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TEST REPORT IEC 61439-5 Low-voltage switchgear and controlgear assemblies - Part 5: Assemblies for power distribution in public networks	
Report Number	305145B
Date of issue	17-08-2016
Total number of pages	80
Applicant's name	Multilux AS
Address	Sandavegen 19, 3802 Bø i Telemark Norway
Test specification:	
Standard	NEK-IEC 61439-5:2010 (First Edition) IEC 61439-1 Ed.2, NEK-EN 61439-5:2012, NEK 439-5:2013
Test procedure.....	Nemko Test Report
Non-standard test method.....	N/A
Test Report Form No.....	IEC61439_5A
Test Report Form(s) Originator.....	TÜV Rheinland InterCert Kft., MEEI Division
Master TRF	Dated 2013-11
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Test item description	Tennskap for belysning
Trade Mark	Multilux
Manufacturer	Same as applicant
Model/Type reference	MU-serie. MU2
Ratings	Fullt bestykket skap for 400V TN-C-S

Testing procedure and testing location:		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	Nemko AS
Testing location/ address		Gaustadallen 30, 0314 Oslo,Norway
<input type="checkbox"/>	Associated CB Testing Laboratory:	
Testing location/ address		
Tested by (name + signature)		Thomas Volan <i>Thomas Volan</i>
Approved by (name + signature)		Tore Ledaal <i>Tore Ledaal</i>
<input type="checkbox"/>	Testing procedure: TMP	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature)		
<input type="checkbox"/>	Testing procedure: WMT	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name + signature)		
Approved by (name + signature)		
<input type="checkbox"/>	Testing procedure: SMT	
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: Photos (6 pages)

Summary of testing:**Tests performed (name of test and test clause):**

Tested according to relevant clauses.

Testing location:Nemko AS
Gaustadalleen 30
0373 Oslo**Summary of compliance with National Differences****List of countries addressed:**☒ The product fulfils the requirements of
NEK EN 61439-1:2011. NEK 439-5:2013

Copy of marking plate

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

Multilux		CE	
ID nr:	505050	Ordre nr:	131313
Norm:	NEK 439-1 OG 5	Fordeling:	433.101
Prod. dato:	15.08.2016	IP-grad:	IP 66
MU Serie:	MU2	Spinning:	400V TN-C-S
SANDAVEGEN 19 - 3802 BØ TELEMARK - TLF 35061300			
post@multilux.no - multilux.no			

Test item particulars.....:	
Classification of installation and use.....:	Class I
Supply Connection	4P 63A TN/400V/50Hz
.....:	
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	May 2016
Date (s) of performance of tests	June – August 2016
General remarks:	
<p>The test results presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.</p> <p>"(See Enclosure #)" refers to additional information appended to the report.</p> <p>"(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:	
<p>The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided</p>	<p><input type="checkbox"/> Yes</p> <p><input checked="" type="checkbox"/> Not applicable</p>
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies)	MTS Tavler & Automasjon AS Evjeløkka 3, 1661 Rolvsøy Norway
General product information:	
<p>MU-serie. MU2</p> <p>400V TN-C-S</p> <p>Fullt bestykket tennskap for belysning. Metall kapsling med låsbar dør. Monteres på fast eller justerbar sokkel og mellomsokke. Nipler for strekkavlastning. Avtakbare løfteører og brøytestikk. Dimensjoner (HxBxD); 120x80x40cm. IP66</p>	

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
5	INTERFACE CHARACTERISTICS		
5.2	Voltage ratings		
	Rated voltage (Un) (of the ASSEMBLY)	4x400V AC TN C-S system	-
	Rated operational voltage (Ue) (of a circuit of an ASSEMBLY)	400V AC	P
	Rated insulation voltage (Ui) (of a circuit of an ASSEMBLY)	400V	P
	Rated impulse withstand voltage (Uimp) (of the ASSEMBLY)	4kV	P
5.3	Current ratings		
	Rated current of the ASSEMBLY (InA)	Hovedbryter 4P 160A Sikring overspenningsvern 4P 63A	-
	Rated current of a circuit (Inc)	Lyskurs 1/2: 4P 40A Lyskurs 3: 4P 25A	-
	Rated diversity factor (RDF) (In the absence of an agreement between manufacturer and user, value based on Table 101)	0,9	N/A
	Rated peak withstand current (Ipk)		-
	Rated short-time withstand current (Icw) (of a circuit of an ASSEMBLY)		-
	Rated conditional short-circuit current of an ASSEMBLY (Icc)	10kA	P
5.4	Rated frequency (fn)	50Hz	P
5.5	Other characteristics		
	additional requirements depending on the specific service conditions of a functional unit (e.g. type of coordination, overload characteristics);		-
	pollution degree	2	-
	types of system earthing for which the ASSEMBLY is designed.....	TN	P
	indoor and/or outdoor installation.....	Outdoor	P
	stationary or movable	Stationary	P
	degree of protection	IP66	P
	intended for use by skilled or ordinary persons.....	Skilled	P
	electromagnetic compatibility (EMC) classification :		N/A
	special service conditions, if applicable		N/A
	external design	Metallic enclosure	P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	mechanical impact protection, if applicable		N/A
	the type of construction - fixed, removable or withdrawable parts.....	Fixed	P
	the form of internal separation		P
	the types of electrical connections of functional units		P
6	INFORMATION		
6.1	ASSEMBLY designation marking		
	Place of designation plates	Outside an enclosure	P
	ensuring good legibility and visibility when the door(s) is open or the cover is removed		P
	The following information regarding the ASSEMBLY is provided on the designation label(s):		-
	a) ASSEMBLY manufacturer's name or trade mark (see 3.10.2);	Multilux	-
	b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the ASSEMBLY manufacturer;	MU serie. MU2	P
	c) means of identifying date of manufacture;	Prod. date	P
	d) IEC 61439-5.	NEK 439-1 & 5	P
6.2	Documentation		
6.2.1	Information relating to the PCS-ASSEMBLY		-
	a) rated voltage (U_n) (of the ASSEMBLY) (V).....	400	-
	b) rated operational voltage (U_e) (of a circuit)(V) ...	250	-
	c) rated impulse withstand voltage (U_{imp}) (kV)	4kV	-
	d) rated insulation voltage (U_i) (V)	400	-
	e) rated current of the ASSEMBLY (I_n) (A)	63A	-
	f) rated current of each circuit (I_{nc}) (A)	2x40A, 1x25A	-
	g) rated peak withstand current (I_{pk}) (kA)	-	-
	h) rated short-time withstand current (I_{cw}) together with its duration (kA – s)	-	-
	i) rated conditional short-circuit current (I_{cc}) (kA)..	17	-
	j) rated frequency (f_n) (Hz)	50	-
	k) rated diversity factor(s) (RDF)	0,9	-
	l) form of internal separation		-
	m) types of electrical connections of functional units		-

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	All necessary information relating to the other declared classifications and characteristics (see 5.5) is provided.		P
	The following additional information regarding the ASSEMBLY is provided where applicable:		-
	1) the short-circuit withstand strength and nature of short-circuit protective device(s) (see 9.3.2); :		N/A
	2) measures for protection against electric shock; :		N/A
	3) overall dimensions (including projections e.g handles, covers, doors); :	H = 120cm W = 80cm D = 40cm	P
	4) the weight where this exceeds 30 kg. :		N/A
6.2.2	Instructions for handling, installation, operation and maintenance		
	The ASSEMBLY manufacturer provides in documents or catalogues:		-
	the conditions, if any, for the handling, installation, operation and maintenance of the ASSEMBLY and the equipment contained therein.	According to mounting instructions	P
	the proper and correct transport, handling, installation and operation of the ASSEMBLY.	According to mounting instructions	P
	The provision of weight details in connection with the transport and handling of ASSEMBLIES.	According to mounting instructions	P
	The correct location and installation of lifting means and the thread size of lifting attachments, if applicable, is given in the ASSEMBLY manufacturer's documentation or the instructions on how the ASSEMBLY has to be handled.	According to mounting instructions	P
	The measures to be taken, if any, with regard to EMC associated with the installation, operation and maintenance of the ASSEMBLY is specified (see Annex J).	According to mounting instructions	P
	If an ASSEMBLY specifically intended for environment A is to be used in environment B a warning is included in the operating instructions	According to mounting instructions	P
	If the circuitry is not obvious from the physical arrangement of the apparatus installed, suitable information is supplied, for example wiring diagrams or tables.	According to mounting instructions	P
6.3	Device and/or component identification		
	Inside the ASSEMBLY, it is possible to identify individual circuits and their protective devices.	List of circuits enclosed	P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Any designations used is in compliance with IEC 61346-1 and IEC 61346-2 and identical with those used in the wiring diagrams, which is in accordance with IEC 61082-1.		N/A
	In the case of removable fuse-carriers which are specific to a fuse way, a label placed on the fuse carrier as well as on the fuse base, to avoid incorrect interchangeability of the fuse-carrier		N/A
6.101	It is possible to identify each functional unit in a clearly visible manner		P
7	SERVICE CONDITIONS		
7.1	Normal service conditions		
7.1.1.1	Ambient air temperature for indoor installations		
	The ambient air temperature does not exceed +40 °C and its average over a period of 24 h does not exceed +35 °C. The lower limit of the ambient air temperature is –5 °C.		N/A
7.1.1.2	Ambient air temperature for outdoor installations		
	The ambient air temperature does not exceed +40 °C and its average over a period of 24 h does not exceed +35 °C. Unless the user specifies a PENDA shall be suitable for use in an arctic climate, the lower limit of ambient air temperature is –25 °C. For an arctic climate the lower limit of ambient temperature is –50 °C.		P
7.1.2.1	Atmospheric conditions for indoor installations		
	The air is clean and its relative humidity does not exceed 50 % at a maximum temperature of +40 °C. Higher relative humidity may be permitted at lower temperatures, for example 90 % at +20 °C. Moderate condensation is taken care of, which may occasionally occur due to variations in temperature.		N/A
7.1.2.2	Atmospheric conditions for outdoor installations		
	The relative humidity may temporarily be as high as 100 % at a maximum temperature of +25 °C.		P
7.1.3	Pollution degree		
	The pollution degree refers to the environmental conditions for which the ASSEMBLY is intended.	2	P
7.1.4	Altitude		
	The altitude of the site of installation does not exceed 2 000 m.		P
7.2	Special service conditions		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Where any special service conditions exist, the applicable particular requirements are met or special agreements are made between the ASSEMBLY manufacturer and the user.		N/A
	a) values of temperature, relative humidity and/or altitude differing from those specified in 7.1;		N/A
	b) applications where variations in temperature and/or air pressure take place at such a speed that exceptional condensation is liable to occur inside the ASSEMBLY;		N/A
	c) heavy pollution of the air by dust, smoke, corrosive or radioactive particles, vapours or salt;	Dust, Salt	P
	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) installation in locations where fire or explosion hazards exist;		N/A
	h) exposure to heavy vibration and shocks;		N/A
	i) installation in such a manner that the current-carrying capacity or breaking capacity is affected, for example equipment built into machines or recessed into walls;		N/A
	j) exposure to conducted and radiated disturbances other than electromagnetic, and electromagnetic disturbances in environments other than those described in 9.4;		N/A
	k) exceptional overvoltage conditions.		N/A
	l) excessive harmonics in the supply voltage or load current		N/A
	m) installation in locations where heavy snowfalls occur or adjacent to areas where there is snow clearance by ploughing		P
7.3	Conditions during transport, storage and installation		
	A special agreement is made between the ASSEMBLY manufacturer and the user if the conditions during transport, storage and installation, for example temperature and humidity conditions, differ from those defined in 7.1.		N/A
8	CONSTRUCTIONAL REQUIREMENTS		
8.1	Strength of materials and parts		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	ASSEMBLIES are constructed of materials capable of withstanding the mechanical, electrical, thermal and environmental stresses that are likely to be encountered in specified service conditions.		P
	Outgoing circuits are suitable for connection by means of cables		P
	A reliable locking device provided on outdoor enclosures which prevents access by unauthorized persons		P
8.1.2	Protection against corrosion		
	Protection against corrosion is ensured by the use of suitable materials or by protective coatings to the exposed surface, taking account of the intended normal service conditions of use and maintenance.		P
8.1.3	Thermal stability		
	For enclosures or parts of enclosures made of insulating materials, thermal stability is verified according to 10.2.3.1.		N/A
8.1.4	Resistance to ultra-violet radiation		
	For enclosures and external parts made of insulating materials which are intended to be used outdoor, resistance to ultra-violet radiation is verified according to 10.2.4.		N/A
8.1.5	Resistance of insulating materials to heat and fire		
	If an identical material having representative cross-sections as the parts has already satisfied the requirements of 8.1.5.2 and/or 8.1.5.3. then those respective tests need not be repeated. It is the same for all parts which have been previously tested according to their own specifications.	Metal enclosure	N/A
8.1.5.2	Verification of resistance of insulating materials to heat		
	The original 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.	Metal enclosure	N/A
	If this data is not available the ball pressure test in 10.2.3.2 is conducted to verify the suitability of insulating materials used to resist the effects of heat.	Metal enclosure	N/A
8.1.5.3	Resistance of insulating materials to abnormal heat and fire due to internal electric effects		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Insulating materials used for parts necessary to retain current carrying parts in position and parts which might be exposed to thermal stresses due to internal electrical effects, and the deterioration of which might impair the safety of the ASSEMBLY, are not adversely affected by abnormal heat and fire and are verified by the glow-ire test in 10.2.3.3. For the purpose of this test, a protective conductor (PE) is not considered as a current-carrying part.	Metal enclosure	N/A
	For small parts (having surface dimensions not exceeding 14 mm x 14 mm), an alternative test may be used (e.g. needle flame test, according to IEC 60695-11-5). The same procedure may be applicable for other practical reasons where the metal material of a part is large compared to the insulating material.	Metal enclosure	N/A
	The original manufacturer may provide data on the suitability of materials from the insulating material supplier to demonstrate compliance with these requirements.	Metal enclosure	N/A
8.1.5.101	Verification of category of flammability		
	The insulating materials used for enclosures, barriers and other insulating parts have flame retardant properties in accordance with 10.2.3.102	Metal enclosure	N/A
8.1.6	Mechanical strength		
	All enclosures or partitions including locking means and hinges for doors are of a mechanical strength sufficient to withstand the stresses to which they may be subjected in normal service, and during short-circuit conditions (see also 10.13).		P
	The mechanical operation of removable parts, including any insertion interlock, is verified by test according to 10.13.		P
8.1.6.101	Verification of mechanical strength		
	Mechanical properties of a PENDA-O comply with 10.2.101		P
	Parts of the PENDA-O intended to be embedded in the ground withstand the stresses imposed on them during installation and normal service and comply with 10.2.101.6.		P
8.1.7	Lifting provision		
	Where required, ASSEMBLIES are provided with the appropriate provision for lifting. Compliance is checked according to the test of 10.2.5.		P
8.1.101	Thermal stability		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	The thermal stability of a PENDA verified according to 10.2.3.101		P
8.2	Degree of protection provided by an ASSEMBLY enclosure		
8.2.2	Protection against contact with live parts, ingress of solid foreign bodies and liquids		
	The degree of protection provided by any ASSEMBLY against contact with live parts, ingress of solid foreign bodies and liquid is indicated by the IP code according to IEC 60529 and verified according to 10.3	IP66	P
	The degree of protection of an enclosed ASSEMBLY is at least IP 2X, after installation in accordance with the ASSEMBLY manufacturer's instructions. The degree of protection provided from the front of a dead front ASSEMBLY is at least IP XXB.	IP66	P
	For ASSEMBLIES for outdoor use having no supplementary protection, the second characteristic numeral is at least 3.		N/A
	Unless otherwise specified, the degree of protection indicated by the ASSEMBLY manufacturer applies to the complete ASSEMBLY when installed in accordance with the ASSEMBLY manufacturer's instructions, for example sealing of the open mounting surface of an ASSEMBLY, etc.		P
	Where the ASSEMBLY does not have the same IP rating		N/A
	Enclosed ASSEMBLIES, for outdoor and indoor installation, intended for use in locations with high humidity and temperatures varying within wide limits, are provided with suitable arrangements (ventilation and/or internal heating, drain holes, etc.) to prevent harmful condensation within the ASSEMBLY. However, the specified degree of protection is the same time maintained.	Internal heating	P
	For PENDA-O intended to be installed in places accessible to the public: - its enclosure provides a degree of protection of at least IP34D. In other locations, the minimum level of protection at least IP33. - when any temporary cables are connected, the enclosure provides at least IP 23C.	IP66	P
8.2.3	Degree of protection of removable parts		
	The degree of protection indicated for ASSEMBLIES normally applies to the connected position (see 3.2.3) of removable parts.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	If, after the removal of a removable part, the original degree of protection is not maintained, an agreement is made between the ASSEMBLY manufacturer and the user as to what measures are taken to ensure adequate protection. Information provided by the ASSEMBLY manufacturer may take the place of such an agreement.		N/A
8.3	Clearances and creepage distances		
	The requirements for clearances and creepage distances are based on the principles of IEC 60664-1 and are intended to provide insulation co-ordination within the installation.		P
	The clearances and creepage distances of equipment that form part of the ASSEMBLY comply with the requirements of the relevant product standard.		P
	When incorporating equipment into the ASSEMBLY, the specified clearances and creepage distances are maintained during normal service conditions.		P
	For dimensioning clearances and creepage distances between separate circuits, the highest voltage ratings is used (rated impulse withstand voltage for clearances and rated insulation voltage for creepage distances).		P
	The clearances and creepage distances apply to phase to phase, phase to neutral, and except where a conductor is connected directly to earth, phase to earth and neutral to earth.		P
	For bare live conductors and terminations (e.g. busbars, connections between equipment and cable lugs), the clearances and creepage distances are at least equivalent to those specified for the equipment with which they are directly associated.		N/A
	The effect of a short-circuit up to and including the declared rating(s) of the ASSEMBLY does not reduce permanently the clearances or creepage distances between busbars and/or connections, below the values specified for the ASSEMBLY. Deformation of parts of the enclosure or of the internal partitions, barriers and obstacles due to a short-circuit do not reduce permanently the clearances or creepage distances below those specified in 8.3.2 and 8.3.3 (see also 10.11.5.5).		P
	8.3.2 Clearances		


IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	The clearances are sufficient to enable the declared rated impulse withstand voltage (Uimp) of a circuit to be achieved. The clearances is as specified in Table 1 unless a design verification test and routine impulse withstand voltage test is carried out in accordance with 10.9.3 and 11.3, respectively.		P
8.3.3	Creepage distances		
	The original manufacturer selects a rated insulation voltage(s) (Ui) for the circuits of the ASSEMBLY from which the creepage distance(s) are determined. For any given circuit the rated insulation voltage is not less than the rated operational voltage (Ue).		P
	The creepage distances are not less than the associated minimum clearances.		P
8.4	Protection against electric shock		
8.4.2	Basic protection		
	Basic protection can be achieved either by appropriate constructional measures on the ASSEMBLY itself or by additional measures to be taken during installation; this may require information to be given by the ASSEMBLY manufacturer.		P
	Where basic protection is achieved by constructional measures one or more of the protective measures given in 8.4.2.2 and 8.4.2.3 may be selected.		P
	The choice of the protective measure is declared by the ASSEMBLY manufacturer if not specified within the relevant ASSEMBLY standard.		P
8.4.2.2	Basic insulation provided by insulating material		
	Hazardous live parts are completely covered with insulation that can only be removed by destruction.		N/A
	The insulation is made of suitable materials capable of durably withstanding the mechanical, electrical and thermal stresses to which the insulation may be subjected in service.		N/A
	Paints, varnishes and lacquers alone are not considered to satisfy the requirements for basic insulation.		N/A
8.4.2.3	Barriers or enclosures		
	Air insulated live parts are inside enclosures or behind barriers providing at least a degree of protection of IP XXB.	IP66	P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Horizontal top surfaces of accessible enclosures having a height equal to or lower than 1,6 m above the standing area, provide a degree of protection of at least IP XXD.		P
	Barriers and enclosures are firmly secured in place and have sufficient stability and durability to maintain the required degrees of protection and appropriate separation from live parts under normal service conditions, taking account of relevant external influences. The distance between a conductive barrier or enclosure and the live parts they protect is not less than the values specified for the clearances and creepage distances in 8.3.		P
	Where it is necessary to remove barriers or open enclosures or to remove parts of enclosures, this is possible only if one of the conditions a) to c) is fulfilled:		P
	a) By the use of a key or tool, i.e. any mechanical aid, to open the door, cover or override an interlock.		P
	b) After isolation of the supply to live parts, against which the barriers or enclosures afford basic protection, restoration of the supply being possible only after replacement or reclosure of the barriers or enclosures. In TN-C systems, the PEN conductor is not be isolated or switched. In TN-S systems and TN-C-S systems the neutral conductors need not be isolated or switched (see IEC 60364-5-53, 536.1.2).		N/A
	c) Where an intermediate barrier providing a degree of protection of at least IP XXB prevents contact with live parts, such a barrier being removable only by the use of a key or tool.		N/A
8.4.2.101	Earthing and short-circuiting means		
	Outgoing units in an ASSEMBLY constructed that they can be earthed and short-circuited in a secure manner		P
	Manufacturer's indicated degree of protection is maintained for all parts		P
8.4.3	Fault protection		
8.4.3.1	Installation conditions		
	The ASSEMBLY includes protective measures and is suitable for installations designed to be in accordance with IEC 60364-4-41.		P
	Protective measures suitable for particular installations (e.g. railways, ships) are subject to agreement between the ASSEMBLY manufacturer and the user.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	For an ASSEMBLY that is expected to feed overhead cable lines, outgoing units designed in such a way that an attached cable(s) can be earthed at the termination(s)		N/A
8.4.3.2	Protection by automatic disconnection of the supply		
	Each ASSEMBLY has a protective conductor to facilitate automatic disconnection of the supply for:		P
	a) protection against the consequences of faults (e.g. failure of basic insulation) within the ASSEMBLY;		P
	b) protection against the consequences of faults (e.g. failure of basic insulation) in external circuits supplied through the ASSEMBLY.		P
8.4.3.2.2	Requirements for earth continuity providing protection against the consequences of faults within the ASSEMBLY		
	All exposed conductive parts of the ASSEMBLY are interconnected together and to the protective conductor of the supply or via an earthing conductor to the earthing arrangement.		P
	These interconnections may be achieved either by metal screwed connections, welding or other conductive connections or by a separate protective conductor. In the case of a separate protective conductor Table 3 is used.		P
	For the continuity of these connections the following is applied:		
	a) When a part of the ASSEMBLY is removed, for example for routine maintenance, the protective circuits (earth continuity) for the remainder of the ASSEMBLY is not interrupted. Means used for assembling the various metal parts of an ASSEMBLY are considered sufficient for ensuring continuity of the protective circuits if the precautions taken guarantee permanent good conductivity.		P
	Flexible or pliable metal conduits are not used as protective conductors unless they are designed for that purpose.		P
	b) For lids, doors, cover plates and the like, the usual metal screwed connections and metal hinges are considered sufficient to ensure continuity provided that no electrical equipment exceeding the limits of extra low voltage (ELV) is attached to them.		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	If apparatus with a voltage exceeding the limits of extra-low voltage are attached to lids, doors, or cover plates additional measures are taken to ensure earth continuity. These parts are fitted with a protective conductor (PE) whose cross-sectional area is in accordance with Table 3 depending on the highest rated operational current I_e of the apparatus attached or, if the rated operational current of the attached apparatus is less than or equal to 16 A, an equivalent electrical connection especially designed and verified for this purpose (sliding contact, hinges protected against corrosion).		N/A
	Exposed conductive parts of a device that cannot be connected to the protective circuit by the fixing means of the device are connected to the protective circuit of the ASSEMBLY by a conductor whose cross-sectional area is chosen according to Table 3.		N/A
	Certain exposed conductive parts of an ASSEMBLY that do not constitute a danger —either because they cannot be touched on large surfaces or grasped with the hand, — or because they are of small size (approximately 50 mm by 50 mm) or so located as to exclude any contact with live parts, need not be connected to a protective conductor. This applies to screws, rivets and nameplates. It also applies to electromagnets of contactors or relays, magnetic cores of transformers, certain parts of releases, or similar, irrespective of their size.		N/A
	When removable parts are equipped with a metal supporting surface, these surfaces are considered sufficient for ensuring earth continuity of protective circuits provided that the pressure exerted on them is sufficiently high.		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		
	A protective conductor within the ASSEMBLY is so designed that it is capable of withstanding the highest thermal and dynamic stresses arising from faults in external circuits at the place of installation that are supplied through the ASSEMBLY. Conductive structural parts may be used as a protective conductor or a part of it.		P
	In principle, with the exception of the cases mentioned below, protective conductors within an ASSEMBLY does not include a disconnecting device (switch, disconnector, etc.):		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	In the run of protective conductors links are permitted which are removable by means of a tool and accessible only to authorized personnel (these links may be required for certain tests).		P
	Where continuity can be interrupted by means of connectors or plug-and-socket devices, the protective circuit can be interrupted only after the live conductors have been interrupted and continuity is established before the live conductors are reconnected.		N/A
	In the case of an ASSEMBLY containing structural parts, frameworks, enclosures, etc., made of conducting material, a protective conductor, if provided, need not be insulated from these parts. Conductors to certain protective devices including the conductors connecting them to a separate earth electrode are insulated. This applies for instance to voltage-operated fault detection devices and can also apply to the earth connection of the transformer neutral.		P
	The cross-sectional area of protective conductors (PE, PEN) in an ASSEMBLY to which external conductors are intended to be connected are not less than the value calculated with the aid of the formula indicated in Annex B using the highest fault current and fault duration that may occur and taking into account the limitation of the short-circuit protective devices (SCPDs) that protect the corresponding live conductors (see 10.11.5.6).		P
	For PEN conductors, the following additional requirements apply:		-
	– the minimum cross-sectional area is 10 mm ² copper or 16 mm ² aluminium;		P
	– the PEN conductor has a cross-sectional area not less than that required for a neutral conductor (see 8.6.1);		N/A
	– the PEN conductors need not be insulated within an ASSEMBLY;		N/A
	– structural parts are not used as a PEN conductor. However, mounting rails made of copper or aluminium may be used as PEN conductors;		P
	– for certain applications in which the current in the PEN conductor may reach high values, for example large fluorescent lighting installations, a PEN conductor having the same or higher current-carrying capacity as the phase conductors may be necessary, subject to special agreement between the ASSEMBLY manufacturer and the user.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
8.4.3.3	Electrical separation		
	Electrical separation of individual circuits is intended to prevent electrical shock through contact with exposed-conductive-parts, which may be energized by a fault in basic insulation of the circuit. For this type of protection, see Annex K.		N/A
8.4.3.4	Protection by total insulation		
	For protection, by total insulation, against indirect contact the following requirements are met.		-
	a) The apparatus is completely enclosed in insulating material which is equivalent of double or reinforced insulation. The enclosure carries the symbol  which is visible from the outside.		N/A
	b) The enclosure is at no point pierced by conducting parts in such a manner that there is the possibility of a fault voltage being brought out of the enclosure.		P
	This means that metal parts, such as actuator shafts which for constructional reasons have to be brought through the enclosure, are insulated on the inside or the outside of the enclosure from the live parts for the maximum rated insulation voltage and the maximum rated impulse withstand voltage of all circuits in the ASSEMBLY.		N/A
	If an actuator is made of metal (whether covered by insulating material or not), it is provided with insulation rated for the maximum rated insulation voltage and the maximum impulse withstand voltage of all circuits in the ASSEMBLY.		N/A
	If an actuator is principally made of insulating material, any of its metal parts which may become accessible in the event of insulation failure are also insulated from live parts for the maximum rated insulation voltage and the maximum rated impulse withstand voltage of all circuits in the ASSEMBLY.		N/A
	c) The enclosure, when the ASSEMBLY is ready for operation and connected to the supply, encloses all live parts, exposed conductive parts and parts belonging to a protective circuit in such a manner that they cannot be touched. The enclosure gives at least the degree of protection IP 2XC (see IEC 60529)		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	If a protective conductor, which is extended to electrical equipment connected to the load side of the ASSEMBLY, is to be passed through an ASSEMBLY whose exposed conductive parts are insulated, the necessary terminals for connecting the external protective conductors are provided and identified by suitable marking.		N/A
	Inside the enclosure, the protective conductor and its terminal are insulated from the live parts and the exposed conductive parts in the same way as the live parts are insulated.		N/A
	d) Exposed conductive parts within the ASSEMBLY are not connected to the protective circuit, i.e. they are not included in a protective measure involving the use of a protective circuit. This applies also to built-in apparatus, even if they have a connecting terminal for a protective conductor.		N/A
	e) If doors or covers of the enclosure can be opened without the use of a key or tool, a barrier of insulating material is provided that will afford protection against unintentional contact not only with the accessible live parts, but also with the exposed conductive parts that are only accessible after the cover has been opened; this barrier, however, is not removable except with the use of a tool.		P
8.4.4	Limitation of steady-state touch current and charge		
	If the ASSEMBLY contains items of equipment that may have steady-state touch current and charges after they have been switched off (capacitors, etc.) a warning plate is required.		N/A
	Small capacitors such as those used for arc extinction, for delaying the response of relays, etc., are not considered dangerous.		N/A
8.4.5	Operating and servicing conditions		
8.4.5.1	Devices to be operated or components to be replaced by ordinary persons		
	Protection against any contact with live parts is maintained when operating devices or when replacing components.		N/A
	Openings larger than those defined by degree of protection IP XXC are allowed during the replacement of certain lamps or fuselinks.		N/A
8.4.5.2	Requirements related to accessibility in service by authorized persons		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	If, for reasons of operation, the ASSEMBLY is fitted with a device permitting authorized persons to obtain access to live parts while the equipment is live (e.g by overriding the interlock or using a tool), the interlock is automatically restored on reclosing the door(s).		N/A
8.4.5.2.2	Requirements related to accessibility for inspection and similar operations		
	The ASSEMBLY is constructed in such a way that certain operations, according to agreement between the ASSEMBLY manufacturer and the user, can be performed when the ASSEMBLY is in service and under voltage.		P
	Such operations may consist of:		
	– visual inspection of □□switching devices and other apparatus, □□settings and indicators of relays and releases, □□conductor connections and marking;		P
	– adjusting and resetting of relays, releases and electronic devices;		P
	– replacement of fuse-links;		N/A
	– replacement of indicating lamps;		N/A
	– certain fault location operations, for example voltage and current measuring with suitably designed and insulated devices.		N/A
8.4.5.2.3	Requirements related to accessibility for maintenance		
	To enable maintenance as agreed upon between the ASSEMBLY manufacturer and the user on an isolated functional unit or isolated group of functional units in the ASSEMBLY, with adjacent functional units or groups still under voltage, necessary measures are taken.		N/A
	The choice depends on such factors as service conditions, frequency of maintenance, competence of the authorized person, as well as local installation rules. Such measures may include:		N/A
	– sufficient space between the actual functional unit or group and adjacent functional units or groups. It is recommended that parts likely to be removed for maintenance have, as far as possible, retainable fastening means;		N/A
	– use of barriers or obstacles designed and arranged to protect against direct contact with equipment in adjacent functional units or groups;		N/A
	– use of terminal shields;		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	– use of compartments for each functional unit or group;		N/A
	– insertion of additional protective means provided or specified by the ASSEMBLY manufacturer.		N/A
8.4.5.2.4	Requirements related to accessibility for extension under voltage		
	When it is required to enable future extension of an ASSEMBLY with additional functional units or groups, with the rest of the ASSEMBLY still under voltage, the requirements specified in 8.4.5.2.3 apply, subject to agreement between the ASSEMBLY manufacturer and the user.		N/A
	These requirements also apply for the insertion and connection of additional outgoing cables when the existing cables are under voltage.		N/A
	The extension of busbars and connection of additional units to their incoming supply are not made under voltage, unless the ASSEMBLY is designed for this purpose.		N/A
8.4.5.2.5	Obstacles		
	Obstacles prevent either:		
	– unintentional bodily approach to live parts, or		N/A
	– unintentional contact with live parts during the operation of live equipment in normal service.		N/A
	Obstacles may be removed without using a key or tool but are so secured as to prevent unintentional removal. The distance between a conductive obstacle and the live parts they protect is not less than the values specified for the clearances and creepage distances in 8.3.		N/A
	Where a conductive obstacle is separated from hazardous live parts by basic protection only, it is an exposed conductive part, and measures for fault protection are also applied.		N/A
8.5	Incorporation of switching devices and components		
	Individual components, such as fuses and switching devices that are in compliance with others standards, also comply with the supplementary requirements of this standard		P
8.5.1	Fixed parts		
	For fixed parts (see 3.2.1), the connections of the main circuits (see 3.1.3) is only connected or disconnected when the ASSEMBLY is not under voltage.		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	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
	In order to prevent unauthorized operation, the switching device may be provided with means to secure it in one or more of its positions.		P
8.5.2.	Removable parts		
	The removable and withdrawable parts are so constructed that their electrical equipment can be safely isolated from or connected to the main circuit whilst this circuit is live.	No removable or withdrawable parts.	N/A
	The removable and withdrawable parts may be provided with an insertion interlock		N/A
	Minimum clearances and creepage distances are complied with in the different positions as well as during transfer from one position to another.		N/A
8.5.3	Selection of switching devices and components		
	Switching devices and components incorporated in ASSEMBLIES comply with the relevant IEC standards.	See TABLE: Critical components information	P
	The switching devices and components having a short-circuit withstand strength and/or a breaking capacity which is insufficient to withstand the stresses likely to occur at the place of installation, are protected by means of current-limiting protective devices, for example fuses or circuit-breakers.		P
	When selecting current-limiting protective devices for built-in switching devices, account is taken of the maximum permissible values specified by the device manufacturer, having due regard to co-ordination (see 9.3.4).		P
	Co-ordination of switching devices and components, for example co-ordination of motor starters with short-circuit protective devices, comply with the relevant IEC standards.		P
	Fuses comply with the general requirements of IEC 60269-1 or with the relevant national standard where it is an established practice for such use		P
8.5.4	Installation of switching devices and components		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Switching devices and components are installed and wired in the ASSEMBLY in accordance with instructions provided by their manufacturer and in such a manner that their proper functioning is not impaired by interaction, such as heat, switching emissions, vibrations, electromagnetic fields, which are present in normal operation.		P
	In the case of electronic assemblies, this may necessitate the separation or screening of all electronic signal processing circuits.		N/A
	When fuses are installed the original manufacturer states the type and rating of the fuselinks to be used.		N/A
8.5.5	Accessibility		
	Adjusting and resetting devices, which have to be operated inside the ASSEMBLY are easily accessible.		P
	Functional units mounted on the same support (mounting plate, mounting frame) and their terminals for external conductors are so arranged as to be accessible for mounting, wiring, maintenance and replacement.		P
	Unless otherwise agreed between the ASSEMBLY manufacturer and the user the following accessibility requirements associated with floor-mounted ASSEMBLIES apply:		
	The terminals, excluding terminals for protective conductors, are situated at least 0,2 m above the base of the ASSEMBLIES and, moreover, be so placed that the cables can be easily connected to them.		P
	Indicating instruments that need to be read by the operator are located within a zone between 0,2 m and 2,2 m above the base of the ASSEMBLY.		P
	Operating devices such as handles, push buttons, or similar are located at such a height that they can easily be operated; this means that their centreline are located within a zone between 0,2 m and 2 m above the base of the ASSEMBLY.		P
	Actuators for emergency switching devices (see 536.4.2 of IEC 60364-5-53) are accessible within a zone between 0,8 m and 1,6 m above the base of the ASSEMBLY		N/A
8.5.6	Barriers		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	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, unless the design and location of the fuses makes this unnecessary.		N/A
8.5.7	Direction of operation and indication of switching positions		
	The operational positions of components and devices are clearly identified. If the direction of operation is not in accordance with IEC 60447, then the direction of operation is clearly identified.		P
8.5.8	Indicator lights and push-buttons		
	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		
8.6.1	Main circuits		
	The busbars (bare or insulated) are arranged in such a manner that an internal short-circuit is not to be expected.		N/A
	They are rated at least in accordance with the information concerning the short-circuit withstand strength (see 9.3) and designed to withstand at least the short-circuit stresses limited by the protective device(s) on the supply side of the busbars.		N/A
	Within one section, the conductors (including distribution busbars) between the main busbars and the supply side of functional units as well as the components included in these units may be 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 under normal operation an internal short-circuit between phases and/or between phases and earth is not to be expected (see 8.6.4).		N/A
	Unless otherwise agreed between the ASSEMBLY manufacturer and the user, the minimum cross-sectional area of the neutral within a three phase and neutral circuit is:		
	<input type="checkbox"/> For circuits with a phase conductor cross-sectional area up to and including 16 mm ² , 100 % of that of the corresponding phases.		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	□□ 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
	It is assumed that the neutral currents do not exceed 50 % of the phase currents.		N/A
8.6.2	Auxiliary circuits		
	The design of the auxiliary circuits takes into account the supply earthing system and ensures that an earth-fault or a fault between a live part and an exposed conductive part does not cause unintentional dangerous operation.		P
	In general, auxiliary circuits are protected against the effects of short circuits.		P
	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		
	The connections of current-carrying parts do not suffer undue alteration as a result of normal temperature rise, ageing of the insulating materials and vibrations occurring in normal operation.		P
	The effects of thermal expansion and of the electrolytic action in the case of dissimilar metals, and the effects of the endurance of the materials to the temperatures attained, are taken into consideration		P
	Connections between current-carrying parts are established by means that ensure a sufficient and durable contact pressure.		P
	If verification of temperature rise is carried out on the basis of tests (see 10.10.2) the selection of conductors and their cross-sections used inside the ASSEMBLY is the responsibility of the ASSEMBLY manufacturer.		P
	If verification of temperature rise is made following the rules of 10.10.3, the conductors have a minimum cross-section 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
	In the case of insulated solid or flexible conductors:		
	– They are rated for at least the rated insulation voltage (see 5.2.3) of the circuit concerned.		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	– Conductors connecting two termination points have no intermediate joint, e.g. spliced or soldered.		N/A
	– Conductors with only basic insulation are prevented from coming into contact with bare live parts at different potentials.		N/A
	– Contact of conductors with sharp edges are prevented.		N/A
	- Supply conductors to apparatus and measuring instruments in covers or doors are so installed that no mechanical damage can occur to the conductors as a result of movement of these covers or doors.		N/A
	– Soldered connections to apparatus are permitted in ASSEMBLIES only in cases where provision is made for this type of connection on the apparatus and the specified type of conductor is used.		N/A
	- For apparatus other than those mentioned above, soldering cable lugs or soldered ends of stranded conductors are not acceptable under conditions of heavy vibration. In locations where heavy vibrations exist during normal operation, for example in the case of dredger and crane operation, operation on board ships, lifting equipment and locomotives, attention is given to the support of conductors.		N/A
	– Generally only one conductor is connected to a terminal; the connection of two or more conductors to one terminal is permissible only in those cases where the terminals are designed for this purpose.		N/A
	The dimensioning of solid insulation between separate circuits are based on the circuit of highest rated insulation voltage.		N/A
8.6.4	Selection and installation of non-protected live conductors to reduce the possibility of short-circuits		
	Live conductors in an ASSEMBLY that are not protected by short-circuit protective devices (see 8.6.1 and 8.6.2) are selected and installed throughout the entire ASSEMBLY in such a manner that an internal short-circuit between phases or between phase and earth is a remote possibility. See Table 4.		N/A
	Non-protected live conductors selected and installed as in Table 4 and having a SCPD on the load side do not exceed 3 m in length.		N/A
8.6.5	Identification of the conductors of main and auxiliary circuits		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	With the exception of the cases mentioned in 8.6.6, the method and the extent of identification of conductors, for example by arrangement, colours or symbols, on the terminals to which they are connected or on the end(s) of the conductors themselves, is the responsibility of the ASSEMBLY manufacturer and is in agreement with the indications on the wiring diagrams and drawings.		P
	Where appropriate, identification according to IEC 60445 and IEC 60446 are applied		N/A
8.6.6	Identification of the protective conductor (PE, PEN) and of the neutral conductor (N) of the main circuits		
	The protective conductor is readily distinguishable by location and/or marking or colour.		P
	If identification by colour is used, it is only green and yellow (twin-coloured), which is strictly reserved for the protective conductor.		P
	When the protective conductor is an insulated single-core cable, this colour identification is used, preferably throughout the whole length.		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 60446).		P
8.7	Cooling		
	ASSEMBLIES can be provided with both natural and forced cooling. If special precautions are required at the place of installation to ensure proper cooling, the ASSEMBLY manufacturer furnishes the necessary information (for instance indication of the need for spacing with respect to parts that are liable to impede the dissipation of heat or produce heat themselves).	Natural cooling	P
8.8	Terminals for external conductors		
	Terminals are capable of accommodating cables having copper or aluminium conductors from the smallest to the largest cross-sectional area corresponding to the appropriate rated current		P
	The terminations for outgoing circuits are located so that adequate spacing is provided and to facilitate terminating the phase conductors of a cable irrespective of their lay		P
	Where specified by the user, the incoming circuit is suitable for connection by means of either bare or insulated bars.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	In the case where external conductors for electronic circuits with low level currents and voltages (less than 1 A and less than 50 V a.c. or 120 V d.c.) have to be connected to an ASSEMBLY, Table A.1 does not apply.		N/A
	The available wiring space permits proper connection of the external conductors of the indicated material and, in the case of multicore cables, spreading of the cores.		P
	The conductors are not subjected to stresses		P
	Unless otherwise agreed between the ASSEMBLY manufacturer and the user, on three-phase and neutral circuits, terminals for the neutral conductor allow the connection of copper conductors having a current-carrying capacity:		
	– equal to half the current-carrying capacity of the phase conductor, with a minimum of 16 mm ² , if the size of the phase conductor exceeds 16 mm ² ;		P
	– equal to the full current-carrying capacity of the phase conductor, if the size of the latter is less than or equal to 16 mm ² .		P
	If connecting facilities for incoming and outgoing neutral, protective and PEN conductors are provided; they are arranged in the vicinity of the associated phase conductor terminals.		P
	Openings in cable entries, cover plates, etc., are so designed that, when the cables are properly installed, the 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 (steel conduit, lead sheath, etc.) are, where required, bare and, unless otherwise specified, 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
	Unless otherwise agreed between the ASSEMBLY manufacturer and the user, terminals for protective conductors allow the connection of copper conductors having a cross-section depending on the cross-section of the corresponding phase conductors according to Table 5.		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	In the case of enclosures and conductors of aluminium or aluminium alloys, particular consideration are given to the danger of electrolytic corrosion.		P
8.101	Marking as an obstacle to snow clearance		
	Where a PENDA-O is intended for use in regions where heavy snowfalls occur in accordance with 7.2, or alternatively, if required by the user: - it is possible to mark it as an obstacle to snow clearance - holders provided, attached to the PENDA-O, to accommodate marking rods - it is possible to install and make adjustments to the position of the marking rod from outside the PENDA - holders are constructed in a manner which ensures that the holder or marking rod will give way to a mechanical force before the transmitted force to the PENDA-O's enclosure reaches the value which would adversely affect the degree of protection		P
8.102	Ease of operation and maintenance		
	All parts of the ASSEMBLY are readily accessible and replaceable without excessive dismantling		P
	The design is such that the cables can be readily connected from the front		P
	When an PENDA does not have a means of measurement incorporated, it is possible, by the use of a portable instrument, to readily and safely measure voltages in all phases of incoming units and on both sides of all current breaking and/or switch devices of outgoing units, also the current in one phase of all outgoing units. During this operation all live parts of the PENDA is protected sufficiently to retain the required degree of protection in accordance with 8.2. Instructions concerning the procedure to be adopted are provided by the manufacturer		P
	If the ASSEMBLY is intended to be connected to a live reserve power, the switchgear connecting device is designed so that connection can be made with the live parts having a protection of IP 10		N/A
	Locking arrangements are provided to secure the door(s) and prevent unauthorised access. The fixings of any covers etc. which are removable for installation or maintenance operations are only accessible while the door(s) are open		P
9	PERFORMANCE REQUIREMENTS		
9.1	Dielectric properties		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
9.1.2	Power-frequency withstand voltage		
	The circuits of the ASSEMBLY are capable of withstanding the appropriate power frequency withstand voltages given in Tables 8 and 9. The rated insulation voltage of any circuit of the ASSEMBLY is equal to or higher than its maximum operational voltage.		P
9.1.3	Impulse withstand voltage		
9.1.3.1	Impulse withstand voltages of main circuits		
	Clearances from live parts to parts intended to be earthed and between poles are capable of withstanding the test voltage given in Table 10 appropriate to the rated impulse withstand voltage.		P
	The rated impulse withstand voltage for a given rated operational voltage is not be less than that corresponding in Annex G to the nominal voltage of the supply system of the circuit at the point where the ASSEMBLY is to be used and the appropriate overvoltage category.	Uimp; 4kV	P
9.1.3.2	Impulse withstand voltages of auxiliary circuits		
	a) Auxiliary circuits that are connected to the main circuit and operate at the rated operational voltage without any means for reduction of overvoltage comply with the requirements of 9.1.3.1.		P
	b) Auxiliary circuits that are not connected to the main circuit may have an overvoltage withstand capacity different from that of the main circuit. The clearances of such circuits – a.c. or d.c. – are capable of withstanding the appropriate impulse withstand voltage in accordance with Annex G.		N/A
9.1.4	Protection of surge protective devices		
	When overvoltage conditions require surge protective devices (SPD's) to be connected to the main busbars, such SPD's are protected to prevent uncontrolled short-circuit conditions as specified by the SPD manufacturer.		P
9.2	Temperature rise limits		
	The temperature-rise limits given in Table 6 apply for mean ambient air temperatures less than or equal to 35 °C and are not exceeded for ASSEMBLIES when verified in accordance with 10.10.		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	The temperature rise of an element or part is the difference between the temperature of this element or part measured in accordance with 10.10.2.3.3 and the ambient air temperature outside the ASSEMBLY.		P
	The temperature rises obtained during the test do not cause damage to current-carrying parts or adjacent parts of the ASSEMBLY. In particular, 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		
	ASSEMBLIES are capable of withstanding the thermal and dynamic stresses resulting from short-circuit currents not exceeding the rated values.		P
	ASSEMBLIES are protected against short-circuit currents by means of, for example, circuitbreakers, fuses or combinations of both, which may either be incorporated in the ASSEMBLY or arranged outside it.		P
9.3.2	Information concerning short-circuit withstand strength		
	For ASSEMBLIES with a short-circuit protective device (SCPD) incorporated in the incoming unit, the ASSEMBLY manufacturer indicates the maximum allowable value of prospective short-circuit current at the input terminals of the ASSEMBLY.		P
	This 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.		P
	If a circuit breaker with time-delay release is used as the short-circuit protective device, the ASSEMBLY manufacturer states the maximum time-delay and the current setting corresponding to the indicated prospective short-circuit current.		N/A
	For ASSEMBLIES where the short-circuit protective device is not incorporated in the incoming unit, the ASSEMBLY manufacturer indicates the short-circuit withstand strength in one or more of the following ways:		N/A
	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).		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	For times up to a maximum of 3 s, the relationship between the rated short-timer current and the associated duration is given by the formula $I^2t = \text{constant}$, provided that the peak value does not exceed the rated peak withstand current.		N/A
	The ASSEMBLY manufacturer indicates the characteristics of the short-circuit protective devices necessary for the protection of the ASSEMBLY.		N/A
	For an ASSEMBLY having 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
	For an ASSEMBLY having several incoming units which are likely to be in operation simultaneously, and for an ASSEMBLY having one incoming unit and one or more outgoing high-power units likely to contribute to the short-circuit current, it is necessary to determine the values of the prospective short-circuit current in each incoming unit, in each outgoing unit and in the busbars based on data provided by the user.		N/A
9.3.3	Relationship between peak current and short-time current		
	For determining the electrodynamics' stresses, the value of peak current is obtained by multiplying the r.m.s.value of the short-circuit current by the factor n . The values for the factor n and the corresponding power factor are given in Table 7.		N/A
9.3.4	Co-ordination of protective devices		
	The co-ordination of protective devices within the ASSEMBLY with those to be used external to the ASSEMBLY are the subject of an agreement between the ASSEMBLY manufacturer and the user. Information given in the ASSEMBLY manufacturer's catalogue may take the place of such an agreement.		N/A
	If the operating conditions require maximum continuity of supply, the settings or selection of the short-circuit protective devices within the ASSEMBLY are, where possible, so coordinated that a short circuit occurring in any outgoing circuit is cleared by the switching device installed in the circuit without affecting the other outgoing circuits, thus ensuring selectivity of the protective system.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Where short-circuit protective devices are connected in series and are intended to operate simultaneously to reach the required short-circuit switching capability (i.e. back-up protection), the ASSEMBLY Manufacturer informs the User (e.g. by a warning label in the ASSEMBLY or in the operating instructions, see 6.2) that none of the protective devices are allowed to be replaced by another device which is not of identical type and rating, since the switching capability of the whole combination may otherwise be compromised.		N/A
9.4	Electromagnetic compatibility (EMC)		
	For EMC related performance requirements, see Annex J of 61439-1, clause J.9.4		N/A
10	DESIGN VERIFICATION		
	Design verification is intended to verify compliance of the design of an ASSEMBLY or ASSEMBLY system with the requirements of this series of standards.		-
	The tests is performed on a representative sample of an ASSEMBLY in a clean and new condition.		P
	Where tests on the ASSEMBLY have been conducted in accordance with the IEC 60439 series, and the test results fulfil the requirements of the relevant part of IEC 61439, the verification of these requirements need not be repeated.		N/A
	Repetition of verifications in the product standards of switching devices or components incorporated in the ASSEMBLY, which have been selected in accordance with 8.5.3 and installed in accordance with the instructions of their manufacturer is not required.		N/A
	Tests on individual devices to their respective product standards are not an alternative to the design verifications in this standard for the ASSEMBLY.		-
	Design verification can be achieved only by the application of tests in accordance with Clause 10 of this standard. Alternatives methods of verification by calculation and validation of design rules are not applicable.		P
	The performance of the ASSEMBLY may be affected by the verification tests (e.g. short-circuit test). These tests are not performed on an ASSEMBLY that is intended to be placed in service.		-

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	An ASSEMBLY which is verified in accordance with this standard by an original manufacturer (see 3.10.1) and manufactured or assembled by another does not require the original design verifications to be repeated if all the requirements and instructions specified and provided by the Original Manufacturer are met in full.		N/A
	Where the ASSEMBLY manufacturer incorporates their own arrangements not included in the original manufacturer's verification, the ASSEMBLY manufacturer is deemed to be the original manufacturer in respect of these arrangements.		N/A
	The number of ASSEMBLIES or parts thereof used for verification and the order in which the verification is carried out is at the discretion of the original manufacturer.		N/A
	The data used, calculations made and comparison undertaken for the verification of ASSEMBLIES are recorded in a verification report.	See attachment xx	N/A
	Where necessary to suit their particular network parameters, users may specify more onerous or additional test requirements		N/A
10.2	STRENGTH OF MATERIALS AND PARTS		
10.2.1	General		
	The mechanical, electrical and thermal capability of constructional materials and parts of the ASSEMBLY are deemed to be proven by verification of construction and performance characteristics.		P
	Where an empty enclosure in accordance with IEC 62208 is used, and it has not been modified so as to degrade the performance of the enclosure, no repetition of the enclosure testing to 10.2 is required.		P
10.2.2	Resistance to corrosion		
	The resistance to corrosion of representative samples of ferrous metallic enclosures and internal and external ferrous metallic parts of the ASSEMBLY are verified.		-
	The test are carried out on an enclosure or representative sample showing the same constructional detail as the enclosure itself.		N/A
	In all cases hinges, locks and fastenings are also tested unless they have previously been subjected to an equivalent test and their resistance to corrosion has not been compromised by their application.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Where the enclosure is subjected to the test it is mounted as for normal use according to the original manufacturer's instructions.		N/A
	Corrosion resistance properties and projected life (as agreed between manufacturer and user), confirmed by reference to ISO 9223. Tests detailed herein not performed.		N/A
	The test specimens is new and in a clean condition and is subjected to severity test A or B, as detailed in 10.2.2.2 and 10.2.2.3.		N/A
	Severity test A: Damp heat cycling test of IEC 60068-2-30: Severity – temperature 55 °C, 6 cycles and variant 1.		N/A
	Severity test B: The test comprises two identical 12 day periods. Each 12 day period comprises: 5 cycles of 24 h each to damp heat cycling test according to IEC 60068-2-30 (Test Db) at $(40 \pm 3) ^\circ\text{C}$ and relative humidity of 95 % and 7 cycles of 24 h each to salt mist test according to IEC 60068-2-11; (Test Ka: Salt mist), at a temperature of $(35 \pm 2) ^\circ\text{C}$.		N/A
10.2.2.4	Results to be obtained Subclause 10.2.2.4 of Part 1 is not applicable in respect of tests carried out in accordance with 10.2.2.2		N/A
	After the test, the enclosure or samples are washed in running tap water for 5 min, rinsed in distilled or demineralized water then shaken or subjected to air blast to remove water droplets. The specimen under test is then stored under normal service conditions for 2 h.		N/A
	Compliance is checked by visual inspection to determine that:		-
	– there is no evidence of iron oxide, cracking or other deterioration more than that allowed by ISO 4628-3 for a degree of rusting Ri1. However surface deterioration of the protective coating is allowed. In case of doubt associated with paints and varnishes, reference is made to ISO 4628-3 to verify that the samples conform to the specimen Ri1;		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		N/A
10.2.3.1	Verification of thermal stability of enclosures		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	The thermal stability of enclosures manufactured from insulated material is verified by the dry heat test. The test is carried out according to IEC 60068-2-2 Test Bb, at a temperature of 70 °C, with natural air circulation, for a duration of 168 h and with a recovery of 96 h.	No insulating materials	N/A
	Parts, intended for decorative purposes that have no technical significance are not considered for the purpose of this test.		N/A
	The enclosure, mounted as for normal use, is subjected to a test in a heating cabinet with an atmosphere having the composition and pressure of the ambient air and ventilated by natural circulation. If the dimensions of the enclosure are inconsistent with those of the heating cabinet, the test may be carried out on a representative sample of the enclosure.		N/A
	The use of an electrically heated cabinet is recommended.		N/A
	The enclosure or sample shows no crack visible to normal or corrected vision without additional magnification nor does the material have become sticky or greasy, this being judged as follows:		N/A
	With the forefinger wrapped in a dry piece of rough cloth, the sample is pressed with a force of 5 N.		N/A
	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 normal heat		
	The resistance of insulating materials to normal heat is verified in accordance with IEC 60695-2-10. The test is carried out on one representative sample of each of the insulating materials taken from enclosures, barriers and other insulating parts.	No insulating materials	N/A
	The test is made in a heating cabinet at a temperature as stated below.		N/A
	–□Parts necessary to retain current carrying parts in position: (125 □□2) °C	See table	N/A
	–□Other parts: (70 □□2) °C.	See table	N/A
10.2.3.3	Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects		
	The glow-wire test principles of IEC 60695-2-10 and the details given in IEC 60695-2-11 are used to verify the suitability of materials used:	No insulating materials	-

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	a) on parts of ASSEMBLIES, or		N/A
	b) on parts taken from these parts.		N/A
	The test is carried out on material with the minimum thickness used for the parts in a) or b).		N/A
	As an alternative the original manufacturer provides data on the suitability of materials from the insulating material supplier to demonstrate compliance with the requirements of 8.1.5.3.		N/A
	The temperature of the tip of the glow-wire is as follows:		-
	– 960 °C for parts necessary to retain current-carrying parts in position;		N/A
	- 850 °C for enclosures intended for mounting in hollow walls;		N/A
	– 650 °C for all other parts, including parts necessary to retain the protective conductor.		N/A
	The specimen is considered to have withstood the glow-wire test if		-
	– there is no visible flame and no sustained glowing, or if		N/A
	– flames and glowing of the specimen extinguish within 30 s after removal of the glow-wire.		N/A
	There is no burning of the tissue paper or scorching of the pinewood board.		N/A
10.2.3.101	Dry heat test		
	The complete ASSEMBLY placed in an oven, the internal temperature of which is raised to (100±2) °C over a period of 2 h to 3 h and maintained at this temperature for 5 h		P
	No visible signs of deterioration. Deformation of protective covers manufactured from insulating materials is acceptable if they are more than 6 mm distant from parts which may have a temperature rise in excess of 40 K and do not support live components		P
10.2.3.102	Verification of category of flammability		
	Representative specimens of each of the materials of enclosures, barriers and other insulating parts subjected to a flammability test in accordance with test method A – horizontal burning test of IEC 60695-11-10		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Compliance is checked by inspection that each set of specimens can be classified to category HB40 criteria a) or b) in accordance with 8.4.1 of IEC 60695-11-10		N/A
10.2.4	Resistance to ultra-violet (UV) radiation		
	This test applies only to enclosures and external parts of ASSEMBLIES intended to be installed outdoors and which are constructed of synthetic materials or metals that are entirely coated by synthetic material. Representative samples of such parts are subjected to the test		N/A
	UV test according to ISO 4892-2 method A; 1 000 cycles of 5 min of watering and 25 min of dry period with xenon lamp providing a total test period of 500 h.		N/A
	The values of temperature and humidity used for the test are (65 ±3) °C and (65 ±5) % respectively, unless declared otherwise by the original manufacturer.		N/A
	For enclosures constructed of synthetic materials compliance is checked by verification that the flexural strength (according to ISO 178) and Charpy impact (according to ISO 179) of synthetic materials have 70 % minimum retention.		N/A
	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 no grooves are cut into the sample and the impact is applied to the exposed surface.		N/A
	After the test, samples are subjected to the glow-wire test of 10.2.3.3.		N/A
	For compliance, enclosures constructed of metals entirely coated by synthetic material, the adherence of the synthetic material (according to ISO 2409) have 50 % minimum retention.		N/A
	Samples show no cracks or deterioration visible to normal or corrected vision without additional magnification.		N/A
	This test need not be carried out if the original manufacturer can provide data from the synthetic material supplier to demonstrate that materials of the same thickness or thinner comply with this requirement.		N/A
10.2.5	Lifting		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	The maximum number of sections allowed by the original manufacturer to be lifted together are equipped with components and/or weights to achieve a weight of 1,25 times its maximum shipping weight. :		P
	With doors closed it is lifted with the specified lifting means and in the manner defined by the original manufacturer.		P
	From a standstill position, the ASSEMBLY is raised smoothly without jerking in a vertical plane to a height of $(1 \pm 0,1)$ m and lowered in the same manner to a standstill position. This test is repeated a further two times after which the ASSEMBLY is raised up and suspended for 30 min at a height of $(1 \pm 0,1)$ m without any movement.		P
	Following this test the ASSEMBLY is raised smoothly without jerking from a standstill position to a height of $(1 \pm 0,1)$ m and moved $(10 \pm 0,5)$ m horizontally, then lowered to a standstill position. This sequence, is carried out three times at uniform speed, each sequence being carried out within 1 min.		P
	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 to normal or corrected vision without additional magnification, which could impair any of its characteristics.		P
10.2.7	Marking		
	Marking made by moulding, pressing, engraving or similar is not submitted to the following test.		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
10.2.101	Verification of mechanical strength		
10.2.101.1	Verification of structural strength		
10.2.101.1.1	Verification of resistance to static load		
	Test 1 - load of 8500 N/m ² ; for 5 min to the roof of the enclosure		P
	Test 2 - force 1200 N; for 5 min in turn to the front and back upper edges of the roof of the enclosure		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Test 3 - load 60 N; for 5 min to each sidewall of the enclosure in turn		P
	After the tests: - degree of protection is in accordance with 8.2.2		P
	- operation of door(s) and locking points not impaired		P
	- electrical clearances remained satisfactory		P
	- in case of metallic enclosure, no contact between live parts and the enclosure		P
10.2.101.1.2	Verification of resistance to shock load		
	A bag with dry sand, mass 15 kg, at least 1 m above the highest point of the CDC		P
	one blow to upper parts of each of the vertical surfaces (If enclosure cylindrical, three blows)		P
	After the tests: - degree of protection is in accordance with 8.2.2		P
	- operation of door(s) and locking points not impaired		P
	- electrical clearances remained satisfactory		P
	- in case of metallic enclosure, no contact between live parts and the enclosure		P
	- in case of insulating enclosure, no associated cracks		P
10.2.101.1.3	Verification of resistance to torsional stress		
	horizontally rotatable frame used, 60x60x5 mm		P
	torsional force 2x1000 N applied for 30 s as shown in Figures 106a and 106b		P
	After the tests: - the door(s) remain closed		P
	- degree of protection is in accordance with 8.2.2.		P
10.2.101.2	Verification of impact force withstand		
10.2.101.2.1	Test applicable to PENDAs designed for ambient temperatures of between 40°C and -25°C		
	solid steel ball of 2 kg mass, raised 1 m providing an impact energy of 20 J (see Figures 103a, 103b)		P
	one blow aimed at the centre of each of the vertical surfaces (If enclosure cylindrical, three blows)		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Test 1: ambient air temperature between 10°C and 40°C, PENDA not less than 12 h		P
	Test 2: ambient air temperature between 10°C and 40°C, after PENDA at -25°C not less than 12 h		P
	After the tests: - degree of protection is in accordance with 8.2.2		P
	- operation of door(s) and locking points not impaired		P
	- electrical clearances remained satisfactory		P
	- in case of metallic enclosure, no contact between live parts and the enclosure		P
	- in case of insulating enclosure, no associated cracks		P
10.2.101.2.2	PENDAs designed for operation in an arctic climate (see 7.1.1.2)		
	ambient air temperature between 10°C and 40°C, after PENDA has been kept at -50°C not less than 12 h		P
	Test 1 and 2: force of 1500 N for 30 s at 10 weakest points.		P
	Test 1 carried out on an empty PENDA		P
	Test 2 carried out on a PENDA containing equipment which provides the minimum clearances inside the enclosure.		P
	Test 3 carried out on an empty PENDA using an impact apparatus as described in 10.2.101.2.1 with a solid steel ball, mass 15 kg, 150 J		P
	one blow at the centre (If enclosure is cylindrical, three blows)		P
	test 1: degree of protection remains in accordance with 8.2.2, operation of door(s) and locking points not impaired		P
	test 2: no puncture or flashover occurs		P
	test 3: degree of protection at least IP3X		P
10.2.101.3	Verification of mechanical strength of doors		
	The test applies to PENDA-O having a door(s) hinged on a vertical edge of the enclosure		
	door(s) open, load 50 N maintained for 3 s.		P
	test repeated with load increased to 450 N		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	door(s) not become unhinged, not impaired by a load of 50 N. In addition, by verification that the degree of protection remains in accordance with 8.2.2		P
	degree of protection remains in accordance with 8.2.2 after door(s) closed following load of 450 N		P
10.2.101.4	Verification of resistance to axial load of metal inserts in synthetic material		
	test carried out on representative specimen		N/A
	PENDA is fully supported on a platform		N/A
	A screw-eye fitted, axial force; applied for 10 s	M ; N	N/A
	inserts remain undamaged		N/A
	no cracking of the surrounding material		N/A
10.2.101.5	Verification of resistance to mechanical shock impacts induced by sharp-edged objects		
	Test carried out using an impact apparatus, mass 5 kg, 20 J		P
	one blow at weakest point (If enclosure is cylindrical, three blows)		P
	Test 1: ambient air temperature between 10°C and 40°C, PENDA not less than 12 h		P
	Test 2: ambient air temperature between 10°C and 40°C, after PENDA at -25°C not less than 12 h		P
	no cracks within a circle of diameter not exceeding 15 mm.		P
10.2.101.6	Test of mechanical strength of the base		
	PENDA is fixed to the base		P
	force applied by means of steel tubes. $F = 3,5 \text{ N/mm} \times L$, for 1 min.	F	P
	Repeated on base of similar length but different profile		P
	base has not broken		P
	degree of protection of CDC part normally above ground remains in accordance with 8.2.2		P
10.3	DEGREE OF PROTECTION OF PCS-ASSEMBLIES		
	The degree of protection provided is verified in accordance with IEC 60529; the test may be carried out on a representative equipped ASSEMBLY.	IP66	P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Where an empty enclosure in accordance with IEC 62208 is used, and no external modification has been carried out that may result in a deterioration of the degree of protection, no further testing is required		N/A
	ASSEMBLIES having a degree of protection of IP 5X are tested according to category 2 in 13.4 of IEC 60529.		N/A
	ASSEMBLIES having a degree of protection of IP 6X are tested according to category 1 in 13.4 of IEC 60529.		P
	The test device for IP X3 and IP X4 as well as the type of support for the enclosure during the IP X4 test is stated in the test report.	See attachment xxx	N/A
	The IP X1 to IP X6 tests on an ASSEMBLY are deemed to be a failure if any water comes into contact with electrical equipment housed within the enclosure. Ingress of water is permissible only if its route of entry is obvious and the water is only in contact with the enclosure at a location where it will not impair safety.		P
10.4	CLEARANCES AND CREEPAGE DISTANCES		
	The clearances are sufficient to enable the declared rated impulse withstand voltage (U_{imp}) of a circuit to be achieved. Rated impulse withstands voltage. :	U_{imp} ; 4kV	P
	Required clearances as specified in Table 1. :		P
	Measured clearances :	See table	P
	The original manufacturer selects a rated insulation voltage(s) (U_i) for the circuits of the ASSEMBLY from which the creepage distance(s) is determined. For any given circuit the rated insulation voltage is not less than the rated operational voltage (U_e). Insulation voltage U_i :	$U_i = 400V$ AC	P
	Pollution degree. :	2	P
	Material group :	IIIa	P
	Minimum clearances required..... :	10mm	-
	The creepage distances measured :	See table	P
	Where functional units are mounted on withdrawable parts, the isolation provided in the isolated position is at least comply with the requirements in the relevant specification for disconnectors (see IEC 60947-3).		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	The isolating distance between the withdrawable unit main contacts and their associated fixed contacts in the isolated position is capable of withstanding the test voltage for the declared impulse withstand voltage as specified in Table 102.		N/A
10.5	PROTECTION AGAINST ELECTRIC SHOCK AND INTEGRITY OF PROTECTIVE CIRCUITS		
10.5.2	Effective earth continuity between the exposed conductive parts of the ASSEMBLY and the protective circuit		
	It is verified that the different exposed conductive parts of the ASSEMBLY are effectively connected to the terminal for the incoming external protective conductor and that the resistance of the circuit does not exceed 0,1 Ω		P
	Verification is made using a resistance measuring instrument which is capable of driving a current of at least 10 A (a.c. or d.c.).	10A AC current is passed between the earth terminal and each of the exposed conductive parts.	P
	The current is passed between each exposed conductive part and the terminal for the external protective conductor. The resistance does not exceed 0,1 Ω	No one of the measured resistance exceed 0,1 Ω	P
10.5.3	Short-circuit withstand strength of the protective circuit		
	Verification achieved by the application of tests in accordance with subclause 10.5.3.5 of Part 1.		N/A
10.5.3.2	Protective circuits that are exempted from short-circuit withstand verification		
	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 the application of design rules		
	Verification by design rules is achieved when comparison of the ASSEMBLY to be verified 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		
	Verification by comparison with a reference design based on calculation is to be in accordance with 10.11.4		N/A
10.5.3.5	Verification by test		
	Subclause 10.11.5.6 applies.		N/A
10.6	INCORPORATION OF SWITCHING DEVICES AND COMPONENTS		

IEC 61439-5			
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		
	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		
	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		
	Compliance with the design requirements of 8.8 for terminals for external conductors is confirmed by inspection.		P
10.9	DIELECTRIC PROPERTIES		
10.9.1	General		
	For this test, all the electrical equipment of the ASSEMBLY is connected, except those items of apparatus which, according to the relevant specifications, are designed for a lower test voltage; current-consuming apparatus (e.g. windings, measuring instruments, voltage surge suppression devices) in which the application of the test voltage would cause the flow of a current, are disconnected.		P
	Such apparatus are disconnected at one of their terminals unless they are not designed to withstand the full test voltage, in which case all terminals may be disconnected.		P
10.9.2	Power-frequency withstand voltage		
10.9.2.1	Main, auxiliary and control circuits		
	Main, auxiliary and control circuits that are connected to the main circuit are subjected to the test voltage according to Table 8.		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		
	The test voltage has a practically sinusoidal waveform and a frequency between 45 Hz and 65 Hz.	2200V AC (50Hz) for 10 sec.	P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	The high-voltage transformer used for the test is so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current is at least 200 mA.	200mA	P
	The overcurrent relay does not trip when the output current is less than 100 mA.	Not less than 100mA	P
	The value of the test voltage is that specified in Table 8 or 9 as appropriate with a permitted tolerance of $\pm 3\%$.	$\pm 3\%$.	P
10.9.2.3	Application of the test voltage		
	The power frequency 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 as follows:		-
	a) between all the poles of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and the earthed enclosure, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;		P
	b) between each pole of the main circuit and, the other poles and the earthed enclosure connected together, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;		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.		P
	The overcurrent relay does not operate and there are no disruptive discharge (see 3.6.18) during the tests.		P
10.9.3	Impulse withstand voltage		
10.9.3.1	General		-
	Verification achieved by the application of tests in accordance with one of the alternative test methods detailed in subclauses 10.9.3.2 to 10.9.3.4, inclusive, of Part 1.		P
	In place of the impulse withstand voltage test the original manufacturer may perform, at his discretion, an equivalent a.c. or d.c. voltage test, in accordance with 10.9.3.3 or 10.9.3.4, but consideration is given to the fact that such a tests exert a higher stress.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
10.9.3.2	Impulse withstand voltage test		
	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 $\pm 3\%$.	Rated U_{imp} ; 4kV Test voltage $U_{1,2/50}$ used when corrected to the sea level; 7,3kV $_{1,2/50}$ pulses.	P
	Impulse withstand voltage (U_{imp}) :	4,0kV (test voltage 7,3kV)	P
	Auxiliary circuits not connected to main circuits are connected to earth.		N/A
	The 1,2/50 μ s impulse voltage is applied to the ASSEMBLY five times for each polarity at intervals of 1 s minimum as follows:		-
	a) between all the poles of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and the earthed enclosure, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;		P
	b) between each pole of the main circuit and, the other poles and the earthed enclosure connected together, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link.		P
	For an acceptable result there are no unintentional disruptive discharge during the tests.		P
10.9.3.3	Alternative power-frequency voltage test		
	The test voltage has a practically sinusoidal waveform and a frequency between 45 Hz and 65 Hz.		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 $\pm 3\%$.		N/A
	Power-frequency :		N/A
	The power-frequency voltage is applied once, at full value, 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
	It is applied:		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	a) between all the poles of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and the earthed enclosure, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;		N/A
	b) between each pole of the main circuit and, the other poles and the earthed enclosure connected together, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;		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
	For an acceptable result the overcurrent relay does not operate and there is no disruptive discharge during the tests.		N/A
10.9.3.4	Alternative d.c. voltage test		
	The test voltage has negligible ripple.		N/A
	The high-voltage source used for the test is so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the 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 $\pm 3\%$.		N/A
	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
	It is applied:		N/A
	a) between all the poles of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and the earthed enclosure, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	b) between each pole of the main circuit and, the other poles and the earthed enclosure connected together, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;		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
	For an acceptable result the overcurrent relay does not operate and there is no disruptive discharge during the tests.		N/A
10.9.3.5	Design rule		
	The clearances are at least 1,5 times the values specified in Table 1.		N/A
	Clearances are verified by measurement, or verification of measurements on design drawings, employing the measurement methods stated in Annex F.		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		
	For ASSEMBLIES with enclosures made of insulating material, an additional dielectric test is carried out by applying an a.c. test voltage between a metal foil laid on the outside of the enclosure over openings and joints, and the interconnected live and exposed conductive parts within the ASSEMBLY located next to the openings and joints.	No insulation materials in the enclosure.	N/A
	For this additional test, the test voltage is equal to 1,5 times the values indicated in Table 8.	No insulation materials	N/A
10.10	VERIFICATION OF TEMPERATURE RISE		
10.10.1	General		
	It is verified that the temperature-rise limits specified in 9.2 of Part 1 for the different parts of the ASSEMBLY will not be exceeded.		P
	Verification is made by test as specified in subclause 10.10.2 of Part 1.		P
10.10.2	Verification by testing with current		
10.10.2.1	General		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	1) If the ASSEMBLY to be verified comprises a number of variants, the most onerous arrangement(s) of the ASSEMBLY is selected according to 10.10.2.2.		N/A
	2) The ASSEMBLY is verified by one of the following methods, determined by the original manufacturer:		N/A
	a) considering individual functional units, the main and distribution busbars and the ASSEMBLY collectively according to 10.10.2.3.5;		N/A
	b) considering individual functional units separately and the complete ASSEMBLY including the main and distribution busbars according to 10.10.2.3.6;		N/A
	c) 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
	3) When the ASSEMBLIES tested are the most onerous variants out of a larger product range then the test results can be used to establish the ratings of similar variants without further testing. Rules for such derivations are given in 10.10.3		N/A
10.10.2.2	Selection of the representative arrangement		
	The test is made on one or more representative arrangements loaded with one or more representative load combinations chosen to obtain with reasonable accuracy the highest possible temperature rise.		N/A
	The selection of the representative arrangements to be tested is given in 10.10.2.2.2 and 10.10.2.2.3 and is the responsibility of the original manufacturer		N/A
	The original manufacturer takes into consideration in his selection for test, the configurations to be derived from the tested arrangements according to 10.10.3		N/A
	When the design of a PENDA is suitable for installation in a recess in wall the temperature rise test carried out with adequate insulation to simulate the presence of the wall.		N/A
10.10.2.2.2	Busbars		
	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.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	For ratings of smaller busbar size variants see 10.10.3.3.		N/A
10.10.2.2.3	Functional units		
	a) Selection of comparable functional unit groups		
	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:		N/A
	i) the function and basic wiring diagram of the main circuit is the same (e.g. incoming unit, reversing starter, cable feeder);		N/A
	ii) the devices are of the same frame size and belong to the same series;		N/A
	iii) the mounting structure is of the same type;		N/A
	iv) the mutual arrangement of the devices is the same;		N/A
	v) the type and arrangement of conductors is the same;		N/A
	vi) 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. Examples on how to adapt this standard for conditions inside an ASSEMBLY are given in the tables included in Annex H.		N/A
	b) Selection of a critical variant out of each comparable group as a specimen for test		
	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.		N/A
	The maximum possible current rating for each variant of functional unit is established.		N/A
	For functional units containing only one device this is the rated current of the device.		N/A
	For functional units with several devices, it is that of the device with the lowest rated current.		N/A
	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

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	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
	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.		N/A
	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		
	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		P
	The ASSEMBLY is mounted as in normal use, with all covers including bottom cover plates, etc., in place.		P
	If the ASSEMBLY includes fuses, these are 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.		P
	The test is made for a time sufficient for the temperature rise to reach a constant value. In practice, this condition is reached when the variation at all measured points (including the ambient air temperature) does not exceed 1 K/h.		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	To shorten the test, if the devices allow it, the current may be increased during the first part of the test, it being reduced to the specified test current afterwards.		N/A
	When a control electro-magnet is energized during the test, the temperature is measured when thermal equilibrium is reached in both the main circuit and the control electro-magnet.		N/A
	Temperature-rise tests on the circuit(s) carried out at 50 Hz are applicable to 60 Hz for rated currents up to and including 800 A.		N/A
	For currents above 800 A, the rated current at 60 Hz is reduced to 95 % of that at 50 Hz.		N/A
	Alternatively, where the maximum temperature rise at 50 Hz does not exceed 90 % of the permissible value, then de-rating for 60 Hz is not required.		N/A
	Tests on an individual section of the ASSEMBLY are acceptable provided the conditions of 10.10.2.2 are met.		N/A
	To make the test representative the external surfaces at which additional sections may be connected are thermally insulated with a covering to prevent any undue cooling.		N/A
	When testing individual functional units within a section, the adjacent functional units can be replaced by heating resistors if the rating of each does not exceed 630 A and their temperature is not being measured.		N/A
	In ASSEMBLIES 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		
	In the absence of detailed information concerning the external conductors and the service conditions, the cross-section of the external test conductors are in accordance with the following.		N/A
	1) For values of rated current up to and including 400 A:		
	a) the conductors are single-core, copper cables or insulated wires with cross-sectional areas as given in Table 11;	For the connection to in terminals 16mm ² stranded conductors are used. For out, 6 and 10 mm ² stranded conductors.	P
	b) as far as practicable, the conductors are in free air;		P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	c) 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 .	Minimum length 1m	P
	2) For values of rated current higher than 400 A but not exceeding 800 A:		
	a) 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
	b) 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 $\square\square 10\%$ and the same or smaller cooling surfaces. Cables or copper bars are not interleaved.		N/A
	c) 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
	3) For values of rated current higher than 800 A but not exceeding 4000 A:		
	a) 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
	b) 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 $\square\square 10\%$ and the same or smaller cooling surfaces. Copper bars are not interleaved.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	c) 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
	4) For values of rated current higher than 4 000 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.	See attachment xxx	N/A
10.10.2.3.3	Measurement of temperatures		
	Thermocouples or thermometers are used for temperature measurements.	Thermocouples type K are used	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.		N/A
10.10.2.3.4	Ambient air temperature		
	The ambient air temperature is measured by means of at least two thermometers or thermocouples equally distributed around the ASSEMBLY at approximately half its height and at a distance of approximately 1 m from the ASSEMBLY.		P
	The thermometers or thermocouples are protected against air currents and heat radiation.	Thermocouples are used	P
	The ambient temperature during the test is between +10 °C and +40 °C.	Between 22-24°C	P
10.10.2.3.5	Verification of the complete ASSEMBLY		
	Incoming and outgoing circuits of the ASSEMBLY are loaded with their rated currents (see 5.3.2) that result in the rated diversity factor being equal to 1 (see 5.3.3).	Testing performed in test report 305145A are considered to cover for both variants.	P

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	If several or all circuits of an ASSEMBLY are loaded simultaneously then the same circuit is only able to carry its rated current multiplied with the rated diversity factor (see 5.3.3), due to the thermal influence of the other circuits.	Testing performed in test report 305145A are considered to cover for both variants.	P
	Thus to verify the rated currents of all circuits a separate test for each type of circuit is necessary. To verify the rated diversity factor one additional test with simultaneous load on all circuits has to be done.		N/A
	To avoid the large number of tests that may be necessary this clause describes a verification method where only one test is made with simultaneous load on all circuits. Because with only one test the rated currents and the rated diversity factor of the circuits cannot be verified separately, it is assumed that the diversity factor is one. In this case the load currents are equal to the rated currents.		N/A
	If the rated current of the incoming circuit or distribution busbar system (DBS) is less than the sum of the rated currents of all outgoing circuits, then the outgoing circuits are split into groups corresponding to the rated current of the incoming circuit or DBS.		N/A
	The groups as defined by the original manufacturer 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		
	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.	The complete assembly is tested.	N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	Individual functional units are verified separately in accordance with 10.10.2.3.7 c).		N/A
	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.		N/A
	If the rated current of the incoming circuit or distribution busbar system (DBS) is less than the sum of the rated currents of all outgoing circuits, then the outgoing circuits are split into groups corresponding to the rated current of the incoming circuit or DBS.		N/A
	The groups as defined by the original manufacturer 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
10.10.2.3.7	Verification considering individual functional units and the main and distribution busbars separately as well as the complete ASSEMBLY		
	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:	The complete assembly is tested	N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	a) Main busbars are tested separately. They are mounted in the ASSEMBLY enclosure as in normal use with all covers and all partitions that separate the main busbars from other compartments, in place. If the main busbar has joints, then they are included in the test. The test is carried out at rated current. The test current passes through the full length of the busbars. Where the design of the ASSEMBLY permits, and, to minimise the influence of the external test conductors on the temperature rise, the length of the main busbar within the enclosure for the test has a minimum of 2 m and include a minimum of one joint when the busbars are extendable.		N/A
	b) Distribution busbars are tested separately from the outgoing units. They are mounted in the enclosure as in normal use with all covers and all partitions that separate the busbar from other compartments, in place. Distribution busbars are connected to the main busbar. No other conductors, e.g. connections to functional units, are connected to the distribution busbar. In order to consider the most onerous condition, the test is carried out at rated current and the test current passes through the full length of the distribution busbar. If the main busbar is rated for a higher current, it is fed with additional current so that it carries its rated current to its junction with the distribution busbar.		N/A
	c) Functional units are tested individually. The functional unit is mounted in the enclosure as in normal use with all covers and all internal partitions in place. If it can be mounted at different places the most unfavourable place is used. It is connected to the main or the distribution busbar as in normal use. If the main busbar and/or the distribution busbar (if any) are rated for a higher current, they are fed with additional currents so that they carry their individual rated currents to the respective junction points. The test is carried out at rated current for the functional unit.		N/A
	d) The complete ASSEMBLY is verified by temperature rise testing of the most onerous arrangement(s) possible in service and as defined by the original manufacturer. For this test the incoming circuit is loaded to its rated current and each outgoing functional unit to its rated current multiplied by the rated diversity factor. Where there is insufficient incoming current to load a representative selection of outgoing units, further configurations may be tested.		N/A
10.10.2.3.8	Results to be obtained		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	At the end of the test, the temperature rise does not exceed the values specified in Table 6.	See table	P
	The apparatus operates satisfactorily within the voltage limits specified for them at the temperature inside the ASSEMBLY.		P
10.11	SHORT-CIRCUIT WITHSTAND STRENGTH		
	With the exception of the circuits of ASSEMBLIES that are exempt verification in accordance with 10.11.2 of Part 1, the short circuit withstand strength specified by the manufacturer is verified. Verification by means of test as specified in 10.11.5 of Part 1.	Exempt <10kA	N/A
10.11.5	Verification by test		
	The ASSEMBLY or its parts as necessary to complete the test are mounted as in normal use.		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		
	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.		P
	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.		P
	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.		P
	All parts of the equipment intended to be connected to the protective conductor in service, including the enclosure, are connected as follows:		-
	1) 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

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	2) 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 1) and 2) 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
10.11.5.3	Testing of main circuits		
	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
	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
	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
	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		
	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

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	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
	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		
	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 □□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
10.11.5.3.4	Connections to the supply side of outgoing units		
	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

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	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		
	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:		N/A
	– 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
10.11.5.5	Results to be obtained		
	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

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	There are no loosening of parts used for the connection of conductors and the conductors are not separated from the outgoing terminals.		N/A
	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:		N/A
	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
10.11.5.6	Testing of the protective circuit		
	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
	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

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	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		
	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.	See table xx	N/A
10.12	ELECTROMAGNETIC COMPATIBILITY (EMC)		
	For EMC tests, see J.10.12.		N/A
10.13	MECHANICAL OPERATION		
	This verification test is not made on such devices of the ASSEMBLY which have already been type tested according to their relevant product standard unless their mechanical operation is impaired by their mounting.		N/A
	For parts, which need verification by test, satisfactory mechanical operation is verified after installation in the ASSEMBLY. The number of operating cycles is 200.		N/A
	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.		N/A
	In the case of withdrawable parts, the operating cycle includes any physical movements from the connected to the isolated position and back to the connected position.		N/A


IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	ANNEX J (61439-1): ELECTROMAGNETIC COMPATIBILITY (EMC)		
J.9.4	Performance requirements		
J.9.4.1	The environmental condition A and/or B for which the ASSEMBLY is suitable is stated by the ASSEMBLY manufacturer.		N/A
J.9.4.2	Requirement for testing		
	No EMC immunity or emission tests are required on final ASSEMBLIES if the following conditions are fulfilled:		N/A
	a) The incorporated devices and components are in compliance with the requirements for EMC for the stated environment (see J.9.4.1) as required by the relevant product or generic EMC standard.		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		
J.9.4.3.1	ASSEMBLIES not incorporating electronic circuits		
	Under normal service conditions, 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		
	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		

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
J.9.4.4.1	ASSEMBLIES not incorporating electronic circuits		
	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 low voltage 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		
	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		
	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		
	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		
	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

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
J.10.12.1	Immunity tests		
J.10.12.1.1	ASSEMBLIES not incorporating electronic circuits		
	No tests are necessary.		N/A
J.10.12.1.2	ASSEMBLIES incorporating electronic circuits		
	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		
J.10.12.2.1	ASSEMBLIES not incorporating electronic circuits		
	No tests are necessary		N/A
J.10.12.2.2	ASSEMBLIES incorporating electronic circuits		
	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

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	ANNEX K (61439-1): PROTECTION BY ELECTRICAL SEPARATION		
K.2	Electrical separation		
K.2.1	Supply source		
	The circuit is supplied through a source that provides separation i.e.		N/A
	• 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:		N/A
	• 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.2.2	Selection and installation of supply source		N/A
K.2.2.1	Voltage		N/A
	The voltage of the electrically separated circuit does not exceed 500 V.		N/A
K.2.2.2	Installation		N/A
K.2.2.2.1	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.2.2.2.2	Flexible cables and cords are visible throughout any part of their length liable to mechanical damage.		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
K.2.2.2.3	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.2.3	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.2.4	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.		N/A
	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
	d) 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		
	Protection is provided by electrical equipment of the following types:		N/A

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict
	• 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

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Heating Test		P
	Test voltage (V) :		—
	Ambient (°C):		—
Thermocouple Locations	max. temperature measured, (K)	max. temperature limit, (K)	
Supplementary information: Testing performed in test report 305145A are considered to cover for both variants.			

	TABLE: Dielectric Strength		P
Test voltage applied between:		Test potential applied (V)	Breakdown / flashover (Yes/No)
Between all three phases connected together and against earth terminal (chassis)		2200V AC in 10 sec.	No flashover
In turn between each phase and all of the other phases and earth connected together		2200V AC in 10 sec.	No flashover
Supplementary information:			

	TABLE: insulation resistance measurements		N/A
Insulation resistance R between:		R (MΩ)	Required R (MΩ)
Between mains poles (primary fuse disconnected)			
Between parts separated by basic or supplementary insulation			
Between parts separated by double or reinforced insulation			
Supplementary information:			

IEC 61439-5						
Clause	Requirement + Test			Result - Remark		Verdict
	TABLE: 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)
Incoming terminals between poles.	800	400	5,5	>10	8	>15
Output terminal between poles.	800	400	5,5	>10	8	>15
Supplementary information:						

	TABLE: Ball Pressure Test of Thermoplastics		N/A
Allowed impression diameter (mm):			—
Part	Test temperature (°C)	Impression diameter (mm)	
Supplementary information:			

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict

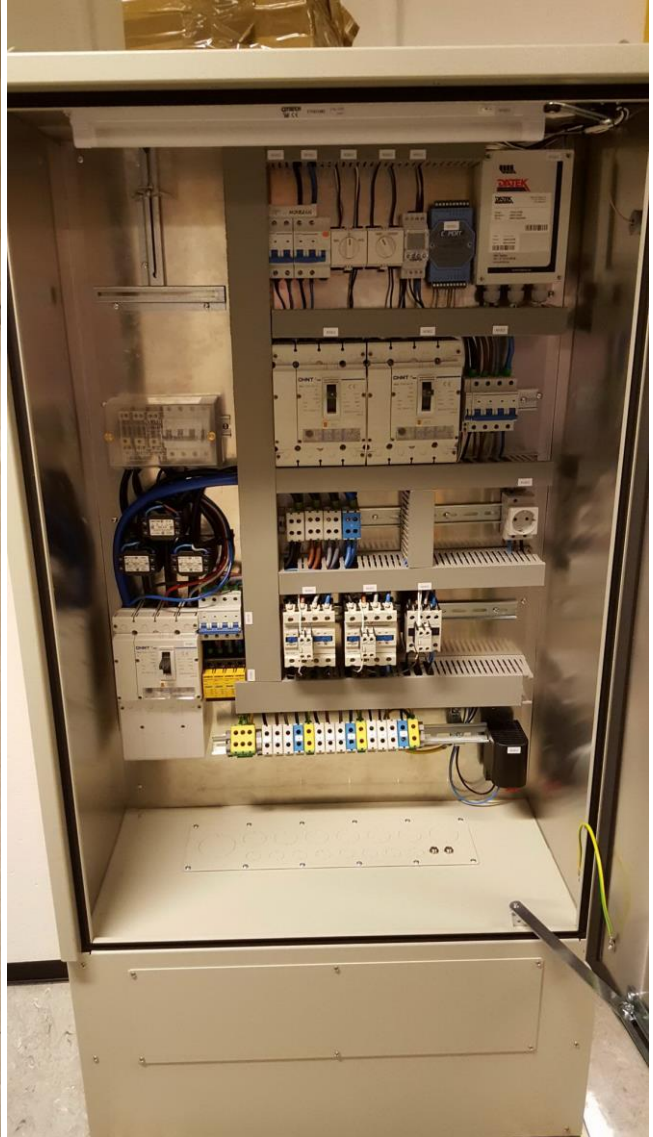
TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
- Description: Tapping block					
Tapping block	CAE Technology Development	TB66	600V 35mm ² , 80°C	EN 60998-1:04 EN 60998-2-1:04	CTS (test report)
- Description: Switchboard wire					
Cable	AMO Specialkabel AB	Texiline HF90 0,6/1 kV	0,6/1 kV	IEC 60092-353 IEC 61031-1/2 IEC 60754-1	DNV
- Description: Single core cable					
Internal wiring	Amokabel AB	H0XX-X	General purpose cable for fixed wiring	EN 50525-2-31	S
- Description: Circuit breaker for overcurrent protection					
Circuit breaker	Zhejiang Chint Electrics	NB1-63H	400V AC 63A	EN 60898-1 +A1+A11+A12 +A13	S
- Description: Residual current operated circuit breaker					
Circuit breaker	Zhejiang Chint Electrics	NB1L	230V AC	EN 61009-1 +A11+A12+A13	S
- Description: Electromagnetic contactors					
Contactor	Zhejiang Chint Electrics	NC1	380/400/415V 32A	EN 60947-4-1 EN 60947-5-1 +A1	Kema TUV
- Description: Residual current operated circuit breakers without integral overcurrent protection					
Residual current device	Zhejiang Chint Electrics	NL1	Un: 240V/415V In: 25/40/63A	EN 61008-1 EN 61008-2-1	S Aenor
- Description: Moulded case circuit breaker					
Circuit breaker	Zhejiang Chint Electrics	NM8S	690V 1250A	EN 60947-2 + A1	DNV, TUV Intertek Kema
- Description: Datek wireless					
Datek wireless	Logic IO Aps.	RTCU AX9T	- -	EN 60950-1+A11 & EMC and R&TTE	CE declaration
Supplementary information:					
¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict

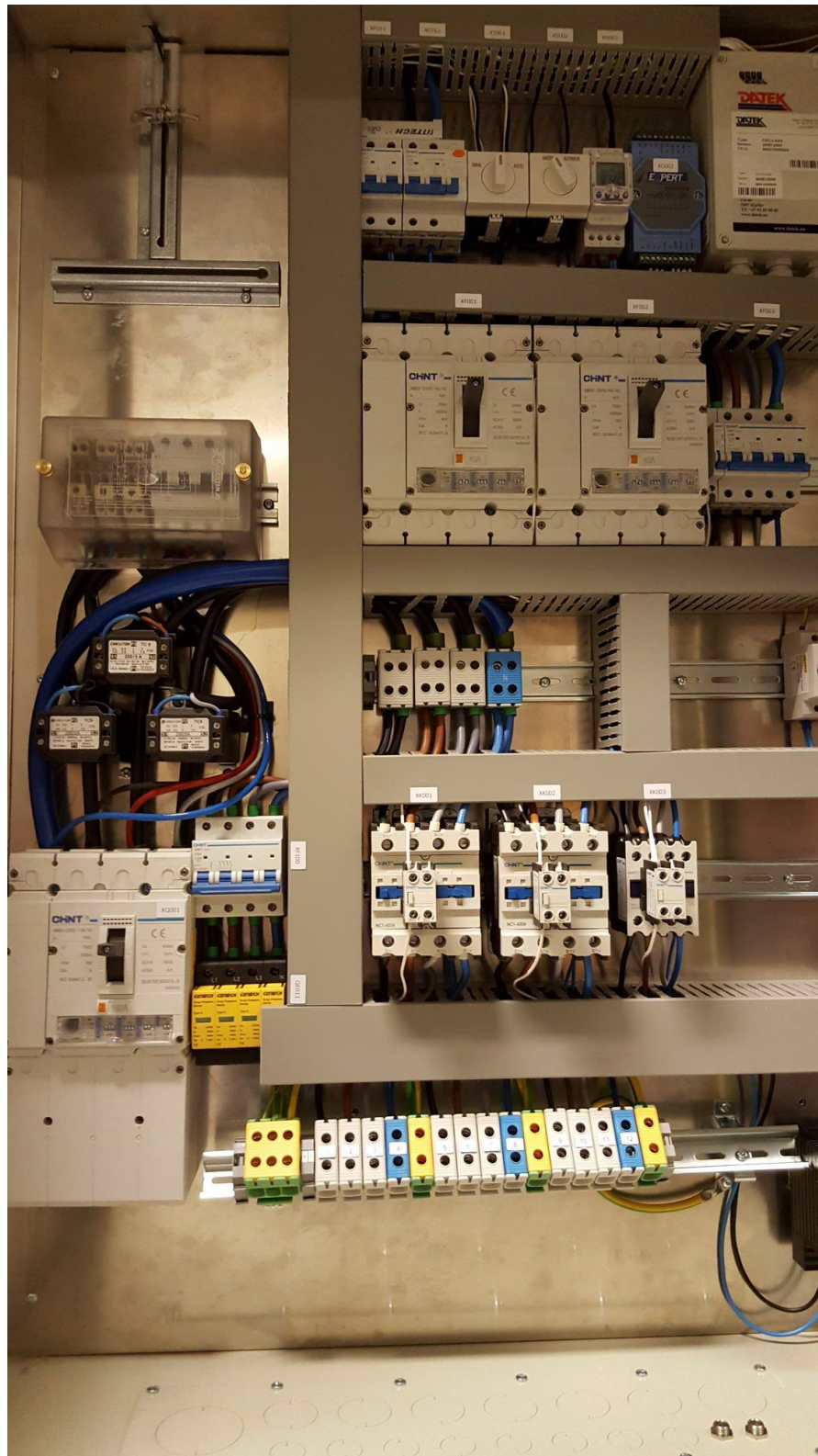
Attachment 1: Photos:



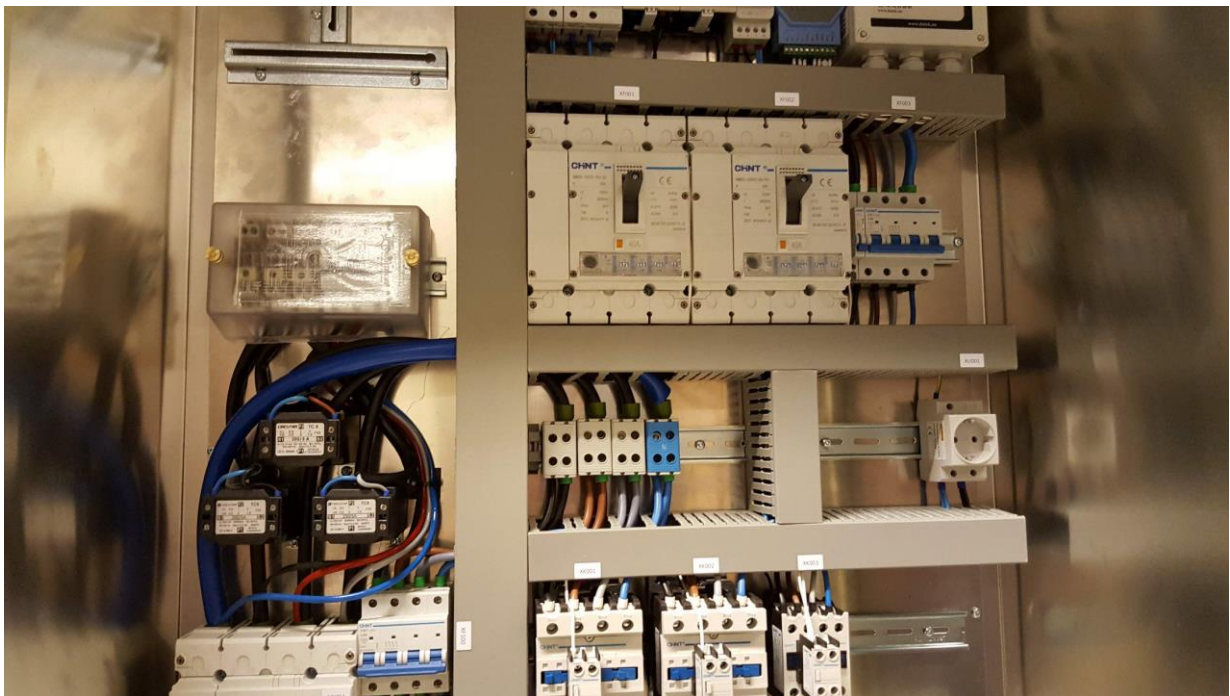
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Clause	Requirement + Test	Result - Remark	Verdict



IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict



IEC 61439-5			
Clause	Requirement + Test	Result - Remark	Verdict

