Akkreditierte Prüfstelle – Notifizierte Stelle

Accredited test laboratory – Notified body
Recognised test laboratory for CCA- and CB-scheme
and ÖVE-approval

Gesellschaft zur Prüfung elektro-
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Zeichen/Ref.: Wo

PA-No.: 2841-2

TEST REPORT No. CTI – PA 2841-2

Applicant: GSAB Elektrotechnik GmbH
Lindenstraße 23
99718 Greußen
Germany

Commission / test items received: 21.12.2011 / 21.12.2011
Date(s) of performance of tests: January – March 2012

Type of test item:

Public electricity network distribution assembly (PENDA) – Type: 1S1000K-7LSL2,
PENDA with a 185mm bus bar system,
fitted with seven size 2 NH-vertical fuse switch disconnector units
(two input units, five output units)

Test specification (standard, test procedure):

Selective tests according to EN 61439-1:2009 (for details see page 2)

Compiled by: J. Wolf Date: 9.10.2012

Approved by: Ing. H. Bachl Date: 9.10.2012

Akkreditierte Versuchsanstalt für Elektrotechnik im Prüfstelle für das ÖVE-Prüfzeichen
Wien

Tests performed (name of test and test clause): according to EN 61439-1:2009:	**Testing location:**
5 - Interface characteristics, 6 – Information, 7 - Service conditions, 10.2.3.3 - Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects, 10.4 - Clearances and creepage distances, 10.5.3 - Short-circuit withstand strength of the protective circuit 10.9 - Dielectric properties 10.10 - Verification of temperature rise 10.11 - Short-circuit withstand strength	**- test clauses 10.5.3 and 10.11:** AIT Austrian institute of technology Giefinggasse 2, 1210 Vienna, Austria **- all other test clauses:** CTI-Vienna, Gesellschaft zur Prüfung elektrotechnischer Industrieprodukte GmbH, Einzingergasse 4, 1210 Vienna, Austria

Summary of testing:

The test item **passed** the selected tests with a positive result.

(for details see test report from page 4 to 39)

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)

- the compliance with the requirements according to EN 61439-1:2009 have been judged by the performed tests and/or (as far as possible) by visual inspection.
requirements which were not judged ..... : N/J

Photos:

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
5	**INTERFACE CHARACTERISTICS**		
5.2	**Voltage ratings**		
	Rated voltage (Un) (of the ASSEMBLY) ..... :	400V	P
	Rated operational voltage (Ue) ..... : (of a circuit of an ASSEMBLY)	690V	P
	Rated insulation voltage (Ui) ..... : (of a circuit of an ASSEMBLY)	1000V	P
	Rated impulse withstand voltage (Uimp) ..... : (of the ASSEMBLY)	8000V	P
5.3	**Current ratings**		
	Rated current of the ASSEMBLY (InA) ..... :	630A	P
	Rated current of a circuit (Inc) ..... :	5 outputs/ 250A	P
	Rated diversity factor (RDF)	0,7	P
	Rated peak withstand current (Ipk) ..... :	52,5kA	P
	Rated short-time withstand current (Icw) ..... : (of a circuit of an ASSEMBLY)	25kA/ 1s	P
	Rated conditional short-circuit current of an ASSEMBLY (Icc) ..... :	25kA	P
5.4	**Rated frequency (fn)**	50Hz	P
5.5	**Other characteristics**		
	additional requirements depending on the specific service conditions of a functional unit (e.g. type of coordination, overload characteristics);		
	pollution degree ..... :	3	P
	types of system earthing for which the ASSEMBLY is designed..... :	TN-system	P
	indoor and/or outdoor installation..... :	Outdoor installation	P
	stationary or movable ..... :	stationary	P
	degree of protection..... :	IP 44	N/J
	intended for use by skilled or ordinary persons..... :	Skilled persons	P
	electromagnetic compatibility (EMC) classification :	---	N/J
	special service conditions, if applicable ..... :	---	N/J
	external design ..... :	enclosed	P
	mechanical impact protection, if applicable ..... :	---	N/J
	the type of construction - fixed, removable or withdrawable parts..... :	---	N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
6	**INFORMATION**		
6.1	**ASSEMBLY designation marking**	No marking on the test item	N/J
6.2	**Documentation**		
6.2.1	**Information relating to the ASSEMBLY**		
a)	Rated voltage (U_n)	400V	P
b)	rated operational voltage (U_e)	690V	P
c)	rated impulse withstand voltage (U_{imp})	1000V	P
d)	rated insulation voltage (U_i)	8000V	P
e)	rated current of the ASSEMBLY (I_{nA})	630A	P
f)	rated current of each circuit (I_{nc})	5 outputs/ 250A	P
g)	rated peak withstand current (I_{pk})	52,5kA	P
h)	rated short-time withstand current (I_{cw})	25kA/ 1s	P
i)	rated conditional short-circuit current (I_{cc})	25kA	P
j)	rated frequency (f_n)	50Hz	P
k)	rated diversity factor(s) (RDF)	0,7	P
	All necessary information relating to the other declared classifications and characteristics (see 5.5) shall be provided.		
	The following additional information regarding the ASSEMBLY shall be provided where applicable:		
1)	the short-circuit withstand strength and nature of short-circuit protective device(s)	120 kA/ NH-fuse link, size 2	P
2)	measures for protection against electric shock;	Total insulation	P
3)	overall dimensions (including projections e.g handles, covers, doors);	Width x height x depth [cm]: 80 x 100 x 30 height of the mounting base: 25 cm	P
4)	the weight where this exceeds 30 kg.	Approximately 50kg	P
6.2.2	**Instructions for handling, installation, operation and maintenance**		N/J
6.3	**Device and/or component identification**		
	Inside the ASSEMBLY, it is possible to identify individual circuits and their protective devices.	---	P
	Any designations used is in compliance with IEC 61346-1 and IEC 61346-2 and identical with those used in the wiring diagrams, which is in accordance with IEC 61082-1.	---	P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict

7	**SERVICE CONDITIONS**		
7.1	**Normal service conditions**		
7.1.1.1	**Ambient air temperature for indoor installations**		
	The ambient air temperature does not exceed +40 °C and its average over a period of 24 h does not exceed +35 °C.The lower limit of the ambient air temperature is –5 °C.	---	N/A
7.1.1.2	**Ambient air temperature for outdoor installations**		
	The ambient air temperature does not exceed +40 °C and its average over a period of 24 h does not exceed +35 °C. The lower limit of the ambient air temperature is –25 °C.	---	P
7.1.2.1	**Atmospheric conditions for indoor installations**		
	The air is clean and its relative humidity does not exceed 50 % at a maximum temperature of +40 °C. Higher relative humidity may be permitted at lower temperatures, for example 90 % at +20 °C. Moderate condensation is taken care of, which may occasionally occur due to variations in temperature.	---	N/A
7.1.2.2	**Atmospheric conditions for outdoor installations**		
	The relative humidity may temporarily be as high as 100 % at a maximum temperature of +25 °C.	---	P
7.1.3	**Pollution degree**		
	The pollution degree refers to the environmental conditions for which the ASSEMBLY is intended.	Pollution degree 3	P
7.1.4	**Altitude**		
	The altitude of the site of installation does not exceed 2 000 m.	---	P
7.2	**Special service conditions**		N/J
7.3	**Conditions during transport, storage and installation**		N/J

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
10.2	**STRENGTH OF MATERIALS AND PARTS**		
10.2.3	**Properties of insulating materials**		
10.2.3.2	**Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects**		
	The glow-wire test principles of IEC 60695-2-10 and the details given in IEC 60695-2-11 are used to verify the suitability of materials used:		
	a) on parts of ASSEMBLIES, or	---	N/A
	b) on parts taken from these parts.	---	P
	The test is carried out on material with the minimum thickness used for the parts in a) or b).	---	P
	The temperature of the tip of the glow-wire is as follows:		
	– 960 °C for parts necessary to retain current-carrying parts in position;	1.)Housing, 2.)busbar cover	P
	- 850 °C for enclosures intended for mounting in hollow walls;	---	N/A
	– 650 °C for all other parts, including parts necessary to retain the protective conductor.	3.)protective cover	P
	The specimen is considered to have withstood the glow-wire test if		
	– there is no visible flame and no sustained glowing, or if	1.), 3.)	P
	– flames and glowing of the specimen extinguish within 30 s after removal of the glow-wire.	2.)	P
	There is no burning of the tissue paper or scorching of the pinewood board.	1.), 2.), 3.)	P
	As an alternative the original manufacturer may provide data on the suitability of materials from the insulating material supplier to demonstrate compliance with the requirements of 8.1.3.2.3	---	N/A
10.4	**CLEARANCES AND CREEPAGE DISTANCES**		
	The clearances are sufficient to enable the declared rated impulse withstand voltage (Uimp) of a circuit to be achieved. Rated impulse withstands voltage. ..... :	Uimp=8kV	P
	Required clearances as specified in Table 1. ..... :	≥ 8 mm	P
	Measured clearances ..... :	> 8 mm	P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The original manufacturer selects a rated insulation voltage(s) (Ui) for the circuits of the ASSEMBLY from which the creepage distance(s) is determined. For any given circuit the rated insulation voltage is not less than the rated operational voltage (Ue). Insulation voltage Ui ..... :	Ui=1kV	P
	Pollution degree. ..... :	3	P
	Material group . ..... :	IIIa	P
	Minimum clearances required..... :	≥ 16 mm	P
	The creepage distances measured ..... :	> 16mm	P

10.5	**PROTECTION AGAINST ELECTRIC SHOCK AND INTEGRITY OF PROTECTIVE CIRCUITS**		
10.5.3	**Short-circuit withstand strength of the protective circuit**		
	The short-circuit withstand strength is verified.	By test	P
	The original manufacturer determines the reference design(s) that will be used in 10.5.3.3 and 10.5.3.4.	See annex	N/A
10.5.3.2	**Protective circuits that are exempted from short-circuit withstand verification**		N/A
10.5.3.3	**Verification by comparison with a reference design – Utilising a check list**		N/A
10.5.3.4	**Verification by comparison with a reference design – Utilising calculation**		N/A
10.5.3.5	**Verification by test**		P
	Subclause 10.11.5.6 applies.	See 10.11.5.6	P

10.9	**DIELECTRIC PROPERTIES**		
10.9.1	**General**		
	For this test, all the electrical equipment of the ASSEMBLY is connected, except those items of apparatus which, according to the relevant specifications, are designed for a lower test voltage; current-consuming apparatus (e.g. windings, measuring instruments, voltage surge suppression devices) in which the application of the test voltage would cause the flow of a current, are disconnected.	---	P
	Such apparatus are disconnected at one of their terminals unless they are not designed to withstand the full test voltage, in which case all terminals may be disconnected.	---	N/A
10.9.2	**Power-frequency withstand voltage**		
10.9.2.1	**Main, auxiliary and control circuits**		

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Main, auxiliary and control circuits that are connected to the main circuit are subjected to the test voltage according to Table 8.	2200V	P
	Auxiliary and control circuits, whether a.c. or d.c., that are not connected to the main circuit are subjected to the test voltage according to Table 9.	---	N/A
10.9.2.2	**Test voltage**		
	The test voltage has a practically sinusoidal waveform and a frequency between 45 Hz and 65 Hz.	---	P
	The high-voltage transformer used for the test is so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current is at least 200 mA.	---	P
	The overcurrent relay does not trip when the output current is less than 100 mA.	---	P
	The value of the test voltage is that specified in Table 8 or 9 as appropriate with a permitted tolerance of ± 3 %.	---	P
10.9.2.3	**Application of the test voltage**		
	The power frequency voltage at the moment of application does not exceed 50 % of the full test value. It is then be increased progressively to this full value and maintained for 5 s as follows:		
	a) between all 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	---	P
	b) between each live part of different potential of the main circuit and, the other live parts of different potential and exposed conductive parts connected together, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;	---	P
	c) between each control and auxiliary circuit not normally connected to the main circuit and the – main circuit; – other circuits; – exposed conductive parts including the earthed enclosure.	---	N/A
	The overcurrent relay does not operate and there are no disruptive discharge (see 3.6.18) during the tests.	---	P
10.9.3	**Impulse withstand voltage**		

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
10.9.3.1	**General**		
	Verification shall be made by test or by assessment	By test	P
	In place of the impulse withstand voltage test the original manufacturer may perform, at his discretion, an equivalent a.c. or d.c. voltage test, in accordance with 10.9.3.3 or 10.9.3.4, but consideration is given to the fact that such a tests exert a higher stress.	---	N/A
10.9.3.2	**Impulse withstand voltage test**		
	The impulse voltage generator is adjusted to the required impulse voltage with the ASSEMBLY connected. The value of the test voltage is that specified in 9.1.3. The accuracy of the applied peak voltage is ± 3 %.	---	P
	Impulse withstand voltage (Uimp) ..... :	Test voltage: 9,8kV	P
	Auxiliary circuits not connected to main circuits are connected to earth.	---	N/A
	The 1,2/50 µs impulse voltage is applied to the ASSEMBLY five times for each polarity at intervals of 1 s minimum as follows:		
	a) 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	---	P
	b) between each live part of different potential of the main circuit and, the other live parts of different potential and exposed conductive parts connected together, with the main contacts of all switching devices in the closed position or bridged by a suitable low resistance link;	---	P
	For an acceptable result there are no unintentional disruptive discharge during the tests.	---	P
10.9.3.3	**Alternative power-frequency voltage test**		N/A
10.9.3.4	**Alternative d.c. voltage test**		N/A
10.9.3.5	**Verification assessment**		N/A
10.9.4	**Testing of enclosures made of insulating material**		
	For ASSEMBLIES with enclosures made of insulating material, an additional dielectric test is carried out by applying an a.c. test voltage between a metal foil laid on the outside of the enclosure over openings and joints, and the interconnected live and exposed conductive parts within the ASSEMBLY located next to the openings and joints.	---	P
	For this additional test, the test voltage is equal to 1,5 times the values indicated in Table 8.	3300V	P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
10.10	**VERIFICATION OF TEMPERATURE RISE** (see ANNEX 1 for details)		
10.10.1	**General**		
	It is 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
	Verification is made by one or more of the following methods:		
	a) testing (10.10.2);	---	P
	b) derivation (from a tested design) of ratings for similar variants (10.10.3); or	---	N/A
	c) calculation (10.10.4).	---	N/A
	In ASSEMBLIES rated for frequencies above 60 Hz verification of temperature rise by test (10.10.2) or by derivation from a similar design tested at the same intended frequency (10.10.3) is always required.	---	N/A
10.10.2	**Verification by testing**		
10.10.2.1	**General**		
	1) If the ASSEMBLY to be verified comprises a number of variants, the most onerous arrangement(s) of the ASSEMBLY is selected according to 10.10.2.2.	tested as delivered by the applicant	P
	2) The ASSEMBLY is verified by one of the following methods:		
	a) considering individual functional units, the main and distribution busbars and the ASSEMBLY collectively according to 10.10.2.3.5;	---	N/A
	b) considering individual functional units separately and the complete ASSEMBLY including the main and distribution busbars according to 10.10.2.3.6;	---	N/A
	c) considering individual functional units and the main and distribution busbars separately as well as the complete ASSEMBLY according to 10.10.2.3.7.	---	N/A
	3) When the ASSEMBLIES tested are the most onerous variants out of a larger product range then the test results can be used to establish the ratings of similar variants without further testing. Rules for such derivations are given in 10.10.3	---	N/A
10.10.2.2	**Selection of the representative arrangement**		
	The test is made on one or more representative arrangements loaded with one or more representative load combinations chosen to obtain with reasonable accuracy the highest possible temperature rise.	See 10.10.2.1	P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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	---	P
	The original manufacturer takes into consideration in his selection for test, the configurations to be derived from the tested arrangements according to 10.10.3	---	P
10.10.2.2.2	**Busbars**		
	variants of which differ only in the reduction of height, or reduction of thickness or quantity of bars per conductor, but which have the same arrangement of bars, the same conductor spacing, the same enclosure and busbar compartment (if any), as a minimum for the test, the busbars with the greatest cross-sectional area is selected as the representative arrangement.	---	P
	For ratings of smaller busbar size variants or other materials see 10.10.3.3.	---	N/A
10.10.2.2.3	**Functional units**		N/A
10.10.2.3	**Methods of test**		
	The temperature-rise test on the individual circuits is made with the type of current for which they are intended, and at the design frequency.	AC, 50Hz	P
	Coils of relays, contactors, releases, etc., are supplied with rated operational voltage	---	N/A
	The ASSEMBLY is mounted as in normal use, with all covers including bottom cover plates, etc., in place.	See ANNEX 1	P
	If the ASSEMBLY includes fuses, these are fitted for the test with fuse-links as specified by the manufacturer.	See ANNEX 1	P
	The power losses of the fuse-links used for the test are stated	See ANNEX 1	P
	The size and the disposition of external conductors used for the test are stated in the test report.	See ANNEX 1	P
	The test is made for a time sufficient for the temperature rise to reach a constant value. In practice, this condition is reached when the variation at all measured points (including the ambient air temperature) does not exceed 1 K/h.	After 8 hours	P
	To shorten the test, if the devices allow it, the current may be increased during the first part of the test, it being reduced to the specified test current afterwards.	---	N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	When a control electro-magnet is energized during the test, the temperature is measured when thermal equilibrium is reached in both the main circuit and the control electro-magnet.	---	N/A
	Temperature-rise tests on the circuit(s) carried out at 50 Hz are applicable to 60 Hz for rated currents up to and including 800 A.	---	N/A
	For currents above 800 A, the rated current at 60 Hz is reduced to 95 % of that at 50 Hz.	---	N/A
	Alternatively, where the maximum temperature rise at 50 Hz does not exceed 90 % of the permissible value, then de-rating for 60 Hz is not required.	---	N/A
	Tests on an individual section of the ASSEMBLY are acceptable provided the conditions of 10.10.2.2 are met.	---	N/A
	To make the test representative the external surfaces at which additional sections may be connected are thermally insulated with a covering to prevent any undue cooling.	---	N/A
	When testing individual functional units within a section, the adjacent functional units can be replaced by heating resistors if the rating of each does not exceed 630 A and their rating is not to be verified with this test.	---	N/A
	In ASSEMBLIES where there is a possibility that additional control circuits or devices may be incorporated, heating resistors simulate the power dissipation of these additional items.	---	N/A
10.10.2.3.2	**Test conductors**		
	In the absence of detailed information concerning the external conductors and the service conditions, the cross-section of the external test conductors are in accordance with the following.		
	1) **For values of rated current up to and including 400 A:**		P
	a) the conductors are single-core, copper cables or insulated wires with cross-sectional areas as given in Table 11;	See ANNEX 1	P
	b) as far as practicable, the conductors are in free air;	---	P
	c) the minimum length of each temporary connection from terminal to terminal is: – 1 m for cross-sections up to and including 35 mm2; – 2 m for cross-sections larger than 35 mm2.	See ANNEX 1	P
	2) **For values of rated current higher than 400 A but not exceeding 800 A:**		N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	3) **For values of rated current higher than 800 A but not exceeding 4000 A:**		N/A
	4) **For values of rated current higher than 4 000 A:**		N/A
10.10.2.3.3	**Measurement of temperatures**		
	Thermocouples or thermometers are used for temperature measurements.	---	P
	For windings, the method of measuring the temperature by resistance variation is used.	---	N/A
	The thermometers or thermocouples is protected against air currents and heat radiation.	---	P
	The temperature is measured at all points where a temperature-rise limit (see 9.2) must be observed.	See ANNEX 1	P
	Particular attention is given to joints in conductors and terminals within the main circuits.	---	P
	For measurement of the temperature of air inside an ASSEMBLY, several measuring devices are arranged in convenient places.	See ANNEX 1	P
10.10.2.3.4	**Ambient air temperature**		
	The ambient air temperature is measured by means of at least two thermometers or thermocouples equally distributed around the ASSEMBLY at approximately half its height and at a distance of approximately 1 m from the ASSEMBLY.	See ANNEX 1	P
	The thermometers or thermocouples are protected against air currents and heat radiation.	---	P
	The ambient temperature during the test is between +10 °C and +40 °C.	See ANNEX 1	P
10.10.2.3.5	**Verification of the complete ASSEMBLY**		
	Incoming and outgoing circuits of the ASSEMBLY are loaded with their rated currents that result in the rated diversity factor being equal to 1.	---	N/A
	If the rated current of the incoming circuit or distribution busbar system is less than the sum of the rated currents of all outgoing circuits, then the outgoing circuits shall be split into groups corresponding to the rated current of the incoming circuit or distribution busbar system.	See ANNEX 1	P
	The groups are formed in a manner so that the highest possible temperature rise is obtained.	---	P
	Sufficient groups are formed and tests undertaken so as to include all different variants of functional units in at least one group.	---	N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Where the fully loaded circuits do not distribute exactly the total incoming current, the remaining current is distributed via any other appropriate circuit.	---	P
	This test is repeated until all types of outgoing circuit have been verified at their rated current.	---	N/A
	Change in the arrangement of functional units within a verified ASSEMBLY, or section of an ASSEMBLY may necessitate additional tests as the thermal influence of the adjacent units may differ significantly.	---	N/A
10.10.2.3.6	**Verification considering individual functional units separately and the complete ASSEMBLY**		N/A
10.10.2.3.7	**Verification considering individual functional units and the main and distribution busbars separately as well as the complete ASSEMBLY**		N/A
10.10.2.3.8	**Results to be obtained**		
	At the end of the test, the temperature rise does not exceed the values specified in Table 6.	See ANNEX 1	P
	The apparatus operates satisfactorily within the voltage limits specified for them at the temperature inside the ASSEMBLY.	---	P
10.11	**SHORT-CIRCUIT WITHSTAND STRENGTH** (see ANNEX 2 for details)		
	The short-circuit withstand strength declared is verified. Verification may be by the application of design rules, by calculation or by test.	By test	P
10.11.3	**Verification by comparison with a reference design – Utilising a check list**		N/A
10.11.4	**Verification by comparison with a reference design – Utilising a check list**		N/A
10.11.5	**Verification by test**		
	The ASSEMBLY or its parts as necessary to complete the test are mounted as in normal use.	---	P
	It is sufficient to test a single functional unit if the remaining functional units are of the same construction.	---	P
	Similarly it is sufficient to test a single busbar configuration if the remaining busbar configurations are of the same construction.	---	P
10.11.5.2	**Performance of the test – General**		
	If the test circuit incorporates fuses, fuse-links with the maximum let-through current and, if required, of the type indicated by the original manufacturer as being acceptable, they are used.	See ANNEX 2	P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The supply conductors and the short-circuit connections required for testing the ASSEMBLY have sufficient strength to withstand short-circuits and be so arranged that they do not introduce any additional stresses on the ASSEMBLY.	See ANNEX 2	P
	Unless otherwise agreed, the test circuit is connected to the input terminals of the ASSEMBLY. Three-phase ASSEMBLIES are connected on a three-phase basis.	See ANNEX 2	P
	All parts of the equipment intended to be connected to the protective conductor in service, including the enclosure, are connected as follows:		
	1) for ASSEMBLIES suitable for use on three-phase four-wire systems (see also IEC 60038) with an earthed star point and marked accordingly, to the neutral point of supply or to a substantially inductive artificial neutral permitting a prospective fault current of at least 1500 A;	---	N/A
	2) for ASSEMBLIES also suitable for use in three-phase three-wire as well as on three-phase four-wire systems and marked accordingly, to the phase conductor least likely to arc to earth.	---	N/A
	The connection mentioned in 1) and 2) include a fusible element consisting of a copper wire of 0,8 mm diameter and at least 50 mm long, or of an equivalent fusible element for the detection of a fault current.	---	N/A
10.11.5.3	**Testing of main circuits**		
	Circuits are tested with the highest thermal and dynamic stresses that may result from short circuit currents up to the rated values for one or more of the following conditions as declared by the original manufacturer.	See ANNEX 2 (see test arrangement numbers 1+2)	P
	a). Not dependent upon a SCPD. The ASSEMBLY is tested with the rated peak withstand current and the rated short-time withstand current for the specified duration	---	N/A
	b). Dependent upon an incoming SCPD included within the ASSEMBLY. The assembly is tested with an incoming prospective short-circuit current for a period time that is limited by the incoming SCPD.	---	N/A
	c). Dependent upon an upstream SCPD. The ASSEMBLY is tested to the let through values permitted by the upstream SCPD as defined by the original manufacturer.	---	N/A
	Where an incoming or outgoing circuit includes a SCPD that reduces the peak and/or duration of the fault current, then the circuit is tested allowing the SCPD to operate and interrupt the fault current	---	P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	If the SCPD contains an adjustable short-circuit release, then this is set to the maximum allowed value	---	N/A
	One of each type of circuit is subject to a short-circuit test	See ANNEX 2	P
10.11.5.3.2	**Outgoing circuits**		
	The outgoing terminals of outgoing circuits are provided with a bolted short-circuit connection.	See ANNEX 2	P
	When the protective device in the outgoing circuit is a circuit-breaker, the test circuit may include a shunting resistor in accordance with 8.3.4.1.2 b) of IEC 60947-1 in parallel with the reactor used to adjust the short-circuit current.	---	N/A
	For circuit-breakers having a rated current up to and including 630 A, a conductor 0,75 m in length having a cross-sectional area corresponding to the rated current (see Tables 11 and 12) is included in the test circuit.	---	N/A
	The switching device is closed and held closed in the manner normally used in service. The test voltage is then applied once and,	---	P
	a) for a time sufficiently long to enable the short-circuit protective device in the outgoing unit to operate to clear the fault and, in any case, for not less than 10 cycles (test voltage duration), or	See ANNEX 2	P
	b) in cases where the outgoing circuit does not include a SCPD, for a magnitude and duration as specified for the busbars by the original manufacturer. Testing of outgoing circuits may also result in the operation of the incoming circuit SCPD.	---	N/A
10.11.5.3.3	**Incoming circuit and main busbars**		
	ASSEMBLIES containing main busbars are tested to prove the short-circuit withstand strength of the main busbars and the incoming circuit including at least one joint where the busbars are intended to be extendable.	See ANNEX 2	P
	The short-circuit is placed such that the length of main busbar included in the test is (2 □□0,4) m.	See ANNEX 2	P
	For the verification of rated short-time withstand current (see 5.3.5) and rated peak withstand current (see 5.3.4), this distance may be increased and the test conducted at any convenient voltage providing the test current is the rated value	---	N/A

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Where the design of the ASSEMBLY is such that the length of the busbars to be tested is less than 1,6 m and the ASSEMBLY is not intended to be extended, then the complete length of busbar is tested, the short-circuit being established at the end of these busbars.	See ANNEX 2	P
	If a set of busbars consists of different sections (as regards cross-sections, distance between adjacent busbars, type and number of supports per metre), each section is tested separately or concurrently, provided that the above conditions are met.	---	N/A
10.11.5.3.4	**Connections to the supply side of outgoing units**		
	Where an ASSEMBLY contains conductors between a main busbar and the supply side of outgoing functional units that do not fulfil the requirements of 8.6.4 one circuit of each type is subject to an additional test.	---	N/A
	A short-circuit is obtained by bolted connections on the conductors connecting the busbars to a single outgoing unit, as near as practicable to the terminals on the busbar side of the outgoing unit. The value of the short-circuit current is the same as that for the main busbars.	---	N/A
10.11.5.3.5	**Neutral conductor**		N/A
10.11.5.5	**Results to be obtained**		
	After the test deformation of busbars and conductors is acceptable provided that the clearances and creepage distances specified in 8.3 are still complied with.	---	P
	The characteristics of the insulation remains such that the mechanical and dielectric properties of the equipment satisfy the requirements of the relevant ASSEMBLY standard.	---	P
	A busbar insulator or support or cable restraint has not separated into two or more pieces.	---	P
	There are no cracks appearing on opposite sides of a support and no cracks, including surface cracks, running the full length or width of the support.	---	P
	There are no loosening of parts used for the connection of conductors and the conductors are not separated from the outgoing terminals.	---	P
	Distortion of the busbars or structure of the ASSEMBLY that impairs its normal use are a failure.	---	N/A
	Any distortion of the busbars or structure of the ASSEMBLY that impairs normal insertion or removal of the removable parts is a failure.	---	N/A

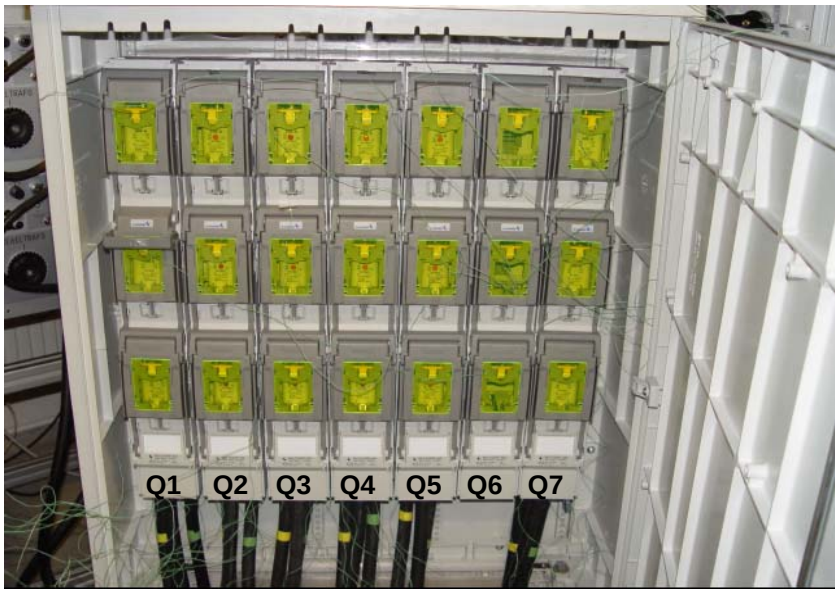
EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Deformation of the enclosure or of the internal partitions, barriers and obstacles due to short-circuit is permissible to the extent that the degree of protection is not impaired and the clearances or creepage distances are not reduced to values, which are less than those specified	---	N/A
	Additionally after the tests incorporating short-circuit protective devices, the tested equipment is capable of withstanding the dielectric test at a value of voltage for the “after test” condition prescribed in the relevant short-circuit protective device standard for the appropriate short-circuit test, as follows:	---	P
	a) between all live parts and the exposed conductive parts of the ASSEMBLY, and	3300V	P
	b) between each pole and all other poles connected to the exposed conductive parts of the ASSEMBLY.	2200V	P
	If tests a) and b) above are conducted, they are carried out with any fuses replaced and with any switching device closed.	---	P
	The fusible element (see 10.11.5.2.), if any, does not indicate a fault current.	---	N/A
10.11.5.6	**Testing of the protective circuit**		
	A single-phase test supply is connected to the incoming terminal of one phase and to the terminal for the incoming protective conductor.	See ANNEX 2 (see test arrangement number 3)	P
	When the ASSEMBLY is provided with a separate protective conductor, the nearest phase conductor is used.	---	N/A
	For each representative outgoing unit, a separate test is made with a bolted short-circuit connection between the corresponding outgoing phase terminal of the unit and the terminal for the relevant outgoing protective conductor.	See ANNEX 2	P
	Each outgoing unit on test is fitted with its intended protective device. Where alternative protective devices can be incorporated in the outgoing unit, the protective device which lets through the maximum values of peak current and I 2t is used.	---	N/A
	For this test, the frame of the ASSEMBLY is insulated from earth. The test voltage is equal to 1,05 times the single-phase value of the rated operational voltage.	See ANNEX 2	P
	Unless otherwise agreed between the original manufacturer and the user, the value of the test current in the protective conductor is at least 60 % of the phase current during the three-phase test of the ASSEMBLY.	See ANNEX 2	P

EN 61439-1			
Clause	Requirement + Test	Result - Remark	Verdict
	All other conditions of this test are analogous to 10.11.5.2 to 10.11.5.4 inclusive.	See ANNEX 2	P
10.11.5.6.2	**Results to be obtained**		
	The continuity and the short-circuit withstand strength of the protective circuit, whether it consists of a separate conductor or the frame, are not significantly impaired.	---	P
	Besides visual inspection, this may be verified by measurements with a current in the order of the rated current of the relevant outgoing unit.	Visual inspection	P

EN 61439-1
ANNEX 1: Details to item 10.10 (Verification of temperature rise)

A 1.1: *Test arrangement and test conductors*

- Photos of the test arrangement:



- Test conductors:

I. Incoming units:
Q1,Q7: Cu / 1 x 185 mm^2 / length 2m for each terminal / clamping screws tightened with a torque of 35 Nm

II. Outgoing units:
Q2 - Q5: Cu / 1 x 150 mm^2 / length 2m for each terminal / clamping screws tightened with a torque of 35 Nm

III. Busbar: Cu / 30 x 10 mm / length 720 mm

A 1.2: *Test current*
Rated current of the PENDA: 630A
- simultaneously line entry Q1 and Q7, fitted with 400A NH2 – fuse links (size 2) according to A1.6
- Outgoing units Q2 to Q5 fitted with 200A NH2 – fuse links according to A1.6
- Outgoing unit Q6 without load and no fuse links fitted.

Component	***Rated current***	***RDF***	***Test current***	***Test conductor - cross section***
Q1, Q7	315A	---	315A	185 mm^2
Q2,Q3,Q4	200A	0,7	175A	150 mm^2
Q5	200A	---	105A	150 mm^2

EN 61439-1
ANNEX 1: Details to item 10.10 (Verification of temperature rise)

A 1.3: P*ower dissipation of the fuse-link*

Methode of measurement:

-The fuse-link (see A 1.6) is loaded with its rated current I_N (AC, 50 Hz).
-The voltage drop U_V on the fuse-link is measured.
-The power dissipation Pv is calculated (Pv = Uv x In).

Type of fuse link / No.	***Component***	***Phase***	***In***	***Uv***	***Pv***
NH 2 – 400A / 1	Q1	L1	400 A	0,055 V	22 W
NH 2 – 400A / 2		L2		0,054 V	21,6 W
NH 2 – 400A / 3		L3		0,055 V	22 W
NH 2 – 400A / 4	Q7	L1	400 A	0,054 V	21,6 W
NH 2 – 400A / 5		L2		0,054 V	21,6 W
NH 2 – 400A / 6		L3		0,054 V	21,6 W
NH 2 – 200A / 7	Q2	L1	200 A	0,067 V	13,4 W
NH 2 – 200A / 8		L2		0,065 V	13 W
NH 2 – 200A / 9		L3		0,065 V	13 W
NH 2 – 200A / 10	Q3	L1	200 A	0,062 V	12,4 W
NH 2 – 200A / 11		L2		0,064 V	12,8 W
NH 2 – 200A / 12		L3		0,064 V	12,8 W
NH 2 – 200A / 13	Q4	L1	200 A	0,062 V	12,4 W
NH 2 – 200A / 14		L2		0,062 V	12,4 W
NH 2 – 200A / 15		L3		0,064 V	12,8 W
NH 2 – 200A / 16	Q5	L1	200 A	0,064 V	12,8 W
NH 2 – 200A / 17		L2		0,064 V	12,8 W
NH 2 – 200A / 18		L3		0,062 V	12,4 W

EN 61439-1
ANNEX 1: Details to item 10.10 (Verification of temperature rise)

A 1.4: *Points of measurement*

1: Q1 busbar terminal L1
2: Q1 busbar terminal L2
3: Q1 busbar terminal L3
4: Q1 cable terminal L1
5: Q1 cable terminal L2
6: Q1 cable terminal L3

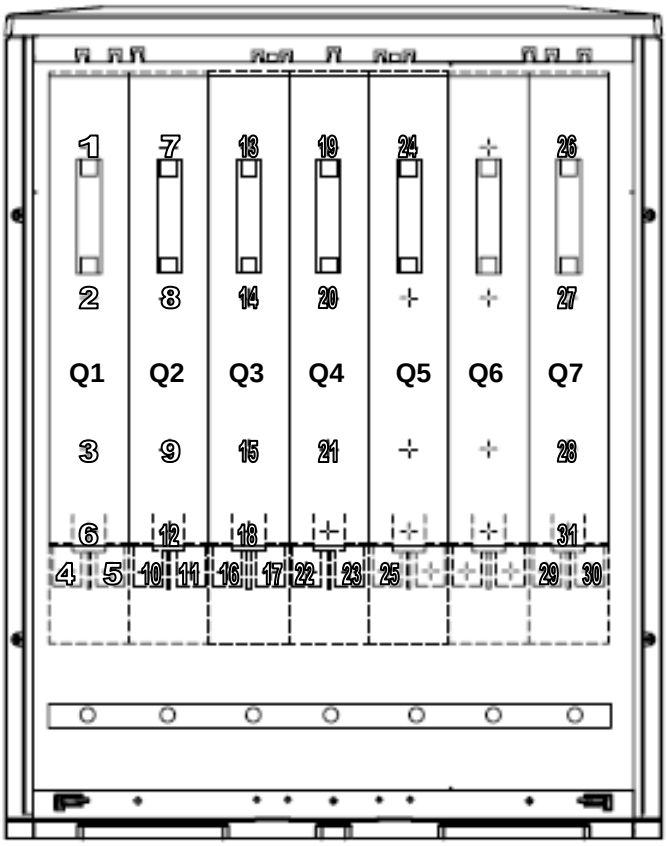
7: Q2 busbar terminal L1
8: Q2 busbar terminal L2
9: Q2 busbar terminal L3
10: Q2 cable terminal L1
11: Q2 cable terminal L2
12: Q2 cable terminal L3

13: Q3 busbar terminal L1
14: Q3 busbar terminal L2
15: Q3 busbar terminal L3
16: Q3 cable terminal L1
17: Q3 cable terminal L2
18: Q3 cable terminal L3

19: Q4 busbar terminal L1
20: Q4 busbar terminal L2
21: Q4 busbar terminal L3
22: Q4 cable terminal L1
23: Q4 cable terminal L2

24: Q5 busbar terminal L1
25: Q5 cable terminal L1

26: Q7 busbar terminal L1
27: Q7 busbar terminal L2
28: Q7 busbar terminal L3
29: Q7 cable terminal L1
30: Q7 cable terminal L2
31: Q7 cable terminal L3



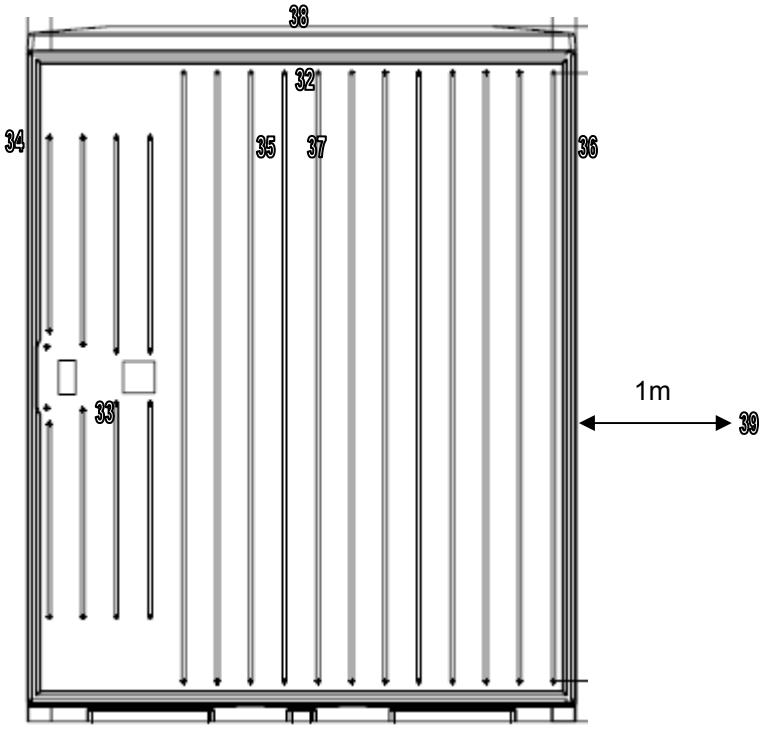
EN 61439-1
ANNEX 1: Details to item 10.10 (Verification of temperature rise)

A 1.4: *Points of measurement (continued)*

32: Housing/ inside/ ambiente temperature

33: Housing/ outside/ door/
manual operating means
34: Housing/ outside/ left side
35: Housing/ outside/ back side
36: Housing/ outside/ right side
37: Housing/ outside/ door
38: Housing/ outside/ roof

39: Ambient temperature



EN 61439-1
ANNEX 1: Details to item 10.10 (Verification of temperature rise)

A 1.5: *Table – temperature-rise*

Mean ambient temperature: 23,3 °C

Point of measurement No.:	***Designation***	***Temperature-rise limits [K]***	***Measured temperature ($_{\Delta}T \leq 1$ K/h) [°C]***	***Temperature-rise [K]***	***Verdict***
1	Q1 busbar terminal L1	80*)	101,6	78,3	P
2	Q1 busbar terminal L2	80*)	93,6	70,3	P
3	Q1 busbar terminal L3	80*)	85,3	62,0	P
4	Q1 cable terminal L1	70	70,3	47,0	P
5	Q1 cable terminal L2	70	71,1	47,8	P
6	Q1 cable terminal L3	70	75,2	51,9	P
7	Q2 busbar terminal L1	80*)	99,2	75,9	P
8	Q2 busbar terminal L2	80*)	91,8	68,5	P
9	Q2 busbar terminal L3	80*)	79,6	56,3	P
10	Q2 cable terminal L1	70	54,5	31,2	P
11	Q2 cable terminal L2	70	57,2	33,9	P
12	Q2 cable terminal L3	70	63,7	40,4	P
13	Q3 busbar terminal L1	80*)	97,3	74,0	P
14	Q3 busbar terminal L2	80*)	90,7	67,4	P
15	Q3 busbar terminal L3	80*)	77,4	54,1	P
16	Q3 cable terminal L1	70	57,2	33,9	P
17	Q3 cable terminal L2	70	57,8	34,5	P
18	Q3 cable terminal L3	70	62,9	39,6	P
19	Q4 busbar terminal L1	80*)	93,1	69,8	P
20	Q4 busbar terminal L2	80*)	86,5	63,2	P
21	Q4 busbar terminal L3	80*)	76,1	52,8	P
22	Q4 cable terminal L1	70	56,0	32,7	P
23	Q4 cable terminal L2	70	57,0	33,7	P
24	Q5 busbar terminal L1	80*)	90,7	67,4	P
25	Q5 cable terminal L1	70	37,4	14,1	P
26	Q7 busbar terminal L1	80*)	100,8	77,5	P
27	Q7 busbar terminal L2	80*)	90,3	67,0	P
28	Q7 busbar terminal L3	80*)	78,4	55,1	P
29	Q7 cable terminal L1	70	75,8	52,5	P
30	Q7 cable terminal L2	70	71,5	48,2	P
31	Q7 cable terminal L3	70	76,8	53,5	P
32	Housing/ inside/ ambiente temperature	---	52,3	---	P
33	Housing/ outside/ door/ manual operating means	25	33,3	10,0	P
34	Housing/ outside/ left side	40	47,6	24,3	P
35	Housing/ outside/ back side	40	53,6	30,3	P
36	Housing/ outside/ right side	40	48,2	24,9	P
37	Housing/ outside/ door	40	45,6	22,3	P
38	Housing/ outside/ roof	40	50,2	26,9	P
39	Ambient temperature	+10 - +40°C	23,3	---	P

***)… Permitted temperature-rise limit of the busbar terminals of the NH-vertical fuse switch disconnector units listed under item A 1.6 and limited to this application. (according to a manufacturer declaration of MERSEN Österreich GmbH).**

EN 61439-1
ANNEX 1: Details to item 10.10 (Verification of temperature rise)

A 1.6: *Components:*

Component	***Quantity***	***Manufacturer***	***Marking***	***Safety mark***
NH-vertical fuse switch disconnector, size 2, Q1-Q7	7	mSchneider	MULTIVERT 400A, 400A, 690V~, 50-60Hz, NH-2, Pn=34W, EN60947-3	ÖVE
NH – fuse link, size 2	6	mSchneider/ Eurofuse	NH-2, 400A, AC 500V,gG, 120kA, IEC/EN60269-2	VDE
NH – fuse link, size 2	12	mSchneider/ Eurofuse	NH-2, 200A, AC 500V,gG, 120kA, IEC/EN60269-2	VDE

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AUSTRIAN INSTITUTE OF TECHNOLOGY

TEST PROTOCOL

2.03.02380.1.0-02En

Test item : Cable distribution box with
Low voltage fuse switch disconnectors
Short circuit test with 25 kA three-phase and 15 kA single-phase

Client: CTI-Vienna
Herr Wolf
1210 Wien, Einzingergasse 4

Testing location:	Energy Department Electric Energy System
Period of testing	20.01.2012
Performance by	Brauner Steindorfer
Protocol	1/1
Number of pages	13

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 2 of 13 Date 20.01.2012 Protocol by Steindorfer

Test item

The test item for the short circuit test was delivered by the client at 19.01.2012.

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 3 of 13 Date 20.01.2012 Protocol by Steindorfer

Measuring instruments

Measurement parameter	Measuring point	Equipment	Code
Current	Between testing transformer and test item	Linearized current transformer 6000A:1A Kl. 1% to transient recorder	WLIN 6000/1 ... /3
Voltage (steady)	Between testing transformer and test item	Voltage transformer 1500V:100V Kl. 0,5% to multimeter HP 3478A	WU1500.HVF/1 ... /3 G901-1
Voltage (transient)	Supply terminals of test item	Differential amplifier to transient recorder	ARCUS
Transient recorder		NICOLET	2580-P

Adjustment of the control unit for calibration of the test circuit: (390ms)

Channel	Signal	Delay	Impulse duration	
-	-	[cs]	[100, 300, 900 ms]	
K1	Reset	001,11	100	
K2	Trigger	011,11	100	
K3	30 kV Ein	016,49	300	
K4	LS 110 kV AUS	057,81	900	
K5	LS 30 kV AUS	089,11	900	
K6	Hub	AUS	900	

Adjustment of the control unit for O.: (55ms)

Channel	Signal	Delay	Impulse duration	
-	-	[cs]	[100, 300, 900 ms]	
K1	Reset	001,11	100	
K2	Trigger	011,11	100	
K3	30 kV Ein	016,49	300	
K4	LS 110 kV AUS	037,81	900	
K5	LS 30 kV AUS	089,11	900	
K6	Hub	AUS	900	

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 4 of 13 Date 20.01.2012 Protocol by Steindorfer

Test circuit three-phase: U=1.05*400 V, I=25 kA, PF=0.25

			Derivation		Derivation		Derivation	
test value	Voltage	1,05 fache	-0% / +5%	Current	-0% / +5%	cos phi	-0,05	n-Wert
	400	420	441,00	25000	26250	0,25	0,2	2,1

Supply star point grounded.

Calibration of the test circuit: CTI0120.001

20.01.2012 10:00 HN150 3 Phasen	Stellung Schaltung	ü	Spannung (Leerlauf) 5kV U [kV]	 30kV U [kV]	Strom 5kV I [kA]	 30kV I [kA]	Impedanz auf Ebene individuell R [mΩ]	 X [mΩ]	5kV transformiert, Y R [mΩ]	 X [mΩ]	30kV transformiert, Y R [mΩ]	 X [mΩ]
110kV-Netz		Korr. 1.013	D 117.9		0.003	0.094	110kV, Y 240	1600	0.36	2.39	11.54	76.93
Trafo T01 >Umax?	4	4.56	sek. D 25.52		sek. 0.014	sek. 0.431	110kV, Y 1911	17847	2.86	26.71	91.87	858.15
Trafo T02	Bleibt 1	5.67	sek. D 4.50	ohne T02 25.52			30kV, Y 532	5358	16.56	166.79	ohne T02 0.00	0.00
30kV-Kabel					0.078	0.431	30kV, Y 8.08	16.63	8.08	16.63	8.08	16.63
Stern Dreieck	Dy	0.577										
Vorimpedanz	R 12	X 9			0.045	0.249	HN150-Primärwicklg 20580	78674	4860.01	26224.58	6860.01	26224.58
Trafo HN150	prim 6	sek 3	103.4	sek. D 0.075	sek. D 0.428		HN150-Primärwicklg 2520	18436	840.10	6145.94	840.10	6145.94
Last+Nachimp.	Z [mΩ] Y 0.00	cosphi 0.050	in Halle		4.67	25.89	Y 0.00	0.00	0.00	0.00	0.00	0.00
Summe aller Impedanzen Betrag [mΩ] cosphi Scheinleistung gesamt [MVA]									7728 33487 0.231 0.6	32683	7812 34224 0.225 19.0	33322

n= 5.55

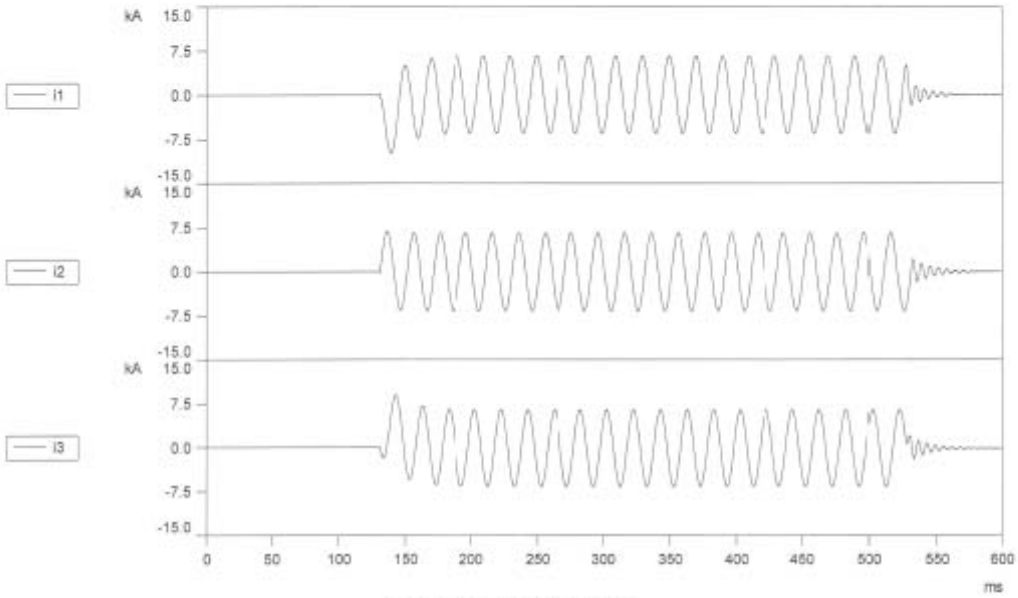
Phase	Messung	Strom 5kV	Strom 30kV	Strom 5 kV	Strom 30 kV		cos phi
-	[kA pp]	I [kA]	I [kA]	I [kA peak]	I [kA peak]		0.228
L1	13.2	4.67	25.88	9.86	54.68		
L2	13.31	4.71	26.10	6.89	38.21		
L3	13.16	4.65	25.80	8.99	49.86	n-Wert	Abspeicherung
							CTI0120.001
Mittel	**13.26**	**4.69**	**25.99**		**54.68**	**2.10**	

Actual test value: 428V / 26.0 kA / cos phi 0,23

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wof	A.Nr. 2.03.02380.1.0-02En Page Nr. 5 of 13 Date 20.01.2012 Protocol by Steindorfer

Scaling factor: 5.55



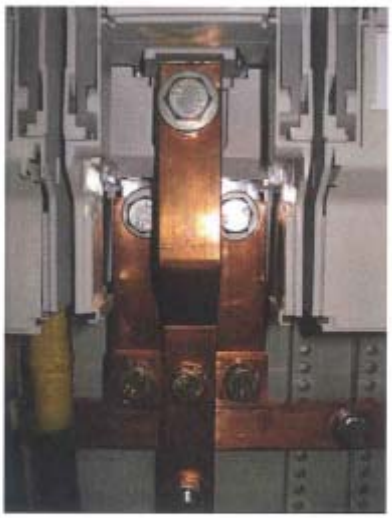
Oscillogram CTIC120.001

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 6 of 13 Date 20.01.2012 Protocol by Steindorfer

Test arrangement number 1

The supply connection was at Q1 (Fuses NH-2 400A gG Eurofuse) with wire cross sections of 185 mm² and the three-phase short circuit was mounted at Q2 (solid links inserted)

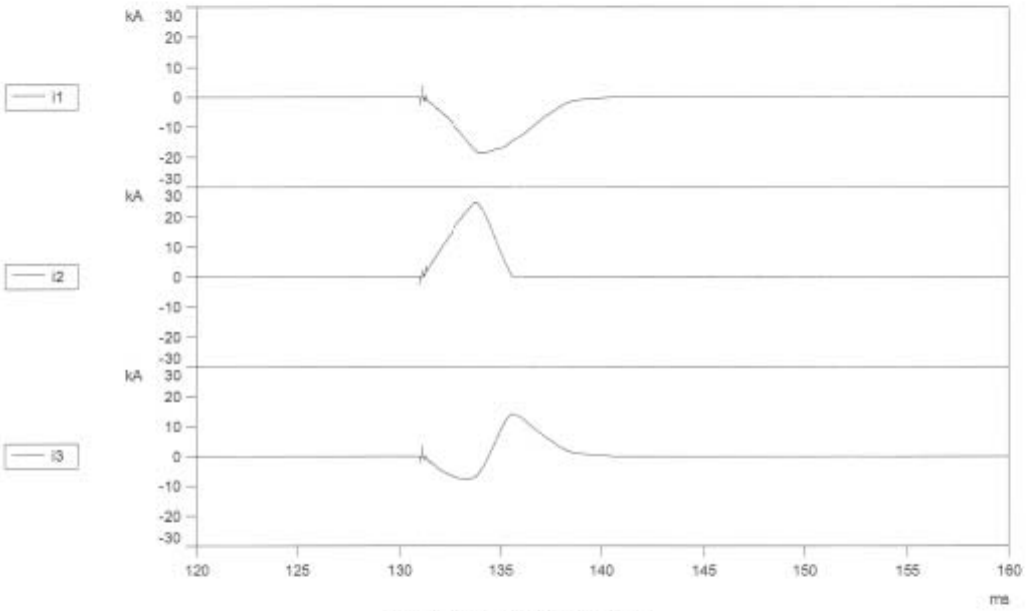


EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.023&0.1.0-02En Page Nr. 7 of 13 Date 20.01.2012 Protocol by Steindorfer

Short circuit test:

Circuit	File	Phase	Current peak [kA]	I²t / [A²s]	Remark
	CTI 0120.002	L1	18,6	1,01*E6	
		L2	25,1	1,07*E6	
		L3	14,3	0,417 *E6	



Oscillogram CTI0120.002

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 8 of 13 Date 20.01.2012 Protocol by Steindorfer

Test arrangement number 2

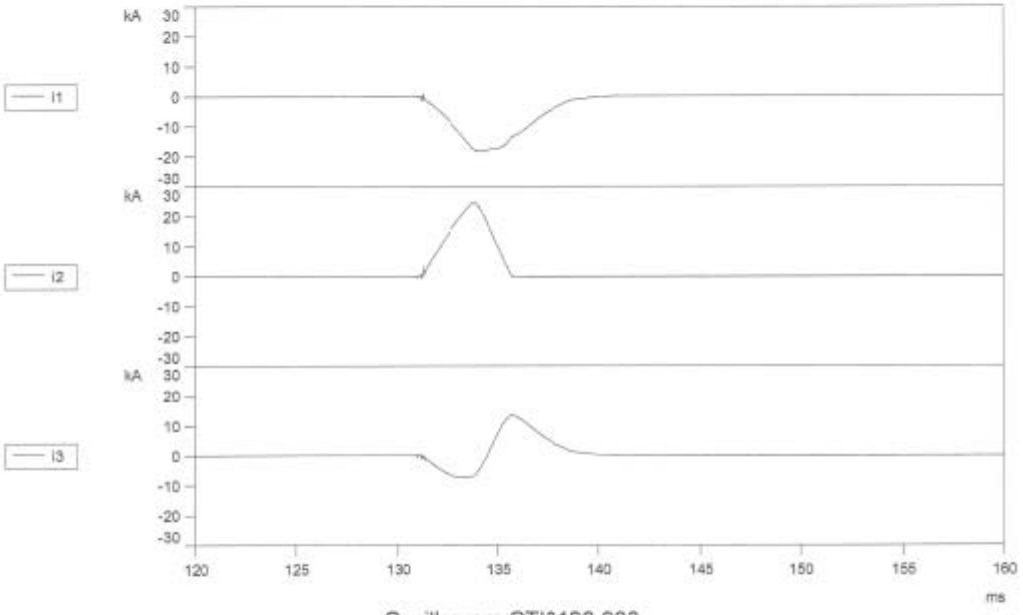
The supply connection was at Q1 (Fuses NH-2 400A gG Eurofuse) with wire cross sections of 185mm² and the three-phase short circuit was mounted at Q7 (solid links inserted)

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 9 of 13 Date 20.01.2012 Protocol by Steindorfer

Short circuit test:

Circuit	File	Phase	Current peak [kA]	I^2t / [A^2s]	Remark
	CTI 0120.003	L1	18,5	0,995*E6	
		L2	24,7	1,07*E6	
		L3	13,6	0,390 *E6	



Oscillogram CTI0120.003

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

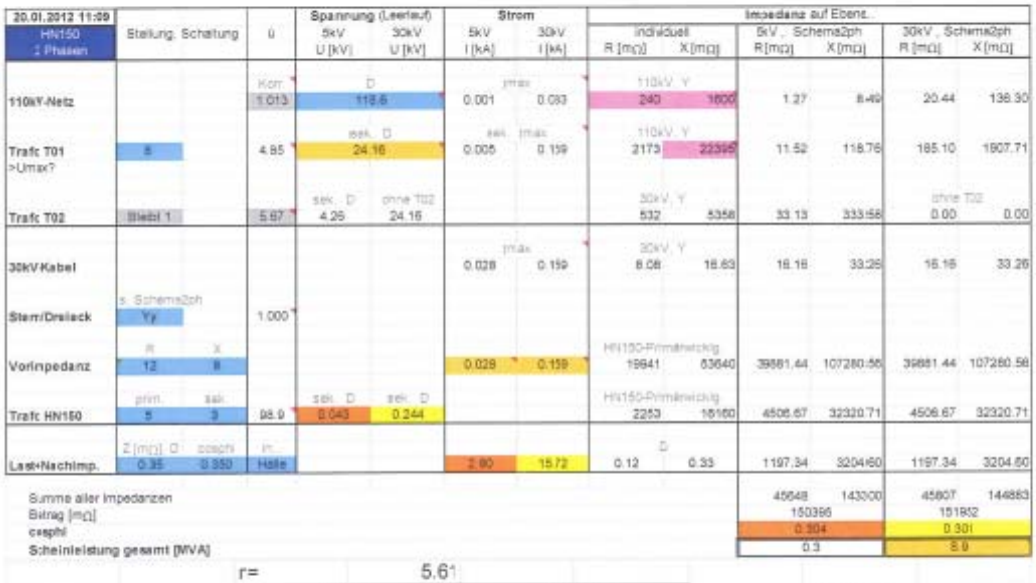
AIT AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 10 of 13 Date 20.01.2012 Protocol by Steindorfer

Test circuit single-phase g: U=1.05*230 V, I=15 kA, PF=0,25

test value	Voltage	1,05 fache	Derivation -0% / +5%	Current	Derivation -0% / +5%	cos phi	Derivation -0,05	n-Wert
	230	241,5	253,58	15000	15750	0,3	0,25	2,1

Supply star point grounded.

Calibration of the test circuit: CTI0120.005



r= 5.61

Phase	Messung	Strom 5kV	Strom 30kV	Strom 5 kV	Strom 30 kV		cos phi
-	[kA pp]	I [kA]	I [kA]	I [kA peak]	I [kA peak]		0.301
L1	7.89	2.79	15.65	5	29.12		
L2	7.89	2.79	15.65	5	29.12		
L3	7.89	2.79	15.65	5.19	29.12	n-Wert	Abspeicherung
Mittel	**7.89**	**2.79**	**15.65**		**29.12**	**1.86**	CTI0120.005

Actual test value: 244V / 15.7 kA / cos phi 0.30

EN 61439-1
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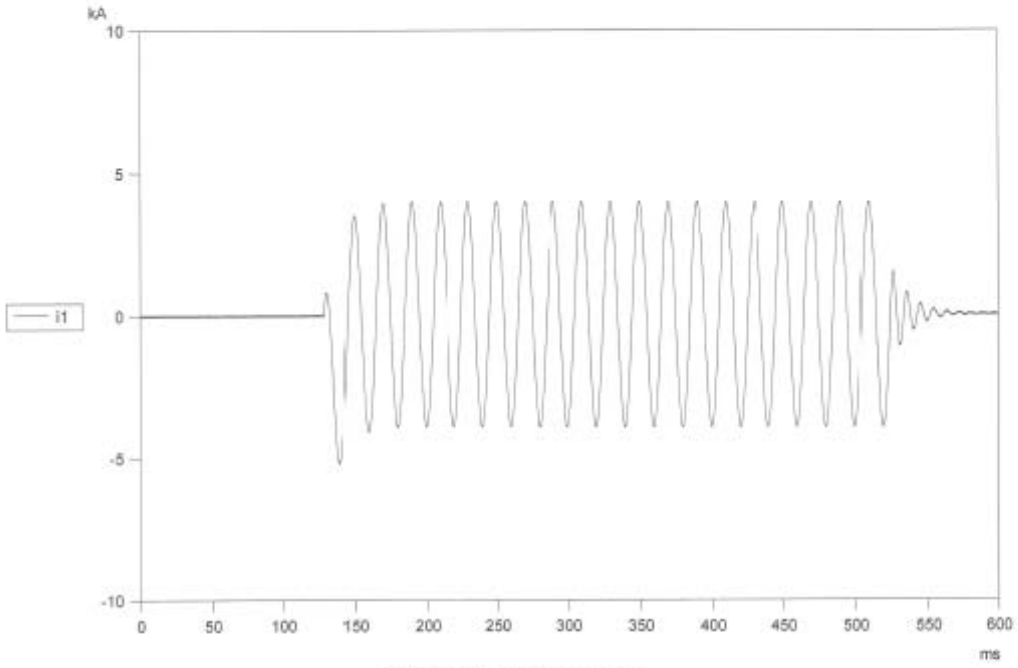
AIT AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 11 of 13 Date 20.01.2012 Protocol by Steindorfer

Scaling factor: 5.61



Oscillogram CTI0120.005

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 12 of 13 Date 20.01.2012 Protocol by Steindorfer

Test arrangement number 3

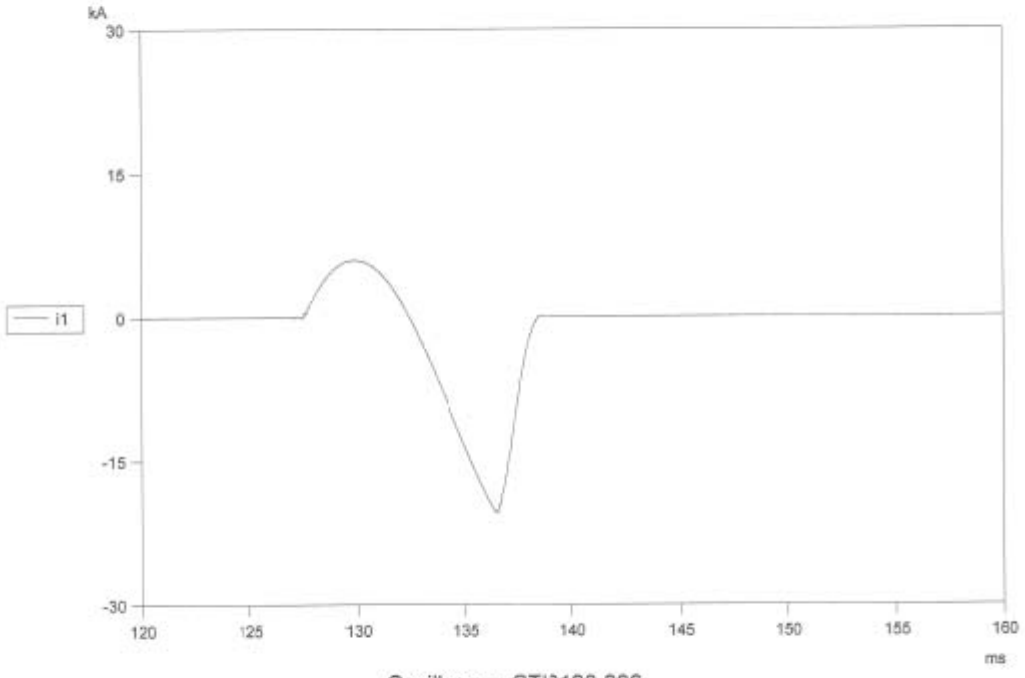
The supply connection was at Q1 (Fuses NH-2 400A gG Eurofuse in L3) with wire cross section of 185mm² and the single phase short circuit (L3 against PEN) was mounted at Q7 (solid links inserted)

EN 61439-1
ANNEX 2: Details to item 10.11 (Short-circuit withstand strength)

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY	Client / Present persons CTI / Herr Wolf	A.Nr. 2.03.02380.1.0-02En Page Nr. 13 of 13 Date 20.01.2012 Protccol by Steindorfer

Short circuit test:

Circuit	File	Phase	Current peak [kA]	I²t / [A²s]	Remark
	CTI 0120.006	L1	20,5	0,957*E6	
		L2			
		L3			



Oscillogram CTI0120.006