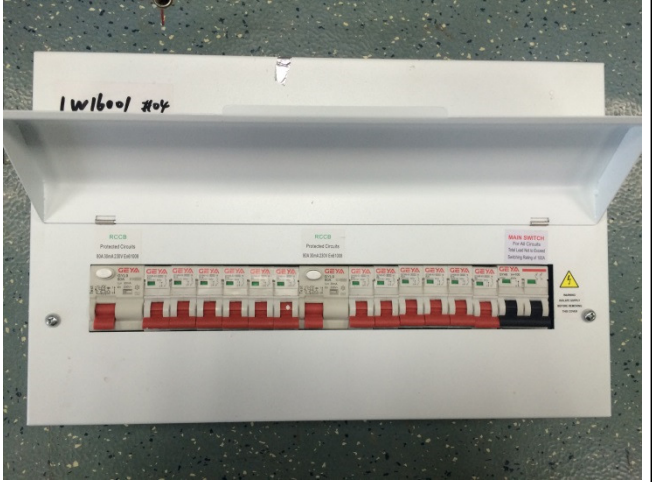


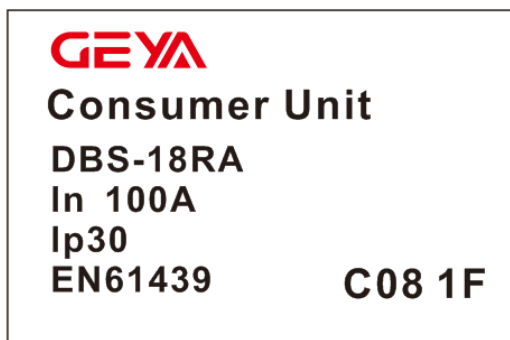
Prüfbericht-Nr.: <i>Test Report No.:</i>	15093455 001	Auftrags-Nr.: <i>Order No.:</i>	154144278	Seite 1 von 67 Page 1 of 67	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	28.01.2016		
Auftraggeber: <i>Client:</i>	Zhejiang GEYA Electrical Co., Ltd. Wenzhou Brige Industrial Zone, Beibaixiang Town, Yueqing, Zhejiang 325603, P. R. China				
Prüfgegenstand: <i>Test item:</i>	Metallic Consumer Unit				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	DBS series				
Auftrags-Inhalt: <i>Order content:</i>	CE-LVD approval				
Prüfgrundlage: <i>Test specification:</i>	EN 61439-3: 2012 / BS EN 61439-3: 2012				
Wareneingangsdatum: <i>Date of receipt:</i>	03.01.2016				
Prüfmuster-Nr.: <i>Test sample No.:</i>	N/A				
Prüfzeitraum: <i>Testing period:</i>	05.01.2016 to 28.01.2016				
Ort der Prüfung: <i>Place of testing:</i>	The Low Voltage Apparatus Laboratory of Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality (ZTME)				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:		kontrolliert von / reviewed by:			
29.01.2016	Ma Rui / PE		29.01.2016	Wencai Zhang / Reviewer	
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	
					
				Unterschrift <i>Signature</i>	
Sonstiges / Other:					
This report is created with TRF of IEC61439_3A.					
Attachment 1: Deviation test between IEC 61439-3: 2012 and BS EN 61439-3: 2012 (5 pages)					
Attachment 2: Equipment list (1 page)					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	
Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable	
				5 = mangelhaft N/T = nicht getestet	
				5 = poor 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.					
<i>This test report only relates to the a. m. 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.</i>					



TEST REPORT IEC 61439-3 Low-voltage switchgear and controlgear assemblies - Part 3: Distribution boards intended to be operated by ordinary persons (DBO)	
Report reference No. : 15093455 001 Date of issue..... : See cover page Total number of pages : See cover page	
Applicant's name : Zhejiang GEYA Electrical Co., Ltd. Address..... : Wenzhou Brige Industrial Zone, Beibaixiang Town, Yueqing, Zhejiang 325603, P. R. China	
Test specification: Standard..... : IEC 61439-3:2012 (First Edition) for use in conjunction with IEC 61439-1:2011 (Second Edition) Test procedure : CE-LVD approval Non-standard test method : N/A	
Test Report Form No. : IEC61439_3A Test Report Form(s) Originator : VDE Master TRF : Dated 2013-05 Copyright © 2013 Worldwide System for Conformity Testing and Certification of Electrotechnical Equipment and Components (IECEE), Geneva, Switzerland. All rights reserved. This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed. This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.	
Test item description..... : Metallic Consumer Unit Trade Mark..... : GEYA Manufacturer : Zhejiang GEYA Electrical Co., Ltd. Model/Type reference : DBS series Ratings : Ue = 230V AC; I_{NA} = 100A; Ui = 500V; IP30; Rated conditional short-circuit current: 16kA	

Testing procedure and testing location:		
☒	Testing Laboratory:	The Low Voltage Apparatus Laboratory of Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality (ZTME)
Testing location/ address		No 125 Miaohouwang Road Binjiang District Hangzhou Zhejiang CHINA
☐	Associated CB Laboratory:	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature) ...:		
☐	Testing procedure: TMP	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature) ...:		
☐	Testing procedure: WMT	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name + signature) ..:		
Approved by (name + signature) ...:		
☐	Testing procedure: SMT	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature) ...:		
Supervised by (name + signature) :		
☐	Testing procedure: RMT	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature) ...:		
Supervised by (name + signature) :		

List of Attachments (including a total number of pages in each attachment): Attachment 1: Deviation test between IEC 61439-3: 2012 and BS EN 61439-3: 2012 (1 page) Attachment 2: Equipment list (1 page)	
Summary of testing: Based on the General product information on page 6, DBS-18RA with the maximum dimension and representative circuit of ASSEMBLY was selected as samples under all testing items to cover the other types. All test items passed.	
Tests performed (name of test and test clause): All the other tests	Testing location: The Low Voltage Apparatus Laboratory of Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality (ZTME)
Summary of compliance with National Differences: N/A List of countries addressed: ☒ The product fulfils the requirements of EN 61439-3: 2012 ☒ The product fulfils the requirements of BS EN 61439-3: 2012	

Copy of marking plate:**DBS-18RA as example.****Code of date of manufacture (C08 1F as example)****C08 1F: month day, year****C: stands for 3--March****F: stands for 6****C08 1F: Mar 08, 2016**

Test item particulars	Metallic Consumer Unit
Classification of installation and use	For fixed installation and indoor use
Supply Connection	Fixed wiring
.....	:
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	03.01.2016
Date (s) of performance of tests.....	05.01.2016 to 28.01.2016
General remarks:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(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. Note TRF originator: Due to the different methods for design verification, it is left open if the tables at the end of the TRF are used or if separate reports are created for the test results. To prove compliance, the essential data shall be provided. The product fulfils the requirements of: N/A	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:	
The application for obtaining a CB Test Certificate ☐ Yes includes more than one factory location and a ☒ Not applicable declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	
When differences exist, they shall be identified in the General product information section.	
Name and address of factory (ies)	Zhejiang GEYA Electrical Co., Ltd. / Wenzhou Brige Industrial Zone, Beibaixiang Town, Yueqing, Zhejiang 325603, P. R. China

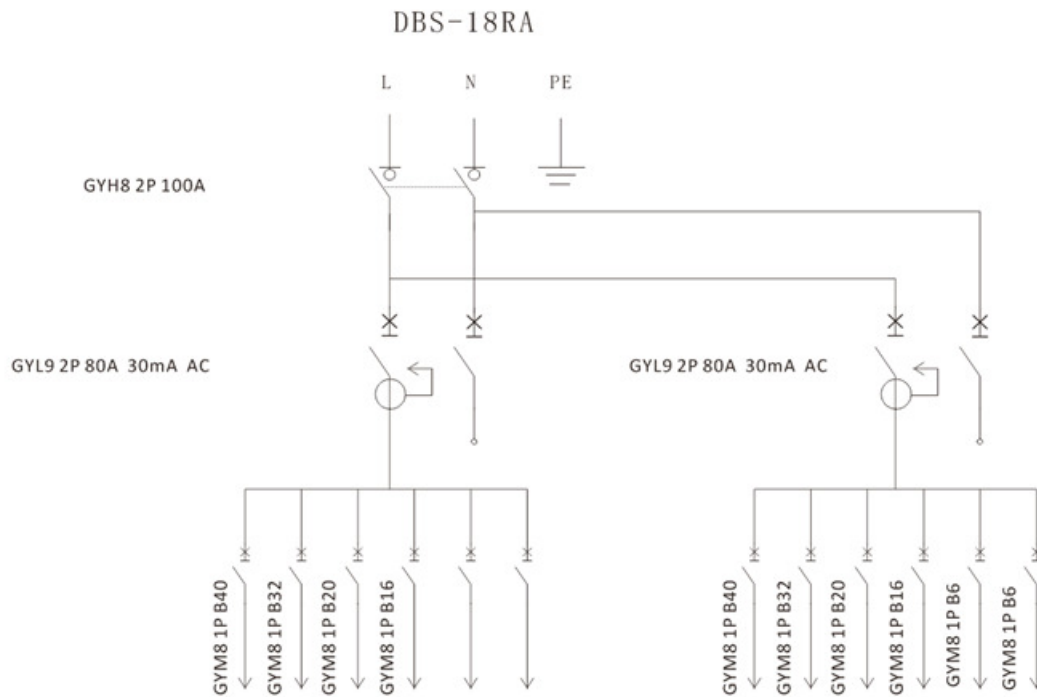
General product information:
Wall-mounting indoor use;
U_e = 230V AC; I_{nA} = 100A; U_i = 500V; IP30; Rated conditional short-circuit current: 16kA

Type nomenclature :

DBS-xy series	
x stands for	Number of modules 1; 3; 5; 6; 8; 10; 14; 16; 18;
y stands for	Different Circuit RA; MS; RCD; S

Model	Description and Specifications
DBS -1MS	Only with 1 pcs 2P GYH8/100A
DBS -1RCD	With 1 pcs GYL9/2P/63A/AC30mA 6kA
DBS-3RA	With 1 pcs GYL9/2P/63A/AC30mA + 1pcs GYM8-1P-B40
DBS -5RA	With 1pcs GYL9/2p/63A/AC30mA +1pcs GYM8-1P-B32+1pcs GYM8-1P-B6
DBS -6MS	Only with 1 pcs 2P GYH8/100A
DBS -6RCD	With 1 pcs GYL9/2P/63A/AC30mA 6kA
DBS -8MS	Only with 1 pcs 2P GYH8/100A
DBS -8RCD	With 1 pcs GYL9/2P/63A/AC30mA 6kA
DBS -10S	With 2 pcs GYL9/2P/80A/AC30mA + 1pcs GYH8/2P100A
DBS-10MS	Only with 1 pcs 2P GYH8/100A
DBS-10RCD	With 1 pcs GYL9/2P/80A/AC30mA 6kA
DBS -14S	With 2 pcs GYL9/2P/80A /AC30mA +1 pcs GYH8/2P100A
DBS-14MS	Only with 1 pcs 2P GYH8/100A
DBS -14RA	With 2pcs GYL9/2P80A AC30mA+GYM8-1pcs 40A,1pcs 32A,2 pcs16A, 2pcs6A,+1 pcs GYH8/2P100A
DBS-14RCD	With 1 pcs GYL9/2P/80A/AC30mA 6kA
DBS -16S	With 2 pcs GYL9/2P80A AC 30mA +1 pcs GYH8/2P100A
DBS -16MS	Only with 1 pc 2P GYH8/100A
DBS -16RA	With 2pcs GYL9/2P80A AC30mA+GYM8-1pcs 40A,2pcs 32A,1pcs 20A,2 pcs16A, 2pcs6A,+1 pcs GYH8/2P100A
DBS -16RCD	With 1 pcs GYL9 2P 80A 30mA AC 6kA
DBS -18S	With 2 pcs GYL9/2P80A AC 30mA +1 pcs GYH8/2P100A
DBS-18MS	Only with 1 pcs 2P GYH8/100A
DBS -18RA	With 2pcs GYL9/2P80A AC30mA+GYM8-2pcs 40A,2pcs 32A,2pcs 20A,2 pcs16A, 2pcs6A,+1 pc GYH8/2P100A
DBS-18RCD	With 1 pcs GYL9/2P/63A/AC30mA 6kA

Representative circuit of DBS-18RA:



IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
5	INTERFACE CHARACTERISTICS		P
5.2	Voltage ratings		
	Rated voltage (U_n) (of the ASSEMBLY)	230V	P
	Rated operational voltage (U_e) (of a circuit of an ASSEMBLY)	230V	P
	Rated insulation voltage (U_i) (of a circuit of an ASSEMBLY)	500V	P
	Rated impulse withstand voltage (U_{imp}) (of the ASSEMBLY)	4000V	P
	DGO's comply with minimum overvoltage category III according IEC 60364-4-44	III	P
5.3	Current ratings		P
	Rated current of the ASSEMBLY (I_{nA})	100A	P
	Rated current of a circuit (I_{nc})	80A...40A...32A...20A...6A	P
	Rated peak withstand current (I_{pk})		N/A
	Rated short-time withstand current (I_{cw}) (of a circuit of an ASSEMBLY)	≤10kA	P
	Rated conditional short-circuit current of an ASSEMBLY (I_{cc})	16kA	P
5.4	Rated diversity factor (RDF)		P
	Based on the values in table 101 or agreement between manufacturer and user	0,5	P
5.5	Rated frequency (f_n)		P
5.6	Other characteristics		P
	a) additional requirements (e.g. type of coordination, overload characteristics);		N/A
	b) pollution degree	2	P
	c) types of system earthing		N/A
	d) indoor and/or outdoor installation	indoor installation	P
	e) stationary or movable	Stationary	P
	f) degree of protection.....	IP30	P
	g) intended for use by skilled or ordinary persons....	By ordinary persons	P
	h) electromagnetic compatibility (EMC) classification	Environmental condition A	P
	i) special service conditions, if applicable		N/A

IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	j) external design..... :	Wall-mounted surface type ASSEMBLY	P
	k) mechanical impact protection, if applicable..... :	IK07, specified by the client	P
	l) type of construction - fixed, removable or withdrawable parts :	Fixed	P
	m) nature of short-circuit protective device(s) :		N/A
	n) measures for protection against electric shock... :		P
	o) overall dimensions (including projections e.g handles, covers, doors), if required :	See "General product information" on page 7	P
	p) the weight, if required..... :		N/A
	q) type A or type B DBO	Type B	P
6	INFORMATION		P
6.1	ASSEMBLY designation marking		P
	Information regarding the ASSEMBLY provided on the designation label(s):		P
	a) ASSEMBLY manufacturer's name or trade mark	GEYA	P
	b) type designation or identification number or any other means of identification	DBS-18RA	P
	c) means of identifying date of manufacture		P
	d) IEC 61439-3	EN 61439-3	P
	e) rated current of the DBO	I _{NA} : 100A	P
	d) degree of protection if greater than IP 2XC	IP30	P
6.2	Documentation		P
6.2.1	Information relating to the ASSEMBLY		P
	All applicable interface characteristics according cl. 5, provided in technical documentation.		P
6.2.2	Instructions for handling, installation, operation and maintenance		P
	The ASSEMBLY manufacturer provides in documents or catalogues:		P
	Conditions for handling, installation, operation and maintenance and equipment contained		P
	proper and correct transport, handling, installation and operation		P
	provision of weight details		P
	correct location and installation of lifting means and the thread size of lifting attachments		P

IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	The measures to be taken, if any, with regard to EMC		N/A
	If an ASSEMBLY specifically intended for environment A is to be used in environment B a warning is included		N/A
	Circuitry - suitable information is supplied, e. g. wiring diagrams or tables.		P
6.3	Device and/or component identification		P
	it is possible to identify individual circuits and their protective devices.		P
	Identification tags are legible, permanent and appropriate		P
	Any designations used are according IEC 61346-1 and IEC 61346-2 and identical to wiring diagrams, in accordance with IEC 61082-1.		P
7	SERVICE CONDITIONS		P
7.1	Normal service conditions		P
7.1.3	Pollution degree		P
	A minimum pollution degree 2 applies for DBO	2	P
7.1.4	Altitude		P
	The altitude of installation site not exceed 2 000 m.		P
7.2	Special service conditions		N/A
	Special service conditions, agreements manufacturer and user.		N/A
	a) values of temperature, relative humidity and/or altitude differing from those specified in 7.1		N/A
	b) exceptional condensation inside the ASSEMBLY		N/A
	c) heavy pollution		N/A
	d) exposure to strong electric or magnetic fields		N/A
	e) exposure to extreme climatic conditions		N/A
	f) attack by fungus or small creatures		N/A
	g) fire or explosion hazards		N/A
	h) heavy vibration, shocks, seismic occurrences		N/A
	i) current-carrying capacity or breaking capacity affected		N/A

IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	j) exposure to conducted and radiated disturbances other than described in 9.4		N/A
	k) exceptional overvoltage conditions		N/A
	l) harmonics in the supply voltage or load current		N/A
7.3	Conditions during transport, storage and installation		N/A
	transport, storage and installation conditions differ from 7.1.		N/A
8	CONSTRUCTIONAL REQUIREMENTS		P
8.1	Strength of materials and parts		P
	Materials capable of withstanding mechanical, electrical, thermal and environmental stresses		P
8.1.2	Protection against corrosion		P
	Corrosion prevented by use of suitable materials, coatings. Compliance checked by 10.2.2.		P
8.1.3	Properties of insulating materials		P
8.1.3.1	Thermal stability		P
	For enclosures or parts of enclosures made of insulating materials, thermal stability is verified according to 10.2.3.1.		P
8.1.3.2	Resistance of insulating materials to heat and fire		P
8.1.3.2.2	Resistance of insulating materials to heat		P
	Compliance either by reference to the insulation temperature index (determined for example by the methods of IEC 60216) or by compliance with IEC 60085.		P
8.1.3.2.3	Resistance of insulating materials to abnormal heat and fire due to internal electric effects		P
	Insulating materials withstand glow-wire test in 10.2.3.3.		P
	Alternative test method for small parts		P
8.1.4	Resistance to ultra-violet radiation		N/A
	External insulating materials for outdoor use resistive to ultra-violet radiation according to 10.2.4.		N/A
8.1.5	Mechanical strength		P
	All enclosures, locking means, etc. have sufficient mechanical strength (see also 10.13).		P

IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	The mechanical operation of removable parts, including any insertion interlock, is verified by test according to 10.13.		P
8.1.6	Lifting provision		N/A
	Provision for lifting complies with 10.2.5.		N/A
8.2	Degree of protection provided by an ASSEMBLY enclosure		P
8.2.1	Protection against mechanical impact		P
	The DBO complies with IK codes according to IEC 62262. Compliance verified according to 10.2.6.		P
	- IK 05 for a DBO for indoor use		N/A
	- IK 07 for a DBO for outdoor use	IK07, specified by client	P
8.2.2	Protection against contact with live parts, ingress of solid foreign bodies and liquids		P
	IP code verified according to 10.3		P
	IP degree for indoor at least 2XC after installation	IP30	P
	IP degree for outdoor at least IP X3.		N/A
	IP rating for separate parts		N/A
	Enclosed ASSEMBLIES, for use in locations with high humidity and temperatures varying within wide limits, are provided with suitable arrangements to prevent harmful condensation		N/A
	Suitable arrangements (ventilation and/or internal heating, drain holes, etc.) are available		P
	The specified degree of protection is maintained.		N/A
8.2.3	Assembly with removable parts		N/A
	measures to ensure adequate protection given		N/A
	Shutters prevented from unintentional removal.		N/A
8.3	Clearances and creepage distances		P
	clearances and creepage distances of equipment comply with their product standard.		P
8.3.2	Clearances		P
	Clearances as specified in IEC 61439-1, table 1 or design verification test and routine impulse withstand voltage test according 10.9.3 and 11.	see table 8.3	P
8.3.3	Creepage distances		P
	Creepage distances according to IEC 61439-1 in table 2. The creepage distances are not less than the associated minimum clearances.	see table 8.3	P

IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
8.4	Protection against electric shock		P
8.4.1	General		P
	Arrangement ensures necessary degree of safety.		P
8.4.2	Basic protection		P
	Basic protection achieved by appropriate constructional measures or during installation.		P
	Manufacturer provides relevant information.		P
8.4.2.2	Basic insulation provided by insulating material		P
	Hazardous live parts completely covered with insulation, only removable by destruction or tool.		P
	Insulation suitable		P
	Paints, varnishes and not used as basic insulation.		P
8.4.2.3	Barriers or enclosures		P
	Air insulated live parts at least IP XXB.		N/A
	Horizontal top surfaces of accessible height $\leq 1,6$ m at least IP XXD.		N/A
	Barriers and enclosures firmly secured in place		P
	distance between conductive barrier or enclosure and live parts not less than distances in 8.3.		P
	For removal, opening enclosures one of conditions a) to c) is fulfilled:		P
	a) use of a key or tool		P
	b) restoration of supply possible only after replacement or reclosure.		N/A
	In TN-C systems, PEN conductor not switched		N/A
	c) Intermediate barrier removable only by key or tool		N/A
8.4.3	Fault protection		P
8.4.3.1	Installation conditions		P
	protective measures according IEC 60364-4-41		P
	For TT system incoming circuits fulfil a) or b)		N/A
	a) double or reinforced insulation		N/A
	b) RCD protection		N/A
8.4.3.2	Requirements for the protective conductor to facilitate automatic disconnection of the supply		P
8.4.3.2.1	General		P

IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	protective conductor for automatic disconnection provided		P
8.4.3.2.2	Requirements for earth continuity providing protection against the consequences of faults within the ASSEMBLY		P
	exposed conductive parts connected together and to the protective conductor of the supply		P
	Connections achieved by metal screwed connections, welding or other conductive connections or separate protective conductor.		P
	For the continuity of these connections the following is applied:		P
	a) When a part is removed, protective circuits not interrupted. Means are sufficient for permanent conductivity.		P
	Flexible or pliable metal conduits not used as protective conductors unless designed therefore		P
	b) Sufficient connection of lids, doors, cover plates, etc. If apparatus with voltages exceeding ELV is attached, sufficient PE conductor acc tab 3 is assembled		N/A
	Removable parts equipped with a metal supporting surface, sufficient pressure ensured		N/A
8.4.3.2.3	Requirements for protective conductors providing protection against the consequences of faults in external circuits supplied through the ASSEMBLY		N/A
	Protective conductor capable of stresses by external faults.		N/A
	Protective conductors don't include disconnecting device , except the following: - Links only with access limited or by tool - Connectors: Interruption of PE last break, first make		N/A
	Conductors to voltage-operated fault detection devices insulated		N/A
	cross-sectional area not less than value calculated from Annex B		N/A
	For PEN conductors, the following additional requirements apply:		N/A
	– minimum cross-sectional area 10 mm ² copper or 16 mm ² aluminium		N/A
	–PEN conductor cross-sectional area not less than for neutral conductor		N/A

IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	– structural parts, except mounting rails, not used as a PEN conductor		N/A
8.4.3.3	Electrical separation		N/A
	see Annex K		N/A
8.4.4	Protection by total insulation		N/A
	For protection, by total insulation, against indirect contact the following requirements are met:		N/A
	a) Enclosure completely of insulating material and carrying symbol  visible from outside.		N/A
	b) Fault voltages not possible , if enclosure pierced by conducting parts		N/A
	c) All live parts enclosed, at least IP 2XC		N/A
	Assemblies for protective conductor through-wiring have terminals and are marked adequately.		N/A
	Inside the enclosure, the protective conductor and its terminals insulated		N/A
	d) Exposed conductive parts not connected to the protective circuit		N/A
	e) barrier of insulating material against unintentional contact and not removable without tool		N/A
8.4.5	Limitation of steady-state touch current and charge		N/A
	Warning plate for steady-state touch current and charges		N/A
8.4.6	Operating and servicing conditions		P
8.4.6.1	Devices to be operated or components to be replaced by ordinary persons		P
	Protection against contact with live parts maintained when operating devices or replacing components.		P
8.4.6.2	Requirements related to accessibility in service by authorized persons		N/A
	interlock automatically restored		N/A
8.4.6.2.2	Requirements related to accessibility for inspection and similar operations		N/A
	Operations in service and under voltage performable		N/A
	Such operations may consist of:		N/A
	– visual inspection		N/A
	– adjusting and resetting of relays, releases and electronic devices		N/A
	– replacement of fuse-links		N/A

IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	– replacement of indicating lamps		N/A
	– certain fault location operations, e. g. measuring		N/A
8.4.6.2.3	Requirements related to accessibility for maintenance		N/A
	maintenance on isolated functional unit or isolated group of functional units, necessary measures are enabled		N/A
	Such measures may include:		N/A
	– sufficient space		N/A
	– use of barriers or obstacles		N/A
	– use of terminal shields		N/A
	– use of compartments		N/A
	– insertion of additional protective means		N/A
8.4.6.2.4	Requirements related to accessibility for extension under voltage		N/A
	extension with additional functional units or groups, with the rest of the ASSEMBLY still under voltage		N/A
8.4.6.2.5	Obstacles		N/A
	This subclause of Part 1 does not apply.		N/A
8.5	Incorporation of switching devices and components		P
8.5.1	Fixed parts		P
	For fixed parts, the connections of the main circuits is only connected or disconnected when the ASSEMBLY is not under voltage.		P
	Removal and installation of fixed parts requires the use of a tool.		P
	The disconnection of a fixed part requires the isolation of the complete ASSEMBLY or part of it.		P
8.5.2	Removable and withdrawable parts		N/A
	The removable and withdrawable parts can be safely isolated from or connected to the main circuit .		N/A
	clearances and creepage distances comply during transfer		N/A
	Removable parts fitted with a device, which ensures that it can only be removed and inserted after its main circuit has been switched off from the load.		N/A
	unauthorized operation prevented		N/A
8.5.3	Selection of switching devices and components		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Switching devices and components comply with the relevant IEC standards.	See attachment Table 11	P
	Switching devices and components suitable for application		P
	Switching devices and components with insufficient short-circuit withstand strength and/or a breaking capacity protected by means of current-limiting protective devices		P
	Co-ordination of current-limiting protective devices		P
	Co-ordination of switching devices and components		P
	Outgoing circuits contain protective devices, intended to be operated by ordinary persons		P
	Re-closing of the incoming protective device not complying with the above standards, require a key or tool or instruction label		N/A
	Modifications on circuit breaker settings not possible without tool and visible indication		P
	Incoming protective device contains fuse-links not complying with IEC 60269-3, a key or is required for access		N/A
8.5.4	Installation of switching devices and components		P
	Switching devices and components installed and wired in accordance with instructions and proper function not impaired		P
	When fuses are installed the original manufacturer states the type and rating of the fuselinks to be used.	See attachment Table 10	N/A
8.5.5	Accessibility		P
	Adjusting and resetting devices easily accessible.		P
	Functional units on the same support so arranged as accessible for mounting, wiring, maintenance and replacement.		P
	Following accessibility requirements associated with floor-mounted ASSEMBLIES apply:		N/A
	- Terminals so placed that the cables can easily connected		N/A
	- Indicating instruments within a zone between 0,2 m and 2,2 m above the base		N/A
	- Operating devices centreline located within a zone between 0,2 m and 2 m		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- Actuators for emergency switching devices are accessible within a zone between 0,8 m and 1,6 m		N/A
8.5.6	Barriers		P
	Barriers for manual switching devices are so designed that the switching emissions do not present a danger to the operator.		P
	To minimize danger when replacing fuse-links, interphase barriers are applied		N/A
8.5.7	Direction of operation and indication of switching positions		P
	The operational positions of components and devices are clearly identified.		P
8.5.8	Indicator lights and push-buttons		N/A
	Unless otherwise specified in the relevant product standard the colours of indicator lights and push-buttons are in accordance with IEC 60073.		N/A
8.6	Internal electrical circuits and connections		P
8.6.1	Main circuits		P
	The busbars (bare or insulated) are arranged in such a manner that an internal short-circuit is not to be expected.		P
	They are rated at least in accordance with the information concerning the short-circuit withstand strength and designed to withstand at least the short-circuit stresses limited by the protective device(s) on the supply side of the busbars.		P
	minimum cross-sectional area of the neutral within a three phase and neutral circuit is:		N/A
	- For circuits with a phase conductor cross-sectional area up to and including 16 mm ² , 100 % of that of the corresponding phases		N/A
	- For circuits with a phase conductor cross-sectional area above 16 mm ² , 50 % of that of the corresponding phases with a minimum of 16 mm ²		N/A
	neutral currents not exceed 50 % of phase currents.		N/A
8.6.2	Auxiliary circuits		N/A
	Faults do not cause unintentional dangerous operation.		N/A
	auxiliary circuits are protected against the effects of short circuits.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	However, a short-circuit protective device is not provided if its operation is liable to cause a danger. In such a case, the conductors of auxiliary circuits are arranged in such a manner that a short-circuit is not to be expected (see 8.6.4).		N/A
8.6.3	Bare and insulated conductors		P
	current-carrying parts not suffer undue alteration		P
	effects of thermal expansion , electrolytic action		P
	connections: sufficient and durable contact pressure		P
	selection of conductors and their cross-sections		P
	minimum cross-section according to IEC 60364-5-52		P
	In the case of insulated solid or flexible conductors:		P
	- rated for insulation voltage of circuit		P
	- Conductors connecting two termination points have no intermediate joint, e.g. spliced or soldered		P
	- basic insulated conductors prevented from coming into contact with bare live parts at different potentials		P
	- Contact of conductors with sharp edges prevented		P
	mechanical damage can occur by moving covers or doors		P
	- Soldered connections only where provision is made for this type of connection		N/A
	- For other apparatus ,soldering cable lugs or soldered ends of stranded conductors are not used under conditions of heavy vibration.		N/A
	In locations where heavy vibrations exist during normal operation, attention is given to the support of conductors		N/A
	- only one conductor connected to a terminal		N/A
	two or more conductors to one terminal only where the terminals are designed for this purpose.	Special preparation by the use of eyelets	P
	solid insulation between separate circuits based on the circuit of highest rated insulation voltage.		P
8.6.4	Selection and installation of non-protected live conductors to reduce the possibility of short-circuits		P
	Non protected live conductors installed so that an internal short-circuit between phases or between phase and earth is a remote possibility.		P
	Non-protected live conductors not exceed 3m length.		P

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Clause	Requirement + Test	Result - Remark	Verdict
8.6.5	Identification of the conductors of main and auxiliary circuits		P
	identification of conductors agrees with indications on the wiring diagrams and drawings.		P
	Where appropriate, identification according to IEC 60445 and IEC 60446 are applied		P
8.6.6	Identification of the protective conductor (PE, PEN) and of the neutral conductor (N) of the main circuits		P
	The protective conductor is readily distinguishable by location and/or marking or colour.		P
	only green and yellow for protective conductor.		P
	When the protective conductor is an insulated single-core cable, this colour identification is used		P
	Any neutral conductor of the main circuit is readily distinguishable by location and/or marking or colour. If identification by colour only is used, it is blue (see IEC 60445).		P
8.7	Cooling		N/A
	natural and active or forced cooling.		N/A
8.8	Terminals for external conductors		P
	The terminals are suitable for connection of copper or aluminium conductors, or both.		P
	The terminals provided sufficient contact pressure		P
	Terminals are capable of accommodating copper conductors from the smallest to the largest cross-sectional areas corresponding to the appropriate rated current.		P
	Where aluminium conductors are to be terminated, the type, size and termination method of the conductors are as agreed between the ASSEMBLY manufacturer and the user.		N/A
	The available wiring space permits proper connection		P
	The conductors are not subjected to stresses		P
	Terminals for the neutral conductor allow the connection of copper conductors having a current-carrying capacity:		N/A
	– equal to half the current-carrying capacity of the phase conductor, with a minimum of 16 mm ² ,		N/A
	– equal to the full current-carrying capacity of the phase conductor, if less than or equal to 16 mm ²		N/A

IEC 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	If connecting facilities for incoming and outgoing neutral, protective and PEN conductors are provided.		P
	They are arranged in the vicinity of the associated phase conductor terminals		P
	Openings so designed that, stated protective measures against contact and degree of protection are obtained.		P
	The terminals for external protective conductors are marked according to IEC 60445.		P
	The terminals for external protective conductors (PE, PEN) and metal sheathing of connecting cables are suitable for the connection of copper conductors.		P
	A separate terminal of adequate size is provided for the outgoing protective conductor(s) of each circuit.		P
	Terminals for protective having a cross-section depending on corresponding phase conductors.		P
	consideration to the danger of electrolytic corrosion if aluminium used		N/A
	The connecting means to ensure the continuity of the conductive parts with external protective conductors have no other function.		P
	Identification of terminals shall comply with IEC 60445.		P
	The number of neutral terminals not less than one outgoing terminal for each outgoing circuit requiring a neutral terminal.		P
	These Terminals are located or identified in the same sequence as their respective phase conductor terminals.		P
	DBOs are a minimum of two terminals for electrical installation protective bonding conductors.		P

9	PERFORMANCE REQUIREMENTS		P
9.1	Dielectric properties		P
9.1.2	Power-frequency withstand voltage		P
	withstanding temporary and transient overvoltages	see test 10.9	–
	The rated insulation voltage of any circuit equal higher than its maximum operational voltage.		P
9.1.3	Impulse withstand voltage		N/A
9.1.3.1	Impulse withstand voltages of main circuits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Clearances capable of withstanding the test voltage given appropriate to the rated impulse withstand voltage.	see test 10.9.3	—
	The rated impulse withstand voltage not less than that corresponding to the nominal voltage and appropriate overvoltage category in Annex G		N/A
9.1.3.2	Impulse withstand voltages of auxiliary circuits		N/A
	a) Auxiliary circuits without overvoltage reduction comply with 9.1.3.1.		N/A
	b) Auxiliary circuits not connected to main circuit capable of withstanding the appropriate impulse withstand voltage.		N/A
9.1.4	Protection of surge protective devices		N/A
	SPDs on main busbars protected to prevent uncontrolled short-circuit conditions		N/A
9.2	Temperature rise limits		P
	Currents can be carried without exceeding any temperature limits	see test 10.10	P
	No damages during test		P
	For insulating materials, the ASSEMBLY Manufacturer demonstrates compliance either by reference to the insulation temperature index (determined for example by the methods of IEC 60216) or by compliance with IEC 60085.		P
9.3	Short-circuit protection and short-circuit withstand strength		P
9.3.1	General		P
	ASSEMBLIES are capable of withstanding the thermal and dynamic stresses resulting from short-circuit currents not exceeding the rated values.	see test 10.11	P
	ASSEMBLIES protected against short-circuit currents		P
9.3.2	Information concerning short-circuit withstand strength		P
	For short-circuit protective device (SCPD) incorporated in the incoming unit, maximum value of prospective short-circuit current indicated.		N/A
	value does not exceed the appropriate rating(s) (see 5.3.4, 5.3.5 and 5.3.6). The corresponding power factor and peak values are those shown in 9.3.3.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	If a circuit breaker with time-delay release is used as the short-circuit protective device, settings corresponding		N/A
	where the short-circuit protective device is not incorporated in the incoming unit, short-circuit withstand strength indicated in one or more of the following ways:		P
	a) rated short-time withstand current (I_{cw}) together with the associated duration (see 5.3.5) and rated peak withstand current (I_{pk}) (see 5.3.4)		N/A
	b) rated conditional short-circuit current (I_{cc}) (see 5.3.6)	16kA	P
	characteristics of the short-circuit protective devices necessary for the protection indicated	BS 1361 type II fuse-links	P
	For several incoming units which are unlikely to be in operation simultaneously, the short-circuit withstand strength can be indicated for each of the incoming units in accordance with the above.		N/A
	incoming units likely operated simultaneously, and one incoming unit and one or more outgoing high-power units likely to contribute to the short-circuit current, prospective short-circuit current values determined in each incoming unit, in each outgoing unit and in the busbars		N/A
9.3.3	Relationship between peak current and short-time current		P
	For determining the electrodynamic stresses, the value of peak current is obtained by multiplying the r.m.s. value of the short-circuit current by the factor $\sqrt{2}$.		P
9.3.4	Co-ordination of protective devices		P
	co-ordination of protective devices agreed between manufacturer user or given in catalogue		P
	Selectivity of protective devices		P
	Series connected short-circuit protective devices: warning notice for replacing devices		P
9.4	Electromagnetic compatibility (EMC)		N/A
	For EMC related performance requirements, see J.9.4 of Annex J.		N/A
10	DESIGN VERIFICATION		P
10.2	STRENGTH OF MATERIALS AND PARTS		P
10.2.1	General		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Enclosure fulfils IEC 62208, no enclosure testing to 10.2 required.		N/A
10.2.2	Resistance to corrosion		P
10.2.2.2	Severity test A		P
	This test is applies to:		P
	- metallic indoor enclosures		P
	- external metallic parts of indoor ASSEMBLIES		N/A
	- internal metallic parts of indoor and outdoor ASSEMBLIES		P
	6 cycles of 24 h each to damp heat cycling test (Test Db) at $40 \pm 3^{\circ}\text{C}$ and relative humidity of 95% 2 cycles of 24 h each to salt mist test (Test Ka: Salt mist) at $35 \pm 2^{\circ}\text{C}$		-
	The following is an alternative test on parts or representative samples of the steel enclosures of the DBO:		P
	- Immersion in cold chemical degreaser such as methylchloroform or refined petrol for 10 min.		P
	- Then the parts are immersed in a 10% solution of ammonium chloride in water at a temperature of $20 \pm 5^{\circ}\text{C}$ for 10 min.		P
	- The parts placed in a box containing air saturated with moisture at $20 \pm 5^{\circ}\text{C}$ for 10 min.		P
	- After the parts have dried in a heating cabinet at $100 \pm 5^{\circ}\text{C}$ for 10 min. and have been left at room temperature for 24 h		P
	After the test their surface are show no signs of iron oxidation		P
10.2.2.3	Severity test B		N/A
	This test is applies to:		N/A
	- metallic indoor enclosures		N/A
	- external metallic parts of indoor ASSEMBLIES		N/A
	Each 12 day period comprises:		N/A
	5 cycles of 24 h each to damp heat cycling test (Test Db) at $40 \pm 3^{\circ}\text{C}$ and relative humidity of 95% 7 cycles of 24 h each to salt mist test (Test Ka: Salt mist) at $35 \pm 2^{\circ}\text{C}$		N/A
10.2.2.4	Results to be obtained		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	After the test, samples washed, dried and stored under normal service conditions for 2 h. This does not apply to the alternative test		N/A
	Compliance is checked by visual inspection to determine that:		N/A
	– there is no evidence of iron oxide, cracking or other deterioration more than that allowed by ISO 4628-3;		N/A
	– the mechanical integrity is not impaired;		N/A
	– seals are not damaged;		N/A
	– doors, hinges, locks, and fastenings work without abnormal effort.		N/A
10.2.3	Properties of insulating materials		P
10.2.3.1	Verification of thermal stability of enclosures		N/A
	Heating test 70 °C for <u>168</u> h and recovery of 96 h.	See attachment Table 1	N/A
	No visible cracks		N/A
	Dry piece of rough cloth, pressed with 5 N. No traces of the cloth remains on the sample and the material of the enclosure or sample does not stick to the cloth.		N/A
10.2.3.2	Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects		P
	– 960 °C for parts necessary to retain current-carrying parts in position;	See attachment Table 2	P
	– 850 °C for enclosures intended for mounting in hollow walls;	See attachment Table 2	N/A
	– 650 °C for all other parts, including parts necessary to retain the protective conductor.	See attachment Table 2	P
	– flames and glowing extinguish within 30 s		P
	no burning of tissue paper		P
10.2.4	Resistance to ultra-violet (UV) radiation		N/A
	Representative samples of such parts subjected to the following test:		N/A
	UV test according to ISO 4892-2 method A; Cycle 1 of a total test period of 500 h.		N/A
	Insulating enclosures: Flexural strength (according to ISO 178) and Charpy impact (according to ISO 179) of insulating materials have 70 % minimum retention.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For the test carried out in accordance with ISO 178, the surface of the sample exposed to UV is turned face down and the pressure applied to the non-exposed surface.		N/A
	For the test carried out in accordance with ISO 179 for materials whose impact bending strength cannot be determined prior to exposure because no rupture has occurred, not more than three of the exposed test specimens break.		N/A
	enclosures constructed of metals entirely coated by synthetic material have a minimum retention of category 3 according to ISO 2409.		N/A
	Samples show no cracks or deterioration		N/A
10.2.5	Lifting		N/A
	The maximum number of sections lifted together, equipped with components and/or weights to achieve a weight of 1,25 times its maximum shipping weight. :		N/A
	During the test, with the test weights in place, the ASSEMBLY shows no deflections and after the test show no cracks or permanent distortions visible, which could impair any of its characteristics.		N/A
10.2.6	Mechanical impact		P
	Verification of the degrees of protection against mechanical impacts shall be carried out in accordance with IEC 62262.	See attachment Table 3	-
	Impact spring hammer test as described in IEC 60068-2-75.		-
	The test made after the samples has been for 2 h at a temperature of $-5^{\circ}\text{C} \pm 1 \text{ K}$ for indoor use and $-25^{\circ}\text{C} \pm 1 \text{ K}$ for outdoor use	-25°C 2h	P
	Compliance is checked on those exposed parts which may be subjected to mechanical impact		P
	Three blows applied on separate places of each of the accessible faces and door.		P
	The impacts evenly distributed on the faces of the enclosures under test.		P
	Blows not applied to knock-outs, built-in components, other fastening means which are to be subject to impact.		P
	Cable entries which are not provided with knock-outs left open. Two knock-outs opened.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Before applying the blows, fixing screws of bases, covers and the like tightened with torque of table 102		P
	After the test, the specified IP code and dielectric properties maintain		P
	removable covers can still be removed and reinstalled, doors opened and closed		P
10.2.7	Marking		P
	The test is made by rubbing the marking by hand for 15 s with a piece of cloth soaked in water and then for 15 s with a piece of cloth soaked with petroleum spirit.		P
	After the test the marking is legible to normal or corrected vision without additional magnification.		P
10.3	DEGREE OF PROTECTION OF ASSEMBLIES		P
	The degree of protection provided is verified in accordance with IEC 60529	IP30	P
	Empty enclosure according IEC 62208 not influenced by external modification, further tests not required		N/A
	IP 5X tested according to category 2 in 13.4 of IEC 60529.		N/A
	No harmful ingress of dust.		N/A
	IP 6X are tested according to category 1 in 13.4 of IEC 60529.		N/A
	No ingress of dust.		N/A
	The test device for IP X3 and IP X4 as well as the type of support for the enclosure during the IP X4....		-
	No or acceptable ingress of water after IP X1 to IP X6 tests		N/A
10.4	CLEARANCES AND CREEPAGE DISTANCES		P
	The clearances are sufficient to enable the declared rated impulse withstand voltage (Uimp) of a circuit to be achieved. Rated impulse withstands voltage. :	See attachment Table 4	-
	Required clearances as specified in Table 1. :	3,0	-
	Measured clearances	>4,5	P
	For any given circuit the rated insulation voltage is not less than the rated operational voltage (Ue). Insulation voltage Ui..... :	500V	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Pollution degree. :	3	P
	Material group :	IIIa	P
	Minimum creepage required..... :	8,0	P
	The creepage distances measured..... :	>11	P
10.5	PROTECTION AGAINST ELECTRIC SHOCK AND INTEGRITY OF PROTECTIVE CIRCUITS		P
10.5.1	Effectiveness of the protective circuit		P
	The effectiveness of protective circuit is verified for the following functions:		-
	a) protection against the consequences of a fault within the ASSEMBLY as outlined in 10.5.2, and		P
	b) protection against the consequences of faults in external circuits supplied through the ASSEMBLY as outlined in 10.5.3		P
10.5.2	Effective earth continuity between the exposed conductive parts of the ASSEMBLY and the protective circuit		P
	A current of 10 A a.c. or d.c. is passed between each exposed conductive part and the terminal for the external protective conductor.		P
	The resistance does not exceed 0,1 Ω	4,3m Ω	P
10.5.3	Short-circuit withstand strength of the protective circuit		P
10.5.3.2	Protective circuits that are exempted from short-circuit withstand verification		N/A
	Where a separate protective conductor is provided in accordance with 8.4.3.2.3, short-circuit testing is not required if one of the conditions of 10.11.2. is fulfilled.		N/A
10.5.3.3	Verification by comparison with a reference design – Utilising a check list		N/A
	Verification by design rules is achieved by verification with an already tested design utilising items 1 to 6 and 8 to 10 of the check list in Table 13 shows no deviations.		N/A
10.5.3.4	Verification by comparison with a reference design – Utilising calculation		N/A
	Verification by comparison with a reference design based on calculation is in accordance with 10.11.4		N/A
10.5.3.5	Verification by test		N/A
	Subclause 10.11.5.6 applies.	Refer to attachment 1 of this report	N/A
10.6	INCORPORATION OF SWITCHING DEVICES AND COMPONENTS		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Compliance with the design requirements of 8.5 for the incorporation of switching devices and components is confirmed by inspection and verified to the requirements of this standard.		P
10.6.2	Electromagnetic compatibility		N/A
	The performance requirements of J.9.4 for electromagnetic compatibility is confirmed by inspection or where necessary by test (see J.10.12).		N/A
10.7	INTERNAL ELECTRICAL CIRCUITS AND CONNECTIONS		P
	Compliance with the design requirements of 8.6 for internal electrical circuits and connections is confirmed by inspection and verified to this standard.		P
10.8	TERMINALS FOR EXTERNAL CONDUCTORS		P
	Compliance with the design requirements of 8.8 for terminals for external conductors is confirmed by inspection.		P
10.9	DIELECTRIC PROPERTIES		P
10.9.1	General		P
10.9.2	Power-frequency withstand voltage		P
10.9.2.1	Main, auxiliary and control circuits		P
	Main, auxiliary and control circuits that are connected to the main circuit are subjected to the test voltage according to Table 8.	See attachment Table 5	P
	Auxiliary and control circuits, whether a.c. or d.c., that are not connected to the main circuit are subjected to the test voltage according to Table 9.		N/A
10.9.2.2	Test voltage		P
	The test voltage sinusoidal between 45 Hz and 65 Hz.		P
	The high-voltage transformer output current is at least 200 mA.		P
	The overcurrent relay does not trip when the output current is less than 100 mA.		P
	The value of the test voltage is that specified in Table 8 or 9 as appropriate with a permitted tolerance of $\pm 3\%$.	2500V	P
10.9.2.3	Application of the test voltage		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The voltage at the moment of application does not exceed 50 % of the full test value. It is then be increased progressively to this full value and maintained for 5 s		-
	a) between all live parts of the main circuit connected together and exposed conductive parts		P
	b) between each live part of different potential of the main circuit and the other live parts of different potential and exposed conductive parts connected together		P
	c) between each control and auxiliary circuit not normally connected to the main circuit and the – main circuit; – other circuits; – exposed conductive parts including the earthed enclosure.		N/A
10.9.2.4	Acceptance criteria		P
	The overcurrent relay does not operate and there are no disruptive discharge (see 3.6.17) during the tests.		P
10.9.3	Impulse withstand voltage		N/A
10.9.3.1	General		N/A
	Verification made by test or by assessment		N/A
10.9.3.2	Impulse withstand voltage test		N/A
	The impulse voltage generator is adjusted to the required impulse voltage with the ASSEMBLY connected. The value of the test voltage is that specified in 9.1.3. The accuracy of the applied peak voltage is $\pm 3\%$.		-
	Impulse withstand voltage (Uimp) :		-
	Auxiliary circuits not connected to main circuits are connected to earth. The 1,2/50 μ s impulse voltage is applied to the ASSEMBLY five times for each polarity at intervals of 1 s		-
	a) between all live parts of the main circuit connected together and exposed conductive parts		N/A
	b) between each live part of different potential of the main circuit and the other live parts of different potential and exposed conductive parts connected together		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) between each control and auxiliary circuit not normally connected to the main circuit and the – main circuit; – other circuits; – exposed conductive parts		N/A
	Overcurrent relay does not and no disruptive discharge occur during test.		N/A
10.9.3.3	Alternative power-frequency voltage test		N/A
	The test voltage sinusoidal between 45 Hz and 65 Hz.		N/A
	The high-voltage transformer output current is at least 200 mA.		N/A
	The overcurrent relay does not trip when the output current is less than 100 mA.		N/A
	The value of the test voltage is that specified in 9.1.3 and Table 10 as appropriate with a permitted tolerance of $\pm 3\%$.		-
	Power-frequency		N/A
	The power-frequency voltage is applied once, at full value, for a duration sufficient for the magnitude to be ascertained, not less than 15 ms		N/A
	a) between all live parts of the main circuit connected together and exposed conductive parts		N/A
	b) between each live part of different potential of the main circuit and the other live parts of different potential and exposed conductive parts connected together		N/A
	c) between each control and auxiliary circuit not normally connected to the main circuit and the – main circuit; – other circuits; – exposed conductive parts including the earthed enclosure.		N/A
	Overcurrent relay does not and no disruptive discharge occur during test.		N/A
10.9.3.4	Alternative d.c. voltage test		N/A
	The test voltage has negligible ripple.		N/A
	The high-voltage transformer output current is at least 200 mA.		N/A
	The overcurrent relay does not trip when the output current is less than 100 mA.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The value of the test voltage is that specified in 9.1.3 and Table 10 as appropriate with a permitted tolerance of $\pm 3\%$.		-
	Alternative d.c. voltage		N/A
	The d.c. voltage is applied once for each polarity for a duration sufficient for the magnitude to be ascertained, but it is not less than 15 ms or greater than 100 ms.		N/A
	a) between all live parts of the main circuit connected together and exposed conductive parts		N/A
	b) between each live part of different potential of the main circuit and the other live parts of different potential and exposed conductive parts connected together		N/A
	Overcurrent relay does not and no disruptive discharge occur during test.		N/A
10.9.3.5	Verification assessment		N/A
	Clearances are verified by measurement, or verification of measurements on design drawings, employing the measurement methods stated in Annex F.		N/A
	The clearances are at least 1,5 times the values specified in Table 1.		N/A
	It is verified by assessment of the device manufacturer's data that all incorporated devices are suitable for the specified rated impulse withstand voltage (Uimp).		N/A
10.9.4	Testing of enclosures made of insulating material		P
	a.c. voltage applied between enclosure covered with metal foil and interconnected live and exposed conductive parts inside the enclosure. Test voltage 1,5 times of table 8.	2500 x 1,5 = 3750V	P
	Overcurrent relay does not and no disruptive discharge occur during test.		P
10.9.5	External operating handles of insulating material		P
	A dielectric test is carried out on handles made of or covered by insulating material by applying a test voltage equal to 1,5 times the test voltage indicated in Table 8 between the live parts and a metal foil wrapped round the whole surface of the handle.	2500 x 1,5 = 3750V	P
	During this test, the exposed conductive parts shall not be earthed or connected to any other circuit.		P

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Clause	Requirement + Test	Result - Remark	Verdict
10.10	VERIFICATION OF TEMPERATURE RISE		P
10.10.2	Verification by testing		P
10.10.2.1	General		P
	a) most onerous arrangement(s) selected		P
	b) The ASSEMBLY is verified by one of the following methods:		P
	1) considering individual functional units, the main and distribution busbars and the ASSEMBLY collectively according to 10.10.2.3.5;		N/A
	2) considering individual functional units separately and the complete ASSEMBLY including the main and distribution busbars according to 10.10.2.3.6;		P
	3) considering individual functional units and the main and distribution busbars separately as well as the complete ASSEMBLY according to 10.10.2.3.7.		N/A
	c) test results used to establish the ratings of similar variants without further testing according rules of 10.10.3		P
10.10.2.2	Selection of the representative arrangement		P
	Selection of representative arrangements according 10.10.2.2.2 and 10.10.2.2.3		P
10.10.2.2.2	Busbars		P
	variants of which differ only in the reduction of height, or reduction of thickness or quantity of bars per conductor, but which have the same arrangement of bars, the same conductor spacing, the same enclosure and busbar compartment (if any), as a minimum for the test, the busbars with the greatest cross-sectional area is selected as the representative arrangement.		P
	For ratings of smaller busbar size variants or other materials see 10.10.3.3.		P
10.10.2.2.3	Functional units		P
	a) Selection of comparable functional unit groups		N/A
	Functional units intended to be used at different rated currents can be considered to have a similar thermal behaviour and form a comparable range of units, if they fulfil the following conditions:		-
	1) the function and basic wiring diagram of the main circuit is the same (e.g. incoming unit, reversing starter, cable feeder);		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	2) the devices are of the same frame size and belong to the same series;		N/A
	3) the mounting structure is of the same type;		N/A
	4) the mutual arrangement of the devices is the same;		N/A
	5) the type and arrangement of conductors is the same;		N/A
	6) the cross-section of the main circuit conductors within a functional unit has a rating at least equal to that of the lowest rated device in the circuit. Selection of conductors are as tested or in accordance with IEC 60364-5-52.		N/A
	b) Selection of a critical variant out of each comparable group as a specimen for test		P
	For the critical variant the most onerous compartment (where applicable) and enclosure conditions (with respect to shape, size, design of partitions and enclosure ventilation) is tested.		P
	The maximum possible current rating for each variant of functional unit is established.		P
	For functional units containing only one device this is the rated current of the device.		P
	For functional units with several devices, it is that of the device with the lowest rated current.		P
	If a combination of devices connected in series is intended to be used at a lower current (e.g. motor starter combination), this lower current is used.		N/A
	For each functional unit the power loss is calculated at the maximum possible current using the data given by the device manufacturer for each device together with the power losses of the associated conductors.		N/A
	For functional units with currents up to and including 630 A, the critical unit in each range is the functional unit with the highest total power loss.		N/A
	For functional units with currents above 630 A the critical unit in each range is that which has the highest rated current. This ensures that additional thermal effects relating to eddy currents and current displacement are taken into consideration.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The critical functional unit is at least tested inside the smallest compartment (if any) which is intended for this functional unit; and with the worst variant of internal separation (if any) with respect to size of ventilation openings; and the enclosure with the highest installed power loss per volume; and the worst variant of ventilation of the enclosure with respect to kind of ventilation (natural or forced convection) and size of ventilation openings.		P
	If the functional unit can be arranged in different orientations (horizontal, vertical), then the most onerous arrangement is tested.		N/A
10.10.2.3	Methods of test		P
	The temperature-rise test on the individual circuits is made with the type of current for which they are intended, and at the design frequency.		P
	Coils of relays, contactors, releases, etc., are supplied with rated operational voltage		N/A
	mounted as in normal use, with all covers including bottom cover plates, etc., in place.		P
	tightening torque applied to terminals in accordance with those specified for the temperature rise test in the relevant device product standard.		P
	fuses fitted for the test with fuse-links as specified by the manufacturer.		N/A
	The power losses of the fuse-links used for the test are stated		N/A
	The size and the disposition of external conductors used for the test are stated in the test report.	35mm ²	P
	The average value of the actual incoming test currents between -0 % and + 3% of intended value. Each phase within $\pm 5\%$ of the intended value.		P
	undue cooling prevented		P
	adjacent functional units replaced by heating resistors		N/A
	where there is a possibility that additional control circuits or devices may be incorporated, heating resistors simulate the power dissipation of these additional items.		N/A
10.10.2.3.2	Test conductors		P
	the cross-section of the external test conductors are in accordance with the following:		P
	a) For values of rated current up to and including 400 A:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	1) the conductors are single-core, copper cables or insulated wires with cross-sectional areas as given in Table 11	35mm ² ... 1mm ²	P
	2) as far as practicable, the conductors are in free air		P
	3) the minimum length of each temporary connection from terminal to terminal is: – 1 m for cross-sections up to and including 35 mm ² – 2 m for cross-sections larger than 35 mm ² .	1m	P
	b) For values of rated current higher than 400 A but not exceeding 800 A:		N/A
	1) The conductors are single-core copper cables with cross-sectional areas as given in Table 12, or the equivalent copper bars given in Table 12 as specified by the original manufacturer.		N/A
	2) Cables or copper bars are spaced at approximately the distance between terminals. Multiple parallel cables per terminal are bunched together and arranged with approximately 10 mm air space between each other. Multiple copper bars per terminal are spaced at a distance approximately equal to the bar thickness. If the sizes stated for the bars are not suitable for the terminals or are not available, it is allowed to use other bars having the same cross-sectional dimensions $\pm 10\%$ and the same or smaller cooling surfaces. Cables or copper bars are not interleaved.		N/A
	3) For single-phase or multi-phase tests, the minimum length of any temporary connection to the test supply is 2 m. The minimum length to a star point may be reduced to 1,2 m where agreed by the original manufacturer.		N/A
	c) For values of rated current higher than 800 A but not exceeding 4000 A:		N/A
	1) The conductors are copper bars of the sizes stated in Table 12 unless the ASSEMBLY is designed only for cable connection. In this case, the size and arrangement of the cables are as specified by the original manufacturer.		N/A
	2) Copper bars are spaced at approximately the distance between terminals. Multiple copper bars per terminal are spaced at a distance approximately equal to the bar thickness. If the sizes stated for the bars are not suitable for the terminals or are not available, it is allowed to use other bars having the same cross-sectional dimensions $\pm 10\%$ and the same or smaller cooling surfaces. Copper bars are not interleaved.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	3) For single-phase or multi-phase tests, the minimum length of any temporary connection to the test supply is 3 m, but this can be reduced to 2 m provided that the temperature rise at the supply end of the connection is not more than 5 K below the temperature rise in the middle of the connection length. The minimum length to a star point is 2 m.		N/A
	d) For values of rated current higher than 4 000 A:		N/A
	The original manufacturer determines all relevant items of the test, such as type of supply, number of phases and frequency (where applicable), cross-sections of test conductors, etc. This information is part of the test report.		N/A
10.10.2.3.3	Measurement of temperatures		P
	Thermocouples or thermometers are used for temperature measurements.		P
	For windings, the method of measuring the temperature by resistance variation is used.		N/A
	The thermometers or thermocouples is protected against air currents and heat radiation.		P
	The temperature is measured at all points where a temperature-rise limit (see 9.2) must be observed.		P
	Particular attention is given to joints in conductors and terminals within the main circuits.		P
	For measurement of the temperature of air inside an ASSEMBLY, several measuring devices are arranged in convenient places.		P
10.10.2.3.4	Ambient air temperature		P
	The thermometers or thermocouples are protected against air currents and heat radiation.		P
	The ambient temperature during the test is between +10 °C and +40 °C.		P
10.10.2.3.5	Verification of the complete ASSEMBLY		N/A
	Incoming and outgoing circuits of the ASSEMBLY are loaded with their rated currents that result in the rated diversity factor being equal to 1.		N/A
	If the rated current of the incoming circuit or distribution busbar system is less than the sum of the rated currents of all outgoing circuits, then the outgoing circuits shall be split into groups corresponding to the rated current of the incoming circuit or distribution busbar system.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The groups are formed in a manner so that the highest possible temperature rise is obtained.		N/A
	Sufficient groups are formed and tests undertaken so as to include all different variants of functional units in at least one group.		N/A
	Where the fully loaded circuits do not distribute exactly the total incoming current, the remaining current is distributed via any other appropriate circuit.		N/A
	This test is repeated until all types of outgoing circuit have been verified at their rated current.		N/A
	Change in the arrangement of functional units within a verified ASSEMBLY, or section of an ASSEMBLY may necessitate additional tests as the thermal influence of the adjacent units may differ significantly.		N/A
10.10.2.3.6	Verification considering individual functional units separately and the complete ASSEMBLY		P
	The rated currents of the circuits according to 5.3.2 and the rated diversity factor according to 5.3.3 are verified in two stages.		P
	The rated current of each critical variant functional unit (10.10.2.2.3.b)) shall be verified separately in accordance with 10.10.2.3.7 c).		P
	The ASSEMBLY is verified by loading the incoming circuit to its rated current and all outgoing functional units collectively to their rated current multiplied by the diversity factor.		P
	If the rated current of the incoming circuit or distribution busbar system is less than the sum of the test currents of all outgoing circuits (i.e. the rated currents multiplied by the diversity factor), then the outgoing circuits shall be split into groups corresponding to the rated current of the incoming circuit or distribution busbar system.		P
	The groups as defined by the original manufacturer are formed in a manner so that the highest possible temperature rise is obtained.		P
	Sufficient groups are formed and tests undertaken so as to include all different variants of functional units in at least one group.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	One method to determine the most onerous group, is for the rated current of the DBO (I_{nA}), to be distributed amongst the smallest possible number of outgoing circuits, so that each of these circuits is loaded with its rated current multiplied by the assumed loading factor shown in table 101 of this standard or a diversity factor stated by the manufacturer.		P
	Where the fully loaded circuits do not distribute exactly the total incoming current, the remaining current is distributed via any other appropriate circuit.		P
	This test is repeated until all types of outgoing circuit have been verified at their rated current.		P
	Change in the arrangement of functional units within a verified ASSEMBLY, or section of an ASSEMBLY may necessitate additional tests as the thermal influence of the adjacent units may differ significantly.		P
10.10.2.3.7	Verification considering individual functional units and the main and distribution busbars separately as well as the complete ASSEMBLY		N/A
	ASSEMBLIES are verified by separate verification of standard elements a) to c) as selected in accordance with 10.10.2.2.2 and 10.10.2.2.3, and verification of a complete ASSEMBLY d) under worst case conditions as detailed below:		-
	a) Main busbars are tested separately.		N/A
	b) Distribution busbars are tested separately from the outgoing units.		N/A
	c) Functional units are tested individually.		N/A
	d) The complete ASSEMBLY verified by temperature rise testing of the most onerous arrangement(s) possible in service and as defined by the original manufacturer.		N/A
	One method to determine the most onerous group, is for the rated current of the DBO (I_{nA}), to be distributed amongst the smallest possible number of outgoing circuits, so that each of these circuits is loaded with its rated current multiplied by the rated diversity factor shown in table 101 of this standard or a diversity factor stated by the manufacturer.		N/A
10.10.2.3.8	Results to be obtained		P
	At the end of the test, the temperature rise does not exceed the values specified in Table 6.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The apparatus operates satisfactorily within the voltage limits specified for them at the temperature inside the ASSEMBLY.		P
10.10.3	Derivation of ratings for similar variants		N/A
10.10.3.2	ASSEMBLIES		N/A
	The ASSEMBLY that incorporates non-tested variants are verified by derivation from similar tested arrangements.		N/A
	ASSEMBLIES verified in this manner comply with the following:		-
	a) the functional units belong to the same group as the functional unit selected for test (see 10.10.2.2.3);		N/A
	b) the same type of construction as used for the test;		N/A
	c) the same or increased overall dimensions as used for the test;		N/A
	d) the same or increased cooling conditions as used for the test (forced or natural convection, same or larger ventilation openings);		N/A
	e) the same or reduced internal separation as used for the test (if any);		N/A
	f) the same or reduced power losses in the same section as used for the test;		N/A
	g) the same or reduced number of outgoing circuits for every section		N/A
	The ASSEMBLY being verified may comprise all or only part of the electrical circuits of the ASSEMBLY previously verified.		N/A
	Alternative arrangement(s) of functional units within the ASSEMBLY or section compared to the tested variant is allowed as long as the thermal influences of the adjacent units are not more severe.		N/A
	Thermal tests performed on 3-phase, 3-wire ASSEMBLIES are considered as representing 3-phase, 4-wire and single-phase, 2-wire or 3-wire ASSEMBLIES, provided that the neutral conductor is sized equal to or greater than the phase conductors arranged in the same manner.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	DBO's with synthetic enclosures are considered representative of DBOs with metallic enclosures, if the highest air temperature rise on the inside surfaces of the synthetic enclosure does not exceed the maximum surface temperature rise for the accessible external metal surface according to Table 6 of Part 1.		N/A
10.10.3.3	Busbars		N/A
	Ratings established for aluminium busbars are valid for copper busbars with the same cross sectional dimensions and configuration.		N/A
	The ratings of variants not selected for test according to 10.10.2.2.2 are determined by multiplying their cross-section with the current density of a larger cross-section busbar that has been verified by test.		N/A
	If additionally a smaller cross-section than the one to be derived has been tested, which also fulfils the conditions of 10.10.2.2.2, then the rating of the intermediate variants may be established by interpolation.		N/A
10.10.3.4	Functional units		N/A
	After the critical variants of a group of comparable functional units (see 10.10.2.2.3 a)) have been subjected to a test for verification of temperature rise limits, the actual rated currents of all other functional units in the group are calculated using the results of these tests.		N/A
	For each functional unit tested a de-rating factor (rated current, resulting from the test divided by the maximum possible current of this functional unit, see 10.10.2.2.3 b)) is calculated.		N/A
	The rated current of each non-tested functional unit in the range is the maximum possible current of the functional unit multiplied by the lowest de-rating factor established for the variants tested in the range.		N/A
10.10.3.5	Functional units – Device substitution		N/A
	A device may be substituted with a similar device from another series to that used in the original verification, provided that the power loss and terminal temperature rise of the device, when tested in accordance with its product standard, is the same or lower.		N/A
	In addition, the physical arrangement within the functional unit and the rating of the functional unit is maintained.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
10.10.4	Verification by calculation		N/A
	Determine the approximate air temperature rise inside the enclosure, which is caused by the power losses of all circuits, and compare this temperature with the limits for the installed equipment.		N/A
	Because the actual local temperatures of the current-carrying parts cannot be calculated by these methods, some limits and safety margins are necessary and are included.		N/A
10.10.4.2	Single compartment assembly with rated current not exceeding 630 A		N/A
	Verification of the temperature rise of a single compartment ASSEMBLY with the total supply current not exceeding 630 A and for rated frequencies up to and including 60 Hz may be made by calculation if all the following conditions are fulfilled:		-
	a) the power loss data for all built-in components is available from the component manufacturer;		N/A
	b) there is an approximately even distribution of power losses inside the enclosure;		N/A
	c) the rated current of the circuits of the ASSEMBLY as verified (see 10.10.1) does not exceed 80 % of the rated conventional free air thermal current (I_{th}) if any, or the rated current (I_n) of the switching devices and electrical components included in the circuit. Circuit protection devices shall be selected to ensure adequate protection to outgoing circuits, e.g. thermal motor protection devices at the calculated temperature in the ASSEMBLY;		N/A
	d) the mechanical parts and the installed equipment are so arranged that air circulation is not significantly impeded;		N/A
	e) conductors carrying currents in excess of 200 A, and the adjacent structural parts are so arranged that eddy-current and hysteresis losses are minimised;		N/A
	f) all conductors have a minimum cross-sectional area based on the current rating of the functional unit according to IEC 60364-5-52. Examples on how to adapt this standard for conditions inside an ASSEMBLY are given in the tables included in Annex H. Where the device manufacturer specifies a conductor with a larger cross sectional area this is used;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	g) the temperature rise depending on the power loss installed in the enclosure for the different installation methods (e.g. flush mounting, surface mounting), is: – available from the enclosure manufacturer; – determined in accordance with 10.10.4.2.2; or – in accordance with performance and installation criteria from the cooling equipment manufacturer when active cooling (e.g. forced cooling, internal air conditioning, heat exchanger etc.) is incorporated.		N/A
	The effective power losses of all circuits including interconnecting conductors are calculated based on maximum load currents of the circuits.		N/A
	The total power loss of the ASSEMBLY is calculated by adding the power losses of the circuits taking additionally into account that the total load current is limited to the rated current of the ASSEMBLY.		N/A
	The power losses of the conductors are determined by calculation (see Annex H).		N/A
10.10.4.2.2	Determination of the power loss capability of an enclosure by test		N/A
	The power loss is simulated by means of heating resistors that produce heat equivalent to the intended power loss capability of the enclosure.		N/A
	The heating resistors are distributed evenly over the height of the enclosure and installed in suitable places inside the enclosure.		N/A
	The cross-section of the leads to these resistors are such that no appreciable amount of heat is conducted away from the enclosure.		N/A
	The test is carried out in accordance with 10.10.2.3.1 to 10.10.2.3.4 and the air temperature rise is measured in the top of the enclosure.		N/A
	Enclosure temperatures do not exceed the values given in Table 6.		N/A
10.10.4.2.3	Results to be obtained		N/A
	The ASSEMBLY is verified if the air temperature determined from the calculated power loss does not exceed the permissible operating air temperature as declared by the device manufacturer.		N/A
	This means for switching devices or electrical components in the main circuits that the continuous load does not exceed its permissible load at the calculated air temperature and not more than 80 % of its rated current (see 10.10.4.2.1 c).		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
10.10.4.3	ASSEMBLY with rated current not exceeding 1 600 A		N/A
10.10.4.3.1	Verification method		N/A
	Verification of the temperature-rise of a multiple compartment ASSEMBLY with the total supply current not exceeding 1 600 A and for rated frequencies up to and including 60 Hz, may be made by calculation in accordance with the method of IEC 60890 if all the following conditions are fulfilled:		-
	a) the power loss data for all built-in components is available from the component manufacturer;		N/A
	b) there is an approximately even distribution of power losses inside the enclosure;		N/A
	c) the rated current of the circuits of the ASSEMBLY as verified (see 10.10.1) do not exceed 80 % of the rated conventional free air thermal current (I _{th}) if any, or the rated current (I _n) of the switching devices and electrical components included in the circuit.		N/A
	d) the mechanical parts and the installed equipment are so arranged that air circulation is not significantly impeded;		N/A
	e) conductors carrying currents in excess of 200 A, and the adjacent structural parts are so arranged that eddy-current and hysteresis losses are minimised;		N/A
	f) all conductors have a minimum cross-sectional area based on the current rating of the functional unit according to IEC 60364-5-52. Examples on how to adapt this standard for conditions inside an ASSEMBLY are given in the tables included in Annex H.		N/A
	Where the device manufacturer specifies a conductor with a larger cross sectional area this conductor is used;		N/A
	g) for enclosures with natural ventilation, the cross section of the air outlet openings is at least 1,1 times the cross section of the air inlet openings;		N/A
	h) there are no more than three horizontal partitions in the ASSEMBLY or a section of an ASSEMBLY;		N/A
	i) for enclosures with compartments and natural ventilation the cross section of the ventilating openings in each horizontal partition is at least 50 % of the horizontal cross section of the compartment.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The effective power losses of all circuits including interconnecting conductors are calculated based on maximum load currents of the circuits.		N/A
	The total power loss of the ASSEMBLY is calculated by adding the power losses of the circuits taking additionally into account that the total load current is limited to the rated current of the ASSEMBLY.		N/A
	The power losses of the conductors are determined by calculation (see Annex H).	See attachment xxx	N/A
	The temperature rise within the ASSEMBLY is then determined from the total power loss using the method of IEC 60890.		N/A
10.10.4.3.2	Results to be obtained		N/A
	The ASSEMBLY is verified if the calculated air temperature at the mounting height of any device does not exceed the permissible ambient air temperature as declared by the device manufacturer.		N/A
	Switching devices or electrical components in the main circuits that the continuous load do not exceed its permissible load at the calculated local air temperature and not more than 80 % of its rated current (see 10.10.4.3.1 c).		N/A
10.11	SHORT-CIRCUIT WITHSTAND STRENGTH		P
	Short-circuit current ratings declared shall be verified except where exempt, see 10.11.2.		-
	Verification may be, by comparison with a reference design (10.11.3 and 10.11.4) or by test (10.11.5). For verification the following applies:		-
	a) If the ASSEMBLY system to be verified comprises a number of variants, most onerous arrangement(s) of the ASSEMBLY shall be selected, taking into account the rules in 10.11.3.		N/A
	b) the ASSEMBLY variants selected for test shall be verified according to 10.11.5.		N/A
	c) when the ASSEMBLIES tested are the most onerous variants of the larger product range of an ASSEMBLY system then the test results can be used to establish the ratings of similar variants without further testing. Rules for such derivations are given in 10.11.3 and 10.11.4.		N/A
10.11.2	Circuits of ASSEMBLIES which are exempted from the verification of the short-circuit withstand strength		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Verification of the short-circuit withstand strength is not required for the following:		-
	a) ASSEMBLIES having a rated short-time withstand current or rated conditional short-circuit current not exceeding 10 kA r.m.s;	$I_{cw} \leq 10 \text{ kA}$, $I_{cc} = 16 \text{ kA}$, for more test with $I_{cc} = 16 \text{ kA}$ according to BSEN61439-3, please refer to attachment 1 of this report.	P
	b) ASSEMBLIES, or circuits of ASSEMBLIES, protected by current-limiting devices having a cut-off current not exceeding 17 kA with the maximum allowable prospective short-circuit current at the terminals of the incoming circuit of the ASSEMBLY;		N/A
	c) Auxiliary circuits of ASSEMBLIES intended to be connected to transformers whose rated power does not exceed 10 kVA for a rated secondary voltage of not less than 110 V, or 1,6 kVA for a rated secondary voltage less than 110 V, and whose short-circuit impedance is not less than 4 %.		N/A
	All other circuits shall be verified.		N/A
10.11.3	Verification by comparison with a reference design – Utilising a check list		N/A
	Verification by the application of design rules is undertaken by comparison of the assembly to be verified with an already tested design using the check list provided in Table 13.	See attachment Table 7	N/A
	Should any elements identified in the check list not comply with the requirements of the check list and be marked "NO", one of the following means of verification shall be used (see 10.11.4 and 10.11.5).		N/A
10.11.4	Verification by comparison with a reference design – Utilising calculation		N/A
	Assessment of the rated short-time withstand current of an ASSEMBLY and its circuits, by calculation and the application of design rules, is undertaken by a comparison of the ASSEMBLY to be assessed with an ASSEMBLY or an ASSEMBLY module, already verified by test.		N/A
	In addition each of the circuits of the ASSEMBLY to be assessed meets the requirements of items 6, 8, 9 and 10 in Table 13.		N/A
	The data used, calculations made and comparison undertaken are recorded.		N/A
	If the assessment in accordance with Annex P is not passed or any of the items listed above are not fulfilled then the ASSEMBLY and its circuits shall be verified by test in accordance with 10.11.5.		N/A
10.11.5	Verification by test		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The ASSEMBLY or its parts as necessary to complete the test are mounted as in normal use.	See attachment Table 7 and 8	N/A
	It is sufficient to test a single functional unit if the remaining functional units are of the same construction.		N/A
	Similarly it is sufficient to test a single busbar configuration if the remaining busbar configurations are of the same construction.		N/A
10.11.5.2	Performance of the test – General		N/A
	If the test circuit incorporates fuses, fuse-links with the maximum let-through current and, if required, of the type indicated by the original manufacturer as being acceptable, they are used.		N/A
	The supply conductors and the short-circuit connections required for testing the ASSEMBLY have sufficient strength to withstand short-circuits and be so arranged that they do not introduce any additional stresses on the ASSEMBLY.		N/A
	Unless otherwise agreed, the test circuit is connected to the input terminals of the ASSEMBLY. Three-phase ASSEMBLIES are connected on a three-phase basis.		N/A
	All parts of the equipment intended to be connected to the protective conductor in service, including the enclosure, are connected as follows:		-
	a) for ASSEMBLIES suitable for use on three-phase four-wire systems (see also IEC 60038) with an earthed star point and marked accordingly, to the neutral point of supply or to a substantially inductive artificial neutral permitting a prospective fault current of at least 1500 A;		N/A
	b) for ASSEMBLIES also suitable for use in three-phase three-wire as well as on three-phase four-wire systems and marked accordingly, to the phase conductor least likely to arc to earth.		N/A
	The connection mentioned in a) and b) include a fusible element consisting of a copper wire of 0,8 mm diameter and at least 50 mm long, or of an equivalent fusible element for the detection of a fault current.		N/A
	The prospective fault current in the fusible element circuit shall be $1\,500\text{ A} \pm 10\%$.		N/A
10.11.5.3	Testing of main circuits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Circuits are tested with the highest thermal and dynamic stresses that may result from short circuit currents up to the rated values for one or more of the following conditions as declared by the original manufacturer.		N/A
	a) Not dependent upon a SCPD. The ASSEMBLY is tested with the rated peak withstand current and the rated short-time withstand current for the specified duration		N/A
	b) Dependent upon an incoming SCPD included within the ASSEMBLY. The assembly is tested with an incoming prospective short-circuit current for a period time that is limited by the incoming SCPD.		N/A
	c) Dependent upon an upstream SCPD. The ASSEMBLY is tested to the let through values permitted by the upstream SCPD as defined by the original manufacturer.		N/A
	Where an incoming or outgoing circuit includes a SCPD that reduces the peak and/or duration of the fault current, then the circuit is tested allowing the SCPD to operate and interrupt the fault current		N/A
	If the SCPD contains an adjustable short-circuit release, then this is set to the maximum allowed value		N/A
	One of each type of circuit is subject to a short-circuit test		N/A
10.11.5.3.2	Outgoing circuits		N/A
	The outgoing terminals of outgoing circuits are provided with a bolted short-circuit connection.		N/A
	When the protective device in the outgoing circuit is a circuit-breaker, the test circuit may include a shunting resistor in accordance with 8.3.4.1.2 b) of IEC 60947-1 in parallel with the reactor used to adjust the short-circuit current.		N/A
	For circuit-breakers having a rated current up to and including 630 A, a conductor 0,75 m in length having a cross-sectional area corresponding to the rated current (see Tables 11 and 12) is included in the test circuit.		N/A
	The switching device is closed and held closed in the manner normally used in service. The test voltage is then applied once and,		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	a) for a time sufficiently long to enable the short-circuit protective device in the outgoing unit to operate to clear the fault and, in any case, for not less than 10 cycles (test voltage duration), or		N/A
	b) in cases where the outgoing circuit does not include a SCPD, for a magnitude and duration as specified for the busbars by the original manufacturer. Testing of outgoing circuits may also result in the operation of the incoming circuit SCPD.		N/A
10.11.5.3.3	Incoming circuit and main busbars		N/A
	ASSEMBLIES containing main busbars are tested to prove the short-circuit withstand strength of the main busbars and the incoming circuit including at least one joint where the busbars are intended to be extendable.		N/A
	The short-circuit is placed such that the length of main busbar included in the test is $(2 \pm 0,4)$ m.		N/A
	For the verification of rated short-time withstand current (see 5.3.5) and rated peak withstand current (see 5.3.4), this distance may be increased and the test conducted at any convenient voltage providing the test current is the rated value		N/A
	Where the design of the ASSEMBLY is such that the length of the busbars to be tested is less than 1,6 m and the ASSEMBLY is not intended to be extended, then the complete length of busbar is tested, the short-circuit being established at the end of these busbars.		N/A
	If a set of busbars consists of different sections (as regards cross-sections, distance between adjacent busbars, type and number of supports per metre), each section is tested separately or concurrently, provided that the above conditions are met.		N/A
	A rated conditional short-circuit current can be assigned where the distance of the main and distribution busbar between the load terminals of the incoming device connected to the main busbar and the supply terminals of the outgoing functional unit does not exceed 3 m.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The main busbar, distribution busbar and incoming device may be tested and rated on the basis of the reduced short-circuit stresses occurring on the load side of the respective short-circuit protective device within each unit. Provided that these conductors are arranged so that an internal short-circuit between phases and/or between phases and earth is not to be expected.		N/A
10.11.5.3.4	Connections to the supply side of outgoing units		N/A
	Where an ASSEMBLY contains conductors between a main busbar and the supply side of outgoing functional units that do not fulfil the requirements of 8.6.4 one circuit of each type is subject to an additional test.		N/A
	A short-circuit is obtained by bolted connections on the conductors connecting the busbars to a single outgoing unit, as near as practicable to the terminals on the busbar side of the outgoing unit. The value of the short-circuit current is the same as that for the main busbars.		N/A
10.11.5.3.5	Neutral conductor		N/A
	If a neutral conductor exists within a circuit it is subjected to one test to prove its short-circuit withstand strength in relation to the nearest phase conductor of the circuit under test including any joints.		N/A
	Unless otherwise agreed between the original manufacturer and the User, the value of the test current in the neutral is at least 60 % of the phase current during the three-phase test.		N/A
	The test need not be executed if the test is intended to be made with a current of 60 % of the phase current and if the neutral conductor is:		-
	– the same shape and cross- section as the phase conductors		N/A
	– supported in an identical manner as the phase conductors and with support centres along the length of the conductor not greater than that of the phases;		N/A
	– spaced at a distance from the nearest phase(s) not less than that between phases;		N/A
	– spaced at a distance from earthed metalwork not less than the phase conductors.		N/A
10.11.5.4	Value and duration of the short-circuit current		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For all short-circuit withstand ratings, the dynamic and thermal stresses shall be verified with a prospective current, at the supply side of the specified protective device, if any, equal to the value of the rated short-time withstand current, rated peak withstand current or rated conditional short-circuit current assigned.		N/A
	For the verification of all the short-circuit withstand ratings, the value of prospective short-circuit current at a test voltage equal to 1,05 times the rated operational voltage shall be determined from a calibration oscillogram which is taken with the supply conductors to the ASSEMBLY short-circuited by a connection of negligible impedance placed as near as possible to the input supply of the ASSEMBLY.		N/A
	The oscillogram shall show that there is a constant flow of current such that it is measurable at a time equivalent to the operation of the protective device incorporated in the ASSEMBLY or for the specified duration (see 9.3.2. a)).		N/A
	The value of current during the calibration is the average of the r.m.s. values of the a.c. component in all phases. When making the tests at maximum operational voltage, the calibration current in each phase is equal to the rated short-circuit current within a +5 % tolerance and the power factor is within a -0,05 tolerance.		N/A
	All tests shall be made at the rated frequency of the ASSEMBLY with a tolerance of $\pm 25\%$, and at the power factor appropriate to the short-circuit current in accordance with Table 7.		N/A
	a) For a test at rated conditional short circuit current I_{cc} , whether the protective devices are in the incoming circuit of the ASSEMBLY or elsewhere, the test voltage shall be applied for a time sufficiently long to enable the short-circuit protective devices to operate to clear the fault and, in any case, for not less than 10 cycles. The test shall be conducted at 1,05 times the rated operational voltage with prospective short circuit currents, at the supply side of the specified protective device, equal to the value of the rated conditional short-circuit current. Tests at lower voltages are not permitted.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) For a test at rated short-time withstand current and rated peak withstand current, the dynamic and thermal stresses shall be verified with a prospective current equal to the value of rated short-time withstand current and rated peak withstand current declared. The current shall be applied for the specified time during which the r.m.s. value of its a.c. component shall remain constant.		N/A
	In the case of test station difficulty of making the short-time or peak withstand tests at the maximum operational voltage, the tests according to 10.11.5.3.3, 10.11.5.3.4 and 10.11.5.3.5 are made at any convenient voltage, with the original manufacturer's agreement, the actual test current being, in this case, equal to the rated short-time current or peak withstand current. This shall be stated in the test report.		N/A
	The peak current withstand test and the short-time current test may be separated. In this case, the time during which the short-circuit is applied for the peak current withstand test shall be such that the value I^2t is not larger than the equivalent value for the short-time current test, but it shall be not less than three cycles.		N/A
	Where the required test current in each phase cannot be achieved the positive tolerance may be exceeded with the agreement of the original manufacturer.		N/A
10.11.5.5	Results to be obtained		N/A
	After the test deformation of busbars and conductors is acceptable provided that the clearances and creepage distances specified in 8.3 are still complied with.		N/A
	The characteristics of the insulation remains such that the mechanical and dielectric properties of the equipment satisfy the requirements of the relevant ASSEMBLY standard.		N/A
	A busbar insulator or support or cable restraint has not separated into two or more pieces.		N/A
	There are no cracks appearing on opposite sides of a support and no cracks, including surface cracks, running the full length or width of the support.		N/A
	There are no loosening of parts used for the connection of conductors and the conductors are not separated from the outgoing terminals.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Distortion of the busbars or structure of the ASSEMBLY that impairs its normal use are a failure.		N/A
	Any distortion of the busbars or structure of the ASSEMBLY that impairs normal insertion or removal of the removable parts is a failure.		N/A
	Deformation of the enclosure or of the internal partitions, barriers and obstacles due to short-circuit is permissible to the extent that the degree of protection is not impaired and the clearances or creepage distances are not reduced to values, which are less than those specified		N/A
	Additionally after the tests incorporating short-circuit protective devices, the tested equipment is capable of withstanding the dielectric test at a value of voltage for the "after test" condition prescribed in the relevant short-circuit protective device standard for the appropriate short-circuit test, as follows:		-
	a) between all live parts and the exposed conductive parts of the ASSEMBLY, and		N/A
	b) between each pole and all other poles connected to the exposed conductive parts of the ASSEMBLY.		N/A
	If tests a) and b) above are conducted, they are carried out with any fuses replaced and with any switching device closed.		N/A
	The fusible element (see 10.11.5.2.), if any, does not indicate a fault current.		N/A
	In case of any doubt, it shall be checked that the apparatus incorporated in the ASSEMBLY are in a condition as prescribed in the relevant specifications.		N/A
10.11.5.6	Testing of the protective circuit		N/A
	A single-phase test supply is connected to the incoming terminal of one phase and to the terminal for the incoming protective conductor.		N/A
	When the ASSEMBLY is provided with a separate protective conductor, the nearest phase conductor is used.		N/A
	For each representative outgoing unit, a separate test is made with a bolted short-circuit connection between the corresponding outgoing phase terminal of the unit and the terminal for the relevant outgoing protective conductor.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Each outgoing unit on test is fitted with its intended protective device. Where alternative protective devices can be incorporated in the outgoing unit, the protective device which lets through the maximum values of peak current and I^2t is used.		N/A
	For this test, the frame of the ASSEMBLY is insulated from earth. The test voltage is equal to 1,05 times the single-phase value of the rated operational voltage.		N/A
	Unless otherwise agreed between the original manufacturer and the user, the value of the test current in the protective conductor is at least 60 % of the phase current during the three-phase test of the ASSEMBLY.		N/A
	All other conditions of this test are analogous to 10.11.5.2 to 10.11.5.4 inclusive.		N/A
10.11.5.6.2	Results to be obtained		N/A
	The continuity and the short-circuit withstand strength of the protective circuit, whether it consists of a separate conductor or the frame, are not significantly impaired.		N/A
	Besides visual inspection, this may be verified by measurements with a current in the order of the rated current of the relevant outgoing unit.		N/A
	Deformation of the enclosure or of the internal partitions, barriers and obstacles due to short-circuit is permissible to the extent that the degree of protection is not apparently impaired and the clearances or creepage distances are not reduced to values, which are less than those specified in 8.3.		N/A
10.12	ELECTROMAGNETIC COMPATIBILITY (EMC)		N/A
	For EMC tests, see J.10.12.		N/A
10.13	MECHANICAL OPERATION		P
	For parts, which need verification by test, satisfactory mechanical operation is verified after installation in the DBO. The number of operating cycles is 50.		P
	At the same time, the operation of the mechanical interlocks associated with these movements is checked.		N/A
	The test is passed if the operating conditions of the apparatus, interlocks, specified degree of protection etc., have not been impaired and if the effort required for operation is practically the same as before the test.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	ANNEX J: ELECTROMAGNETIC COMPATIBILITY (EMC)		N/A
J.9.4	Performance requirements		N/A
J.9.4.1	General		N/A
	environmental condition A and/or B	Environmental condition A	N/A
J.9.4.2	Requirement for testing		N/A
	a) devices and components are in compliance stated environment (see J.9.4.1)		N/A
	b) The internal installation and wiring is carried out in accordance with the devices and Components Manufacturers' instructions (arrangement with regard to mutual influences, cable, screening, earthing etc.)		N/A
	In all other cases the EMC requirements are to be verified by tests as per J.10.12.		N/A
J.9.4.3	Immunity		N/A
J.9.4.3.1	ASSEMBLIES not incorporating electronic circuits		N/A
	ASSEMBLIES not incorporating electronic circuits are not sensitive to electromagnetic disturbances and therefore no immunity tests are required.		N/A
J.9.4.3.2	ASSEMBLIES incorporating electronic circuits		N/A
	Electronic equipment incorporated in ASSEMBLIES comply with the immunity requirements of the relevant product or generic EMC standard and are suitable for the specified EMC environment stated by the ASSEMBLY manufacturer.		N/A
	In all other cases the EMC requirements are to be verified by tests as per J.10.12.		N/A
	Equipment utilizing electronic circuits in which all components are passive (for example diodes, resistors, varistors, capacitors, surge suppressors, inductors) are not required to be tested.		N/A
	The ASSEMBLY manufacturer obtains from the device and or component manufacturer the specific performance criteria of the product based on the acceptance criteria given in the relevant product standard.		N/A
J.9.4.4	Emission		N/A
J.9.4.4.1	ASSEMBLIES not incorporating electronic circuits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For ASSEMBLIES not incorporating electronic circuits, electromagnetic disturbances can only be generated by equipment during occasional switching operations. The duration of the disturbances is of the order of milliseconds. The frequency, the level and the consequences of these emissions are considered as part of the normal electromagnetic environment of lowvoltage installations. Therefore, the requirements for electromagnetic emission are deemed to be satisfied, and no verification is necessary.		N/A
J.9.4.4.2	ASSEMBLIES incorporating electronic circuits		N/A
	Electronic equipment incorporated in the ASSEMBLY comply with the emission requirements of the relevant product or generic EMC standard and are suitable for the specific EMC environment stated by the ASSEMBLY manufacturer.		N/A
J.9.4.4.2.1	Frequencies of 9 kHz or higher		N/A
	ASSEMBLIES incorporating electronic circuits (such as switched mode power supplies, circuits incorporating microprocessors with high-frequency clocks) may generate continuous electromagnetic disturbances.		N/A
	For such emissions, these do not exceed the limits specified in the relevant product standard, or the requirements of Table J.1 for environment A and/or Table J.2 for environment B applies. These tests are only required when the main and/or auxiliary circuits contain components with fundamental switching frequencies equal or greater than 9 kHz.		N/A
	Tests are to be carried out as detailed in the relevant product standard, if any, otherwise according to J.10.12.		N/A
J.9.4.4.2.2	Frequencies lower than 9 kHz		N/A
	ASSEMBLIES incorporating electronic circuits, which generate low frequency harmonics on the mains supply, comply with the requirements of IEC 61000-3-2 where applicable.		N/A
J.10.12	Tests for EMC		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The emission and immunity tests are carried out in accordance with the relevant EMC standard (see Tables J.1, J.2, J.3 and J.4); however, the ASSEMBLY manufacturer specifies any additional measures necessary to verify the criteria of performance for the ASSEMBLIES if necessary (e.g. application of dwell times).		N/A
J.10.12.1	Immunity tests		N/A
J.10.12.1.1	ASSEMBLIES not incorporating electronic circuits		N/A
	No tests are necessary.		N/A
J.10.12.1.2	ASSEMBLIES incorporating electronic circuits		N/A
	Tests are made according to the relevant environment: A or B		N/A
	The values used are given in Tables J.3 and/or J.4 except where a different test level is given in the relevant specific product standard and justified by the electronic components manufacturer.		N/A
	Electrostatic discharge immunity test IEC 61000-4-2	Performance criterion A/B/C	N/A
	Radiated radio-frequency electromagnetic field immunity test IEC 61000-4-3 at 80 MHz to 1 GHz and 1,4 GHz to 2 GHz	Performance criterion A/B/C	N/A
	Electrical fast transient/burst immunity test IEC 61000-4-4	Performance criterion A/B/C	N/A
	1,2/50 μ s and 8/20 μ s surge immunity test IEC 61000-4-5	Performance criterion A/B/C	N/A
	Conducted radio-frequency immunity test IEC 61000-4-6 at 150 kHz to 80 MHz	Performance criterion A/B/C	N/A
	Immunity to power-frequency magnetic fields IEC 61000-4-8	Performance criterion A/B/C	N/A
	Immunity to voltage dips and interruptions IEC 61000-4-11	Performance criterion A/B/C	N/A
	Immunity to harmonics in the supply IEC 61000-4-13	Performance criterion A/B/C	N/A
J.10.12.2	Emission tests		N/A
J.10.12.2.1	ASSEMBLIES not incorporating electronic circuits		N/A
	No tests are necessary		N/A
J.10.12.2.2	ASSEMBLIES incorporating electronic circuits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Tests are made according to the relevant environment: A or B		N/A
	The test methods used; see J.9.4.4.2.		N/A
	If the ASSEMBLY incorporates telecommunication ports, the emission requirements of CISPR 22, relevant to that port and to the selected environment, applies.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	ANNEX K: PROTECTION BY ELECTRICAL SEPARATION		N/A
K.2	Electrical separation		N/A
K.2.2	Supply source		N/A
	The circuit is supplied through a source that provides separation i.e.		-
	• an isolating transformer, or		N/A
	• a source of current providing a degree of safety equivalent to that of the isolating transformer specified above, for example a motor generator with windings providing equivalent isolation.		N/A
	Mobile sources of supply connected to a supply system are selected in accordance with Clause K.3 (class II equipment or equivalent insulation).		N/A
	Fixed sources of supply are either:		-
	• selected in accordance with Clause K.3, or		N/A
	• such that the output is separated from the input and from the enclosure by an insulation satisfying the conditions of Clause K.3; if such a source supplies several items of equipment, the exposed conductive parts of that equipment are not connected to the metallic enclosure of the source.		N/A
K.2.3	Selection and installation of supply source		N/A
K.2.3.1	Voltage		N/A
	The voltage of the electrically separated circuit does not exceed 500 V.		N/A
K.2.3.2	Installation		N/A
K.2.3.2.1	Live parts of the separated circuit are not connected at any point to another circuit or to earth.		N/A
	To avoid the risk of a fault to earth, particular attention is given to the insulation of such parts from earth, especially for flexible cables and cords.		N/A
	Arrangements ensure electrical separation not less than that between the input and output of an isolating transformer.		N/A
K.2.3.2.2	Flexible cables and cords are visible throughout any part of their length liable to mechanical damage.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
K.2.3.2.3	For separated circuits, the use of separate wiring systems is necessary. If the use of conductors of the same wiring system for the separated circuits and other circuits is unavoidable, multi-conductor cables without metallic covering, or insulated conductors in insulating conduit, ducting or trunking is used, provided that their rated voltage is not less than the highest voltage likely to occur, and that each circuit is protected against overcurrent.		N/A
K.2.4	Supply of a single item of apparatus		N/A
	Where a single item of apparatus is supplied, the exposed conductive parts of the separated circuit is not connected either to the protective conductor or exposed conductive parts of other circuits.		N/A
K.2.5	Supply of more than one item of apparatus		N/A
	If precautions are taken to protect the separated circuit from damage and insulation failure, a source of supply, complying with K.2.1, may supply more than one item of apparatus provided that all the following requirements are fulfilled.		-
	a) The exposed-conductive-parts of the separated circuit is connected together by insulated non-earthed equipotential bonding conductors. Such conductors are not connected to the protective conductors or exposed-conductive-parts of other circuits or to any extraneous conductive parts.		N/A
	b) All socket-outlets are provided with protective contacts which are connected to the equipotential bonding system provided in accordance with item a).		N/A
	c) Except where supplying class II equipment, all flexible cables embody a protective conductor for use as an equipotential bonding conductor.		N/A
	It is ensured that if two faults affecting two exposed conductive parts occur and these are fed by conductors of different polarity, a protective device disconnects the supply in a disconnecting time conforming to Table K.1.		N/A
	For voltages which are within the tolerance band stated in IEC 60038, the disconnecting time appropriate to the nominal voltage applies.		N/A
	For intermediate values of voltage, the next higher value in table K.1 is to be used.		N/A
K.3	Class II equipment or equivalent insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Protection is provided by electrical equipment of the following types:		-
	• Electrical equipment having double or reinforced insulation (class II equipment)		N/A
	• ASSEMBLIES having total insulation see 8.4.3.4.		N/A
	This equipment is marked with the symbol  .		N/A

8.3	TABLE 4: Clearance And Creepage Distance Measurements					P
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
Phase to neutral	4000	500	3,0	10,1	8,0	22,3
Phase to PE	4000	500	3,0	30,7	8,0	31,2
Neutral to earth	4000	500	3,0	10,1	8,0	11,1
Live part to naked conductor	4000	500	3,0	10,9	8,0	11,1
Supplementary information: N/A						

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Clause	Requirement + Test	Result - Remark	Verdict

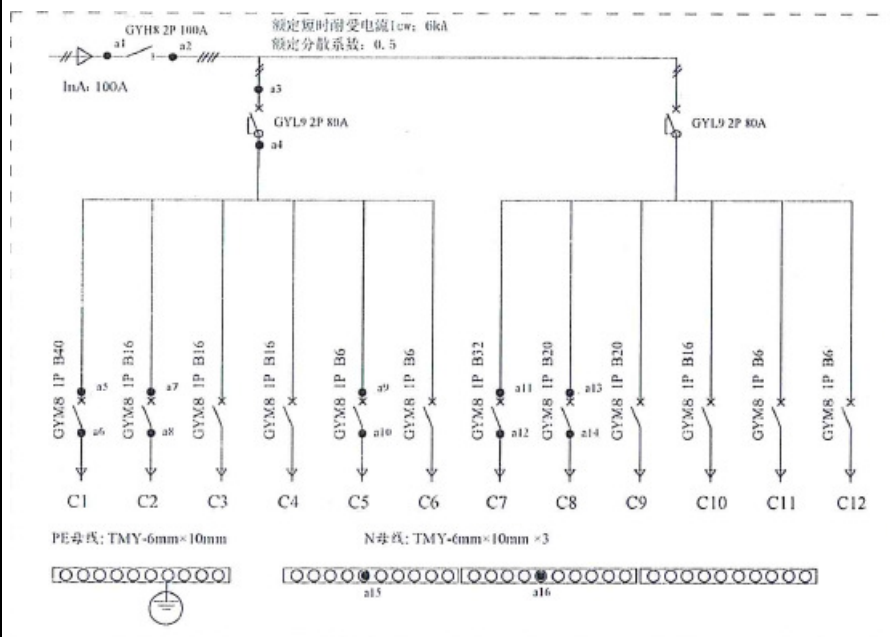
TABLE 5: Dielectric Strength			P
Test voltage applied between:	Test potential applied (V)	Breakdown / flashover (Yes/No)	
Live part to enclosure	2500	No	
Live part to naked conductor	2500	No	
Live part to button	3750	No	
Supplementary information: N/A			

TABLE 6: Heating Test			P
Test voltage (V)	230V~		—
Ambient (°C)	12,7		—
Thermocouple Locations	max. temperature measured, (°C)	max. temperature limit, (°C)	
Incoming terminal of main switch-disconnector	48,2/49,6K	70K	
Outgoing terminal of main switch-disconnector	44,8/45,5K	70K	
Incoming terminal of RCCB1	42,1/39,1K	60K	
Incoming terminal of RCCB1	49,8/47,8K	60K	
Incoming terminal of MCB (C1)	34,5K	60K	
Outgoing terminal of MCB (C1)	35,7K	60K	
Incoming terminal of MCB (C2)	34,3K	60K	
Outgoing terminal of MCB (C2)	30,5K	60K	
Incoming terminal of MCB (C5)	33,9K	60K	
Outgoing terminal of MCB (C5)	28,4K	60K	
Incoming terminal of MCB (C7)	33,8K	60K	
Outgoing terminal of MCB (C7)	25,5K	60K	
Incoming terminal of MCB (C8)	32,6K	60K	
Outgoing terminal of MCB (C8)	21,6K	60K	
Terminal of N busbar	22,6K	60K	
Enclosure	8,6K	30K	
Handle of Switch-disconnector, RCCB, MCB	Max. 21,1K	25K	

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

Test circuit see below:



Test current: main busbar: 100A; C1: 20A; C2: 8A; C3: 8A; C4: 8A; C5: 3A; C6: 3A; C7: 16A; C8: 10A; C9: 10A; C10: 8A; C11: 3A; C12: 3A

TABLE 7: Short-circuit verification – Check list			N/A
Item No.	Requirements to be considered	YES	NO
1	Is the short-circuit withstand rating of each circuit of the ASSEMBLY to be assessed, less than or equal to, that of the reference design?	--	--
2	Is the cross-sectional dimensions of the busbars and connections of each circuit of the ASSEMBLY to be assessed, greater than or equal to, those of the reference design?	--	--
3	Is the centre line spacing of the busbars and connections of each circuit of the ASSEMBLY to be assessed, greater than or equal to, those of the reference design?	--	--
4	Are the busbar supports of each circuit of the ASSEMBLY to be assessed of the same type, shape and material and have, the same or smaller centre line spacing, along the length of the busbar as the reference design? And is the mounting structure for the busbar supports of the same design and mechanical strength?	--	--

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Clause	Requirement + Test	Result - Remark	Verdict
5	Are the material and the material properties of the conductors of each circuit of the ASSEMBLY to be assessed the same as those of the reference design?	--	--
6	Are the short-circuit protective devices of each circuit of the ASSEMBLY to be assessed equivalent, that is of the same make and series ^a with the same or better limitation characteristics (Pt , I_{pk}) based on the device manufacturer's data, and with the same arrangement as the reference design?	--	--
7	Is the length of unprotected live conductors, in accordance with 8.6.4, of each non-protected circuit of the ASSEMBLY to be assessed less than or equal to those of the reference design?	--	--
8	If the ASSEMBLY to be assessed includes an enclosure, did the reference design include an enclosure when verified by test?	--	--
9	Is the enclosure of the ASSEMBLY to be assessed of the same design, type and have at least the same dimensions to that of the reference design?	--	--
10	Are the compartments of each circuit of the ASSEMBLY to be assessed of the same mechanical design and at least the same dimensions as those of the reference design?	--	--
'YES' to all requirements – no further verification required.			
'NO' to any one requirement – further verification is required.			
^a Short-circuit protective devices of the same manufacturer but of a different series may be considered equivalent where the devices manufacturer declares the performance characteristics to be the same or better in all relevant respects to the series used for verification, e.g. breaking capacity and limitation characteristics (Pt , I_{pk}), and critical distances.			

TABLE 8: Short-circuit Withstand Strength						N/A
Test locations	Test voltage	Test current	Peak value	Power factor	Test duration	
Supplementary information:						

10.11.5.5	TABLE: Clearance and Creepage Distance Measurements					N/A
Test locations	Clearance measured (mm)		Clearance required (mm)	Creepage distance measured (mm)		Creepage distance required (mm)
	before short-circuit test	after short-circuit test		before short-circuit test	after short-circuit test	

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Clause	Requirement + Test			Result - Remark		Verdict
Supplementary information:						

TABLE 10: Electrical Data (in normal conditions)						N/A
fuse #	I rated (A)	U (V)	P (W)	I (mA)	I fuse (mA)	condition/status
Supplementary information:						

TABLE 11: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹
- Description:					
Switch-disconnector	GEYA	GYH8	AC-22A, 240VAC, 100A, 2P	IEC/EN/BSEN 60947-3	
RCCB	GEYA	GYL9	2P, 230VAC, 80A, type AC, 30mA	IEC/EN/BSEN 61008-1	
MCB	GEYA	GYM8	240VAC, 1P, 6kA, B40/B32/B20/B16/B10/B6	IEC/EN/BSEN 60898-1	
- Description:					
Supplementary information:					
Refer to constructional data form					

BS EN 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict

	BS EN 61439-3 COMMON MODIFICATIONS		
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	Annex ZB A-deviations - United Kingdom		
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3.1	GENERAL TERMS		
3.1.104 Addition	Customer distribution board CDB		P
	An integrated assembly, for the control and distribution of electrical energy, principally in a house hold or similar premise, incorporating manual means of double pole isolation on the incoming circuit(s), with polarity observed throughout.		P
	They are designed for use exclusively with specific protective devices on the outgoing circuits, and type-tested for use when energized through the specified 100 amp fuse.	BS 88.3 type II, 100A fuse	P

10.11	SHORT-CIRCUIT WITHSTAND STRENGTH		P
10.11.5 Addition	Verification by test		P
10.11.5.7	Verification of the capability of the CDB to withstand a 16 kA fault		P
10.11.5.7.1	Test arrangements		P
	The CDB shall be set up as in normal use.		
	It will be sufficient to test a single functional unit if the remaining functional units are constructed in the same way and cannot affect the test result		P
10.11.5.7.2	Short-circuit test procedure		P
	The following test procedure is intended to verify the performance of the incoming device and its connections, and any other item in the CDB not separately rated in excess of 16 kA, when the complete CDB is protected by a fuse-link complying with BS 88.3 (formerly BS 1361).	Icc=16kA	P

BS EN 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	This type test shall be deemed to cover the use of any other short-circuit protective device having a Joule integral (I^2t) and cut-off current not exceeding values given in item b) below, at the rated voltage, prospective current and power factor.		P
	a) It shall be verified that the representative samples of the final circuit protective devices used for the test comply with Table ZB.1 and Table ZB.2 where applicable.	MCB: 1,13In, 1h no trip; 1,45In, trip within 1h	P
	b) The reference fuse shall be a 100 A fuse-link complying with type II of BS 88.3. Details of the fuse-links used for the test, i.e. manufacturer's name, reference, rated current, rated voltage and pre-arcing (I^2t), shall be given in the test report.	BS88.3 type II fuse-link, 100A Manufacture: Bussmann I^2t : 48,6kA ² s	P
	Where BS 1361 type II fuse-links are available for test / certification purposes, they may be used in place of BS 88-3 fuse-links as key performance characteristics are identical.		N/A
	c) The final circuit protective device shall be mounted as in service in the manufacturer's smallest recommended enclosure (metal if offered in the catalogue).		P
	The connection on the load side of the protective device under test shall be in accordance with Table ZB.3 and 0,6 m $\pm$ 0,05 m in length.		P
	d) The test circuit shall be connected as shown in Figure ZB.1 The relative positions of the closing switch, inductive reactor and resistor are not obligatory, but the resistor shall be in series with the master circuit-breaker.		P
	e) The impedance used for limiting the prospective short-circuit fault current to the required value shall be inserted on the supply side of the circuit.		P
	Resistors shall be connected between line and neutral, after the impedances for adjusting the prospective current, so as to draw current of 10 A per phase at rated voltage from the supply. If an air-cored inductor is used, a resistor taking approximately 1 % of the current through the inductor shall be connected in parallel with it.		P
	A lower value of shunt current may be used with the consent of the manufacturer.		P
10.11.5.7.3	Circuit conditions		P

BS EN 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	The applied voltage shall be not less than 100 % and not more than 110 % of the rated single phase voltage of the final circuit protective device. The recovery voltage measured two cycles after operation shall be not less than 95 % nor more than 105 % of the rated single phase voltage of the final circuit protective device, and shall be maintained for at least 30 s after the interruption of the short-circuit current. The higher limit of 105 % may be exceeded with the consent of the manufacturer.		P
	The value of the prospective short-circuit current shall be 16 kA -0% +5 % at a power factor of $0,6 \pm 0,05$ determined from a calibration oscillogram taken with a link of negligible impedance positioned as shown in Figure ZB.1. All parts of the equipment normally earthed in service, including its enclosure, shall be insulated from earth, but shall be connected to the neutral of the supply or to a substantially inductive artificial neutral, permitting a prospective fault current of at least 100 A.		P
	This connection shall include a reliable device, such as a fuse consisting of a copper wire of 0,1 mm diameter and not less than 50 mm in length for the detection of the fault current and, if necessary, a resistor to limit the value of the prospective fault current to approximately 100 A.		P
10.11.5.7.4	Test sequence		P
	The CDB shall be subject to the following two tests A and B with the outgoing way fitted with a final circuit protective device of the maximum thermal current rating.		P
	If the final circuit protective devices have a short-circuit rating less than 16 kA, two further tests A and B shall be carried out with a device of the minimum thermal rating fitted.	Final circuit protective devices: MCB, I _{cn} =6kA	P
	In addition, if the CDB is designed to accept different types or ranges of outgoing devices, each type shall be further tested separately		P
	The two tests are as follows		P
	a) Test A. With the circuit connected as described above, with all fuses in place and all circuit-breakers closed, the test voltage is applied with the point-on-wave controlled to provide initiation of the fault at between 0° and 20° (electrical) on the rising voltage.		P
	b) Test B. A further short-circuit operation shall be applied after suitable preparation as indicated in Table ZB.4 dependent on which of the alternative results of test A is achieved.	One test A with MCB B40, one test A with MCB B6. Both B40 and B6 were operated during the test A, so no need to perform test B.	N/A

BS EN 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	If circuit-breakers are included in the customer distribution board, the test shall be applied by reclosing a circuit-breaker with the test circuit energized. If fuses are used, the test shall be as in Test A.		N/A
	During the tests cheesecloth shall be placed on the outside of the enclosure at all openings, e.g. arc vents and handles. There shall be no ignition of the cheesecloth.		P
	The cheesecloth shall be clean and dry bleached plain cotton of approximately 30 g to 40 g per square metre.		P
	When placed into position the cheesecloth shall be folded loosely in such a manner that cut and torn edges will not be exposed directly to the arc or flash. Ignition of the cheesecloth is considered to have occurred when a flame is visible.		P
	Smouldering is not considered to be evidence of ignition.		P
	The cheesecloth may be changed following each test B.		N/A
	Details of the I ² t let through by the combination of devices during the test shall be given in the test report.	I ² t: 36,8kA ² s (B40 test A); I ² t: 35,2 kA ² s (B6 test A)	P
	A new CDB of the same design may be used for each of the two test sequences.		N/A
10.11.5.7.5	Conditions after test		P
	Where the incoming switch is a protective device, the test report shall state which of the protective devices operated during the test, i.e. the incoming and/or outgoing devices.	Outgoing device: MCB, B40 operated. Outgoing device: MCB, B6 operated.	P
	The earth fault indicating device shall be intact and the degree of protection of the enclosure shall not be impaired.	RCCB was intact	P
	The insulation resistance a) shall be measured within 3 min of the conclusion of the series of tests		P
	The insulation resistance for b) and c) shall be measured as soon as practical after measurement of a), the times of measurement of b) and c) being recorded in the test report.		P
	The values shall be measured at 500 V d.c. and shall not be less than the following:		P
	a) 0,10 MΩ between the final circuit protective device incoming terminal and the corresponding outgoing terminal, with the isolating device open and with the blown fuse in position or the circuit-breaker or RCBO opened, whichever is applicable.	>200 MΩ	P

BS EN 61439-3			
Clause	Requirement + Test	Result - Remark	Verdict
	b) 0,25 MΩ between the final circuit protective device terminals and earth, with the final circuit fuse rewired, the final circuit cartridge fuse replaced, or the circuit-breaker or RCBO reclosed, whichever is applicable, and with the incoming isolating device open.	>200 MΩ	P
	c) 0,25 MΩ between the final circuit protective device incoming terminals and any other metal parts which are unearthed and exposed in service	>200 MΩ	P
	The condition of the incoming isolating device shall comply with its product specification with regard to isolating properties.	Switch-disconnector GYH8 could be isolating	P
	The conductors shall not be deformed such that the clearance and creepage distances specified in 8.3 are impaired.		P
	There shall be no loosening of parts used for the connection of the conductors.		P
	Where an RCD is included in CDB its operation shall be checked. With the RCD closed and connected to a supply at 0,85 times rated voltage ± 5 % the test device shall be operated The RCD shall open.	RCCB GYL9 could be open	P