Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC 61851-1:2017
Electric vehicle conductive charging system
Part 1: General requirements

Report Number. .....:	**CN26FHWJ 001**
Date of issue .....:	**2026-10-20**
Total number of pages.....:	**57**
Name of Testing Laboratory preparing the Report.....:	**TÜV Rheinland (Shanghai) Co., Ltd.**
Applicant's name.....:	**GoodWe Technologies Co., Ltd.**
Address .....:	No.90 Zijin Rd., New District, 215011 Suzhou P.R. China
Test specification:	
Standard .....:	IEC 61851-1:2017
Test procedure.....:	CB Scheme
Non-standard test method.....:	N/A
TRF template used .....:	IECEE OD-2020-F1:2022, Ed.1.5
Test Report Form No.....:	IEC61851_1D
Test Report Form(s) Originator.....:	VDE Prüf- und Zertifizierungsinstitut GmbH
Master TRF .....:	Dated 2023-06-02

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Test item description .....:	AC Charger
Trade Mark .....:	GOODWE
Manufacturer.....:	Same as applicant
Model/Type reference .....:	GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30
Ratings .....:	Input/Output:400Vac,32Amax,50/60Hz, 22kWMax.Refer to model difference list for details.

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**CB Testing Laboratory:**	**TÜV Rheinland (Shanghai) Co., Ltd.**	
Testing location/ address ..... :		No.177, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China	
Tested by (name, function, signature) ..... :		Zhi Zhou / Project Handler	Zhi Zhou
Approved by (name, function, signature) .. :		David Chen / Authorizer	David Chen
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address ..... :			
Tested by (name + signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) .. :			
Supervised by (name, function, signature) :			

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

Attachment 1: Additional test data (pages 4)

Attachment 2: Photo documentation (pages 12)

Attachment 3: RCD test report CN26N4CH 001 according to IEC 62955:2018(pages 60)

Summary of testing:

Tests performed (name of test, test clause and date test performed):

Clause	Name of test	date
6.3	Function provided in Mode 2, 3 and 4	2026.07.29
8.1	Degrees of protection against access to hazardous-live-parts	2026.08.03 - 2026.08.07
8.2.2	Loss of supply voltage to permanently connected EV supply equipment	2026.08.03 - 2026.08.07
8.3	Fault protection	2026.08.03 - 2026.08.05
8.4	Protective conductor	2026.08.03 - 2026.08.05
11.6	Strain relief	2026.08.03 - 2026.08.05
12.3	Clearances and creepage distances	2026.08.09
12.4	IP degrees	2026.08.09 -2026.08.10
12.5	Insulation resistance	2026.08.21
12.6	Touch current	2026.08.21
12.7.1	AC withstand voltage	2026.08.21
12.7.2	Impulse dielectric withstand test	2026.08.21
12.8	Temperature rise	2026.09.16 -2026.09.17
12.9	Damp heat functional test	2026.08.11 -2026.08.20
12.10	Minimum temperature functional test	2026.08.22
16.5	Durability test for marking	2026.08.28
Annex A	Control pilot function through a control pilot circuit using a PWM signal and a control	2026.09.01 -2026.09.04

Testing location: (CBTL, SPTL, CTF, Subcontractor)

TÜV Rheinland (Shanghai) Co., Ltd.

No. 177, Lane 777, West Guangzhong Road, Zhabei District, Shanghai 200072, P.R. China

	pilot wire	

Note: Model GW22K-HCA-G30(Case C Version) and Model GW7K-HCA-G30(Case C Version) are tested as representative types.

Summary of compliance with National Differences (List of countries addressed):

No national differences

☒ **The product fulfils the requirements of EN IEC 61851-1:2019, IEC 61851-1:2017, BS EN IEC 61851-1:2019**

Use of uncertainty of measurement for decisions on conformity (decision rule):

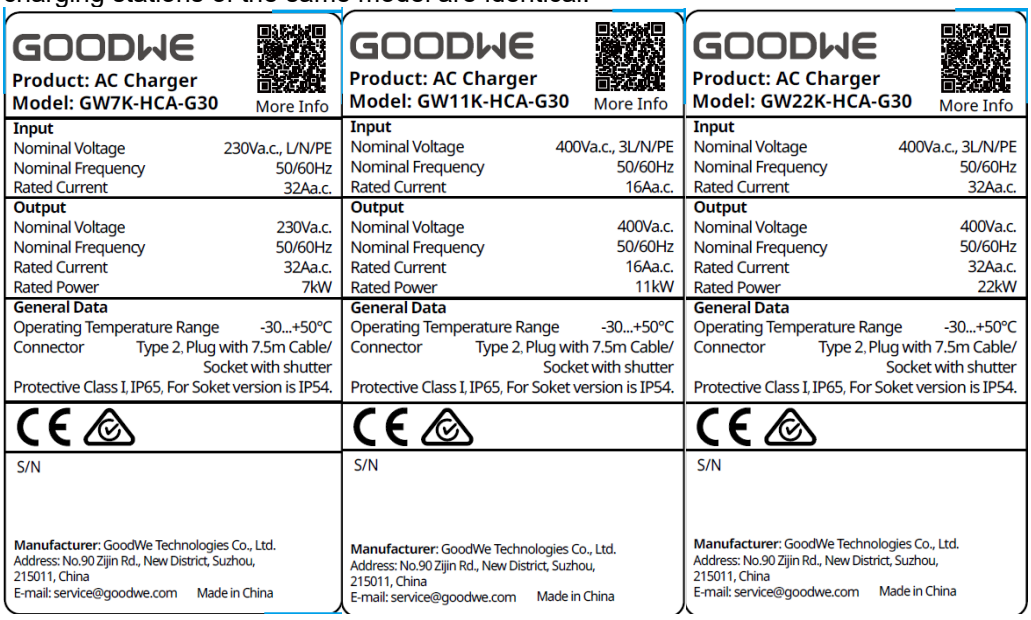
☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").
☐ Other: … (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

Information on uncertainty of measurement:
The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.
IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.
Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

For the nameplate, the ustomer decares that the nameplates for the wall-mounted and pedestal-mounted charging stations of the same model are identical.



GOODWE	GOODWE	GOODWE
Product: AC Charger	**Product: AC Charger**	**Product: AC Charger**
Model: GW7K-HCA-G30 More Info	**Model: GW11K-HCA-G30** More Info	**Model: GW22K-HCA-G30** More Info
Input	**Input**	**Input**
Nominal Voltage 230Va.c., L/N/PE	Nominal Voltage 400Va.c., 3L/N/PE	Nominal Voltage 400Va.c., 3L/N/PE
Nominal Frequency 50/60Hz	Nominal Frequency 50/60Hz	Nominal Frequency 50/60Hz
Rated Current 32Aa.c.	Rated Current 16Aa.c.	Rated Current 32Aa.c.
Output	**Output**	**Output**
Nominal Voltage 230Va.c.	Nominal Voltage 400Va.c.	Nominal Voltage 400Va.c.
Nominal Frequency 50/60Hz	Nominal Frequency 50/60Hz	Nominal Frequency 50/60Hz
Rated Current 32Aa.c.	Rated Current 16Aa.c.	Rated Current 32Aa.c.
Rated Power 7kW	Rated Power 11kW	Rated Power 22kW
General Data	**General Data**	**General Data**
Operating Temperature Range -30...+50°C	Operating Temperature Range -30...+50°C	Operating Temperature Range -30...+50°C
Connector Type 2, Plug with 7.5m Cable/ Socket with shutter	Connector Type 2, Plug with 7.5m Cable/ Socket with shutter	Connector Type 2, Plug with 7.5m Cable/ Socket with shutter
Protective Class I, IP65, For Soket version is IP54.	Protective Class I, IP65, For Soket version is IP54.	Protective Class I, IP65, For Soket version is IP54.
CE	CE	CE
S/N	S/N	S/N
Manufacturer: GoodWe Technologies Co., Ltd. Address: No.90 Zijin Rd., New District, Suzhou, 215011, China E-mail: service@goodwe.com Made in China	**Manufacturer**: GoodWe Technologies Co., Ltd. Address: No.90 Zijin Rd., New District, Suzhou, 215011, China E-mail: service@goodwe.com Made in China	**Manufacturer**: GoodWe Technologies Co., Ltd. Address: No.90 Zijin Rd., New District, Suzhou, 215011, China E-mail: service@goodwe.com Made in China

Test item particulars ..... :	
Equipment mobility ..... :	☐ movable ☐ hand-held ☐ transportable ☒ stationary ☐ for building-in ☐ direct plug-in
Connection to the mains ..... :	☐ pluggable equipment ☐ type A ☐ type B ☒ permanent connection ☐ detachable power supply cord ☐ non-detachable power supply cord ☐ not directly connected to the mains
EV charging modes ..... :	☐ Mode 1 charging ☐ Mode 2 charging ☒ Mode 3 charging ☐ Mode 4 charging
Type of EV connection ..... :	☐ Case A ☒ Case B ☒ Case C
Access location ..... :	☒ operator accessible ☐ service access area ☐ restricted access location
Over voltage category (OVC) ..... :	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV ☐ other:
Mains supply tolerance (%) or absolute mains supply values ..... :	±10%
Tested for IT power systems ..... :	☐ Yes ☒ No
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Considered current rating (A) ..... :	40A for GW7K-HCA-G30/ GW22K-HCA-G30 20A for GW11K-HCA-G30
Pollution degree (PD) ..... :	☐ PD 1 ☒ PD 2 (internal) ☒ PD 3(external)
IP protection class ..... :	IP65(Case C) IP54(Case B)
Altitude during operation (m) ..... :	<2000
Altitude of test laboratory (m) ..... :	≤500
Mass of equipment (kg) ..... :	Refer to model difference list
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)
Testing ..... :	
Date of receipt of test item ..... :	2026-07-29
Date (s) of performance of tests ..... :	2026-07-29 - 2026-09-17

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.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) ..... :	**GoodWe (GuangDe) Power Supply Technology Co., Ltd.** No. 208, Tong Rui East Road, Guangde, Anhui, P.R. China

General product information and other remarks:

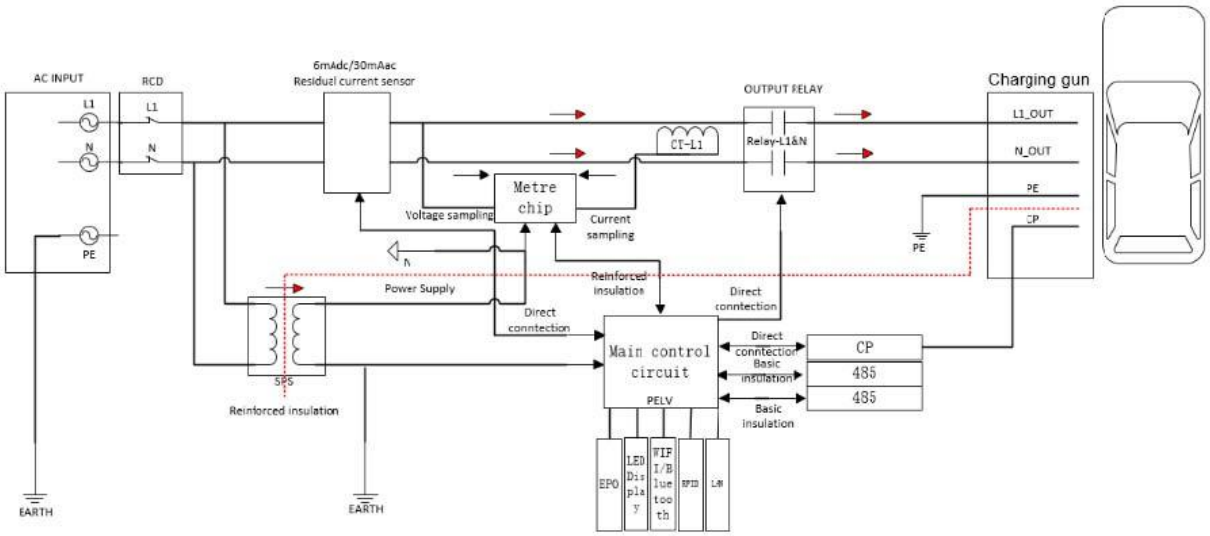
1. The AC Charger has a Class I protection rating. The Case C version has an IP65 degree of protection, while the Case B version has an IP54 degree of protection. Both versions are suitable for indoor and outdoor use.
2. According to the manufacturers declaration, Case C has the same model number as Case B, the versions with and without a screen also have the same model number. The units used for this test were all Case C versions with screens.
3. The AC Charger can charge different types of electric vehicles according to different voltage level. The circuit structure of 11kW charging system is the same as 22kW charging system.
4. For the aspect of Residual Current Protection, the suitable disconnect device should be installed before product's input terminal.
5.S/N on the labels identify the date of manufacture (for example, S/N: XXXXXXXXHCA268XXXXX means the AC charger will be manufactured in August 2026).

Model difference list:

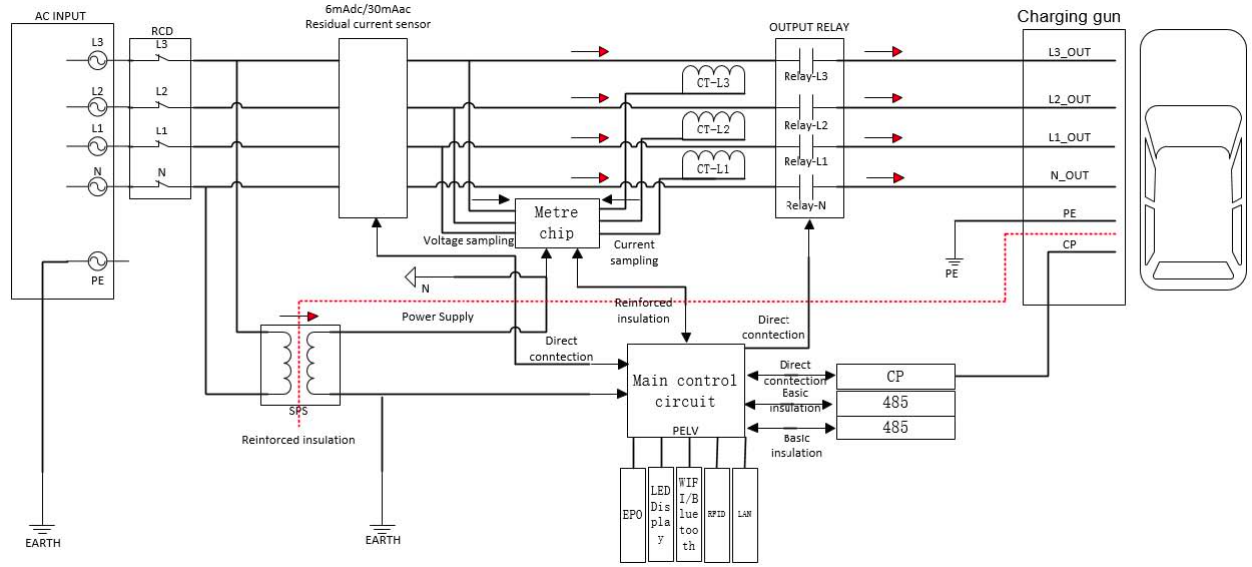
Models	Maximum Power(kW)	Voltage (Va.c.)	Current(A)	Wireless function	Mass(kg) Case C/B
GW7K-HCA	7	AC 230/1-Phase	32	WIFI+Bluetooth+RFID+4G	6.2/5.2
GW11K-HCA	11	AC 400/3-Phases	16	WIFI+Bluetooth+RFID+4G	6.3/5.3
GW22K-HCA	22	AC 400/3-Phases	32	WIFI+Bluetooth+RFID+4G	6.9/5.9

System diagram:

GW7K-HCA-G30:



GW22K-HCA-G30/ GW11K-HCA-G30:



SPECIFICATIONS		
Type designation		Refer to model difference list
Supply	Power System	☒ TN-S ☒ TN-C-S ☒ TN-C ☒ TT ☐ IT
	Number of phases	☒ Single phase ☒ Three phases
	Rated Voltage	Refer to model difference list
	Rated Current	Refer to model difference list
	Rated Frequency	50/60Hz
Output	Rated Voltage	Refer to model difference list
	Rated Current	Refer to model difference list
	Rated Frequency	50/60Hz
	Rated Power	Refer to model difference list
IP degree		IP65(Case C) IP54(Case B)
EV charging mode		Mode 3
Ambient temperature range (normal)		-30°C ~ +50°C declared by manufacturer
Classification		☒ Indoor ☒ Outdoor
Short-circuit protective device		Circuit Breaker: 40A for GW7K-HCA-G30/ GW22K-HCA-G30 20A for GW11K-HCA-G30
Overall dimensions		235mm*360mm*110mm(W*L*H)
Mass		Refer to model difference list
SPD		☐ Internal ☐ External ☒ No installation required
Charger class		☒ Class I charger ☐ Class II charger
EV class		☒ Class I EV ☐ Class II EV
RCD		☒ Type A+6mA
Usage		☒ Pole ☒ Wall mounting ☐ Movable
Altitude		<2000m
Input		☐ Cable ☒ Screw Terminal block
Input cable		--
	-Nominal cross-sectional areas (mm^2):	See user manual, installation
	-Length (m):	See user manual, installation
	-Type of terminals:	See user manual, installation
EV Cable:		IEC 62893-3
	-Nominal cross-sectional areas (mm^2):	7kw single phase: 3G6.0+1-1x0.5 11kw three phases: 5G2.5+1-1x0.5 22kw three phases: 5G6.0+1-1x0.5
	-Type of terminals:	Vehicle connector

-Length (m):	≤7.5
Vehicle connector:	EN 62196-1 / EN 62196-2
-Rating:	7kw single phase: AC 250V 32A 11kw three phases: AC 480V 20A 22kw three phases: AC 480V 32A
-IP degree:	IP 55

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
4	**GENERAL REQUIREMENTS**		P
	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.		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.	Not considered.	N/A
5	**CLASSIFICATION**		**P**
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:		P
	– 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:		P
	– Plug and cable connected;		N/A
	– Permanently connected.		P
5.1.2	**Characteristics of power supply output**		P
	The EV supply equipment shall be classified according to the type of current the EV supply equipment delivers:		P

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– 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:		P
	– indoor use;	Both indoor and outdoor use considered.	P
	– outdoor use.	IP65 Case C version IP54 Case B version	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:		P
	– equipment for locations with restricted access;		N/A
	– equipment for locations with non-restricted access.		P
5.5	**Mounting method**		—
	The EV supply equipment shall be classified according to the type of mounting:		P
	a) stationary equipment;		P
	– mounted on walls, poles or equivalent positions:		P
	•flush mounted;		N/A
	•surface mounted.		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**		—
	The equipment shall be classified according to the protection against electric shock:		P
	– class I equipment;		P

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– class II equipment;		N/A
	– 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:		N/A
	– 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
	The rated values for current and voltage shall not exceed:		N/A
	– 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		N/A

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	used in a shock resistant enclosure shall use protection equipment as required by IEC 62752.		
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:		P
	•Continuous continuity checking of the protective conductor according to 6.3.1.2;		P
	•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.		
	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,		P

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	shall be provided with control pilot function according to Annex A.		
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.		P
	•incapacity to verify the continuity of the protective conductor (e.g. short circuit between pilot wire and protective conductor), within 3 s.		P
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.	Without the ventilation	N/A

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
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.		P
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:		P
	•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
	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**		P
	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.	Approved connector used	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:		N/A
	•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

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	•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
	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**		N/A
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.		N/A
8	**PROTECTION AGAINST ELECTRIC SHOCK**		P

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Clause	Requirement + Test	Result - Remark	Verdict
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:		P
	•IP ratings for enclosures shall be at least IPXXC;		P
	•vehicle connector when mated with vehicle inlet: IPXXD;		P
	•plug mated with socket-outlet: IPXXD;		N/A
	•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
	•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);	>3mm	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;		N/A
	c) presence of shutters on live entry hole of the socket-outlets or connectors for case C.		N/A
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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	shall be less than 50 µC.		
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.	0V,0J	P
8.3	**Fault protection**		—
	Fault protection shall consist of one or more protective measures as permitted according to IEC 60364-4-41:		P
	•automatic disconnection of supply;		P
	•double or reinforced insulation;		P
	•electrical separation if limited to the supply of one item of current-using equipment;		P
	•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.		P
	Mode 4 EV supply equipment shall provide either:		N/A
	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.		P
8.5	**Residual current protective devices**		—
	EV supply equipment can have one or more connecting points to supply energy to EVs.	Type A+DC 6mA	P
	Where connecting points can be used		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		
	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.		N/A
	EV supply equipment that includes an RCD and that does not use the protective measure of electrical separation shall comply with the following:		P
	•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;		P
	•RCDs shall comply with one of the following standards: IEC 61008-1, IEC 61009-1, IEC 60947-2 and 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:		P
	•RCD type B or		N/A
	•RCD Type A and appropriate equipment that ensures the disconnection of the supply in case of DC fault current above 6 mA.	Evaluated according to IEC 62955 refer to report CN26N4CH 001.	P
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.		P
9	**CONDUCTIVE ELECTRICAL INTERFACE REQUIREMENTS**		P
9.1	**General**		—
	Clause 9 provides a description of the conductive electrical interface requirements.		P

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Clause	Requirement + Test	Result - Remark	Verdict
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.		N/A
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.		P
	The following contacts are indicated:		P
	•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.		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
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.		N/A
9.7	**Wiring of the neutral conductor**		—
	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**		N/A
	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**		P
11.1	**General**		—
	The cable assembly shall be provided with a cable that is suitable for the application.	Cable assembly provided.	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.		P

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Clause	Requirement + Test	Result - Remark	Verdict
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.		P
	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.		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.		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.		P
	For Class I equipment: between live part and earth with test voltage for Class I equipment;		P
	For Class II equipment: between live part and exposed conductive parts with test voltage for Class II equipment.		N/A
11.4	**Construction requirements**		—
	A cable assembly shall be so constructed that it cannot be used as a cord extension set.		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.		P
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
	For case C the strain relief at the EV supply equipment shall be in accordance with the requirements in IEC 62196-1.		P

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Clause	Requirement + Test	Result - Remark	Verdict
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.		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.	7.5m max, with cable management system	P
	Prevention of overheating of cables or cable assemblies used in stored or partially stored position shall be ensured.		P
12	**EV SUPPLY EQUIPMENT CONSTRUCTIONAL REQUIREMENTS AND TESTS**		P
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.	Not Mode 2 EV supply equipment.	N/A
	For case C EV supply equipment, the output cable assembly is considered part of the assembly for testing purpose.	Considered.	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.	Components, which were found to affect safety aspects, comply with the requirements of this standard or within the safety aspects of the relevant IEC/EN component standards. (see appended table 5)	P
	For extreme environment or other special service conditions, see IEC TS 61439-7.		N/A
12.2	**Characteristics of mechanical switching devices**		—
12.2.1	**General**		P
	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**	No such part.	N/A
	Switches and switch-disconnectors shall comply with IEC 60947-3.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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**	No such part.	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**		P
	Relays used to switch the main current path shall comply with IEC 61810-1 with the following minimum characteristics:		P
	•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:		P
	•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**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	(RDC MD)		
	This will be covered in the future IEC 62955 (under consideration).	Evaluated according to IEC 62955.	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.	Refer to table 12.3 in Attachment 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.		N/A
	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:		P
	•indoor use: at least IP41;	IP65 Case C version IP54 Case B version	P
	•outdoor use: at least IP44.	IP65 Case C version IP54 Case B version	P
	The minimum IP degree for socket-outlets and the vehicle connectors shall be in accordance with their appropriate standards.		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.		P
12.4.2	**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:		P
	•Indoor use:		P
	– vehicle connector when mated with vehicle inlet:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	IP21;		
	– EV plug mated with EV socket-outlet: IP21;		P
	– vehicle connector for case C when not mated: IP21;		P
	– vehicle connector for case B when not mated: IP24.		P
	•Outdoor use:		P
	– vehicle connector when mated with vehicle inlet: IP44;		P
	– EV plug mated with EV socket-outlet: IP44;		p
	– vehicle connector when not mated: IP24;		P
	– vehicle connector for case B when not mated: IP24;		P
	– socket-outlet when not mated: IP24.		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.		P
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:		P
	•for a class I EV supply equipment: R > 1 MΩ;	Refer to table 12.5 in Attachment 1	P
	•for a class II EV supply equipment: R > 7 MΩ.		N/A
	For this test all extra low voltage (ELV) circuits shall be connected to the accessible parts during the test.		P
	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.		N/A
	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		P

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Clause	Requirement + Test	Result - Remark	Verdict
	accordance with IEC 60990 and shall not exceed the values indicated in Table 1.		
	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.		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:		P
	Class I 3,5 mA	61μA	P
	Class II 0,25 mA		N/A
	Between any network poles and the metal inaccessible parts normally non-activated (in the case of double insulation):		N/A
	Class I N/A		N/A
	Class II 3,5 mA		N/A
	Between inaccessible and accessible parts connected with each other and a metal foil covering insulated external parts (additional insulation):		N/A
	Class I N/A		N/A
	Class II 0,5 mA		N/A
	This test shall be made when the EV supply equipment is functioning with a resistive load at rated output power.		P
	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:		P
	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	Refer to table 12.7.1 in Attachment 1	P

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Clause	Requirement + Test	Result - Remark	Verdict
	in 5.3.3.2 of IEC 60664-1:2007.		
	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.		N/A
	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.		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		P
12.7.2	**Impulse dielectric withstand (1,2 µs/50 µs)**		P
	The dielectric withstand of the power circuits at impulse test shall be tested according to IEC 60664-1.	Refer to table 12.7.2 in Attachment 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.		P
	EV supply equipment supplied through a cable and plug shall be tested according to an overvoltage category II.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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:		P
	– 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 12 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 %.	10 days	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.	-30 °C	P
	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.	Although the product is a charging pile of mode 3, it has been tested by IK09 for enclosure. After the test, it has no damage and passed the IP grade test. It conforms to IP65(Case C version) and IP54(Case B version).	N/A
	After the test, the samples shall show that:		N/A
	– 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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	requirements, if applicable;		
	– 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**		P
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
	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.		P
	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	Short-circuit current protection provided by circuit	P

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Clause	Requirement + Test	Result - Remark	Verdict
	protection for the cable assembly if not provided by the supply network.	breaker.	
	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.		P
	The real value of the prospective short-circuit current is evaluated at the point where the cable assembly is connected.		P
14	**AUTOMATIC RECLOSING OF PROTECTIVE DEVICES**		P
	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:		N/A
	•the socket-outlet shall not be mated to a plug. This shall be checked by the EV supply equipment.	No such part.	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
	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)**		P
	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.		P
	Such equipment shall be installed in accordance with national rules.		P
	Such equipment may be part of the supply network or either the EV charging station or the Mode 2 supply equipment.		P
16	**MARKING AND INSTRUCTIONS**		P
16.1	**Installation manual of EV charging stations**		—

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		N/A
	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
	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).		N/A
	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:		P
	•which adaptors or conversion adapters are allowed to be used, or		N/A
	•which adaptors or conversion adapters are not allowed to be used, or		N/A
	•that adaptors or conversion adapters are not allowed to be used, and		P
	•that cord extension sets are not allowed to be		P

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Clause	Requirement + Test	Result - Remark	Verdict
	used.		
	The user manual shall include information about national usage restrictions.		P
16.3	**Marking of EV supply equipment**		P
	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:		P
	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;		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:		P
	d) means of identifying date of manufacture;	Refer to label(SN)	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**		P
	Cable assemblies for Mode 1 Case B or Mode 3 Case B shall be marked in a durable manner with the following information:		P
	a) manufacturer's name or trade mark;		P
	b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the manufacturer;		P
	c) rated voltage;		P
	d) rated current;		P
	e) number of phases. f) degree of protection		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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**		P
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:		P
	•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.		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

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Clause	Requirement + Test	Result - Remark	Verdict
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.		N/A
	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.		N/A
	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).		N/A
A.2.3	**Simplified control pilot circuit** **(see IEC 61851-1:2017)**		P
	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.		P
	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.		P
	EVs using simplified control pilot circuit (Figure A.2) are not able to create state B.		P
	An EV using the simplified control pilot circuit can measure the duty cycle.		P
	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).		P
	It is not recommended to use the simplified control pilot circuit for new EV design.		P
A.2.4	**Additional components and high frequency signals**		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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	the control pilot signal.		
	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
	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.		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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:		P
	– remain in state F, or		P
	– 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:		P
	– remain in or change to state F, or		P
	– 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.		P
	A transition from state E or state F to any other state (x1 or x2) is allowed.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
	In case, no authentication is needed, the system may go to state x2.		P
	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.		P
	This means that no repeated authentication shall be needed.		P
	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.		P
	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.		P
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)	P
A.4.7.4	**Optional testing the EV supply equipment that support grid**	(see table 4.7.4)	P
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

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Clause	Requirement + Test	Result - Remark	Verdict
A.4.10	**Example of a test simulator of the vehicle (informative)**		P
A.4.11	**Optional hysteresis test**		N/A
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**		P
A.5.2	**Load control using transitions between state x1 and x2**		P
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**		N/A
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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Table B.2 and use the result to set the value of the maximum allowed current, if necessary, according to 6.3.1.6.		
	The resistor is also used for proximity detection.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

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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	12.0	R2: 1300 R3: 2740	1000 Hz	P
State B1, B2 / positive	8,37	9,59	9.0	R2: 1300 R3: 2740	1000 Hz	P
Negative B	-12,6	-11,4	-12.0	R2: 1300 R3: 2740	1000 Hz	P
State C1, C2 / positive	5,47	6,53	6.0	R2: 1300 R3: 2740	1000 Hz	P
Negative C	-12,6	-11,4	-12.0	R2: 1300 R3: 2740	1000 Hz	P
State D1, D2 / positive	-	-	-	-	-	N/A
Negative D	-12,6	-11,4	-	-	-	N/A
	Internal resistor value (1000 Ω +/-3%) [Ω] Calculated: R1_calc (= 2 740 × (U_StateA – U_StateB) / (U_StateB – 0,7)					
R1	990.36 Ω					P

Test with model GW22K-HCA-G30(Case C version)

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	12.0	R2: 1300 R3: 2740	1000 Hz	P
State B1, B2 / positive	8,37	9,59	9.0	R2: 1300 R3: 2740	1000 Hz	P
Negative B	-12,6	-11,4	-12.0	R2: 1300 R3: 2740	1000 Hz	P

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Clause	Requirement + Test			Result - Remark		Verdict
State C1, C2 / positive	5,47	6,53	6.0	R2: 1300 R3: 2740	1000 Hz	P
Negative C	-12,6	-11,4	-12.0	R2: 1300 R3: 2740	1000 Hz	P
State D1, D2 / positive	-	-	-	-	-	N/A
Negative D	-12,6	-11,4	-	-	-	N/A
	Internal resistor value (1000 Ω +/-3%) [Ω] Calculated: R1_calc (= 2 740 × (U_StateA – U_StateB) / (U_StateB – 0,7)					
R1	990.36 Ω					P

Test with model GW7K-HCA-G30(Case C Version)

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	-	-	-	-	-	-
State B / 10% Duty cycle	-	-	-	-	-	-
State B / Max declared / Default Duty cycle	9.0	R2: 1300 R3: 2740	511.8	50.92%	30.55	P

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Clause	Requirement + Test	Result - Remark	Verdict

Test with model GW22K-HCA-G30(Case C version)

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	-	-	-	-	-	-
State B / 10% Duty cycle	-	-	-	-	-	-
State B / Max declared / Default Duty cycle	9.0	R2: 1300 R3: 2740	533.1	53.33%	32.00	P

Test with model GW7K-HCA-G30(Case C Version)

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	9.0	10	9.94	13	10.58	50.94	P
State C1, C2 / positive	6.0	7	6.54	13	5.58	50.88	P
State D1, D2 / positive	-	-	-	-	-	-	-
[a] with nominal resistance values							

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Clause	Requirement + Test	Result - Remark	Verdict

Test with model GW22K-HCA-G30(Case C Version)

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	9.0	10	9.93	13	10.33	53.33	P
State C1, C2 / positive	6.0	7	6.98	13	10.87	53.36	P
State D1, D2 / positive	-	-	-	-	-	-	-
[a] with nominal resistance values							

Test with model GW7K-HCA-G30(Case C Version)

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	0.072	0.153	0.106	0.801	0.073	0.109	--	0.641	0.081	0.293	0.045	P
Test 2 / Max resistance + HF voltage	--	--	--	--	--	--	--	--	--	--	--	N/A
Test 3 / Min resistance	0.121	0.121	0.101	0.437	0.053	0.113	--	0.397	0.089	0.133	0.088	P
Test 4 / Min resistance +HF voltage	--	--	--	--	--	--	--	--	--	--	--	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

Test with model GW22K-HCA-G30(Case C Version)

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	0.241	0.169	0.102	0.682	0.005	0.113	--	0.701	0.009	0.209	0.185	P
Test 2 / Max resistance + HF voltage	--	--	--	--	--	--	--	--	--	--	--	N/A
Test 3 / Min resistance	0.512	0.216	2.856	0.660	0.010	0.102	--	0.358	0.006	0.309	0.173	P
Test 4 / Min resistance +HF voltage	--	--	--	--	--	--	--	--	--	--	--	N/A

Test with model GW7K-HCA-G30(Case C Version)

4.7.3	**TABLE: Sequence test using the simplified control pilot circuit**					**P**
Sequence	**1.2 [s]**	**3.2 [s]**	**5 [s]**	**6 [s]**	**2.2 [s]**	**Verdict**
Test 1 / Max resistance	0.192	0.017	0.095	/	0.191	P
Test 2 / Max resistance + HF voltage	--	--	--	--	--	N/A
Test 3 / Min resistance	0.104	0.013	0.100	/	0.126	P
Test 4 /	--	--	--	--	--	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

Min resistance +HF voltage						

Test with model GW22K-HCA-G30(Case C Version)

4.7.3	**TABLE: Sequence test using the simplified control pilot circuit**					**P**
Sequence	**1.2 [s]**	**3.2 [s]**	**5 [s]**	**6 [s]**	**2.2 [s]**	**Verdict**
Test 1 / Max resistance	0.072	0.028	0.048	/	0.016	P
Test 2 / Max resistance + HF voltage	--	--	--	--	--	N/A
Test 3 / Min resistance	0.069	0.003	0.041	/	0.019	P
Test 4 / Min resistance +HF voltage	--	--	--	--	--	N/A

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	--	--	--	--	--	--	--	--	--	--	--	--	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

Test with model GW7K-HCA-G30(Case C Version)

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	65	100	P

Test with model GW22K-HCA-G30(Case C Version)

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	16.9	100	P

Test with model GW7K-HCA-G30(Case C Version)

4.9	**TABLE: Test of short circuit values of the voltage**	P
	Shutdown time [s]	**Verdict**
State C + 120Ω resistance	0.107	P

Test with model GW22K-HCA-G30(Case C Version)

4.9	**TABLE: Test of short circuit values of the voltage**	P
	Shutdown time [s]	**Verdict**
State C + 120Ω resistance	0.013	P

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Clause	Requirement + Test	Result - Remark	Verdict

5	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Charging gun (for 22kW integrated gun cable)	Suzhou Yihang Electronic Science & Technology Co., Ltd.	WB-IC- AC2.1-32AT	Other line Vehlcle si de to Power side 7500mm±50mm - 30~50°C IP55 480 V/32A	EN 62196-1:2014 EN 62196-2:2017	TUV RH R 50393619
Charging gun (for 11kW integrated gun cable)	Suzhou Yihang Electronic Science & Technology Co., Ltd.	WB-IC- AC2.1-20AT	Other line Vehlcle si de to Power side 7500mm±50mm - 30~50°C IP55 480 V/20A	EN 62196-1:2014 EN 62196-2:2017	TUV RH R 50393619
Charging gun (for 7kW integrated gun cable)	Suzhou Yihang Electronic Science & Technology Co., Ltd.	WB-IC- AC2.1-32AS	Other line Vehlcle si de to Power side 7500mm±50mm - 30~50°C IP55 250V /32A	EN 62196-1:2014 EN 62196-2:2017	TUV RH R 50393619
Charging gun (for 22kW,11kW gun-line separation)	Suzhou Yihang Electronic Science & Technology Co., Ltd.	WB-IP3- AC2.1-32AT	Other line Vehlcle si de to Power side 7500mm±50mm - 30~50°C IP55 480 V/32A	EN 62196-1/2:2022 EN 61851-1:2019	TUV RH R 50393619
Charging gun (for 7kW gun-line separation)	Suzhou Yihang Electronic Science & Technology Co., Ltd.	WB-IP3- AC2.1-32AS	Other line Vehlcle si de to Power side 7500mm±50mm - 30~50°C IP55 250 V/32A	EN 62196-1/2:2022 EN 61851-1:2019	TUV RH R 50393619
Three-phase charging gun holder (for 22kW,11kW)	Suzhou Yihang Electronic Science & Technology Co., Ltd.	WB-IS- AC3.0-32AT	Other line inside the power supply 210mm/220mm*2/1 85mm/200mm/120 mm*2 - 30~50°C IP54 480 V/32A	EN 62196-1:2014 EN 62196-2:2017	TUV RH R 50393619

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict

Single-phase charging gun holder (for 7kW)	Suzhou Yihang Electronic Science & Technology Co., Ltd.	WB-IS- AC3.0-32AS	Other line inside the power supply 210mm/185mm/200 mm/120mm*2 - 30~50°C IP54 250 V/32A	EN 62196-1:2014 EN 62196-2:2017	TUV RH R 50393619
RCD detector (for 22kw,11kw)	Shanghai Liangxin Electrical Co., Ltd	NDB2LM-63 C40/4P	400/415VAC 40A 4P 60°C 30mA	EN 61009-1:2012/A12:2016 EN 61009-2-1:1994/A11:1998	TUV SUD B 083574 0333
RCD detector (for 7kW)	Shanghai Liangxin Electrical Co., Ltd	NDB2T-63 C40/2L	240VAC 40A 2P 70°C	EN 60947-2:2017 EN 60947-2:2017+A1	TUV RH R 50450631
AC input terminal (for 22kW, 11kW)	Shenzhen Connection Electronic Co,Ltd	PVAC-05CRBA40-03	380V/40A, UL94 V-0, 125°C,CNNT	EN 61984:2009	TUV SUD B 108338 0005
-Alternative	Suzhou Exceed conn Technology Co., Ltd	EN050-1136-00 EN050-2236- 10	500V/32A, UL94 V-0,120°C, Exceedconn	EN 61984:2009	TUV SUD B0770460056
AC input terminal (for 7kW)	Shenzhen Connection Electronic Co.,Ltd	PVAC-03CRBA40-03	380V/40A, UL94 V-0, 125°C,CNNT	EN 61984:2009	TUV SUD B 1083380005
-Alternative	Suzhou Exceed conn Technology Co., Ltd	EN050-1136-00 EN050-2236- 10	500V/32A, UL94 V-0,120°C, Exceedconn	EN 61984:2009	TUV SUD B0770460056
-Alternative	EXCEEDCON N PRECISION IND.CO.,LTD.	EN050-2236-00, EN050-2236-10,	500VAC/32A UL94- V0, 85°C	EN 61984:2009	TUV SUD B0770460056

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict

Internal AC wire	DONGGUAN WENCHANG ELECTRONIC PRODUCTS CO.,LTD	10269	UL94 V-0 6.0mm2, 85°C.	UL1581	UL E214500
-Alternative	EXCEEDCON N PRECISION IND.CO.,LTD.	EN050-2236-00, EN050-2236-10	500VAC/32A UL94- V0, 85°C.	IEC 61984: 2009	TUV SUD B 0770460056
-Alternative	Wuxi Xinhongye Wire&Cable Co., Ltd.	UL10269	1000V 105°C,10AWG	UL1581 UL758	UL E248566
Plastic enclosure (Upper Shell)	SABIC JAPAN L L C.	SABIC PC(945AU)	3.0mm ,V-0,130°C	UL 746C	UL E207780
Plastic enclosure (Middle plate)	SABIC JAPAN L L C	SABIC PC(XD2322)	3.0mm, V-0,125°C	UL 746C	UL E207780
Plastic enclosure (Lower Shell)	SABIC JAPAN L L C	SABIC PC(XD2322)	3.0mm, V-0,125°C	UL 746C	UL E207780
Plastic enclosure (Upper Shell)	Covestro	PC Makrolon_6557-550115	3.0mm V0 125°C	UL 94 UL 746	UL E41613
Plastic enclosure (Upper Shell)	Guangdong Xingshengdi Technology Co., Ltd.	PC XD933V NC0251	1.0mm V0 125°C	UL 94 UL 746B	UL E342846
Plastic enclosure (Lower Shell)	Guangdong Xingshengdi Technology Co., Ltd.	PC XD933H	1.0mm V0 125°C	UL 94 UL 746B	UL E342846
Plastic enclosure (Gun Rest Bracket)	Guangdong Xingshengdi Technology Co., Ltd.	PC XD933H	1.0mm V0 125°C	UL 94 UL 746B	UL E342846
Plastic enclosure (Gun Rest Bracket)	Covestro	PC Makrolon_6557-550115	3.0mm V0 125°C	UL 94 UL 746	UL E41613

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict

Plastic enclosure (cover plate)	Guangdong Xingshengdi Technology Co., Ltd.	PC XD933H	1.0mm, V0 125°C	UL 94 UL 746B	UL E342846
WIFI/BT Module chip (U100) (for OCPP Moduie)	Espressif Systems Technology CO.,LTD	ESP32-S3-WROOM-1-N16R2	COMM IC SMT41 SMD Lev el 3 2KV 85°C	EN 62368-1:2020+A11	CE R2111A1079-L1
4G Module chip (U301) (for OCPP Module)	Quectel	EG800Z-EU	75°C,3.3V	IEC 61851-1:2017	Tested with unit
LCD (for LCD DISPLAY)	Waltek Testing Group (Foshan) Co., Ltd.	ACM1602V-FLY-YBE- XBW	Character Display DIP16 80°C	IEC 61851-1:2017	Tested with unit
Gland	Celanese (Suzhou) Engineering Plastics Co Ltd	PG29	IP68 100°C	UL 94	UL E331274
-Alternative	SUC(Shanghai) New Material Technology Co Ltd	PG29	IP68 105°C	UL94	UL E484742
Gland	Jiangxi Huntec Electrical Technology Co., Ltd.	RSKP-N-PG29B-L- BL-PM-PA66	IP68 -40°C to105°C	UL94	UL E475610
plug	Jiangxi Huntec Electrical Technology Co., Ltd.	RDC-PG29-37*15-BL- PM-PA66	IP68 -40°C to105°C	UL94	UL E484742
Empty gun rack	Guang dong Great Materials Co.,Ltd	GM928 F08B	3.0mm V-0 125°C	UL 746C	UL E504623
-Alternative	HonseaTechnologyCo..Ltd	A26FMO	3.0mm V-0125°C	UL 746C	UL E345092

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict

Type2 outlet socket (Used for 22kW)	Suzhou Yihang Electronic Science and Technology Co., Ltd.	WB-IS- AC3.0-32AT	480VAC, 32A, IP55, 55°C	EN IEC62196-1:2022 EN IEC62196-2:2022 EN 17186:2019	TUV RH R 50393619
Type2 outlet socket (Used for 7kW)	Suzhou Yihang Electronic Science and Technology Co., Ltd.	WB-IS- AC3.0-32AS	250VAC, 32A, IP55, 55°C	EN IEC62196-1:2022 EN IEC62196-2:2022 EN 17186:2019	TUV RH R 50393619
RFID Module	Kunshan Quanbao Electronics Co., Ltd	QB-TTL663	≤50mA 3.3V 13.56MHz 85°C	IEC 61851-1:2017	Tested with unit
FUSE(FU200)	Xiamen SET Electronics Co.,Ltd.	SPT478T2A 300V	DIP FUSE SET 2.0A 300Vac	EN 60127-1:2006+A1+A2 EN 60127-3:2015+A1	TUV RH J 50583371
output connector (CN101) (for 22kW, 11kW)	SHENZHEN CONNECTION ELECTRONIC S CO.,LTD	ERTB10-05-12.70-R1	600V/57A UL94, V-0, 120°C	UL94	UL E304128
output connector (CN101) (for 7kW)	SHENZHEN CONNECTION ELECTRONIC S CO.,LTD	ERTB10-03-12.70-R1	600V/57A, UL94, V-0, 120°C	UL94	UL E304128
input connector (CN100) (for 22kW, 11kW)	SHENZHEN CONNECTION ELECTRONIC S CO.,LTD	ERTB10-05-12.70-R1	600V/57A UL94, V-0, 120°C	UL94	UL E304128

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict

Input connector (CN100) (for 7kW)	SHENZHEN CONNECTION ELECTRONIC S CO.,LTD	ERTB10-03-12.70-R1	600V/57A, UL94, V-0, 120°C	UL94	UL E304128
Varistor(TVR100,TVR101,TVR102,TVR103)	Xiamen SET Electronics Co.,Ltd	SFV25D821 KT	670V,125°C	EN 61051-1:2018 EN 61051-2:1991+A1 EN 61051-2-2:1991 EN 62368-1:2018	TUV RH J 50500874
Gas tube (GS100)	Xiamen SET Electronics Co.,Ltd	SE601H-L	600V,1350V,20kA,2 0A DIP	UL 497B	UL E513446
Gas tube (GS100)	SHENZHEN BENCENT ELECTRONIC S CO LTD	B8G600H	480-720,950V,20kA,10A DIP	UL 497B	UL E232249
Y2-cap (C102,C103,C111, C115,C117,C125, C 240,C265) (for 22kW,11kW)	Shantou High-NewTechnolog y Dev. Zone Songtian Enterprisse Co., Ltd.,	CD-Series	Y1-400VAC-Y5P-471K 125°C	EN 60384-14:2013+A1	VDE 40025754
Y2-cap (C111,C115,C117, C125) (for 7kW)	S Shantou High-NewTechnolog y Dev. Zone Songtian Enterprisse Co., Ltd.,	CD-Series	Y1-400VAC-Y5P-471K 125°C	EN 60384-14:2013+A1	VDE 40025754
Y2-cap (C100, C101) (for 22kW,11kW)	XIAMEN FARATRONIC CO.,LTD	MKP63	0.033uF,300VAC, 110°C	EN 60384-14:2013+A1	ENEC SE/0366-2D

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict

Y1-cap (C222)	Shantou High-NewTechnolog y Dev. Zone Songtian Enterprisse Co., Ltd.,	CY	10nF, 500Vac/1500Vdc , 125°C	EN 60384-14: 2013-04	VDE 40056133
X2-cap (C201,C206)	Nantong Jianghai Capacitor CO.,LTD	CBB311	0.22uF 350V 110 °C	EN 60384-14:2013	CB CN55169
X2-cap (C204)	XIAMEN FARATRONIC CO.,LTD.	C4B	1uF 350V 110°C	EN 60384-14:2013	ENEC SE/0366-6
NTC (NTC200)	SHANTOU FREE TRADE ZONE SONGTIAN ELECTRONIC TECHNOLOGY CO.,LTD.	8D-9X	8ohm, 2A, 175°C	EN 60539-1:2017-01	VDE 40050168
Inductor (L200)	GoodWe Technologies Co., Ltd.	141-11073-00	15mH 1500Vac Class B 130°C	IEC 61851-1:2017	Tested with unit
Inductor (L201)	GoodWe Technologies Co., Ltd.	141-11077-00	44mH 1000Vac Class B 130°C	IEC 61851-1:2017	Tested with unit
Transformer(T200)	GoodWe Technologies Co., Ltd.	140-00313-00	2.1mH±10% 3000Vac 130°C Class B	IEC 61851-1:2017	Tested with unit
Optocoupler (U100,U202,U308, U309)	SHENZHEN ORIENT COMPONENT S CO ., LTD	ORPC-817SA1-H-TA1-C-G- (GK)-(GDW)	Vce=80V Ic=50mA 125°C	IEC 60747-5-5:2020	VDE 40029733
Optocoupler (U100,U202,U308, U309)	Xiamen Hualian Semiconductor Technology Co., Ltd.	HPC817XX- XX	Vce=80V Ic=50mA 110°C	IEC 60747-5-5:2021-10 IEC 60747-5-5:2020	VDE 40004708

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict

Relay(RLY100, RLY103) (for 22kW,11kW)	Zettler Relay (Xiamen) Co., Ltd.	AZEV678 series	Relay 12VDC 480VAC/40A 3poles 85°C	EN 61810-1:2015+A1 IEC 61810-1:2015+A1	TUV SUD B 0887930020
Relay(RY100) (for 7kW)	Zettler Relay (Xiamen) Co., Ltd.	AZEV678 series	Relay 12VDC 480VAC/40A 3poles 85°C	EN 61810-1:2015+A1 IEC 61810-1:2015+A1	TUV SUD B 0887930020
Relay(RY101) (for 7kW)	Sanyou Relay Co.,Ltd.	SPV40-S-212DMF	Relay 12VDC 480VAC/40A 3poles 85°C	EN 61810-1:2015+A1	TUV RH R50710460
PCB (POWER BOARD) (for 22kW,11kW,7kW)	GUANGDE BAODA PRECISION PCB CO.,LTD.	BD-M	94V-0 CTI≥175V 130°C	UL796	UL E465142
-Alternative	interchange abl e	interchangea ble	94V-0 CTI≥175V 130°C	UL796	/
PCB (POWER BOARD) (for 7kW)	GUANGDE BAODA PRECISION PCB CO.,LTD	BD-M	94V-0 CTI≥175V 130°C	UL796	UL E465142
-Alternative	interchange abl e	interchangea ble	94V-0 CTI≥175V 130°C	UL796	/
PCB (OCPP Module)	GUANGDE BAODA PRECISION PCB CO.,LTD.	BD-M	94V-0 CTI≥175V 130°C	UL796	UL E234156
-Alternative	interchange abl e	interchangea ble	94V-0 CTI≥175V 130°C	UL796	/
PCB (LED DISPLAY)	GUANGDE BAODA PRECISION PCB CO.,LTD.	BD-M	94V-0 CTI≥175V 130°C	UL796	UL E234156
-Alternative	interchange abl e	interchangea ble	94V-0 CTI≥175V 130°C	UL796	/

IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict

PCB (LCD DISPLAY)	GUANGDE BAODA PRECISION PCB CO.,LTD.	BD-M	94V-0 CTI≥175V 130°C	UL796	UL E234156
-Alternative	interchange abl e	interchangea ble	94V-0 CTI≥175V 130°C	UL796	/
RCMU(Three phases)	MAGTRON	RCMU101S N-4P4E-4SK	85°C,5.5V	IEC 62955:2018	TUV RH AK 50514000
RCMU(Single phase)	MAGTRON	RCMU101S M3-6EI-K	85°C,5.5V	IEC 62955:2018	TUV RH AK 50514000
Supplementary information: 1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

--End of report--

IEC 61851-1 Additional test data			
Clause	Requirement + Test	Result - Remark	Verdict

12.3	TABLE: Clearance and creepage distances measurements				P
clearance cl and creepage distance dcr at/of:	**U r.m.s. (V)**	**Required cl (mm)**	**cl (mm)**	**required dcr (mm)**	**dcr (mm)**
Input L to N (BI)	300	3.0	3.2	3.0	3.2
Input L1 to L2 (BI)	300	3.0	3.2	3.0	3.2
Output L to N of main borad (BI)	300	3.0	3.2	3.0	3.2
Input L to N of main borad (BI)	300	3.0	3.2	3.0	3.2
Optocoupler to MCU (RI)	300	5.5	7.5	5.5	7.5
PCB trace at T200 (RI)	300	5.5	5.7	5.5	5.7
Supplementary information: BI=Basic insulation, RI=reinforced insulation					

12.5	TABLE: insulation resistance measurements		P
Insulation resistance R between:	**R (MΩ)**	**Required R (MΩ)**	
Input circuits to PE	>5000	>1	
Output circuits to PE	>5000	>1	
Input circuits to output circuits	>5000	>1	
Input circuits to enclosure	>5000	>7	
Output circuits to enclosure	>5000	>7	
Input circuits to CP/PP	20.96	>7	
Output circuits to CP/PP	>5000	>7	
Input circuits to screen	>5000	>7	
Output circuits to screen	>5000	>7	
Supplementary information: Test with model GW7K-HCA-G30(Case C version), The measurement of insulation resistance shall be carried out after applying the test voltage during 1 min. For Class I R>1 MΩ; for Class II R>7MΩ			

12.5	TABLE: insulation resistance measurements		P
Insulation resistance R between:	**R (MΩ)**	**Required R (MΩ)**	
Input circuits to PE	>5000	>1	
Output circuits to PE	>5000	>1	
Input circuits to output circuits	>5000	>1	
Input circuits to enclosure	>5000	>7	
Output circuits to enclosure	>5000	>7	
Input circuits to CP/PP	20.89	>7	
Output circuits to CP/PP	>5000	>7	

IEC 61851-1 Additional test data			
Clause	Requirement + Test	Result - Remark	Verdict

Input circuits to screen	>5000	>7
Output circuits to screen	>5000	>7
Supplementary information: Test with model GW22K-HCA-G30(Case C version), The measurement of insulation resistance shall be carried out after applying the test voltage during 1 min. For Class I R>1 MΩ; for Class II R>7MΩ		

12.7.1	**TABLE: Dielectric strength**	**P**

Test voltage applied between:	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
Input circuits to PE	DC2121	No
Output circuits to PE	DC2121	No
Input circuits to enclosure	DC4242	No
Output circuits to enclosure	DC4242	No
Input circuits to output circuits	DC2121	No
Input circuits to CP/PP	DC4242	No
Output circuits to CP/PP	DC4242	No
Input circuits to screen	DC4242	No
Output circuits to screen	DC4242	No
Supplementary information:		

12.7.2	**TABLE: Impulse dielectric withstand tests (1.2/50μs)**	**P**

Test voltage applied between:	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
Input circuits to PE	4000	No
Output circuits to PE	4000	No
Input circuits to enclosure	6000	No
Output circuits to enclosure	6000	No
Input circuits to output circuits	4000	No
Input circuits to CP/PP	6000	No
Output circuits to CP/PP	6000	No
Input circuits to screen	6000	No
Output circuits to screen	6000	No
Supplementary information:		

IEC 61851-1 Additional test data			
Clause	Requirement + Test	Result - Remark	Verdict

12.8	**Maximum temperatures**		P
	Test voltage (V) ..... :	230Vac	—
	Test current (A) ..... :	32Aac	—
	Ambient (°C) ..... :	50 °C	—

Thermocouple Locations	**Max. temperature measured, (°C)**	**Max. temperature limit, (°C)**
L1 terminal-Input	59.7	125
CT	66.1	105
RCMU	62.9	85
Relay (RY100)	77.9	85
Varistor-TVR100	58.4	105
X- capacitor (C100)	56.5	105
Y- capacitor (C125)	68.4	105
L1 terminal-Output	61.5	125
Transformer	60.8	105
MCU-Main	66.5	105
Enclosure	49.3	125
RFID Area	49.6	60
Charging cable	51.8	60
Charging Connector	55.4	60
Environment temperature I	48.3	/
Environment temperature II	48.8	/

Supplementary information: Test with model GW7K-HCA-G30(Case C Version) full load

12.8	**Maximum temperatures**		P
	Test voltage (V) ..... :	400Vac	—
	Test current (A) ..... :	32Aac	—
	Ambient (°C) ..... :	50 °C	—

Thermocouple Locations	**Max. temperature measured, (°C)**	**Max. temperature limit, (°C)**
L1 terminal-Input	64.1	125
CT	78.5	105
RCMU	68.7	85
Relay (RY103)	72.5	85
Relay (RY100)	79.5	85

IEC 61851-1 Additional test data			
Clause	Requirement + Test	Result - Remark	Verdict

Varistor-TVR100	70.1	105
X- capacitor (C100)	80.0	105
Y- capacitor (C125)	74.9	105
L1 terminal-Output	82.4	125
Transformer	68.2	105
MCU-Main	68.4	105
Enclosure	52.0	125
RFID Area	49.9	60
Charging cable	53.33	60
Charging Connector	58.1	60
Environment temperature I	48.4	/
Environment temperature II	49.1	/
Supplementary information: Test with model GW22K-HCA-G30(Case C Version) full load		

#End of attachment#

Photo Documentation

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30



Figure 1 Overview (Case B Version with Screen)



Figure 2 Overview (Case C Version With Screen)

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30



Figure 3 Overview (Case B Version)

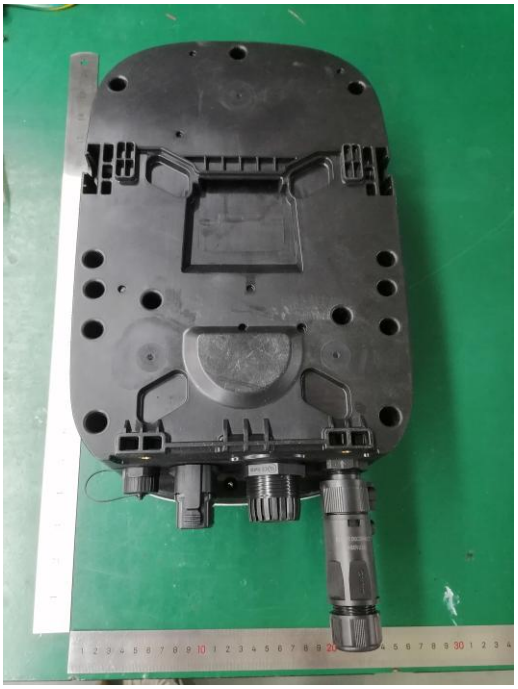


Figure 4 Rear view (Case B Version)

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30



Figure 5 Side view (Case B Version)



Figure 6 Side view (Case B Version)

Photo Documentation

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30

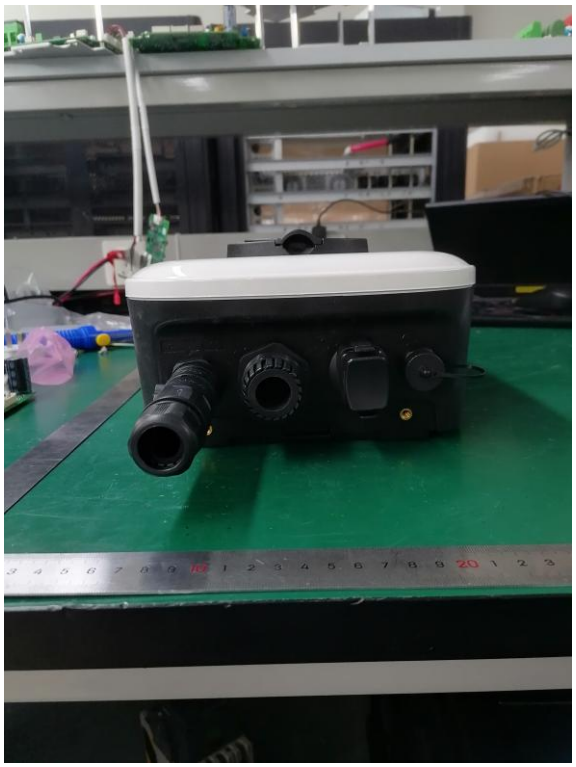


Figure 7 Side view(Case B Version)



Figure 8 Overview (Case C Version)

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30



Figure 9 Rear view (Case C Version)



Figure 10 Vehicle connector

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30



Figure 11 Vehicle connector

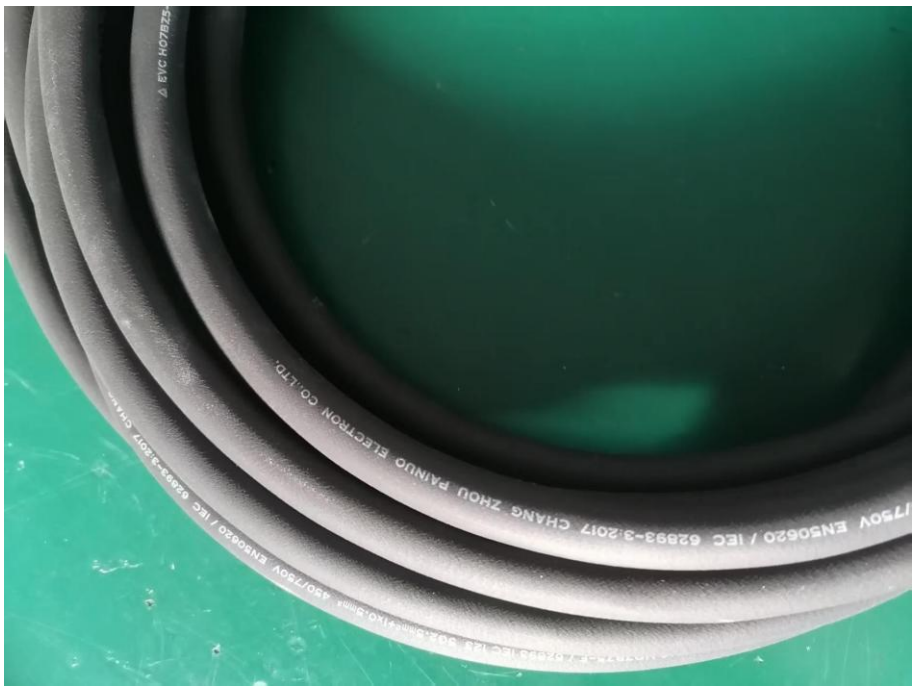


Figure 12 EV Cables

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30



Figure 13 Interview (Three -Phase models Case C)



Figure 14 Interview (Three -Phases models Case C)

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30



Figure 15 Interview (Three -Phases models Case B)

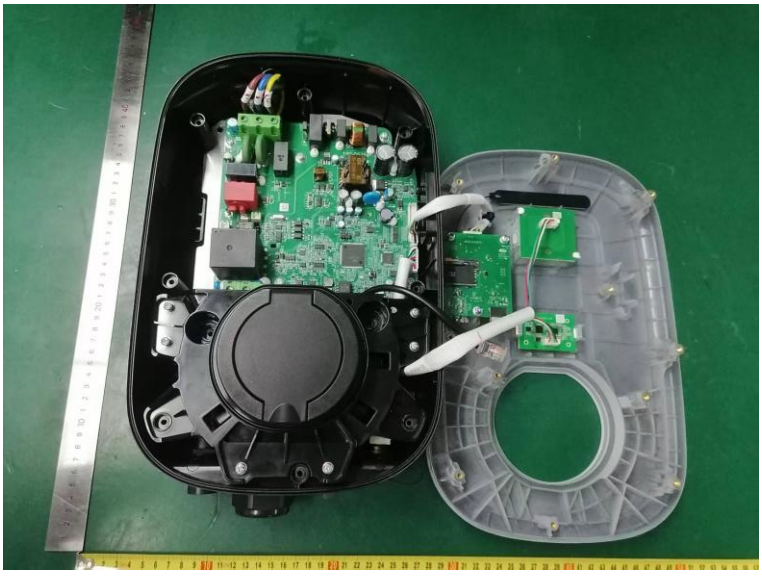


Figure 16 Interview (Single -Phase models Case B)

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30



Figure 17 Component side of main board (single -Phase models)

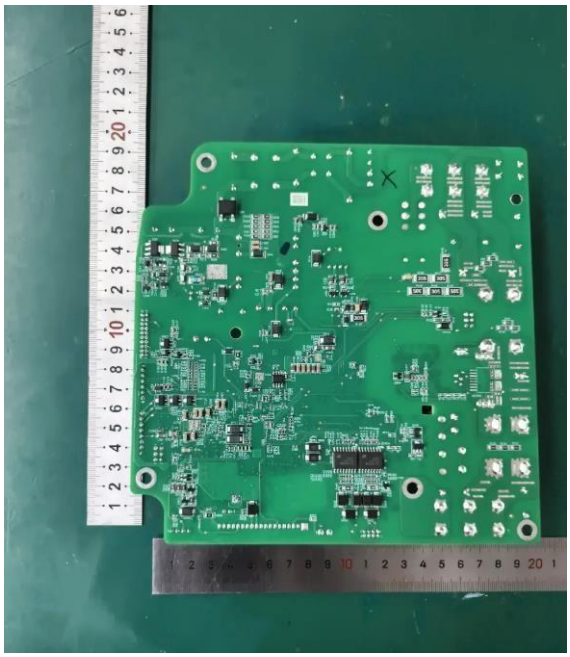


Figure 18 Rear side of main board (single -Phase models)

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30

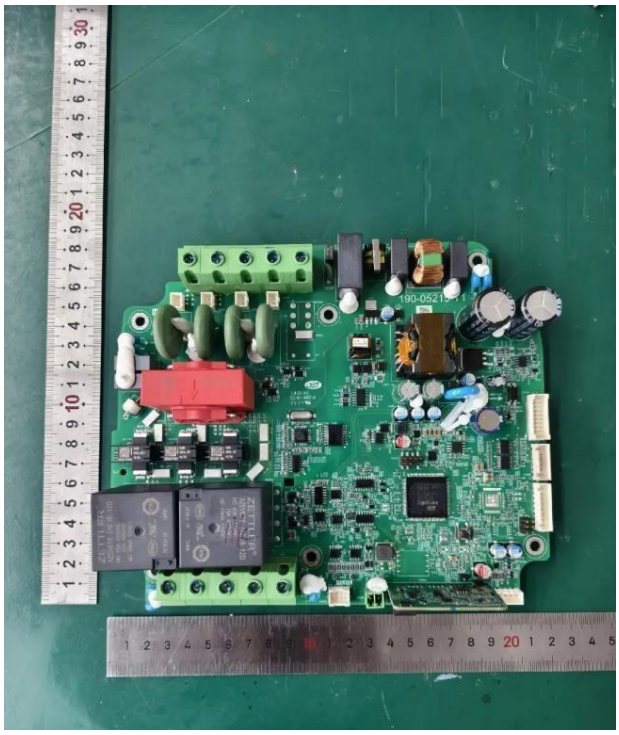


Figure 19 Component side of main board (Three -Phases models)

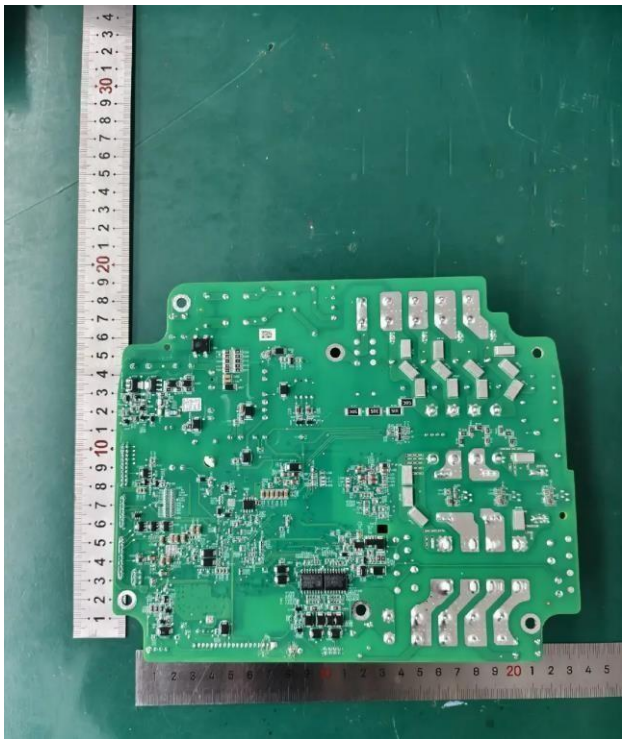


Figure 20 Rear side of main board (Three -Phases models)

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30

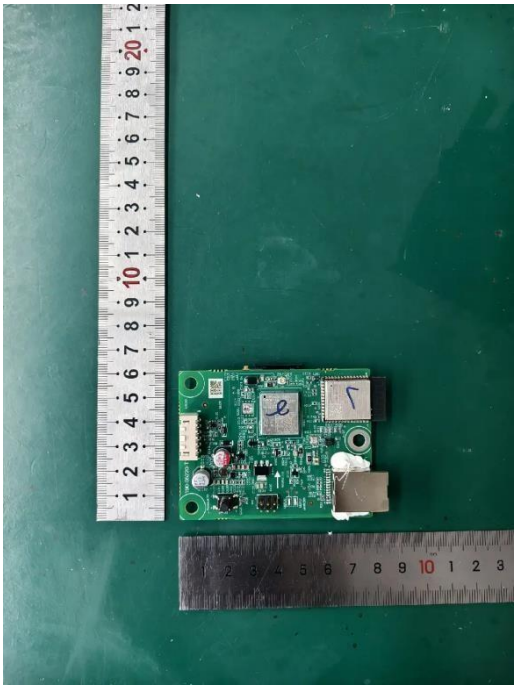


Figure 21 Component side of communication board

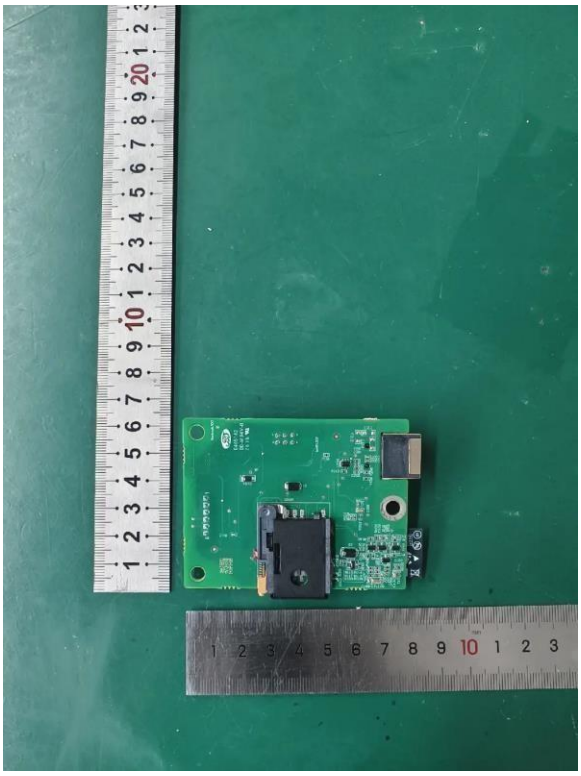


Figure 22 Rear side of communication board

Photo Documentation

Product: AC Charger

Type Designation: GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30

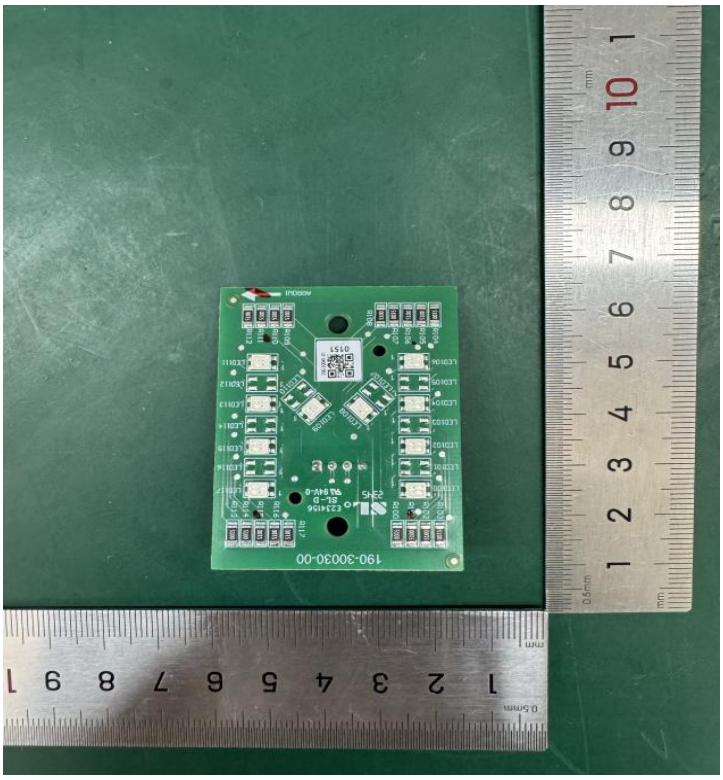


Figure 23 Component side of LED board

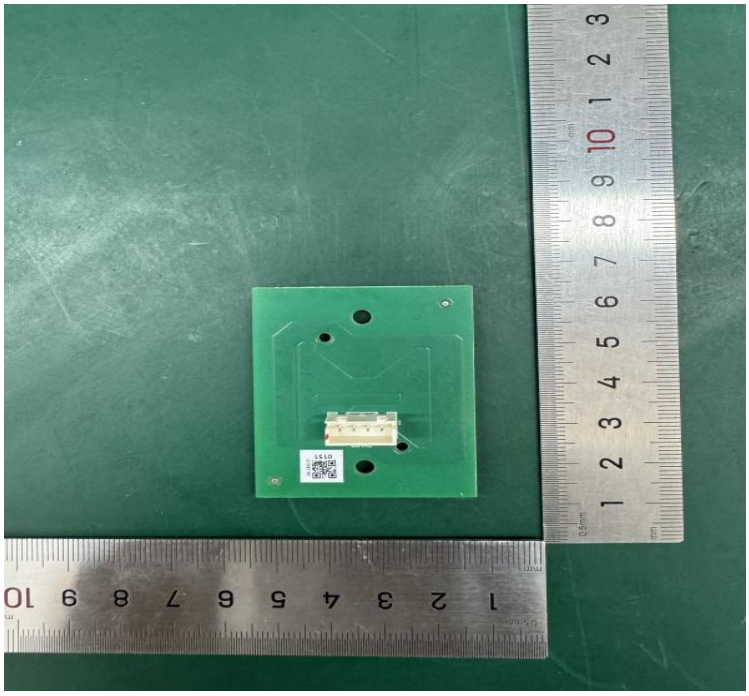


Figure 24 Rear side of LED board

--End of attachment--

Prüfbericht-Nr.: *Test report no.:*	**CN26N4CH 001**	**Auftrags-Nr.:** *Order no.:*	**326198797**	Seite 1 von 60 *Page 1 of 60*
Kunden-Referenz-Nr.: *Client reference no.:*	**2028101**	**Auftragsdatum:** *Order date:*	2026-07-23	
Auftraggeber: *Client:*	**Ginlong technologies Co., Ltd.** No.90 Zijin Rd., New District, Suzhou, 215011, P.R. China			
Prüfgegenstand: *Test item:*	**RDC-MD**			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	**GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30**			
Auftrags-Inhalt: *Order content:*	**Acceptance test according to IEC 62955: 2018**			
Prüfgrundlage: *Test specification:*	**IEC 62955: 2018 - Partial testing items**			
Wareneingangsdatum: *Date of sample receipt:*	**2026-07-28**			
Prüfmuster-Nr.: *Test sample no:*	**326198797#1 to #18**			
Prüfzeitraum: *Testing period:*	**2026.07.28-2026.09.02**			
Ort der Prüfung: *Place of testing:*	**Zhejiang Testing and Inspection Institute for Mechanical and Electrical Products Quality**			
Prüflaboratorium: *Testing laboratory:*	**TÜV Rheinland (Shanghai) Co., Ltd.**			
Prüfergebnis*: *Test result*:*	Pass			



geprüft von: tested by:	Ye Ding	**genehmigt von:** *authorized by:*	Wencai Zhang
Datum: *Date:* 2026-10-12		**Ausstelldatum:** *Issue date:* 2026-10-12	
Stellung / Position:	Project Engineer	**Stellung** / Position:	Authorizer

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:*	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	P(ass) =	F(ail) = entspricht	N/A = nicht anwendbar	N/T = nicht getestet	* Legende:
** Legend:*	*P(ass) = passed a.m. test specification(s)*		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

Prüfbericht-Nr.: CN26N4CH 001
Test report no.:

Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.* *Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the “Zero Guard Band Rule” and “Simple Acceptance” in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.*

Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC 62955
Residual direct current detecting device (RDC-DD) to be used for mode 3 charging of electric vehicles (RDC-MD)

Report Number. ..... :	**CN26N4CH 001**
Date of issue ..... :	**See cover page**
Total number of pages ..... :	**See cover page**
Name of Testing Laboratory preparing the Report ..... :	**TÜV Rheinland (Shanghai) Co., Ltd.**
Applicant's name ..... :	**GoodWe Technologies Co., Ltd.**
Address ..... :	No.90 Zijin Rd., New District, Suzhou, 215011, P.R. China
Test specification:	
Standard ..... :	IEC 62955:2018
Test procedure ..... :	Acceptance test
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC62955A
Test Report Form(s) Originator .... :	TÜV Rheinland InterCert Kft., MEEI Division
Master TRF ..... :	Dated 2018-11

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General disclaimer:

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Test item description ..... :	**RDC-MD**
Trade Mark ..... :	GOODWE
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	**GW7K-HCA-G30, GW11K-HCA-G30, GW22K-HCA-G30**
Ratings ..... :	**Un=400VAC(3P+N), In=32A, IΔdc=6mA, Ui=500V, Uimp=4kV, Im=500A, Inc=IΔc=1,5kA**

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☒	**~~CB~~ Testing Laboratory:**	**Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality Co.,Ltd. (ZTME)**	
Testing location/ address.....:		**No 125 Miaohouwang Road Binjiang District Hangzhou Zhejiang CHINA**	
Tested by (name, function, signature).....:		See cover page	
Approved by (name, function, signature)...:		See cover page	
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address.....:			
Tested by (name, function, signature).....:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address.....:			
Tested by (name + signature) .....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address.....:			
Tested by (name, function, signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature)...:			
Supervised by (name, function, signature) :			

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

N/A

Summary of testing:

This report is created for acceptance tests, the functional of RDC-MD in EV charge station performed the acceptance test as partial test items of IEC 62955: 2018.

So model GW22K-HCA-G30 was selected as samples to perform the partial test items to cover the other type.

All test items passed.

Tests performed (name of test and test clause):

Test sequence B	page 8
Test sequence C	page 15
Test sequence D	page 17
Test sequence E	page 27
Test sequence F	page 30
Test sequence G	page 32

Testing location:

Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality Co.,Ltd. (ZTME)

Summary of compliance with National Differences (List of countries addressed):

N/A

☐ **The product fulfils the requirements of _____ (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)**

Copy of marking plate:

See the final appliance report CN26FHWJ 001

Test item particulars .....:	
Classification of RDC-DD .....:	RDC-MD
- RDC-MD with mechanical switching in one unit.....:	☐ Yes / ☒ No
- RDC-MD consisting of RDC-M-unit mechanically coupled to a separate protective device .....:	☐ Yes / ☒ No
a) RCBO .....:	☐ Type A (IEC 61009) / ☐ Type F (IEC 62423)
b) RCCB .....:	☐ Type A (IEC 61008) / ☐ Type F (IEC 62423)
c) Circuit breaker .....:	☐ IEC 60898-1
- RDC-MD consisting of RDC-M-module electrically coupled to a separate protective or switching device..:	☒ Yes / ☐ No
a) RCBO .....:	☐ Type A (IEC 61009) / ☐ Type F (IEC 62423)
b) RCCB .....:	☐ Type A (IEC 61008) / ☐ Type F (IEC 62423)
c) Circuit breaker .....:	☐ IEC 60898-1
d) remotely operated switch.....:	☐ contactor / ☒ relay
enclosed.....:	☒ Yes / ☐ No
unenclosed.....:	☐ Yes / ☐ No
IP number.....:	IP depends on final appliance
Number of poles.....:	☒ 2 / ☐ 3 / ☒ 4
Ambient air temperature (°C) .....:	☐ −5 °C to 40 °C / ☒ −25 °C to 40 °C / ☐ ___
Method of mounting .....:	☐ surface-type ☐ flush-type ☒ panel board type ☐ on rail
Method of connection .....:	☒ not associated with the mechanical mounting / ☐ associated with the mechanical mounting
Type of terminal .....:	☒ screw-type (for copper) ☐ screwless type (for copper) ☐ flat quick-connect (for copper) ☐ screw-type (for aluminium)
Rated voltage U_n (V) .....:	400V
Rated operational voltage U_e (V) .....:	400V
Rated insulation voltage U_i (V).....:	500
Rated impulse withstand voltage U_{imp} (V) .....:	4,0kV
Rated current I_n (A).....:	☒ 16A ☐ 20A ☒ 32A ☐63A ☐80A ☐___
Rated DC residual operating current $I_{\Delta dc}$ (A) .....:	0,006A
Rated DC residual on- operating current $I_{\Delta ndc}$ (A).....:	0,003A
Nature of supply.....:	☒ AC ☐ DC
Nature of supply of control circuit .....:	☒ AC ☐ DC
Rated frequency (Hz).....:	☐ 50Hz ☐ 60Hz ☒ 50/60Hz
Rated making and breaking capacity I_m (A).....:	☒ 500A ☐ 10 I_n:____ ☐
Rated conditional short-circuit current I_{nc} (A).....:	☐ 3kA ☐ 4,5kA ☐ 6kA ☐10kA ☐20kA ☒1,5kA Declared by client

Rated conditional residual short-circuit current $I_{\Delta c}$(A)..:	☐ 3kA ☐ 4,5kA ☐ 6kA ☐10kA ☐20kA ☒1,5kA Declared by client
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)
Testing.....:	
Date of receipt of test item .....:	2026.07.28
Date (s) of performance of tests.....:	2026.07.28-2026.09.02
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.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided .....:	☒ **Yes** ☐ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies).....:	**GoodWe (GuangDe) Power Supply Technology Co., Ltd.** No. 208, Tong Rui East Road, Guangde, Anhui, P.R. China
General product information and other remarks: Refer to report **CN26FHWJ 001**	

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	TEST SEQUENCE B (3 SAMPLES)		—
8	**REQUIREMENTS FOR CONSTRUCTION AND OPERATION**		—
8.3	**Dielectric properties**		—
	RDC-DDs have adequate dielectric properties		P
9.7	**Test of dielectric properties**		—
9.7.7.3	Verification of resistance of the insulation of open contact and basic insulation against an impulse voltage in normal conditions		—
	These tests are not preceded by the humidity treatment described in 9.7.1.		P
	The test is carried out on an RDC-DD fixed on a metal support		P
	The impulses are given by a generator producing positive and negative impulses having a front time of 1,2μs, and a time to half-value of 50μs		P
	The shape of the impulses is adjusted with the RDC-DD under test connected to the impulse generator.		P
	For RDC-DDs with incorporated surge arresters that cannot be disconnected, the shape of the impulses is adjusted without connection of the RDC-DD to the impulse generator.		P
	rated impulse withstand voltage [kV]:	4,0kV	—
	see level of test laboratory [m]	20m	—
	test voltage (acc. Table 22) [kV]:	4,9kV	—
9.7.7.3.2	RDC-DD in opened position (contacts in opened position)		P
	The impulses are applied between:		P
	the line terminals connected together and the load terminals connected together		P
9.7.7.3.3	RDC-DD in closed position		P
	All components bridging the basic insulation disconnected		P
	A first series of tests is made applying the impulse voltage between the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminal(s) intended for the protective conductor(s), if any		P

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	A second series of tests is made applying the impulse voltage between the phase pole(s), connected together, and the neutral pole (or path) of the RDC-DD		P
	Five positive impulses and five negative impulses are applied, the interval between consecutive impulses being at least 1 s for impulses of the same polarity and being at least 10 s for impulses of the opposite polarity.		P
	no disruptive discharges during the test		P
9.7.7.4	Verification of the behaviour of components bridging the basic insulation		—
	A new RDC-DD sample is tested		P
	Test only performed on RDC-DDs, where components bridging the basic insulation have been disconnected during the impulse voltage test of 9.7.7.3.3		P
	test voltage 1200V+U_0	1600V	P
	The voltage is applied during 5s between the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminal(s) intended for the prospective conductor(s), if any		P
	after test, no component bridging the basic insulation should show a visible alteration.		P
	Then, the equipment is connected to the mains acc. manufacturer's instruction		P
	The RDC-DD shall trip with a test current of 1,25 $I_{\Delta dc}$	[ms]	—
		B1 – 684ms B2 – 683ms B3 – 686ms	P
	Test switch S_2 and RDC-DD in the closed position, test voltage established by closing the test switch S_1.		P
9.7.1	**Resistance to humidity**		**P**
9.7.1.1	Parts which can be removed without a tool are removed, spring lids kept open, inlet openings are left open and if knock-outs one is opened.		P
9.7.1.2 9.7.1.3	Test conditions: 48 h in humidity cabinet RH = 91% to 95% T = 20 to 30°C ± 1°C	48h 92-94% 23,1-23,9°C	—
9.7.1.4	The samples show no damage		P

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
9.7.2	Insulation resistance of the main circuit measured between 30 and 60 min after this treatment with 500 V DC after 5 s:		—
	a) between the terminals which are electrically connected together when the RDC-DD is in the closed position ..... ≥ 2 MΩ	B1 - B2 - B3 -	N/A
	b) between each pole and the others connected together (electronic components, connected between current path being disconnected)..... ≥ 2 MΩ	B1 - B2 - B3 -	N/A
	c) between all poles connected together and the frame ..... ≥ 5 MΩ	B1 - B2 - B3 -	N/A
	d) between metal parts of the mechanism and the frame ..... ≥ 5 MΩ	B1 - B2 - B3 -	N/A
	e) between the frame and a metal foil in contact with the inner surface of the lining of insulating material ..... ≥ 5 MΩ	B1 - B2 - B3 -	N/A
9.7.3	Dielectric strength of the main circuit measured with an AC voltage (45-65Hz) for 1 min:		—
	a) electronic components disconnected ..... 2000 V	B1 - B2 - B3 -	N/A
	b) electronic components disconnected ..... 2000 V	B1 - B2 - B3 -	N/A
	c) electronic components disconnected ..... 2000 V	B1 - B2 - B3 -	N/A
	d) electronic components disconnected ..... 2000 V	B1 - B2 - B3 -	N/A
	e) electronic components disconnected ..... 2500 V	B1 - B2 - B3 -	N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	No flashover or breakdown		P
9.7.4	Insulation resistance of auxiliary circuits measured with 500 V DC after 1 min:		—
	1) between all auxiliary circuits and the frame ..... ≥ 2 MΩ	B1 - ≥550MΩ B2 - ≥550MΩ B3 - ≥550MΩ	P
	2) between each part of the auxiliary circuits which might be isolated from the other parts and the whole of the other parts connected together ..... ≥ 2 MΩ	B1 - ≥550MΩ B2 - ≥550MΩ B3 - ≥550MΩ	P
	Dielectric strength of auxiliary circuits measured with an AC voltage at rated frequency for 1 min:		—
	Rated voltage of auxiliary circuits (a.c. or d.c.) — Test voltage (V) ≤ 30 — 600 > 30 ≤ 50 — 1000 > 50 ≤ 110 — 1500 **> 110 ≤ 250 — 2000** > 250 ≤ 500 — 2500	2000V	—
	1) between all auxiliary circuits and the frame	B1 – 2000V B2 – 2000V B3 – 2000V	P
	2) between each part of the auxiliary circuits which might be isolated from the other parts and the whole of the other parts connected together	B1 – 2000V B2 – 2000V B3 – 2000V	P
	No flashover or perforation		P
9.7.7.2	**Verification of clearances with the impulse withstand voltage**		—
	If the measurement of clearances of items 2 and 4 in Table 6 shows a reduction of the required length, this test applies.		—
	The test is carried out on an RDC-DD fixed on a metal support and being in the closed position		N/A
	The impulses are given by a generator producing positive and negative impulses having a front time of 1,2μs, and a time to half-value of 50μs		N/A
	The shape of the impulses is adjusted with the RDC-DD under test connected to the impulse generator.		N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	For RDC-DDs with incorporated surge arresters that cannot be disconnected, the shape of the impulses is adjusted without connection of the RDC-DD to the impulse generator.		N/A
	test performed with:		—
	- surge impedance of the test apparatus ≤500Ω and surge protective devices disconnected Before testing or		N/A
	- hybrid generator with an surge impedance of 2 Ω and surge protective devices not disconnected before testing		N/A
	rated impulse withstand voltage [kV]:		—
	see level of test laboratory [m]		—
	test voltage (acc. Table 14) [kV]:		—
	A first series of tests is made applying the impulse voltage between the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminal(s) intended for the protective conductor(s), if any		N/A
	A second series of tests is made applying the impulse voltage between the phase pole(s), connected together, and the neutral pole (or path) of the RDC-DD		N/A
	A third series of tests is made applying the impulse voltage between (and not tested during the two first sequences described here above):		N/A
	b) between each pole and the others connected together (electronic components, connected between current path being disconnected)	B1 - B2 - B3 -	N/A
	c) between all poles connected together and the frame	B1 - B2 - B3 -	N/A
	d) between metal parts of the mechanism and the frame	B1 - B2 - B3 -	N/A
	e) between the frame and a metal foil in contact with the inner surface of the lining of insulating material	B1 - B2 - B3 -	N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	Five positive impulses and five negative impulses are applied, the interval between consecutive impulses being at least 1 s for impulses of the same polarity and being at least 10 s for impulses of the opposite polarity.		N/A
	no disruptive discharges during the test		N/A
9.7.5	**Secondary circuit of detection transformers**		—
	No insulation test, provided that no connection with accessible metal parts or with protective conductor or live parts exists.		P
9.7.6	**Capability of control circuits connected to the main circuit of withstanding high DC voltages due to insulation measurements**		—
	RDC-DD fixed on metal support in closed position with all control circuits connected as in service.		P
	Open test voltage 600 V_0^{+25} V Maximum ripple 5% Short-circuit current 12 mA_0^{+2}mA Applied for 1 min between each pole and the other poles connected together to the frame.	B1 – 612V B2 – 612V B3 – 612V	P
Table 2	Standard values of maximum break time at a residual direct current equal to s		—
	6 mA / 60 mA / 200 mA		—
	10,0 / 0,3 / 0,1		—
9.9.2.3	Verification of correct operation in case of sudden appearance of smooth DC residual current:		P
	Maximum break times (ms) at:		—
	- 6mA dc ($I_{\Delta dc}$)	B1 – 685ms B2 – 684ms B3 – 681ms	P
	- 60mA dc (10 $I_{\Delta dc}$)	B1 – 128ms B2 – 126ms B3 – 127ms	P
	- 200mA dc	B1 – 76ms B2 – 78ms B3 – 79ms	P
	No value exceeds the relevant specified limiting value		P

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Clause	Requirement + Test	Result - Remark	Verdict
8.4	**Temperature rise**		—
	Temperature rises do not exceed the limiting values stated in table 8.		P
	Cross-section (mm²)	6mm² (for external conductor)	—
9.8	**Test of temperature-rise**		—
9.8.1	Ambient air temperature (°C)	21,3°C	—
9.8.2	Test current I_n (A) until steady state values are reached.	32A	—
	Four pole RDC-DDs:		N/A
	Current passing through		N/A
	- 3 phase poles (1)		N/A
	- neutral and adjacent pole (2)		N/A
	Parts .....Temperature rise K		—
	Terminals for external connections 65K	B1 – 40,1 B2 – 41,2 B3 – 40,3	P
	External parts liable to be touched during manual operation of the RDC-DD, including operating means of insulating material and metallic means for coupling insulated operating means of several poles 40K	B1 – B2 – B3 –	N/A
	External metallic parts of operating means 25K	B1 - B2 - B3 -	N/A
	Other external parts, including that face of the RDC-DD in direct contact with the mounting surface.....60K	B1 – 15,8K B2 – 16,9K B3 – 17,1K	P
8.13	**Reliability**		—
	RDC-DDs operate reliably even after long service.		P
9.19.3	**Test with 28 cycles at 40 ± 2°C**		—
	Cross-section (mm²).....:	6mm² (for external conductor)	—
	Torque $^2/_3$ (Nm).....:	Nm	—
	Test current I_n (A) .....:	32A	—
	- with current passing .....21 h	21h	P
	- without current .....3 h	3h	P

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Clause	Requirement + Test	Result - Remark	Verdict
	For 4 pole RDC-DDs with 3 overcurrent protected poles only 3 poles loaded		N/A
	At the end of the last period of 21 h with current passing the temperature rise of the terminals shall not exceed 65K	B1 – 47,0K B2 – 48,2K B3 – 49,2K	P
	After cool down the RDC-DD shall trip with a test current of 1,25 $I_{\Delta dc}$	B1 – 652ms B2 – 657ms B3 – 652ms	P
	Test switch S_2 and RDC-DD in the closed position, test voltage established by closing the test switch S_1.		P
9.20	**Verification of ageing of electronic components**		—
	168 h at 40 ± 2°C .....:	40,3°C	—
	Test current I_n (A) .....:	32A(for external conductor)	—
	Cross-section (mm²).....:	6,0mm²	—
	Electronic parts at 1,1 U_n.....:	440V	—
	After cool down:		P
	- electronic parts show no damage		P
	The RDC-DD shall trip with a test current of 1,25 $I_{\Delta dc}$	B1 – 650ms B2 – 651ms B3 – 649ms	P
	Test switch S_2 and RDC-DD in the closed position, test voltage established by closing the test switch S_1		P
	TEST SEQUENCE C (3 samples)		—
8.6	**Electrical endurance**		—
	RDC-DDs shall be capable of performing an adequate number of mechanical and electrical operations		P
9.10	**Verification of mechanical and electrical endurance**		—
	Test is made:		P
	- $I_n \leq 25$ A; 2 s on; 13 s off ..... :		N/A
	- $I_n > 25$ A; 2 s on; 28 s off ..... :	2s on; 28s off	P
	Number of operating cycles: 2000	2000 cycles	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test voltage Un (V); test current In (A); cos phi 0,85-0,9 ..... :	0,87	—
	Cross-sectional area (mm²) ..... :	6mm² (for external conductor)	—
	RDC-DDs tested at:		—
	- 1000 cycles for manual operation ..... :	C1 – 1000 cycles C2 – 1000 cycles C3 – 1000 cycles	P
	- 500 cycles by using the test device ..... :	C1 – 500 cycles C2 – 500 cycles C3 – 500 cycles	P
	- 500 or 1000 cycles at a current of 60mA ..... :	C1 – 500 cycles C2 – 500 cycles C3 – 500 cycles	P
	After the test:		—
	- no undue wear		P
	- no damage		P
	- no loosening of connections		P
	- no seepage of sealing compound		P
	The RDC-DDs shall trip with a test current of 1,25 $I_{\Delta dc}$ ..... :	C1 – 630ms C2 – 640ms C3 – 636ms	P
	Dielectric strength test at a voltage of 900 V a.c. for 1 min:		—
	a) ..... :	C1 – 900V C2 – 900V C3 – 900V	P
	b) ..... :	C1 – 900V C2 – 900V C3 – 900V	P
	c) ..... :	C1 – 900V C2 – 900V C3 – 900V	P
	d) ..... :	C1 - C2 - C3 -	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	e) ..... :	C1 - C2 - C3 -	N/A
	TEST SEQUENCE D_0 (3 SAMPLES)		—
	TESTS "D_0"		—
8.5	**Operating characteristics**		—
	For multiple settings of I∆n tests are made for each setting		P
9.9.1	RDC-DD installed as for normal use, test circuit according to fig. 2 or 3		P
	each test is made at 1,1 and 0,85 times the rated line voltage; voltage (V) ..... :	340V, 457V All the relevant tests are done at 50/60Hz. Choose 50Hz as representative frequency.	P
	Unless otherwise specified, the tests are performed with no load at the reference temperature of 20 °C ± 5 °C.	20,5°C	P
Table 2	Standard values of maximum break time at a residual direct current equal to s		—
	6 mA / 60 mA / 200 mA		—
	10,0 / 0,3 / 0,1		—
9.9.2	operation in case of smooth d.c. residual current		P
9.9.2.1	Verification of the correct operation in case of a steady increase of smooth DC residual current:		—
	- steady increase from 2 mA to 6 mA DC within 30 s (mA) ..... :	D1 – 2mA to 6mA D2 – 2mA to 6mA D3 – 2mA to 6mA	P
	- tripping current between 3 mA and 6 mA DC (mA) ..... : **340V**	D1 – 4,5mA – 4,8mA D2 – 4,6mA – 4,8mA D3 – 4,6mA – 4,8mA	P
	440V	D1 – 4,5mA – 4,6mA D2 – 4,6mA – 4,6mA D3 – 4,5mA – 4,6mA	P
9.9.2.2	Verification of the correct operation at closing on a smooth DC residual current		—

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Clause	Requirement + Test	Result - Remark	Verdict
	- the RDC-DD closes on 6 mA DC: no value exceeds the specified limiting value of Table 2 (ms) ..... : **340V**	D1 – 664ms D2 – 668ms D3 – 666ms	P
	440V	D1 – 681ms D2 – 682ms D3 – 682ms	P
9.9.2.3	The test circuit being successively calibrated at each of the values of residual current specified in Table 2, the test switch S2 and the RDC-DD being in the closed position, the test voltage is suddenly established by closing the test switch S1		—
	- maximum break time (ms) at: 6 mA ..... : **340V**	D1 – 658ms D2 – 668ms D3 – 664ms	P
	440V	D1 – 672ms D2 – 665ms D3 – 666ms	P
	- maximum break time (ms) at: 60 mA ..... : **340V**	D1 – 129ms D2 – 127ms D3 – 127ms	P
	440V	D1 – 129ms D2 – 127ms D3 – 129ms	P
	- maximum break time (ms) at: 200mA ..... : **340V**	D1 – 77ms D2 – 77ms D3 – 75ms	P
	440V	D1 – 77ms D2 – 78ms D3 – 76ms	P
	No value exceeds the relevant specified limiting value		P
9.9.2.4	Verification of correct operation with load:		P
	- test current (A): In, the pole under test and one other pole loaded with rated current, the current being established shortly before the test ..... :	32A (for external conductor)	—
	- cross-sectional area (mm²) ..... :	6 mm²	—
	- the RDC-DD closes on 6 mA DC: no value exceeds the specified limiting value of Table 2 (ms) ..... : **340V**	D1 – 655ms D2 – 658ms D3 – 657ms	P

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Clause	Requirement + Test	Result - Remark	Verdict
	440V	D1 – 654ms D2 – 656ms D3 – 659ms	P
	the test switch S2 and the RDC-DD being in the closed position, the test voltage is suddenly established by closing the test switch S1:		—
	- maximum break time (ms) at: 6 mA ..... : **340V**	D1 – 662ms D2 – 669ms D3 – 666ms	P
	440V	D1 – 664ms D2 – 668ms D3 – 664ms	P
	- maximum break time (ms) at: 60 mA ..... : **340V**	D1 – 127ms D2 – 129ms D3 – 129ms	P
	440V	D1 – 127ms D2 – 129ms D3 – 127ms	P
	- maximum break time (ms) at: 200mA ..... : **340V**	D1 – 75ms D2 – 76ms D3 – 78ms	P
	440V	D1 – 78ms D2 – 76ms D3 – 78ms	P
9.9.2.5	Tests at the temperature limits		—
	The RDC-DD shall perform the tests specified in 9.9.2.3 at 1,1 Un under the following conditions, successively:		—
	a) Tests repeated at a temperature of -5 °C or -25 °C: **-25 °C**		—
	The test circuit being successively calibrated at each of the values of residual current specified in Table 2, the test switch S2 and the RDC-DD being in the closed position, the test voltage is suddenly established by closing the test switch S1		P
	-5 °C or -25 °C:	**-25,1 °C**	P
	- maximum break time (ms) at: 6 mA ..... : **340V**	D1 – 667ms D2 – 669ms D3 – 663ms	P
	- maximum break time (ms) at: 6 mA ..... : **440V**	D1 – 660ms D2 – 663ms D3 – 664ms	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- maximum break time (ms) at: 60 mA ..... : **340V**	D1 – 127ms D2 – 129ms D3 – 127ms	P
	- maximum break time (ms) at: 60 mA ..... : **440V**	D1 – 127ms D2 – 124ms D3 – 124ms	P
	- maximum break time (ms) at: 200mA ..... : **340V**	D1 – 76ms D2 – 79ms D3 – 73ms	P
	- maximum break time (ms) at: 200mA ..... : **440V**	D1 – 76ms D2 – 77ms D3 – 72ms	P
	No value exceeds the relevant specified limiting value		P
	b) Tests repeated at a temperature of +40 °C:		—
	The test circuit being successively calibrated at each of the values of residual current specified in Table 2, the test switch S2 and the RDC-DD being in the closed position, the test voltage is suddenly established by closing the test switch S1		
	- test current (A): In at a temperature of +40 °C: until steady state conditions are reached ..... :	55,1°C	—
	- cross-sectional area (mm²) ..... :	6mm² (for external conductor)	—
	- maximum break time (ms) at: 6 mA ..... : **340V**	D1 – 665ms D2 – 666ms D3 – 665ms	P
	- maximum break time (ms) at: 6 mA ..... : **440V**	D1 – 664ms D2 – 665ms D3 – 664ms	P
	- maximum break time (ms) at: 60 mA ..... : **340V**	D1 – 127ms D2 – 129ms D3 – 127ms	P
	- maximum break time (ms) at: 60 mA ..... : **440V**	D1 – 124ms D2 – 125ms D3 – 124ms	P
	- maximum break time (ms) at: 200mA ..... : **340V**	D1 – 75ms D2 – 77ms D3 – 76ms	P
	- maximum break time (ms) at: 200mA ..... : **440V**	D1 – 73ms D2 – 76ms D3 – 76ms	P

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Clause	Requirement + Test	Result - Remark	Verdict
	No value exceeds the relevant specified limiting value		P
9.9.2.6	Verification of the correct operation in case of a residual direct currents which may result from rectifying circuits supplied from two phases		—
	Test acc. figure 4		N/A
a)	Test switch S1 and S2 and RDC-DD in closed position		N/A
	Residual pulsating direct current:		N/A
	- steady increase from max. 2 mA to 7 mA DC within 30 s (mA) :	D1 - D2 - D3 -	N/A
	-tripping current between 3.5 mA and 7 mA DC :	D1 - D2 - D3 -	N/A
b)	The test circuit being successively calibrated at current values of 60 mA and 200 mA, the test switch S1 and the RDC-DD being in the closed position, residual current suddenly establish by closing test switch S2, S3 in position I and II		—
	RDC-DD connected at two-line terminals chosen at random		N/A
	- maximum break time (ms) at: 6 mA ..... :	D1 - D2 - D3 -	N/A
	- maximum break time (ms) at: 60 mA ..... :	D1 - D2 - D3 -	N/A
	- maximum break time (ms) at: 300mA ..... :	D1 - D2 - D3 -	N/A
	No value exceeds the relevant specified limiting value		N/A
9.9.2.7	Verification of the correct operation in case of a residual direct currents which may result from rectifying circuits supplied from three phases		—
	Test acc. figure 5		N/A
a)	Test switch S1 and S2 and RDC-DD in closed position		N/A
	Residual pulsating direct current:		N/A
	- steady increase from max. 2 mA to 6.2 mA within 30 s (mA)..... :	D1 – D2 – D3 –	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	-tripping current between 3.1 mA and 6.2 mA.....: **340V**	D1 – D2 – D3 –	N/A
	-tripping current between 3.1 mA and 6.2 mA.....: **440V**	D1 – D2 – D3 –	N/A
b)	The test circuit being successively calibrated at current values of 60 mA and 200 mA, the test switch S1 and the RDC-DD being in the closed position, residual current suddenly establish by closing test switch S2, S3 in position I and II		—
	- maximum break time (ms) at: 6 mA .....: **340V**	D1 – D2 – D3 –	N/A
	- maximum break time (ms) at: 6 mA .....: **440V**	D1 – D2 – D3 –	N/A
	- maximum break time (ms) at: 60 mA .....: **340V**	D1 – D2 – D3 –	N/A
	- maximum break time (ms) at: 60 mA .....: **440V**	D1 – D2 – D3 –	N/A
	- maximum break time (ms) at: 200mA .....: **340V**	D1 – D2 – D3 –	N/A
	- maximum break time (ms) at: 200mA .....: **440V**	D1 – D2 – D3 –	N/A
9.9.3	**Verification of non-operating time for alternating residual currents**		—
	A first test is made with switches S1 and S2 and the RDC-MD in the closed position.		—
	Alternating residual current:	30mA	P
	- steady increase from max. 6 mA to 30 mA AC within 30 s, The current of 30 mA shall be kept for 10 s. The RDC-DD shall not trip.....:	D1 – No trip D2 – No trip D3 – No trip	P
	Test circuit being successively calibrated at each of the remaining values of the alternating residual current specified in Table 3., the test switch S_1 and the RDC-DD being in the closed position, residual current suddenly establish by closing test switch S_2,		—

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Clause	Requirement + Test	Result - Remark	Verdict
	- minimum non-operating time (ms) at: 60mA ..... :	D1 – >300ms D2 – >300ms D3 – >300ms	P
	- minimum non-operating time (ms) at: 150mA ... :	D1 - >80ms D2 - >80ms D3 - >80ms	P
	- minimum non-operating time (ms) at: 5A ..... :	D1 - >80ms D2 - >80ms D3 - >80ms	P
	The RDC-MD shall not trip during any of the tests.	D1 – not trip D2 – not trip D3 – not trip	P
	TEST SEQUENCE D1 (3 samples)		—
8.15	Behaviour of the correct operation for three- and four- pole RDC-DD powered on two poles only		—
9.17	Verification of the correct operation in case of three- and four- pole RDC-DDs powered on two poles only		—
	tests acc. 9.9.2.1 and 9.9.2.3		P
	RDC-DD only supplied between neutral terminal and one-phase terminal chosen at random for four-pole devices or		P
	RDC-DD only supplied between 2-phase terminals chosen at random for 3-pole devices		P
	Tests at rated frequency and without load		P
	each test is made at 1,1 and 0,85 times the rated line voltage; voltage (V) ..... :		P
9.9.2.1	Verification of the correct operation in case of a steady increase of smooth DC residual current:		—
	- steady increase from 2 mA to 6 mA DC within 30 s (mA) ..... : 196V	D1 – 4,5-4,6 D2 – 4,3-4,5 D3 - 4,2-4,6	P
	253V	D1 – 4,1-4,2 D2 – 4,2-4,6 D3 – 4,4-4,6	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- tripping current between 3 mA and 6 mA DC (mA)	D1 - D2 - D3 -	N/A
9.9.2.3	The test circuit being successively calibrated at each of the values of residual current specified in Table 2, the test switch S2 and the RDC-DD being in the closed position, the test voltage is suddenly established by closing the test switch S1		—
	- maximum break time (ms) at: 6 mA ..... : 196V	D1 – 152 D2 - 155 D3 - 153	P
	253V	D1 - 148 D2 - 149 D3 - 149	P
	- maximum break time (ms) at: 60 mA ..... : 196V	D1 - 65 D2 - 68 D3 - 67	P
	253V	D1 - 64 D2 - 63 D3 - 61	P
	- maximum break time (ms) at: 200mA ..... : 196V	D1 - 23 D2 - 25 D3 - 22	P
	253V	D1 - 25 D2 - 26 D3 - 22	P
	No value exceeds the relevant specified limiting value		N/A
8.12	Behaviour of RDC-DDs in the case of current surges caused by impulse voltages		—
9.18	Verification of behaviour of RDC-DDs in case of current surges caused by impulse voltages		—
9.18.1	Current surge test for all RDC-DDs (0,5µs/100kHz ring wave test)		P
	One pole of the RDC-DD is submitted to 10 applications of a surge current according to the following requirements:		P
	- peak value: 200 A + 10/0%		P
	- virtual front time: 0,5 µs ± 30%		P
	- period of the following oscillatory wave: 10 µs ± 20%		P
	- each successive reverse peak: about 60% of the preceding peak		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The polarity shall be inverted after every two applications		P
	The interval between two consecutive applications shall be about 30 s		P
	During the test the RDC-DD shall not trip ..... :	D1 – 203A D2 – 203A D3 – 203A	P
	- break time (ms) at: IΔdc ..... :	D1 – 659ms D2 – 645ms D3 – 643ms	P
9.18.2	Verification of behaviour at surge currents up to 3000A (8/20μs surge current)		—
9.18.2.1	Test conditions		P
	One pole of the RDC-DD is submitted to 10 applications of a surge current according to the following requirements:		P
	Peak value: 3000A +10/-0%		P
	Virtual front time: 0,8μs ± 20%		P
	Virtual time of half value: 20μs ± 20%		P
	Peak of reverse current: less than 30 % of peak value		P
	The polarity shall be inverted after every two applications		P
	The interval between two consecutive applications shall be about 30 s		P
9.18.2.2	During the test the RDC-DD shall not trip	D1 – 1,5kA D2 – 1,5kA D3 – 1,5kA	P
	- break time (ms) at IΔdc ..... :	D1 – 646ms D2 – 648ms D3 – 647ms	P
8.11	Test device		—
	An RDC-DD shall be provided with a manual or an automatically initiated test function or both that checks the residual DC detection circuit.		P
	Where provided the automatic test function shall be performed at every switch on and at intervals not exceeding at least once a day.		P
	During automatic testing, it is not required to open the contacts.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	In the event that a malfunction is detected during automatic testing, the RDC-DD shall cause disconnection of the supply to the EV.		P
	The protective conductor of the installation shall not become live when the test function is initiated and it shall not be possible to energize the circuit on the load side when the RDC-DD is in the open position and connected as in normal use.		P
9.16	Verification of the operation of the test device at the limits of rated voltage:		—
	a) RDC-DD at 0,85 times the rated voltage, test device actuated 25 times at intervals of 5 s ..... :	D1 – 340V D2 – 340V D3 – 340V	P
	b) test a) repeated at 1,1 times the rated voltage :	D1 – 440V D2 – 440V D3 – 440V	P
	c) test b) repeated, but only once, the operating means of the test device being held in the closed position for 30 s ..... :	D1 – 30s D2 – 30s D3 – 30s	P
	RDC-DD operated at each test ..... :	D1 - D2 - D3 -	P
	No change impairing further use ..... :	D1 - D2 - D3 -	P
	In order to check that the ampere-turns due to the operations of the test device are less than 10 times the ampere-turns produced by a residual current equal to IΔdc, at 0,85 times the rated voltage, the impedance of the circuit of the test device is measured and the test current is calculated, taking into account the configuration of the circuit of the test device.		P
	If, for such verification, the dismantling of the RDC-DD is necessary, a separate sample shall be used.		P
8.8	Resistance to mechanical shock and impact		—
	RDC-DDs shall have adequate mechanical behaviour so as to withstand the stresses imposed during installation and use		P
9.12.1	Mechanical shock		P
	Mechanical shock: 50 falls of 40 mm on one side; 50 falls on opposite side C turned through 90°; 50 falls on one side; 50 falls on opposite side		P

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Clause	Requirement + Test	Result - Remark	Verdict
	No opening of RDC-DD during the test ..... :	D1 - OK D2 - OK D3 - OK	P
9.12.2	Mechanical impact		—
9.12.2.2	Impact test (10 blows, height 10 cm): no damage :	D1 – 10 blows, 10cm D2 – 10 blows, 10cm D3 – 10 blows, 10cm	P
9.12.2.3	RDC-DD s for rail mounting downward vertical force of 50 N for 1 min, upward vertical force of 50 N for 1 min		P
	RDC-DD shall not become loose during test and no damage impairing its further use ..... :	D1 – No damage D2 – No damage D3 – No damage	P
	TEST SEQUENCE E (3 SAMPLES)		
8.7	**Performance at short-circuit currents**		—
9.11.2.3	Verification of the coordination between the RDC-DD and the SCPD		—
	a) Verification of the coordination at the rated conditional short-circuit current (I_{nc})		—
	Verification of the coordination at the rated conditional short-circuit current (A): I_{nc} ..... :	1,5kA	—
	Test circuit according to figure ..... :	figure 6	—
	Point of test circuit which is directly earthed ..... :		—
	Grid distance "a" (mm) ..... :	50mm	—
	Silver wire diameter (mm) or fuse ..... :	0,1mm	—
	Prospective current (A) ..... :	1,5kA	—
	Prospective current obtained (A) ..... :	1,51kA	—
	Power factor ..... :	0,93-0,98	—
	Power factor obtained ..... :	0,96	—
	Point of initiation: 45° ± 5°	45°	P
	Verification of I^2t (kA^2s) and Ip (kA) prior to testing ((≥1x ≤1,1x values of table 16), RDC-DD replaced by a connection having negligible impedance	I^2t = 1,48 kA^2s Ip = 0,92 kA	P
	Test sequence: O-t-CO		P

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Clause	Requirement + Test	Result - Remark	Verdict
	I^2t (kA²s); I_p (kA) ..... :	E1 – 1,45 kA²s, 0,92kA E2 – 1,22 kA²s, 0,86kA E3 – 1,48 kA²s, 0,92kA	P
	During tests no endangering of operator, no permanent arcing, no flashover and no melting of fuse F		P
	After the tests no damage impairing further use		P
9.7.3	Dielectric strength test of the main circuit at test voltage of 2 Un for 1 min:		—
	a) ..... :	E1 – 800V, 1min E2 – 800V, 1min E3 – 800V, 1min	P
	b) ..... :	E1 – 800V, 1min E2 – 800V, 1min E3 – 800V, 1min	P
	c) ..... :	E1 – 800V, 1min E2 – 800V, 1min E3 – 800V, 1min	P
	d) ..... :	E1 - E2 - E3 -	N/A
	e) ..... :	E1 - E2 - E3 -	N/A
	No flashover or breakdown ..... :	E1 – OK E2 – OK E3 – OK	P
	Making and breaking In at Un .....:(for MCB)	E1 – 400V, E2 – 400V, E3 – 400V,	P
	The RDC-DD shall trip with a test current of 1,25 $I_{\Delta dc}$ (ms) ..... :	E1 – 636ms E2 – 635ms E3 – 632ms	P
	The polyethylene sheet shows no holes		P
9.11.2.2	Verification of the rated making and breaking capacity (A): I_m ..... :	500A	—

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Clause	Requirement + Test	Result - Remark	Verdict
	Test circuit according to figure ..... :	figure 6	—
	Residual operating current (A): 10 $I\Delta n$ ..... :	60mA	—
	Point of test circuit which is directly earthed ..... :		—
	Grid distance "a" (mm) ..... :	50mm	—
	Prospective current (A) ..... :	500A	—
	Prospective current obtained (A) ..... :	515A	—
	Power factor ..... :	0,93-0,98	—
	Power factor obtained ..... :	0,96	—
	Point of initiation: 45° ± 5°	45°	P
	Test sequence: CO-t-CO-t-CO		P
	During tests no endangering of operator, no permanent arcing, no flashover and no melting of fuse F		P
	After the tests no damage impairing further use		P
9.7.3	Dielectric strength test of the main circuit at test voltage of 2 Un for 1 min:		—
	a) ..... :	E1 – 800V, 1min E2 – 800V, 1min E3 – 800V, 1min	P
	b) ..... :	E1 – 800V, 1min E2 – 800V, 1min E3 – 800V, 1min	P
	c) ..... :	E1 – 800V, 1min E2 – 800V, 1min E3 – 800V, 1min	P
	d) ..... :	E1 - E2 - E3 -	N/A
	e) ..... :	E1 - E2 - E3 -	N/A
	No flashover or breakdown	E1 – OK E2 – OK E3 – OK	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Making and breaking *I*n at *U*n .....: (for MCB)	E1 – 400V, 32A E2 – 400V, 32A E3 – 400V, 32A	P
	The RDC-DD shall trip with a test current of 1,25 $I_{\Delta dc}$ (ms) ..... :	E1 – 636ms E2 – 635ms E3 – 635ms	P
	The polyethylene sheet shows no holes		P
	TEST SEQUENCE F (3 SAMPLES)		
8.7	**Performance at short-circuit currents**		—
9.11.2.3	Verification of the coordination between the RDC-DD and the SCPD		—
	b) Verification of the coordination at the rated making and breaking capacity (A): Im ..... :	500A	—
	Test circuit according to figure ..... :	figure 6	—
	Point of test circuit which is directly earthed ..... :	60mA	—
	Grid distance "a" (mm) ..... :		—
	Silver wire diameter (mm) or fuse ..... :	50mm	—
	Prospective current (A) ..... :	500A	—
	Prospective current obtained (A) ..... :	515A	—
	Power factor ..... :	0,93-0,98	—
	Power factor obtained ..... :	0,96	—
	Point of initiation: 45° ± 5°	45°	P
	Test sequence: O-t-CO-t-CO		P
	During tests no endangering of operator, no permanent arcing, no flashover and no melting of fuse F		P
	After the tests no damage impairing further use		P
9.7.3	Dielectric strength test of the main circuit at test voltage of 2 Un for 1 min:		—
	a) ..... :	F1 – 800V, 1min F2 – 800V, 1min F3 – 800V, 1min	P
	b) ..... :	F1 – 800V, 1min F2 – 800V, 1min F3 – 800V, 1min	P

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	c) ..... :	F1 – 800V, 1min F2 – 800V, 1min F3 – 800V, 1min	P
	d) ..... :	F1 - F2 - F3 -	N/A
	e) ..... :	F1 - F2 - F3 -	N/A
	No flashover or breakdown ..... :	F1 – OK F2 – OK F3 – OK	P
	Making and breaking In at Un ..... :	F1 – 400A, 32A F2 – 400A, 32A F3 – 400A, 32A	P
	The RDC-DD shall trip with a test current of 1,25 $I_{\Delta dc}$ (ms) ..... :	F1 – 638ms F2 – 639ms F3 – 638ms	P
	The polyethylene sheet shows no holes		P
9.11.2.3	c) Verification of the coordination at the rated conditional residual short-circuit current (A): IΔc . :	1,5kA	—
	Test circuit according to figure ..... :	figure 6	—
	Point of test circuit which is directly earthed ..... :		—
	Grid distance "a" (mm) ..... :	50mm	—
	Silver wire diameter (mm) or fuse ..... :	0,12mm	—
	Prospective current (A) ..... :	1,5kA	—
	Prospective current obtained (A) ..... :	1,51kA	—
	Power factor ..... :	0,93-0,98	—
	Power factor obtained ..... :	0,96	—
	Point of initiation: 45° ± 5°	45°	P
	Verification of I^2t (kA^2s) and Ip (kA) prior to testing (≥1x ≤1,1x values of table 15), RDC-DD replaced by a connection having negligible impedance	I^2t = 3,74 kA^2s Ip = 1,25 kA	P
	Test sequence: O-t-CO-t-CO		P
	I^2t (kA^2s); Ip (kA) ..... :	F1 – 3,04 kA^2s, 0,98kA F2 – 3,19 kA^2s, 1,01kA F3 – 2,91 kA^2s, 0,96kA	P

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	During tests no endangering of operator, no permanent arcing, no flashover and no melting of fuse F		P
	After the tests no damage impairing further use		P
9.7.3	Dielectric strength test of the main circuit at test voltage of 2 Un for 1 min:		—
	a) ..... :	F1 – 800V, 1min F2 – 800V, 1min F3 – 800V, 1min	P
	b) ..... :	F1 – 800V, 1min F2 – 800V, 1min F3 – 800V, 1min	P
	c) ..... :	F1 – 800V, 1min F2 – 800V, 1min F3 – 800V, 1min	P
	d) ..... :	F1 - F2 - F3 -	N/A
	e) ..... :	F1 - F2 - F3 -	N/A
	No flashover or breakdown ..... :	F1 – OK F2 – OK F3 – OK	P
	Making and breaking In at Un ..... :	F1 – 400V, 32A F2 – 400V, 32A F3 – 400V, 32A	P
	The RDC-DD shall trip with a test current of 1,25 $I_{\Delta dc}$ (ms) ..... :	F1 – 638ms F2 – 639ms F3 – 638ms	P
	The polyethylene sheet shows no holes		P
	TEST SEQUENCE G (3 SAMPLES)		
9.19	**Verification of reliability**		—
9.19.2	Climatic test based on Clause 4 of IEC 60068-2-3:2000 and IEC 60068-3-4:		—
	- number of cycles: 28		P
	- test temperature: upper temperature 55 °C ± 2 °C	55,6°C	P
	Initial verification:		P

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
9.9.2.3	- maximum break time at $I_{\Delta dc}$ (ms) ..... :	G1 – 38ms G2 – 36ms G3 – 39ms	P
	No value exceeds the specified limiting value		P
	No tripping during tests		P
	Climatic test: no tripping during 28 cycles test .... :	G1 – No tripping G2 – No tripping G3 – No tripping	P
	Final verification: the RDC-DD shall trip with a test current of 1,25 $I_{\Delta dc}$ (ms) ..... :	G1 – 639ms G2 – 635ms G3 – 639ms	P

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX A (NORMATIVE)		
Test sequence and number of samples to be submitted for certification purposes **Table A.1 - Test sequences**		
Test sequence	**Clause or subclause**	**Test (or inspection)**
A_1	6 8.1.1 8.1.2 9.3 8.1.3 9.15 9.4 9.5 9.6 9.13 8.1.3 9.25	Marking General Mechanism Indelibility of marking Clearance and creepage distances (external parts only) Trip free mechanism Reliability of screws, current-carrying parts and connections Reliability of terminals for external conductors Protection against electric shock Resistance to heat Clearances and creepage distances (internal parts) Resistance to rusting
A_2	9.14	Resistance to abnormal heat and to fire
B	9.7.7.3 9.7.7.4 b) 9.7.1 9.7.2 9.7.3 9.7.4 9.7.7.2 9.7.5 9.7.6 9.8 9.19.3 9.20	Resistance of the insulation of open contacts and basic insulation against an impulse voltage in normal conditions Verification of the behaviour of components bridging the basic insulation Resistance to humidity Insulation resistance of the main circuit Dielectric strength of the main circuit Insulation resistance an dielectric strength of auxiliary circuits Verification of clearances with the impulse withstand voltage Secondary circuit of detection transformers Capability of control circuits connected to the main circuits etc. Temperature-rise Reliability at 40°C Ageing of electronic components
C	9.10	Mechanical and electrical endurance
D D_0	9.9	Residual operating characteristics
D D_1	9.17 9.18 9.16 9.12	Three- and four- pole RDC-DD powered on two poles only Behaviour in the case of surge currents. Test device Resistance to mechanical shock and impact
E	9.11.2.3 a)	Coordination at I_{nc}
	9.11.2.2	Performance at I_m
F	9.11.2.3 b)	Coordination at I_m
	9.11.2.3 c)	Coordination at $I_{\Delta c}$
G	9.19.2	Reliability (climatic tests)
H a)	IEC 61543 Table 4 -T1.1 IEC 61543 Table 4 -T1.2 IEC 61543 Table 5 -T2.3	Harmonics, interharmonics Signalling voltage Surges

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

I	IEC 61543 Table 5 -T2.1 IEC 61543 Table 5 -T2.5 IEC 61543 Table 5 -T2.2	Conducted sine-wave voltages or currents Radiated electromagnetic field Fast transients (burst)
J	IEC 61543 Table 5 -T2.6 IEC 61543 Table 6 -T3.1	Conducted common mode disturbances in the frequency range lower than 150 kHz Electrostatic discharges
a) For devices containing a continuously operating oscillator, the test of CISPR 14-1 shall be carried out on the samples prior to the tests of this sequence. b) This test may be done on separate samples.		

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

Table A.2 - Number of samples for full test procedure

Test sequence [a]	Number of samples	Minimum number of accepted samples [b]	Maximum number of samples for repeated tests [c]
A_1	1	1	--
A_2	3	2	3
B	3	2	3
C	3	2	3
D	3	2 [d]	3
E	3	2 [d]	3
F	3	2 [d]	3
G	3	2	3
H [e]	3	2	3
I [e]	3	2	3
J [e]	3	2	3

a) In total a maximum of three test sequences may be repeated.

b) It is assumed that a sample which has not passed a test has not met the requirements due to workmanship or assembly defects which are not representative of the design.

c) In the case of repeated tests, all test results must be acceptable.

d) All samples shall meet the requirements in 9.9.2.1, 9.9.2.2, 9.9.2.3, 9.9.2.4 and 9.9.3, as appropriate. In addition, permanent arcing or flashover between poles or between poles and frame shall not occur in any sample during tests of 9.11.2.2, 9.11.2.3 a), 9.11.2.3 b) or 9.11.2.3 c).

e) At the manufacturer's request, the same set of samples may be subjected to more than one of these test sequences.

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

Table A.3 - Number of samples for simplified test procedure			
Test sequence	**Number of samples according to the number of poles** [a) g)]		
	2-poles [b) c)]	**3-poles** [d) f) i)]	**4-poles** [e)]
A_1	1 max. rating I_n	1 max. rating I_n	1 max. rating I_n
A_2	3 max. rating I_n	3 max. rating I_n	3 max. rating I_n
B	3 max. rating I_n	3 max. rating I_n	3 max. rating I_n
C	3 max. rating I_n	3 max. rating I_n	3 max. rating I_n
D_0 + D_1	3 max. rating I_n	3 max. rating I_n	3 max. rating I_n
D_0		1 with rated $I_{\Delta dc}$	
E	3 max. rating I_n	3 max. rating I_n	3 max. rating I_n
F	3 max. rating I_n 3 min. rating I_n	3 max. rating I_n 3 min. rating I_n	3 max. rating I_n 3 min. rating I_n
G	3 max. rating I_n 3 min. rating I_n	3 max. rating I_n 3 min. rating I_n	3 max. rating I_n 3 min. rating I_n
H			3 [g] samples of the same I_n chosen at random
I			3 [g] samples of the same I_n chosen at random
J			3 [g] samples of the same I_n chosen at random

a If a test is to be repeated according to the minimum performance criteria of Clause A.2, a new set of samples is used for the relevant test. In the repeated test, all test results shall be acceptable.
b If only 3-pole or 4-pole RDC-DDs are submitted, this column shall also apply to a set of samples with the smallest number of poles.
c Also applicable to 1-pole RDC-DDs with uninterrupted neutral and to 2-pole RDC-DDs with 1 protected pole.
d Also applicable to 3-pole RDC-DDs with 2 protected poles.
e Also applicable to 3-pole RDC-DDs with uninterrupted neutral and to 4-pole RDC-DDs with 3 protected poles.
f This column is omitted when 4-pole RDC-DDs have been tested.
g Only the highest number of current paths.
h If a 3-pole RDC-DD with 4 current paths and a 4-pole RDC-DD are submitted, then only the 4-pole RDC-DD is tested, with exception of the test of 9.8 of test sequence B, for which both types are submitted to the test.

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX B (NORMATIVE) **DETERMINATION OF CLEARANCES AND CREEPAGE DISTANCES**	—
B.1	**General**	P
	In determining clearances and creepage distances, it is recommended that the following points should be considered.	P
B.2	**Orientation and location of a creepage distance**	P
	If necessary, the manufacturer shall indicate the intended orientation of the equipment or component in order that creepage distances are not adversely affected by the accumulation of pollution for which they were not designed.	P
B.3	**Creepage distances where more than one material is used**	N/A
	A creepage distance may be split in several portions of different materials and/or have different pollution degrees if one of the creepage distances is dimensioned to withstand the total voltage or if the total distance is dimensioned according to the material having the lowest CTI.	N/A
B.4	**Creepage distances split by floating conductive part**	N/A
	A creepage distance may be split into several parts, made with insulation material having the same CTI, including or separated by floating conductors as long as the sum of the distances across each individual part is equal or greater than the creepage distance required if the floating part did not exist. The minimum distance X for each individual part of the creepage distance is given in IEC 60664-1:2007, 6.2 (see also Example 11 in Figure B.1).	N/A
B.5	**Measurement of creepage distances and clearances**	P
	In determining creepage distances according to IEC 60664-1, the dimension *X*, specified in the following examples, has a minimum value of 1,0 mm for pollution degree 2.	P
	If the associated clearance is less than 3 mm, the minimum dimension *X* may be reduced to one third of this clearance.	P
	The methods of measuring creepage distances and clearances are indicated in Example 1 to 11. These cases do not differentiate between gaps and grooves or between types of insulation.	P
	The following assumptions are made:	P
	- any recess is assumed to be bridged with an insulating link having a length equal to the specified width *X* and being placed in the most unfavourable position (see Example 3);	P
	- where the distance across a groove is equal to or larger than the specified width *X*, the creepage distance is measured along the contours of the groove (see Example 3);	P
	- creepage distances and clearances measured between parts which can assume different positions in relation to each other, are measured when these parts are in their most unfavourable position.	P

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX C (NORMATIVE) ARRANGEMENT FOR THE DETECTION OF THE EMISSION OF IONIZED GASES DURING SHORT-CIRCUIT TESTS	
	The device under test is mounted as shown in figure C.1, which may require adapting to the specific design of the device, and in accordance with the manufacturer's instructions.	P
	When required (i.e. during "O" operations), a clear polyethylene sheet (0,05 ± 0,01) mm thick, of a size at least 50 mm larger, in each direction, than the overall dimensions of the front face of the device but not less than 200 mm × 200 mm, is fixed and reasonably stretched in a frame, placed at a distance of 10 mm from	P
	– either the maximum projection of the operating means of a device without recess for the operating means;	P
	– or the rim of a recess for the operating means of a device with recess for the operating means.	P
	The sheet should have the following physical properties: Density at 23 °C: 0,92 ± 0,05 g/cm³ Melting-point: 110 °C – 120 °C.	P
	When required, a barrier of insulating material, at least 2 mm thick, is placed, as shown in figure C.1, between the arc vent and the polyethylene sheet to prevent damage of the sheet due to hot particles emitted from the arc vent.	P
	When required, a grid (or grids) according to figure C.2 is (are) placed at a distance of "a" mm from each arc vent side of the device.	P
	The grid circuit (see figure C.3) shall be connected to the points B and C (see figures 7 or 8, as applicable).	P
	The parameters for the grid circuit are as follows:	P
	Resistor R': 1,5 Ω	P
	Copper wire F': length 50 mm, and diameter in accordance with 9.11.2.1 f 1).	P

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX D (NORMATIVE) ROUTINE TESTS				—
D.1	**General**				—
	The tests specified in this standard are intended to reveal, as far as safety is concerned, unacceptable variations in material or manufacture.				P
	In general, further tests have to be made to ensure that every RDC-DD conforms with the samples that withstood the tests of this standard, according to the experience gained by the manufacturer.				P
D.2	**Tripping test**				—
	A DC residual current is passed through the RDC-DD. The RDC-DD shall trip at a DC residual current chosen from Table 2 within the specified time.	[ms]	[ms]	[ms]	P
	The test current shall be applied once on each RDC-DD.				P
D.3	**Electric strength test**				—
	A voltage of substantially sine-wave form of 1 500 V having a frequency of 50 Hz/60 Hz is applied for 1 s as follows:				P
	- with the RDC-DD in the open position, between each pair of terminals which are electrically connected together when the RDC-DD is in the closed position;				P
	- with the RDC-DD in the open position, either between all incoming terminals of poles in turn or between all outgoing terminals at poles in turn, depending on the position of the incorporated electronic components.				P
	No flashover or breakdown shall occur				P
D.4	**Performance of the test device**				—
	With the RDC-DD provided with a manual test device in the closed position, and connected to a supply at the appropriate voltage, the test device, when operated, shall open the RDC-DD.				P
	RDC-DD provided with an automatic test device the manufacturer shall give a convenient method of verification.				P

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX I (NORMATIVE) PARTICULAR REQUIREMENTS FOR RDC-DDS WITH SCREWLESS TYPE TERMINALS FOR EXTERNAL COPPER CONDUCTORS		
I.1	**Scope**		—
	This annex applies to RDC-DDs within the scope of Clause 1, equipped with screwless terminals, for current not exceeding 20 A primarily suitable for connecting unprepared (see I.3.6) copper conductors of cross-section up to 4 mm^2.		—
I.6	**Marking and other product information**		—
	In addition to clause 6:		N/A
	Universal terminals:		N/A
	– no markings		N/A
	Non-universal terminals:		N/A
	– terminals for rigid-solid conductors marked by “sol”		N/A
	– terminals for rigid (solid and stranded) conductors marked by “r”		N/A
	– terminals for flexible conductors marked by “f”		N/A
	Marking on the RDC-DD or		N/A
	if the space available is not sufficient on the smallest package unit or in technical information		N/A
	Marking indicating the length of insulation to be removed before insertion of the conductor into the terminal shown on the RDC-DD		N/A
	Manufacturer shall provide information in his literature, on the maximum number of conductors which may be clamped.		N/A
I.7	**Standard conditions for operating in service and for installation**		—
I.8	**Requirements for construction and operation**		—
I.8.1	clause 8 applies with the following modifications: in 8.1.5, only 8.1.5.1, 8.1.5.2, 8.1.5.3, 8.1.5.6 and 8.1.5.7 apply		N/A
	Compliance is checked by inspection and by the tests of I.9.1 and I.9.2 of this annex, instead of 9.4 and 9.5.		N/A
I.8.2	**Connection or disconnection of conductors**		N/A
	The connection or disconnection of conductors shall be made:		N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	- by the use of a general purpose tool or by a convenient device integral with the terminal to open it and to assist the insertion or the withdrawal of the conductors (e.g. for universal terminals)		N/A
	- or, for rigid conductors by simple insertion. For the disconnection of the conductors an operation other than a pull on the conductor shall be necessary (e.g. for push-wire terminals).		N/A
	Universal terminals shall accept rigid (solid or stranded) and flexible unprepared conductors.		N/A
	Non-universal terminals shall accept the types of conductors declared by the manufacturer.		N/A
	Compliance is checked by inspection and by the tests of I.9.2 and I.9.3.		N/A
I.8.3	**Dimensions of connectable conductors**		N/A
	The dimensions of connectable conductors are given in Table I.1.		N/A
	The ability to connect these conductors shall be checked by inspection and by the tests of I.9.2 and I.9.3.		N/A
I.8.4	**Connectable cross-sectional areas**		N/A
	nominal cross-sections to be clamped acc. table I.2		N/A
	compliance checked by inspection and tests of I.9.2 and I.9.3.		N/A
I.8.5	**Insertion and disconnection of conductors**		N/A
	The insertion and disconnection of the conductors shall be made in accordance with the manufacturer's instructions.		N/A
	Compliance is checked by inspection.		N/A
I.8.6	**Design and construction of terminals**		N/A
	terminals so designed and constructed that:		—
	- each conductor clamped individually		N/A
	- during operation of connection or disconnection the conductors can be connected or disconnected either at the same time or separately		N/A
	- inadequate insertion of the conductor is avoided		N/A
	It shall be possible to clamp securely any number of conductors up to the maximum provided for		N/A
	compliance checked by inspection and tests of I.9.2 and I.9.3.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
I.8.7	**Resistance to ageing**		N/A
	compliance checked by the test of I.9.4.		N/A
I.9	**Tests**		—
I.9.1	Clause 9 applies, by replacing 9.4 and 9.5 by the by the tests in I.9.2, I.9.3 and I.9.4.		N/A
I.9.2	**Test of reliability of screwless terminals**		—
I.9.2.1	**Reliability of screwless system**		N/A
	three terminals of poles of new samples, with copper conductors of the rated cross sectional area in accordance with Table I.2, types of conductors in accordance with I.8.2.		N/A
	The connection and subsequent disconnection shall be made five times with:		N/A
	Min. cross-section (mm²).....:	mm²	N/A
	Max. cross-section (mm²).....:	mm²	N/A
	new conductors used each time, except for the fifth time, when the conductor used for the fourth insertion is clamped at the same place. Before insertion into the terminal, wires of stranded rigid conductors re-shaped and wires of flexible conductors twisted to consolidate the ends.		N/A
	After each insertion, the conductor being inserted rotated 90 ° along its axis at the level of the clamped section and subsequently disconnected.		N/A
	After tests, the terminal not damaged in such a way as to impair its further use.		N/A
I.9.2.2	**Test of reliability of connection**		N/A
	three terminals of poles of new samples, with copper conductors of the rated cross sectional area in accordance with Table I.2, types of conductors in accordance with I.8.2.		N/A
	Before insertion into the terminal, wires of stranded rigid conductors and flexible conductors reshaped and wires of flexible conductors twisted to consolidate the ends.		N/A
	possible to fit the conductor into the terminal without undue force in the case of universal terminals and with the force necessary by hand in the case of push-wire terminals.		N/A
	conductor pushed as far as possible into the terminal or inserted so that adequate connection is obvious.		N/A
	Min. cross-section (mm²).....:	mm²	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	Max. cross-section (mm²) ..... :	mm²			N/A
	After the test, no wire of the conductor shall have escaped outside the terminal.				N/A
I.9.3	**Tests of reliability of terminals for external conductors: mechanical strength**				N/A
	three terminals of poles of new samples fitted with new conductors of the type and of the minimum and maximum cross-sectional areas acc. Table I.2.				N/A
	Min. cross-section (mm²) ..... :	mm²			N/A
	Max. cross-section (mm²) ..... :	mm²			N/A
	wires of stranded rigid conductors and flexible conductors reshaped and wires of flexible conductors twisted to consolidate the ends.				N/A
	Pull for 1 min, min. cross-section (N) ..... :	N			N/A
	Pull for 1 min, max. cross-section (N) ..... :	N			N/A
	During the test, the conductor shall not slip out of the terminal.				N/A
I.9.4	**Cycling test**				N/A
	Universal, rigid conductors - 3 samples Universal, flexible conductors - 3 samples				N/A
	Non-universal, solid conductors - 3 samples				N/A
	Non-universal, rigid (solid) stranded conductors - 3 samples Non-universal, rigid (stranded) stranded conductors - 3 samples				N/A
	Non-universal, flexible conductors - 3 samples				N/A
	Cross-section (mm²) ..... :	mm²			N/A
	Test current I_N (A) ..... :	A			N/A
	samples subjected to 192 temperature cycles				N/A
	Voltage drop after 192 cycles:				—
	voltage drop, measured at each terminal, at the end of the 192nd cycle, exceeded not the smaller of the two following values:				N/A
	– 22,5 mV				N/A
	– 1,5 times the value measured after the 24th cycle				N/A
		sample 1	sample 2	sample 3	—
		[mV]	[mV]	[mV]	—
	- rigid solid conductors ..... :				N/A

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Clause	Requirement + Test	Result - Remark			Verdict
	- rigid stranded conductors..... :				N/A
	- flexible conductors ..... :				N/A
	Voltage drop after 24th cycle:				—
		sample 1	sample 2	sample 3	—
		[mV]	[mV]	[mV]	—
	- rigid solid conductors ..... :				N/A
	- rigid stranded conductors..... :				N/A
	- flexible conductors ..... :				N/A
	after this test: no changes evidently impairing further use, such as cracks, deformations or the like.				N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX J (NORMATIVE) PARTICULAR REQUIREMENTS FOR RDC-DD S WITH FLAT QUICK-CONNECT TERMINATIONS		
J.1	**Scope**		—
	This annex applies to RDC-DDs within the scope of Clause 1, equipped with flat quickconnect terminations consisting of a male tab (see J.3.2) with nominal width 6,3 mm and thickness 0,8 mm, to be used with a mating female connector for connecting electrical copper conductors according to the manufacturer's instructions, for rated currents up to and including 16 A.		—
J.6	**Marking and other product information**		—
	in addition to clause 6, addition after the lettered item k):		—
	Information regarding the female connector acc. to IEC 61210 and type of conductor to be used shall be given in the manufacturers' instructions:		N/A
	i) manufacturer´s name or trade mark		N/A
	m) type reference		N/A
	n) information on cross-sections of conductors and colour code of insulated female connectors (see Table J.1)		N/A
	o) the use of only silver or tin-plated copper alloys		N/A
J.8	**Requirements for construction and operation**		—
J.8.1	Clause 8 applies, with the following exceptions:		N/A
	Replace the contents of 8.1.3 with the text in J.8.2.		N/A
J.8.2	**Clearances and creepage distances (see Annex B)**		N/A
	Subclause 8.1.3 applies, the female connectors being fitted to the male tabs of the RDC-DD.		N/A
	Replace the contents of 8.1.5 by the following text:		N/A
J.8.3	**Terminals for external conductors**		N/A
J.8.3.1	Male tabs and female connectors shall be of a metal having mechanical strength, electrical conductivity and resistance to corrosion adequate for their intended use.		N/A
J.8.3.2	The nominal width of the male tab is 6,3 mm and the thickness 0,8 mm, applicable to rated currents up to and including 16 A. NOTE 1:The use for rated currents up to and including 20 A is accepted in BE, FR, IT, PT, ES and US		N/A
	The dimensions of the male tab shall comply with those specified in Table J.3 and in figures J.2, J.3,		N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

	J.4 and J.5						
J.8.3.3	Male tabs shall be securely retained						N/A
	Compliance is checked by the mechanical overload test of J.9.2.						N/A
		Dimensions of tabs according Table J.3		Measured in mm			—
		Minimum [mm]	Maximum [mm]				—
A	Dimple	0,7	1,0				N/A
	Hole	0,5	1,0				N/A
B	Dimple	7,8 min					N/A
	Hole	7,8 min					N/A
C	Dimple	0,77	0,84				N/A
	Hole	0,77	0,84				N/A
D	Dimple	6,20	6,40				N/A
	Hole	6,20	6,40				N/A
E	Dimple	3,6	4,1				N/A
	Hole	4,3	4,7				N/A
F	Dimple	1,6	2,0				N/A
	Hole	1,6	2,0				N/A
J	Dimple	8°	12°				N/A
	Hole	8°	12°				N/A
M	Dimple	2,2	2,5				N/A
	Hole	---	---				—
N	Dimple	1,8	2,0				N/A
	Hole	---	---				—
P	Dimple	0,7	1,8				N/A
	Hole	0,7	1,8				N/A
Q	Dimple	8,9 min	---				N/A
	Hole	8,9 min	---				N/A
	Dimensions of the female connector which may be fitted-on are given in Figure J.6 and in Table J.4.						N/A
				--	request acc. table K.3	measured value	—
				B_3 max	7,8mm		N/A
				L_2 max	3,5mm		N/A
J.9	**Tests**						—

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
J.9.1	clause 9 applies with the following modifications:		N/A
	replace the contents of 9.5 by the following text:		N/A
J.9.2	**Mechanical overload-force**		N/A
	Test done on 10 terminals of RDC-DDs, mounted as in normal use when wiring takes place.		N/A
	Axial push force, and successively the axial pull force gradually applied to the male tab integrated in the RDC-DD		N/A
	Push 96N		N/A
	Pull 88N		N/A
	No damage occurred to the tab or to the RDC-DD in which the tab is integrated.		N/A
	addition to 9.8.3:		N/A
	Fine -wire thermocouples shall be placed in such a way as not to influence the contact or the connection area. An example of placement is shown in fig J.1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX K (NORMATIVE) SPECIFIC REQUIREMENTS FOR RDC-DD S WITH SCREW-TYPE TERMINALS FOR EXTERNAL UNTREATED ALUMINIUM CONDUCTORS AND WITH ALUMINIUM SCREW-TYPE TERMINALS FOR USE WITH COPPER OR WITH ALUMINIUM CONDUCTORS		
K.6	**Marking and other product information**		—
	In addition to clause 6 the following apply:		N/A
	Terminal marking according table K.1, on the RDC-DD, near the terminals		N/A
	Conductor types accepted:		N/A
	Copper only	☐ None	N/A
	Aluminium only	☐ “Al”	N/A
	Aluminium and copper	☐ “Al/Cu”	N/A
	Other information concerning the number of conductors, screw torque (if different from table 11) and cross-section shall be indicated on the RDC-DD	Nm mm²	N/A
K.7	**Standard conditions for operation in service**		—
	Clause 7 applies		N/A
K.8	**Constructional requirements**		—
	Clause 8 applies with the following exceptions:		N/A
8.1.5.2	add the following text at the end of 8.1.5.2:		N/A
	For connection of aluminium conductors, RDC-DD s shall be provided with screw-type terminals allowing the connection of conductors having nominal cross-sections as shown in table K.2		N/A
	Terminals for the connection of aluminium conductors and terminals of aluminium for the connection of copper or aluminium conductors shall have mechanical strength adequate to withstand the tests of 9.4, with the test conductors tightened with the torque indicated in table 11, or with the torque specified by the manufacturer, which shall never be lower than that specified in table 11.		N/A
	Compliance is checked by inspection, by measurement and by fitting in turn one conductor of the smallest and one of the largest cross-section areas as specified		N/A
8.1.5.4	replace the text of 8.1.5.4 by the following:		N/A
	Terminals shall allow the conductors to be connected without special preparation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Compliance is checked by inspection and by the tests of K.9		N/A
K.9	**Tests**		—
K.9.1	Clause 9 applies with the following modifications/additions:		N/A
	For the tests which are influenced by the material of the terminal and the type of conductor that can be connected, the test conditions of table K.3 are applied		N/A
	Additionally the test of K.9.2 is carried out on terminals separated from the RDC-DD		N/A
K.9.2	**Test conditions**		N/A
	Subclause 9.1 applies, except that the Al conductors to be connected are taken from Table K.5.		N/A
K.9.3	**Current cycling test**		N/A
	This test is carried out on separate terminals		N/A
K.9.3.3	Test arrangement		N/A
	The general arrangement of the samples shall be as shown in figure K.1		N/A
	90 % of torque stated by the manufacturer or selected in Table 11 used for the specimens	torque: Nm	N/A
	The test is carried out with conductors according to Table K.5. The length of the test conductor from the point of entry to the screw-type terminal specimens to the equalizer (see K.3.3) shall be as in Table K.6.	cross-section: mm^2 minimum conductor length: mm	N/A
	Cross section of equalizer not greater than that given in table K.7	max. cross-section: mm^2	N/A
K.9.3.5	Test method and acceptance criteria		N/A
	Test loop subjected to 500 cycles of 1h current-on and 1h current-off, starting at an a.c. current value of 1,12 times the test current value determined in table K.8	test current: A	N/A
	Near the end of each current-on period of the first 24 cycles, the current shall subsequently be adjusted to raise the temperature of the reference conductor to 75°C		N/A
	At the end of the 25^{th} cycle the test current shall be adjusted the last time and the stable temperature shall be recorded as the first measurement. No further adjustment of test current for the remainder of the test		N/A

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Clause	Requirement + Test	Result - Remark		Verdict
	Temperatures recorded for at least one cycle of each working day, and after approximately 25, 50, 75, 100, 125, 175, 225, 275, 350, 425 and 500 cycles			N/A
	For each screw-type terminal:			N/A
	- the temperature rise shall not exceed 110 K			N/A
	- the stability factor Sf shall not exceed ± 10 °C			N/A
	ambient air temperature: °C			N/A
		max. temperature rise [K]	max. stability factor Sf [°C]	—
	Terminal 1			N/A
	Terminal 2			N/A
	Terminal 3			N/A
	Terminal 4			N/A
	Terminal 5			N/A
	Terminal 6			N/A
	Terminal 7			N/A
	Terminal 8			N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX M (NORMATIVE) ADDITIONAL REQUIREMENTS AND TESTS FOR RDC-MDS ACCORDING TO CLASSIFICATION 4.1.1.2 CONSISTING OF AN RDC-M-UNIT DESIGNED TO BE ASSEMBLED ON SITE TOGETHER TO A SEPARATE SWITCHING PROTECTIVE DEVICE		
M.1	**Scope**		—
	This annex applies to RDC-MDs consisting of a residual direct current monitoring unit (RDCM- unit), with 6 mA DC detection and evaluation, designed for being mechanically assembled on site in accordance with the manufacturer's instructions to one or more declared protective device(s), which can be either a circuit breaker in compliance with IEC 60898-1, or a RCD in compliance with IEC 61008-1 or IEC 61009-1 or IEC 62423.		—
	For RDC-MDs according to classification 4.1.1.2 the separate units shall be from the same manufacturer, being affixed with the same trade mark or all parts shall be declared suitable for use together with the other units by the individual manufacturer.		—
	The main body of this document applies in all respects to devices covered by this annex, unless otherwise specified.		—
M.5.1	**Summary of characteristics**		—
Replace	– rated current In (see 5.2.2);		—
by	– maximum rated current of the circuit-breaker or RCD with which it may be assembled.		—
M.6	**Marking and other product information**		—
M.6.1	**Manufacturer's name or trademark**		N/A
	With reference to Clause 6 item a) of this document, the circuit-breaker and/or the RCD and the RDC-M- unit with which it is to be assembled shall bear the same manufacturer's name or trademark.		N/A
M.6.2	**Marking**		N/A
M.6.2.1	**Marking of the RDC-M-unit**		N/A
	The RDC-M-unit shall be marked with the following items, with reference to Clause 6 of this document:		N/A
	a) manufacturer’s name or trademark .....:		N/A
	b) type designation, catalogue number or serial number .....:		N/A
	c) rated voltage(s) (V) .....:		N/A
	e) rated current (A) .....:		N/A
	f) rated residual DC operating current (A) .....:		N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	g) marking with lowest temperature value.....:		N/A
	j) degree of protection .....:	IP	N/A
	k) position of use .....:		N/A
	l) rated residual making and breaking capacity (A) :	(if necessary)	N/A
	m) operating means of test device .....:	T	N/A
	n) wiring diagram .....:		N/A
	In addition, the RDC-M- unit shall be marked with		N/A
	the maximum rated current of the circuit-breaker or RCD with which it may be assembled.....:		N/A
	the symbol see figure M.1. .....:		N/A
	It is recommended to mark the references of the circuit-breakers with which the RDC-M-unit can be assembled.		N/A
M.6.2.2	**Marking of the assembled circuit-breaker or RCD and RDC-M-unit (RDC-MD)**		N/A
	The following marking on the RDC-M-unit specified in M.6.2.1 shall not be visible after assembly:		N/A
	c) rated voltage(s) (V) .....:		N/A
	maximum rated current of the protective device with which the RDC-M-unit may be assembled. :		N/A
	Marking k) of the RDC-M-unit, if applicable, shall remain visible after assembly.		N/A
M.6.3	**Instructions for assembly and operation**		N/A
	The manufacturer shall provide adequate instructions with the RDC-M-unit. These instructions shall cover at least the following:		N/A
	– reference to the type(s) and catalogue number(s), covering current and voltage ratings, number of poles, etc. of the circuit-breakers or RCDs with which the RDC-M-unit is designed to be assembled; the number of paths of the circuit breaker or RCD corresponds to the number of paths of the RDC-M-unit. A neutral terminal or link may take the place of the neutral pole of a circuit-breaker or RCD.		N/A
	– this RDC-M-unit is intended to be used with an RCD of at least type A, if applicable;		N/A
	– de-rating factor, if any;		N/A
	– method of assembly;		N/A
	– need for checking operation after assembly to verify the mechanical operation.		N/A
M.7	**Constructional requirements**		—

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
M.7.1	**General**		N/A
	The design shall be such that it shall be possible to assemble the RDC-MD on site. Design may be such that the device may be disassembled on site in accordance with the manufacturer's instructions.		N/A
	For devices declared not suitable for disassembling, the disassembly shall leave permanent visible damage.		N/A
	Compliance is checked according to M.8.3.		N/A
M.7.3	**Mechanical requirements**		N/A
	The circuit-breaker or RCD and the RDC-M-unit shall fit together readily in the correct manner, and the design shall be such as to prevent an incorrect assembly.		N/A
	There shall be no loose parts for coupling the tripping mechanisms.		N/A
	Fixing means for assembly shall be captive.		N/A
	Terminal covers, if any, are not covered by this requirement.		N/A
M.7.4	**Electrical compatibility**		N/A
	It shall not be possible to use a circuit-breaker or an RCD of a given rated voltage with an RDC-M-unit of a lower rated voltage.		N/A
	It shall not be possible to associate a circuit-breaker or an RCD of a given rated current with a RDC-M- unit of a lower maximum current (see M.6.2.2).		N/A
	The terminals of the RDC-M- unit shall be able to clamp the range of nominal cross-sections of conductors specified in Table 5 of IEC 60898-1:2015 or in Table 6 of IEC 61008-1:2013 or in Table 6 of IEC 61009-1:2010 with which it is designed to be assembled.		N/A
	It shall not be possible to associate a circuit-breaker or an RCD of a given rated short-circuit capacity with an RDC-M-unit so as to result in a lower short-circuit performance.		N/A
	Compliance is checked by inspection and manual test.		N/A
M.8	**Type tests and verifications**		—
M.8.1	**Tests on RDC-M-units**		N/A
	The RDC-M- units shall comply with the following type tests specified in Table 9: tests of 9.3, 9.4, 9.5, 9.13, 9.14 and 9.15 (if applicable).		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.8.2	**Tests on assembled RDC-MDs**		N/A
	In case of RDC-M-units intended to be assembled with several protective devices, the testing procedure has to be		N/A
	- either repeated with each protective device declared by the manufacturer		N/A
	- or the most stringent tests among all applicable standards shall be applied only once but the acceptance criteria combines any acceptance criteria of any applicable standard.		N/A
	The type tests specified in Table 9 apply to RDC-MDs covered by this annex except as follows:		N/A
	– 9.3, 9.5, 9.13 and 9.14 do not apply;		N/A
	– 9.4: tests shall be made on the interconnections between the circuit-breaker or RCD and the RDC-M-unit.		N/A
M.8.3	**Verification of marking and constructional requirements of RDC-MDs**		N/A
	Compliance with the requirements of M.6.1, M.6.2, M.6.3, M.7.1, M.7.2, M.7.3 and M.7.4 shall be checked by inspection and manual test, as applicable.		N/A
	For devices declared suitable to be disassembled, compliance with the requirements of M.7.1 is checked by the following test to be performed at the beginning of test sequence D_0 in Table A.1.		N/A
	The number of samples shall be in accordance with test sequence D_0 + D_1 in Table A.3.		N/A
	The RDC-M-unit and compatible circuit-breakers or RCDs, as declared by the manufacturer, have to be assembled and disassembled 5 times. The RDC-M-unit and the compatible circuit breaker or RCDs are then reassembled and used for the test of test sequence D_0. After each assembly, the correct operation of the combination shall be verified for RCDs by using the test button and for circuit breakers with the upper limit of the instantaneous tripping current.		N/A
	The RDC-MD shall trip each time.		N/A
M.9	**Routine tests on the RDC-M-unit**		N/A
	Annex D applies, but the tests shall be made on the RDC-M-units in association with a test circuit breaker or RCD adjusted to the most onerous conditions.		N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict

	ANNEX N (NORMATIVE) ADDITIONAL REQUIREMENTS AND TESTS FOR RDC-MDS ACCORDING TO CLASSIFICATION 4.1.1.3 CONSISTING OF AN RDC-MD MODULE ELECTRICALLY COUPLED TO A SEPARATE SWITCHING DEVICE OR A PROTECTIVE DEVICE		
N.1	**Scope**		—
	This annex applies to RDC-MDs consisting of residual direct current detection and monitoring module electrically coupled to a separate switching or protective device.		—
	The manufacturer shall declare which detection, monitoring and switching or protective device(s) are suitable to be connected together.		—
	The main body of this document applies in all respects to devices covered by this annex, unless otherwise specified.		—
N.5	**Characteristics**		—
	Clause 5 of this document applies with the following modification:		—
N.5.1	**Summary of characteristics**		—
Replace	– rated current In (see 5.2.2);		—
by	– maximum rated current of the monitored circuit.		—
N.6	**Marking and other product information**		—
N.6.1	**Marking of the RDC-M Module**		**N/A**
	Clause 6 applies with the following specifications together with Table N.1:		N/A
	– The RDC-M module shall be marked with the following items, with reference to Clause 6 of this standard:		N/A
	a) manufacturer's name or trademark .....:		N/A
	b) type designation, catalogue number or serial number .....:		N/A
	c) rated voltage(s) (V) .....:		N/A
	e) rated current (A) .....:		N/A
	f) rated residual DC operating current (A) .....:		N/A
	g) marking with lowest temperature value.....:		N/A
	j) degree of protection .....:		N/A
	k) position of use .....:		N/A
	m) operating means of test device .....:		N/A
	n) wiring diagram .....:		N/A
	– If the detection module and the monitoring module of a RDC-M modules are separate, both shall be marked with the following items, with reference to Clause 6 of this document:		N/A
	a) manufacturer's name or trademark :		N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	b) type designation, catalogue number or serial number :		N/A
	c) rated voltage(s) (V) :		N/A
	e) rated current (A) :		N/A
	g) marking with lowest temperature value :		N/A
	j) degree of protection :		N/A
	Furthermore, the monitoring module of a RDC-MD in separate modules module shall be marked with the items f), m) and n).		N/A
	f) rated residual DC operating current (A) :		N/A
	m) operating means of test device :		N/A
	n) wiring diagram :		N/A
	k) position of use .....:		N/A
	It is recommended to mark the references of the circuit-breakers with which the RDC-MD can be assembled.		N/A
N.6.2	**Instructions for assembly and operation**		N/A
	The manufacturer of the RDC-MD shall provide adequate instructions. These instructions shall cover at least the following:		N/A
	– reference to the type(s) and catalogue number(s), covering current and voltage ratings, number of poles, etc. of the switching or protective devices with which the RDC-MD is designed to be connected;		N/A
	– for RDC-MD in separate modules, reference to the type(s) and catalogue number(s) of the required current transformer (CT) and monitoring module, as applicable;		N/A
	– method of connection/assembly;		N/A
	– need for checking operation after connection/assembly to verify operation.		N/A
	The manufacturer of the modular RDC-MD shall provide adequate instructions. These instructions shall cover at least the following:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– reference to the type(s) and catalogue number(s), covering current and voltage ratings, number of poles, etc. of the switching or protective devices with which the modular RDC-M module is designed to be connected;		N/A
	– the conditions to be observed for the connection between the monitoring module and the switching or protective device, as applicable;		N/A
	– for RDC-M modules in separate modules, reference to the type(s) and catalogue number(s) of the required detection module and monitoring module, as applicable;		N/A
	– for a separate detection module, the details of the current transformer (CT) including the conditions for connection to the monitoring module (cable type, length etc.);		N/A
	– for a through-conductor type modular RDC-MD, the dimensions of the conductor aperture and the position of the through-conductors relative to the detection unit;		N/A
	– distances to be respected with regard to nearby conductors, as applicable;		N/A
	– the SCPDs to be associated with the Modular RDC-MD, as applicable, to achieve the rated conditional short-circuit current or rated residual short-circuit current;		N/A
	– de-rating factor, if any;		N/A
	– need for checking operation after connection/assembly to verify operation.		N/A
N.7	**Constructional requirements**		—
N.7.1	**Degree of protection**		
	The degree of protection of the RDC-MD detection and monitoring modules shall be not less than that of the switching or protective device with which they are to be assembled.		N/A
N.7.2	**Electrical compatibility**		N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	The detection, monitoring and switching or protective device shall be electrically compatible. Terminals shall be suitable for the associated current rating of the assembly.		N/A
	Compliance is checked by inspection and manual test.		N/A
N.8	**Type tests and verifications**		—
N.8.1	**Tests on RDC-M-module**		N/A
	The tests specified in Table 9 shall be applied in order to show conformity to this document.		N/A
	In case of RDC-M-module intended to be assembled with several switching or protective devices, the testing procedure has to be		N/A
	– either repeated with each device declared by the manufacturer		N/A
	– or the most stringent tests among all applicable standards shall be applied only once but the acceptance criteria combines any acceptance criteria of any applicable standard.		N/A
	The type tests specified in Table 9 apply to RDC-M-module covered by this annex as follows:		N/A
	– 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.13, 9.14 and 9.22 apply only to the RDC-M-module, however, where applicable, the switching or protective device is connected as in normal use;		N/A
	– 9.9, 9.10, 9.11, 9.16, 9.18, 9.19, 9.20 and 9.21 apply to the RDC-M-module and switching or protective devices connected as in normal use; additionally 9.17, only if applicable;		N/A
	– 9.12 shall be performed on each RDC-M-module;		N/A
	– 9.15 do not apply.		N/A
N.8.2	**Verification of marking and constructional requirements of RDC-M-module**		N/A
	Compliance with the requirements of N.6.1, N.6.2, N.7.1 and N.7.2 shall be checked by inspection and manual test, as applicable.		N/A
N.8.3	**Verification of behaviour in case of disconnection of the external detection module**		N/A
	This test is only applicable to M-module with facility for connection of an external detection module.		N/A
	The external detection module is connected to the monitoring module as in normal use as prescribed by the manufacturer.		N/A
	The M-module is connected as for normal use and supplied with rated supply voltage.		N/A

IEC 62955			
Clause	Requirement + Test	Result - Remark	Verdict
	There shall be no smooth DC residual current flowing in the external detection.		N/A
	The external detection module is then disconnected and the M-module shall cause opening of the switching or protective device within 10 s.		N/A
N.9	**Routine tests on the RDC-M-module**		N/A
	Annex D applies, but the tests shall be made on the M-module in association with a test switching or protective device adjusted to the most unfavourable conditions.		N/A

END of TEST REPORT