TEST REPORT

EN IEC 61439-1
Low-voltage switchgear and controlgear assemblies - Part 1: General rules
EN IEC 61439-2
Low-voltage switchgear and controlgear assemblies - Part 2: Power switchgear and controlgear assemblies

Report Number. :	KTi251021S1512
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Applicant's name :	Cook Cooper Electric (shanghai) Co., Ltd.
Address :	Room A56, 4th Floor, Block B 505 Xinbei Road Minhang District Shanghai
Manufacturer name :	Cook Cooper Electric (shanghai) Co., Ltd.
Address :	Room A56, 4th Floor, Block B 505 Xinbei Road Minhang District Shanghai
Test specification:	
Standard :	EN 61439-1:2011 EN 61439-2:2011
Test procedure :	Test report
Non-standard test method :	N/A
Test item description :	Static Var Generator
Trade Mark :	N/A
Model/Type reference :	SVG-400-35K-4L, 5 Kvar, 10Kvar, 15Kvar, 20Kvar, 35Kvar, 50Kvar, 70Kvar, 100Kvar
Ratings :	AC220-400V, 50/60Hz, 50A Max

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List of Attachments:

Annex I: Photos documents, 4 pages.

Summary of testing:

The tested samples fulfilled the requirements of specified standards.

Testing location:

Guangdong KAIXU Testing Technology Co., Ltd.

Room 215, Building 2, No. 123, Dongcheng Section, Guanlong Road, Dongcheng Street, Dongguan City, Guangdong Province, China

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.

Static Var GeneratorModel:

SVG-400-35K-4L

AC220-400V, 50/60Hz, 50A Max

Cook Cooper Electric (shanghai) Co., Ltd.

Made in China

Importer: xxx

Address: yyy

Remarks:

Note: xxx means importer company name; yyy means importer company address information.

All models rating label are in the same design except for model name and rating. Above label was shown for representing the others models.

Test item particulars..... :	See test report
Classification of installation and use ..... :	Movable
Supply Connection ..... :	Connect directly to AC power supply
Mass of equipment (kg)..... :	
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..... :	Oct. 21, 2025
Date (s) of performance of tests ..... :	Oct. 21, 2025 to Oct. 28, 2025

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

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

Name and address of factory (ies) ..... : --

General product informration:

1.The appliance/equipment is “Static Var Generator” with models “Test Model : SVG-400-35K-4L

Additional Model: 5 Kvar, 10Kvar, 15Kvar, 20Kvar, 35Kvar, 50Kvar, 70Kvar, 100Kvar”. All models covered in this reports are identical except model name.

2.All test mode on SVG-400-35K-4L. Test voltage: 220 V / 50 Hz or 240 V / 50 Hz.

3. This equipment can choose used as Three-phase four-wire power supply.
4. Metal enclosure and equipment body is sealed together by screw.
5.The ambient temperature is 25℃.

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If different from the rated voltage of the ASSEMBLY, the appropriate rated operational voltage of the circuit shall be stated.</td><td></td><td>P</td></tr>
<tr><td>5.2.3</td><td>Rated insulation voltage (Ui) (of a circuit of an ASSEMBLY)</td><td></td><td>N/A</td></tr>
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<tr><td></td><td>The rated insulation voltage of a circuit shall be equal or higher than the values stated for Un
and for Ue for the same circuit.</td><td></td><td>N/A</td></tr>
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Clause	Requirement + Test	Result - Remark	Verdict
5.2.4 R	**ated impulse withstand voltage (Uimp) (of the ASSEMBLY)**		N/A
	The rated impulse withstand voltage shall be equal to or higher than the values stated for the transient overvoltages occurring in the electrical system(s) to which the circuit is designed to be connected.		N/A
5.3	**Current ratings**		P
5.3.1	**Rated current of the ASSEMBLY (InA)**		N/A
	The rated current of the ASSEMBLY is the smaller of: -the sum of the rated currents of the incoming circuits within the ASSEMBLY operated in parallel; -the total current which the main busbar is capable of distributing in the particular ASSEMBLY arrangement. This current shall be carried without the temperature rise of the individual parts exceeding the limits specified in 9.2.		N/A
5.3.2	**Rated current of a circuit (Inc)**		N/A
	The rated current of a circuit is the value of the current that can be carried by this circuit loaded alone, under normal service conditions. This current shall be carried without the temperature rise of the various parts of the ASSEMBLY exceeding the limits specified in 9.2.		N/A
5.3.3	**Rated peak withstand current (Ipk)**		N/A
	The rated peak withstand current shall be equal to or higher than the values stated for the peak value of the prospective short-circuit current of the supply system(s) to which the circuit(s) is (are) designed to be connected (see also 9.3.3).		N/A
5.3.4	**Rated short-time withstand current (Icw) (of a circuit of an ASSEMBLY)**		N/A
	The rated short-time withstand current shall be equal to or higher than the prospective r.m.s. value of the short-circuit current (Icp) at each point of connection to the supply, (see also 3.8.10.3). Different values of Icw for different durations (e.g. 0,2 s; 1 s; 3 s) may be assigned to an ASSEMBLY. For a.c., the value of the current is the r.m.s. value of the a.c. component.		N/A
5.3.5	**Rated conditional short-circuit current of an ASSEMBLY (Icc)**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The rated conditional short-circuit current shall be equal to or higher than the prospective r.m.s. value of short-circuit current (Icp) for a duration limited by the operation of the shortcircuit protective device that protects the ASSEMBLY. The breaking capacity and current limitation characteristic (I2t, Ipk) of the specified shortcircuit protective device shall be stated by the ASSEMBLY manufacturer, taking into consideration the data given by the device manufacturer.		N/A
5.4	**Rated diversity factor (RDF)**		N/A
	The rated diversity factor is the per unit value of the rated current, assigned by the ASSEMBLY manufacturer, to which outgoing circuits of an ASSEMBLY can be continuously and simultaneously loaded taking into account the mutual thermal influences. Rated diversity factor can be stated: •for groups of circuits; •for the whole ASSEMBLY.		N/A
	The rated diversity factor multiplied by the rated current of the circuits shall be equal to or higher than the assumed loading of the outgoing circuits. The assumed loading of outgoing circuits shall be addressed by the relevant ASSEMBLY standard.		N/A
5.5	**Rated frequency (fn)**		P
	The rated frequency of a circuit is the value of frequency to which the operating conditions are referred. Where the circuits of an ASSEMBLY are designed for different values of frequency, the rated frequency of each circuit shall be given.	50/60Hz	P
5.6	**Other characteristics**		N/A
	The following characteristics shall be declared:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	)additional requirements depending on the specific service conditions of a functional unit (e.g. type of coordination, overload characteristics);)pollution degree (see 3.6.9);)types of system earthing for which the ASSEMBLY is designed;)indoor and/or outdoor installation (see 3.5.1 and 3.5.2);)stationary or movable (see 3.5.3 and 3.5.4); degree of protection;)intended for use by skilled or ordinary persons (see 3.7.12 and 3.7.14);)electromagnetic compatibility (EMC) classification (see Annex J);)special service conditions, if applicable (see 7.2);)external design (see 3.3); k)mechanical impact protection, if applicable (see 8.2.1);)the type of construction – fixed or removable parts (see 8.5.1 and 8.5.2.); m)the nature of short-circuit protective device(s) (see 9.3.2); n)measures for protection against electric shock; o)overall dimensions (including projections e.g handles, covers, doors), if required; p)the weight, if required.		N/A
6	**Information**		P
6.1	**ASSEMBLY designation marking**	See operating instructions	P
	The ASSEMBLY manufacturer shall provide each ASSEMBLY with one or more labels, marked in a durable manner and located in a place such that they are visible and legible when the ASSEMBLY is installed and in operation. Compliance is checked according to the test of 10.2.7 and by inspection.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The following information regarding the ASSEMBLY shall be provided on the designation label(s):)ASSEMBLY manufacturer's name or trade mark (see 3.10.2);)type designation or identification number or any other means of identification, making it possible to obtain relevant information from the ASSEMBLY manufacturer;)means of identifying date of manufacture;)EN 61439-X (the specific part “X” shall be identified).	See operating instructions	P
6.2	**Documentation**		P
6.2.1	**Information relating to the ASSEMBLY**		P
	All interface characteristics according to Clause 5, where applicable, shall be provided in the ASSEMBLY manufacturer’s technical documentation supplied with the ASSEMBLY.	See technical documentation	P
6.2.2	**Instructions for handling, installation, operation and maintenance**		P
	The ASSEMBLY manufacturer shall provide in documents or catalogues the conditions, if any, for the handling, installation, operation and maintenance of the ASSEMBLY and the equipment contained therein. If necessary, the instructions shall indicate the measures that are of particular importance for the proper and correct transport, handling, installation and operation of the ASSEMBLY. The provision of weight details is of particular importance in connection with the transport and handling of ASSEMBLIES. The correct location and installation of lifting means and the thread size of lifting attachments,if applicable, shall be given in the ASSEMBLY manufacturer's documentation or the instructions on how the ASSEMBLY has to be handled. The measures to be taken, if any, with regard to EMC associated with the installation, operation and maintenance of the ASSEMBLY shall be specified (see Annex J).	See Instructions for handling, installation, operation and maintenance	P

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Clause	Requirement + Test	Result - Remark	Verdict
	If an ASSEMBLY specifically intended for environment A is to be used in environment B the following warning shall be included in the operating instructions: CAUTION This product has been designed for environment A. Use of this product in environment B may cause unwanted electromagnetic disturbances in which case the user may be required to take adequate mitigation measures.		P
	Where necessary, the above-mentioned documents shall indicate the recommended extent and frequency of maintenance. If the circuitry is not obvious from the physical arrangement of the apparatus installed, suitable information shall be supplied, for example wiring diagrams or tables.		P
6.3	**Device and/or component identification**		P
	Inside the ASSEMBLY, it shall be possible to identify individual circuits and their protective devices. Identification tags shall be legible, permanent and appropriate for the physical environment. Any designations used shall be in compliance with IEC 81346-1 and IEC 81346-2 and identical with those used in the wiring diagrams, which shall be in accordance with IEC 61082-1.		P
7	**Service conditions**		P
7.1	**Normal service conditions**		P
	ASSEMBLIES conforming to this standard are intended for use under the normal service conditions detailed below.		P
7.1.1	**Ambient air temperature**		P
7.1.1.1	**Ambient air temperature for indoor installations**		P
	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.	–5 °C~+40 °C	P
7.1.1.2	**Ambient air temperature for outdoor installations**		N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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 –25 °C.		N/A
7.1.2	**Humidity conditions**		P
7.1.2.1	**Humidity conditions for indoor installations**		P
	The relative humidity of the air 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 should be borne in mind which may occasionally occur due to variations in temperature.		P
7.1.2.2	**Humidity conditions for outdoor installations**		N/A
	The relative humidity may temporarily be as high as 100 % at a maximum temperature of +25 °C.		N/A
7.1.3	**Pollution degree**		P
	The pollution degree (see 3.6.9) refers to the environmental conditions for which the ASSEMBLY is intended.		P
	For switching devices and components inside an enclosure, the pollution degree of the environmental conditions in the enclosure is applicable. For the purpose of evaluating clearances and creepage distances, the following four degrees of pollution in the micro-environment are established.		P
	Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence. Pollution degree 2: Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected. Pollution degree 3: Conductive pollution occurs or dry, non-conductive pollution occurs which is expected to become conductive due to condensation. Pollution degree 4: Continuous conductivity occurs due to conductive dust, rain or other wet conditions. Pollution degree 4 is not applicable for a micro-environment inside the ASSEMBLY to this standard.	Pollution degree 2	P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Unless otherwise stated, ASSEMBLIES for industrial applications are generally for use in a pollution degree 3 environment. However, other pollution degrees may be considered to apply, depending upon particular applications or the micro-environment.		P
7.1.4	**Altitude**		P
	The altitude of the site of installation does not exceed 2 000 m.	<1000m	P
7.2	**Special service conditions**		P
	Where any special service conditions exist, the applicable particular requirements shall be complied with or special agreements shall be made between the ASSEMBLY manufacturer and the user. The user shall inform the ASSEMBLY manufacturer if such exceptional service conditions exist.		P
	Special service conditions include, for example:)values of temperature, relative humidity and/or altitude differing from those specified in 7.1;)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;)heavy pollution of the air by dust, smoke, corrosive or radioactive particles, vapours or salt;)exposure to strong electric or magnetic fields;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	)exposure to extreme climatic conditions; attack by fungus or small creatures;)installation in locations where fire or explosion hazards exist;)exposure to heavy vibration, shocks, seismic occurrences;)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;)exposure to conducted and radiated disturbances other than electromagnetic, and electromagnetic disturbances in environments other than those described in 9.4; k)exceptional overvoltage conditions or voltage fluctuations;)excessive harmonics in the supply voltage or load current.		N/A
7.3	**Conditions during transport, storage and installation**		N/A
	A special agreement shall be 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**		P
8.1	**Strength of materials and parts**		P
8.1.1	**General**		P
	ASSEMBLIES shall be constructed of materials capable of withstanding the mechanical, electrical, thermal and environmental stresses that are likely to be encountered in specified service conditions. The external shape of the ASSEMBLY enclosure can vary to suit the application and use, some examples have been defined in 3.3. These enclosures may also be constructed from various materials e.g. insulating, metallic or a combination of these.		P
8.1.2	**Protection against corrosion**		N/A
	Protection against corrosion shall be ensured by the use of suitable materials or by protective coatings to the exposed surface, taking account of the normal service conditions (see 7.1). Compliance to this requirement is checked by the test of 10.2.2.		N/A
8.1.3	**Properties of insulating materials**		P
8.1.3.1	**Thermal stability**		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	For enclosures or parts of enclosures made of insulating materials, thermal stability shall be verified according to 10.2.3.1.		P
8.1.3.2	**Resistance of insulating materials to heat and fire**		P
8.1.3.2.1	**General**		P
	Parts of insulating materials which might be exposed to thermal stresses due to internal electrical effects, and the deterioration of which might impair the safety of the ASSEMBLY, shall not be adversely affected by normal (operational) heat, abnormal heat or fire.		P
8.1.3.2.2	**Resistance of insulating materials to heat**		P
	The original manufacturer shall select insulating materials either by reference to the insulation temperature index (determined for example by the methods of IEC 60216) or by compliance with IEC 60085.	Compliance with IEC 60216	P
8.1.3.2.3	**Resistance of insulating materials to abnormal heat and fire due to internal electric effects**		P
	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, shall not be adversely affected by abnormal heat and fire and shall be verified by the glow-wire test in 10.2.3.2. For the purpose of this test, a protective conductor (PE) is not considered as a current-carrying part.		P
	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.		P
8.1.4	**Resistance to ultra-violet radiation**		P
	For enclosures and external parts made of insulating materials which are intended to be used outdoor, resistance to ultra-violet radiation shall be verified according to 10.2.4.		P
8.1.5	**Mechanical strength**		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	All enclosures or partitions including locking means and hinges for doors shall be 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). The mechanical operation of removable parts, including any insertion interlock, shall be verified by test according to 10.13.	see also 10.13	P
8.1.6	**Lifting provision**		N/A
	Where required, ASSEMBLIES shall be provided with the appropriate provision for lifting. Compliance is checked according to the test of 10.2.5.		N/A
8.2	**Degree of protection provided by an ASSEMBLY enclosure**		P
8.2.1	**Protection against mechanical impact**		P
	The degree of protection provided by an ASSEMBLY enclosure against mechanical impact, if necessary, shall be defined by the relevant ASSEMBLY standards and verified in accordance with IEC 62262 (see 10.2.6).	see 10.2.6	P
8.2.2	**Protection against contact with live parts, ingress of solid foreign bodies and water**		P
	The degree of protection provided by any ASSEMBLY against contact with live parts, ingress of solid foreign bodies and water is indicated by the IP code according to IEC 60529 and verified according to 10.3		P
8.2.3	**ASSEMBLY with removable parts**		P
	The degree of protection indicated for ASSEMBLIES normally applies to the connected position (see 3.2.3) of removable parts. If, after the removal of a removable part, it is not possible to maintain the original degree of protection e.g. by closing a door, an agreement shall be reached between the ASSEMBLY manufacturer and the user as to what measures shall be taken to ensure adequate protection. Information provided by the ASSEMBLY manufacturer may take the place of such an agreement. When shutters are used to provide adequate protection to live parts they shall be secured to prevent unintentional removal.		P
8.3	**Clearances and creepage distances**		P
8.3.1	**General**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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. The clearances and creepage distances of equipment that form part of the ASSEMBLY shall comply with the requirements of the relevant product standard.		P
	When incorporating equipment into the ASSEMBLY, the specified clearances and creepage distances shall be maintained during normal service conditions. For dimensioning clearances and creepage distances between separate circuits, the highest voltage ratings shall be used (rated impulse withstand voltage for clearances and rated insulation voltage for creepage distances).		P
8.3.2	**Clearances**		P
	The clearances shall be sufficient to enable the declared rated impulse withstand voltage (Uimp) of a circuit to be achieved. The clearances shall be 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. The method of determining clearances by measurement is given in Annex F.		P
8.3.3	**Creepage distances**		P
	The original manufacturer shall select a rated insulation voltage(s) (Ui) for the circuits of the ASSEMBLY from which the creepage distance(s) shall be determined. For any given circuit the rated insulation voltage shall not be less than the rated operational voltage (Ue). The creepage distances shall not, in any case, be less than the associated minimum clearances. Creepage distances shall correspond to a pollution degree as specified in 7.1.3 and to the corresponding material group at the rated insulation voltage given in Table 2. The method of determining creepage distances by measurement is given in Annex F.		P
8.4	**Protection against electric shock**		P
8.4.1	**General**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The apparatus and circuits in the ASSEMBLY shall be so arranged as to facilitate their operation and maintenance, and at the same time to ensure the necessary degree of safety. The following requirements are intended to ensure that the required protective measures are obtained when an ASSEMBLY is installed in an electrical system conforming to the IEC 60364 series.		P
8.4.2	**Basic protection**		P
8.4.2.1	**General**		P
	Basic protection is intended to prevent direct contact with hazardous live parts. 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
	An example of additional measures to be taken is the installation of an open-type ASSEMBLY without further provisions in a location where access is only permitted for authorized personnel. 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. The choice of the protective measure shall be declared by the ASSEMBLY manufacturer if not specified within the relevant ASSEMBLY standard.		N/A
8.4.2.2	**Basic insulation provided by insulating material**		P
	Hazardous live parts shall be completely covered with insulation that can only be removed by destruction or by the use of a tool. The insulation shall be made of suitable materials capable of durably withstanding the mechanical, electrical and thermal stresses to which the insulation may be subjected in service.		P
8.4.2.3	**Barriers or enclosures**		P
	Air insulated live parts shall be inside enclosures or behind barriers providing at least a degree of protection of IP XXB. Horizontal top surfaces of accessible enclosures having a height equal to or lower than 1,6 m above the standing a rea, shall provide a degree of protection of at least IP XXD.		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Barriers and enclosures shall be 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 shall not be 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 shall be possible only if one of the conditions a) to c) is fulfilled:)By the use of a key or tool, i.e. any mechanical aid, to open the door, cover or overide an interlock.)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 shall 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 60364-5-53:2001, 536.1.2). Example: By interlocking the door(s) with a disconnector so that they can only be opened when the disconnector is open, and closing of the disconnector without the use of a tool is impossible while the door is open. NOTE In Norway, the neutral conductor shall be isolated or switched.)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.		P
8.4.3	**Fault protection**		P
8.4.3.1	**Installation conditions**		P
	The ASSEMBLY shall include protective measures and be suitable for installations designed to be in accordance with IEC 60364-4-41. Protective measures suitable for particular installations (e.g. railways, ships) shall be subject to agreement between the ASSEMBLY manufacturer and the user.		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	When a TT earthing system is being used in the electrical network one of the following measures shall be applied in the ASSEMBLY:)double or reinforced insulation of the incoming connections, or)residual current device (RCD) protection on the incoming circuit Such provisions are subject to agreement between user and manufacturer.		P
8.4.3.2	**Requirements for the protective conductor to facilitate automatic disconnection of the supply**		P
8.4.3.2.1	**General**		P
	Each ASSEMBLY shall have a protective conductor to facilitate automatic disconnection of the supply for:)protection against the consequences of faults (e.g. failure of basic insulation) within the ASSEMBLY;)protection against the consequences of faults (e.g. failure of basic insulation) in external circuits supplied through the ASSEMBLY. The requirements to be complied with are given in the following subclauses. Requirements for identification of the protective conductor (PE, PEN) are given in 8.6.6.		P
8.4.3.2.2	**Requirements for earth continuity providing protection against the consequences of faults within the ASSEMBLY**		N/A
	All exposed conductive parts of the ASSEMBLY shall be interconnected together and to the protective conductor of the supply or via an earthing conductor to the earthing arrangement. These interconnections may be achieved either by metal screwed connections, welding or other conductive connections or by a separate protective conductor. The method to verify the earth continuity between the exposed conductive parts of the ASSEMBLY and the protective circuit is given in 10.5.2.		N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	For the continuity of these connections the following shall apply:)When a part of the ASSEMBLY is removed, for example for routine maintenance, the protective circuits (earth continuity) for the remainder of the ASSEMBLY shall not be 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. Flexible or pliable metal conduits shall not be used as protective conductors unless they are designed for that purpose.)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.		N/A
	If apparatus with a voltage exceeding the limits of extra-low voltage are attached to lids, doors, or cover plates additional measures shall be taken to ensure earth continuity. These parts shall be fitted with a protective conductor (PE) whose cross-sectional area is in accordance with Table 3 depending on the highest rated operational current Ie 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). Exposed conductive parts of a device that cannot be connected to the protective circuit by the fixing means of the device shall be 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

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	When removable parts are equipped with a metal supporting surface, these surfaces shall be 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**		N/A
	A protective conductor within the ASSEMBLY shall be 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. Except where verification of the short-circuit withstand strength is not required in accordance with 10.11.2, verification shall be made in accordance with 10.5.3. In principle, with the exception of the cases mentioned below, protective conductors within an ASSEMBLY shall not include a disconnecting device (switch, disconnector, etc.).		N/A
	In the run of protective conductors links shall be permitted which are removable by means of a tool and accessible only to authorized personnel (these links may be required for certain tests). Where continuity can be interrupted by means of connectors or plug-and-socket devices, the protective circuit shall be interrupted only after the live conductors have been interrupted and continuity shall be 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 voltage-operated fault detection devices including the conductors connecting them to a separate earth electrode shall be insulated when specified by their manufacturer. This can also apply to the earth connection of the transformer neutral. The cross-sectional area of protective conductors (PE, PEN) in an ASSEMBLY to which external conductors are intended to be connected shall be 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. The short-circuit withstand strength is verified according to 10.5.3.		N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	For PEN conductors, the following additional requirements apply: -the minimum cross-sectional area shall be 10 mm2 copper or 16 mm2 aluminium; -the PEN conductor shall have a cross-sectional area not less than that required for a neutral conductor (see 8.6.1); -the PEN conductors need not be insulated within an ASSEMBLY; -structural parts shall not be used as a PEN conductor. However, mounting rails made of copper or aluminium may be used as PEN conductors For details of requirements for terminals for external protective conductors, see 8.8..		N/A
8.4.3.3	**Electrical separation**		P
	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.		P
8.4.4	**Protection by total insulation**		P
	For basic and fault protection, by total insulation, the following requirements shall be met.		P
	)The apparatus shall be completely enclosed in insulating material which is equivalent of double or reinforced insulation. The enclosure shall carry the symbol which shall be visible from the outside.)The enclosure shall at no point be pierced by conducting parts in such a manner that there is the possibility of a fault voltage being brought out of the enclosure. This means that metal parts, such as actuator shafts which for constructional reasons have to be brought through the enclosure, shall be 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. If an actuator is made of metal (whether covered by insulating material or not), it shall be provided with insulation rated for the maximum rated insulation voltage and the maximum impulse withstand voltage of all circuits in the ASSEMBLY. If an actuator is principally made of insulating material, any of its metal parts which may become accessible in the event of insulation failure shall also be insulated from live parts for the maximum rated insulation voltage and the maximum rated impulse withstand voltage of all circuits in the ASSEMBLY.		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	c) The enclosure, when the ASSEMBLY is ready for operation and connected to the supply,shall enclose all live parts, exposed conductive parts and parts belonging to a protective circuit in such a manner that they cannot be touched. The enclosure shall give at least the degree of protection IP 2XC (see IEC 60529). 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 shall be provided and identified by suitable marking. Inside the enclosure, the protective conductor and its terminal shall be insulated from the live parts and the exposed conductive parts in the same way as the live parts are insulated.		P
	d) Exposed conductive parts within the ASSEMBLY shall not be connected to the protective circuit, i.e. they shall not be 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.		
	e) If doors or covers of the enclosure can be opened without the use of a key or tool, a barrier of insulating material shall be 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, shall not be removable except with the use of a tool.		
8.4.5	**Limitation of steady-state touch current and charge**		P
	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. Small capacitors such as those used for arc extinction, for delaying the response of relays, etc., shall not be considered dangerous.		P
8.4.6	**Operating and servicing conditions**		P
8.4.6.1	**Devices to be operated or components to be replaced by ordinary persons**		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Protection against any contact with live parts shall be maintained when operating devices or when replacing components. The minimum level of protection shall be IP XXC. During the replacement of certain lamps or fuselinks openings larger than those defined by degree of protection IP XXC are allowed.		P
8.4.6.2	**Requirements related to accessibility in service by authorized persons**		N/A
8.4.6.2.1	**General**		N/A
	For accessibility in service by authorized persons, one or more of the following requirements in 8.4.6.2.2 to 8.4.6.2.4 shall be fulfilled subject to agreement between the ASSEMBLY manufacturer and the user. These requirements shall be complementary to the basic proIf doors or covers of the ASSEMBLY can be opened by authorized persons by overriding an interlock to obtain access to live parts, then the interlock shall automatically be restored on reclosing the door(s) or replacing the cover(s).tection specified in 8.4.2. If doors or covers of the ASSEMBLY can be opened by authorized persons by overriding an interlock to obtain access to live parts, then the interlock shall automatically be restored on reclosing the door(s) or replacing the cover(s).		N/A
8.4.6.2.2	**Requirements related to accessibility for inspection and similar operations**		N/A
	The ASSEMBLY shall be 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. Such operations may consist of: – visual inspection of •switching devices and other apparatus, •settings and indicators of relays and releases, •conductor connections and marking; -adjusting and resetting of relays, releases and electronic devices; -replacement of fuse-links; -replacement of indicating lamps; -certain fault location operations, for example voltage and current measuring with suitably designed and insulated devices.		N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.4.6.2.3	**Requirements related to accessibility for maintenance**		N/A
	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 shall be taken. 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: -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; -use of barriers or obstacles designed and arranged to protect against direct contact with equipment in adjacent functional units or groups; -use of terminal shields; -use of compartments for each functional unit or group; -insertion of additional protective means provided or specified by the ASSEMBLY manufacturer.		N/A
8.4.6.2.4	**Requirements related to accessibility for extension under voltage**		N/A
	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 8.4.6.2.3 shall apply, subject to agreement between the ASSEMBLY manufacturer and the user. These requirements also apply for the insertion and connection of additional outgoing cables when the existing cables are under voltage. The extension of busbars and connection of additional units to their incoming supply shall not be made under voltage, unless the ASSEMBLY is designed for this purpose.		N/A
8.4.6.2.5	**Obstacles**		N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Obstacles shall prevent either: -unintentional bodily approach to live parts, or -unintentional contact with live parts during the operation of live equipment in normal service. Obstacles may be removed without using a key or tool but shall be so secured as to prevent unintentional removal. The distance between a conductive obstacle and the live parts they protect shall not be less than the values specified for the clearances and creepage distances in 8.3. 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 shall also be applied.		N/A
8.5	**Incorporation of switching devices and components**		P
8.5.1	**Fixed parts**		P
	For fixed parts (see 3.2.1), the connections of the main circuits (see 3.1.3) shall only be connected or disconnected when the ASSEMBLY is not under voltage. In general, removal and installation of fixed parts requires the use of a tool. The disconnection of a fixed part shall require the isolation of the complete ASSEMBLY or part of it. 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**		P
	The removable parts shall be so constructed that their electrical equipment can be safely removed from or connected to the main circuit whilst this circuit is live. The removable parts may be provided with an insertion interlock (see 3.2.5). Clearances and creepage distances (see 8.3) shall be complied with during transfer from one position to another. A removable part shall be fitted with a device, which ensures that it can only be removed and inserted after its main circuit has been switched off from the load. In order to prevent unauthorized operation, the removable parts or their associated ASSEMBLY location may be provided with a lockable means to secure them in one or more of their positions.		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.5.3	**Selection of switching devices and components**		P
	Switching devices and components incorporated in ASSEMBLIES shall comply with the relevant IEC standards. The switching devices and components shall be suitable for the particular application with respect to the external design of the ASSEMBLY (e.g. open type or enclosed), their rated voltages, rated currents, rated frequency, service life, making and breaking capacities, shortcircuit withstand strength, etc.		P
	The rated insulation voltage, and rated impulse withstand voltage of the devices installed in the circuit shall be equal or higher than the corresponding value assigned to that circuit. In some cases overvoltage protection may be necessary e.g. for equipment fulfilling overvoltage category II (see 3.6.11).The switching devices and components having a short-circuit withstand strength and/or a breaking capacity which is instufficien to withstand the stresses likely to occur at the place of installation, shall be protected by means of current-limiting protective devices, for example fuses or circuit-breakers. When selecting current-limiting protective devices for built-in switching devices, account shall be taken of the maximum permissible values specified by the device manufacturer, having due regard to co-ordination (see 9.3.4). Co-ordination of switching devices and components, for example co-ordination of motor starters with short-circuit protective devices, shall comply with the relevant IEC standards.		P
8.5.4	**Installation of switching devices and components**		P
	Switching devices and components shall be 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. In the case of electronic assemblies, this may necessitate the separation or screening of all electronic signal processing circuits. When fuses are installed the original manufacturer shall state the type and rating of the fuselinks to be used.		P
8.5.5	**Accessibility**		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Adjusting and resetting devices, which have to be operated inside the ASSEMBLY shall be easily accessible. Functional units mounted on the same support (mounting plate, mounting frame) and their terminals for external conductors shall be 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 shall apply: -The terminals, excluding terminals for protective conductors, shall be 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. -Indicating instruments that need to be read by the operator shall be located within a zone between 0,2 m and 2,2 m above the base of the ASSEMBLY. -Operating devices such as handles, push buttons, or similar shall be located at such a height that they can easily be operated; this means that their centreline shall be located within a zone between 0,2 m and 2 m above the base of the ASSEMBLY. Devices which are infrequently operated, e.g less than once per month, may be installed at a height up to 2,2 m. -Actuators for emergency switching devices (see 536.4.2 of IEC 60364-5-53:2001) shall be accessible within a zone between 0,8 m and 1,6 m above the base of the ASSEMBLY.		P
8.5.6	**Barriers**		N/A
	Barriers for manual switching devices shall be so designed that the switching emissions do not present a danger to the operator. To minimize danger when replacing fuse-links, interphase barriers shall be 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**		P
	The operational positions of components and devices shall be clearly identified. If the direction of operation is not in accordance with IEC 60447, then the direction of operation shall be clearly identified.		P
8.5.8	**Indicator lights and push-buttons**		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Unless otherwise specified in the relevant product standard the colours of indicator lights and push-buttons shall be in accordance with IEC 60073.		P
8.6	**Internal electrical circuits and connections**		P
8.6.1	**Main circuits**		P
	The busbars (bare or insulated) shall be arranged in such a manner that an internal shortcircuit is not to be expected. They shall be 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.	Internal wiring prevents short circuits	P
8.6.2	**Auxiliary circuits**		P
	The design of the auxiliary circuits shall take into account the supply earthing system and ensure that an earth-fault or a fault between a live part and an exposed conductive part shall not cause unintentional dangerous operation.		P
	In general, auxiliary circuits shall be protected against the effects of short circuits. However, a short-circuit protective device shall not be provided if its operation is liable to cause a danger. In such a case, the conductors of auxiliary circuits shall be arranged in such a manner that a short-circuit is not to be expected (see 8.6.4).		P
8.6.3	**Bare and insulated conductors**		P
	The connections of current-carrying parts shall not suffer undue alteration as a result of normal temperature rise, ageing of the insulating materials and vibrations occurring in normal operation. In particular, 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, shall be taken into consideration.		P
8.6.4	**Selection and installation of non-protected live conductors to reduce the possibility of short-circuits**		P
	Live conductors in an ASSEMBLY that are not protected by short-circuit protective devices (see 8.6.1 and 8.6.2) shall be 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. Examples of conductor types and installation requirements are given in Table 4. Non-protected live conductors selected and installed as in Table 4 shall have a total length not exceeding 3 m between the main busbar and each respective SCPD.		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.6.5	**Identification of the conductors of main and auxiliary circuits**		P
	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 shall be in agreement with the indications on the wiring diagrams and drawings. Where appropriate, identification according to IEC 60445 shall be applied.		P
8.6.6	**Identification of the protective conductor (PE, PEN) and of the neutral conductor (N) of the main circuits**		N/A
	The protective conductor shall be readily distinguishable by location and/or marking or colour. If identification by colour is used, it shall only be green and yellow (twin-coloured), which is strictly reserved for the protective conductor. When the protective conductor is an insulated single-core cable, this colour identification shall be used, preferably throughout the whole length. Any neutral conductor of the main circuit shall be readily distinguishable by location and/or marking or colour (see IEC 60445 where blue is required).		N/A
8.7	**Cooling**		P
	ASSEMBLIES can be provided with natural cooling and/or active cooling (e.g. forced cooling, internal air conditioning, heat exchanger etc.). If special precautions are required at the place of installation to ensure proper cooling, the ASSEMBLY manufacturer shall furnish 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).		P
8.8	**Terminals for external conductors**		P
	The ASSEMBLY manufacturer shall indicate whether the terminals are suitable for connection of copper or aluminium conductors, or both. The terminals shall be such that the external conductors may be connected by a means (screws, connectors, etc.) which ensures that the necessary contact pressure corresponding to the current rating and the short-circuit strength of the apparatus and the circuit is maintained.		N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	In the absence of a special agreement between the ASSEMBLY manufacturer and the user, terminals shall be capable of accommodating copper conductors from the smallest to the largest cross-sectional areas corresponding to the appropriate rated current (see Annex A).		N/A
9	**Performance requirements**		P
9.1	**Dielectric properties**		P
9.1.1	**General**		P
	Each circuit of the ASSEMBLY shall be capable of withstanding: –temporary overvoltages; –transient overvoltages. The ability to withstand temporary overvoltages, and the integrity of solid insulation, is verified by the power-frequency withstand voltage and the ability to withstand transient overvoltages is verified by the impulse withstand voltage.		N/A
9.1.2	**Power-frequency withstand voltage**		P
	The circuits of the ASSEMBLY shall be capable of withstanding the appropriate powerfrequency withstand voltages given in Tables 8 and 9 (see 10.9.2.1). The rated insulation voltage of any circuit of the ASSEMBLY shall be equal to or higher than its maximum operational voltage.		P
9.1.3	**Impulse withstand voltage**		P
9.1.3.1	**Impulse withstand voltages of main circuits**		P
	Clearances from live parts to exposed conductive parts and between live parts of different potential shall be capable of withstanding the test voltage given in Table 10 appropriate to the rated impulse withstand voltage. The rated impulse withstand voltage for a given rated operational voltage shall 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.		N/A
9.1.3.2	**Impulse withstand voltages of auxiliary circuits**		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	)Auxiliary circuits that are connected to the main circuit and operate at the rated operational voltage without any means for reduction of overvoltage shall comply with the requirements of 9.1.3.1.)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. – shall be capable		N/A
9.1.4	**Protection of surge protective devices**		P
	When overvoltage conditions require surge protective devices (SPD's) to be connected to the main circuit, such SPD's shall be protected to prevent uncontrolled short-circuit conditions as specified by the SPD manufacturer.		P
9.2	**Temperature rise limits**		P
	The ASSEMBLY and its circuits shall be able to carry their rated currents under specified conditions (see 5.3.1, 5.3.2 and 5.3.3), taking into consideration the ratings of the components, their disposition and application, without exceeding the limits given in Table 6 when verified in accordance with 10.10. The temperature rise limits given in Table 6 apply for a mean ambient air temperature up to 35 °C.		N/A
	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. If the mean ambient air temperature is higher than 35 °C, then the temperature rise limits have to be adapted for this special service condition, so that the sum of the ambient temperature and the individual temperature rise limit remains the same. If the mean ambient air temperature is lower than 35 °C the same adaptation of the temperature rise limits is allowed subject to agreement between the user and ASSEMBLY manufacturer.		N/A
9.3	**Short-circuit protection and short-circuit withstand strength**		P
9.3.1	**General**		P
	ASSEMBLIES shall be capable of withstanding the thermal and dynamic stresses resulting from short-circuit currents not exceeding the rated values.		P
9.3.2	**Information concerning short-circuit withstand strength**		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	For ASSEMBLIES with a short-circuit protective device (SCPD) incorporated in the incoming unit, the ASSEMBLY manufacturer shall indicate the maximum allowable value of prospective short-circuit current at the input terminals of the ASSEMBLY. This value shall not exceed the appropriate rating(s) (see 5.3.3, 5.3.4 and 5.3.5). The corresponding power factor and peak values shall be those shown in 9.3.3. If a circuit breaker with time-delay release is used as the short-circuit protective device, the ASSEMBLY manufacturer shall state the maximum time-delay and the current setting corresponding to the indicated prospective short-circuit current.		P
9.3.3	**Relationship between peak current and short-time current**		P
	For determining the electrodynamic stresses, the value of peak current shall be 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**		N/A
	The co-ordination of protective devices within the ASSEMBLY with those to be used external to the ASSEMBLY shall be 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
9.4	**Electromagnetic compatibility (EMC)**		N/A
	For EMC related performance requirements, see J.9.4 of Annex J.		N/A
10	**Design verification**		P
10.1	**General**		P
	Design verification is intended to verify compliance of the design of an ASSEMBLY or ASSEMBLY system with the requirements of this series of standards. Where tests on the ASSEMBLY have been conducted in accordance with the IEC 60439 series, and the test results fulfill the requirements of the relevant part of EN 61439, the verification of these requirements need not be repeated.		P
10.2	**Strength of materials and parts**		P
10.2.1	**General**		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The mechanical, electrical and thermal capability of constructional materials and parts of the ASSEMBLY shall be deemed to be proven by verification of construction and performance characteristics. 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
	The glow-wire test principles of IEC 60695-2-10 and the details given in IEC 60695-2-11 shall be used to verify the suitability of materials used: a)on parts of ASSEMBLIES, or b)on parts taken from these parts. The test shall be carried out on material with the minimum thickness used for the parts in a) or b).	No ignition, roll of paper without burn mark	P
10.2.4	**Resistance to ultra-violet (UV) radiation**		P
	This test applies only to enclosures and external parts of ASSEMBLIES intended to be installed outdoors and which are constructed of insulating materials or metals that are entirely coated by synthetic material. Representative samples of such parts shall be subjected to the following test: UV test according to ISO 4892-2 Method A, Cycle 1 providing a total test period of 500 h. For enclosures constructed of insulating materials compliance is checked by verification that the flexural strength (according to ISO 178) and Charpy impact (according to ISO 179) of insulating materials have 70 % minimum retention.		P
10.2.5	**Lifting**		P
	For ASSEMBLIES with provision for lifting means compliance is verified by the following tests. The maximum number of sections allowed by the original manufacturer to be lifted together shall be equipped with components and/or weights to achieve a weight of 1,25 times its maximum shipping weight. With doors closed it shall be lifted with the specified lifting means and in the manner defined by the original manufacturer.		P
10.2.6	**Mechanical impact**		N/A
	Mechanical impact tests where required by the specific ASSEMBLY standard are to be carried out in accordance with IEC 62262.		N/A
10.2.7	**Marking**		P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Marking made by moulding, pressing, engraving or similar, including labels with a laminated plastic covering, shall not be submitted to the following test. 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.	See table 10.2.7	P
10.3	**Degree of protection of ASSEMBLIES**		P
	The degree of protection provided in accordance with 8.2.2, 8.2.3 and 8.4.2.3 shall be verified in accordance with IEC 60529; the test may be carried out on one representative equipped ASSEMBLY in a condition stated by the original manufacturer. Where an empty enclosure in accordance with IEC 62208 is used, a verification assessment shall be performed to ensure that any external modification that has been carried out does not result in a deterioration of the degree of protection. In this case no further testing is required.		P
10.4	**Clearances and creepage distances**		P
	It shall be verified that the clearances and creepage distances comply with the requirements of 8.3. The clearances and creepage distances shall be measured in accordance with Annex F.		P
10.5	**Protection against electric shock and integrity of protective circuits**		P
10.5.1	**Effectiveness of the protective circuit**		P
	The effectiveness of protective circuit is verified for the following functions:)protection against the consequences of a fault within the ASSEMBLY (internal faults) as outlined in 10.5.2, and)protection against the consequences of faults in external circuits supplied through the ASSEMBLY (external faults) as outlined in 10.5.3.		P
10.5.2	**Effective earth continuity between the exposed conductive parts of the ASSEMBLY and the protective circuit**		N/A
	It shall be 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.		N/A
10.5.3	**Short-circuit withstand strength of the protective circuit**		P
10.5.3.1	**General**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The rated short-circuit withstand strength shall be verified. Verification may be by comparison with a reference design or by test as detailed in 10.5.3.3 to 10.5.3.5. The original manufacturer shall determine the reference design(s) that will be used in 10.5.3.3 and 10.5.3.4.		P
10.5.3.2	**Protective circuits that are exempted from short-circuit withstand verification**		N/A
	Where a separate protective conductor is provided in accordance with 8.4.3.2.3, short-circuit testing is not required if one of the conditions of 10.11.2. is fulfilled.		N/A
10.5.3.3	**Verification by comparison with a reference design** **– Utilising a check list**		N/A
	Verification 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. To ensure the same current carrying capacity for that portion of the fault current that flows through the exposed conductive parts, the design, number and arrangement of the parts that provide contact between the protective conductor and the exposed conductive parts, shall be the same as in the tested reference design.		N/A
10.5.3.4	**Verification by comparison with a reference design** **– Utilising calculation**		N/A
	Verification by comparison with a reference design based on calculation is to be in accordance with 10.11.4 To ensure the same current carrying capacity for that portion of the fault current that flows through the exposed conductive parts, the design, number and arrangement of the parts that provide contact between the protective conductor and the exposed conductive parts, shall be the same as in the tested reference design.		N/A
10.5.3.5	**Verification by test**		P
	Subclause 10.11.5.6 applies.		P
10.6	**Incorporation of switching devices and components**		P
10.6.1	**General**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Compliance with the design requirements of 8.5 for the incorporation of switching devices and components shall be confirmed by the original manufacturer's inspection.		P
10.6.2	**Electromagnetic compatibility**		P
	The performance requirements of J.9.4 for electromagnetic compatibility shall be confirmed by inspection or where necessary by test (see J.10.12).		P
10.7	**Internal electrical circuits and connections**		P
	Compliance with the design requirements of 8.6 for internal electrical circuits and connections shall be confirmed by the original manufacturer's inspection.		P
10.8	**Terminals for external conductors**		P
	Compliance with the design requirements of 8.8 for terminals for external conductors shall be confirmed by the original manufacturer's inspection.		P
10.9	**Dielectric properties**		P
10.9.1	**General**		P
	For this test, all the electrical equipment of the ASSEMBLY shall be connected, except those items of apparatus which, according to the relevant specifications, are designed for a lower test voltage; current-consuming apparatus (e.g. windings, measuring instruments, voltage surge suppression devices) in which the application of the test voltage would cause the flow of a current, shall be disconnected. Such apparatus shall be disconnected at one of their terminals unless they are not designed to withstand the full test voltage, in which case all terminals may be disconnected.		P
10.9.2	**Power-frequency withstand voltage**	See table 10.9.2	P
10.9.2.1	**Main, auxiliary and control circuits**		P
	Main circuits as well as auxiliary and control circuits that are connected to the main circuit shall be subjected to the test voltage according to Table 8. Auxiliary and control circuits, whether a.c. or d.c., that are not connected to the main circuit shall be subjected to the test voltage according to Table 9.		P
10.9.2.2	**Test voltage**		P
	The test voltage shall have a substantially sinusoidal waveform and a frequency between 45 Hz and 65 Hz.		P
	The high-voltage transformer used for the test shall be 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 shall be at least 200 mA.		P

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Clause	Requirement + Test	Result - Remark	Verdict
10.9.2.3	**Application of the test voltage**		P
	The power frequency voltage at the moment of application shall not exceed 50 % of the full test value. It shall then be increased progressively to this full value and maintained for 5 (0+2) s as follows:)between all live parts of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and exposed conductive parts, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;)between each live part of different potential of the main circuit and, the other live parts of different potential and exposed conductive parts connected together, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;)between each control and auxiliary circuit not normally connected to the main circuit and the –main circuit; –other circuits; –exposed conductive parts.		P
10.9.2.4	**Acceptance criteria**		P
	The overcurrent relay shall not operate and there shall be no disruptive discharge (see 3.6.17) during the tests.		P
10.9.3	**Impulse withstand voltage**		N/A
10.9.3.1	**General**		N/A
	Verification shall be made by test or by assessment. 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.		N/A
10.9.3.2	**Impulse withstand voltage test**		N/A
	The impulse voltage generator shall be adjusted to the required impulse voltage with the ASSEMBLY connected. The value of the test voltage shall be that specified in 9.1.3. The accuracy of the applied peak voltage shall be ± 3 %.		N/A
10.9.3.3	**Alternative power-frequency voltage test**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The test voltage shall have a substantially sinusoidal waveform and a frequency between 45 Hz and 65 Hz. The high-voltage transformer used for the test shall be 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 shall be at least 200 mA.		N/A
10.9.3.4	**Alternative d.c. voltage test**		N/A
	The test voltage shall have negligible ripple. The high-voltage source used for the test shall be 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 shall be at least 200 mA.		N/A
10.9.3.5	**Verification assessment**		N/A
	Clearances shall be verified by measurement, or verification of measurements on design drawings, employing the measurement methods stated in Annex F. The clearances shall be at least 1,5 times the values specified in Table 1.		N/A
10.9.4	**Testing of enclosures made of insulating material**		N/A
	For ASSEMBLIES with enclosures made of insulating material, an additional dielectric test shall be 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. For this additional test, the test voltage shall be equal to 1,5 times the values indicated in Table 8.		N/A
10.9.5	**External operating handles of insulating material**		N/A
	In the case of handles made of or covered by insulating material, a dielectric test shall be carried out by applying a test voltage equal to 1,5 times the test voltage indicated in Table 8 between the live parts and a metal foil wrapped round the whole surface of the handle. During this test, the exposed conductive parts shall not be earthed or connected to any other circuit.		N/A
10.10	**Verification of temperature rise**	See table 10.10.1	P
10.10.1	**General**		P
	It shall be verified that the temperature-rise limits specified in 9.2 for the different parts of the ASSEMBLY or ASSEMBLY system will not be exceeded.		P
10.10.2	**Verification by testing**		P
10.10.2.1	**General**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Verification by test comprises the following:)If the ASSEMBLY system to be verified comprises a number of variants, the most onerous arrangement(s) of the ASSEMBLY system shall be selected according to 10.10.2.2.)The ASSEMBLY variant(s) selected shall be verified by one of the following methods(seeAnnex O):)considering individual functional units, the main and distribution busbars and the ASSEMBLY collectively according to 10.10.2.3.5;)considering individual functional units separately and the complete ASSEMBLY including the main and distribution busbars according to 10.10.2.3.6;)considering individual functional units and the main and distribution busbars separately as well as the complete ASSEMBLY according to 10.10.2.3.7. c) When the ASSEMBLY variant(s) tested are the most onerous variants out of an ASSEMBLY system then the test results can be used to establish the ratings of similar variants without further testing. Rules for such derivations are given in 10.10.3.		P
10.10.2.2	**Selection of the representative arrangement**		P
10.10.2.2.1	**General**		P
	The test shall be 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. 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. The original manufacturer shall take into consideration in his selection for test, the configurations to be derived from the tested arrangements according to 10.10.3.		P
10.10.2.2.2	**Busbars**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For busbar systems consisting of single or multiple rectangular sections of conductor, where the variants differ only in the reduction of one or more of •height, •thickness, •quantity of bars per conductor, and have the same •arrangement of bars, •center line spacing of conductors, •enclosure and •busbar compartment (if any),		P
10.10.2.2.3	**Functional units**		P
	a) Selection of comparable functional unit groups		P
	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:)the function and basic wiring diagram of the main circuit is the same (e.g. incoming unit, reversing starter, cable feeder);)the devices are of the same frame size and belong to the same series;)the mounting structure is of the same type;)the mutual arrangement of the devices is the same;)the type and arrangement of conductors is the same;		P
10.10.2.3	**Methods of test**		P
10.10.2.3.1	**General**		P
	In 10.10.2.3.5 to 10.10.2.3.7 three methods for test are given, which differ in the number of tests needed and in the range of applicability of the test results, an explanation is provided in Annex O. The temperature-rise test on the individual circuits shall be made with the type of current for which they are intended, and at the design frequency. Any convenient value of the test voltage may be used to produce the desired current. Coils of relays,contactors, releases,etc., shall be supplied with rated operational voltage.		P
10.10.2.3.2	**Test conductors**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	In the absence of detailed information concerning the external conductors and the service conditions, the cross-section of the external test conductors shall be chosen considering the rated current of each circuit as follows:)**For values of rated current up to and including 400 A:**)the conductors shall be single-core, copper cables or insulated wires with crosssectional areas as given in Table 11;)as far as practicable, the conductors shall be in free air;)the minimum length of each temporary connection from terminal to terminal shall be: –1 m for cross-sections up to and including 35 mm2; –2 m for cross-sections larger than 35 mm2.		N/A
10.10.2.3.3	**Measurement of temperatures**		P
	Thermocouples or thermometers shall be used for temperature measurements. For windings, the method of measuring the temperature by resistance variation shall generally be used.		P
10.10.2.3.4	**Ambient air temperature**		P
	The ambient air temperature shall be 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. The thermometers or thermocouples shall be protected against air currents and heat radiation.		P
10.10.2.3.5	**Verification of the complete ASSEMBLY**		P
	Incoming and outgoing circuits of the ASSEMBLY shall be loaded with their rated currents (see 5.3.2) being equivalent to a rated diversity factor of 1 (see 5.4 and Annex O).		P
10.10.2.3.6	**Verification considering individual functional units separately and the complete ASSEMBLY**		P
	The rated currents of the circuits according to 5.3.2 and the rated diversity factor according to 5.4 shall be verified in two stages.		P
10.10.2.3.7	**Verification considering individual functional units and the main and distribution busbars separately as well as the complete ASSEMBLY**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
10.10.2.3.8	**Results to be obtained**		N/A
	At the end of the test, the temperature rise shall not exceed the values specified in Table 6. The apparatus shall operate satisfactorily within the voltage limits specified for them at the temperature inside the ASSEMBLY.		N/A
10.10.3	**Derivation of ratings for similar variants**		N/A
10.10.3.1	**General**		N/A
	The following sub-clauses define how the rated currents of variants can be verified by derivation from similar arrangements verified by test.		N/A
10.10.3.2	**ASSEMBLIES**		N/A
10.10.3.3	**Busbars**		N/A
	Ratings established for aluminium busbars are valid for copper busbars with the same cross sectional dimensions and configuration. However, ratings established for copper busbars shall not be used to establish ratings of aluminium busbars.		N/A
10.10.4	**Verification assessment**		N/A
10.10.4.1	**General**		N/A
	Two calculation methods are provided. Both determine the approximate air temperature rise inside the enclosure, which is caused by the power losses of all circuits, and compare this temperature with the limits for the installed equipment. The methods differ only in the way the relationship between the delivered power loss and the air temperature rise inside the enclosure is ascertained.		N/A
10.11	**Short-circuit withstand strength**		N/A
10.11.1	**General**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The short-circuit current ratings declared shall be verified except where exempt, see 10.11.2.Verification may be, by comparison with a reference design (10.11.3 and 10.11.4.) or by test (10.11.5). For verification the following applies:)If the ASSEMBLY system to be verified comprises a number of variants, the most onerous arrangement(s) of the ASSEMBLY shall be selected, taking into account the rules in 10.11.3.)The ASSEMBLY variants selected for test shall be verified according to 10.11.5.)When the ASSEMBLIES tested are the most onerous variants of the larger product range of an ASSEMBLY system then the test results can be used to establish the ratings of similar variants		N/A
10.11.2	**Circuits of ASSEMBLIES which are exempted from the verification of the shortcircuit withstand strength**		N/A
	A verification of the short-circuit withstand strength is not required for the following:)ASSEMBLIES having a rated short-time withstand current (see 5.3.4) or rated conditional short-circuit current (see 5.3.5) not exceeding 10 kA r.m.s;)ASSEMBLIES, or circuits of ASSEMBLIES, protected by current-limiting devices having a cut-off current not exceeding 17 kA with the maximum allowable prospective short-circuit current at the terminals of the incoming circuit of the ASSEMBLY;)Auxiliary circuits of ASSEMBLIES intended to be connected to transformers whose rated power does not exceed 10 kVA for a rated secondary voltage of not less than 110 V, or 1,6 kVA for a rated secondary voltage less than 110 V, and whose short-circuit impedance is not less than 4 %.		N/A
10.11.3	**Verification by comparison with a reference design** **– Utilising a check list**		N/A
	Verification is undertaken by comparison of the ASSEMBLY to be verified with an already tested design using the check list provided in Table 13.		N/A
10.11.4	**Verification by comparison with a reference design** **– Utilising calculation**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Assessment of the rated short-time withstand current of an ASSEMBLY and its circuits, by calculation, shall be undertaken by a comparison of the ASSEMBLY to be assessed with an ASSEMBLY, already verified by test. The assessment to verify the main circuits of an ASSEMBLY shall be in accordance with Annex P. In addition each of the circuits of the ASSEMBLY to be assessed shall meet the requirements of items 6, 8, 9 and 10 in Table 13.		N/A
10.11.5	**Verification by test**		N/A
10.11.5.1	**Test arrangements**		N/A
	The ASSEMBLY or its parts as necessary to complete the test shall be mounted as in normal use. It is sufficient to test a single functional unit if the remaining functional units are of the same construction. Similarly it is sufficient to test a single busbar configuration if the remaining busbar configurations are of the same construction. Table 13 provides clarification on items not requiring additional tests.		N/A
10.11.5.2	**Performance of the test – General**		N/A
	If the test circuit incorporates fuses, fuse-links with the maximum let-through current and, if required, of the type indicated by the original manufacturer as being acceptable, shall be used.		N/A
10.11.5.3	**Testing of main circuits**		N/A
10.11.5.3.1	**General**		N/A
	Circuits shall be 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
10.11.5.3.2	**Outgoing circuits**		N/A
	The outgoing terminals of outgoing circuits shall be provided with a bolted short-circuit connection. 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 60947-1:2007 in parallel with the reactor used to adjust the short-circuit current.		N/A
10.11.5.3.3	**Incoming circuit and main busbars**		N/A
10.11.5.3.4	**Connections to the supply side of outgoing units**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Where an ASSEMBLY contains conductors, including distribution busbars, if any, 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 shall be subject to an additional test.		N/A
10.11.5.3.5	**Neutral conductor**		N/A
	If a neutral conductor exists within a circuit it shall be subjected to one test to prove its shortcircuit withstand strength in relation to the nearest phase conductor of the circuit under test including any joints. Phase to neutral short-circuit connections shall be applied as specified in 10.11.5.3.3.		N/A
10.11.5.4	**Value and duration of the short-circuit current**		N/A
	For all short-circuit withstand ratings, the dynamic and thermal stresses shall be verified with a prospective current, at the supply side of the specified protective device, if any, equal to the value of the rated short-time withstand current, rated peak withstand current or rated conditional short-circuit current assigned.		N/A
10.11.5.5	**Results to be obtained**		N/A
	After the test deformation of busbars and conductors is acceptable provided that the clearances and creepage distances specified in 8.3 are still complied with. In case of any doubt clearances and creepage distances shall be measured (see 10.4).		N/A
10.11.5.6	**Testing of the protective circuit**		N/A
10.11.5.6.1	**General**		N/A
	This test does not apply for circuits according to 10.11.2.		N/A
10.12	**Electromagnetic compatibility (EMC)**		N/A
	For EMC tests, see J.10.12.		N/A
10.13	**Mechanical operation**		P
11.5	**Incorporation of built-in components**		N/A
	The installation and identification of built-in components shall be in accordance with the ASSEMBLY manufacturing instructions.		N/A
11.6	**Internal electrical circuits and connections**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The connections, especially screwed and bolted connections, shall be checked for the correct tightness on a random basis. Conductors shall be checked in accordance with the ASSEMBLY manufacturing instructions.		N/A
11.7	**Terminals for external conductors**		N/A
	The number, type and identification of terminals shall be checked in accordance with the ASSEMBLY manufacturing instructions.		N/A
11.8	**Mechanical operation**		N/A
	The effectiveness of mechanical actuating elements, interlocks and locks including those associated with removable parts shall be checked.		N/A
11.9	**Dielectric properties**		N/A
	A power-frequency withstand test shall be performed on all circuits in accordance with 10.9.1and 10.9.2 but for a duration of 1 s.		N/A
11.10	**Wiring, operational performance and function**		N/A
	It shall be verified that the information and markings specified in Clause 6 are complete.Depending on the complexity of the ASSEMBLY, it may be necessary to inspect the wiring and to carry out an electrical function test. The test procedure and the number of tests depend on whether or not the ASSEMBLY includes complicated interlocks, sequence control facilities, etc.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.4	**Rated diversity factor (RDF)**		N/A
	Addition: In the absence of an agreement between the ASSEMBLY manufacturer and user concerning the actual load currents, the assumed loading of the outgoing circuits of the ASSEMBLY or group of outgoing circuits may be based on the values in Table 101.		N/A
5.6	**Other characteristics**		N/A
	Replacement of item l): l) the type of construction – fixed, removable or withdrawable parts (see 8.5.1 and 8.5.2 of Part 1);		P
	Addition: m) the form of internal separation (see 8.101);		N/A
	n) the types of electrical connections of functional units (see 8.5.101).		P
8.2	**Degree of protection provided by a PSC-ASSEMBLY enclosure**		N/A
8.2.1	**Protection against mechanical impact**		P
	Replacement of text: Where a degree of protection provided by a PSC-ASSEMBLY enclosure against mechanical impact is declared by the original manufacturer this shall be verified in accordance with IEC 62262 (see 10.2.6).		P
8.2.101	**PSC-ASSEMBLY with withdrawable parts**		N/A
	The degree of protection indicated for PSC-ASSEMBLIES normally applies to the connected position (see 3.2.3) of withdrawable parts. The ASSEMBLY manufacturer shall indicate the degree of protection obtained in the other positions and during the transfer between positions.		N/A
	PSC-ASSEMBLIES with withdrawable parts may be so designed that the degree of protection applying to the connected position is also maintained in the test and isolated positions and during transfer from one position to another.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	If, after the removal of a withdrawable part, it is not possible to maintain the original degree of protection e.g. by closing a door, an agreement shall be reached between the ASSEMBLY manufacturer and user as to what measures shall be taken to ensure adequate protection. Information provided by the ASSEMBLY manufacturer may take the place of such an agreement.		N/A
8.3.2	**Clearances**		P
	For withdrawable parts, the isolation provided in the isolated position shall at least comply with the requirements in the relevant specification for disconnectors (see IEC 60947-3). This applies with the equipment in new condition, taking account of the manufacturing tolerances and anticipated changes in dimensions due to wear.		P
	The isolating distance between the withdrawable unit main contacts and their associated fixed contacts in the isolated position shall be capable of withstanding the test voltage for the declared impulse withstand voltage as specified in Table 102.		P
8.4.3.2.2	**Requirements for earth continuity providing protection against the consequences of faults within the PSC-ASSEMBLY**		N/A
	When removable or withdrawable parts are equipped with a metal supporting surface, these surfaces shall be considered sufficient for ensuring earth continuity of protective circuits provided that the pressure exerted on them is sufficiently high. The continuity of the protective circuit of a withdrawable part shall remain effective from the connected position to the isolated position inclusively		N/A
8.4.6.2.10 1	**Operating and maintenance gangways within a PSC-ASSEMBLY**		N/A
	Operating and maintenance gangways (see 3.102.1 and 3.102.2) within an ASSEMBLY shall comply with the requirements for basic protection as specified in IEC 61140. The design and construction of such gangways shall be agreed upon between ASSEMBLY manufacturer and user.		N/A
	Recesses within a PSC-ASSEMBLY of limited depth, in the order of 1 m, are not considered to be gangways.		N/A
8.5.2	**Removable and withdrawable parts**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The removable and withdrawable parts shall be so constructed that their electrical equipment can be safely removed and/or isolated from or connected to the main circuit whilst this circuit is live. The removable and withdrawable parts may be provided with an insertion interlock (see 3.2.5 of Part 1).		N/A
	Clearances and creepage distances (see 8.3 of Part 1 and 8.3.2 above) shall be complied with in the different positions as well as during transfer from one position to another.		N/A
8.5.2.101	**Withdrawable parts**		N/A
	Withdrawable parts shall have in addition an isolated position (see 3.2.103) and may have a test position (see 3.2.102), or a test situation (see 3.1.102). They shall be distinctly located in these positions. These positions shall be clearly discernible.		N/A
	In PSC-ASSEMBLIES with withdrawable parts all live parts shall be protected in such a manner that they cannot unintentionally be touched when the door, if any, is open and the withdrawable part is withdrawn from the connected position or removed. Where an obstacle or shutter is used they shall meet the requirements of 8.4.6.2.5 of Part 1.		N/A
	For the electrical conditions associated with the different positions of withdrawable parts, see Table 103.		N/A
8.5.2.102	**Interlocking and padlocking of removable and withdrawable parts**		N/A
	Unless otherwise specified the removable and withdrawable parts shall be fitted with a device, which ensures that the apparatus can only be removed/withdrawn and/or re-inserted after its main circuit has been interrupted.		N/A
	In order to prevent unauthorized operation the removable and withdrawable parts or their associated ASSEMBLY location may be provided with a lockable means to secure them in one or more of their positions.		N/A
8.5.101	**Description of the types of electrical connections of functional units**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The types of electrical connections of functional units within PSC-ASSEMBLIES or parts of PSCASSEMBLIES can be denoted by a three-letter code: -the first letter denotes the type of electrical connection of the main incoming circuit; -the second letter denotes the type of electrical connection of the main outgoing circuit; -the third letter denotes the type of electrical connection of the auxiliary circuits.		N/A
	The following letters shall be used: –F for fixed connections (see 3.2.6 of Part 1); –D for disconnectable connections (see 3.101.1); –W for withdrawable connections (see 3.101.2).		P
8.101	**Internal separation of PSC-ASSEMBLIES**		N/A
	Typical arrangements of internal separation by barriers or partitions are described in Table 104 and are classified as forms (for examples, see Annex AA).		N/A
	The form of separation and higher degrees of protection shall be the subject of an agreement between ASSEMBLY manufacturer and user.		N/A
	Internal separation may be used to attain one or more of the following conditions between functional units, separate compartments or enclosed protected spaces: -protection against contact with hazardous parts. The degree of protection shall be at least IP XXB (see 8.4.2.3); -protection against the passage of solid foreign bodies. The degree of protection shall be at least IP 2X.		N/A
10.2.6	**Mechanical impact**		N/A
	When a mechanical impact test is performed, it shall be carried out according to 9.6 of IEC 62208:2002.		N/A
10.3	**Degree of protection of ASSEMBLIES**		N/A
	The degree of protection associated with withdrawable parts as specified in accordance with 8.2.101 and associated with internal separation in accordance with 8.101 shall be verified in accordance with IEC 60529.		N/A
10.9.3.2	**Impulse withstand voltage test**		N/A
	The impulse withstand voltage capability of the isolating distance between the withdrawable units' main contacts and their associated fixed contacts shall be verified to confirm compliance with 8.3.2.		N/A
10.13	**Mechanical operation**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
11.8	**Mechanical operation**		P
	Verification shall include the checking of interlocking and locking arrangements associated with removable and withdrawable parts.		P

10.2.3	TABLE: Verification of thermal stability of enclosures	P
Temperature (℃)	Duration	Result
70	168h	No soften

10.2.7	TABLE: durability of marking test		P
Location	Checked by	Time	Result
External enclosure	Water	15s	No any curling and still legibility
External enclosure	Petroleum spirit	15s	No any curling and still legibility

10.4	TABLE: clearance and creepage distance measurements					
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)
Live part to enclosure	420	240	2.0	>10.0	3.8	>10.0
Between live parts and Sec.	420	240	5.0	>10.0	7.2	>10.0
Remark:						

10.5.2	TABLE:Earth Resistance		N/A
Location	Require	Test value	Result
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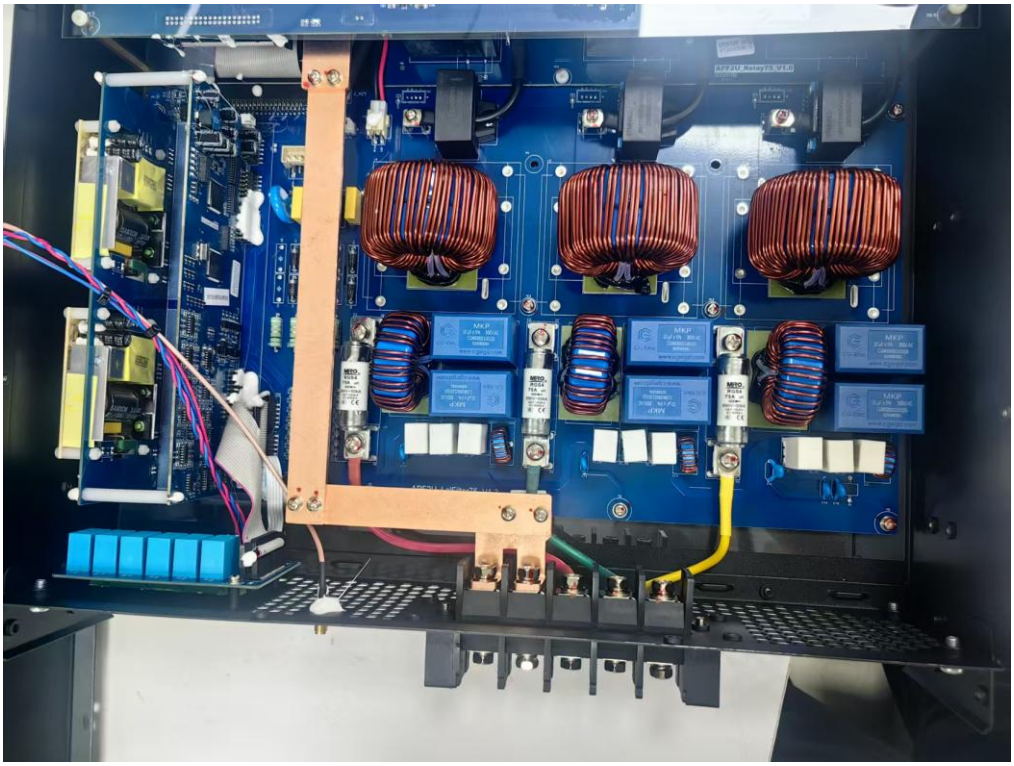
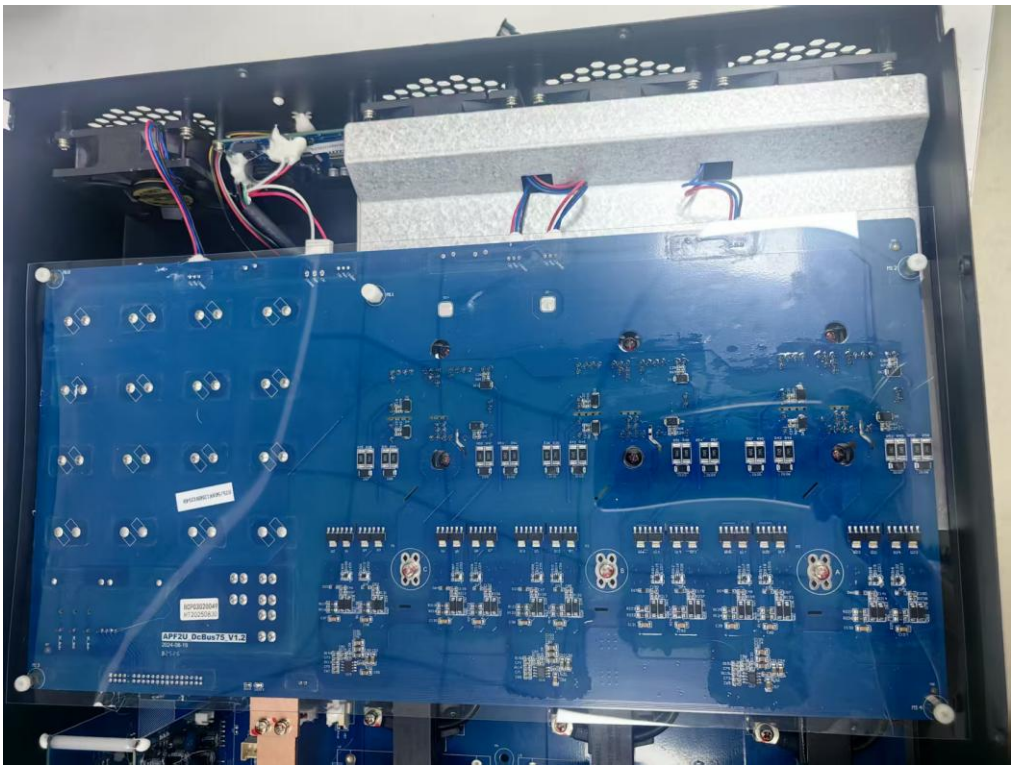
10.9.2	TABLE: Electric strength tests, impulse tests and voltage surge tests		P
Test voltage applied between: From/To	Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes / No
Live part to enclosure	AC	1500	No

10.10.1	TABLE: temperature rise measurements			P
	t1 (℃)……:	23.8℃		—
	t2 (℃)……:	25.0℃		—
temperature rise Dt of part/at:	240V	220V	Required T (K)	
	Temperature rise(K)	Temperature rise(K)		
Input wire	5.2K	4.8K	65K	
Terminal	8.6K	7.6K	65K	
Enclosure	4.9K	4.2K	40K	
Ambient	25.0℃	25.0℃	--	

Sample photo


N
N
C
B
A





— End of Report —