m.s.) shall be applied to the insulation.	2860 VAC x 1,41: 4032 VDC	P
	Alternatively the test can be carried out using a DC voltage equal to the AC peak values.		P
	For this test, all the electrical equipment shall be connected, except those items of apparatus which, according to the relevant specifications, are designed for a lower test voltage; current consuming apparatus (e.g. windings, measuring instruments, voltage surge suppression devices) in which the application of the test voltage would cause the flow of a current, shall be disconnected.		P
	Such apparatus shall be disconnected at one of their terminals unless they are not designed to withstand the full test voltage, in which case all terminals may be disconnected		N/A
12.7.2	**Impulse dielectric withstand (1,2 µs/50 µs)**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The dielectric withstand of the power circuits at impulse test shall be tested according to IEC 60664-1.		P
	The impulse voltage shall be applied to live parts and exposed conductive parts.		P
	The test shall be carried out in accordance with the requirements of IEC 61180.		P
	Parts of the EV supply equipment directly connected to the public AC supply network shall be tested according to overvoltage category IV.		N/A
	Permanently connected EV supply equipment shall be tested according to an overvoltage category III except for the socket-outlet or the vehicle connector in case C where an overvoltage category II applies.	4000 V	P
	EV supply equipment supplied through a cable and plug shall be tested according to an overvoltage category II.		N/A
12.8	**EV supply equipment shall comply with IEC TS 61439-7.**		—
12.9	**Damp heat functional test**		—
	Following the conditioning defined below, the EV supply equipment is deemed to pass the test, if, it passes the normal sequences test according to A.4.7 of Annex A. The precision of the timing does not need to be verified.		P
	Conditioning:		—
	– For indoor units, 6 cycles of 24 h each to a damp heat cycling test according to IEC 60068-2-30 (Test Db) at (40±3) °C and relative humidity of 95 %;		N/A
	– For outdoor units, two 5 day periods, with each period consisting of 5 cycles of 24 h each to a damp heat cycling test according to IEC 60068-2-30 (Test Db) at (40±3) °C and relative humidity of 95 %.	at (55±3) °C and relative humidity of 95 %.	P
12.10	**Minimum temperature functional test**		—
	The EV supply equipment shall be pre-conditioned in accordance with IEC 60068-2-1, test Ab, at the minimum operating temperature (either -5 °C for indoor, -25 °C outdoor or lower values declared by the manufacturer ± 3 K) for (16 ± 1) h.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The EV supply equipment is deemed to pass the test, if, immediately after the preconditioning, it passes the sequences test according to A.4.7 of Annex A while at the minimum operating temperature. The precision of the timing does not need to be verified.		P
12.11	**Mechanical strength**		—
	For Mode 2 EV supply equipment the minimum degree of protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262	Mode 3	N/A
	After the test, the samples shall show that:		—
	– the IP degree according to 12.5 is not impaired;		N/A
	– no part has moved, loosened, detached or deformed to the extent that any safety functions are impaired;		N/A
	– the test did not cause a condition that results in the equipment not complying with the strain relief requirements, if applicable;		N/A
	– the test did not result in a reduction of creepage and clearance between uninsulated live parts of opposite polarity, uninsulated live parts and accessible dead or grounded metal below the minimum acceptable values;		N/A
	– the test did not result in any other evidence of damage that could increase the risk of fire or electric shock.		N/A
13	**OVERLOAD AND SHORT-CIRCUIT PROTECTION**		—
13.1	**General**		—
	Where connecting points can be used simultaneously and are intended to be supplied from the same input line, they shall have individual protection incorporated in the EV supply equipment.		P
	If the EV supply equipment presents more than one connecting point then such connecting points may have common overload protection means and may have common short-circuit protection means, if those protection means provide the required protection for each of the connecting points		P
	If the EV supply equipment presents more than one connecting point that cannot be used simultaneously then such connecting points can have common protection means.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Such overcurrent protective devices shall comply with IEC 60947-2, IEC 60947-6-2 or IEC 61009-1 or with the relevant parts of IEC 60898 series or IEC 60269 series.		P
13.2	**Overload protection of the cable assembly**		—
	The EV charging stations or Mode 2 EV supply equipment shall provide overload protection for all cases for all intended cable conductor sizes if not provided by the upstream supply network.	Mode 3	N/A
	The overload protection may be provided by a circuit breaker, fuse or combination thereof.		P
	If overload protection is provided by a means other than a circuit breaker, fuse or combination thereof, such means shall trip within 1 min if the current exceeds 1,3 times the rated current of the cable assembly.		P
13.3	**Short-circuit protection of the charging cable**		—
	The EV charging stations or Mode 2 EV supply equipment shall provide short-circuit current protection for the cable assembly if not provided by the supply network.		N/A
	In case of short-circuit, the value of I2t at the EV socket-outlet of the Mode 3 charging station shall not exceed 75 000 A2s.		N/A
	In case of short-circuit, the value of I2t at the vehicle connector (Case C) of the Mode 3 charging station shall not exceed 80 000 A2s.		N/A
	The real value of the prospective short-circuit current is evaluated at the point where the cable assembly is connected.		N/A
14	**AUTOMATIC RECLOSING OF PROTECTIVE DEVICES**		—
	The automatic or remote reclosing of protective devices after tripping in the EV supply equipment shall only be possible in case the following requirement is fulfilled:		—
	•the socket-outlet shall not be mated to a plug. This shall be checked by the EV supply equipment.		N/A
	For automatic or remote reclosing automatic reclosing devices (ARDs) with an assessment means may be used.		N/A
	The EV supply equipment may close the contactor during an automatic or remote reset cycle to establish conductivity between the protection device and the socket-outlet.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	By this procedure the EV supply equipment can check the circuit up to the socket-outlet to be free of fault current.		N/A
	For case C the EV supply equipment shall not provide automatic or remote reclosing of protective devices.		P
15	**EMERGENCY SWITCHING OR DISCONNECT (OPTIONAL)**		—
	Emergency switching or disconnect equipment shall be used either to disconnect the supply network from EV supply equipment or to disconnect the socket-outlet(s) or the cable assembly(ies) from the supply network.		N/A
	Such equipment shall be installed in accordance with national rules.		N/A
	Such equipment may be part of the supply network or either the EV charging station or the Mode 2 supply equipment.		N/A
16	**MARKING AND INSTRUCTIONS**		—
16.1	**Installation manual of EV charging stations**		—
	The installation manual of EV charging stations shall indicate the classification as given in Clause 5.		P
	The EV supply equipment manufacturer shall state the interface characteristics specified in Clause 5 of IEC TS 61439-7:2014 in the manual where applicable.		P
	Wiring instructions shall be provided.		P
	If protective devices are included in the EV charging station, the manual shall indicate the characteristics of those protection devices explicitly describing the type and rating.		P
	If the protective devices are not in the EV charging station, the manual shall indicate all information necessary for the installation of external protection explicitly describing the type and rating of the devices to be used.		P
	It is recommended that the installation manual be made available to future customers.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	If the EV charging station has more than one connection of the equipment to the AC supply network, and does not have individual protection for each connecting point to the vehicles, then the installation manual shall indicate that each connection of the equipment to the AC supply network requires individual protection.		N/A
	The installation manual shall indicate if the optional function for ventilation is supported by the charging station (6.3.2.2).		P
	The installation manual shall indicate ratings or other information that denote special (severe or unusual) environmental conditions of use, see 5.3.		P
16.2	**User manual for EV supply equipment**		—
	User information shall be provided by the manufacturer on the EV supply equipment or in a user's manual.		P
	Such information shall state:		—
	•which adaptors or conversion adapters are allowed to be used, or		P
	•which adaptors or conversion adapters are not allowed to be used, or		P
	•that adaptors or conversion adapters are not allowed to be used, and		P
	•that cord extension sets are not allowed to be used.		P
	The user manual shall include information about national usage restrictions.		P
16.3	**Marking of EV supply equipment**		—
	The EV supply equipment manufacturer shall provide each EV supply equipment with one or more labels, marked in a durable manner and located in a place such that they are visible and legible during installation and maintenance:		—
	a) EV supply equipment manufacturer's name, initials, trade mark or distinctive marking;		P
	b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the EV supply equipment manufacturer;		P
	c) "Indoor Use Only", or the equivalent, if intended for indoor use only;	indoor and outdoor use	N/A
	The EV supply equipment manufacturer shall provide each EV supply equipment with one or more labels, marked in a durable manner and located in a place such that they are visible and legible during installation:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	d) means of identifying date of manufacture;		P
	e) type of current;		P
	f) frequency and number of phases in case of alternating current;		P
	g) rated voltage (input and output if different);		P
	h) rated current (input and output if different) and the ambient temperature used to determine the rated current;		P
	i) degree of protection;		P
	j) all necessary information relating to the special declared classifications, characteristics and diversity factor(s), severe or unusual environmental conditions of use, see 5.3.		P
16.4	**Marking of charging cable assemblies case B**		—
	Cable assemblies for Mode 1 Case B or Mode 3 Case B shall be marked in a durable manner with the following information:		—
	a) manufacturer's name or trade mark;	Charging Cable: HONGQI CABLE GROUP EVC Charging connector: LuXshare LCS-AC35E00	P
	b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the manufacturer;	Charging Cable: H07BZ5-F Charging connector: Type 2	P
	c) rated voltage;	Charging Cable: 450/750 V Charging connector: 480~	P
	d) rated current;	Charging connector: 32 A	P
	e) number of phases. f) degree of protection	Charging connector: IP54	P
	Marking for the entire cable assembly shall be provided in a clear manner by a label or equivalent means.		P
16.5	**Durability test for marking**		—
	Marking made by moulding, pressing, engraving or similar, including labels with a laminated plastic covering, shall not be submitted to the following test.		P
	The markings required by this standard shall be legible with corrected vision, durable and visible during use.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	After the test, the marking shall be legible to normal or corrected vision without additional magnification. It shall not be easily possible to remove marking plates and they shall show no curling.		P
A	**ANNEX A – CONTROL PILOT FUNCTION TROUGH A CONTROL PILOT CIRCUIT USING A PWM SIGNAL AND A CONTROL PILOT WIRE**		—
A.1	**General**		—
A.2	**Control pilot circuit**		—
A.2.1	**General**		—
	Figures A.1 and A.2 illustrate an electric equivalent circuit of the control pilot circuit. The EV supply equipment shall set the duty cycle of the PWM control pilot signal to indicate the maximum current according to Table A.7.		P
	The indicated maximum current transmitted shall not exceed the value according to 6.3.1.6.		P
	The EV supply equipment may open the switching device that energizes the EV if the EV draws a higher current than the PWM signal (duty cycle) indicates. In this case, the EV supply equipment shall respect the following conditions:		—
	•the allowed response time of the EV, according to Table A.6 (e.g. sequence 6).		P
	•the current tolerance related to the duty cycle generated by the EV supply equipment (1 percentage point).		P
	•the tolerances of the current measurement used in the EV supply equipment itself.		P
	The control pilot circuit shall be designed in accordance with Figures A.1 or A.2 with the values defined in Table A.2, Table A.3 and Table A.4.	Figure A.1	P
	The functionality of the control pilot circuit shall follow the requirements defined in Table A.4, Table A.6, Table A.7 and Table A.8.		P
A.2.2	**Typical control pilot circuit (see IEC 61851-1:2017)**		P
	The EV supply equipment communicates by setting the duty cycle of a PWM signal or a continuous DC voltage signal (Table A.7).		P
	The EV supply equipment may change the duty cycle of the PWM signal at any time.		P
	The EV responds by applying a resistive load to the positive half-wave to the control pilot circuit.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For further information about the PWM signal see also Table A.2, Table A.3 and Table A.4.		P
	EVs using typical control pilot circuit (Figure A.1) shall be able to create state B and use it according to the sequences specified in Table A.6.		P
	EV using a typical control pilot circuit shall determine the maximum current from EV supply equipment from the duty cycle of the PWM signal (Table A.8).		P
A.2.3	**Simplified control pilot circuit (see IEC 61851-1:2017)**		N/A
	An EV using the simplified control pilot circuit shall limit itself to single phase charging and shall not draw a current of more than 10 A.		N/A
	EV supply equipment that supports an EV using the simplified control pilot shall modulate the PWM signal in the same manner as done for EVs using the typical control pilot circuit.		N/A
	EVs using simplified control pilot circuit (Figure A.2) are not able to create state B.		N/A
	An EV using the simplified control pilot circuit can measure the duty cycle.		N/A
	The designer of an EV using the simplified control pilot should be aware that the EV supply equipment can open its switching device, if the EV supply equipment indicates less current (by the duty cycle) than the EV draws (see A 2.1).		N/A
	It is not recommended to use the simplified control pilot circuit for new EV design.		N/A
A.2.4	**Additional components and high frequency signals**	No digital communication	N/A
	Digital communication as described in ISO/IEC 15118 series may be carried out over the control pilot conductor. Additional components can be needed to couple this high-frequency signal onto the control pilot signal.	Not used digital communication	N/A
	Additional components required for signal coupling shall not deform the control pilot signal beyond the limits defined in Tables A.2 and A.4.		N/A
	The maximum inductance of the control pilot circuit of the EV supply equipment is limited to 1 mH (see Table A.3).		N/A
	The maximum inductance of the control pilot circuit of the EV is limited to 1 mH (see Table A.2).		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The additional signal for digital communication shall have a frequency of at least 148 kHz.		N/A
	The voltage of the high frequency signal (used for digital communication) shall be in accordance with the values given in Table A.1.		N/A
	One further capacitive (max of 2 000 pF) branch (on the vehicle and on the EV supply equipment) can be used for detection of the high frequency signals, provided the resistance/impedance to ground is higher than 10 kΩ. Such capacitive/resistive branch would typically be used for signal inputs and automatic signal voltage control (refer to Table A.1).		N/A
A.3	**Requirements for parameters and system behaviour**		—
	The control pilot circuit parameters shall be in accordance with Table A.2 and Table A.3 and are shown in Figures A.1 and A.2.	Figures A.1	P
	EV pilot circuit values and parameters as indicated on Figures A.1 and A.2 are given in Table A.3.		P
	Value ranges shall be maintained over full useful life and under design environmental conditions.		P
	1 % tolerance resistors are commonly recommended for this application.		P
	Table A.4 indicates the pilot voltage range based on components values in Tables A.2 and A.3. It incorporates an increased voltage margin for Va to allow for measurement tolerances of the EV supply equipment.		P
	There is no undefined voltage range, for the PWM signal, between the system states.		P
	The state is valid if it is within the above values. The state detection shall be noise resistant, e.g. against EMC and high frequency data signals on the control pilot circuit.		P
	For reliable detection of a state, it is recommended to apply averaging of the measurement over several milliseconds or PWM cycles.		P
	The EV supply equipment shall verify that the EV is properly connected by verifying the presence of the diode in the control pilot circuit, before energizing the system.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	This shall be done at the transition from x1 to x2 or at least once during state x2, before closing the supply switching device.		P
	Presence of the diode is detected if the low side of the PWM-signal is within the voltage range defined in Table A.4.		P
	The EV supply equipment shall open or close the supply switching device within the time indicated in Table A.6.		P
	Compliance is tested as in Clause A.4		P
	The state changes between A, B, C and D are caused by the EV or by the user.		P
	The state changes between state x1 and x2 are created by the EV supply equipment.		P
	A change between states x1 and x2 indicates an availability (x2) or unavailability (x1) of power supply to the EV.		P
	After changing to state F and while the reason for changing to state F persists, an EV supply equipment with permanently attached cable (case C) shall:		—
	– remain in state F, or		N/A
	– remain in state F for at least 300 ms and then change to state x1 (and stays there), in order to detect if an EV is connected.		N/A
	If the failure is not recovered after disconnecting the vehicle connector, the EV supply equipment shall:		—
	– remain in or change to state F, or		N/A
	– remain in state x1, if the EV supply equipment provides an indicator (e.g. a display) which shows "not available".		N/A
	In the absence of a fault condition in the EV supply equipment, the EV supply equipment shall not use the state F in order to signal that the EV supply equipment will not deliver the energy to the EV. Instead, this shall be done by the state x1.		N/A
	A transition from state E or state F to any other state (x1 or x2) is allowed.		N/A
	If the EV is connected to the EV supply equipment which does not use 5 % duty cycle, and authentication (e.g. RFID identification, payment, etc.) is needed, the control pilot signal shall stay at x1 as long as the energy is not allowed to be supplied.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	In case, no authentication is needed, the system may go to state x2.		N/A
	In case EV supply equipment requires authentication to supply power, a change from states CX or DX to state BX shall not lead to loss of authentication.		N/A
	This means that no repeated authentication shall be needed.		N/A
	Table A.6 indicates the principle sequences and transitions from one state to another with the timing requirements where applicable. Some transitions that may take place are not indicated in the table.		N/A
	If the EV supply equipment or the EV changes to a new state within the timing indicated for that sequence, the new sequence is initiated and replaces the previous sequence.		N/A
A.4	**Test procedures**		—
A.4.1	**General**		—
A.4.2	**Constructional requirements of the EV simulator**		P
A.4.3	**Test procedure**		P
A.4.4	**Test List – Oscillator frequency and generator voltage test**	(see table 4.4)	P
A.4.5	**Duty Cycle test**	(see table 4.5)	P
A.4.6	**Pulse wave shape test**	(see table 4.6)	P
A.4.7	**Sequences test**	(see table 4.7)	P
A.4.7.1	**General**		P
A.4.7.2	**Sequence test using the typical control pilot circuit**	(see table 4.7.2)	P
A.4.7.3	**Sequence test using the simplified control pilot circuit**	(see table 4.7.3)	N/A
A.4.7.4	**Optional testing the EV supply equipment that support grid**	(see table 4.7.4)	N/A
A.4.8	**Test of interruption of the protective conductor**	(see table 4.8)	P
A.4.9	**Test of short-circuit values of the voltage**	(see table 4.9)	P
A.4.10	**Example of a test simulator of the vehicle (informative)**		N/A
A.4.11	**Optional hysteresis test**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
A.4.11.1	**General**		N/A
A.4.11.2	**Test sequence for hysteresis between states B and C**		N/A
A.4.11.3	**Test sequence for hysteresis between states C-E, D-E**		N/A
A.4.11.4	**Test sequence for hysteresis between states C-D**		N/A
A.5	**Implementation hints**		—
A.5.1	**Retaining a valid authentication until reaching CP State B**		N/A
A.5.2	**Load control using transitions between state x1 and x2**		N/A
A.5.3	**Information on difficulties encountered with some legacy EVs for wake-up after a long period of inactivity (informative)**		N/A
B	**ANNEX B – PROXIMITY DETECTION AND CABLE CURRENT CODING CIRCUITS FOR THE BASIC INTERFACE**		—
B.1	**Circuit diagram for vehicle couplers using an auxiliary switch associated with the proximity detection contact**		—
	The vehicle couplers using the proximity contact with an auxiliary switch and without current capability coding of the cable assembly shall use the circuit diagram as indicated in Figure B.1 and Table B.1.		N/A
B.2	**Circuit for simultaneous proximity detection and current coding**		—
	Vehicle connectors and plugs using the proximity contact for simultaneous proximity detection and current capability coding of the cable assembly shall have a resistor electrically connected between the proximity contact and the earthing contact (see Figure B.2) with a value as indicated in Table B.2.		N/A
	The resistor shall be coded to the maximum current capability of the cable assembly.		N/A
	The EV supply equipment shall interrupt the current supply if the current capability of the cable is exceeded as detected by the measurement of the Rc, as specified by the values for the recommended interpretation range in Table B.2.		N/A
	The EV supply equipment shall detect the current coding by measurement of the Rc, as defined in Table B.2 and use the result to set the value of the maximum allowed current, if necessary, according to 6.3.1.6.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The resistor is also used for proximity detection.		N/A

4.4	TABLE: Oscillator frequency and generator voltage test					P
	Minimum Voltage [V]	**Maximum Voltage [V]**	**Measured Value [V]**	**Resistor Value [Ω] (EV Simulator)**	**Oscillator Frequency [Hz] (Req. 1000 Hz +/- 0,5%)**	**Verdict**
State A	11,4	12,6	11,52	1000 Ω	-	P
State B1, B2 / positive	8,37	9,59	9,1	1000 Ω	1000 Hz	P
Negative B	-12,6	-11,4	-12,3	1000 Ω	1000 Hz	P
State C1, C2 / positive	5,47	6,53	6,3	1000 Ω	1000 Hz	P
Negative C	-12,6	-11,4	-12,1	1000 Ω	1000 Hz	P
State D1, D2 / positive	N/A	N/A	N/A	N/A	N/A	N/A
Negative D	-12,6	-11,4	N/A	N/A	N/A	N/A
	Internal resistor value (1000 Ω +/-3%) [Ω] Calculated: R1_calc(= 2 740 × (U_StateA – U_StateB) / (U_StateB – 0,7)					
R1	1000 Ω					P

4.5	TABLE: Duty cycle test					P
Duty cycle	**Measured Value [V]**	**Resistor Value [Ω] (EV Simulator)**	**Pulse width [µs]**	**Duty cycle**	**Indicated current (duty cycle * 0.6)**	**Verdict**
State B / 5% Duty cycle	N/A	N/A	N/A	N/A	N/A	N/A
State B / 10% Duty cycle	N/A	N/A	N/A	N/A	N/A	N/A
State B / Max declared / Default Duty cycle	+8,7 V, -11,7 V	1000 Ω	24	42,4	25,44	P

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Clause	Requirement + Test	Result - Remark	Verdict

4.6	TABLE: Pulse wave shape test						P
	Measured Voltage[a] [V]	**Maximum rise time [µs]**	**Measured Value [µs]**	**Maximum fall time [µs]**	**Measured Value [µs]**	**Duty Cycle [%]**	**Verdict**
State B1, B2 / positive	9,1	10	4	13	12	42,4	P
State C1, C2 / positive	6,3	7	4	13	12	42,4	P
State D1, D2 / positive	N/A	5	N/A	13	-	-	N/A
[a] with nominal resistance values							

4.7.2	TABLE: Sequence test using the typical control pilot circuit											P
Sequence	**1.1 [s]**	**3.1 [s]**	**4 [s]**	**7 [s]**	**8.1 [s]**	**4 [s]**	**6 [s]**	**7 [s]**	**8.1 [s]**	**2.1 [s]**	**9.3 [s]**	**Verdict**
Test 1 / Max resistance	0,62	0,47	0,37	0,47	0,37	0,47	N/A	N/A	N/A	N/A	N/A	P
Test 2 / Max resistance + HF voltage												N/A
Test 3 / Min resistance												The device cuts off the output, the PWM signal stops, that is, the device

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Clause	Requirement + Test							Result - Remark				Verdict
												goes into error with the red LED on.
Test 4 / Min resistance +HF voltage												N/A

4.7.3	TABLE: Sequence test using the simplified control pilot circuit					N/A
Sequence	**1.2 [s]**	**3.2 [s]**	**5 [s]**	**6 [s]**	**2.2 [s]**	**Verdict**
Test 1 / Max resistance						
Test 2 / Max resistance + HF voltage						
Test 3 / Min resistance						
Test 4 / Min resistance +HF voltage						

4.7.4	TABLE: Optional testing the EV supply equipment that support grid												N/A
Sequence	**1.1 [s]**	**3.1 [s]**	**4 [s]**	**9.1 [s]**	**10.1 [s]**	**8.2 [s]**	**3.1 [s]**	**4 [s]**	**7 [s]**	**8.1 [s]**	**2.1 [s]**	**9.3 [s]**	**Verdict**
Nominal resistance values													

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Clause	Requirement + Test	Result - Remark	Verdict

4.8	TABLE: Test of interruption of the protective conductor		P
	Measured cut off time [ms]	**Max. cut off time [ms]**	**Verdict**
State C or D → earth wire open	28	100	P

4.9	TABLE: Test of short circuit values of the voltage	P
	Shutdown time [s]	**Verdict**
State C + 120Ω resistance	6 ms	P

APPENDIX / *EK* 1	**TABLE: Critical components information** / *Kritik bileşen bilgisi*				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
LTE Cat 4 module	Quectel	EC25EUX	-35 °C to +75 °C	EN IEC 62368-1 EN IEC 62311	TIMCO Engineering , Inc Certificate no.: E1177-232890
SMART ENERGY METER	Eastron	SDM54-2T	3x230/400 V, 0,5-10(100) A, 50 Hz, -40°C to +70°C	EN 61326-1 EN 61010-1	SGS 0120/SGS0533
EV PCB Mount RCD sensor	Mega-phase Electronic Techology Ltd / Xiamen Hongfa Electroacoustic Co.,Ltd.	MC003E1-B3 HFCA-F22/S5	5Vdc±3%. max 110 mV, +105°C	IEC 62955	TÜV SÜD Cert. No.: B 118075 0001 Rev 00
Internal cable	Başoğlu Kablo	SIF	300 / 500 V, -60°C / +180°C	IEC/EN 61851-1	Tested with appliance
Socket-outlet for Conductive Charging of Electric Vehicles (for Case C)	JONHON	EVC2A-S-32A-480V-2U-L	AC 480V (Three-phase), 32A, Type 2, IP54 -30°C~50°C	EN IEC 62196-1 EN IEC 62196-2	Tüv Rheinland R 50592210
Connector for conductive charging of electric vehicles (for Case B)	LuXshare	LSC-AC35E00	32 A, 480 V~, Type 2, IP54	EN 62196-1 EN 62196-2	DEKRA Report No.6055789.63
		LSC-AC32E00	32 A, 250 V~, Type 2, IP54		
Charging cable (for Case B)	Hongqi Cable Electric Instrument Group Co., Ltd.	EVC H07BZ5-F	450/750 V, 5G6 mm^2 + 1x0,5 mm^2	EN 50620	DEKRA Mark 31-119601 TUV R 50510460
Power Supply	Mean Well	RPT-60B	Input: AC 100-240V, 50/60Hz, 1.4-0.9A Output: V1:+5 VDC 4 A, V2: +12 VDC 2 A, V3: -12 VDC 0,5 A	EN 62368-1	UL Ref. Certif. No.: DK-92537-UL
Relay	Hongfa	HF187F 12-4HBTF	-40°C to +85°C	IEC/EN 61810-1	VDE Certificate no. 40023708
					Tüv Rheinland R 50506590

Main terminal	SHENZHEN CONNECTION ELECTRONIC CO LTD	DSTB8-05	600V / 40A, -40-125°C, 18-10 AWG	UL1059 IEC61984 IEC60947	UL File no.: E304128
PCB	GOLDENMAX INTERNATIONAL TECHNOLOGY (ZHUHAI) LTD	GDM-R1	FR4, 125°C	IEC 60112 UL94V0	UL File no.: E330731
Varistor	Thinking	TVR10471KSY	300 V, Φ10 mm, -40°C ~ +85°C	EN IEC 61051-2, IEC 61051-1, IEC 61051-2, IEC 61051-2-2, EN IEC 61051-1	VDE Certificate no 005944
PCB terminal block	DEGSON TECHNOLOGY CO., LTD.	DG250-3.5	320 V, 1.5 mm², -40°C~+105°C	EN IEC 60947-7-4	VDE Certificate no 40046309
Fuse	Bel Fuse	0ADKC	1A–16A/500V AC/DC	EN/IEC 60127-1 EN/IEC 60127-7	TÜD SÜD B 058849 0020 UL File no.: E20624
Gas Discharge Tube (GDT) Data Sheet	YAGEO CORP	2RM800L-8/B	DC Sparkover: 800 V, -40°C ~ +85°C	UL	UL File no.: E504765
Ceramic capacitor	Murata	GCM219R72A33KA37	33nF -55°C to 125°C, 100 VDC	IEC/EN 61851-1	Tested with appliance
Current Transformers	Beijing Hop Tech	HCT204KFH	Current Ratio: 2000:1, 5A: 2,5 mA, -40°C ~ +100°C	IEC/EN 61851-1	Tested with appliance
Relay	Hongfa	HF3FA	-40°C to +85°C	IEC/EN 81810-1	VDE Certificate No.: 40023708

APPENDIX / *EK 2*	**TABLE: Heating test** / *Isıl test*		P
	Test voltage (V)	400 V 50 Hz	—
	Ambient (°C)	28,9	—

Thermocouple locations	**Max. temperature rise measured, (K)**	**Max. temperature rise limit, (K)**
RPT60B power supply transformer	54,4	For info
RPT60B Power supply capacitor center	59,4	For info
C13146 PCB	54,9	96,1; T125
Grey connector	42,0	76,1; T105
TVR 10471 varistor	40,8	56,1 K; T85
HF3FA relay	38,0	56,1 K; T85

Robycon 16 V 10000µF electrolyte capacitor	40,1	76,1; T105
HF187F relay	52,6	56,1 K; T85
250 MKT polyester capacitor	42,8	56,1 K; T85
C13152 PCB	53,7	96,1; T125
Terminal connector	35,0	76,1; T105
C13152 PCB	65,3	96,1; T125
Residual direct current monitoring device (RDC MD)	39,3	76,1; T105
3 phase energy meter	35,4	41,1 K; T70
HCT204KFH Current Transformers	39,2	71,1 K; T100
Internal wiring	30,2	151,1K; T180
QECTEL EC25-EUX 4G/LTE module	49,7	51,1 K;T80
C13148 PCB	52,1	96,1 K; T125
Socket inside	20,8	21,1 K; T50
Helper board	54,8	For info
Led PCB	18,5	96,1; T125
Socket surface	16,7	40 K
Enclosure (near socket)	16,8	40 K
Enclosure top surface	12,1	40 K
Enclosure side surface	16,6	40 K
Main terminal block	23,0	96,1; T125
Back mounting surface	35,5	40 K
Power supply ambient	42,1	For info

Supplementary information:

The manufacturer declares that the operating function of the tested device is as follows.

• After the device starts charging, the sensor on the relay card shall start to be monitored.

• As soon as the thermal value of this sensor reaches 80 °C, the current drawn shall automatically be reduced to 6 A and shall be kept constant at 6 A until the thermal value drops to 70 °C.

• As soon as the measured thermal value drops to 70 °C or below, it shall be increased again to the current level desired by the vehicle side.

• This cycle shall be applied continuously until the charging process is completed. /

• Cihaz şarj uygulamasına başladıktan sonra röle kartı üzerindeki sensör izlenmeye başlanacak.

• Bu sensör ısıl değeri 80 °C'yi bulduğu anda çekilen akım değeri otomatik olarak 6 A'e düşürülecek ve ısıl değerin 70 °C'ye düştüğü ana kadar 6 A de sabit tutulacak

• Ölçülen ısıl değer 70 °C ve altına indiği anda araç tarafının istediği akım seviyesine tekrar çıkartılacak.

• Bu çevrim şarj işlemi bitene kadar sürekli olarak uygulanacaktır.

APPENDIX / *EK* 3: **List of test equipment used** / *Kullanılan test ekipmanları listesi*

TABLE: Test Equipment List / *Test ekipmanları listesi*

No.	Test Equipment	Mark	Model/Type	Serial No.	Calibration Date	Calibration Due Date
EL1-228	Varying Transformer 75 KVA	SIEL ENERJI	75 KVA	-	-	-
EL1-117	Touch current test equipment	Esim	-	-	01/2023	01/2026
EL1-203	Ce Test Multimeter	Metrel	MI3394	15150073	08/2023	08/2024
EL1-110	Digital Dinamometer-Force Guage	Handy	-	112438	08/2023	08/2025
EL2-49	Test probe B	KEMA	-	-	08/2023	08/2028
EL1-163	Data Acquisitions	Agilent	Indicator: 34972A, Prob: 34901A	Indicator: MY49012456 Prob: MY41168649	12/2023	12/2025
EL1-164	20 Channel Multiplexer	Agilent	34901A	MY41168649	12/2023	12/2025
EL1-165	20 Channel Multiplexer	Agilent	34901A	MY41168630	12/2023	12/2025
EL1-174	Climate Cabinet	WELLTECH	YTH960ZH	EL1-174	04/2023	04/2025
EL1-208	Digital Multimeter	FLUKE	600 V CAT III 15B+	31190254WS	08/2023	08/2024
EL1-210	Clamp meter	FLUKE	325	35330158WS	08/2023	08/2024
EL1-197	Tape Meter	TOOLS	5m	SM 525	04/2022	04/2027
EL2-89	Electronic Weight	Densi	DS-60	919	08/2023	08/2025
EL2-101	Digital Caliper	Mitutoyo	CD-6"CX	11412751	08/2023	08/2024
EL2-105	Cl-Cr gauges	DEKRA	ORS128269	-	01/2020	01/2025

EL1-238	Oscilloscope	OWON	XDS3102A	XDS3102A1707072	08/2023	08/2024
EL2-79	Dust cabin	-	-	-	-	-
EL1-237	Digital Flowmeter	SICK	FFUS10-1G1IO	18120011	03/2024	03/2026
EL1-171	Digital Flowmeter	LRT-1	LWGY-32	1403306	03/2024	03/2026
EL1-172	Digital Timer	CP	94410-10	KEM86002	01/2023	01/2025
EL1-183	IK10 20J Free Fall Hammer	KBS	-	-	01/2020	2025/01
EL1-170	Impulse generator	Testing Europe	T3-61	20/13	03/2021	03/2025
EE1-337	AC DC Current Probe	PINTECH	PT-710	151225	04/2023	04/2025

APPENDIX / *EK* 4: **Photos of tested device** / *Test edilen cihaz fotoğrafları*