



Instytut Elektrotechniki
Electrotechnical Institute

ZESPÓŁ LABORATORIÓW INSTYTUTU ELEKTROTECHNIKI
LABORATORIUM BADAWCZE APARATURY ROZDZIELCZEJ

M. Pożaryskiego str. 28, 04-703 WARSZAWA
phone: +(48 22) 11 25 300, email: zwarcia@iel.waw.pl



AB 074

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TEST REPORT No. 006/17/NZL/NBR/NN

Test object:

Cable distribution cabinets type:
OKKJK 400 A 2x160+PBS2-2V-500 V, 400 A-IP34D
OKJK K3K 500 V, 630 A-IP34D/IP20

Client:

JSC "JAUDA"
Krustpils str. 19, Riga, LV-1057, Latvia

Manufacturer:

JSC "JAUDA"
Krustpils str. 19, Riga, LV-1057, Latvia

Test specification:

Type tests

Normative documents:

PN-EN 61439-1:2011, EN 61439-1:2011
PN-EN 61439-5:2015-02, EN 61439-5:2015


Date of tests completion:

04.01.2017

Test results:

The test objects have passed the type test successfully

Authorised by
Technical Head of LV Section


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Janusz Domański, M.Sc. Eng.

Head of Laboratories of the
Electrotechnical Institute


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Przemysław Berowski, Dr. Ph. Eng.

WARSAW, 10.03.2017

The Test Report applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designators with that tested rests with the Manufacturer.

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This Test Report comprises 51 sheets in total and 4 Annexes.

Laboratory performs tests of HV, MV and LV distribution equipment, switchgear and controlgear also alternating and direct current (dielectric tests, short-circuit tests, switching capacity, testing under condition of arcing, temperature rise, climate and environmental tests, IP, IK) and tests of transformers, insulators, arresters, fuses, overcurrent and residual-current circuit breakers, terminal blocks, connectors and terminals, protective equipment and tools for live working.



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1. Location and time of tests

The tests were performed at Switchgear and Controlgear Testing Laboratory of the Electrotechnical Institute Laboratories in Warsaw from 12.12.2016 to 04.01.2017.

2. Test object

The Manufacturer has provided for tests the cable distribution cabinets of:

- type OKKJK 400 A 2x160+PBS2-2V – in this Test Report indicated as Sample 1,
- type OKJK K3K 630 A – in this Test Report indicated as Sample 2.

Summary of all types of cable distribution cabinets and metering cabinets for electric utility networks manufactured by AS Energofirma "JAUDA" is given in Table 1.

General characteristic and the rated parameters of the cable distribution cabinets provided for tests are given in Table 2.

The nameplates of cable distribution cabinets for tests are presented on Photos 1 and 2.



Photo 1 – Nameplate of Sample 1



Photo 2 – Nameplate of Sample 2

The Manufacturer has provided Product data sheets for all cable distribution cabinets. The Product data sheets of cable distribution cabinet under tests are given in Annex 1.

The Manufacturer has provided also:

1. Test Reports concerning of resistance to corrosion of cable distribution cabinet and their metal parts. The corrosion tests were made by INSTITUTE OF CHEMISTRY, CORROSION TESTING LABORATORY, Akademijos 7, LT-08412 Vilnius – see Annex 2
 - TEST REPORT No. KBL-9.1/2016, 2016-10-19,
 - TEST REPORT No. KBL-9.2/2016, 2016-11-11,
 - TEST REPORT No. KBL-9.3/2016, 2016-11-15,
 - TEST REPORT No. KBL-9.4/2016, 2016-11-11
2. EC Conformity Declaration Doc. No. L-98-01 - LV HRC Strip type fuse switch disconnectors, series SL and accessories, for panel board building - Jean Müller GmbH Elektrotechnische Fabrik – see Annex 3
3. Manufacture's Confirmation for Bus bar supports type SH100/185 - H.J.-Müller Str.7, D-65343 Eltville, 15-07-2011 – see Annex 4

Table 1 - Product range for electric utility networks

Pos.	TYPE	I _n [A]	U _n [V]	Height [mm]	Width [mm]	Depth [mm]	Weight [kg]
1	LtKU2	630	400/230	1270 *	600	300	59
2	LtKU3	630	400/230	1270 *	800	300	71
3	LtKU4	630	400/230	1270 *	1000	300	83
4	LtKU6	630	400/230	1270 *	1000	300	142
5	ONIKJKO DIII-2	400	500	2600 (1850)*	436	304	85
6	BTAS-400	400	400	1141*	836*	354*	74*
7	BTAS-630	630	400	1141*	836*	354*	77*
8	KKM-2	400	400	1141*	836*	354*	48*
9	KKM-4	400	400	1141*	836*	354*	60*
10	KKM-5	400	400	1141*	836*	354*	60*
11	KKM-6	400	400	1141*	836*	354*	82*
12	PKKM						
13	OKJK K00	630	500	850*	400	360	35
14	OKJK K0	630	500	850*	600	360	45
15	OKJK K00K	630	500	1200*	400	360	45
16	OKJK K0K	630	500	1200*	600	360	56
17	OKJK K1	630	500	850*	850	360	57
18	OKJK K1K	630	500	1200*	850	360	74
19	OKJK K2	630	500	1200*	1050	360	78
20	OKJK K2K	630	500	1200*	1050	360	98
21	OKJK K3	630	500	850*	1350	360	96
22	OKJK K3K	630	500	1200*	1350	360	118
23	OKKJK 250A 3x160 (100mm)	160	500	1284 (765)*	257	223	29
24	OKKJK 250A 100A+D+D	160	500	1400 (1100)*	308	308	37
25	OKKJK 400A 2x160+1x400+PBS2-2V	400	500	1400 (1100)*	400	308	62
26	OKKJK 400A 2x160+PBS2-2V	400	500	1400 (1100)*	308	308	46
27	OKKJK 400A 4x160+PBS2-2V	400	500	1400 (1100)*	400	308	55
28	OKKJK 400A 4x160	160	500	1400 (1100)*	308	308	46
29	OKKJK HK 125A	160	500	1284 (765)*	257	223	25
30	BTAS-400+UBTAS	630	400	1141*	1108*	354*	142*
31	BTAS-630+UBTAS	630	400	1141*	1108*	354*	144*
32	KKM-2 + USM1	400	400	1650*	436*	354*	71*
33	KKM-4 + USM2	400	400	1650*	636*	354*	92*
34	KKM-5 + USM3	400	400	1650*	836*	354*	95*
35	KKM-6 + USM4	400	400	1650*	836*	354*	126*
36	OKKJK DIII-2	400	500	2600 (1850)*	436	304	85
37	OKKJK DIII-4	400	500	2600 (1850)*	636	304	90
* Without base							

Table 2 - General characteristic and rated parameters of cable distribution cabinets declared by Manufacturer

Type	OKKJK 400 A 2x160+PBS2-2V	OKJK K3K 630 A
Sample No.	Sample 1	Sample 2
Rated voltage U_n	500 V	500 V
Rated current I_n	400 A	630 A
Frequency f_n	50 Hz	50 Hz
Rated impulse withstand voltage U_{imp}	6 kV	6 kV
Degree of protection / when doors opened	IP34D	IP34D / IP20
Busbar system	L1, L2, L3, PEN	L1, L2, L3, PEN
Phase busbars L1, L2, L3	Cu 40x5 / phase	Cu 40x10 / phase
PEN busbar	Cu 25x4	Cu 40x5
Rated short-time withstand current I_{cw}	10 kA – 1 s	10 kA – 1 s
Maximum environmental humidity	100 %	100 %
Operating temperature range (min. / max.)	-25 °C / +40 °C	-25 °C / +40 °C
Enclosure dimensions H x W x D [mm]	1400 (1100) ¹⁾ x 308 x 308	1200 ²⁾ x 1350 x 360
Gross weight	46 kg	118 kg
¹⁾ Height above ground level ²⁾ Height without base. Base over ground height 200 mm		

Table 3 - Basic equipment of Sample 1

Pos.	Name	Type	Rated data	Quantity
1.	Main fuse-switch-disconnector APATOR	PBS 2-2V	$I_n=400$ A, $U_n=690$ V	1
2.	Fuse-switch-disconnector APATOR	ARS 00/185 mm	$I_n=160$ A; $U_n=690$ V	2

Table 4 - Basic equipment of Sample 2

Pos.	Name	Type	Rated data	Quantity
1.	Main fuse-switch-disconnector JEAN MÜLLER	SL2-3x3/9/KM2G/IP20	$I_n=630$ A, $U_n=690$ V	1

3. Scope of tests

Type tests according to PN-EN 61439-1:2011, [EN 61439-1:2011, IDT] and PN-EN 61439-5:2015-02, [EN 61439-5:2015, IDT].

1. Lifting (cl. 10.2.5)
2. Resistance to static load (cl. 10.2.101.2)
3. Resistance to shock load (cl. 10.2.101.3)
4. Resistance to torsional stress (cl. 10.2.101.4)
5. Impact force withstand (cl. 10.2.101.5)
6. Mechanical strength of doors (cl. 10.2.101.6)
7. Resistance to mechanical shock induced by sharp objects (cl. 10.2.101.8)
8. Mechanical strength of a base intended to be embedded in the ground (cl. 10.2.101.9)
9. Marking (cl. 10.2.7)
10. Degree of protection of enclosures (cl. 10.3)
11. Clearances (cl. 10.4)
12. Creepage distances (cl. 10.4)
13. Effective continuity between the exposed conductive parts of the ASSEMBLY and the protective circuit (cl. 10.5.2)
14. Short circuit withstand strength of the protection circuit (cl. 10.5.3)
15. Incorporation of switching devices and components (cl. 10.6)
16. Internal electrical circuits and connections (cl. 10.7)
17. Terminals for external conductors (cl. 10.8)
18. Power-frequency withstand voltage (cl. 10.9.2)
19. Impulse withstand voltage (cl. 10.9.3)
20. Temperature-rise limits (cl. 10.10)
21. Short-circuit withstand strength (cl. 10.11)

4. Reference documents for tests

The test and assessment of test results were made according to the standards:

PN-EN 61439-1:2011	Rozdzielnice i sterownice niskonapięciowe – Część 1: Postanowienia ogólne
<i>EN 61439-1:2011</i>	<i>Low-voltage switchgear and controlgear assemblies – Part 1: General rules</i>
PN-EN 61439-5:2015-02	Rozdzielnice i sterownice niskonapięciowe – Część 5: Zestawy do dystrybucji mocy w sieciach publicznych
<i>EN 61439-5:2015</i>	<i>Low-voltage switchgear and controlgear assemblies – Part 5: Assemblies for power distribution in public networks</i>
PN-EN 60529:2003	Stopnie ochrony zapewnianej przez obudowy (Kod IP)
<i>EN 60529</i>	<i>Degrees of protection provided by enclosures (IP Code)</i>

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) |

5. Test results

Requirements and tests results according to PN-EN 61439-1:2011 [EN 61439-1] and PN-EN 61439-5:2015-02 [EN 61439-5] are given in Table 5.

**Table 5 – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1] and PN-EN 61439-5:2015-02 [EN 61439-5]**

PN-EN 61439-1:2011 [EN 61439-1] and PN-EN 61439-5:2015-02 [EN 61439-5]			
Clause	Requirement / Test	Observations and test results	Verdict
6	Information		
6.1	Assembly designation marking		
	Nameplates may be placed inside an enclosure of an Assembly provided their intended place ensures good legibility and visibility when the doors is open or the cover is removed.	Nameplates are placed inside of enclosures of Samples 1 and 2 and are clearly visible and legible when the door is open.	P
	Sample 1: Assembly manufacturer's name or trade mark: Type designation: Degree of protection: Rated current: Rated voltage: Relevant Assembly standard IEC 61439-X: Identification number: Year of manufacture: Country of manufacture:	JAUDA OKKJK 400 A 2x160+PBS2-2V IP 34D 400 A 400/230 V EN 60439-5, EN 61439-5 4310-3017/2016 2016 Made in Latvia	P P P P P P P P
	Sample 2: Assembly manufacturer's name or trade mark: Type designation: Degree of protection: Rated current: Rated voltage: Relevant Assembly standard IEC 61439-X: Identification number: Year of manufacture: Country of manufacture:	JAUDA OKJK K3K 630 A IP 34D 630 A 400/230 V EN 60439-5, EN 61439-5 1312-9005/2016 2016 Made in Latvia	P P P P P P P P
6.2	Documentation		
	Documentation shall contain the conditions, if any for the handling, installation, operation and maintenance of assembly and the equipment contained therein.	Documentation (Product data sheet) of Samples 1 and 2 is complete - see Annex 1.	P
7	Service conditions		
7.1	Normal service conditions		
7.1.1	Ambient air temperature		
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.	The requirement concerns the place of installation of switchgear. -25 °C / +40 °C - see Table 2	P

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 [EN 61439-1]:and PN-EN 61439-5:2015-02 [EN 61439-5]			
Clause	Requirement / Test	Observations and test results	Verdict
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 for temperate climate.	The requirement concerns the place of installation of switchgear. -25 °C / +40 °C - see Table 2	P
7.1.2	Humidity conditions	The requirement concerns the place of installation of switchgear - see Table 2	P
7.1.3	Pollution degree		
	Assemblies for industrial applications are generally for use in a pollution degree 3 environment.	Pollution degree 3	P
7.1.4	Altitude		
	The altitude of the site of installation does not exceed 2000 m	The requirement concerns the place of installation switchgear.	P
8	Constructional requirements		
8.1	Strength of materials and parts		
8.1.1	General		
	Assemblies shall be constructed of materials capable of withstanding the mechanical, electrical, thermal and environmental stresses. A reliable locking device shall be provided on outdoor enclosures which prevents access by unauthorized persons.	Sample 1: Enclosure is made of galvanized steel sheet DX51D Z275 with thickness 1,5 mm and coated with polymer powder coating RAL 7008. Locks of covers closing by a key.	P P
		Sample 2: Enclosure is made of galvanized steel sheet DX51D Z275 with thickness 2 mm and coated with polymer powder coating RAL 7037. Locks of doors closing by a key.	P P
8.1.2	Protection against corrosion		
	Protection against corrosion shall be ensured by the use of suitable materials or by protective coatings to the exposed surface.	Samples 1 and 2: metal enclosures with polymer powder coating See Test Reports of Annex 2	P
8.1.3	Properties of insulating materials	Not for a contract.	N/A
8.1.5	Mechanical strength		
	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.	See cl. 10.2.101 of this Table.	P
8.1.6	Lifting provision		
	Assemblies shall be provided with the appropriate provision for lifting.	See cl. 10.2.5 of this Table.	P

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 [EN 61439-1]:and PN-EN 61439-5:2015-02 [EN 61439-5]			
Clause	Requirement / Test	Observations and test results	Verdict
8.1.101	Thermal stability		
	Verification according to IEC 61439-5, cl. 10.2.3.101	Not for a contract.	N/A
8.2	Degree of protection provided by enclosure		
8.2.2	Protection against contact with live parts, ingress of solid foreign bodies and water		
	Degree of protection is indicated by the IP code according to IEC 60529.	Enclosures of Samples 1 and 2 : IP 34D	P
	Degree of protection of an enclosed Assembly shall be at least IP2X.	Insulating covers of Sample 2 provide degree of protection IP20 when doors opened.	P
	Degree of protection provided from the front of a dead front Assembly shall be at least IP XXB.		
	For Assemblies for outdoor use having no supplementary protection, the second characteristic numeral shall be at least 3.	Sample 1 : IP X4 – see Photo 10 Sample 2 : IP X4 – see Photo 11	P P
	For Assemblies for power distribution in public networks for outdoor use enclosure shall be provided degree of protection at least IP34D.	Enclosures of Samples 1 and 2 provide degree of protection IP34D.	P
8.3	Clearances and creepage distances		
8.3.1	General		
	When incorporating equipment into the Assembly, the specified clearances and creepage distances shall be maintained during normal service conditions.	Verification of clearances was made using the rated impulse withstand voltage $U_{imp} = 8 \text{ kV}$	P
	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).	Verification of creepage distances were made using the power-frequency withstand voltage related to rated insulation voltage U_i	P
8.3.2	Clearances		
	The clearances shall be as specified in IEC 61439-1, Table 1 unless a design verification test and routine impulse withstand voltage test is carried out in accordance with cl. 10.9.3.	See cl. 10.4 of this Table.	P
8.3.3	Creepage distances		
	The creepage distances shall not, in any case, be less than the associated minimum clearances.	See cl. 10.4 of this Table.	P
	The creepage distances shall correspond to a pollution degree as specified in cl. 7.1.3 and to the corresponding material group at the rated insulation voltage given in IEC 61439-1, Table 2.		P
8.101	Marking as an obstacle to snow clearance		N/A

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
8.102	Ease of operation and maintenance		
	All parts of the Assembly shall, as far as practicable, be readily accessible and replaceable without excessive dismantling.	Passed the requirements.	P
	The design shall be such that the cables can be readily connected from the front.	The cables can be readily connected from the front.	P
	Locking arrangements shall be provided on PENDA to secure the door(s) and prevent unauthorized access.	Passed the requirements.	P
9	Performance requirements		
9.1	Dielectric properties		
9.1.1	General		
	Each circuit of the Assembly shall be capable of withstanding temporary overvoltages and transient overvoltages.		P
9.1.2	Power-frequency withstand voltage		
	The circuits of the Assembly shall be capable of withstanding the appropriate power-frequency withstand voltages given in IEC 61439-1, Tables 8 and 9. The rated insulation voltage of any circuit of the Assembly shall be equal to or higher than its maximum operational voltage.	See cl. 10.9.2 of this Table.	P P
9.1.3	Impulse withstand voltage		
	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 IEC 61439-1, Table 10 appropriate to the rated impulse withstand voltage.	See cl. 10.9.3 of this Table.	P
9.2	Temperature rise limits		
	The Assembly and its circuits shall be able to carry their rated currents under specified conditions, taking into consideration the ratings of the components, their disposition and application, without exceeding the limits given in IEC 61439-1, Table 6 when verified in accordance with cl. 10.10. The temperature rise shall not cause damage to current-carrying parts or adjacent parts of the Assembly.	See cl. 10.10 of this Table.	P

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
9.3	Short-circuit protection and short-circuit withstand strength		
9.3.1	General		
	Assemblies shall be capable of withstanding the thermal and dynamic stresses resulting from short-circuit currents not exceeding the rated values.	See cl. 10.11 of this Table.	P
9.3.2	Information concerning short-circuit withstand strength		
	For Assemblies with a short-circuit protective device (SCPD) incorporated in the incoming unit, the Assembly manufacturer shall indicate the maximum allowable value of prospective short-circuit current at the input terminals of the Assembly.	The short-time withstand current $I_{cw} = 10 \text{ kA} - 1 \text{ s}$ was declared by the manufacturer See cl. 10.11 of this Table.	P
10	Design verification		
10.2.2	Resistance to corrosion	See Test Reports of Annex 2	P
10.2.5	Lifting		
	<p>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.</p> <p>Test conditions:</p> <ul style="list-style-type: none"> - the Assembly shall be raised smoothly without jerking from a standstill position three times in height $\geq 1 \text{ m}$ and lowered - the Assembly shall be raised and suspended to a height $\geq 1 \text{ m}$ for 30 minutes - the Assembly shall be raised smoothly without jerking from a standstill position to a height $\geq 1 \text{ m}$ and moved $(10 \pm 0,5) \text{ m}$ horizontally, then lowered to a standstill position. This sequence shall be carried out three times at uniform speed, each sequence being carried out within 1 min <p>Acceptance criteria:</p> <ul style="list-style-type: none"> - the Assembly shall show no cracks or permanent distortions visible to normal or corrected vision without additional magnification, which could impair any of its characteristics 	<p>Sample 2:</p> <ul style="list-style-type: none"> - weight of object – 180 kg - additional load (+25%) – 45 kg - total weight – 225 kg - see Photo 3 <p>The cable distribution cabinet was raised three times to a height of 1 m and lowered to a standstill position.</p> <p>The cable distribution cabinet was raised and suspended to a height of 1 m for 30 minutes</p> <p>The Sample 2 was raised from a standstill position to a height of 1 m and moved 10 m horizontally and lowered to a standstill position. This sequence was made three times, each sequence within 1 min.</p> <p>No visible cracks or permanent distortions were observed</p>	<p>P</p> <p>P</p> <p>P</p> <p>P</p>

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
10.2.101	Verification of mechanical strength		
10.2.101.1	General		
	The tests shall be carried out at an ambient temperature of between 10 °C and 40 °C	The tests were carried out an ambient temperature of between 13 °C do 15 °C	P
10.2.101.2	Verification of resistance to static load		
	Test 1 Test conditions: - an evenly distributed load of 8500 N/m ² shall be applied for 5 min to the roof of the enclosure	Sample 2: - see Photo 4 Roof surface: 1354 mm x 364 mm - test load 4190 N was evenly distributed on the roof of the enclosure - test duration: 5 min	P P
	Test 2 Test conditions: - a force of 1200 N shall be applied for 5 min in turn to the front and back upper edges of the enclosure.	Sample 2: - a force of 1200 N was applied in turn to the front and back upper edges of the enclosure - test duration: 5 min w in each position	P P
	Acceptance criteria: - maintaining a minimum degree of protection IP34D - the proper operation of doors and locks - maintaining the required clearances	- degree of protection IP34D has been maintained - operation of the doors and locking points has been not impaired - required clearances has been maintained	P P P
10.2.101.3	Verification of resistance to shock load		
	The enclosure shall withstand the impact of a bag containing dry sand having a total mass of 15 kg. Test conditions: - bag hung vertically min. 1 m above the highest point of enclosure - one blow aimed at the upper part of each of the vertical surfaces of Assembly	Equipment used for test: - bag with dry sand having a mass of 15 kg, acc. to IEC 61439-5, Fig. 105 Sample 2: - see Photo 5 - the fall height of the bag: 1 m - one blow aimed at each vertical surface of enclosure was apply	P P P
	Acceptance criteria: - maintaining a degree of protection IP34D - the proper operation of doors and locks - maintaining the required clearances	- degree of protection IP34D has been maintained - operation of the doors and locks was not impaired - required clearances has been maintained	P P P
10.2.101.4	Verification of resistance to torsional stress		
	Steel frame constructed from (60x60x5) mm angle iron, having vertical location 100 mm long shall be used. Test conditions: Assembly with door closed - torsional force 2 x 1000 N applied for 30 s to the frame as in Figures 106a and 106b. Acceptance criteria: - the doors remain closed during the test - maintaining a degree of protection IP34D	Equipment used for test: - steel construction frame acc. to IEC 61439-5, Fig. 106b Sample 2: - applied forces: 2 x 1000 N - test duration: 30 s - doors remained closed - degree of protection IP34D has been maintained	P P P P

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
10.2.101.5	Verification of impact force withstand		
10.2.101.5.1	Test applicable to Assemblies designed for operation at ambient temperatures of between -25 °C and 40 °C		
	Test 1 Impact test apparatus with a steel ball of 2 kg mass acc. to IEC 61439-5, Fig. 103a Test conditions: - impact energy: 20 J - one impact at the centre of each of the vertical surfaces of the Assembly - ambient air temperature: 10 °C ÷ 40 °C - pre-conditioning at this temperature: ≥ 12 h Acceptance criteria: - maintaining a degree of protection IP34D - the proper operation of doors and locks - maintaining the required clearances	Test apparatus with a steel ball of 2 kg mass Sample 2: - see Photo 7 - impact energy: 20 J (IK10) - 4 impacts (1 for each side of enclosure) - the fall height of the ball: 1,0 m - ambient air temperature: 13 °C - pre-conditioning: 12 h - degree of protection IP34D has been maintained - operation of the doors and locks has been not impaired - required clearances has been maintained	P P P P P P P P
	Test 2 Impact test apparatus with a steel ball of 2 kg mass acc. to IEC 61439-5, Fig. 103a Test conditions: - impact energy: 20 J - one impact at the centre of each of the vertical surfaces of the Assembly - ambient air temperature: 10 °C ÷ 40 °C - pre-conditioning at temperature – 25 °C (+0;- 0,5) °C: ≥ 12 h Acceptance criteria: - maintaining a degree of protection IP34D - the proper operation of doors and locks - maintaining the required clearances	Equipment used for test: Test apparatus with a steel ball of 2 kg mass Sample 2: - impact energy: 20 J (IK10) - 4 impacts (1 for each side) - the fall height of the ball: 1,0 m - ambient air temperature: 13 °C - pre-conditioning at a temperature -25 °C for 12 h - degree of protection IP34D has been maintained - operation of the doors and locks has been not impaired - required clearances has been maintained	P P P P P P P P
10.2.101.5.2	Test applicable to Assemblies designed for operation in an arctic climate		N/A
10.2.101.6	Verification of mechanical strength of doors		
	Test conditions: - the doors fully open and in contact with the designed restraint - a load of 50 N shall be applied at the top edge of the doors perpendicular to the place of doors - a distance from the hinged edge: 300 mm - load applying time: 3 s Acceptance criteria: - remain hinged doors - the proper operation of doors and locks - maintaining a degree of protection IP34D after doors closing	Sample 2: - load: 50 N - a distance from edge: 300 mm - load applying time: 3 s - the doors have remained on its hinges - operation of the doors and locks was not impaired - degree of protection IP34D has been maintained	P P P P P

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
10.2.101.7	Verification of resistance to axial load of metal inserts in synthetics material		N/A
10.2.101.8	Verification of resistance to mechanical shock impacts induced by sharp-edged objects		
	<p>Impact apparatus having a steel striker element with a mass of 5 kg and having the end profiled as shown in IEC 61439-5, Fig. 108.</p> <p>Test 1</p> <p>Test conditions:</p> <ul style="list-style-type: none"> - ambient temperature: 10 °C ÷ 40 °C - pre-conditioning at this temperature: ≥ 12 h - impact energy: 20 J - one blow aimed at the rated as the weakest of each vertical surface of the assembly <p>Acceptance criteria:</p> <ul style="list-style-type: none"> - any cracks outside of the circle with a diameter of 15 mm - in case of puncture of enclosure – it shall not be possible to insert a gauge of 4 mm diameter having a hemispherical tip, applied to the hole with a force 5 N 	<p>Impact test apparatus with the striker element with a mass of 5 kg was used</p> <p>Sample 2: - see Photo 8</p> <ul style="list-style-type: none"> - ambient air temperature: 13 °C - pre-conditioning: 12 h - impact energy: 20 J - 4 impacts (1 for each side) - the fall height of the striker element: 0,4 m <p>- no cracks</p> <p>- there were no punctures of enclosure</p>	<p>P</p> <p>P</p> <p>P</p> <p>P</p> <p>P</p> <p>P</p> <p>P</p>
	<p>Impact apparatus having a steel striker element with a mass 5 kg and having the end profiled as shown in IEC 61439-5, Fig. 108.</p> <p>Test 2</p> <p>Test conditions:</p> <ul style="list-style-type: none"> - ambient temperature: 10 °C ÷ 40 °C - pre-conditioning at temperature -25 °C (+0;-5) °C: ≥ 12 h - impact energy: 20 J - one blow aimed at the rated as the weakest of each vertical surface of the Assembly <p>Acceptance criteria:</p> <ul style="list-style-type: none"> - any cracks outside of the circle with a diameter of 15 mm - in case of puncture of enclosure – it shall not be possible to insert a gauge of 4 mm diameter having a hemispherical tip, applied to the hole with a force 5 N 	<p>Impact test apparatus with the striker element with a mass of 5 kg was used</p> <p>Sample 2:</p> <ul style="list-style-type: none"> - ambient temperature: 13 °C - pre-conditioning at temperature -25 °C for 12h - impact energy: 20 J - 4 impacts (1 for each side) - the fall height of the striker element: 0,4 m <p>- no cracks</p> <p>- there were no punctures of enclosure</p>	<p>P</p> <p>P</p> <p>P</p> <p>P</p> <p>P</p> <p>P</p> <p>P</p>

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1: [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
10.2.101.9	Test of mechanical strength of a base intended to be embedded in the ground		
	<p>The test shall be carried out with the PENDA-O fixed to the base, in accordance with IEC 61439-5, Fig. 109.</p> <p>Test conditions:</p> <ul style="list-style-type: none"> - the force ($F = 3,5 \text{ N/mm} \times L$) is transferred via a thick-walled steel tube having a diameter of 60 mm and a length of 200 mm, and shall be applied to the lowest part of the longest section of the PENDA base that is beneath the ground surface when it is installed - the force shall be placed in the centre of base width - if the design of the base includes one or more permanent supports, the force shall be applied by means of a number of steel tubes and one tube shall be placed in the centre of each unsupported length - force applying time: 1 min <p>Acceptance criteria:</p> <ul style="list-style-type: none"> - any cracks in the enclosure - maintaining a degree of protection IP34D 	<p>Sample 2:</p> <p>see Photo 9</p> <ul style="list-style-type: none"> - the applied load: 4725 N - the thick-walled steel tube having a diameter of 60 mm and a length of 200 mm – 2 pcs. - base width $L = 1350 \text{ mm}$ - force applied to centre of both unsupported length - see Photo 9. - force applying time: 1 min - no cracks in the enclosure - degree of protection IP34D has been maintained 	<p>P</p> <p>P</p> <p>P</p> <p>P</p> <p>P</p> <p>P</p>
10.2.7	Marking		
	<p>Test conditions:</p> <ul style="list-style-type: none"> - rubbing the marking by hand for 15 s with a piece of cloth soaked in water - rubbing the marking by hand for 15 s with a piece of cloth soaked with petroleum spirit. <p>Acceptance criteria:</p> <ul style="list-style-type: none"> - the marking shall be legible to normal or corrected vision without additional magnification. 	<p>Sample 1:</p> <ul style="list-style-type: none"> - marking was rubbed by hand with a piece of cloth soaked in water - marking was rubbed by hand with a piece of cloth soaked with petroleum spirit - rubbing time for each tests: 15 s - the marking was legible 	<p>P</p> <p>P</p> <p>P</p> <p>P</p>

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
10.3	Degree of protection of Assemblies		
	The degree of protection shall be verified in accordance with IEC 60529		
	Degree of protection against access to hazardous parts and against solid foreign objects indicated by the first characteristic numeral		
	Protection against access to hazardous parts		
	The first characteristic numeral 3 The access probe (acc. to IEC 60529 cl. 12.2 - 12.3) $\varnothing 2,5^{+0,05}$ mm and $100^{\pm 0,2}$ mm length with edges free from burrs. Pressing force: $3\text{ N} \pm 10\%$ Acceptance criteria: - the protection is satisfactory if the access probe does not penetrate and adequate clearance shall be kept	Samples 1: IP3X Samples 2: IP3X The access probe $\varnothing 2,5$ mm pressed with a force of 3 N have not penetrate and the adequate clearance have been kept.	P P P
	Protection against access to hazardous parts when doors opened IP20		
	The access probe – jointed test finger $\varnothing 12$ mm may penetrate up to its 80 mm length, but adequate clearance shall be kept.	Sample 2: The jointed test finger $\varnothing 12$ mm pressed with a force of 10 N have not pass through any opening.	P
	Protection against solid foreign objects		
	The first characteristic numeral 3 Rigid steel rod (acc. to IEC 60529, cl. 13.2 - 13.3) $\varnothing 2,5^{+0,05}$ mm and $100^{\pm 0,2}$ mm length with edges free from burrs. Pressing force: $3\text{ N} \pm 10\%$ Acceptance criteria: - the protection is satisfactory if the access probe does not pass through any opening	Samples 1: IP3X Samples 2: IP3X Rigid steel rod $\varnothing 2,5$ mm pressed with a force of 3 N have not pass through any opening	P P P
	Degree of protection against water indicated by the second characteristic numeral		
	The second characteristic numeral 4 The main conditions of the tests according to Table 8 of IEC 60529: - the water temperature should not differ by more than 5 K from the temperature of the Sample - spray nozzle (acc. to IEC 60529, Fig. 5) - spray $\pm 180^\circ$ from vertical with water flow rate of $10\text{ l/min} \pm 5\%$ from 300 to 500 mm by a time of 1 min / m^2 (at least 5 min) Acceptance criteria: - after testing the enclosure shall be inspected for ingress of water	Samples 1: IPX4 Samples 2: IPX4 Surface of Sample 1: $1,45\text{ m}^2$ Surface of Sample 2: $4,59\text{ m}^2$ - water flow rate: 10 l/min - test duration: 5 min After the test there were not observed water on any live part or the incorporated components of Samples 1 and 2	P p P P P

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
	Degree of protection against access to hazardous parts indicated by the additional letter		
	The additional letter D	Samples 1: IP34D	P
	The access probe (acc. to IEC 60529, Table 6) \varnothing 1,0 ^{+0,05} mm and 100 ^{+0,2} mm length with edges free from burrs.	Samples 2: IP34D	p
	Pressing force: 1 N \pm 10 %	- the access probe \varnothing 1,0 mm - pressing force: 1 N	P P
	Acceptance criteria: - the protection is satisfactory if adequate clearance shall is kept between the access probe and hazardous parts	Adequate clearance have been kept between the access probe and hazardous parts.	P
10.4	Clearance and creepage distances		
	Clearances according to IEC 61439-1, Table 1, for inhomogeneous field conditions and pollution degree 3	Samples 1 and 2: Clearances \geq 8 mm can withstand rated impulse withstand voltage $U_{imp} = 9,6$ kV	P
	Creepage distances according to IEC 61439-1, Table 2, for pollution degree 3 and material group III	Samples 1 and 2: Creepage distances \geq 10 mm can withstand power-frequency withstand voltage $U_p = 1890$ V	P
	Clearances and creepage distances between exposed busbars and cable ends on conductors connected to the installed equipment	Samples 1 and 2: At least are the same as those given for the incorporated switching devices, with which are directly connected	P
10.5.2	Effective earth continuity between the exposed conductive parts of the Assembly and the protective circuit		
	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 .	Sample 1: Test current: 20 A Ambient temperature: 15 °C Resistance measured between PEN busbar and: - side support structure at the bottom – 604,7 $\mu\Omega$ - support structure of cable holders – 923,6 $\mu\Omega$ - support structure of main busbars – 696,7 $\mu\Omega$	P P P
	Verification shall be made using a resistance measuring instrument which is capable of driving a current of at least 10 A (a.c. or d.c.).	Sample 2: Test current: 25 A Ambient temperature: 15 °C Resistance measured between PEN busbar and: - terminal on the door left – 762,9 $\mu\Omega$ - terminal on the door right – 756,7 $\mu\Omega$ - middle support structure – 363,9 $\mu\Omega$ - support structure at the base – 19000 $\mu\Omega$ - upper lock of doors – 13320 $\mu\Omega$	P P P P P
10.5.3	Short-circuit withstand strength of the protective circuit		
	The rated short-circuit withstand strength shall be verified. Short-circuit current of 60 % rms value of 3-phase short-circuit of main busbars	Sample 2: see cl. 10.11.5.6 of this Table - circuit: L3 – PEN – see Photo 14 - $I_{cw} = 6,21$ kA (1 s) - $I_{pk} = 15,45$ kA	P P P

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
10.6	Incorporation of switching devices and components		
	Adjusting and resetting devices shall be easily accessible.	They are easily accessible in all units.	P
	Functional units mounted on the same support, terminals for external conductors shall be arranged as to be accessible for mounting, wiring, maintenance and replacement.	Functional units and terminals for external conductors are easily accessible in all units.	P
10.6.2	Electromagnetic compatibility	Assemblies not incorporating electronic circuits – No Immunity tests and Emission tests are required.	N/A
10.7	Internal electrical circuits and connections	Compliance with the design requirements of 8.6 shall be confirmed by the original manufacturer's inspection	N/A
10.8	Terminals for external conductors	Compliance with the design requirements of 8.6 shall be confirmed by the original manufacturer's inspection	N/A
10.9	Dielectric properties		
10.9.2	Power-frequency withstand voltage		
	Test voltage shall be applied: - between all live parts of the main circuit connected together and the exposed conductive parts of the ASSEMBLY connected with earthed PEN busbar	Sample 1 and Sample 2: - test voltage: 1890 V	P
	- between each part of different potential of the main circuit and the other live parts of different potential and exposed conductive parts of the ASSEMBLY connected together and with earthed PEN busbar	- frequency: 50 Hz	P
	Test duration: 5 ⁺² s Acceptance criteria: - during the test shall be no disruptive discharge	- test duration: 5 s - during the test was no disruptive discharge	P
10.9.3	Impulse withstand voltage		
	Impulse voltage shall be applied: - between all live parts of the main circuit connected together and the exposed conductive parts of the ASSEMBLY connected with earthed PEN busbar - between each part of different potential off the main circuit and the other live parts of different potential and exposed conductive parts of the ASSEMBLY connected together and with earthed PEN busbar Number of impulses: 5 impulses for each polarity of intervals of 1 s minimum Acceptance criteria: - during the test shall be no disruptive discharge	Sample 1 and Sample 2: Ambient temperature: 15,0 °C Relative humidity: 52 % Atmospheric pressure: 1008 hPa Rated impulse voltage: 8,0 kV Test impulse withstand voltage: 9,6 kV Number of impulses: 5 impulses for each polarity - during the test was no disruptive discharge	P P P P P P P

**Table 5 cont. – Requirements and test results according to
PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015]**

PN-EN 61439-1:2011 and PN-EN 61439-5:2015-02			
Clause	Requirement / Test	Observations and test results	Verdict
10.10	Verification of temperature rise		
10.10.2	Verification by testing		
10.10.2.3	Method of test		
10.10.2.3.5	Verification of the complete Assembly		
	It shall be verified that the temperature-rise limits for the different parts of the Assembly or Assembly system will not be exceeded. The carrying capability of the circuits to be verified is determined by the rated current and the rated diversity factor (RDF).	<p>Sample 1: Temperature-rise test 288 A at RDF of 0,9 did not show exceeded the permissible temperatures (see Table 6 and Fig. 1)</p> <p>Sample 2: Temperature-rise test 630 A at RDF of 1 did not show exceeded the permissible temperatures (see Table 7 and Fig. 2)</p>	<p>P</p> <p>P</p>
10.11	Short-circuit withstand strength		
10.11.5	Verification by test		
10.11.5.3	Testing of main circuits		
10.11.5.3.3	Incoming circuit and main busbars		
	Assemblies containing main busbars shall be tested to prove the short-circuit withstand strength of the main busbars and incoming circuit including at least one joint where the busbars are intended to be extendable.	<p>Sample 2: see Table 8 and Fig. 3</p> <ul style="list-style-type: none"> - circuit: L1-L2-L3 (osc. 1449, 1451) - $I_{cw} = 10,47$ kA (1 s) - $I_{pk} = 25,86$ kA <p>- there were any deformation of main busbars or loosening of parts used for the connection of conductors and the conductors were not separate from the outgoing terminals.</p> <p>- there were no cracks of post insulators.</p>	<p>P</p> <p>P</p> <p>P</p>
	There shall be no loosening of parts used for the connection of conductors and the conductors shall not separate from the outgoing terminals.		P
	There shall be no cracks of a post insulators.		P
10.11.5.6	Testing of the protective circuit		
	The value of the current in the protective conductor shall be at least 60 % of the phase current during the three-phase test of Assembly.	<p>Sample 2: see Table 9 and Fig. 4</p> <ul style="list-style-type: none"> - circuit: L3-PEN (osc. 1455, 1458) - $I_{cw} = 6,21$ kA (1 s) - $I_{pk} = 15,45$ kA <p>- there were any deformation of PEN busbar or loosening of parts used for the connection of conductors</p>	<p>P</p> <p>P</p> <p>P</p>
	The continuity of the protective circuit shall not be significantly impaired. There shall be no loosening of parts used for the connection of conductors		P

Because busbars L1, L2 and L3 of cable distribution cabinet type **OKKJK 400 A 2x160+PBS2-2V (Sample 1)** are very short, the short-circuit withstand strength test did not performed. It is accepted that the cable distribution cabinet type **OKKJK 400 A 2x160+PBS2-2V** has the same short-circuit withstand strength as the cable distribution cabinet type **OKJK K3K 630 A**.

According to the standard PN-EN 61439-1:2011 [EN 61439-1:2011], cl. 10.1.2a) verification of short-circuit withstand strength is not required for the rated short-time withstand current not exceeding 10 kA r.m.s.

The cable distribution cabinets type **OKKJK 400 A 2x160+PBS2-2V** and **OKJK K3K 630 A** meet the requirements of standards PN-EN 61439-1:2011 [EN 61439-1:2011] and PN-EN 61439-5:2015-02 [EN 61439-5:2015].

The results of tests are **positive**.

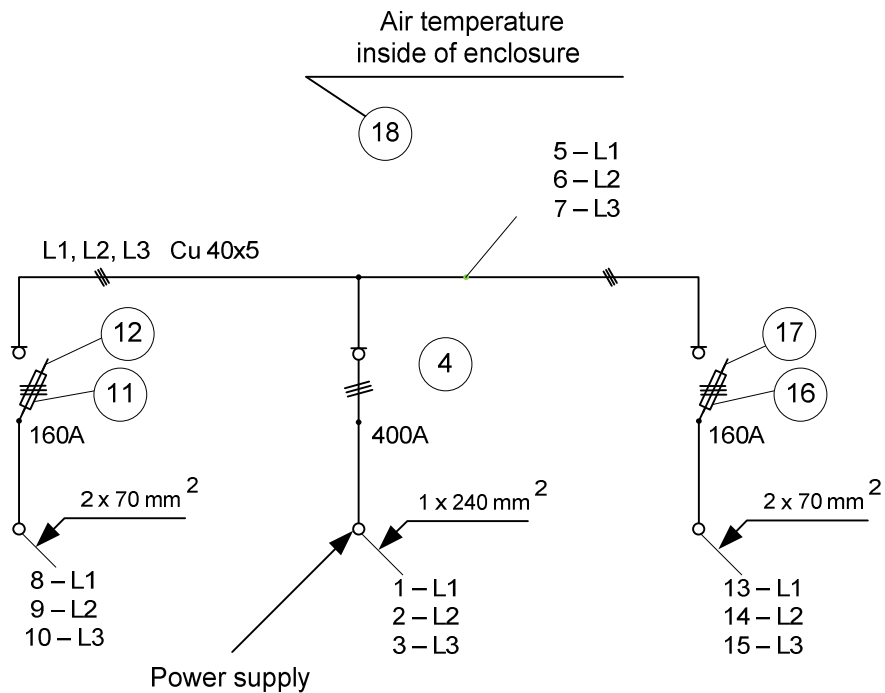


Figure 1 – Location of thermocouples on temperature-rise test of cable distribution cabinet type **OKJK 400 A 2x160+PBS2-2V (Sample 1)**

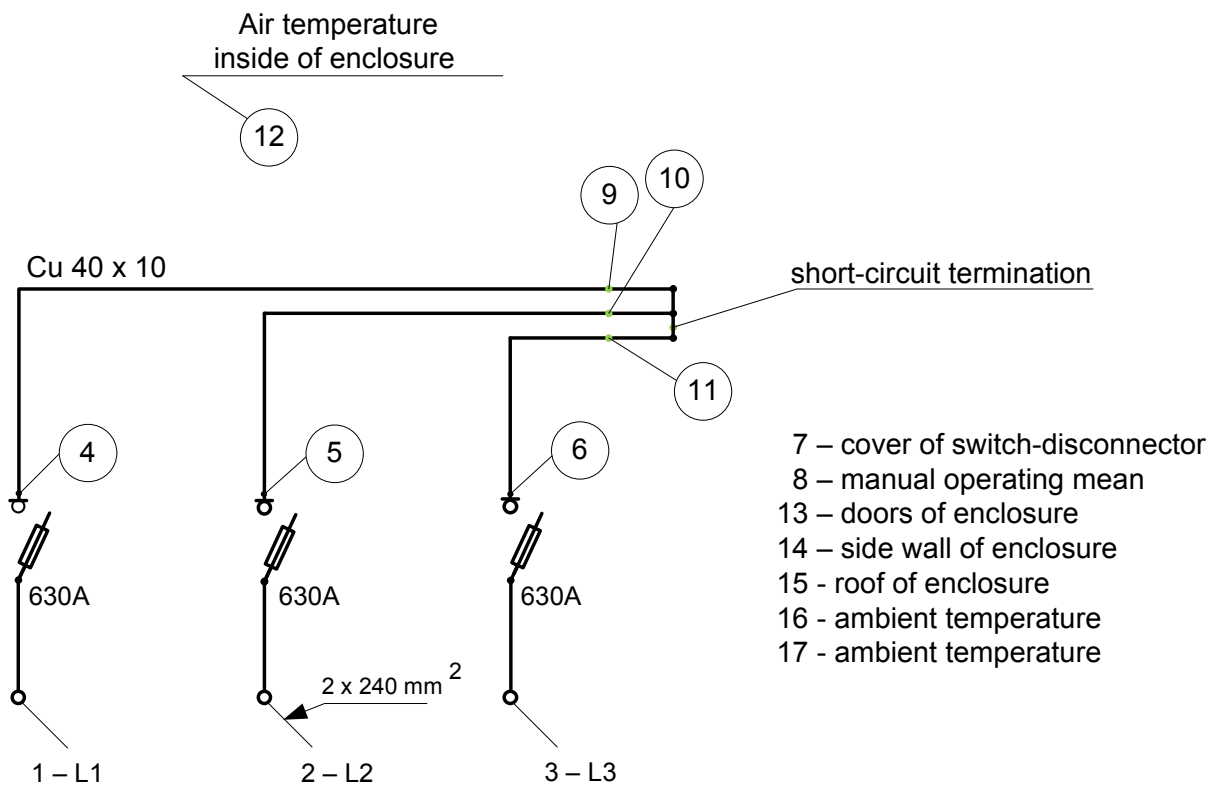


Figure 2 – Location of thermocouples on temperature-rise test of cable distribution cabinet type **OKJK K3K 630 A (Sample 2)**

Table 6 – Temperature rise test results of cable distribution cabinet type OKKJK 400 A 2x160+PBS2-2V (Sample 1)

Ch. No.	Measurement place	Temperature measured in established condition	Temperature rise		Verdict
			Measured	Limited	
1	Incoming (lower) terminal L1 of main switch-disconnector 400A	47,8	36,05	80 ²⁾	P
2	Incoming (lower) terminal L2 of main switch-disconnector 400A	46,0	34,25	80 ²⁾	P
3	Incoming (lower) terminal L3 of main switch-disconnector 400A	43,9	32,15	80 ²⁾	P
4	Insulating enclosure of main switch-disconnector 400A	43,6	31,85	50 ²⁾	P
5	Busbar (L1)	71,8	60,05	105	P
6	Busbar (L2)	66,7	54,95	105	P
7	Busbar (L3)	61,7	49,95	105	P
8	Lower terminal L1 of left switch-disconnector 160A	44,3	32,55	80 ²⁾	P
9	Lower terminal L2 of left switch-disconnector 160A	50,4	38,65	80 ²⁾	P
10	Lower terminal L3 of left switch-disconnector 160A	54,6	42,85	80 ²⁾	P
11	Insulating enclosure of left switch-disconnector 160A	58,8	47,05	50 ²⁾	P
12	Insulating manual operating mean of left switch-disconnector 160A	40,4	28,65	35 ²⁾	P
13	Lower terminal L1 of right switch-disconnector 160A	49,0	37,25	80 ²⁾	P
14	Lower terminal L2 of right switch-disconnector 160A	51,6	39,85	80 ²⁾	P
15	Lower terminal L3 of right switch-disconnector 160A	55,3	43,55	80 ²⁾	P
16	Insulating enclosure of right switch-disconnector 160A	56,9	45,15	50 ²⁾	P
17	Insulating manual operating mean of right switch-disconnector 160A	41,2	29,45	35 ²⁾	P
18	Air temperature inside enclosure of Sample 1	44,5	32,75	¹⁾	N/A
19	Doors of enclosure of Sample 1	24,0	12,25	40	P
20	Roof of enclosure of Sample 1	28,3	16,55	40	P
22	Side wall of enclosure of Sample 1	25,8	14,05	40	P
23	Ambient air temperature	11,6	T _{avg} = 11,75	N/A	
24	Ambient air temperature	11,9			

¹⁾ Informative measurement
²⁾ In accordance with IEC 60947-3

**Table 7 – Temperature rise test results of cable distribution cabinet type
OKJK K3K 630 A (Sample 2)**

Ch. No.	Measurement place	Temperature measured in established condition	Temperature rise		Verdict
			Measured	Limited	
1	Incoming (lower) terminal L1 of main switch-disconnector 630A	83,7	71,1	80 ²⁾	P
2	Incoming (lower) terminal L2 of main switch-disconnector 630A	75,7	63,1	80 ²⁾	P
3	Incoming (lower) terminal L3 of main switch-disconnector 630A	74,3	61,7	80 ²⁾	P
4	Upper terminal L1 (on busbar) of main switch-disconnector 630A	97,0	79,4	80 ²⁾	P
5	Upper terminal L2 (on busbar) of main switch-disconnector 630A	91,0	78,4	80 ²⁾	P
6	Upper terminal L3 (on busbar) of main switch-disconnector 630A	85,4	72,8	80 ²⁾	P
7	Insulating enclosure of main switch-disconnector 630A	52,8	40,2	50 ²⁾	P
8	Insulating manual operating mean of main switch-disconnector 630A	39,4	26,8	35 ²⁾	P
9	Busbar L1	63,6	51,0	105	P
10	Busbar L2	59,3	46,7	105	P
11	Busbar L3	55,0	42,4	105	P
12	Air temperature inside enclosure of Sample 2	37,3	24,7	¹⁾	N/A
13	Doors of enclosure of Sample 2	22,1	9,5	40	P
14	Side wall of enclosure of Sample 2	23,1	10,5	40	P
15	Roof of enclosure of Sample 2	24,9	12,3	40	P
16	Ambient air temperature	11,9	T _{avg} = 12,6	N/A	
17	Ambient air temperature	13,3			
¹⁾ Informative measurement ²⁾ In accordance with IEC 60947-3					

Table 8 – Short-circuit withstand tests results of main busbars of Sample 2

Test No.	Osc. No.	Phase	cos φ	I_{cw}	I_{cw} average value	I_{pk}	Pt	Test time	Test result
–	–	–	–	kA _{r.m.s.}	kA _{r.m.s.}	kA _{max}	MA ² s	s	–
Calibration	1449	L1 L2 L3	0,5	6,78 6,59 6,59	6,65	–	–	0,203	N/A
Test	1451	L1 L2 L3	0,5	10,47 10,05 10,15	10,22	25,86 17,96 23,11	110,54 101,74 103,77	1,01	P

Table 9 – Short-circuit withstand tests results of PEN circuit of Sample 2

Test No.	Osc. No.	Circuit	cos φ	I_{cw}	I_{pk}	Pt	Test time	Test result
–	–	–	–	kA _{r.m.s.}	kA _{max}	MA ² s	s	–
Calibration	1455	L3-PEN	0,5	5,41	–	–	0,206	N/A
Test	1458	L3-PEN	0,5	6,21	15,45	38,86	1,01	P

6. Characteristics of the test conditions

Test object: **Cable distribution cabinet type OKJK K3K 630 A (Sample 2)**

Date of tests: 22.12.2016

Ordered tests:

1. Short-circuit withstand test of main busbars system L1, L2, L3

Test circuit: 3-phase

Power factor $\cos \varphi = 0,5$

Test circuit – Figure 3

2. Short-circuit withstand test of PEN circuit

Test circuit: 1-phase

Power factor $\cos \varphi = 0,5$

Test circuit – Figure 4

GENERATOR: TJ 12,5

winding connections system: *in a star*

neutral point: earthed through a resistor 700 Ω

TRANSFORMER: TWP

primary side winding connections system: *in a star*

secondary side winding connections system: *in a star*

neutral point: *directly earthed*

$$\text{transformation ratio} = \frac{\text{primary side}}{\text{secondary side}} = \frac{6 \text{ kV}}{0,44\sqrt{3} \text{ kV}}$$

Location of test: test chamber LAP

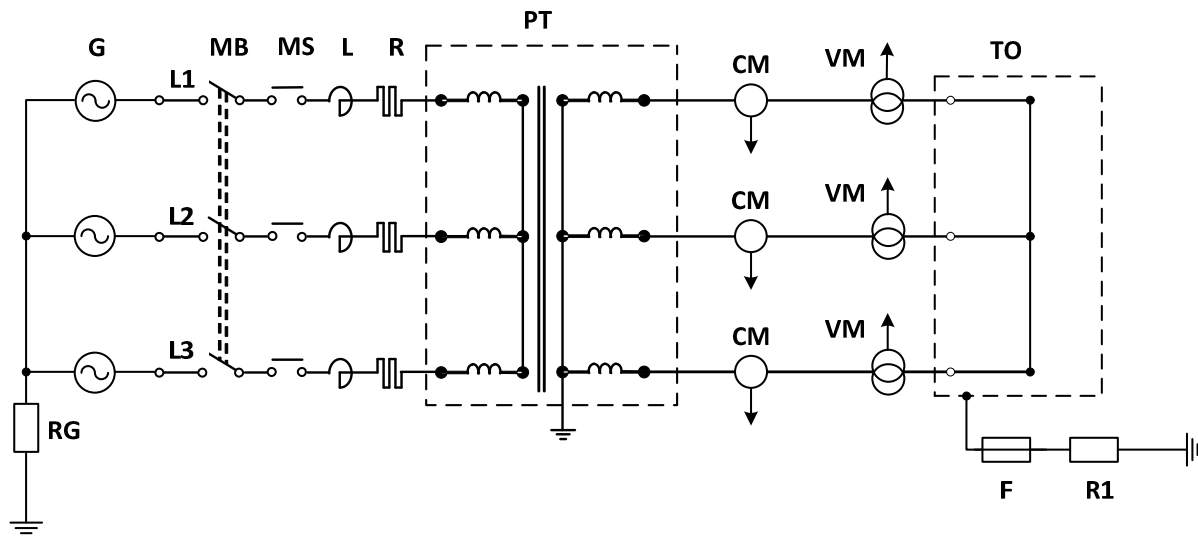
Location of short-circuit: insulated

Oscillograms numbers of tests carried out at connection according to:

Figure 3 – osc. 1449, 1451

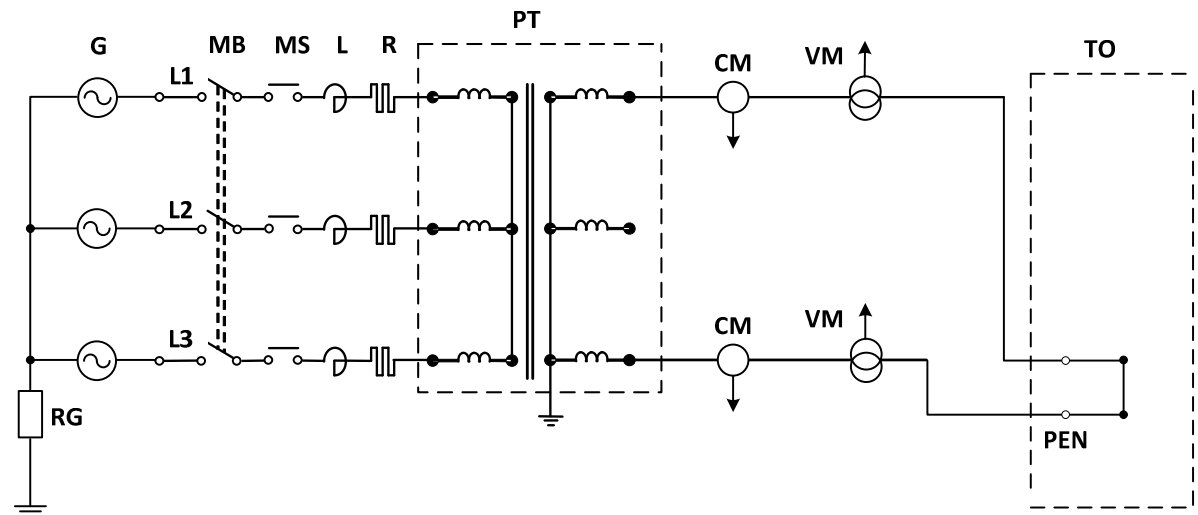
Figure 4 – osc. 1455, 1458

Figure 3 – TEST CIRCUIT DIAGRAM FOR SHORT-CIRCUIT WITHSTAND TESTS OF BUSBARS L1, L2, L3



G - Generator	TO - Test Object	CM - Current Measurement
PT - Power transformer	L - Reactors	VM - Voltage Measurement
MB - Master Breaker	R, R_G, R₁ - Resistors	
MS - Making Switches	F - Fuseable element	

Figure 4 – TEST CIRCUIT DIAGRAM FOR SHORT-CIRCUIT WITHSTAND TEST OF PEN BUSBAR



G - Generator	TO - Test Object	CM - Current Measurement
PT - Power transformer	L - Reactors	VM - Voltage Measurement
MB - Master Breaker	R, R_G - Resistors	
MS - Making Switches		

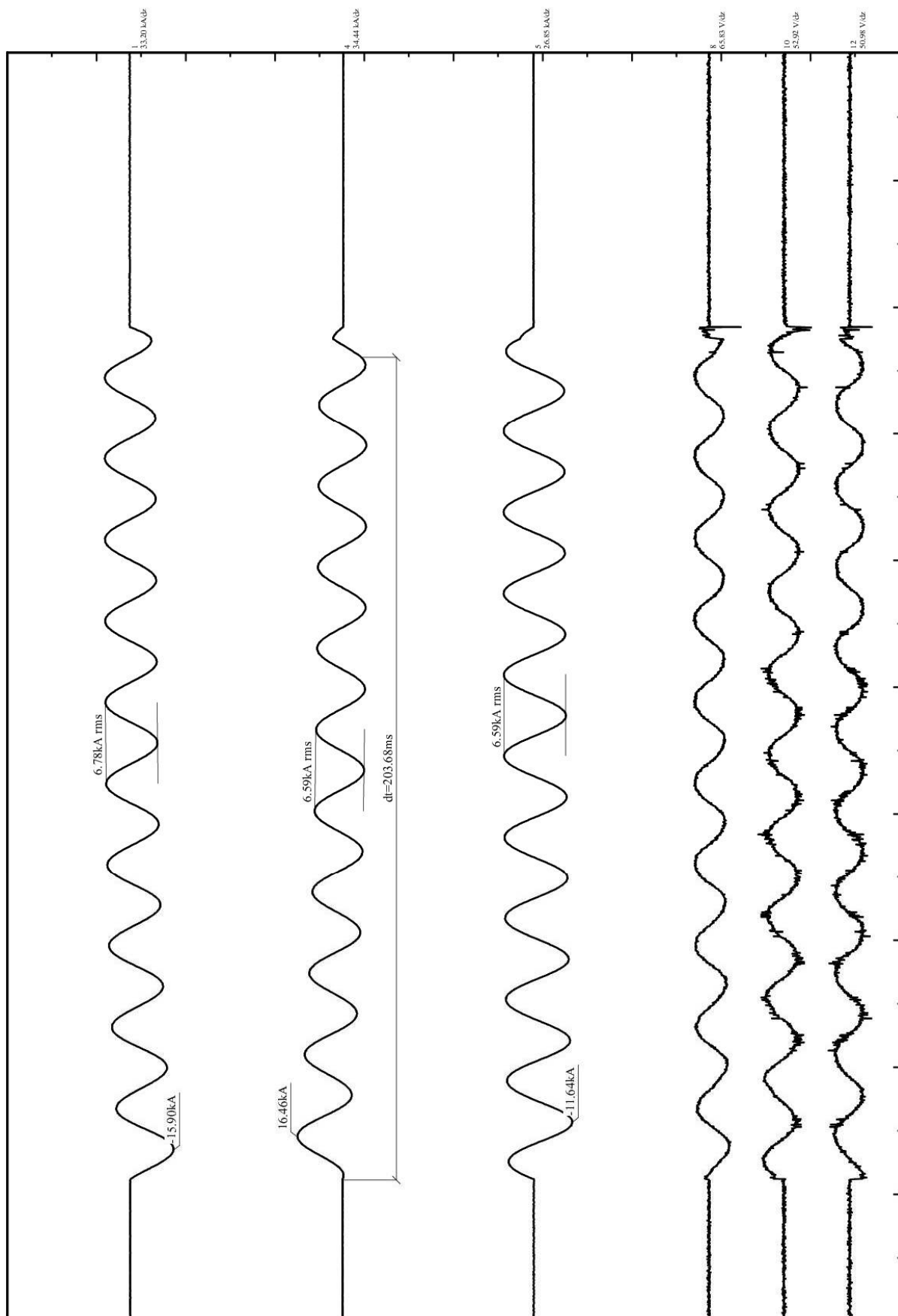
7. Instruments used for tests

Measurement/test equipment	Identification number	Used range	Expiration date of calibration
Dynamometer DS-1K	NAR 359-IV-187	50 kg	25.08.2018
Force meter STAHL MP-100.15A	L30436	196 N	04.04.2021
Access probe \varnothing 1,0 mm	1426024	-	12.03.2020
Access probe \varnothing 2,5 mm	1404028	-	12.03.2020
Jointed test finger \varnothing 12 mm	NAR 353-1004	-	17.09.2017
Water pump NOCCHI	NWM-359-VIII-187	-	01.07.2020
Flowmeter RCDL	72264	-	01.07.2020
Spray nozzle IP X4	V14121	0 ÷ 30 psi	29.07.2020
Steel striker element for resistance test to mechanical shock induced by sharp-edged objects	NWM 800-25100	5 kg	09.2018
Meter stick being 1m	NWM 353-1034	1 m	25.09.2018
Stopwatch Casio	NBR 359-IV-528	-	25.11.2018
Stopwatch Casio	NBR 359-IV-527	-	25.11.2018
Termohygrometer Rotonic	NWM 801-25700	(10 ÷ 98)% RH (-10 ÷ 50) °C	18.02.2019
Barometer	NAR 359 IV 527	913 ÷ 1099 hPa	25.11.2018
Clamp meter FLUKE 355	28040045	0 ÷ 2000 A	29.12.2018
Multimeter HIOKI DT4252	140503982		13.06.2018
Voltage transformers type PNL 1000/100	536, 537, 538		23.09.2020
Rogowski coils 500/5000 type CT9667	140214955 140214956 140214957		23.10.2018
Voltage probe API 5005-2,5/5 kV	NWM 801-316-00	5,5 kV, 500 VA	07.05.2017
Impulse voltage generator	NAR 800-16800	15 kV 1,2/50	07.09.2017
Measuring system HIOKI 8861-50	131011562		25.03.2019
Measurement probe TEKTRONIX P6015A	NAR 801-16003	20 kV	25.06.2020
Oscilloscope HP-54510 B	NAR 801-15300		21.04.2017
Low resistance meter RMO100GP	14G743G	5÷100 A, 1÷100 mΩ	10.10.2018
Temperature recorder EUROTHERM CHESSEL Type 41815	W2727300101012100		16.03.2019
Hook weight KPZ-404E/0050	76600	40 ÷ 5000 kg	05.06.2019

8. The measurement uncertainties of electrical and non-electrical quantities in NBR Laboratory

Measured quantity	Range	Frequency	Measured parameter / uncertainty [%]			
Voltage U / Divider RC	0 ≤ U ≤ 1000V	dc - 20kHz	RMS	< ± 1.5	Peak	< ± 1.0
		> 20kHz	RMS	< ± 2.5	Peak	< ± 2.0
	1000 V ≤ U ≤ 10kV	dc - 20kHz	RMS	< ± 2.0	Peak	< ± 1.5
		> 20kHz	RMS	< ± 2.5	Peak	< ± 2.0
	U > 10kV	50Hz - 20kHz	RMS	< ± 3.0	Peak	< ± 2.5
		> 20kHz	RMS	< ± 3.5	Peak	< ± 3.0
Current I / Shunt	0 ≤ I ≤ 100A	dc - 5kHz	RMS	< ± 1.5	Peak	< ± 1.0
			Joule integral	< ± 2.0	Peak – Peak/√8	< ± 2.0
		> 5kHz	RMS	< ± 2.0	Peak	< ± 1.5
			Joule integral	< ± 3.0	Peak – Peak/√8	< ± 3.0
	100 A ≤ I ≤ 10kA	dc - 5kHz	RMS	< ± 1.5	Peak	< ± 1.0
			Joule integral	< ± 2.0	Peak – Peak/√8	< ± 2.0
		> 5kHz	RMS	< ± 2.0	Peak	< ± 1.5
			Joule integral	< ± 3.0	Peak – Peak/√8	< ± 3.0
	I > 10kA	dc - 5kHz	RMS	< ± 2.0	Peak	< ± 1.5
			Joule integral	< ± 3.0	Peak – Peak/√8	< ± 3.0
		> 5kHz	RMS	< ± 2.5	Peak	< ± 2.0
			Joule integral	< ± 3.5	Peak – Peak/√8	< ± 3.5
Current I / Current transformer	0 ≤ I ≤ 100A	50Hz - 5kHz	RMS	< ± 2.0	Peak	< ± 1.5
			Joule integral	< ± 2.5	Peak – Peak/√8	< ± 2.5
		> 5kHz	RMS	< ± 2.5	Peak	< ± 2.0
			Joule integral	< ± 3.0	Peak – Peak/√8	< ± 3.0
	100 A ≤ I ≤ 10kA	50Hz - 5kHz	RMS	< ± 2.0	Peak	< ± 1.5
			Joule integral	< ± 2.5	Peak – Peak/√8	< ± 2.5
		> 5kHz	RMS	< ± 2.5	Peak	< ± 2.0
			Joule integral	< ± 3.0	Peak – Peak/√8	< ± 3.0
	10kA ≤ I ≤ 30kA	50Hz - 5kHz	RMS	< ± 3.0	Peak	< ± 2.5
			Joule integral	< ± 3.5	Peak – Peak/√8	< ± 3.5
		> 5kHz	RMS	< ± 3.5	Peak	< ± 3.0
			Joule integral	< ± 4.0	Peak – Peak/√8	< ± 3.5
Resistance R bridge, multimeter	20 μΩ ≤ R ≤ 600 μΩ		< ± 5 %			
	0.6 mΩ ≤ R ≤ 600 mΩ		< ± 3 %			
	0.6 Ω ≤ R ≤ 100 MΩ		< ± 1 %			
Frequency f oscilloscope, recorder TR	≤ 10 kHz		< ± 0.2 %			
	10 kHz ≤ f ≤ 1 MHz		< ± 0.5 %			
Time t oscilloscope, recorder TR	≤ 1 μs		< ± 20 %			
	1 μs ≤ t ≤ 1 ms		< ± 10 %			
	> 1 ms		< ± 1ms			
Temperature T thermocouples	-50 °C ≤ t ≤ 100 °C		< ± 0.2°C - thermometer			
	-100 °C ≤ t ≤ 200 °C		< ± 0.8 °C - thermocouples K, recorder			
Relative humidity	20 % do 90% RH		< ± 5 % RH			
Linear dimension	1 mm ≤ l ≤ 30 mm		< ± 0.1 mm			
	> 30 mm		< ± 5 %			
Atmospheric pressure			< ± 0.01 MPa			

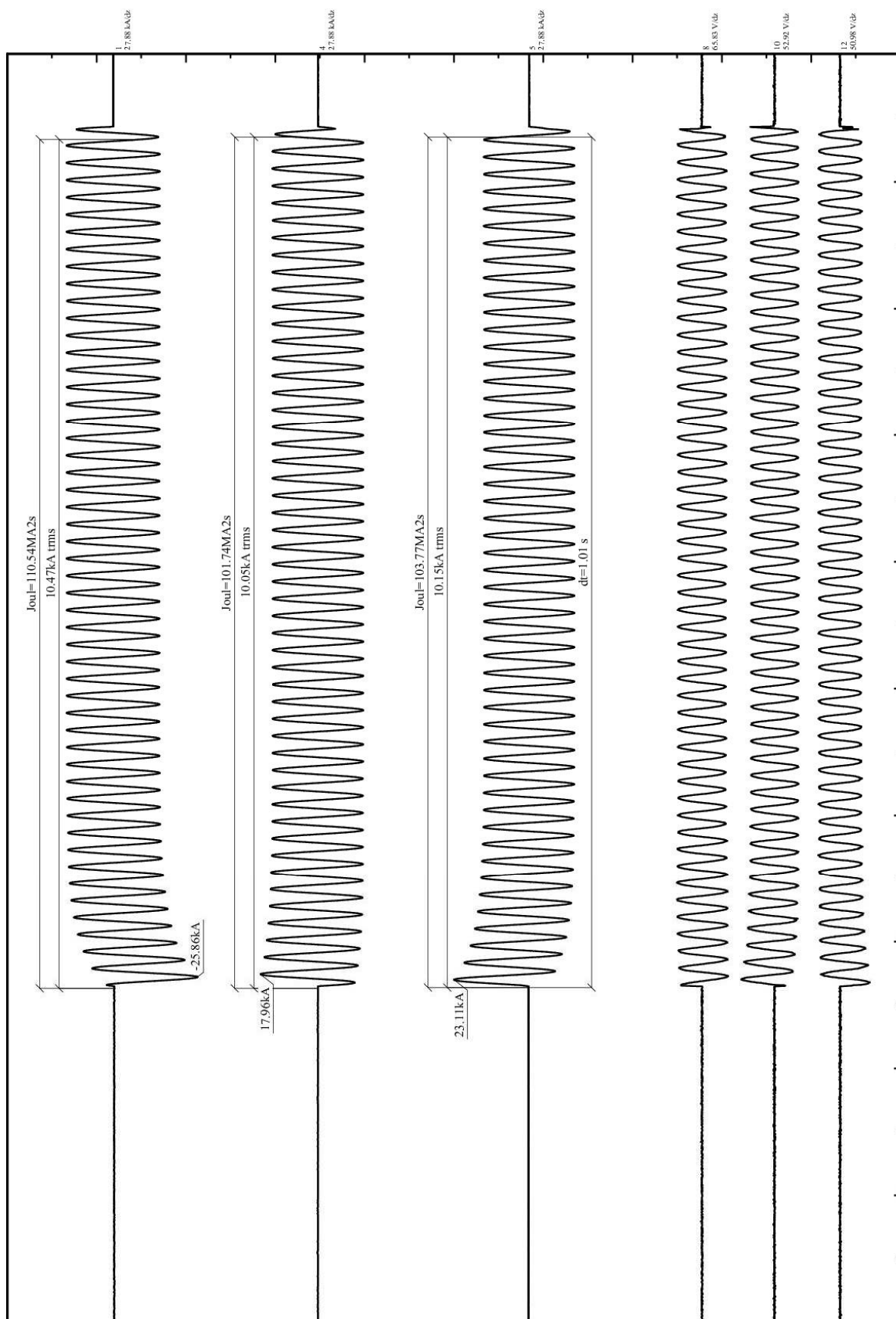
9. Oscillograms of short-circuit withstand tests



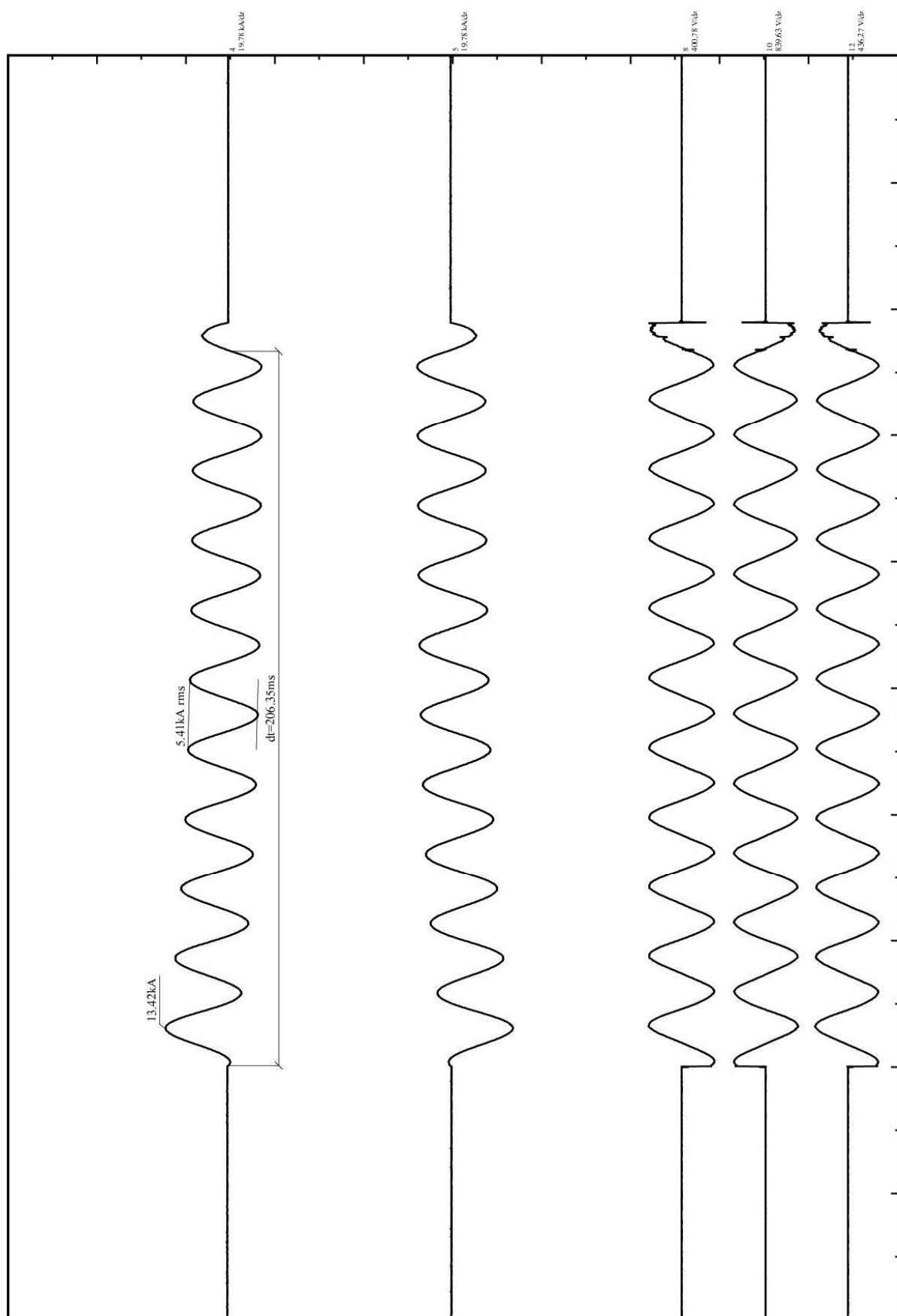
Cable distribution cabinet OKJK K3K 630A
Calibration

Data: 2016-12-22 12:12:01 Oscylogram Nr: 1449

LABORATORIUM BADAWCZE
APARATURY ROZDZIELCZEJ
WARSZAWA



Cable distribution cabinet OKIK K3K 630A
Main circuit



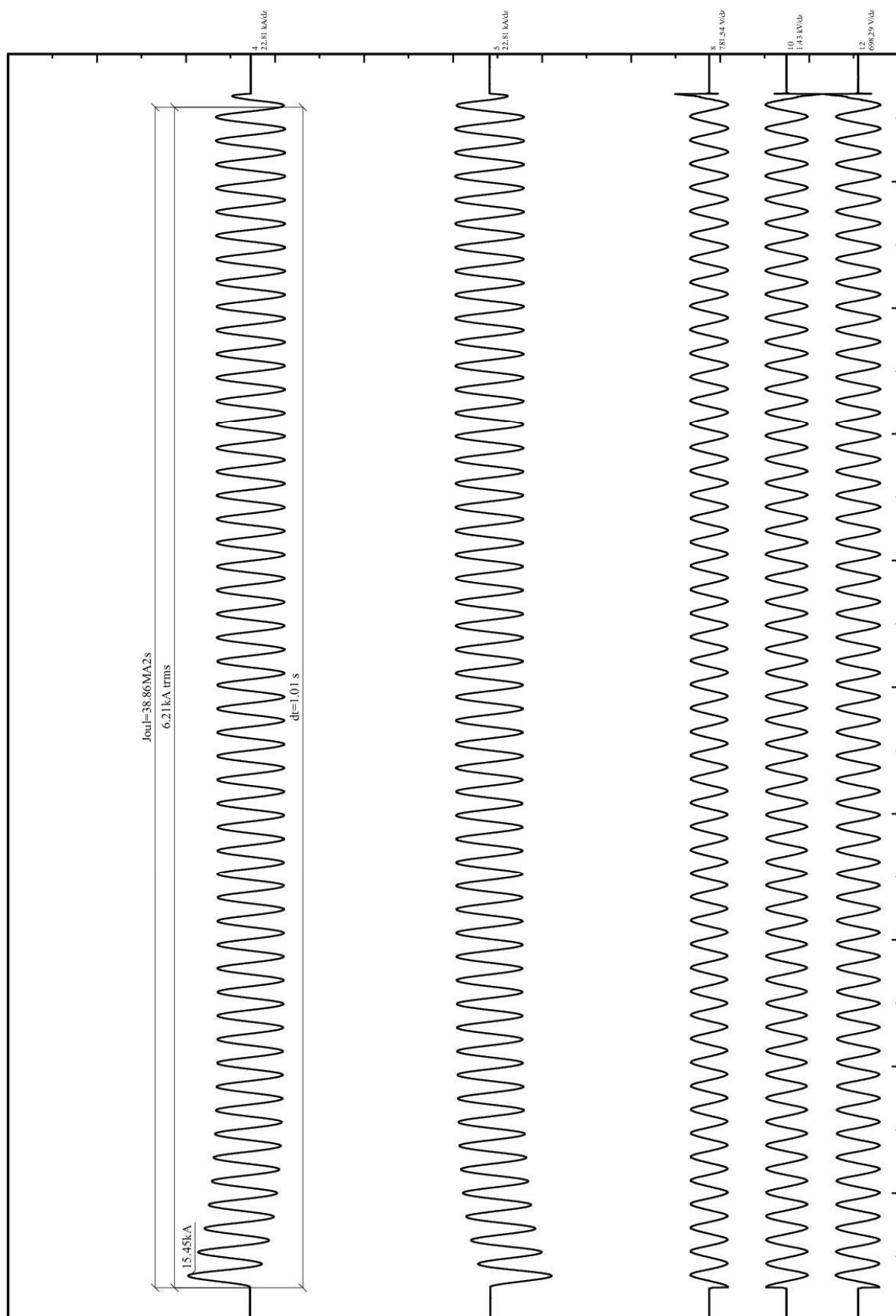
Cable distribution cabinet OK/K K3K 630A
Calibration - PEN circuit

36.47 ms/dz

Data: 2016-12-22 13:13:20 Oscylogram Nr: 1455

LABORATORIUM BADAWCZE
APARATURY ROZDZIELCZEJ
W A R S Z A W A





Cable distribution cabinet OKJK K3K 630A
PEN circuit

107.80 ms/div

Oscylogram Nr: 1458

Data: 2016-12-22 13:24:33

10. Photos



Photo 3 – Verification of lifting (Sample 2)



Photo 4 – Verification of resistance to static load (Sample 2)



Photo 5 – Verification of resistance to shock load (Sample 2)



Photo 6 – Verification of resistance to torsional stress (Sample 2)



Photo 7 – Verification of impact force withstand (Sample 2)



Photo 8 – Verification of resistance to mechanical shock impacts induced by sharp-edged objects (Sample 2)



Photo 9– Test of mechanical strength of a base intended to be embedded in the ground

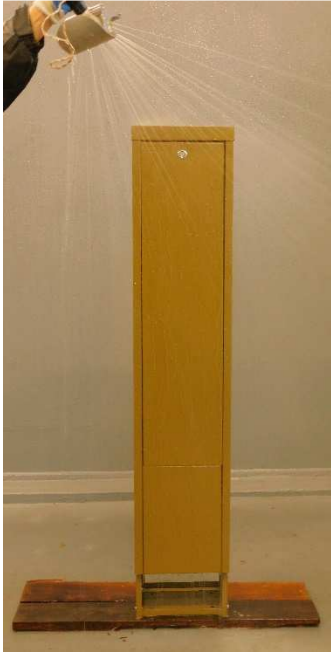


Photo 10 – Verification of degree of protection IPX4 (Sample 1)



Photo 11 – Verification of degree of protection IPX4 (Sample 2)



Sample 1



Sample 2

Photo 12 – Verification of temperature-rise limits



Photo 13 – Verification of temperature-rise limits of Sample 2 (after test)



Before test



After test

Photo 14 – Verification of short-circuit withstand strength of busbars L1, L2, L3 (Sample 2)



Photo 15 – Verification of short-circuit withstand strength of PEN busbar (Sample 2 before test)



Photo 16 – Verification of short-circuit withstand strength of PEN busbar (Sample 2 after test)

ANNEX 1

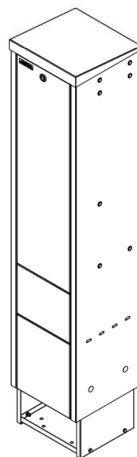
PRODUCT DATA SHEETS

Product data sheet



Cable distribution cabinet

OKKJK 400A 2x160+PBS2-2V



Nominal voltage, U_n	500 V
Nominal current, I_{nA}	400 A
Frequency	50 Hz
Operating temperature range	-25°C to +40°C
Maximum environmental humidity	100%
Degree of protection	IP34D
Height	1400 (1100)* mm
Width	308 mm
Depth	308 mm
Weight (bruto)	46 kg

* Height above ground level

General description

Cable distribution cabinet OKKJK is designed for power distribution and protection from short circuit. This public electricity network assembly is produced according to EN 61439 part 1 and part 5. Enclosure is made of galvanised steel sheet DX51D Z275 with thickness 1,5 mm. Enclosure is coated with polymer powder coating. Coating is suitable for environment according C4, EN 12944-2:2012. Color of coating RAL7008 or other according to RAL pallette.

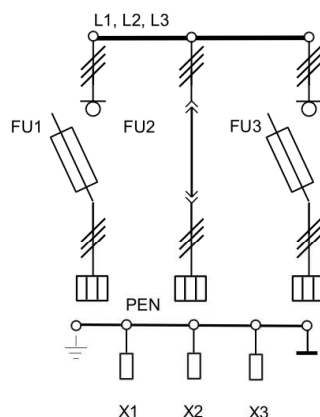


Fig. 1 Electrical diagram

Diagram element designation

Table 1.

	Name	Notes
FU1; FU3	Fuse switch	NH-00
FU2	Fuse rail with solid links	NH-2 with "V" clamps for double cable connection
L1, L2, L3	Busbars	Copper busbar for I_{nA} 400A
PEN	PEN busbar	Copper busbar
X1-X4	Clamps	"V" clamps for cable connection

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Product data sheet



Cable distribution cabinet

OKKJK 400A 2x160+PBS2-2V

Mounting and exploitation

Cable distribution cabinet **OKKJK** is designed to be imbedded in ground. Electrical installation and connection allowed to perform installation service provider, who have a licence to assemble electrical equipment with voltage up to 1000V. Enclosures must be installed leveled in all dimensions. Before connecting connecting to network it is necessary to check all contacts and connections, if necessary tighten contacts with appropriate torque.

Enclosure is designed to operate under normal environmental conditions. Enclosures optimal mode of operation is intended to it's load from 15% to 100% of the nominal current. In other modes and in some cases it is a slight allowance of condensation on enclosure inner walls that do not affect installed hardware and installations operation. Enclosures lifetime is 25 years, considering to the operating rules, operating mode and environmental conditions.

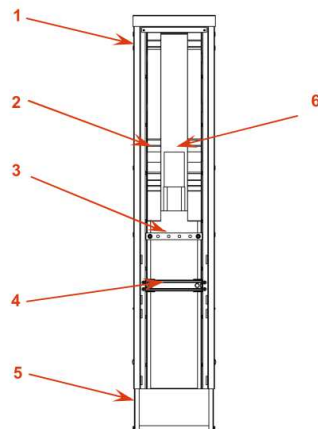


Fig. 2 Hardware and element layout

Hardware and element designation

Table 2.

	Name	Notes
1	Enclosure	Doors (cover) removed
2	Fuse switches	Size NH-00
3	PEN busbar	Copper busbar with "V" clamps for cables
4	Cable holder rail	C30 acc. to EN 60715
5	Extendable base	
6	Fuse rail with solid links	Size NH-2 with "V" clamps for double cable connection

Cable distribution cabinets assembly

Cabinet consists of enclosure, busbars, fuse switches, fuse rail with solid links and clamps for cable connection. Any accessories, if necessary, should be ordered separately.

Warranty

Components which has been installed by JSC "JAUDA", is provided with a 24-month warranty. Enclosure have life expectancy at least 25 years. Warranty will take effect from delivery to customer (date on a bill of lading).

Warranty does not cover damage or failures resulting from the following action :

- operation which is not in accordance with the operating instructions;
- user negligence, improper use of distributor or deliberate damage;
- unauthorized alteration, repair or testing, unauthorized use of components or separate enclosures distributor components (components) merger or joining a manner that is contrary to the manufacturer's instructions;
- force majeure.

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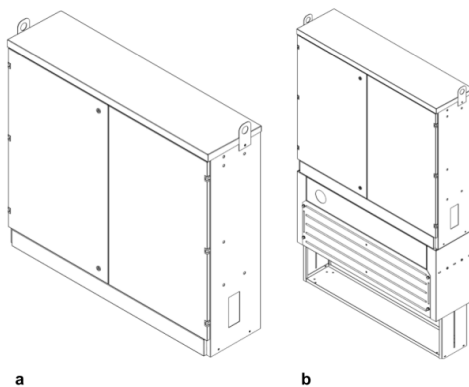


Product data sheet



Cable distribution cabinet

OKJK K3K



Nominal voltage, Un	500 V
Nominal current, In	630 A
Frequency	50 Hz
Operating temperature range	-25°C to + 40°C
Maximum enviromental humidity	100%
Degree of protection	IP34D
Degree of protection for busbar system	IP20
Height	1200* mm
Width	1350 mm
Depth	360 mm
Weight (bruto)	118 kg

* Height without base. Base overground height 200mm

Fig. 1 Cable distribution cabinet: a– cabinet; b– cabinet on base

General description

Cable distribution cabinet OKJK is designed for power distribution and protection from short circuit. This public electricity network assembly is produced according to EN 61439 part 1 and part 5. Enclosure is made of galvanised steel sheet DX51D Z275 with thickness 2 mm. Enclosure is coated with polymer powder coating. Coating is suitable for environment according C4, EN 12944-2:2012. Color of coating RAL7037 or other according to RAL pallette.

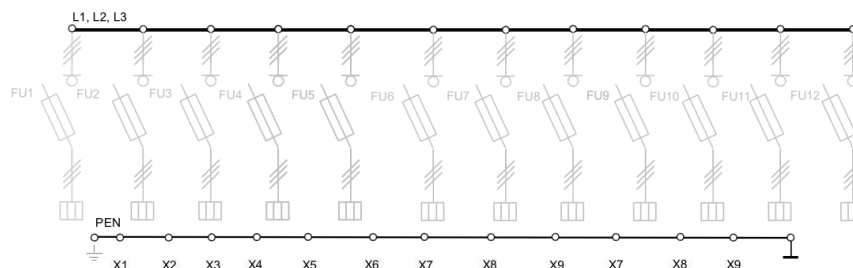


Fig. 1 Electrical diagram

Diagram element designation

Table 1.

	Name	Notes
FU1-FU12	Fuse switch	Space for NH-00*, NH-2, NH-3 Fuse switch
L1, L2, L3	Tined aluminum busbars	Busbars with IP20 covers
PEN	PEN busbar	Copper busbar
X1-X12	PEN connection	For fuse switch NH-2 or NH-3

* 2 pieces per one NH-2/NH-3 space (not shown at diagram)

Product data sheet



Cable distribution cabinet

OKJK K3K

Mounting and exploitation

Cable distribution cabinet **OKJK** is designed to be mounted on base imbedded in ground. Electrical installation and connection allowed to perform installation service provider, who have a licence to assemble electrical equipment with voltage up to 1000V. Enclosures to the base must be installed leveled in all dimensions. Unused holes must be closed with screws in order to maintain an adequate level of protection. Before connecting connecting to network it is necessary to check all contacts and connections, if necessary tighten contacts with appropriate torque.

Enclosure is designed to operate under normal environmental conditions. Enclosures optimal mode of operation is intended to it's load from 15% to 100% of the nominal current. In other modes and in some cases it is a slight allowance of condensation on enclosure inner walls that do not affect installed hardware and installations operation. Enclosures lifetime of 25 years, considering to the operating rules, operating mode and environmental conditions.

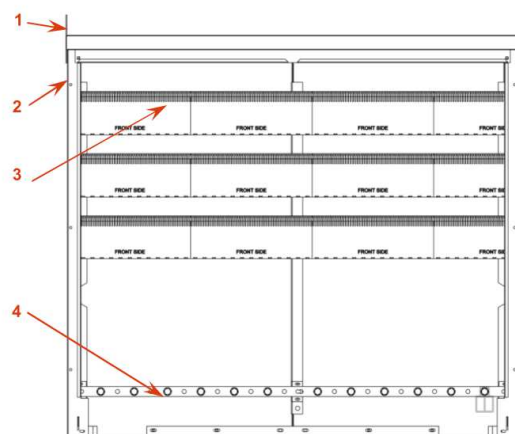


Fig. 2 Hardware and element layout

Hardware and element designation

Table 2.

	Name	Notes
1	Lifting eye	Removable
2	Enclosure	Doors (cover) removed, without base
3	Busbars L1, L2, L3	Tined aluminium busbars for In 630A with IP20 covers
4	PEN busbar	Copper busbar

Cable holder rail is installed in cabinets base

Accessories of enclosure

Table 3.

Cable distribution cabinets assembly

Cabinet consists of enclosure and covered busbar system. Any accessories, if necessary, should be ordered separately.

Designation	Name	Notes
RAL	Different powder coating color	According to RAL pallette
J-OKJK K3	Cabinets base with cable holder rail	Made of galvanised steel sheet DX51D Z275 with thickness 2 mm. Coated with polymer powder coating.

Warranty

Components which has been installed by JSC "JAUDA", is provided with a 24-month warranty. Enclosure have life expectancy at least 25 years. Warranty will take effect from delivery to customer (date on a bill of lading).

Warranty does not cover damage or failures resulting from the following action :

- operation which is not in accordance with the operating instructions;
- user negligence, improper use of distributor or deliberate damage;
- unauthorized alteration, repair or testing, unauthorized use of components or separate enclosures distributor components (components) merger or joining a manner that is contrary to the manufacturer's instructions;
- force majeure.

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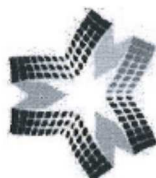


ANNEX 2

TEST REPORTS CONCERNING OF RESISTANCE TO CORROSION

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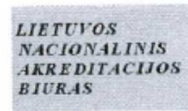


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Tel. 2729492, fax: 2729373, e-mail: leinart@ktl.mii.lt



BANDYMAI
ISO/IEC 17025



Nr. LA.01.083

TEST REPORT No. KBL -9.1/2016,
2016-10-19

1. **CLIENT** (title, address): JSC Jauda, Krustpils str., Riga, LV-1057, Latvia.
2. **SUPPLIER** (title, address): JSC Jauda, Krustpils str., Riga, LV-1057, Latvia.
3. **PRODUCT** (title of manufacturer, product identification): cable distribution cabinets, metal parts for compact substations.
4. **TEST OBJECT** (test object identification): pretreatment - Bonderite M-ZN SP-2500, steel DC01, coated by powder polyester TGIC-free PES GRIGIO BUCC. L. CA RAL 7032 ECO-IND layer thickness 162.92 μm - 9/-/1.1, 9/-/1.3, 9/-/1.4, 9/-/1.5, 9/-/1.6, 9/-/1.7, 9/-/1.17, 9/-/1.18, 9/-/1.19. Steel Dx51D+Z275, layer thickness 133.37 μm - 9/-/3.1, 9/-/3.3, 9/-/3.4, 9/-/3.5, 9/-/3.6, 9/-/3.7, 9/-/3.17, 9/-/3.18, 9/-/3.19. Steel DC01, coated by powder polyester TGIC-free PES VERDE SL. CA RAL 6005 ECO-IND layer thickness 81.13 μm - 9/-/2.1, 9/-/2.3, 9/-/2.4, 9/-/2.5, 9/-/2.6, 9/-/2.7, 9/-/2.17, 9/-/2.18, 9/-/2.19. Steel DX51D+Z275, layer thickness 126.37 μm - 9/-/4.1, 9/-/4.3, 9/-/4.4, 9/-/4.5, 9/-/4.6, 9/-/4.7, 9/-/4.17, 9/-/4.18, 9/-/4.19.
5. **SPECIMENS RECEIPT DATE**: 2016-10-07.
6. **SPECIMENS SELECTION NUMBER OF THE ACT AND THE DATE OF RECEIPT**: -
7. **SPECIMENS DIMENSIONS AND SHAPE**: (150 x100 x1.0) mm in size rectangular details .
8. **CORROSION TESTS PURSUANCE DATE**: October 07, 2016 - October 17, 2016.
9. **TEST** (reference to the standard): LST EN ISO 9227:2012 except 3.2.3, 3.2.4, 5.3, 5.4, 11 f), g) p.p., C and D annexes. Changes in the coating appearance were evaluated visually according to the standards LST EN ISO 4628-2:2016, LST EN ISO 4628-3:2016, LST EN ISO 4628-4:2016, LST EN ISO 4628-5:2016. Assessment of corrosion along the scratch was evaluated according to the standard LST EN ISO 12944-6:2001 annex A (N)*. Assessment of adhesion was evaluated according to the standard LST EN ISO 2409:2013 (N)*.
(N)* - non-accredited test.
10. **FLEXIBLE AREA OF ACCREDITATION**: (reference to the standard): -
11. **DURATION OF THE EXPOSURE TO CORROSIVE ENVIRONMENT**: Duration of test 240 h.
12. **TEST RESULTS**:
Test according LST EN ISO 9227:2012 except 3.2.3, 3.2.4, 5.3, 5.4, 11 f), g) p.p., C and D annexes.



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AKREDITACIJOS
BIURAS

Nr. LA.01.083

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TEST REPORT No. KBL -9.2/2016,
2016-11-11

1. **CLIENT** (title, address): JSC Jauda, Krustpils str., Riga, LV-1057, Latvia.
2. **SUPPLIER** (title, address): JSC Jauda, Krustpils str., Riga, LV-1057, Latvia.
3. **PRODUCT** (title of manufacturer, product identification): cable distribution cabinets, metal parts for compact substations.
4. **TEST OBJECT** (test object identification): steel DC01, pretreatment - Bonderite M-ZN SP-2500 coated by powder polyester TGIC-free PES VERDE SL. CA RAL 6005 ECO-IND layer thickness 81.13 μm - 9/-/2.1, 9/-/2.3, 9/-/2.4, 9/-/2.8, 9/-/2.9, 9/-/2.10, 9/-/2.20, 9/-/2.21, 9/-/2.22, 9/-/2.34, 9/-/2.35, 9/-/2.36.
5. **SPECIMENS RECEIPT DATE**: 2016-10-07.
6. **SPECIMENS SELECTION NUMBER OF THE ACT AND THE DATE OF RECEIPT**: -
7. **SPECIMENS DIMENSIONS AND SHAPE**: (150 x100 x1.0) mm in size rectangular details .
8. **CORROSION TESTS PURSUANCE DATE**: October 07, 2016 - October 27, 2016.
9. **TEST** (reference to the standard): LST EN ISO 9227:2012 except 3.2.3, 3.2.4, 5.3, 5.4, 11 f), g) p.p., C and D annexes. LST EN ISO 6270-1:2003 (N)*. Changes in the coating appearance were evaluated visually according to the standards LST EN ISO 4628-2:2016, LST EN ISO 4628-3:2016, LST EN ISO 4628-4:2016, LST EN ISO 4628-5:2016. Assessment of corrosion along the scratch was evaluated according to the standard LST EN ISO 12944-6:2001 annex A (N)*. Assessment of adhesion was evaluated according to the standard LST EN ISO 2409:2013 (N)*.
(N)* - non-accredited test.
10. **FLEXIBLE AREA OF ACCREDITATION**: (reference to the standard): -
11. **DURATION OF THE EXPOSURE TO CORROSIVE ENVIRONMENT**: Duration of test by the standard LST EN ISO 9227:2012 except 3.2.3, 3.2.4, 5.3, 5.4, 11 f), g) p.p., C and D annexes - 480 h. Duration of test according to LST EN ISO 6270-1:2003 - 240 h.
12. **TEST RESULTS**:
Test according LST EN ISO 9227:2012 except 3.2.3, 3.2.4, 5.3, 5.4, 11 f), g) p.p., C and D annexes.



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Nr. LA.01.083

**TEST REPORT No. KBL -9.3/2016,
2016-11-15**

1. **CLIENT** (title, address): JSC Jauda, Krustpils str., Riga, LV-1057, Latvia.
2. **SUPPLIER** (title, address): JSC Jauda, Krustpils str., Riga, LV-1057, Latvia.
3. **PRODUCT** (title of manufacturer, product identification): cable distribution cabinets, metal parts for compact substations.
4. **TEST OBJECT** (test object identification): pretreatment - Bonderite M-ZN SP-2500, steel DC01, coated by powder polyester TGIC-free PES GRIGIO BUCC. L. CA RAL 7032 ECO-IND layer thickness 162.92 μm - 9/-/1.31, 9/-/1.32, 9/-/1.33. Steel Dx51D+Z275, layer thickness 133.37 μm - 9/-/3.31, 9/-/3.32, 9/-/3.3. Steel DC01, coated by powder polyester TGIC-free PES VERDE SL. CA RAL 6005 ECO-IND layer thickness 81.13 μm - 9/-/2.31, 9/-/2.32, 9/-/2.33. Steel DX51D+Z275, layer thickness 126.37 μm - 9/-/4.31, 9/-/4.32, 9/-/4.33.
5. **SPECIMENS RECEIPT DATE**: 2016-10-07.
6. **SPECIMENS SELECTION NUMBER OF THE ACT AND THE DATE OF RECEIPT**: -
7. **SPECIMENS DIMENSIONS AND SHAPE**: (150 x100 x1.0) mm in size rectangular details.
8. **CORROSION TESTS PURSUANCE DATE**: October 21, 2016 - November 14, 2016.
9. **TEST** (reference to the standard): LVS EN 61439-1:2012 severity test B (IEC 60068-2-30:2005 N*. IEC 60068-2-11:1999 N* \equiv LST EN ISO 9227:2012 except 3.2.3, 3.2.4, 5.3, 5.4, 11 f), g) p.p., C and D annexes). Changes in the coating appearance were evaluated visually according to the standards LST EN ISO 4628-2:2016, LST EN ISO 4628-3:2016, LST EN ISO 4628-4:2016, LST EN ISO 4628-5:2016, LST EN ISO 4628-6:2011.
(N)* - non-accredited test.
10. **FLEXIBLE AREA OF ACCREDITATION**: (reference to the standard): -
11. **DURATION OF THE EXPOSURE TO CORROSIVE ENVIRONMENT**: Duration of test according IEC 60068-2-30 - 240 h, according LST EN ISO 9227:2012 - 336 h.
12. **TEST RESULTS**:
Test according LVS EN 61439-1:2012, severity test B.

Specimen identification marks	Damage evaluation				
	Blistering LST EN ISO 4628-2:2016	Rusting LST EN ISO 4628-3:2016	Cracking LST EN ISO 4628-4:2016	Flaking LST EN ISO 4628-5:2016	Degree of chalking LST EN ISO 4628- 6:2011
9/-/1.31	0	Ri 0	0	0	0
9/-/1.32	0	Ri 0	0	0	0
9/-/1.33	0	Ri 0	0	0	0
9/-/2.31	0	Ri 0	0	0	0
9/-/2.32	0	Ri 0	0	0	0
9/-/2.33	0	Ri 0	0	0	0
9/-/3.31	0	Ri 0	0	0	0
9/-/3.32	0	Ri 0	0	0	0
9/-/3.33	0	Ri 0	0	0	0
9/-/4.31	0	Ri 0	0	0	0
9/-/4.32	0	Ri 0	0	0	0
9/-/4.33	0	Ri 0	0	0	0

13. EXPLANATION OF TEST RESULTS – by LVS EN 61439-1:2012 severity test B (after 240 h according IEC 60068-2-30:2005 and after 336 h of exposition in neutral salt fog according IEC 60068-2-11:1999 = LST EN ISO 9227:2012) damages on samples outer surfaces were not detected.

Definition of abbreviations: 1) LST EN ISO 4628-2:2016 to LST EN ISO 4628-5:2016 and LST EN ISO 4628-6:2011: ratings Ri 0 and 0 - no visible defects.

14. OTHER INFORMATION

These test results are related only to the specific tested specimens, which were supplied by the Client. Any parts of the Test Report shall not be copied.

15. CONDITIONS OF THE TEST PERFORMED:

TYPE OF CHAMBER OF HUMIDITY: Memmert HCP-108.

TYPE AND PURITY OF THE REAGENTS USED: NaCl purity 99,9 %.

TYPE AND PURITY OF THE WATER USED: deionized water with the conductivity of (11.9-13.8) $\mu\text{S}/\text{cm}$.

PREPARATION OF THE TEST SPECIMEN (including any cleaning treatment applied any protection given to edges or other special areas): -.

NUMBER OF SPECIMENS UNDER INVESTIGATION: 13, 1 sample was used as reference.

PREPARATION OF THE SPECIMENS (after the test) PRIOR TO THE EVALUATION: specimens were washed with running deionized water and dried at room temperature.

SPECIMENS INCLINATION ANGLE: 20°.

NUMBER AND FREQUENCY OF CHANGES IN LOCATION OF TESTED SPECIMENS: the location of specimens was not changed during the tests.

DURATION OF INTERMEDIATE EXAMINATION: 35 minutes in total.

PROPERTIES OF STANDARD SPECIMENS ENCLOSED INTO THE CHAMBER: 1 mm thick plates (150x70) mm in size made from CR4 steel were used.



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CORROSION RATE OF STANDARD SPECIMENS (mass decrease, g/m²): 65.36 g/m².

TEST TEMPERATURE: (35±2) °C .

VOLUME OF THE SOLUTION COLLECTED: (32-34) ml per 24 hours.

TEST SOLUTION pH: 6.36-6.51.

pH OF THE SOLUTION COLLECTED: 6.60-6.75.

NACl CONCENTRATION IN THE SOLUTION COLLECTED: 50.09 g/l.

TEST METHOD ABNORMALITIES: were absent.

INTERVALS OF INSPECTION: -.

SAMPLE INSPECTION ABNORMALITIES: -.

ILLUMINATION DURING SAMPLE INSPECTION, Lx: 970.

MAGNIFICATION DURING SAMPLE INSPECTION: 10 times.

CHARACTERISTICS OF ANCILLARY SUBSTANCES USED IN THE TEST: ancillary substances were not used

Test was performed by:

Scientific researcher

Dalia Bučinskienė

Head of the Laboratory

Konstantinas Leinartas



STATE RESEARCH INSTITUTE CENTER FOR
PHYSICAL SCIENCES AND TECHNOLOGY
INSTITUTE OF CHEMISTRY
CORROSION TESTING LABORATORY

Akademijos 7, LT-08412 Vilnius
Tel. 2729492, fax: 2729373, e-mail: leinart@ktl.mii.lt



BANDYMAI
ISO/IEC 17025

LIETUVOS
NACIONALINIS
AKREDITACIJOS
BIURAS

Nr. LA.01.083

Copy No. 2

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TEST REPORT No. KBL -9.4/2016,
2016-11-11

1. **CLIENT** (title, address): JSC Jauda, Krustpils str., Riga, LV-1057, Latvia.
2. **SUPPLIER** (title, address): JSC Jauda, Krustpils str., Riga, LV-1057, Latvia.
3. **PRODUCT** (title of manufacturer, product identification): cable distribution cabinets, metal parts for compact substations.
4. **TEST OBJECT** (test object identification): Steel DX51D+Z275, pretreatment - Bonderite M-ZN SP-2500, coated by powder polyester TGIC-free PES GRIGIO BUCC. L. CA RAL 7032 ECO-IND layer thickness 133.37 μm - 9/-/3.1, 9/-/3.3, 9/-/3.4, 9/-/3.11, 9/-/3.12, 9/-/3.13, 9/-/3.23, 9/-/3.24, 9/-/3.25, 9/-/3.34, 9/-/3.35, 9/-/3.36. Coated by powder polyester TGIC-free PES VERDE SL. CA RAL 6005 ECO-IND, layer thickness 126.37 μm - 9/-/4.1, 9/-/4.3, 9/-/4.4, 9/-/4.11, 9/-/4.12, 9/-/4.13, 9/-/4.23, 9/-/4.24, 9/-/4.25, 9/-/4.34, 9/-/4.35, 9/-/4.36.
5. **SPECIMENS RECEIPT DATE**: 2016-10-07.
6. **SPECIMENS SELECTION NUMBER OF THE ACT AND THE DATE OF RECEIPT**: -
7. **SPECIMENS DIMENSIONS AND SHAPE**: (150 x 100 x 1.0) mm in size rectangular details.
8. **CORROSION TESTS PURSUANCE DATE**: October 07, 2016 - November 06, 2016.
9. **TEST** (reference to the standard): LST EN ISO 9227:2012 except 3.2.3, 3.2.4, 5.3, 5.4, 11 f), g) p.p., C and D annexes. LST EN ISO 6270-1:2003 (N)*. Changes in the coating appearance were evaluated visually according to the standards LST EN ISO 4628-2:2016, LST EN ISO 4628-3:2016, LST EN ISO 4628-4:2016, LST EN ISO 4628-5:2016. Assessment of corrosion along the scratch was evaluated according to the standard LST EN ISO 12944-6:2001 annex A (N)*. Assessment of adhesion was evaluated according to the standard LST EN ISO 2409:2013 (N)*.
(N)* - non-accredited test.
10. **FLEXIBLE AREA OF ACCREDITATION**: (reference to the standard): -
11. **DURATION OF THE EXPOSURE TO CORROSIVE ENVIRONMENT**: Duration of test by the standard LST EN ISO 9227:2012 except 3.2.3, 3.2.4, 5.3, 5.4, 11 f), g) p.p., C and D annexes - 720 h. Duration of test according to LST EN ISO 6270-1:2003 - 480 h.
12. **TEST RESULTS**:
Test according LST EN ISO 9227:2012 except 3.2.3, 3.2.4, 5.3, 5.4, 11 f), g) p.p., C and D annexes.



ANNEX 3

EC CONFORMITY DECLARATION

EG-Konformitätserklärung
EC Conformity DeclarationDok.-Nr. L_98_01
Doc. No.

Hersteller, Anschrift Manufacturer, Address	Jean Müller GmbH Elektrotechnische Fabrik H.J.-Müller-Straße 7, D-65343 Eltville am Rhein
Produktbezeichnung Product designation	NH-Sicherungslastschaltleisten Baureihe SL, für Schalttafeleinbau und Schalttafel Aufbau inklusive Zubehör. LV HRC Strip type fuse switch disconnectors, series SL and accessories, for panel board building. DIN-Size 00 (160A): SL00-3x3/100/; SL00-3x(3); SL00-3x/400A DIN-Size 1 to 3 (250A/400A/630A):SL123-3x(3) DIN-Size 3: SL3-3x(3)/1000A (NH-Trennleiste) (LV HRC Busbar disconnect strip 1-and 3 pole switchable) DIN-Size 3: SL3-3x2/1.250A or 1.600A DIN-Size 3: SL3-3x(3)/910A DIN-Size 3: SL3-3X6/2.000A DIN-Size 3: SLT3-3SRSL/3x(3)/50 (NH-Stromschienen-Trennleiste) (busbar disconnect strip)

Jahr der Anbringung der CE-Kennzeichnung : 1998

Affixing of the CE marking

Das bezeichnete Produkt stimmt mit den Vorschriften folgender EG-Richtlinie/n überein:

The designated product conforms to the provisions of the following European directives

2006/95/EG

Richtlinie des Rates vom 12. Dezember 2006 zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten betreffen elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen.

Directive of the European Parliament and of the council of 12. December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

Die Übereinstimmung des bezeichneten Produktes mit den Vorschriften der oben genannten Richtlinie/n wird nachgewiesen durch die Einhaltung folgender Normen:

The conformity of the designated product with the provisions of the above mentioned Directives is proved by full compliance with the following standards

Europäische Normen Harmonized European standards	EN 60947-3
IEC-Standards IEC standards	
Nationale Normen National standards	VDE 0660 Teil 107

Aussteller / Issuer	G / QM
Ort, Datum / Place, Date	Eltville, den 16. Jan. 2008

Rechtsverb. Unterschriften
Legally binding signature

Dr. B. Müller

i.V. A. Göttert

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Mitgelieferte Sicherheitshinweise sind zu beachten.

This declaration certifies compliance with the indicated directives but implies no warranty of properties. The safety instructions of the accompanying product documentation shall be observed.



ANNEX 4

MANUFACTURE'S CONFIRMATION for Bus bar supports type SH 100/185

Herstellerbestätigung Manufacturer's Confirmation		JEAN MÜLLER <small>THE NAME FOR SAFETY</small>
		Blatt : 1 von 1 Datum : 15.07.11 Zeichen : qs/va
Kunde Customer	: To whom it may concern	
Hersteller Manufacturer	: Jean Müller GmbH Elektrotechnische Fabrik H.-J.-Müller-Str. 7, D-65343 Eltville	
Produktbezeichnung Product designation	: Bus bar supports	
Typ Type	: SH100/185	

Based on the below attached test report and the graph we herewith confirm that the abovementioned bus bar supports are suitable for a short time withstand current capacity I_{cw} of 50kA/1sec with the supports mounting distance of 350mm in combination with the bus bars size of 40mmx10mm cross-sectional area.

Das oben genannte Produkt erfüllt die Bau- und Prüfvorschriften der nachfolgend aufgeführten Normen und Vorschriften.
The above mentioned product(s) fulfils the requirements of the following standards / specifications.

Europäische Normen / EC Standards : EN 60439-1
IEC-Standards / IEC-Standards : IEC 60439-1
VDE-Vorschriften / VDE-Specifications :
ISO-Vorschriften / ISO-Standards :

Aussteller / Issuer : QS
Ort, Datum / Place, Date : Eltville/ 15-07-2011

Unterschriften/Signatures :

I. V. W. Rinkel
Manager Key Account

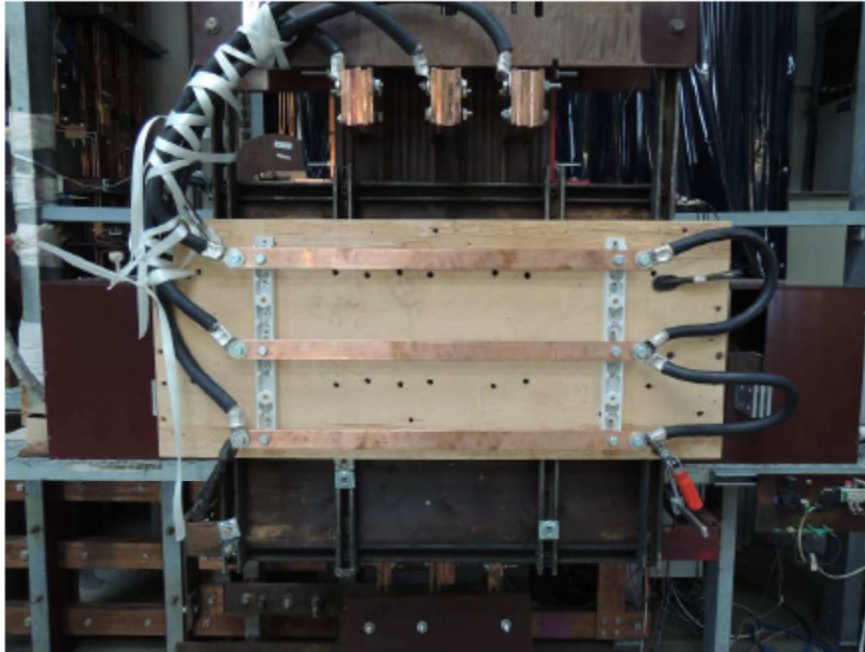
I. A. T. Kurumthottikal
Technical Support

15-AA-QM-002_F04_Herstellerbestätigung 1

Documentation Of Measured Values IEC/EN 61439-1 and IEC/EN 61439-2 Low-voltage switchgear and controlgear assemblies	
Report	
Reference No.	2.03.02447.1.0/SST SH100/185 – S8900003
Tested by (+ signature)	H.Rahelb
Date of issue	15.02.2016 (Tested at 04.06. 2014)
Contents	3 pages
This report is based on a blank test report that was prepared by KEMA using information obtained from the TRF originator (see below).	
Testing laboratory	
Name	AIT Austrian Institute of Technology GmbH
Address	A-1210 Wien, Giefinggasse 2
Testing location	A-1210 Wien, Giefinggasse 2
Client	
Name	Jean Müller GmbH
Address	D-65343 Eltville, H.J.- Müller-Straße 7
Test specification	
Standard	IEC 61439-1 Ed. 2.0:2011 / EN 61439-1:2011 IEC 61439-2 Ed. 2.0:2011 / EN 61439-2:2011
Test procedure	CB / CCA
Procedure deviation	N.A.
Non-standard test method	N.A.
Test Report Form/blank test report	
Test Report Form No.	IEC61439_2B
TRF originator.	DEKRA Certification B.V.
Master TRF	Dated 2011-07
Copyright © 2012 Worldwide System for Conformity Testing and Certification of Electrotechnical Equipment and Components (IECEE), Geneva, Switzerland. All rights reserved..	
Test item	
Description	Busbar support SH100/185 – S8900003
Trademark	Jean Müller
Model and/or type reference	SH100/185 (Article no. S8900003)
Manufacturer	Jean Müller GmbH
Rating(s)	-

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IEC/EN 61439-1; IEC/EN 61429-2			
Clause	Requirement - Test	Result - Remark	Verdict



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IEC/EN 61439-1; IEC/EN 61429-2			
Clause	Requirement - Test	Result - Remark	Verdict

	SHORT-TIME WITHSTAND STRENGTH		
	Test sample 1, Short-circuit withstand strength L1-L2-L3		
	Rated short-time withstand current I_{cw}	25kA / 1s	P
	- test voltage (V) (1,05 U_e)	L1: 426 L2: 427 L3: 425	—
	- r.m.s. test current (A)	L1: 25210 L2: 25880 L3: 25020	—
	- peak test current (A)	L1: 39170 L2: 48380 L3: 52730	—
	- power factor	0,21	—
	factor n	2,10	—
	test duration (ms)	1015	—
	Behaviour of the equipment during the test		P
	Conditions of the equipment after the test		P