

4. List of measuring instruments used

Multimeter Agilent type U1251A	reg. No. TW47310009
DC power source	reg. No. 0209A9016
Measuring current transformer 3150/5A	reg. No. 2496/94
Measuring current transformer 3150/5A	reg. No. 2497/94
Measuring current transformer 3150/5A	reg. No. 2498/94
Unit of measure 1-30 DT 605 A	reg. No. 164200343
Unit of measure 31-60 DT 605 B	reg. No. 164200360
Measuring device for Temperature, Air humidity and Pressure, Sensorika HTPN 27/350	reg. No. 100290

The measurement uncertainties of the test results reported in this document are the following:

voltage: $\pm 5\%$; current: $\pm 5\%$; time: $\pm 5\%$
atmospheric conditions : temperature: $\pm 2^{\circ}\text{C}\%$, pressure : $\pm 15\text{ hPa}$, humidity : $\pm 10\%$

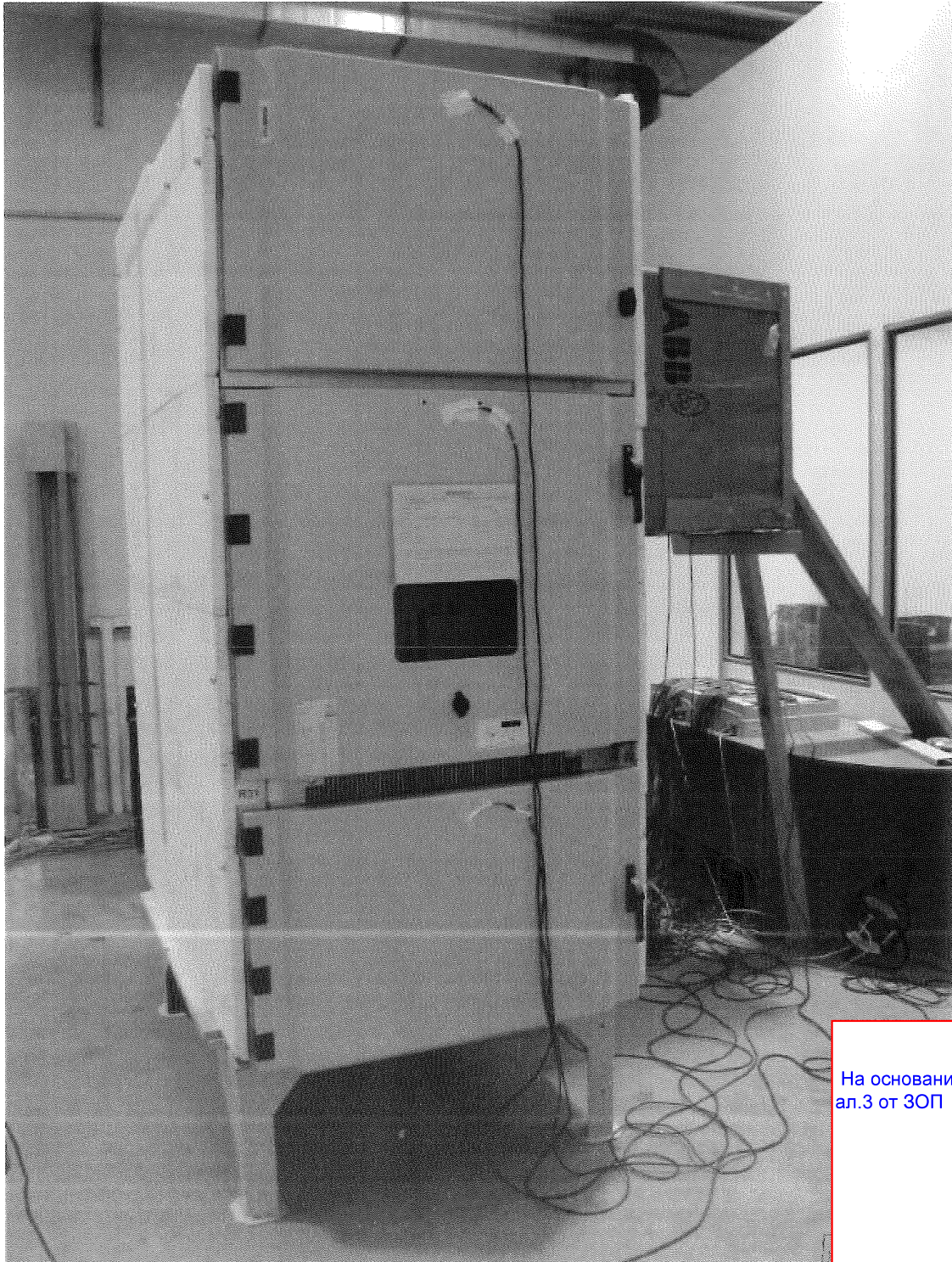
The measurement uncertainties are estimated at the level of twice the standard deviation and have to be considered as maximum values.

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5. Photos of the tested object

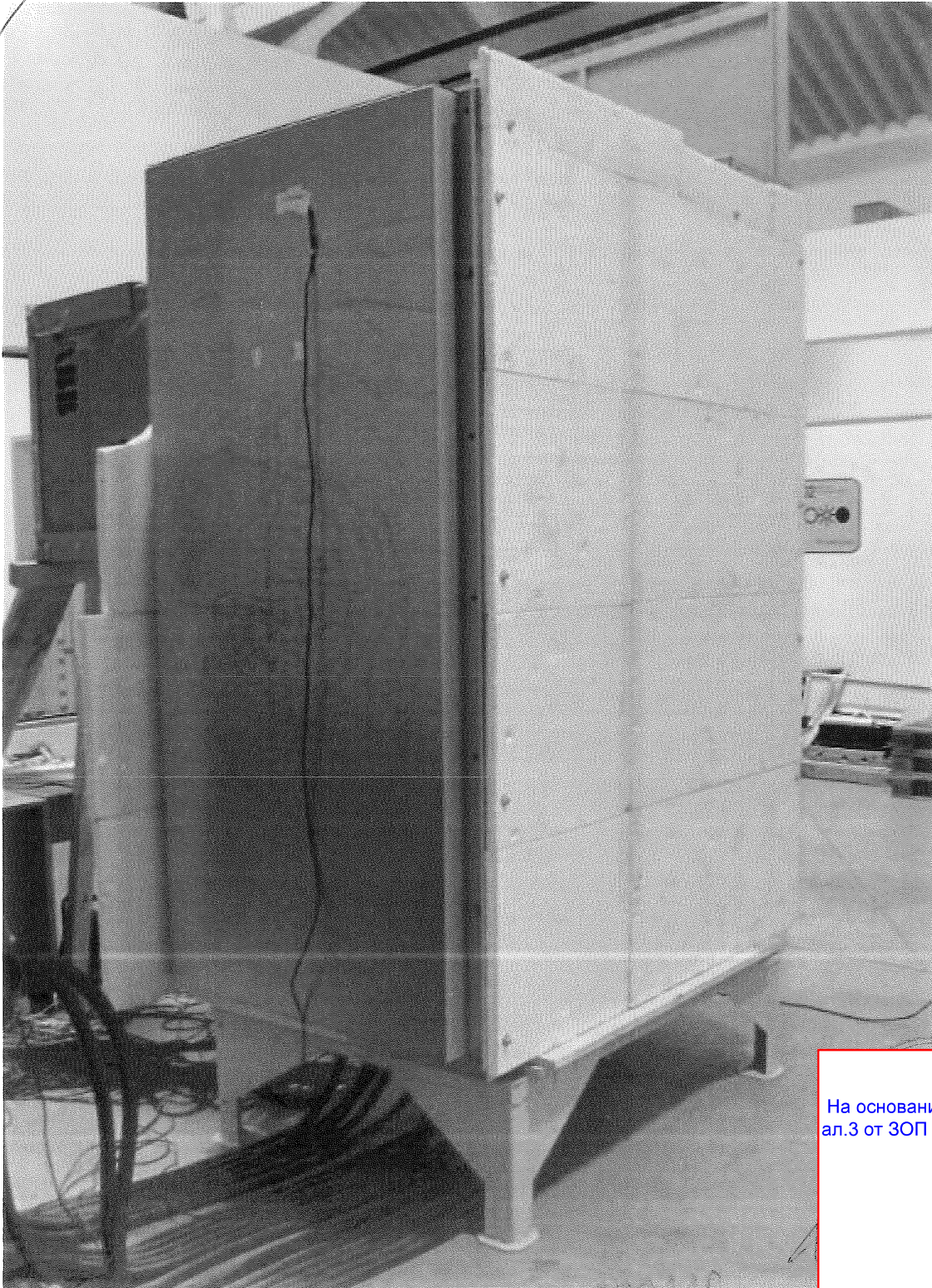
Photo 1: Tested object during temperature rise test - front view



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Photo 2: Tested object during temperature rise test – rear view



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Photo 3: Tested object during temperature rise test – left and right view

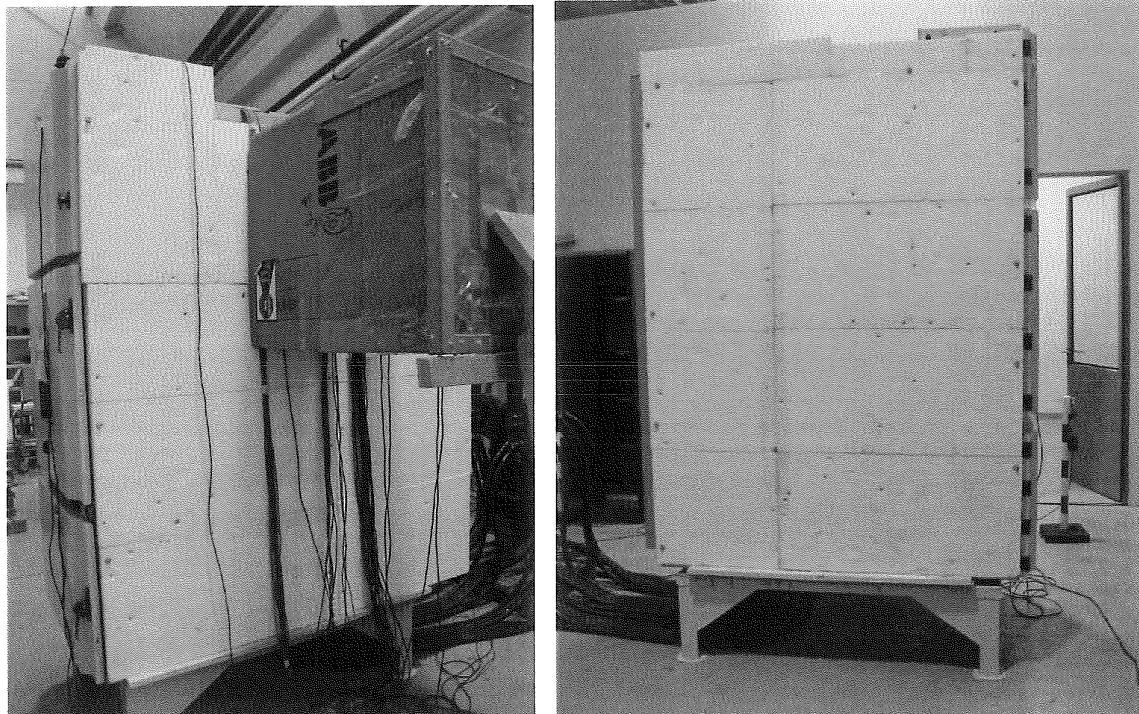
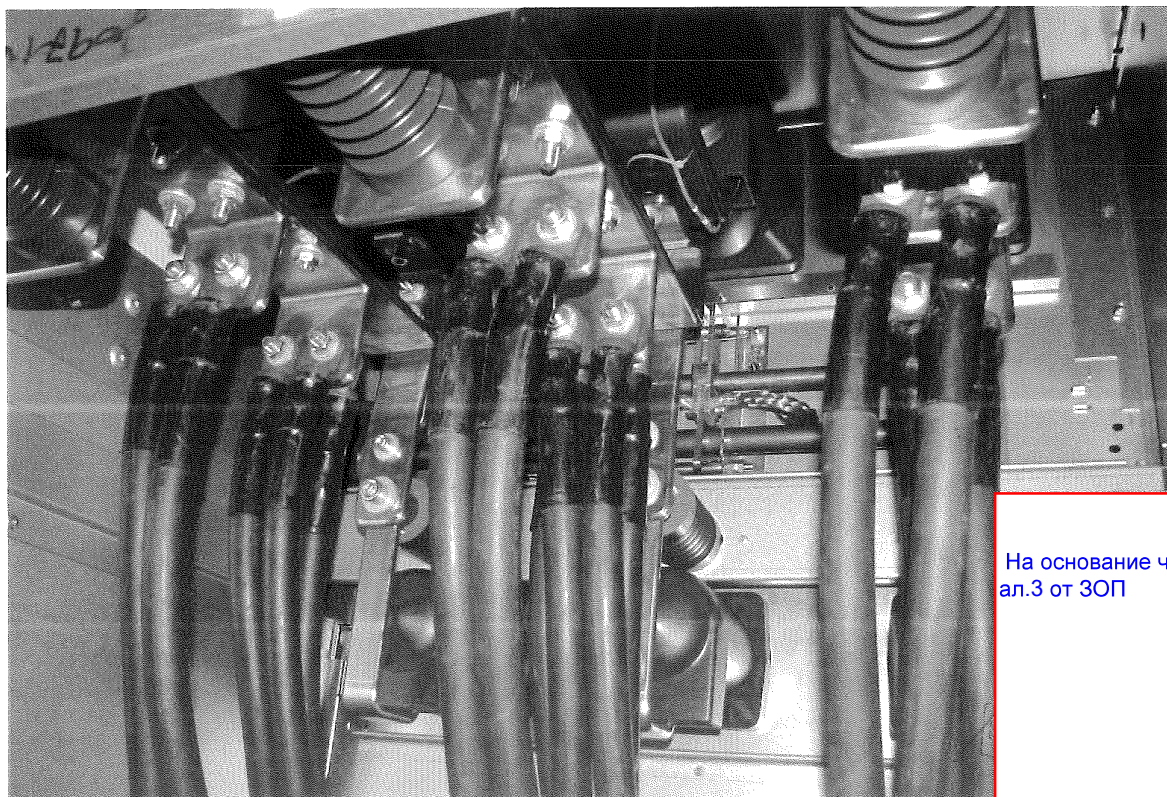


Photo 4: Cable connection



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Photo 5: Circuit breaker

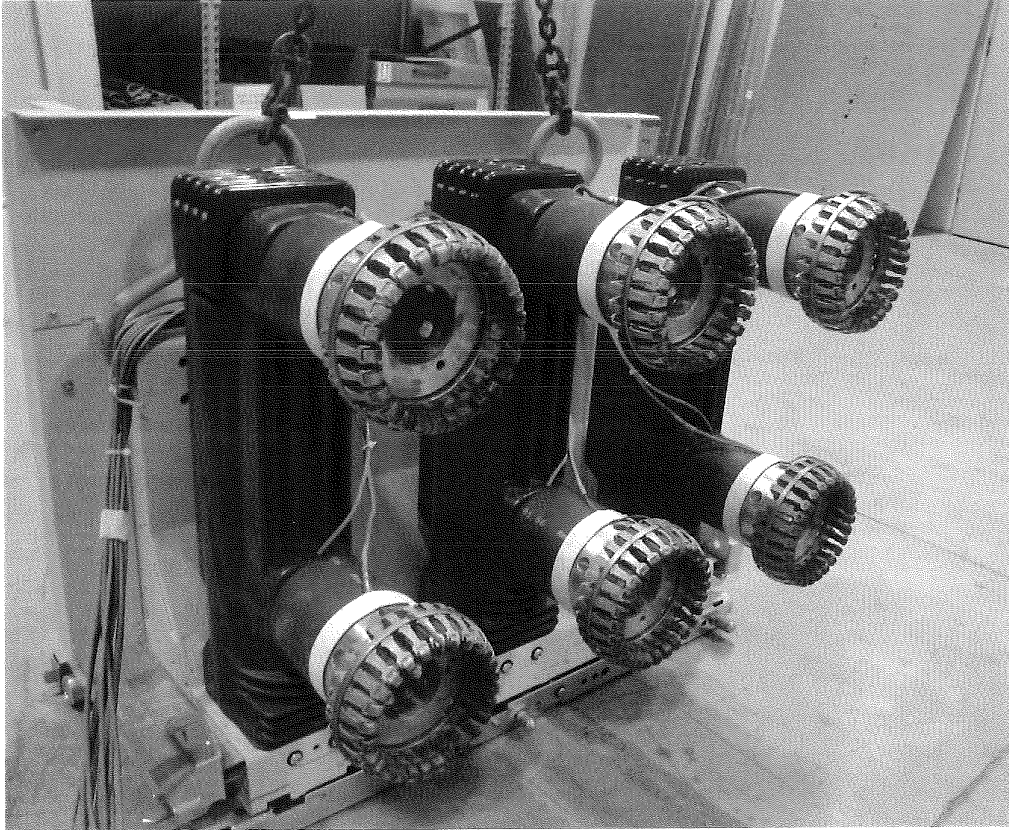
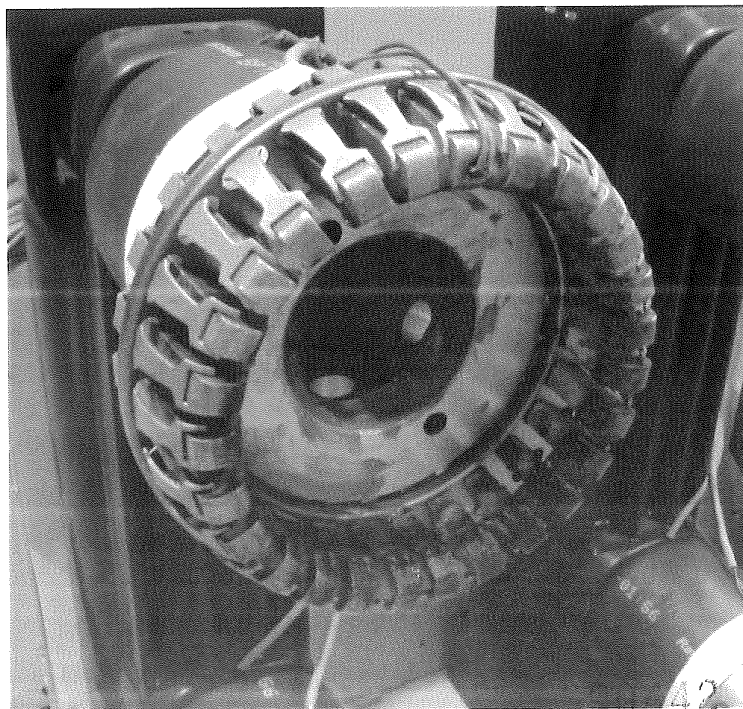


Photo 6: Detail of tulip contact



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PEHLA

GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN
Member of the SHORT-CIRCUIT TESTING LIAISON (STL)

Test Report

Report No.: 08006Ra

Copy No.: 1

Contents: 17 Sheets

Test object: Earthing switch in metal-enclosed, air-insulated switchgear
Designation: EK6 1706-275 in UniGear ZS1, width 1000 mm
Rated voltage: 17.5 kV Rated normal current: - A Rated frequency: 50/60 Hz
Manufacturer: ABB s.r.o., PPMV, Brno, Czech Republic
Client: ABB s.r.o., PPMV, Brno, Czech Republic
under licence of ABB Technology Ltd., Zurich, Switzerland
Testing station: PEHLA-Testing Laboratory Ratingen, Germany
Date of test: 29th January 2008

Applied test specifications:

The tests have been carried out in accordance with client's instructions based on:

IEC 62271-100 / Ed. 1.2 / 2006-10, Clause 6.6

IEC 62271-200 / 1st Ed. / 2003-11, Clause 6.6

IEC 62271-1 / Ed. 1.0 / 2007-10, Clause 6.6

Tests performed:

Type tests 'Short-time withstand current and peak withstand current test of the earthing switch'.
Three-phase short-time withstand current and peak withstand current test of the earthing switch with a peak current of 82.7 kA and a short-time current of 32.4 kA – 1.01 s equivalent to 32.6 kA – 1.00 s at 50 Hz.

No-load operations before and after the tests.

Test results:

The test object passed the tests performed in accordance with the applied test specifications.



Mannheim, 14th February 2008

The test results relate only to the items tested.
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Notes

Accreditation

The PEHLA-Testing Laboratory Ratingen has been approved by the DATech (German accreditation body for technology) according to EN ISO/IEC 17025 for tests in the field of high-voltage switchgear and controlgear and power engineering equipment (Registration-No. DAT-P-032/93-62).

STL-Member

PEHLA is founder member of the SHORT-CIRCUIT TESTING LIAISON (STL) which has been established in 1969. STL is a forum for the international cooperation of the testing organisations with the further full members ASTA (UK), CESI (IT), CPRI (IND), ESEF (FR), KEMA (NL), SATS (NO, SE, FI), STLNA (US, CA) and JSTC (JP). In the framework of EC, STL (EU) has been recognised in 1992 by EOTC as agreement group.

PEHLA-Documents

A Type Test Certificate

is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Document

is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Report

is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients' instructions. Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the test object, and its condition after the tests.

A Test Confirmation

is issued immediately after the tests. It confirms that the tests have been conducted and is valid only until publishing the detailed results in an entire document.

Uncertainty of the measurement systems

The PEHLA - Testing Laboratories apply the PEHLA Guide No. 12 for determining the uncertainties of measurement, based on ENV 13005 (Guide to the expression of uncertainty in measurement). As long as no explicit statements are made, the uncertainties required by the relevant standards have been complied with.

Addresses

Office: PEHLA-Geschäftsstelle
Hallenweg 40
68219 Mannheim
Germany
Internet: www.pehla.com

Testing Station: PEHLA-Testing Laboratory Ratingen
Oberhausener Str. 33
40472 Ratingen
Germany

Manufacturer: ABB s.r.o., PPMV
Org. Unit EJV
Videnska 117
619 00 Brno
Czech Republic

Client: ABB s.r.o., PPMV
Org. Unit EJV
Videnska 117
619 00 Brno
Czech Republic
under licence of
ABB Technology Ltd., Zurich, Switzerland

На основании чл.36а
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List of Test Participants

Representatives of Technical Committee:

Dr. Thomas Ebke PEHLA-Testing Laboratory Ratingen, Germany
Mr. Herbert Feld PEHLA-Testing Laboratory Berlin-Marzahn, Germany

Test Engineer / Test Operator:

Mr. Sebastian Martinek PEHLA-Testing Laboratory Ratingen, Germany
(Test Engineer)
Mr. Frank Idaszek PEHLA-Testing Laboratory Ratingen, Germany
(Measurement)
Mr. Joachim Köhler PEHLA-Testing Laboratory Ratingen, Germany
(Machine Operator)

Representatives of Client:

Mr. Zdenek Otrisal ABB s.r.o., PPMV, Brno, Czech Republic
Mr. Vlastimil Sindler ABB s.r.o., PPMV, Brno, Czech Republic

Further Participants:

Mr. Patrick Jacobs PEHLA-Testing Laboratory Ratingen, Germany

На основание чл.36а
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Technical Data of Test Object Earthing Switch

Test object: Earthing Switch
Designation: EK6 1706-275
Manufacturer: ABB s.r.o., PPMV, Brno, Czech Republic
Serial No.: 1VLA0712149
Year of manufacture: 2008
Serial No. of drive: -
Drawing No.: 1VL1260299A (E12602991)

Ratings assigned by the manufacturer:

Rated voltage	17.5	kV
Rated normal current	-	A
Rated frequency	50 / 60	Hz
Rated lightning impulse withstand voltage	95	kV
Rated switching impulse withstand voltage	-	kV
Rated power-frequency withstand voltage	38	kV
Rated peak withstand current	80 / 82	kA
Rated short-time withstand current	31.5	kA
Rated duration of short-circuit	3	s
Rated short-circuit breaking current	-	kA
DC component of the rated short-circuit breaking current	-	%
Rated short-circuit making current	80 / 82	kA
Rated transient recovery voltage	-	kV
Rate of rise of transient recovery voltage	-	kV/μs
First-pole-to-clear factor	-	
Rated operating sequence	-	
Arc extinguishing medium	-	
Rated filling pressure for interruption	-	MPa abs. at 20 °C
Minimum functional pressure for interruption	-	MPa abs. at 20 °C
Insulating medium	air	
Rated filling pressure for insulation	-	MPa abs. at 20 °C
Minimum functional pressure for insulation	-	MPa abs. at 20 °C
Driving mechanism (type)	spring drive, manual operation	
Number of poles	3	
Number of units per pole	1	
Rated opening time	-	ms
Rated closing time	-	ms
Rated supply voltage of opening device	-	V d.c.
Rated supply voltage of closing device	-	V d.c.
Rated supply voltage of auxiliary circuits	-	V d.c.
Rated frequency of supply voltage	-	Hz
Rated line-charging breaking current	-	A
Rated cable-charging breaking current	-	A

Further data: -

Essential characteristics: -

На основании чл.36а
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Technical Data of Test Object
Switchgear

Test object: Metal-enclosed, air-insulated switchgear
Designation: UniGear ZS1, width 1000 mm
Manufacturer: ABB s.r.o., PPMV, Brno, Czech Republic
Serial No.: 10000 16172 / 2
Year of manufacture: 2008
Drawing No.: 1VL7607240 R0101

Ratings assigned by the manufacturer:

Rated voltage	17.5	kV
Rated normal current	2500	A
Rated frequency	50 / 60	Hz
Rated lightning impulse withstand voltage	95	kV
Rated switching impulse withstand voltage	-	kV
Rated power-frequency withstand voltage	38	kV
Rated peak withstand current	80 / 82	kA
Rated short-time withstand current	31.5	kA
Rated duration of short-circuit	3	s
Insulating medium	air	
Rated filling pressure for insulation	-	MPa abs. at 20 °C
Minimum functional pressure for insulation	-	MPa abs. at 20 °C

Permissible values for internal arc faults:

Peak current	80 / 82	kA
Short-circuit current	31.5	kA
Duration of short-circuit	1	s

Further data: -**Essential characteristics and installed devices: -**

На основании чл.36а
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List of Identified Drawings

The manufacturer has submitted to the testing laboratory drawings and other data containing sufficient information to unambiguously identify by type the essential details and parts of the test object presented for test.

The drawings have been stamped and signed by the manufacturer in order to guarantee that the drawings or data schedules truly represent the test object to be tested.

Further these drawings have been stamped and signed by PEHLA representatives and are kept

at the client.

with the test documents at the test laboratory.

The testing laboratory has checked that drawings and data schedules adequately represent the essential details and parts of the test object to be tested, but is not responsible for the accuracy of the detailed information.

The drawing(s) contained in this document are identical with the checked, stamped and signed drawings.

Drawing No.	Rev.	P/D ^{*)}	Title	Additional remarks
1VL1260299A	-	D	UZEMŇOVAČ	E12602991 used, Included in this test report
E12602991	-	P	UZEMŇOVAČ EK6-ZS1-1706275	-
32608640	-	D	ZEMNÍCÍ KONTAKT	-
3260850A	02	D	NŮŽ UZEMŇOVAČE - ES KNIFE	32608500 used
4262808A	06	D	HŘÍDEL UZEMŇOVAČE - ES SHAFT	-
E4262815A	03	D	SVORNÍK	-
1VL4262824A	001	D	LANO UZEMŇOVACÍ	-
1VL2260318A	001	D	ÚHELNÍK	-
1VL32608420	-	D	PÁKA NAPÍNACÍ	-
32608521	-	D	PLECH UKAZATELE	-
1VL32608540	-	D	PÁKA PŘEKLÁPĚCÍ	-
1VL32608670	-	D	ŠTÍTEK TYPOVÝ	-
42611760	-	D	KROUŽEK STAVĚCÍ	-
1VL42627990	-	D	ROZPĚRKA	-
1VL42628060	-	D	ROZPĚRKA	-
1VL4262807A	-	D	DORAZ	-
1VL4262813A	-	D	ROZPĚRKA	-
1VL42628140	001	D	OBJÍMKA	-
1VL42628170	001	D	ČEP	-
1VL42628190	-	D	PODLOŽKA	-
1VL42628220	003	D	MŮSTEK Cu	-
1CL42628230	001	D	ČEP	-
1VL4262884A	-	D	VEDENÍ SESTAVA	-
1VL4262885	001	D	ČEP	-
4330012	-	D	VÍČKO POJISTNÉ	-
4330017	-	D	PODLOŽKA POJISTNÁ	-
1VL43302570	-	D	ŠTÍTEK I (SPECIÁLNÍ PROVEDENÍ)	-
1VL43302580	-	D	ŠTÍTEK O (SPECIÁLNÍ PROVEDENÍ)	-

*) P: Parts list, D: Drawing

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List of Identified Drawings (2)

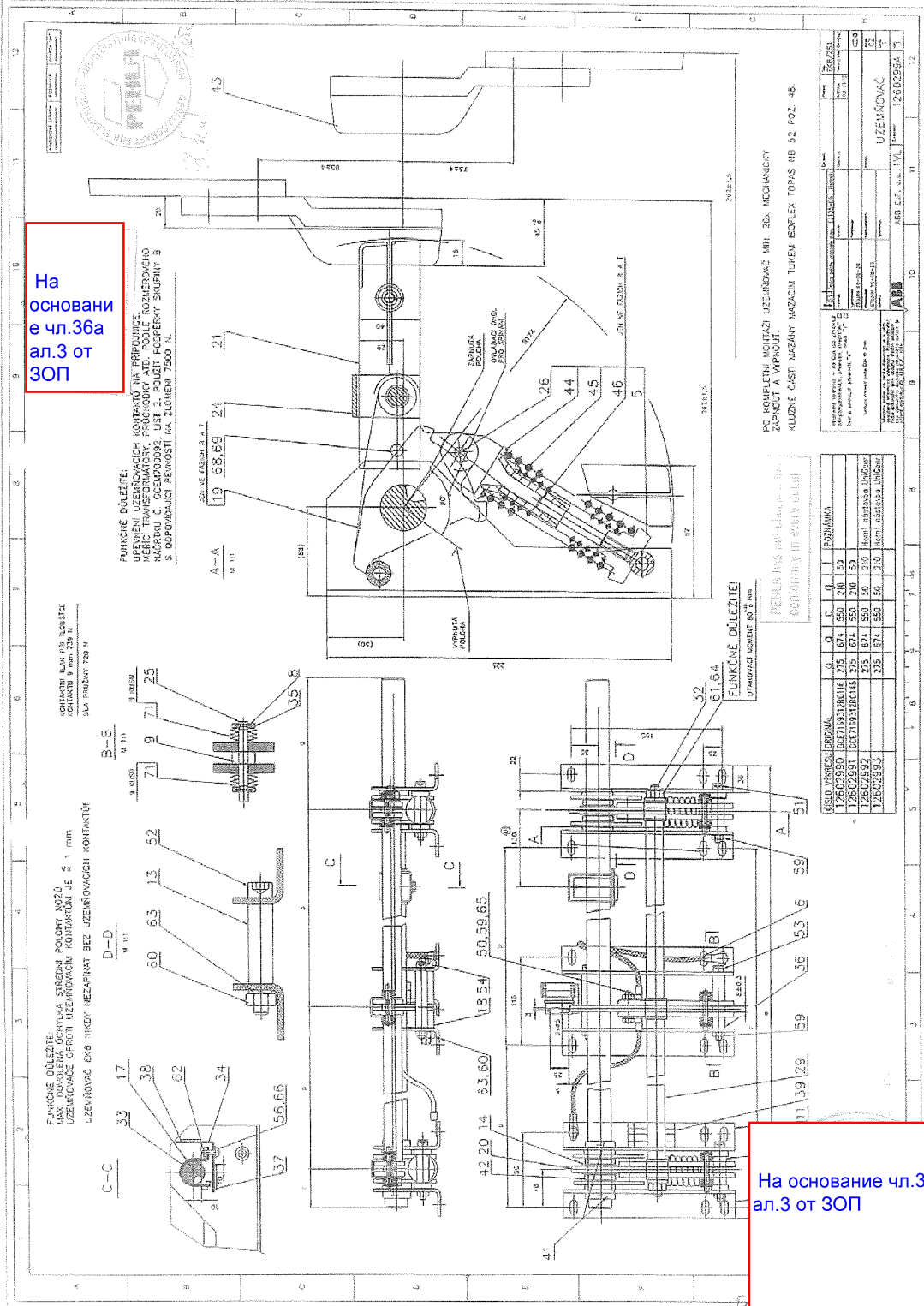
Drawing No.	Rev.	P/D *)	Title	Additional remarks
716-2151.0	09	D	Gabel (Reihe 10)	-
716-2152.0	03	D	Federlager	-
716-2260.0	02	D	Distanzstück	-
716-7079.0	-	D	Zylindrische Schraubendruckfeder	-
716-7080.0	-	D	Zylindrische Schraubendruckfeder	-
GCE8005012	00	D	Elektrode - Electrode	-
1VL7607240 R0101	-	D	SKŘ.-PŘ.ΛΥ. 17,5kV 2500A, 31,5kA, 1000 UNIGEAR IF 17,5kV 2500A, 31,5kA, 1000	Included in this test report
1VL7607240 R0101	-	P	SKŘ.-PŘ.ΛΥ. 17,5kV 2500A, 31,5kA, 1000	19/03/2007
1VL7608577R0102	-	D	ARRANGEMENT OF THE PANELS FOR TESTING / STC TEST ON EK6 ES/	-
1VL7607019 R0111	-	D	KABELOVÉ PŘIPOJENÍ 2500A, 17,5kV, 31.5kA CABLE CONNECTION BAR 2500A, 17.5kV, 31.5kA	-
1VL7607019 R0111	-	P	KABELOVÉ PŘIPOJENÍ 1600- 2000A, 17,5kV, 31.5kA	13/02/2007
1VL7607014 P0102	-	D	PAS PŘIPOJOVACÍ PŘEDNÍ - CONNECTING BAR FRONT	-
1VL7607015 P0102	-	D	PAS PŘIPOJOVACÍ ZADNÍ - CONNECTING BAR REAR	-
1VL7607016 P0101	-	D	DRŽÁK KONTAKTU - CONTACT HOLDER	-
GCE8010544 P0101	01	D	Anschluß - Connecting	-
-	-	D	Insulators for indoor use	taken from suppliers' catalogue (Georg Jordan GmbH)
5J6970174c	c	D	Stützer für Innenanlagen RSGB10 spez.	suppliers' drawing (Georg Jordan GmbH)

*) P: Parts list, D: Drawing

Remarks: -

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Drawing No.
1VL1260299A



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ФУНКЦИОНЕ ДЪЛЕЖИТЕ:
УПРЕДЖЕН УЗЕМЯВАЩИХ КОНТАКТИ НА ТЕРМИНАЛНИ
УЗЕМЯВАЩИХ КОНТАКТИ НА ТЕРМИНАЛНИ
МОНТАЖИ С ОБЕМНОСТИ ЛИСТ 2. ПОЛИТИ ПОДРЕКТИ СУПРЯВИ В
С ВЪРХОВАТА РЕЗОНАНТ НА ЗЛОЧЕИМ 7200 N.

ОТКАСКИ КАК ЕНЪ ЗАКЛУЧКЕ:
ОТКАСКИ 9 mm 228 H
СЛА ПРЕНЪТИ 720 N

ФУНКЦИОНЕ ДЪЛЕЖИТЕ:
НАВЪРХОВАТА ОЩЕТЛИВА СРЕДНА ПОЛОЖИ ПОЗЪ
УЗЕМЯВАЩИ ОЩЕТЛИВА СРЕДНА ПОЛОЖИ ПОЗЪ
УЗЕМЯВАЩИ ОЩЕТЛИВА СРЕДНА ПОЛОЖИ ПОЗЪ

ФУНКЦИОНЕ ДЪЛЕЖИТЕ:
УПРЕДЖЕН УЗЕМЯВАЩИ КОНТАКТИ НА ТЕРМИНАЛНИ
УЗЕМЯВАЩИ КОНТАКТИ НА ТЕРМИНАЛНИ

PEHLA HAS NOT CHECKED THIS
CERTIFICATE IN ANY DETAIL

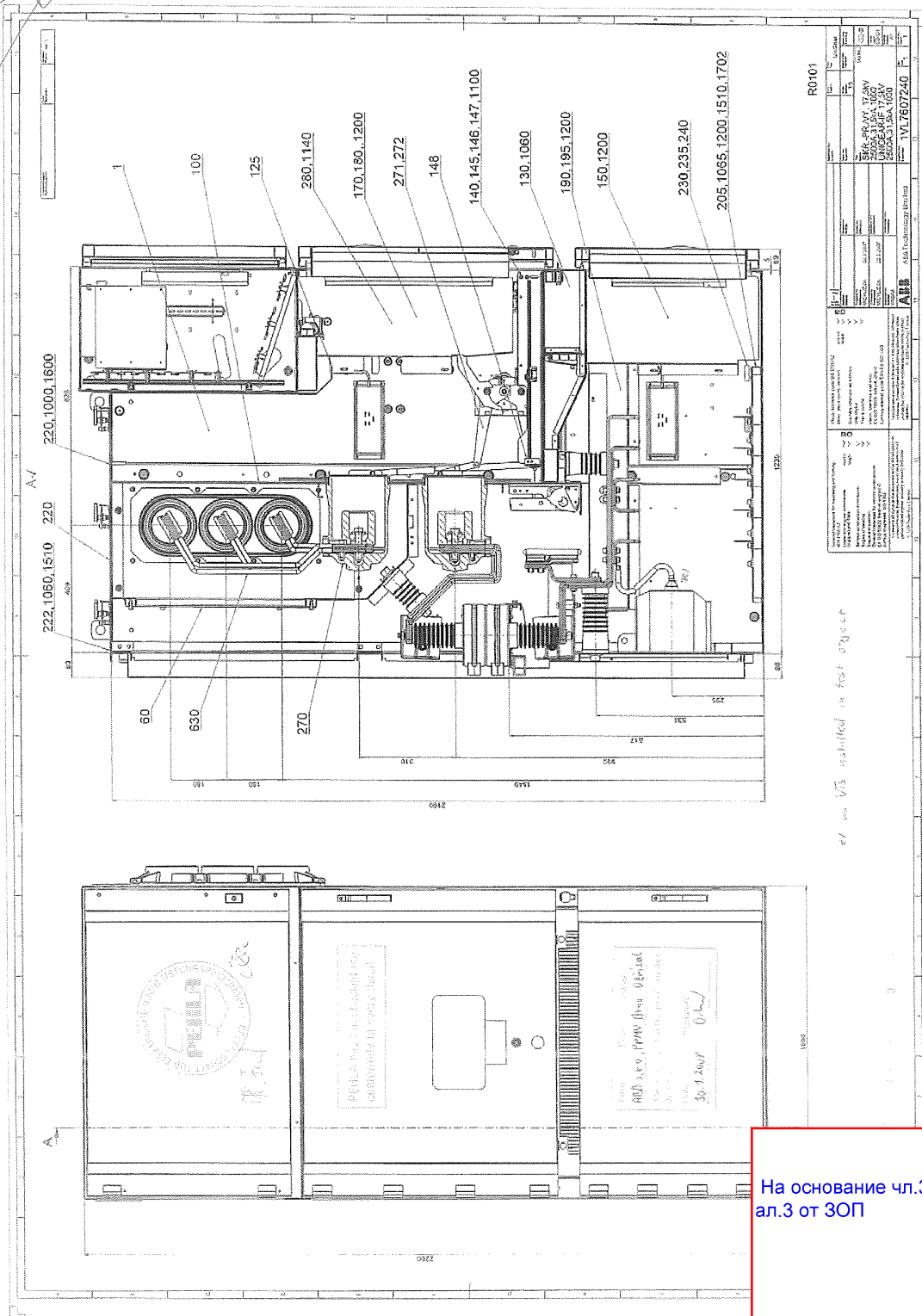
ПО КОМПЛЕТНИ МОДЕЛИ УЗЕМЯВАЩИ МИН. 20x МЕХАНИЧКИ
ЗАПЪКЪТ А УПРЕДЖИТЕ:
КЛУБЕНЕ ЧЪСТИ МОНТАЖИ МОНТАЖИ ТЪКЕМ ИСОФЛЕК ТЪПАС ИБ 52 ПОЗ. 48.

№	ИМЕНЕ	ПОЗИЦИЯ	СЪСТАВ
1	УЗЕМЯВАЩИ	1	УЗЕМЯВАЩИ
2	УЗЕМЯВАЩИ	2	УЗЕМЯВАЩИ

№	ИМЕНЕ	ПОЗИЦИЯ	СЪСТАВ
1	УЗЕМЯВАЩИ	1	УЗЕМЯВАЩИ
2	УЗЕМЯВАЩИ	2	УЗЕМЯВАЩИ

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Drawing No. 1VL7607240 R0101



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Technical Data of Test Circuit
Short-Time Withstand Current and Peak Withstand Current Test

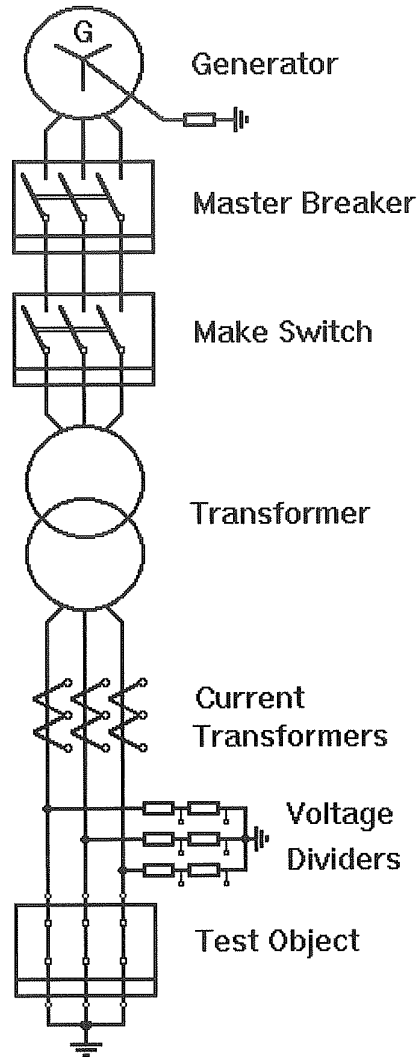
Test performed		STC	-
Test No.	PEHLA 08006Ra /	02 - 06	-
Test circuit			
Circuit diagram	Sheet No.	12	-
Current circuit			
Number of phases		3	-
Power frequency	Hz	50	-
Power factor		< 0.15	-
Earthing conditions			
Generator / System		earthed via 5 kΩ	-
Transformer		not earthed	-
Short-circuit point		earthed	-
Test object		earthed	-
Test object (test values)			
Number of phases	-	3	-
Measurement			
Voltage measurement		Voltage Dividers 80 kΩ / 1.1 kΩ	-
Current measurement		Current Transf. 50 kA / 5 A	-

Remarks: -

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08006Ra

Circuit Diagram
Short-Time Withstand Current and Peak Withstand Current Test



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Test Results
Short-Time Withstand Current and Peak Withstand Current Test

Test performed: Short-time withstand current and peak withstand current tests
Date of test: 29th January 2008
Condition of test object before test: Factory new.
Test arrangement: Direct test circuit, earthing switch in metal-enclosed, air-insulated switchgear.
Connections to test object: Infeed via copper bars to the cable terminals of the metal-enclosed, air-insulated switchgear. Short-circuited via closed earthing switch, switchgear earthed via cable.
Gas pressure (abs. rel. to 20 °C): - MPa

Test No.	PEHLA 08006Ra /		05	06	-	-	-	-	
Peak withstand current	L1	kA	82.7	50.6	-	-	-	-	
	L2	kA	68.7	69.8	-	-	-	-	
	L3	kA	67.6	64.9	-	-	-	-	
Short-circuit current	First cycle	L1	kA	34.6	30.3	-	-	-	-
		L2	kA	35.6	35.6	-	-	-	-
		L3	kA	36.9	34.2	-	-	-	-
	Last cycle	L1	kA	32.4	31.2	-	-	-	-
		L2	kA	33.9	32.7	-	-	-	-
		L3	kA	33.8	32.6	-	-	-	-
Equivalent current	L1	kA	32.6	31.4	-	-	-	-	
	L2	kA	34.2	32.9	-	-	-	-	
	L3	kA	34.1	32.8	-	-	-	-	
Average value	kA	33.6	32.4	-	-	-	-		
Duration of short-circuit	s	0.313	1.01	-	-	-	-		
Short-time withstand current	L1	kA	-	31.6	-	-	-	-	
	L2	kA	-	33.2	-	-	-	-	
	L3	kA	-	33.0	-	-	-	-	
	Average value	kA	-	32.6	-	-	-	-	
Related to rated duration of short-circuit	s	-	1.00	-	-	-	-		
Duration of short-circuit	s	-	1.07	-	-	-	-		
Related to rated short-time withstand current	kA	-	31.5	-	-	-	-		
Emission of flame/gas/oil		no	no	-	-	-	-		
Test result (P/N)		P	P	-	-	-	-		

Resistance of the main circuit

Before test	L1	μΩ	-	-	-	-	-	-
	L2	μΩ	-	-	-	-	-	-
	L3	μΩ	-	-	-	-	-	-
After test	L1	μΩ	-	-	-	-	-	-
	L2	μΩ	-	-	-	-	-	-
	L3	μΩ	-	-	-	-	-	-

Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard

Remarks: PEHLA 08006Ra / 01: Current calibration
 PEHLA 08006Ra / 02 to 04: Tests with reduced values

Condition of test object after test: No visible or functional change or damage. The opening force of the earthing switch at no-load operation was 123 Nm before and 156 Nm after the test.

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Photos

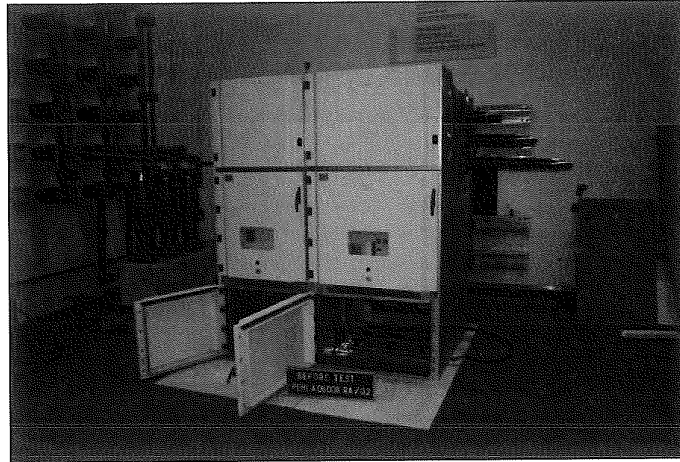


Photo No. 01:
Before test PEHLA 08006Ra / 02

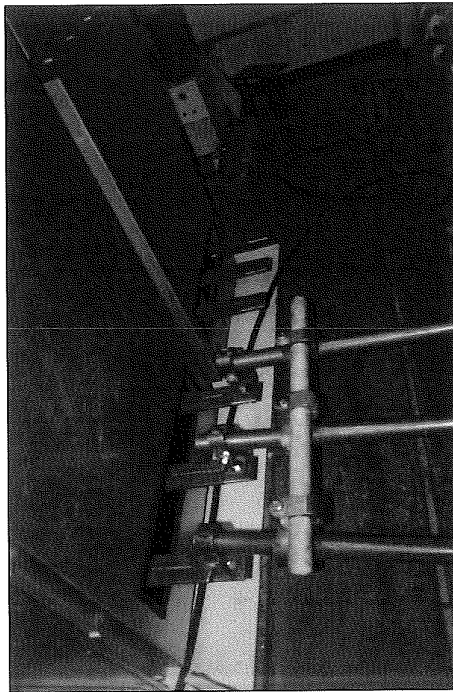


Photo No. 02:
Before test PEHLA 08006Ra / 02

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Photos

[Handwritten signature]

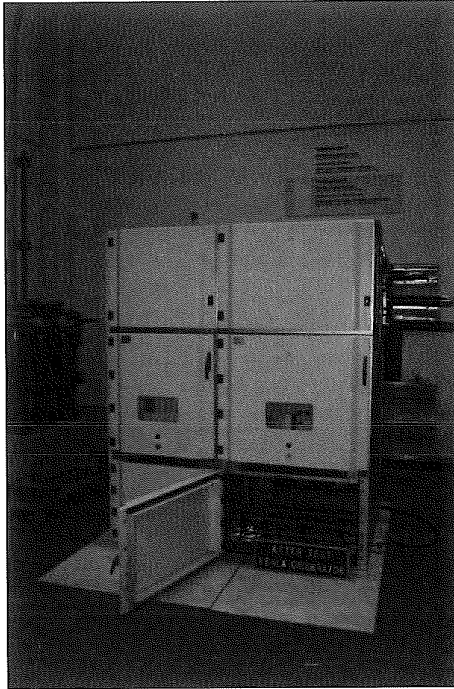


Photo No. 03:
After test PEHLA 08006Ra / 06

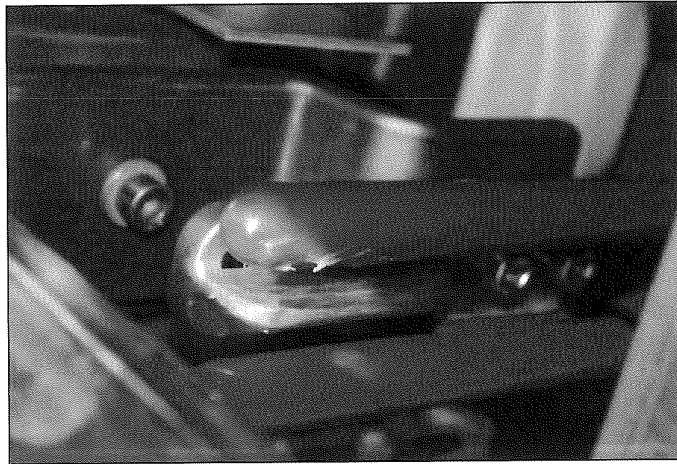
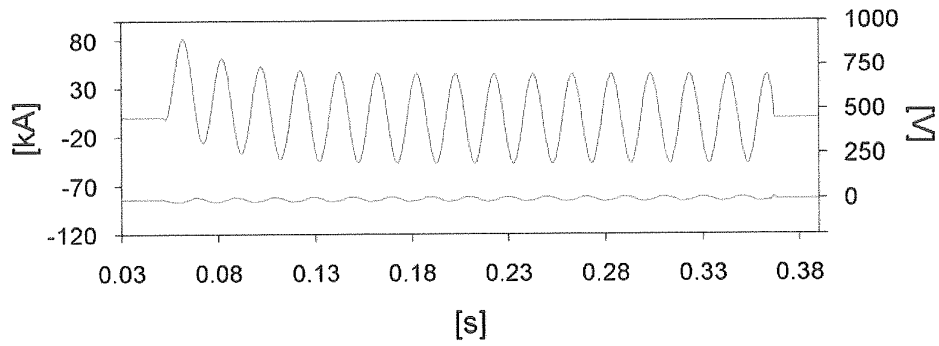
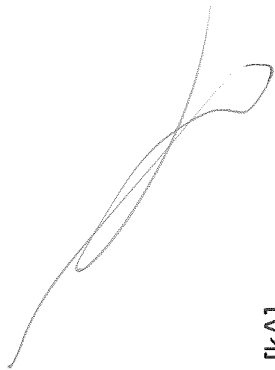


Photo No. 04:
After test PEHLA 08006Ra / 02
(fixed contact of phase L2, all contacts in comparable condition)

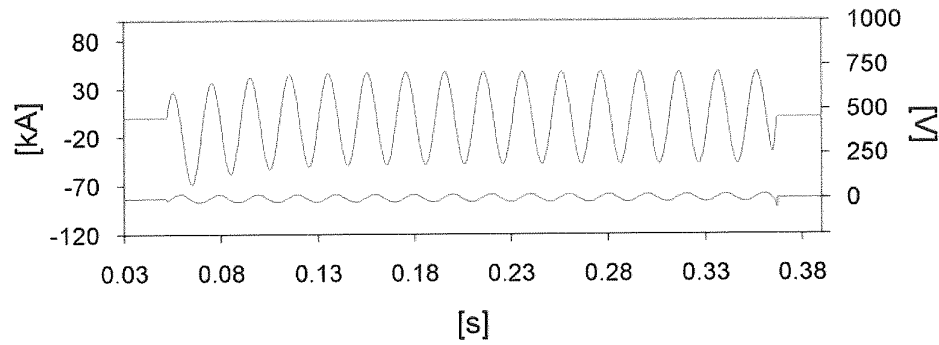
На основании чл.36а
ал.3 от ЗОП

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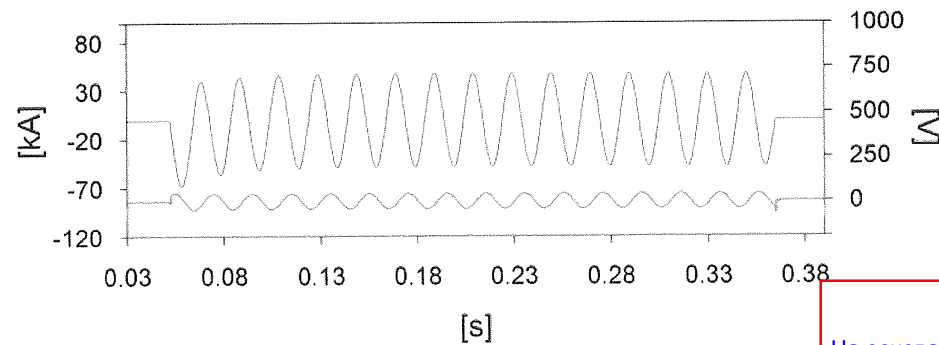
Oscillogram No. PEHLA 08006Ra / 05
Peak Withstand Current Test



— IL1 — UL1



— IL2 — UL2



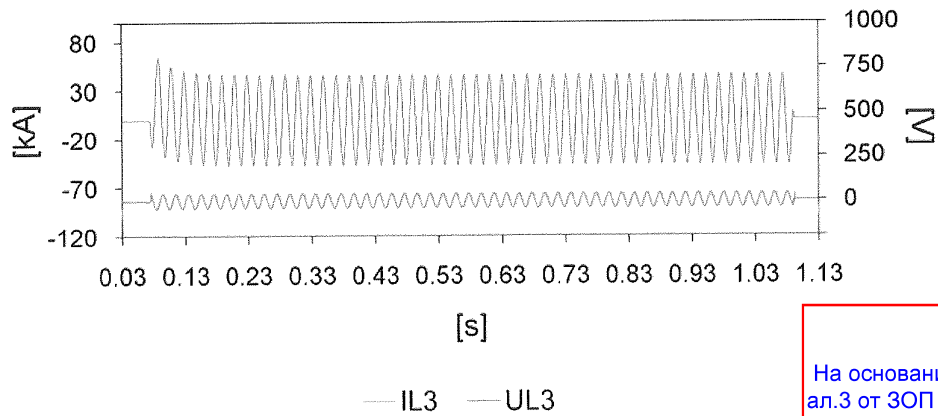
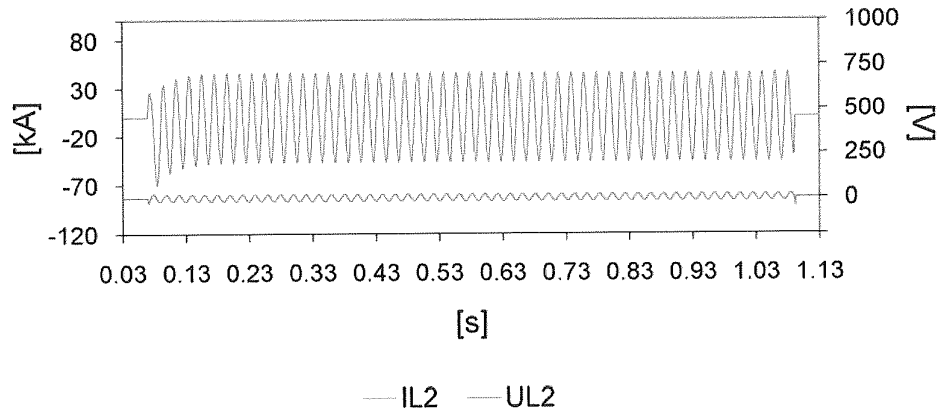
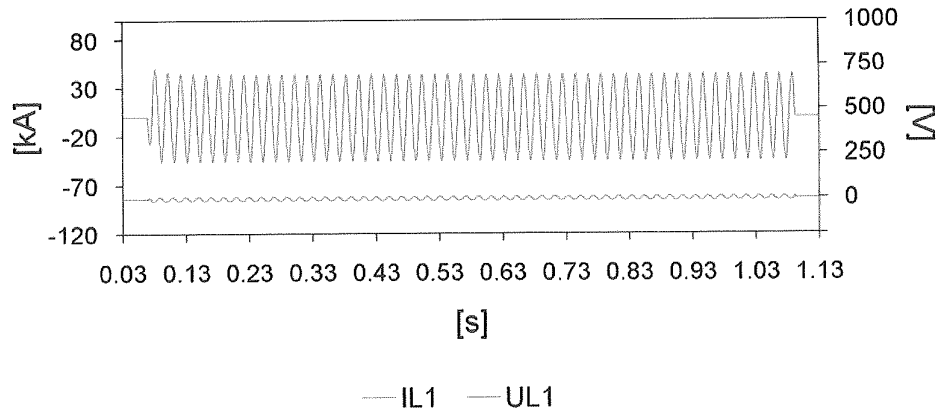
— IL3 — UL3

На основании чл.36а
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08006Ra

Oscillogram No. PEHLA 08006Ra / 06
Short-Time Withstand Current Test - 1s



На основании чл.36а
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08006Ra

PEHLA

GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN
Member of the SHORT-CIRCUIT TESTING LIAISON (STL)

Test Report

Report No.: 08008Ra

Copy No.: 1

Contents: 18 Sheets

Test object: Earthing switch in metal-enclosed, air-insulated switchgear

Designation: EK6 1706-275 in UniGear ZS1, width 1000 mm

Rated voltage: 17.5 kV Rated normal current: - A

Rated frequency: 50/60 Hz

Manufacturer: ABB s.r.o., PPMV, Brno, Czech Republic

Client: ABB s.r.o., PPMV, Brno, Czech Republic
under license of ABB Technology Ltd., Zurich, Switzerland

Testing station: PEHLA-Testing Laboratory Ratingen, Germany

Date of test: 29th January 2008

Applied test specifications:

The tests have been carried out in accordance with client's instructions based on:

IEC 62271-102, 1st Ed., 2001-12, clause 6.101

IEC 60265-1, 3rd Ed., 1998-01, clause 6.101

Tests performed:

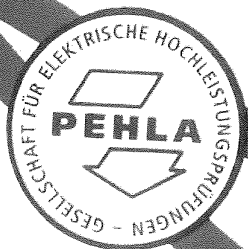
Type test 'Short-Circuit Making Tests'.

Three-phase short-circuit making tests on earthing switch comprising two making operations according to class E1 based on 17.5 kV - 31.5 kA at 50 Hz.

No-load operation before and after the tests.

Test results:

The test object has passed the test performed in accordance with the applied test specifications.



GESELLSCHAFT FÜR ELEKTRISCHE
HOCHLEISTUNGSPRÜFUNGEN

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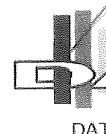
Technical Committee

Mannheim, 14th February 2008

The test results relate only to the items tested.

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Notes

Accreditation

The PEHLA-Testing Laboratory Ratingen has been approved by the DATech (German accreditation body for technology) according to EN ISO/IEC 17025 for tests in the field of high-voltage switchgear and controlgear and power engineering equipment (Registration-No. DAT-P-032/93).

STL-Member

PEHLA is founder member of the SHORT-CIRCUIT TESTING LIAISON (STL) which has been established in 1969. STL is a forum for the international cooperation of the testing organisations with the further full members ASTA (UK), CESI (IT), CPRI (IND), ESEF (FR), KEMA (NL), SATS (NO, SE, FI), STLNA (US, CA) and JSTC (JP). In the framework of EC, STL (EU) has been recognised in 1992 by EOTC as agreement group.

PEHLA-Documents

A Type Test Certificate

is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Document

is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Report

is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients' instructions. Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the test object, and its condition after the tests.

A Test Confirmation

is issued immediately after the tests. It confirms that the tests have been conducted and is valid only until publishing the detailed results in an entire document.

Uncertainty of the measurement systems

The PEHLA - Testing Laboratories apply the PEHLA Guide No. 12 for determining the uncertainties of measurement, based on ENV 13005 (Guide to the expression of uncertainty in measurement). As long as no explicit statements are made, the uncertainties required by the relevant standards have been complied with.

Addresses

Office: PEHLA-Geschäftsstelle
Hallenweg 40
68219 Mannheim
Germany
Internet: www.pehla.com

Testing Station: PEHLA-Testing Laboratory Ratingen
Oberhausener Str. 33
40472 Ratingen
Germany

Manufacturer: ABB s.r.o., PPMV
Org. Unit EJF
Videnska 117
619 00 Brno
Czech Republic

Client: ABB s.r.o., PPMV
Org. Unit EJF
Videnska 117
619 00 Brno
Czech Republic
under licence of
ABB Technology Ltd., Zurich, Switzerland

На основании чл.36а
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List of Test Participants

Representatives of Technical Committee:

Dr. Thomas Ebke PEHLA-Testing Laboratory Ratingen, Germany
Mr. Herbert Feld PEHLA-Testing Laboratory Berlin-Marzahn, Germany

Test Engineer / Test Operator:

Mr. Sebastian Martinek PEHLA-Testing Laboratory Ratingen, Germany
(Test Engineer)
Mr. Frank Idaszek PEHLA-Testing Laboratory Ratingen, Germany
(Measurement)
Mr. Joachim Köhler PEHLA-Testing Laboratory Ratingen, Germany
(Machine Operator)

Representatives of Client:

Mr. Zdenek Otrisal ABB s.r.o., PPMV, Brno, Czech Republic
Mr. Vlastimil Sindler ABB s.r.o., PPMV, Brno, Czech Republic

Further Participants:

Mr. Patrick Jacobs PEHLA-Testing Laboratory Ratingen, Germany

На основании чл.36а
ал.3 от ЗОП

**Technical Data of Test Object
Earthing Switch**

Test object: Earthing Switch
Designation: EK6 1706-275
Manufacturer: ABB s.r.o., PPMV, Brno, Czech Republic
Serial No.: 1VLA0712149
Year of manufacture: 2008
Serial No. of drive: -
Drawing No.: 1VL1260299A (E12602991)

Ratings assigned by the manufacturer:

Rated voltage	17.5	kV
Rated normal current	-	A
Rated frequency	50 / 60	Hz
Rated lightning impulse withstand voltage	95	kV
Rated switching impulse withstand voltage	-	kV
Rated power-frequency withstand voltage	38	kV
Rated peak withstand current	80 / 82	kA
Rated short-time withstand current	31.5	kA
Rated duration of short-circuit	3	s
Rated short-circuit breaking current	-	kA
DC component of the rated short-circuit breaking current	-	%
Rated short-circuit making current	80 / 82	kA
Rated transient recovery voltage	-	kV
Rate of rise of transient recovery voltage	-	kV/μs
First-pole-to-clear factor	-	
Rated operating sequence	-	
Arc extinguishing medium	-	
Rated filling pressure for interruption	-	MPa abs. at 20 °C
Minimum functional pressure for interruption	-	MPa abs. at 20 °C
Insulating medium	air	
Rated filling pressure for insulation	-	MPa abs. at 20 °C
Minimum functional pressure for insulation	-	MPa abs. at 20 °C
Driving mechanism (type)	spring drive, manual operation	
Number of poles	3	
Number of units per pole	1	
Rated opening time	-	ms
Rated closing time	-	ms
Rated supply voltage of opening device	-	V d.c.
Rated supply voltage of closing device	-	V d.c.
Rated supply voltage of auxiliary circuits	-	V d.c.
Rated frequency of supply voltage	-	Hz
Rated line-charging breaking current	-	A
Rated cable-charging breaking current	-	A

Further data: -

Essential characteristics: -

На основании чл.36а
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**Technical Data of Test Object
Switchgear**

Test object: Metal-enclosed, air-insulated switchgear
Designation: UniGear ZS1, width 1000 mm
Manufacturer: ABB s.r.o., PPMV, Brno, Czech Republic
Serial No.: 10000 16172 / 2
Year of manufacture: 2008
Drawing No.: 1VL7607240 R0101

Ratings assigned by the manufacturer:

Rated voltage	17.5	kV	
Rated normal current	2500	A	
Rated frequency	50 / 60	Hz	
Rated lightning impulse withstand voltage	95	kV	
Rated switching impulse withstand voltage	-	kV	
Rated power-frequency withstand voltage	38	kV	
Rated peak withstand current	80 / 82	kA	
Rated short-time withstand current	31.5	kA	
Rated duration of short-circuit	3	s	
Insulating medium	air		
Rated filling pressure for insulation	-	MPa	abs. at 20 °C
Minimum functional pressure for insulation	-	MPa	abs. at 20 °C

Permissible values for internal arc faults:

Peak current	80 / 82	kA
Short-circuit current	31.5	kA
Duration of short-circuit	1	s

Further data: -**Essential characteristics and installed devices: -**

На основании чл.36а
ал.3 от ЗОП

List of Identified Drawings

The manufacturer has submitted to the testing laboratory drawings and other data containing sufficient information to unambiguously identify by type the essential details and parts of the test object presented for test.

The drawings have been stamped and signed by the manufacturer in order to guarantee that the drawings or data schedules truly represent the test object to be tested.

Further these drawings have been stamped and signed by PEHLA representatives and are kept at the client.

with the test documents at the test laboratory.

The testing laboratory has checked that drawings and data schedules adequately represent the essential details and parts of the test object to be tested, but is not responsible for the accuracy of the detailed information.

The drawing(s) contained in this document are identical with the checked, stamped and signed drawings.

Drawing No.	Rev.	P/D ^{*)}	Title	Additional remarks
1VL1260299A	-	D	UZEMŇOVAČ	E12602991 used, Included in this test report
E12602991	-	P	UZEMŇOVAČ EK6-ZS1-1706275	-
32608640	-	D	ZEMNÍČÍ KONTAKT	-
3260850A	02	D	NUŽ UZEMŇOVAČE - ES KNIFE	32608500 used
4262808A	06	D	HŘÍDEL UZEMŇOVAČE - ES SHAFT	-
E4262815A	03	D	SVORNÍK	-
1VL4262824A	001	D	LANO UZEMŇOVACÍ	-
1VL2260318A	001	D	ÚHELNÍK	-
1VL32608420	-	D	PÁKA NAPÍNACÍ	-
32608521	-	D	PLECH UKAZATELE	-
1VL32608540	-	D	PÁKA PŘEKLÁPĚCÍ	-
1VL32608670	-	D	ŠTÍTEK TYPOVÝ	-
42611760	-	D	KROUŽEK STAVĚCÍ	-
1VL42627990	-	D	ROZPĚRKA	-
1VL42628060	-	D	ROZPĚRKA	-
1VL4262807A	-	D	DORAZ	-
1VL4262813A	-	D	ROZPĚRKA	-
1VL42628140	001	D	OBJÍMKA	-
1VL42628170	001	D	ČEP	-
1VL42628190	-	D	PODLOŽKA	-
1VL42628220	003	D	MŮSTEK Cu	-
1CL42628230	001	D	ČEP	-
1VL4262884A	-	D	VEDENÍ SESTAVA	-
1VL4262885	001	D	ČEP	-
4330012	-	D	VÍČKO POJISTNÉ	-
4330017	-	D	PODLOŽKA POJISTNÁ	-
1VL43302570	-	D	ŠTÍTEK I (SPECIÁLNÍ PROVEDENÍ)	-
1VL43302580	-	D	ŠTÍTEK O (SPECIÁLNÍ PROVEDENÍ)	-

*) P: Parts list, D: Drawing

На основании чл.36а
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List of Identified Drawings (2)

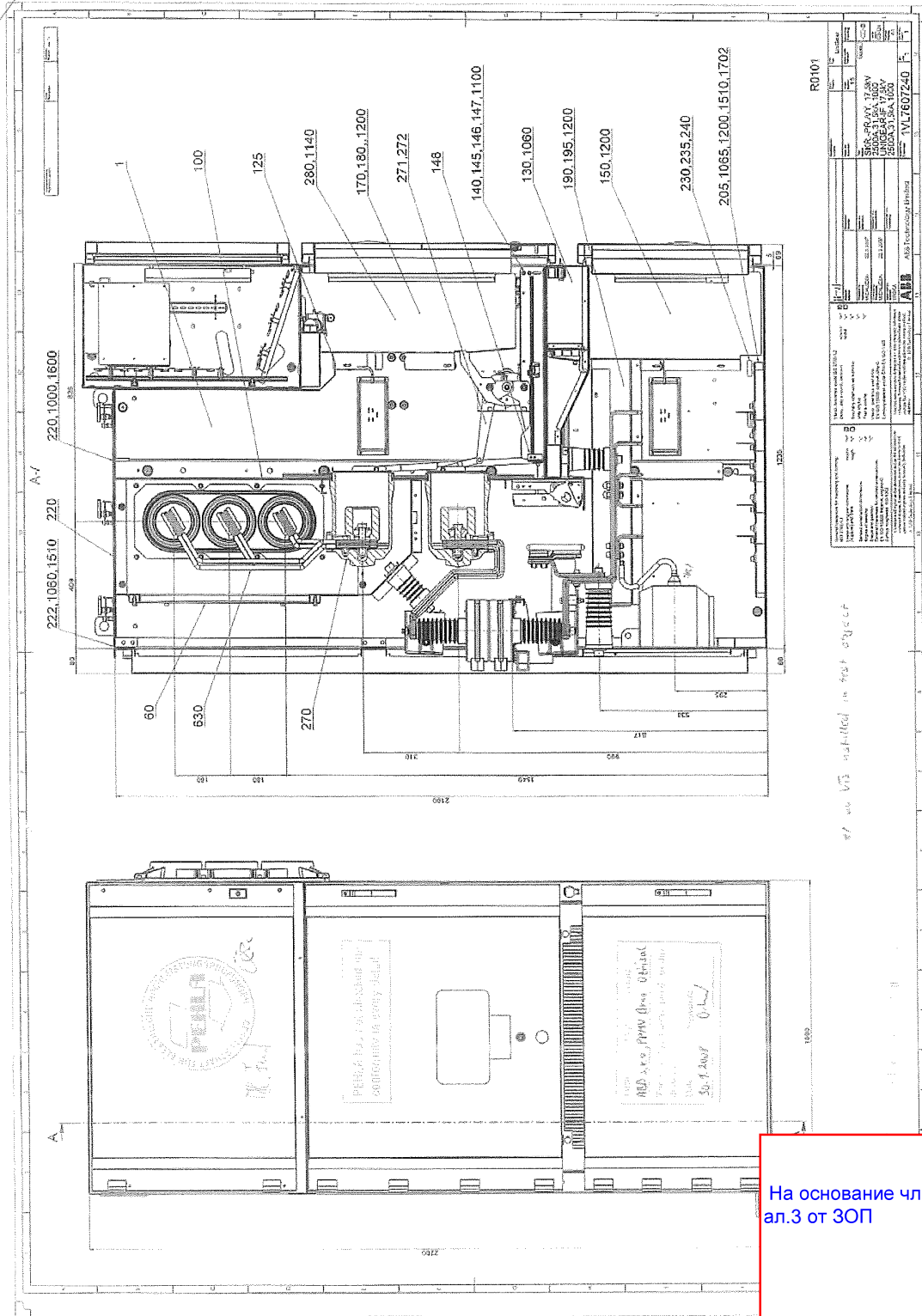
Drawing No.	Rev.	P/D *)	Title	Additional remarks
716-2151.0	09	D	Gabel (Reihe 10)	-
716-2152.0	03	D	Federlager	-
716-2260.0	02	D	Distanzstück	-
716-7079.0	-	D	Zylindrische Schraubendruckfeder	-
716-7080.0	-	D	Zylindrische Schraubendruckfeder	-
GCE8005012	00	D	Elektrode - Electrode	-
1VL7607240 R0101	-	D	SKŘ.-PŘ. / VÝ. 17,5kV 2500A, 31,5kA, 1000 UNIGEAR IF 17,5kV 2500A, 31,5kA, 1000	Included in this test report
1VL7607240 R0101	-	P	SKŘ.-PŘ. / VÝ. 17,5kV 2500A, 31,5kA, 1000	19/03/2007
1VL7608577R0102	-	D	ARRANGEMENT OF THE PANELS FOR TESTING / STC TEST ON EK6 ES/	-
1VL7607019 R0111	-	D	KABELOVÉ PŘIPOJENÍ 2500A, 17,5kV, 31.5kA CABLE CONNECTION BAR 2500A, 17.5kV, 31.5kA	-
1VL7607019 R0111	-	P	KABELOVÉ PŘIPOJENÍ 1600- 2000A, 17,5kV, 31.5kA	13/02/2007
1VL7607014 P0102	-	D	PAS PŘIPOJOVACÍ PŘEDNÍ - CONNECTING BAR FRONT	-
1VL7607015 P0102	-	D	PAS PŘIPOJOVACÍ ZADNÍ - CONNECTING BAR REAR	-
1VL7607016 P0101	-	D	DRŽÁK KONTAKTU - CONTACT HOLDER	-
GCE8010544 P0101	01	D	Anschluß - Connecting	-
-	-	D	Insulators for indoor use	taken from suppliers' catalogue (Georg Jordan GmbH)
5J6970174c	c	D	Stützer für Innenanlagen RSG10 spez.	suppliers' drawing (Georg Jordan GmbH)

*) P: Parts list, D: Drawing

Remarks: -

На основании чл.36а
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**Drawing No.
1VL7607240 R0101**



R0101	
Item	Qty
1	1
100	1
125	1
280, 1140	1
170, 180, 1200	1
271, 272	1
148	1
140, 145, 146, 147, 1100	1
130, 1060	1
190, 195, 1200	1
150, 1200	1
230, 235, 240	1
205, 1065, 1200, 1510, 1702	1

ABB Technology Division
1VL7607240

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ал.3 от ЗОП

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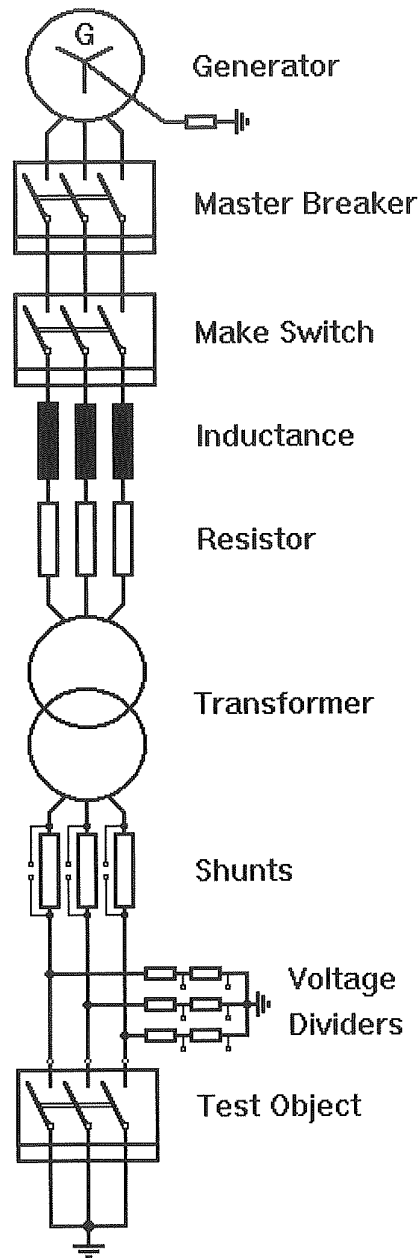
**Technical Data of Test Circuit
Short-Circuit Making Tests**

Test performed	Short-circuit making tests		-		
Test No.	PEHLA 08008Ra /	04 - 10	-		
Circuit diagram (test circuit)	see sheet	12	-		
Test object					
Rated voltage	kV	17.5	-		
Rated frequency	Hz	50 / 60	-		
Short-circuit breaking current	kA	-	-		
Units under test	3 (1 per phase)		-		
Voltage distribution	%	-	-		
Number of phases (test circuit)	3		-		
Power factor (test circuit)	< 0.15		-		
Frequency (test circuit)	Hz	50	-		
Earthing conditions					
Generator	earthed via 5 kΩ		-		
Transformer	not earthed		-		
Short-circuit point	earthed		-		
Prospective transient recovery voltage		Required values	Tested values	Required values	Tested values
Evaluation of oscillogram	No.	-	-	-	-
Crest value u_c	kV	-	-	-	-
Time t_2/t_3	μs	-	-	-	-
Time delay t_d	μs	-	-	-	-
Rate of rise u_1/t_1 or u_c/t_3	kV/μs	-	-	-	-
u_1	kV	-	-	-	-
t_1	μs	-	-	-	-

Remarks: -

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Circuit Diagram Short-Circuit Making Tests



На основании чл.36а
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Test Results Short-Circuit Making Tests

Test performed: Short-circuit making tests
Date of test: 29th January 2008
Condition of test object before test: As after preceding Short-Time Withstand Current and Peak Withstand Current Test performed as PEHLA 08006Ra
Test arrangement: Direct test circuit, earthing switch in metal-enclosed, gas-insulated switchgear.
Connections to test object: Infeed via copper bars to the cable terminals of the metal-enclosed, air-insulated switchgear. Switchgear earthed via cable.
Gas pressure (abs. rel. to 20 °C): - kPa

Test No.	PEHLA 08008Ra /		09	10	-	-	-	-
Operating sequence			C	C	-	-	-	-
Applied voltage (phase-to-phase)		kV	19.9	20.3	-	-	-	-
Pre-arcing voltage	L1	kV	-	-	-	-	-	-
	L2	kV	-	-	-	-	-	-
	L3	kV	-	-	-	-	-	-
Making current	L1	kA	62.2	79.7	-	-	-	-
	L2	kA	72.4	84.6	-	-	-	-
	L3	kA	82.8	59.2	-	-	-	-
Short-circuit current	L1	kA	32.4	30.6	-	-	-	-
	L2	kA	32.0	31.3	-	-	-	-
	L3	kA	31.0	33.3	-	-	-	-
	Average value	kA	31.8	31.7	-	-	-	-
Duration of short-circuit		ms	246	234	-	-	-	-
		MPa	-	-	-	-	-	-
C-Operation	Voltage of closing device	V	-	-	-	-	-	-
	Pre-arcing time	ms	-	-	-	-	-	-
Emission of flame/gas/oil			no	no	-	-	-	-
Number of valid test			1	2	-	-	-	-
Test result			P	P	-	-	-	-

Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard

Remarks: PEHLA 08008Ra / 01: Current calibration
 PEHLA 08008Ra / 02: No-load operation
 PEHLA 08008Ra / 03: Voltage calibration
 PEHLA 08008Ra / 04 to 08: Pre-tests on auxiliary circuit-breaker

Condition of test object after test: No significant visible or functional deterioration.

На основании чл.36а
ал.3 от ЗОП

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Test Results
No-Load Operations

Test performed: No-load operations
Date of test: 29th January 2008
Condition of test object before test: As after preceding Short-Time Withstand Current and Peak Withstand Current Test performed as PEHLA 08006Ra /
As after test PEHLA 08008Ra / 09 /
As after test PEHLA 08008Ra / 10

Gas pressure (abs. rel. to 20 °C): - kPa

No-load operation	Maximum opening torque during no-load operation
Before Test PEHLA 08008Ra / 09	156 Nm
After Test PEHLA 08008Ra / 09	173 Nm
After Test PEHLA 08008Ra / 10	301 Nm

Legend: -

Remarks: -

На основании чл.36а
ал.3 от ЗОП

Photos

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Photo No. 03
After PEHLA 08008Ra / 09
(fixed contact of phase L1, all contacts in comparable condition)



Photo No. 04
After PEHLA 08008Ra / 10
(fixed contact of phase L1, all contacts in comparable condition)

На основании чл.36а
ал.3 от ЗОП

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Photos

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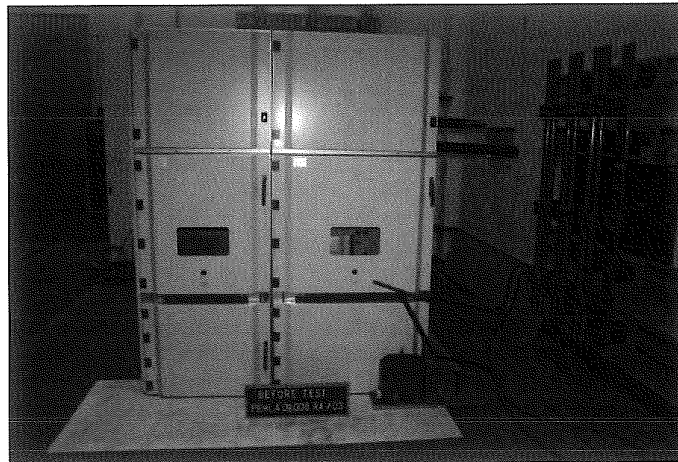


Photo No. 01
Before test PEHLA 08008Ra / 03

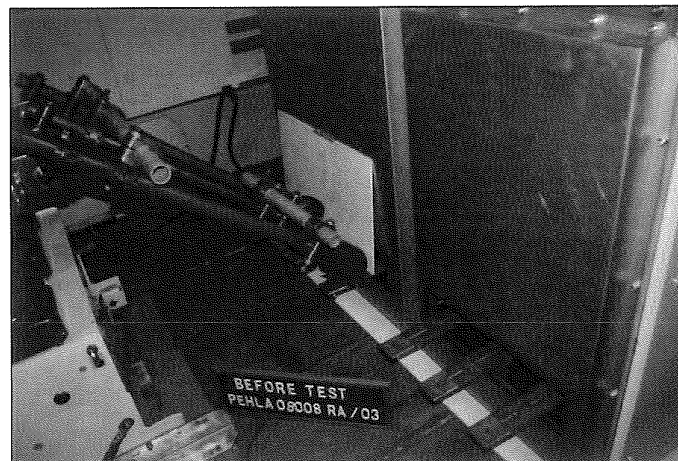


Photo No. 02
Before test PEHLA 08008Ra / 03

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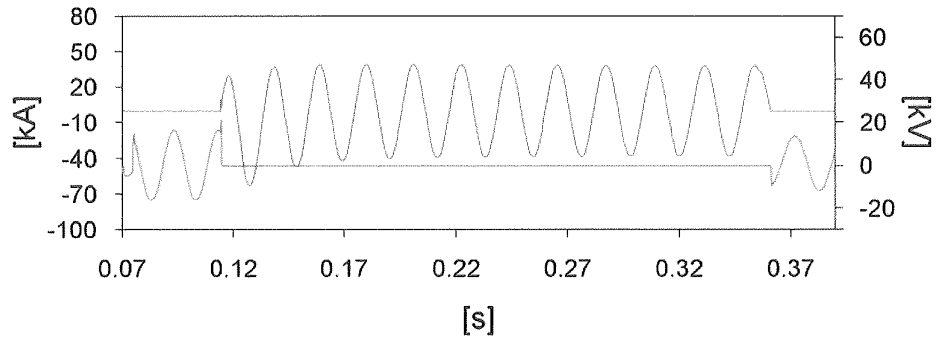
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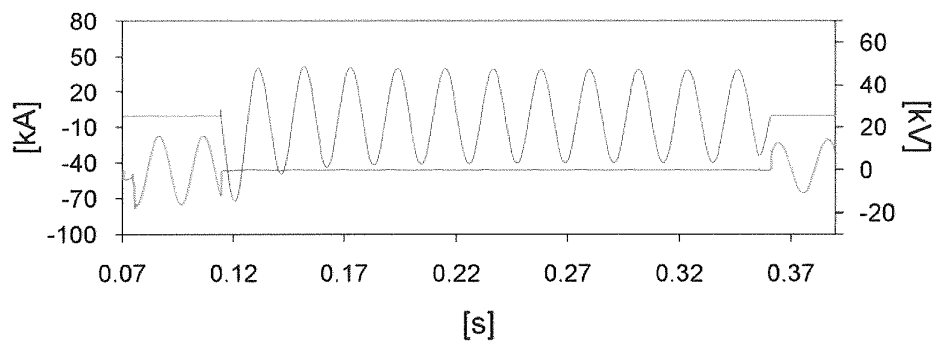
На основании чл.36а
ал.3 от ЗОП

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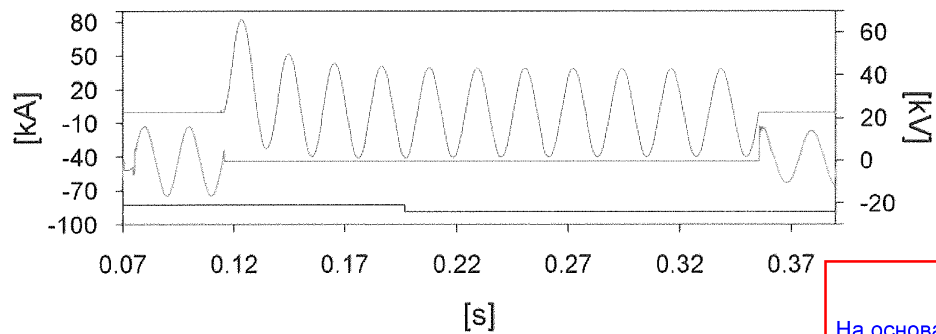
Oscillogramm No. PEHLA 08008Ra / 09
Short-Circuit Making Test No. 1



— IL1 — UL1



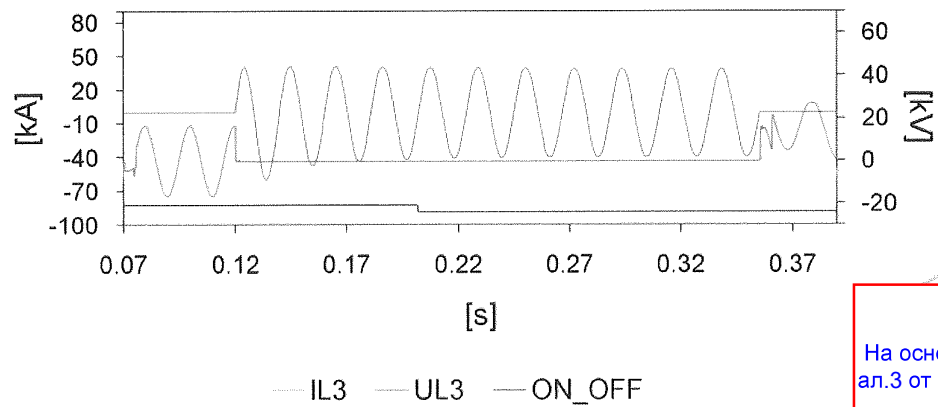
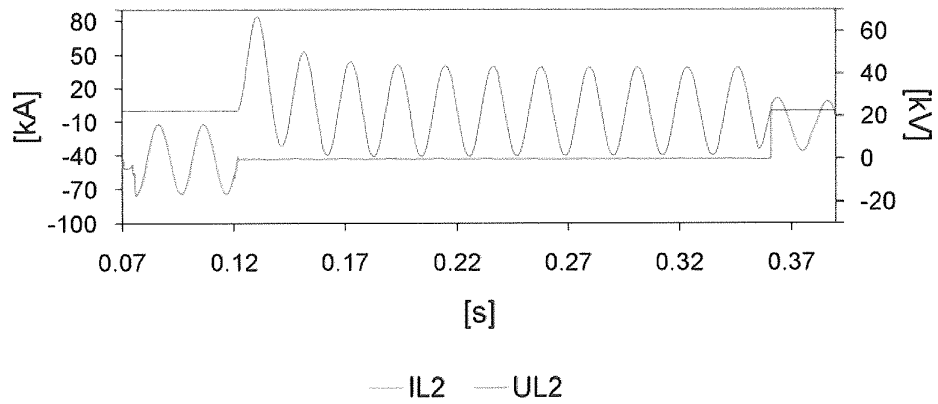
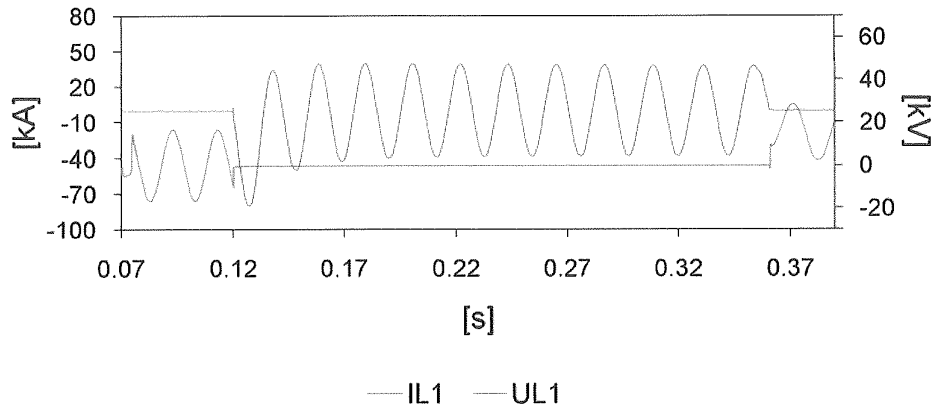
— IL2 — UL2



— IL3 — UL3 — ON_OFF

На основании чл.36а
ал.3 от ЗОП

Oscillogramm No. PEHLA 08008Ra / 10
Short-Circuit Making Test No. 2



На основании чл.36а
ал.3 от ЗОП

000477

PEHLA

GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN
Member of the SHORT-CIRCUIT TESTING LIAISON (STL)

Test Report

Report No.: 11202Ra

Copy No.: 0

Contents: 19 Sheets

Test object: Metal-enclosed, air-insulated switchgear, outgoing panel in a two-panel arrangement

Designation: UniGear ZS1, width 650 mm

Rated voltage: 12 kV Rated normal current: 1250 A Rated frequency: 50 Hz

Manufacturer: ABB s.r.o., Brno, Czech Republic
under licence of ABB Technology Ltd., Zurich, Switzerland

Client: ABB Technology Ltd., Zurich, Switzerland

Testing station: PEHLA-Testing Laboratory Ratingen, Germany

Date of test: 08th December 2011

Applied test specifications:

The tests have been carried out in accordance with:
IEC 62271-200 / 2nd Ed. / 2011-10, cl. 6.106 and Annex AA

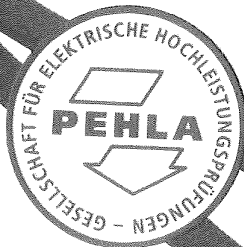
Tests performed:

Type test 'Internal Arc Test' of the metal-enclosed, air-insulated switchgear.
Testing of the behaviour of the metal-enclosed, air-insulated switchgear under conditions of arcing due to an internal fault. The test was performed three-phase in the busbar compartment with a peak current of 82.6 kA and a short-circuit current of 32.1 kA – 1.04 s equivalent to 31.5 kA – 1.06 s at 50 Hz.
Continuation on sheet 3.

Test results:

The test object passed the test performed in accordance with the applied test specifications.

The requirements for the verification of the internal arc classification IAC AFLR 31.5kA 1s are met for the compartment tested.



GESELLSCHAFT FÜR ELEKTRISCHE
HOCHLEISTUNGSPRÜFUNGEN

На основании чл.36а ал.3 от ЗОП

На основании чл.36а
ал.3 от ЗОП

Mannheim, 04th May 2012

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Notes

Accreditation

The PEHLA-Testing Laboratory Ratingen has been approved by the TGA GmbH according to EN ISO/IEC 17025 for tests in the field of high-voltage switchgear and controlgear and power engineering equipment (Registration-No. DAT-PL-032/93-63).

STL-Member

PEHLA is founder member of the SHORT-CIRCUIT TESTING LIAISON (STL) which has been established in 1969. STL is a forum for the international cooperation of the testing organisations with the further full members ASTA (UK), CESI (IT), CPRI (IND), ESEF (FR), KEMA (NL), SATS (NO, SE, FI), STLNA (US, CA) and JSTC (JP). In the framework of EC, STL (EU) has been recognised in 1992 by EOTC as agreement group.

PEHLA-Documents

A Type Test Certificate

is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Document

is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Report

is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients' instructions. Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the test object, and its condition after the tests.

A Test Confirmation

is issued immediately after the tests. It confirms that the tests have been conducted and is valid only until publishing the detailed results in an entire document.

Uncertainty of the measurement systems

The PEHLA - Testing Laboratories apply the PEHLA Guide No. 12 for determining the uncertainties of measurement, based on ENV 13005 (Guide to the expression of uncertainty in measurement). As long as no explicit statements are made, the uncertainties required by the relevant standards have been complied with.

Addresses

Office: PEHLA-Geschäftsstelle
Hallenweg 40
68219 Mannheim
Germany
Internet: www.pehla.com

Testing Station: PEHLA-Testing Laboratory Ratingen
Oberhausener Str. 33
40472 Ratingen
Germany

Manufacturer: ABB s.r.o.
Videnska 117
619 00 Brno
Czech Republic
under licence of
ABB Technology Ltd., Zurich, Switzerland

Client: ABB Technology Ltd.
Affolternstrasse 44
8050 Zurich
Switzerland

На основании чл.36а
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Test Performed

Continuation from Sheet 1

The test object consisted of a two-panel-arrangement (minimum functional unit) of a metal-enclosed, air-insulated switchgear type UniGear ZS1. The panel width was 650 mm for the left-hand side panel under test and for the right-hand side infeed panel. The initiation wire was installed at the busbars connecting the circuit-breaker bushings to the busbars in the busbar compartment.

The test was performed for accessibility type A (restricted to authorized personnel only).

The switchgear was set up in a room mock-up with a ceiling height of 2.75 m above the floor. The distance between the rear wall of the test object and the room mock-up was 0.80 m, the gap was closed to both sides by the end cassettes. The distance between the side wall of the infeed panel and the side wall of the room mock-up was 0.10 m.

The internally developing pressure of the test object was relieved by operation of a pressure relief flap into the outer air beside the test object via pressure relief duct.

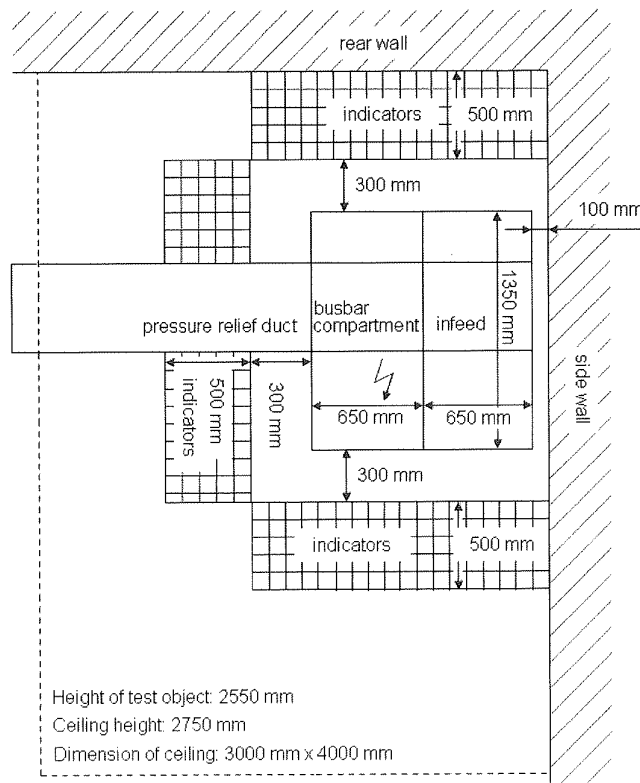
The three-phase infeed connection was made via cables to the cable terminals of the infeed panel and then via the busbars to the test panel.

Each panel was equipped with a common earthing bar.

For the test, indicators of black cretonne (cotton fabric approximately 150 g/m²) were placed in front, on the left-hand side and in the rear of the switchgear as stated in the relevant test specifications.

The test was filmed with a high-speed video camera with a frequency of 2000 frames/s and with two standard digital video cameras.

The evaluation of the RMS-value of the short-circuit current was made according to the Simpson-Formula.



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List of Test Participants

Representatives of Technical Committee:

Mr. Joachim Köhler PEHLA-Testing Laboratory Ratingen, Germany
Mr. Martin Wurster PEHLA-Testing Laboratory Berlin-Siemensstadt, Germany

Test Engineer / Test Operator:

Mr. Joachim Köhler PEHLA-Testing Laboratory Ratingen, Germany
(Test Engineer)
Mr. Uwe Lisseck PEHLA-Testing Laboratory Ratingen, Germany
(Measurement)
Mr. Frank Herff PEHLA-Testing Laboratory Ratingen, Germany
(Machine Operator)

Representatives of Client:

Mr. Vladimír Tauš ABB s.r.o., Brno, Czech Republic
Mr. Pavel Hemek ABB s.r.o., Brno, Czech Republic
Mr. Vlastimil Šindler ABB s.r.o., Brno, Czech Republic
Mr. Jiří Procházka ABB s.r.o., Brno, Czech Republic

Further Participants:

Mr. Alexander Kiesgen PEHLA-Testing Laboratory Ratingen, Germany
Mr. Frank Idaszek PEHLA-Testing Laboratory Ratingen, Germany

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Technical Data of Test Object Switchgear

Test object: Metal-enclosed, air-insulated switchgear, outgoing panel in a two-panel arrangement
Designation: UniGear ZS1, width 650 mm
Manufacturer: ABB s.r.o., Brno, Czech Republic
Serial No.: 1VLS1000024994/3
Year of manufacture: 2011
Drawing No.: See sheet 7 - 8

Ratings assigned by the manufacturer:

Rated voltage	12 kV	
Rated normal current	1250 A	
Rated frequency	50 Hz	
Rated lightning impulse withstand voltage	75 kV	
Rated switching impulse withstand voltage	- kV	
Rated power-frequency withstand voltage	28 kV	
Rated peak withstand current	80 kA	
Rated short-time withstand current	31.5 kA	
Rated duration of short-circuit	3 s	
Insulating medium	air	
Rated filling pressure for insulation	- kPa	abs. at 20 °C
Minimum functional pressure for insulation	- kPa	abs. at 20 °C

Permissible values for internal arc faults:

Peak current	80 kA
Short-circuit current	31.5 kA
Duration of short-circuit	1 s

Further data: -**Essential characteristics and installed devices:**

The circuit-breaker compartment was equipped with an isolating truck type TE 1212-31.

The switchgear was fitted with an IR-window in the rear cover of the tested panel.

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List of Identified Drawings

The manufacturer has submitted to the testing laboratory drawings and other data containing sufficient information to unambiguously identify by type the essential details and parts of the test object presented for test.

The drawings have been stamped and signed by the manufacturer in order to guarantee that the drawings or data schedules truly represent the test object to be tested.

Further these drawings have been stamped and signed by PEHLA representatives and are kept at the client.

with the test documents at the test laboratory.

The testing laboratory has checked that drawings and data schedules adequately represent the essential details and parts of the test object to be tested, but is not responsible for the accuracy of the detailed information.

The drawing(s) contained in this document are identical with the checked, stamped and signed drawings.

Drawing No.	Rev.	P/D ^{*)}	Title	Additional remarks
1VL7615896R0103	Z1743	D	ARRANGEMENT OF THE PANELS FOR TESTING	Included in this test report
GCE8010473 R5102	01	D	FEEDER PANEL 12kV 1250A, 31,5kA, 650mm FEEDER PANEL 12kV 1250A, 31,5kA, 650mm	Included in this test report
GCE8010460 R0121 R5121	00	D	Kabelanschluß 12 kV, TLG.650 Cabel connection/earthing 12 kV, PW.650	Sheet 13
TN. 7412	E0949	D	INTERRUTTORE IN VUOTO TIPO VACUUM CIRCUIT BREAKER TYPE VD4/P 12-17,5kV 630-1250A	-
1VL7619372 R0101 R0102 R0103	00	D	KRYT ZADNÍ S IR OKNEM REAR WALL WITH IR WINDOW	R0101 used
1VL7619372 P0101	00	D	KRYT ZADNÍ S IR OKNEM REAR COVER IR WINDOW	-
1VL7619368 R0101	00	D	NOSNÍK IR OKNA SUPPORT FOR IR WINDOW	-
1VL7619369 P0101	00	D	NOSNÍK SKLÍČKA IR SUPPORT	-
1VL7619370 P0102 P0101	01	D	BOČNICE SIDE WALL	Sheet 1 / 2
1VL7619371 P0101	00	D	PODLOŽKA KRUHOVÁ NEREZ PRO IR FIXING BRACKET	-
GCE8011729 R0101	00	D	Abzweigschienensystem 12kV T-off bar system	Sheet 1 / 2
GCE8011726 P0101	01	D	Abzweigschiene L1 12kV T-off bar L1	Sheet 1 / 2
GCE8011727 P0101	01	D	Abzweigschiene L2 12kV T-off bar L2	Sheet 1 / 2
GCE8011728 P0101	01	D	Abzweigschiene L3 12kV T-off bar L3	She

*) P: Parts list, D: Drawing

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List of Drawings and Parts Lists (2)

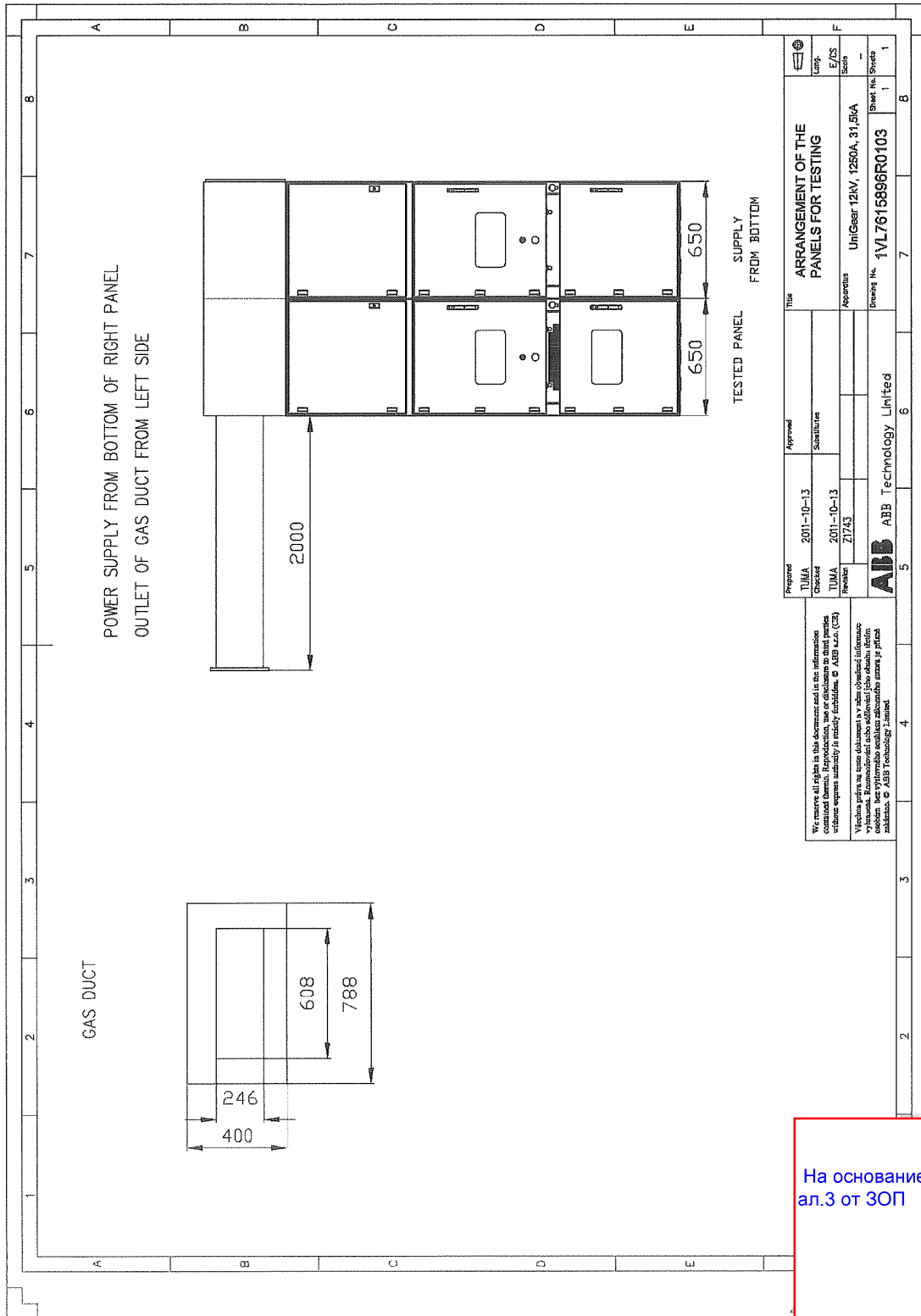
Drawing No.	Rev.	P/D *)	Title	Additional remarks
GCE8011725 R0202	01	D	MONTÁŽ PÁK.MECHANIZMŮ A CLON VE SKŘÍŇI UG 650mm 12/17,5kV	-
1VCR017045 P0001	V2232	D	MOUNTING PLATE PIASTRA MONOBLOCCHI	-
GCE8003624 R0102	02	D	Einfahrtulpe ZS1, 12kV < 1250A Spout ZS1, 12 kV < 1250A	Sheet 2
GCE8685778 P0121	01	D	ROUBÍK CONTACT PIN	-
GCE8010009 R0102	00	D	SS –Schottung f. 1 x Fl.80 x 10 Busbar partitioning with bushing	Sheet 2
1VCR009317	V1392	D	PASSANE TRIPOLARE BUSHING PLATE	-
1YHT010110R0203	-	D	Busbar compartment T650	-
1VCR017046 F0001	V2232	D	PARTITION WALL 650 PIASTRA CHIUSURA 650	-
GCE8010072 P0101	05	D	Flap posteriore Pressure relief flap, rear	-
1VL7619143 R0101	01	D	KANÁL ODFUKOVÝ KOMPAKTNÍ 12kV - 400mm	Sheet 1 / 2
1VL7619139 P0101	00	D	DÍL HORNÍ 650 PLNÝ TOP PART	-
1VL7609243 P0101	-	D	DÍL ZADNÍ 650 REAR PART 650	-
1VL7609245 P0101	-	D	DÍL PŘEDNÍ 650 FRONT PART 650	-
1VL7609248 P0101	-	D	DRŽÁK ZADNÍHO KRYTU 650 HOLDER REAR PART	-
1VL7609240 P0101	00	D	BOČNÍ KRYT SIDE COVER	-
1VL7619144 R0101	01	D	KRYT BOČNÍ S VÝVODEM 2000mmMONTÁŽ SIDE COVER WITH OUTLET	-
1VL7619137 P0101	00	D	DÍL SPONDNÍ - BOČNÍ VÝVOD LOWER PART - SIDE OUTLET	-
1VL7619138 P0101	00	D	DÍL HORNÍ - BOČNÍ VÝVOD UPPER PART - SIDE OUTLET	-
1VL7605085 R0101	-	D	MONTÁŽ BOČNÍCH KRYTŮ IP41-43,50-53 COVER SHEET COMPL. IP41-43,50-53	-
1VL7601541 R0103 R0104	-	D	MONTÁŽ BOČNÍCH KRYTŮ-LEVÝ IP41-43,50-53 COVER SHEET COMPL.-LEFT IP41-43,50-53	-

*) P: Parts list, D: Drawing

Remarks: -

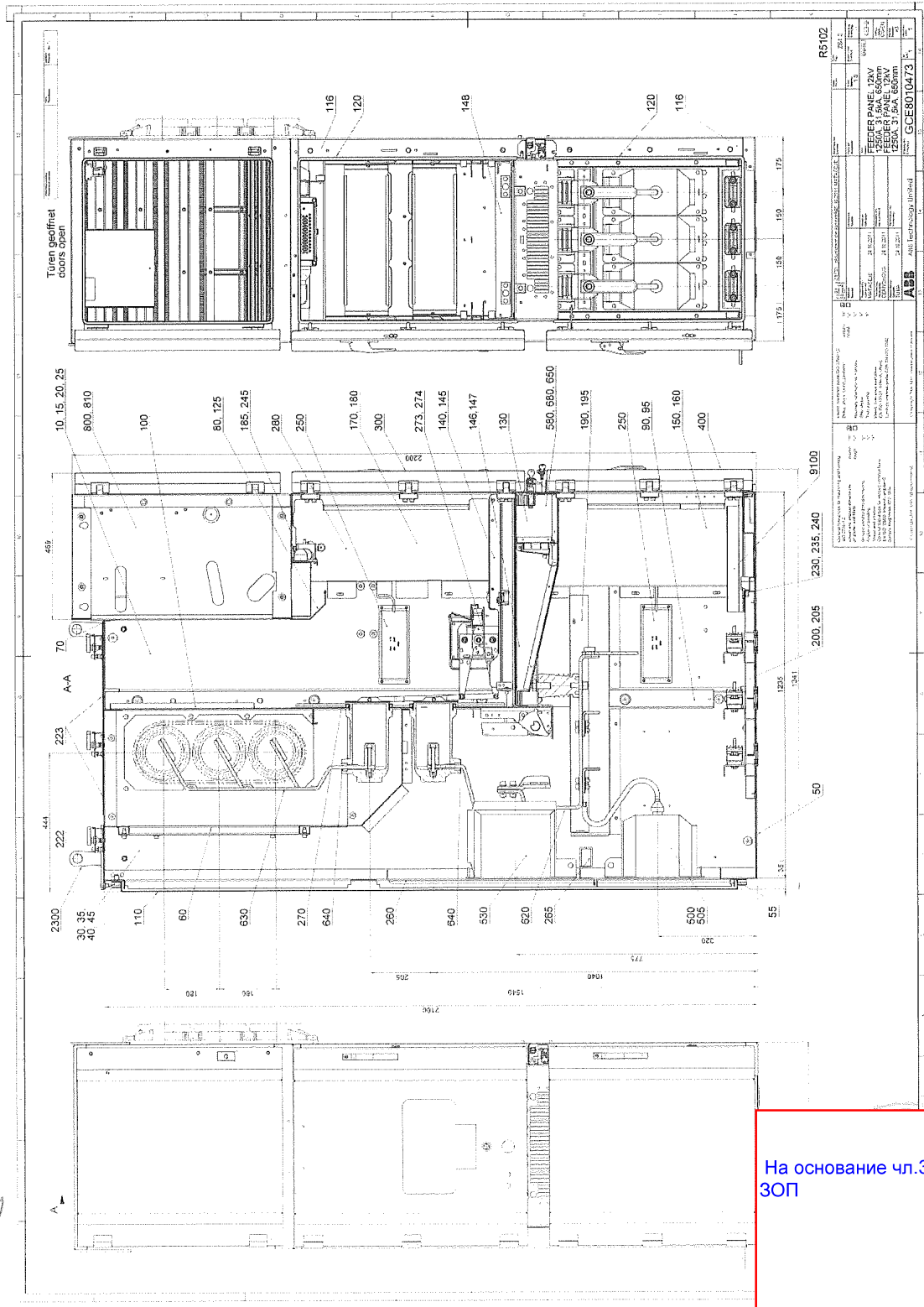
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Drawing No.
1VL7615896R0103



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Drawing No.
GCE8010473 R5102



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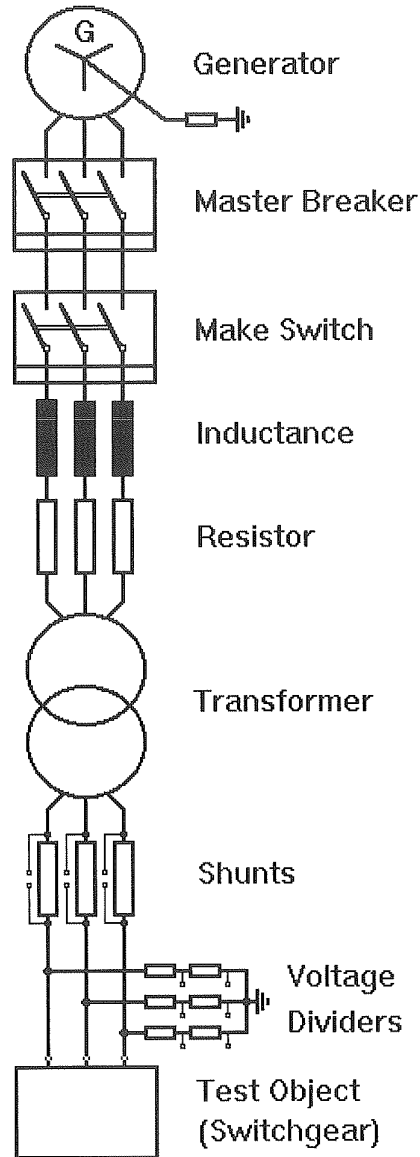
**Technical Data of Test Circuit
Internal Arc Test**

Test performed		Internal Arc Test	-
Test No.	PEHLA 11202Ra /	03	-
Test circuit		Direct	-
Circuit diagram	Sheet No.	12	-
Current circuit			-
Number of phases		3	-
Power frequency	Hz	50	-
Power factor		< 0.15	-
Earthing conditions			-
Generator / System		earthed via 5 kΩ	-
Transformer		-	-
Short-circuit point		not earthed	-
Test object		earthed	-
Test object (test values)			-
Number of phases	-	3	-
Measurement			-
Voltage measurement		Dividers 2500 V / 1 V	-
Current measurement		Shunts 37 μΩ	-

Remarks: -

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**Circuit Diagram
Internal Arc Test**



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**Test Results
Internal Arc Test**

Test performed: Internal arc test
Date of test: 08th December 2011
Condition of test object: Factory new
Test arrangement: See sheet 3
Connections to test object: Infeed three-phase via cables to the cable terminals of the right-hand side infeed panel.
Arc initiation: Three-phase by means of a copper wire Ø 0.5 mm across the busbar above the bushings connecting the busbar compartment with the circuit-breaker compartment.

Test No.: PEHLA 11202Ra / 03		Applied voltage (phase to phase): 6.7 kV	Test frequency: 50 Hz	Test duration: 1.04 s
Test current				
	Peak current kA	AC component		Integral kA
		During the first three half-cycles kA	At the end of the test kA	
L1	82.6	38.5	31.8	31.6
L2	14.7	39.1	33.5	33.2
L3	56.9	37.8	32.8	31.4
Average value				32.1
Equivalent short-circuit duration		1.06 s	related to a short-circuit current of 31.5 kA.	

Assessment of the test:

Criteria according to IEC 62271-200		fulfilled (yes/no)
No.1:	Correctly secured doors and covers do not open	yes
No.2:	No fragmentation of the enclosure occurs and no parts more than 60 g fly away	yes
No.3:	Arcing does not cause holes in the accessible sides up to a height of 2 m	yes
No.4:	Indicators do not ignite due to the effect of hot gases	yes
No.5:	The enclosure remains connected to its earthing point	yes

Remarks:

PEHLA 11202Ra / 01: Current calibration
 PEHLA 11202Ra / 02: Pre-test on external short-circuit to determine the testing

Test results:

The test object passed the test performed in accordance with the applied test specification. The requirements for the verification of the internal arc classification IAC AFLR 31.5kA compartment tested.
 The maximum pressure peak in the busbar compartment was measured to 54.7 kPa.
 There was no visible and functional change or damage around or caused by the IR-wind.

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Photos

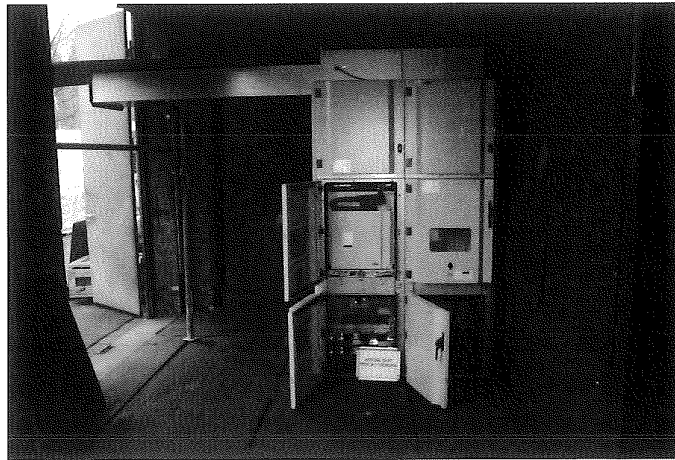


Photo No. 01
Before test PEHLA 11202Ra / 03

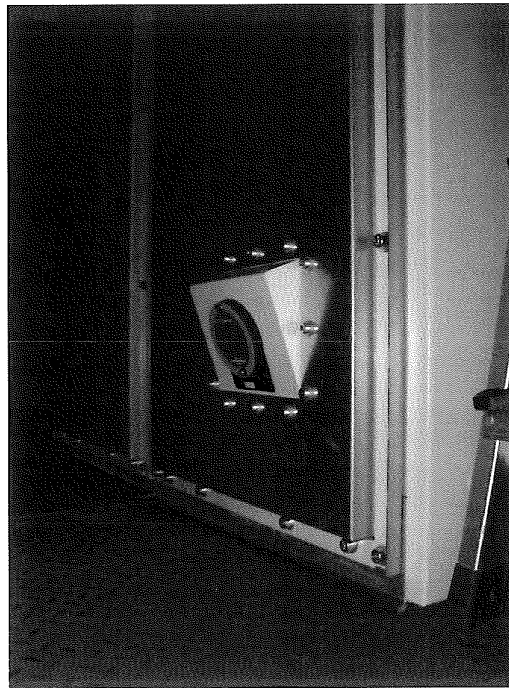


Photo No. 02
Before test PEHLA 11202Ra / 03

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Photos

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Photo No. 03
Before test PEHLA 11202Ra / 03

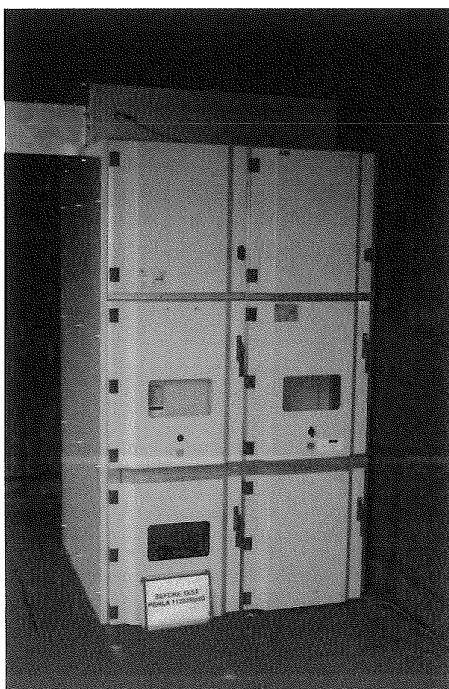


Photo No. 04
Before test PEHLA 11202Ra / 03

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Photos



Photo No. 05
Before test PEHLA 11202Ra / 03

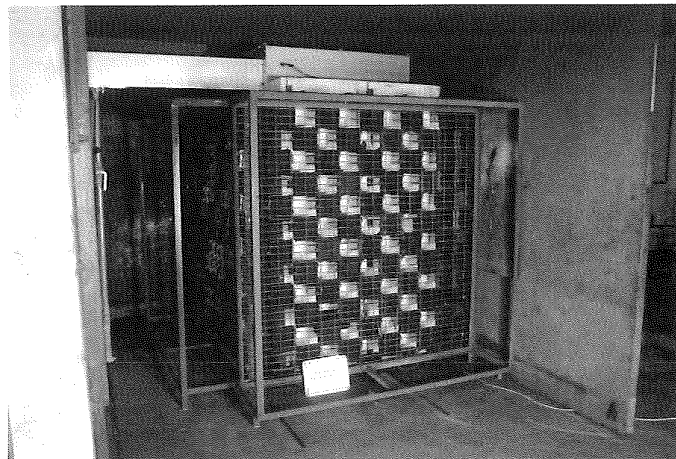


Photo No. 06
Before test PEHLA 11202Ra / 03

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Photos

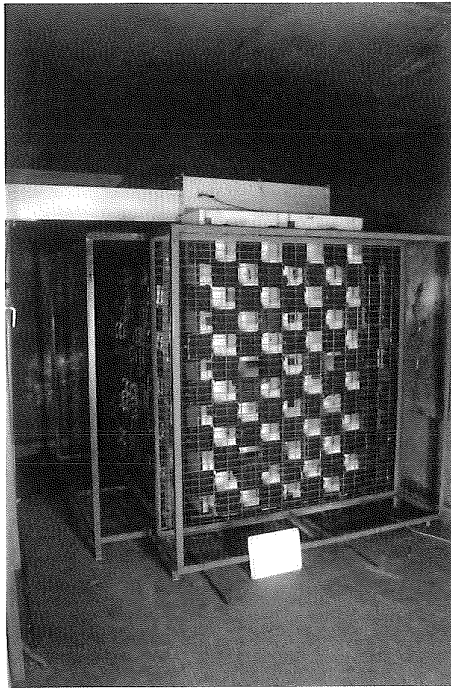


Photo No. 07
After test PEHLA 11202Ra / 03

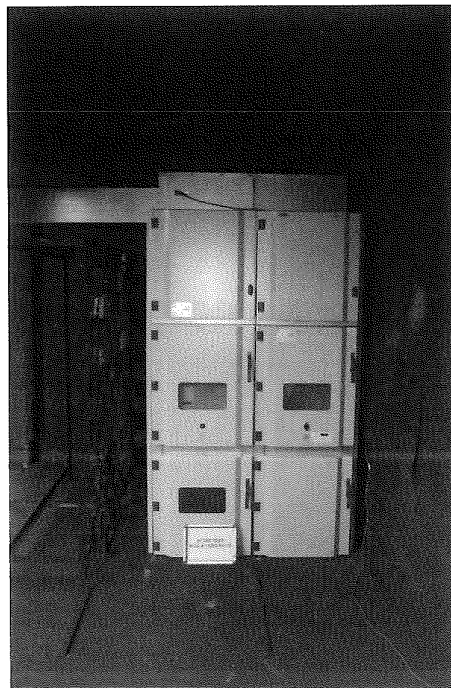
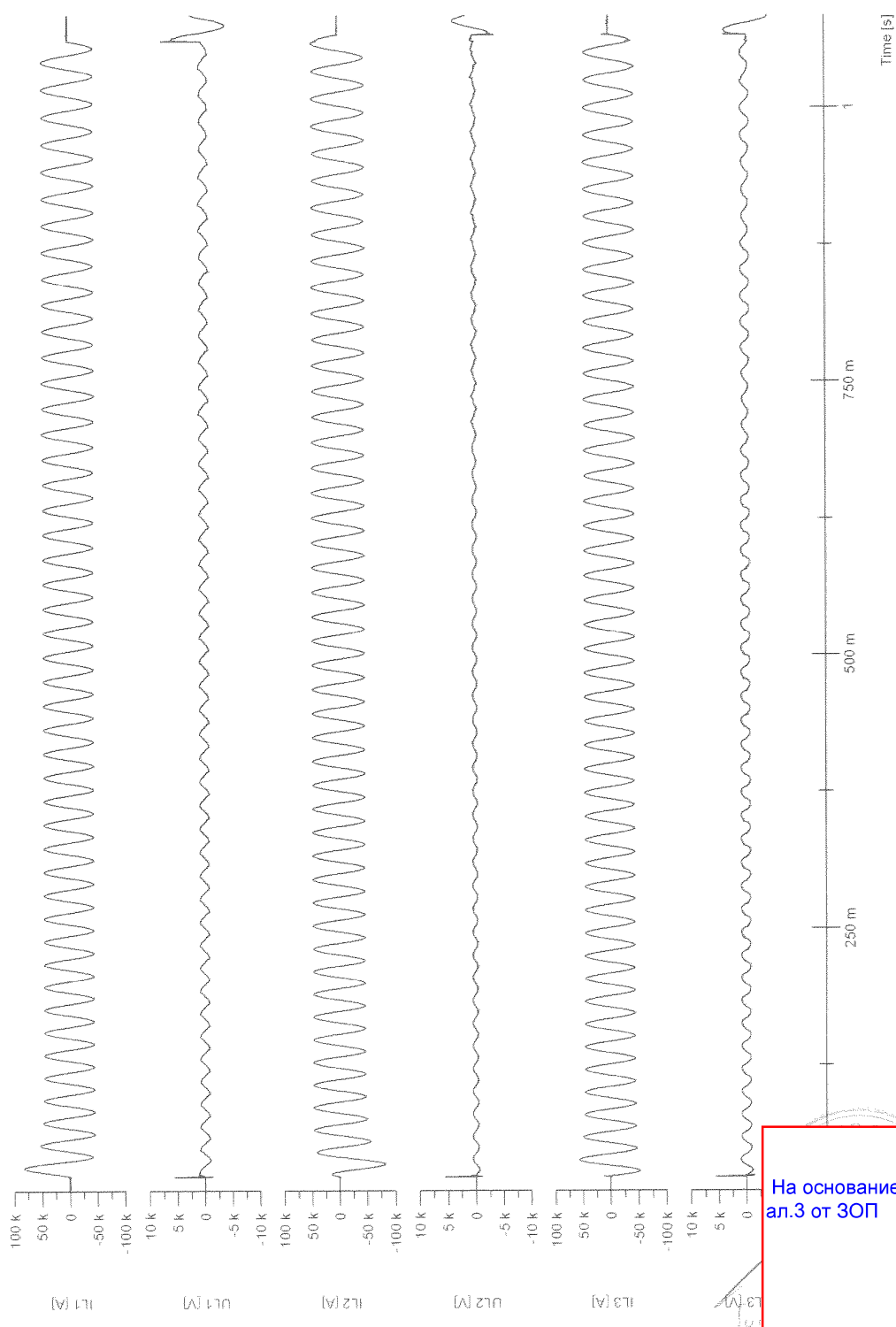


Photo No. 08
After test PEHLA 11202Ra / 03

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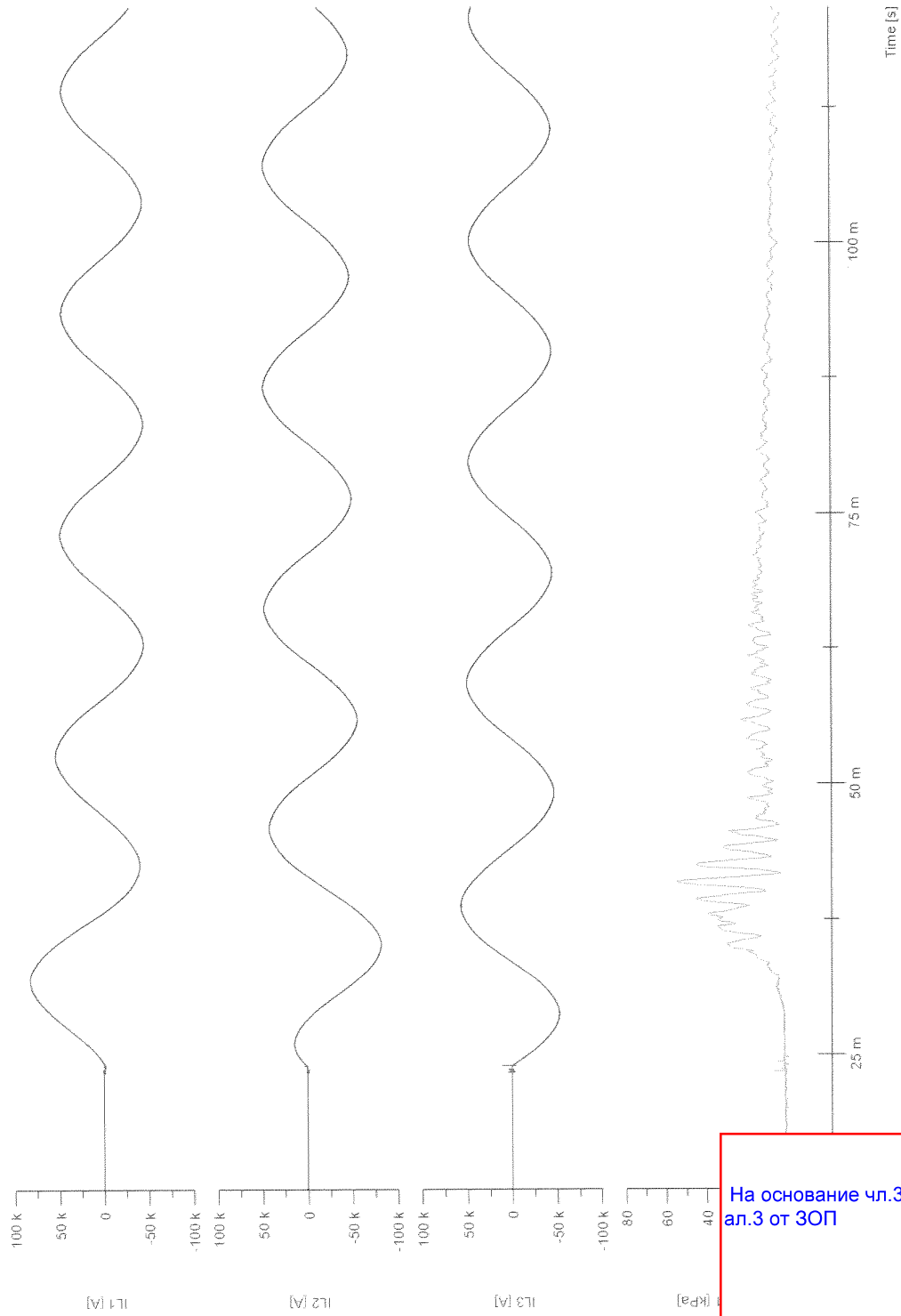
**Oscillogram No.
PEHLA 11202Ra / 03**



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**Oscillogram No.
PEHLA 11202Ra / 03**



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Test Report

Report No.: 11203Ra

Copy No.: 0

Contents: 21 Sheets

Test object: Metal-enclosed, air-insulated switchgear, outgoing panel in a two-panel arrangement
Designation: UniGear ZS1, width 650 mm
Rated voltage: 12 kV Rated normal current: 1000 A Rated frequency: 50 Hz

Manufacturer: ABB s.r.o., Brno, Czech Republic
under licence of ABB Technology Ltd., Zurich, Switzerland
Client: ABB Technology Ltd., Zurich, Switzerland
Testing station: PEHLA-Testing Laboratory Ratingen, Germany
Date of test: 08th December 2011

Applied test specifications:

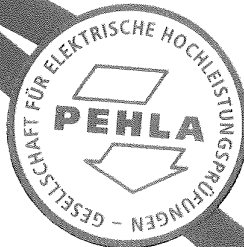
The tests have been carried out in accordance with:
IEC 62271-200 / 2nd Ed. / 2011-10, cl. 6.106 and Annex AA

Tests performed:

Type test 'Internal Arc Test' of the metal-enclosed, air-insulated switchgear.
Testing of the behaviour of the metal-enclosed, air-insulated switchgear under conditions of arcing due to an internal fault. The test was performed three-phase in the circuit-breaker compartment with a peak current of 82.9 kA and a short-circuit current of 32.1 kA – 1.04 s equivalent to 31.5 kA – 1.06 s at 50 Hz.
Continuation on sheet 3.

Test results:

The test object passed the test performed in accordance with the applied test specifications.
The requirements for the verification of the internal arc classification IAC AFLR 31.5kA 1s are met for the compartment tested.



Mannheim, 04th May 2012

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Notes

Accreditation

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Addresses

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68219 Mannheim
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Internet: www.pehla.com

Testing Station: PEHLA-Testing Laboratory Ratingen
Oberhausener Str. 33
40472 Ratingen
Germany

Manufacturer: ABB s.r.o.
Videnska 117
619 00 Brno
Czech Republic
under licence of
ABB Technology Ltd., Zurich, Switzerland

Client: ABB Technology Ltd.
Affolternstrasse 44
8050 Zurich
Switzerland

На основании чл.36а
ал.3 от ЗОП

Test Performed

Continuation from Sheet 1

The test object consisted of a two-panel-arrangement (minimum functional unit) of a metal-enclosed, air-insulated switchgear type UniGear ZS1. The panel width was 650 mm for the left-hand side panel under test and for the right-hand side infeed panel. The initiation wire was installed at the lower contact arms of the circuit-breaker in the circuit-breaker compartment.

The test was performed for accessibility type A (restricted to authorized personnel only).

The switchgear was set up in a room mock-up with a ceiling height of 2.75 m above the floor. The distance between the rear wall of the test object and the room mock-up was 0.80 m, the gap was closed to both sides by the end cassettes. The distance between the side wall of the infeed panel and the side wall of the room mock-up was 0.10 m.

The internally developing pressure of the test object was relieved by operation of a pressure relief flap into the outer air beside the test object via pressure relief duct.

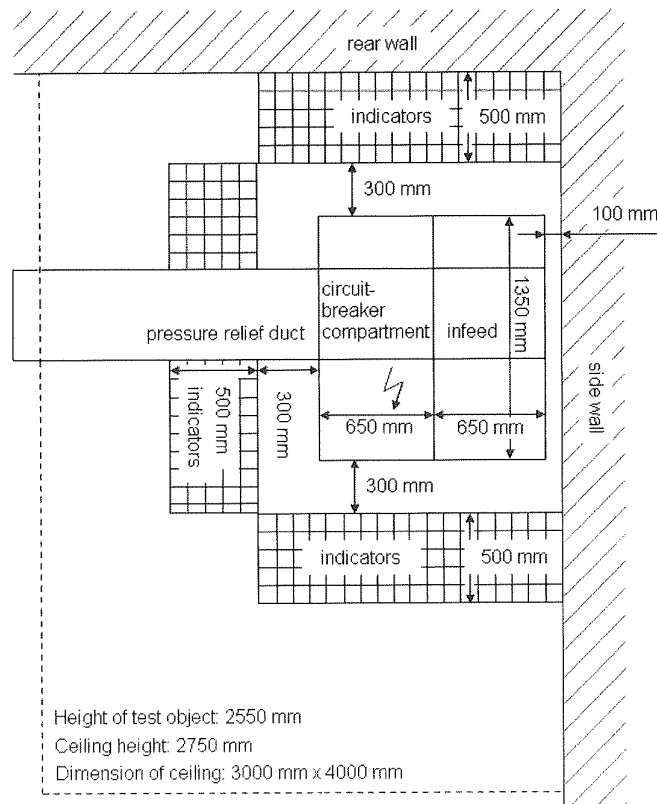
The three-phase infeed connection was made via cables to the cable terminals of the infeed panel and then via the busbars to the test panel.

Each panel was equipped with a common earthing bar.

For the test, indicators of black cretonne (cotton fabric approximately 150 g/m²) were placed in front, on the left-hand side and in the rear of the switchgear as stated in the relevant test specifications.

The test was filmed with a high-speed video camera with a frequency of 2000 frames/s and with two standard digital video cameras.

The evaluation of the RMS-value of the short-circuit current was made according to the Simpson-Formula.



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000500

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List of Test Participants

Representatives of Technical Committee:

Mr. Joachim Köhler PEHLA-Testing Laboratory Ratingen, Germany
Mr. Martin Wurster PEHLA-Testing Laboratory Berlin-Siemensstadt, Germany

Test Engineer / Test Operator:

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(Machine Operator)

Representatives of Client:

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Mr. Pavel Hemek ABB s.r.o., Brno, Czech Republic
Mr. Vlastimil Šindler ABB s.r.o., Brno, Czech Republic
Mr. Jiří Procházka ABB s.r.o., Brno, Czech Republic

Further Participants:

Mr. Frank Idaszek PEHLA-Testing Laboratory Ratingen, Germany

На основании чл.36а
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000301

**Technical Data of Test Object
Switchgear**

Test object: Metal-enclosed, air-insulated switchgear, left hand panel in a two-panel arrangement
Designation: UniGear ZS1
Manufacturer: ABB s.r.o., Brno, Czech Republic
Serial No.: 1VLS1000024994/1
Year of manufacture: 2011
Drawing No.: See sheet 7-9

Ratings assigned by the manufacturer:

Rated voltage	12 kV	
Rated normal current	1000 A	
Rated frequency	50 Hz	
Rated lightning impulse withstand voltage	75 kV	
Rated switching impulse withstand voltage	- kV	
Rated power-frequency withstand voltage	28 kV	
Rated peak withstand current	80 kA	
Rated short-time withstand current	31.5 kA	
Rated duration of short-circuit	3 s	
Insulating medium	air	
Rated filling pressure for insulation	- kPa	abs. at 20 °C
Minimum functional pressure for insulation	- kPa	abs. at 20 °C

Permissible values for internal arc faults:

Peak current	80 kA
Short-circuit current	31.5 kA
Duration of short-circuit	1 s

Further data: -**Essential characteristics and installed devices:**

The circuit-breaker compartment equipped with a circuit-breaker type VD4/P 12.12.32
SN: 1VC1BA00039641

The switchgear was fitted with an IR-window in the rear cover of the tested panel.

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List of Identified Drawings

The manufacturer has submitted to the testing laboratory drawings and other data containing sufficient information to unambiguously identify by type the essential details and parts of the test object presented for test.

The drawings have been stamped and signed by the manufacturer in order to guarantee that the drawings or data schedules truly represent the test object to be tested.

Further these drawings have been stamped and signed by PEHLA representatives and are kept

at the client.

with the test documents at the test laboratory.

The testing laboratory has checked that drawings and data schedules adequately represent the essential details and parts of the test object to be tested, but is not responsible for the accuracy of the detailed information.

The drawing(s) contained in this document are identical with the checked, stamped and signed drawings.

Drawing No.	Rev.	P/D ^{*)}	Title	Additional remarks
1VL7615896R0102	Z1743	D	ARRANGEMENT OF THE PANELS FOR TESTING	Included in this test report
GCE8010473 R5101	01	D	FEEDER PANEL 12kV 1000A, 31,5kA, 650mm FEEDER PANEL 12kV 1000A, 31,5kA, 650mm	Included in this test report
GCE8010460 R0121 R5121	00	D	Kabelanschluß 12 kV, TLG.650 Cabel connection/earthing 12 kV, PW.650	Sheet 13
TN. 7412	E0949	D	INTERRUTTORE IN VUOTO TIPO VACUUM CIRCUIT BREAKER TYPE VD4/P 12-17,5kV 630-1250A	-
1VL7619372 R0101 R0102 R0103	00	D	KRYT ZADNÍ S IR OKNEM REAR WALL WITH IR WINDOW	R0101 used
1VL7619372 P0101	00	D	KRYT ZADNÍ S IR OKNEM REACVER IR WINDOW	-
1VL7619368 R0101	00	D	NOSNÍK IR OKNA SUPPORT FOR IR WINDOW	-
1VL7619369 P0101	00	D	NOSNÍK SKLÍČKA IR SUPPORT	-
1VL7619370 P0102 P0101	01	D	BOČNICE SIDE WALL	Sheet 1 / 2
1VL7619371	00	D	PODLOŽKA KRUHOVÁ NEREZ PRO IR FIXING BRACKET	-
GCE8011725 R0202	01	D	MONTÁŽ PÁK.MECHANIZMŮ A CLON VE SKŘÍNI UG 650mm 12/17,5kV	-
1VCR017045 F001	V2232	D	MOUNTING PLATE PIASTRA MONOBLOCCHI	-
GCE8003624 R0102	02	D	Einfahrtulpe ZS1, 12kV < 1250A Spout ZS1, 12kV < 1250A	She

*) P: Parts list, D: Drawing

На основании чл.36а
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List of Identified Drawings (2)

Drawing No.	Rev.	P/D ^{*)}	Title	Additional remarks
GCE8685778 P0121	01	D	ROUBÍK CONTACT PIN	-
1VCR017046 F001	V2232	D	PARTITION WALL 650 PIASTRA CHIUSURA 650	-
GCE8008730 P0101	04	D	Flap posteriore Pressure relief flap, rear	-
1VL7619148 R0101	00	D	DVEŘE VYP. PROST. S KLIKOU A VÝZTUH. PANTŮ CB COMPART. DOOR COMPL.	-
1VL7619150 R0101	00	D	DVEŘE VYPÍN. PROST.VYZTUŽENÉ CB COMPART. DOOR	-
1VL7605145 P0101	01	D	PLECH DBEŘÍ CB COMP. DOOR PLATE	-
1VL7601388 P0101	02	D	TÁHLO TIE ROD	-
1VL7605148 P0101	-	D	TÁHLO TIE ROD	-
GCE8000436	03	D	Scheibe (Glas) pane	-
1VL7603982 P0101	-	D	ČEP UZAVĚRU BLOCK PIN	-
1VL7607280 R0101	-	D	PANT benz spojov. Mater. HINGE without fasteners	-
J-CN-99-96	C	D/P	ACTUATOR HANDLE ASSEMBLY	-
J-GA-99-001	B	D	CLIP-ON SEALING PROFILE	-
GCE8010045 R0101	00	D	Zwischenboden, vollst. T.650 hor.partition plate	Sheet 1 / 10
GCE8010043 P0101	05	D	Zwischenboden , Tlg.650 Hor. Partition plate	-
GCE8010004 P0101	06	D	Führungsschiene links Guide Rail left	Sheet 1 / 4
GCE8010004 P0102	07	D	Führungsschiene rechts Guide Rail right	Sheet 2
1VL7619143 R0101	01	D	KANÁL ODFUKOVÝ KOMPAKTNÍ 12kV – 400mm	Sheet 1 / 2
1VL7619139 P0101	00	D	DÍL HORNÍ 650 PLNÝ TOP PART	-
1VL7609243 P0101	-	D	DÍL ZADNÍ 650 REAR PART 650	-
1VL7609245 P0101	-	D	DÍL PŘEDNÍ 650 FRONT PART 650	-
1VL7609248 P0101	-	D	DRŽÁK ZADNÍHO KRYTU 650 HOLDER REAR PART	-
1VL7609240 P0101	00	D	BOČNÍ KRYT SIDE COVER	-
1VL7619144 R0101	01	D	KRYT BOČNÍ S VÝVODEM 2000mm MONTÁŽ SIDE COVER WITH OUTLET	-
1VL7619137 P0101	00	D	DÍL SPONDNÍ – BOČNÍ VÝVOD LOWER PART – SIDE OUTLET	-

*) P: Parts list, D: Drawing

На основании чл.36а
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List of Identified Drawings (3)

Drawing No.	Rev.	P/D ^{*)}	Title	Additional remarks
1VL7619138 P0101	00	D	DÍL HORNÍ - BOČNÍ VÝVOD UPPER PART - SIDE OUTLET	-
1VL7605085 R0101	-	D	MONTÁŽ BOČNÍCH KRYTŮ IP41-43,50-53 COVER SHEET COMPL. IP41-43,50-53	-
1VL7601541 R0103 R0104	-	D	MONTÁŽ BOČNÍCH KRYTŮ-LEVÝ IP41-43,50-53 COVER SHEET COMPL.-LEFT IP41-43,50-53	-

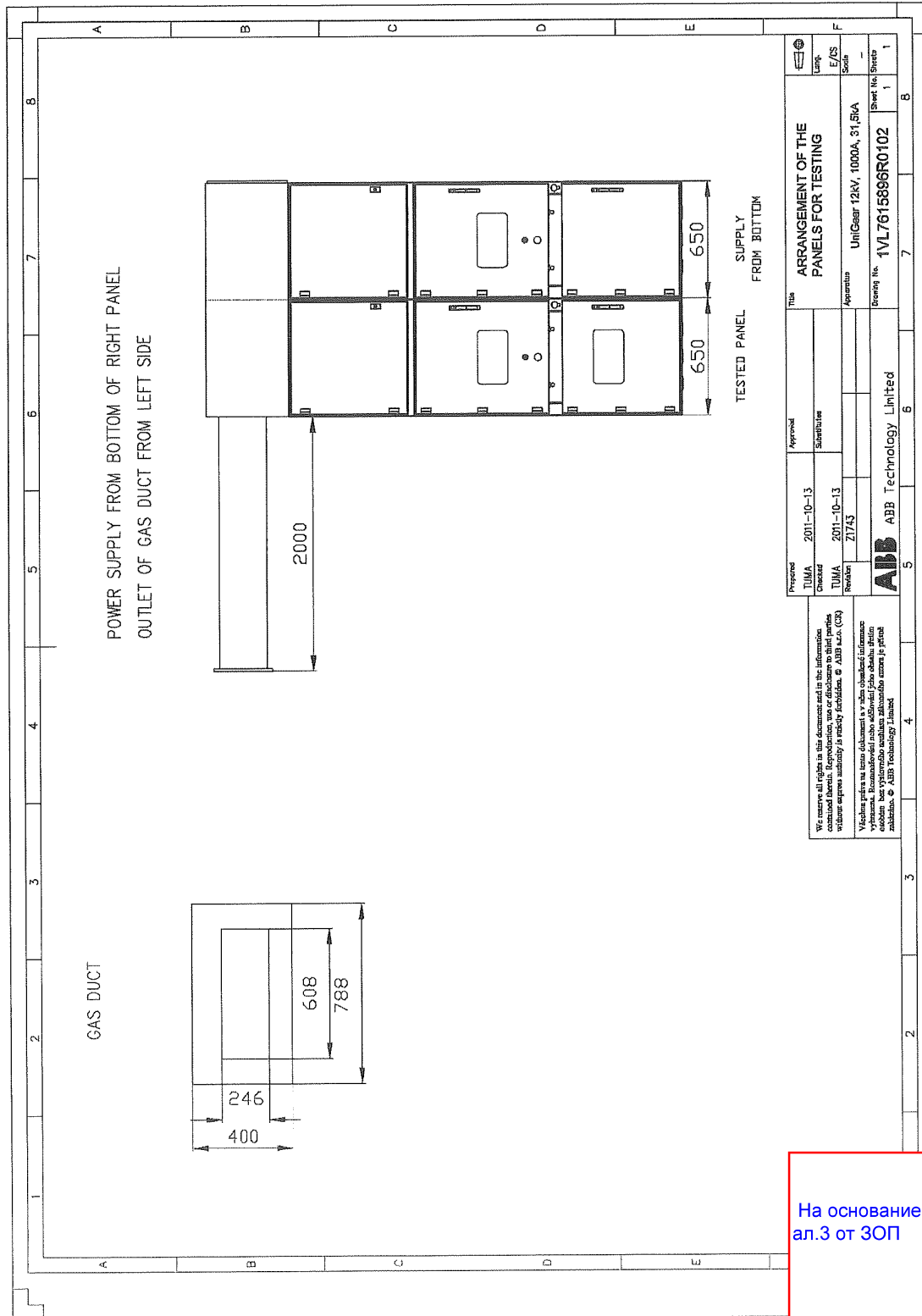
*) P: Parts list, D: Drawing

Remarks: -

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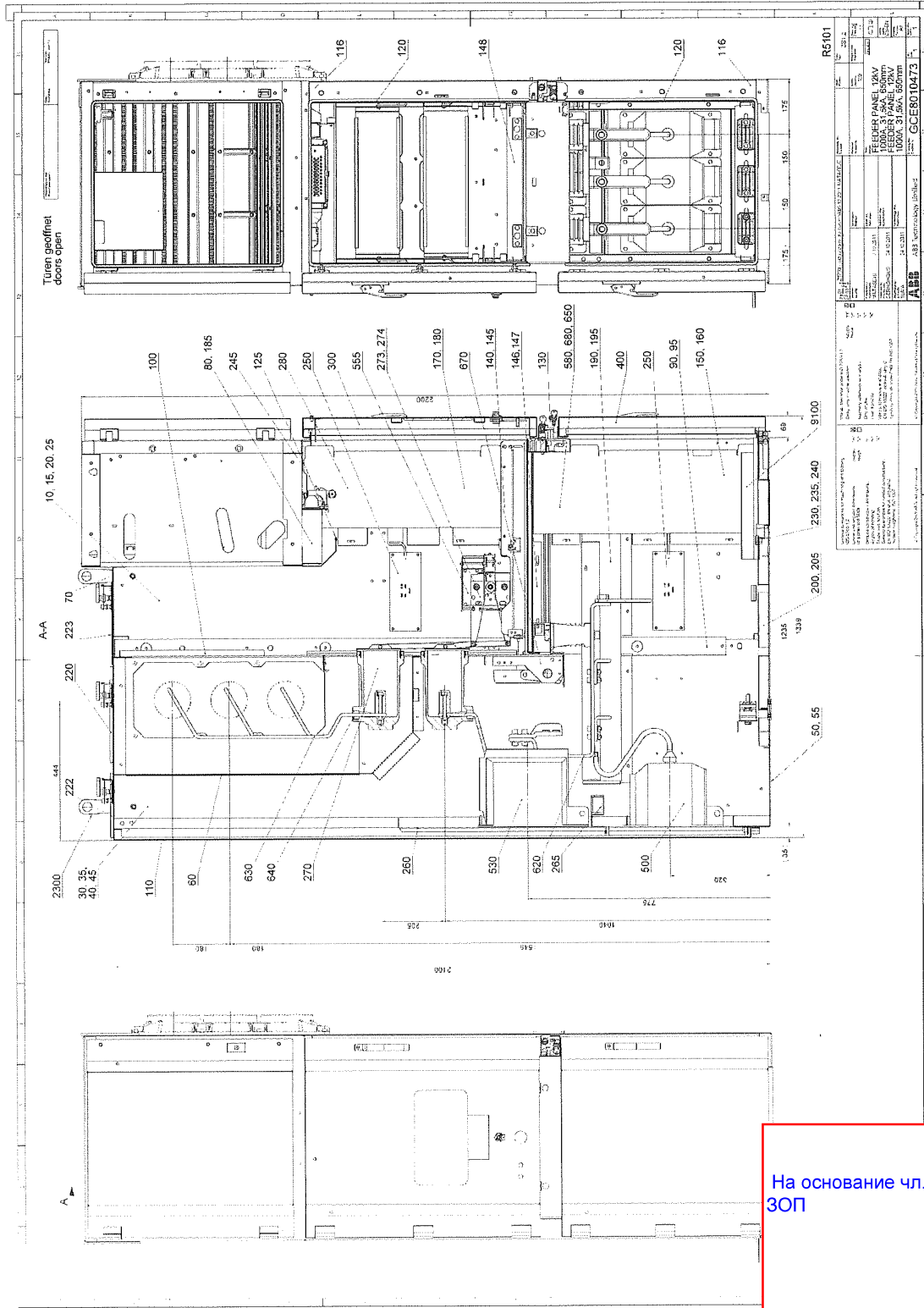
**Drawing No.
1VL7615896R0102**



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Drawing No. GCE8010473 R5101



На основании чл.36а ал.3 от ЗОП

**Technical Data of Test Circuit
Internal Arc Test**

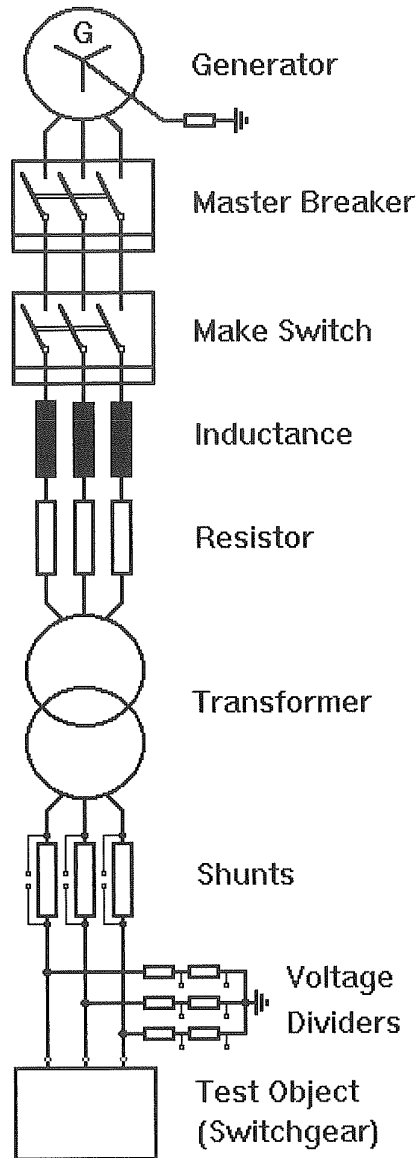
Test performed		Internal Arc Test	-
Test No.	PEHLA 11203Ra /	03	-
Test circuit		Direct	-
Circuit diagram	Sheet No.	13	-
Current circuit			-
Number of phases		3	-
Power frequency	Hz	50	-
Power factor		< 0.15	-
Earthing conditions			-
Generator / System		earthed via 5 kΩ	-
Transformer		-	-
Short-circuit point		not earthed	-
Test object		earthed	-
Test object (test values)			-
Number of phases	-	3	-
Measurement			-
Voltage measurement		Dividers 2500 V / 1 V	-
Current measurement		Shunts 37 μΩ	-

Remarks: -

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**Circuit Diagram
Internal Arc Test**



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**Test Results
Internal Arc Test**

Test performed: Internal arc test
Date of test: 08th December 2011
Condition of test object: Factory new
Test arrangement: See sheet 3
Connections to test object: Infeed three-phase via cables to the cable terminals of the right-hand side infeed panel.
Arc initiation: Three-phase by means of a copper wire Ø 0.5 mm across the contact arms of the circuit-breaker near the poles.

Test No.: PEHLA 11203Ra / 03		Applied voltage (phase to phase): 6.7 kV	Test frequency: 50 Hz	Test duration: 1.04 s
Test current				
	Peak current kA	AC component		Integral kA
		During the first three half-cycles kA	At the end of the test kA	
L1	82.9	38.2	32.2	31.5
L2	16.8	38.8	33.8	33.2
L3	55.9	37.6	32.2	31.6
Average value				32.1
Equivalent short-circuit duration	1.06 s	related to a short-circuit current of		31.5 kA.

Assessment of the test:

Criteria according to IEC 62271-200		fulfilled (yes/no)
No.1:	Correctly secured doors and covers do not open	yes
No.2:	No fragmentation of the enclosure occurs and no parts more than 60 g fly away	yes
No.3:	Arcing does not cause holes in the accessible sides up to a height of 2 m	yes
No.4:	Indicators do not ignite due to the effect of hot gases	yes
No.5:	The enclosure remains connected to its earthing point	yes

Remarks:

PEHLA 11203Ra / 01: Current calibration
 PEHLA 11203Ra / 02: Pre-test on external short-circuit to determine the settings for testing

Test results:

The test object passed the test performed in accordance with the applied test specifications. The requirements for the verification of the internal arc classification IAC A FLR 31.5kA 1 compartment tested. The maximum pressure peak in the circuit-breaker compartment was measured to 68.7 kPa. There was no visible and functional change or damage around or caused by the IR-wind

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Photos

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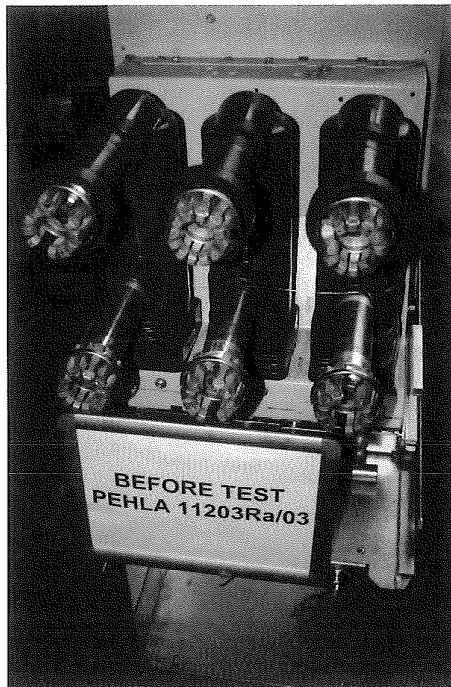


Photo No. 01
Before test PEHLA 11203Ra / 03



Photo No. 02
Before test PEHLA 11203Ra / 03

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Photos

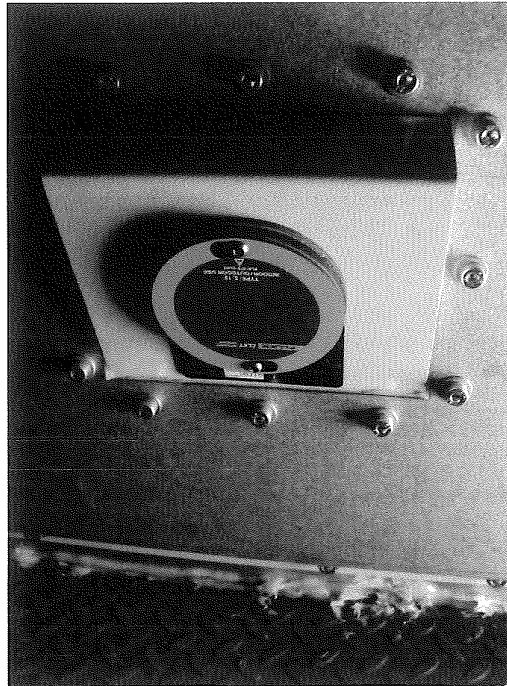


Photo No. 03
Before test PEHLA 11203Ra / 03



Photo No. 04
Before test PEHLA 11203Ra / 03

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Photos

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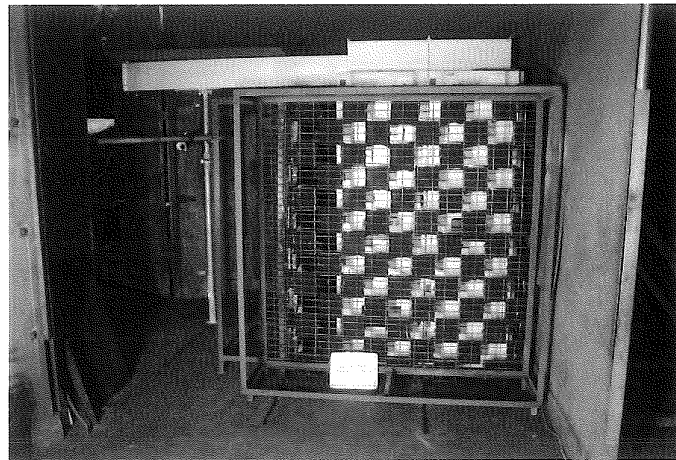


Photo No. 03
Before test PEHLA 11203Ra / 03

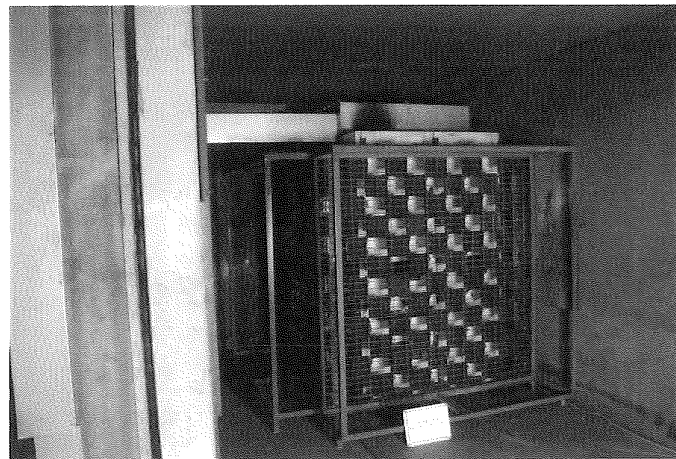


Photo No. 04
After test PEHLA 11203Ra / 03

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11203Ra

Photos

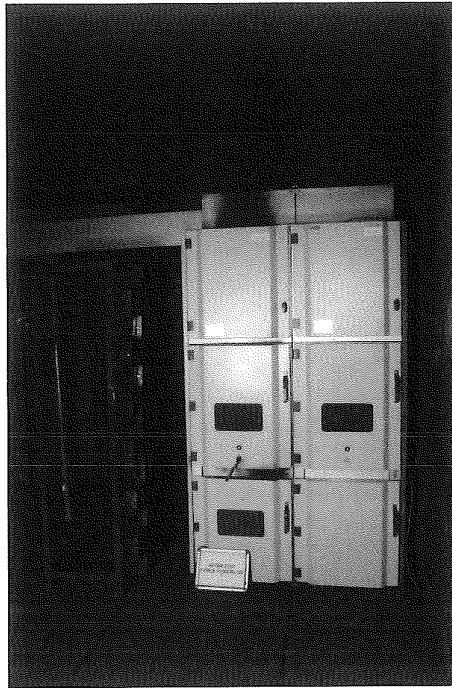


Photo No. 05
After test PEHLA 11203Ra / 03

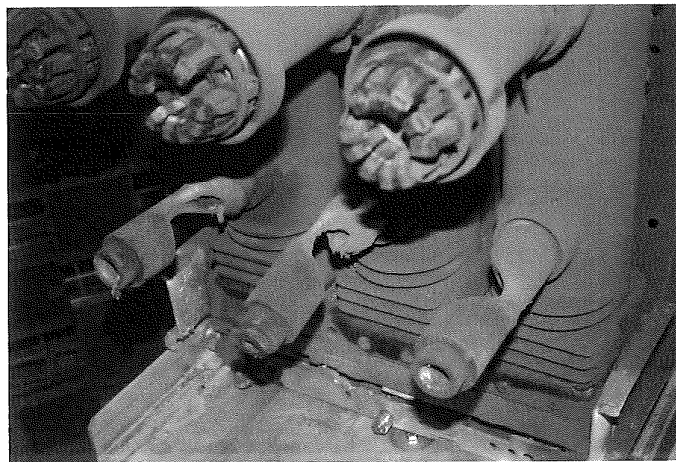


Photo No. 06
After test PEHLA 11203Ra / 03

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Photos

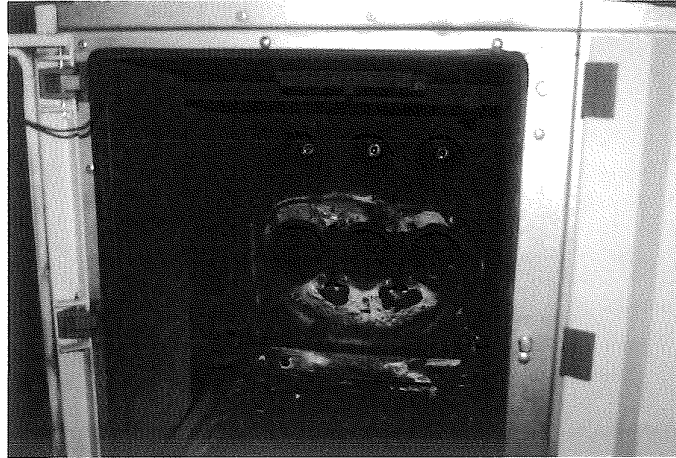
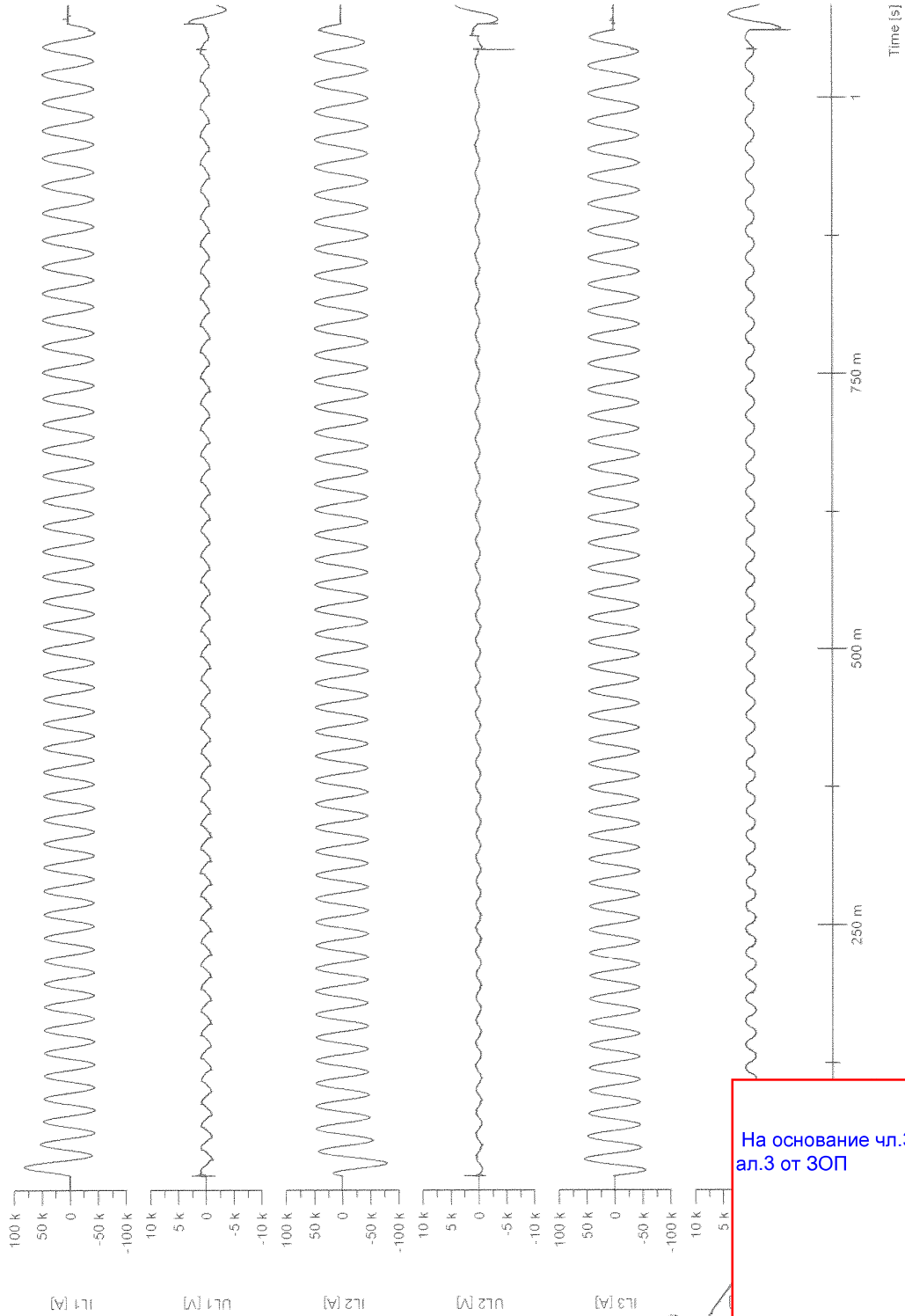


Photo No. 07
After test PEHLA 11203Ra / 03

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**Oscillogram No.
PEHLA 11203Ra / 03**



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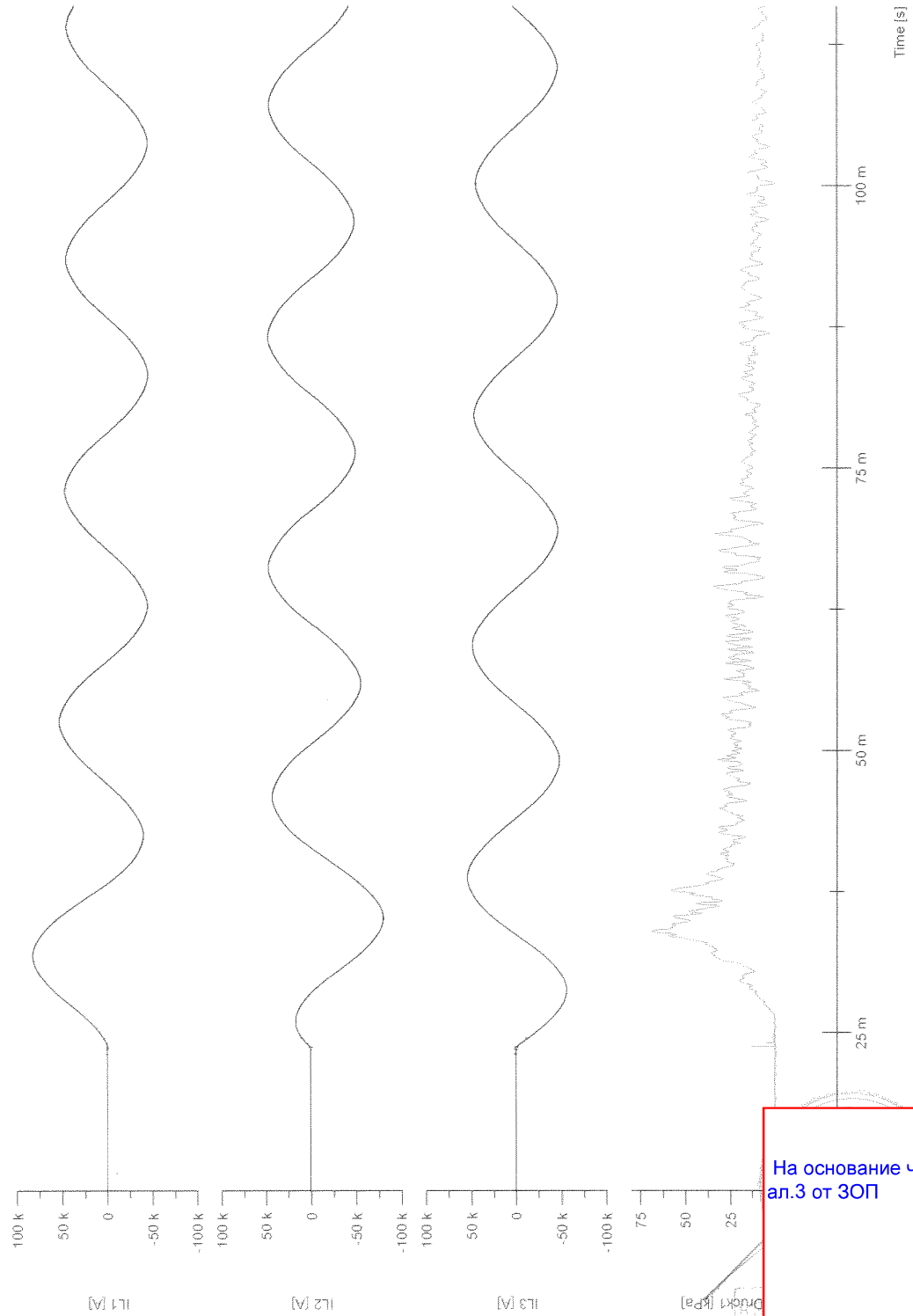
915000

**Oscillogram No.
PEHLA 11203Ra / 03**

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ал.3 от ЗОП

PEHLA

GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN
Member of the SHORT-CIRCUIT TESTING LIAISON (STL)

Test Report

Report No.: 14092Ra

Copy No.: 1

Contents: 23 Sheets

Test object: Metal-enclosed, air-insulated switchgear, outgoing panel in a two-panel arrangement

Designation: UniGear ZS1 (width 650 mm)

Rated voltage: 12 kV Rated normal current: 1000 A Rated frequency: 50 Hz

Manufacturer: ABB s.r.o. PPMV, Brno, Czech Republic
under licence of ABB Technology Ltd., Zurich, Switzerland

Tested for: ABB Technology Ltd., Zurich, Switzerland

Testing station: PEHLA-Testing Laboratory Ratingen, Germany

Date of test: 07th May 2014

Applied test specifications:

The tests have been carried out strictly in accordance with:

IEC 62271-200 / Ed. 2.0 / 2011-10, cl. 6.106 and Annex AA

Additional requirements:
- Indicators placed in low-voltage compartment.
- Increased peak factor of 2.6 p.u. (82.0 kA) to cover 60 Hz applications

Tests performed:

Type test 'Internal Arc Test'.

Testing of the behaviour of the metal-enclosed, air-insulated switchgear, outgoing panel, width 650 mm, under conditions of arcing due to an internal fault. The test was performed three-phase in the cable compartment for a peak current of 82 kA and a short-circuit current of 31.5 kA – 1 s at 50 Hz also valid for 60Hz.

Continuation on sheet 3.

Test results:

The test object passed the test performed in accordance with the applied test specifications.

The requirements for the verification of the internal arc classification IAC AFLR 31.5kA 1s are met for the compartment tested.



Mannheim, 27th August 2014

GESELLSCHAFT FÜR ELEKTRISCHE

На основании чл.36а ал.3 от ЗОП

На основании чл.36а
ал.3 от ЗОП

The test results relate only to the items tested.

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Notes

Accreditation

The PEHLA GbR, PEHLA-Testing Laboratory Ratingen has been approved by the DAkkS (German Accreditation Body) according to EN ISO/IEC 17025 for tests in the field of high-voltage switchgear and controlgear and power engineering equipment (Registration-No. D-PL-12072-06-01).

STL-Member

PEHLA is founder member of the SHORT-CIRCUIT TESTING LIAISON (STL) which has been established in 1969. STL is a forum for the international cooperation of the testing organisations with the further full members ASTA (UK), CESI (IT), CPRI (IND), ESEF (FR), KEMA (NL), SATS (NO, SE, FI), STLNA (US, CA) and JSTC (JP). In the framework of EC, STL (EU) has been recognised in 1992 by EOTC as agreement group.

PEHLA-Documents

A Type Test Certificate

is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Document

is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Report

is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients' instructions. Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the test object, and its condition after the tests.

A Test Confirmation

is issued immediately after the tests. It confirms that the tests have been conducted and is valid only until publishing the detailed results in an entire document.

Uncertainty of the measurement systems

The PEHLA - Testing Laboratories apply the PEHLA Guide No. 12 for determining the uncertainties of measurement, based on ENV 13005 (Guide to the expression of uncertainty in measurement). As long as no explicit statements are made, the uncertainties required by the relevant standards have been complied with.

Addresses

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Hallenweg 40
68219 Mannheim
Germany
Internet: www.pehla.com

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Kallstadter Str. 1
68309 Mannheim
as shareholder and contractor of PEHLA GbR

Testing Station: PEHLA-Testing Laboratory Ratingen
Oberhausener Str. 33
40472 Ratingen
Germany

Manufacturer: ABB s.r.o. PPMV
Videnska 117
Brno 619 00
Czech Republic
under licence of
ABB Technology Ltd., Zurich, Switzerland

Tested for: ABB Technology Ltd.
Affolternstrasse 44
8050 Zurich
Switzerland

На основании чл.36а
ал.3 от ЗОП

Test Performed

Continuation from Sheet 1

The test object consisted of a two-panel-arrangement of a metal-enclosed, air-insulated switchgear type UniGear ZS1 for 12 kV. The panel width was 650 mm for the left-hand side outgoing panel under test and 800 mm for the right-hand side infeed panel. It was equipped with end covers on both sides. The initiation wire was installed across the cable terminals in the cable compartment.

The test was performed for accessibility type A (restricted to authorized personnel only).

The switchgear was set up in a room mock-up with a ceiling height of 2.73 m above the floor (200 mm above the top of the test object). The distance between the rear wall of the test object and the room mock-up was 0.80 m. The distance between the side wall of the left-hand side panel and the side wall of the room mock-up was 0.10 m.

The internally developing pressure of the test object was relieved by operation of a pressure relief flap via an arc duct with opening flap into the outer air outside the room mock-up.

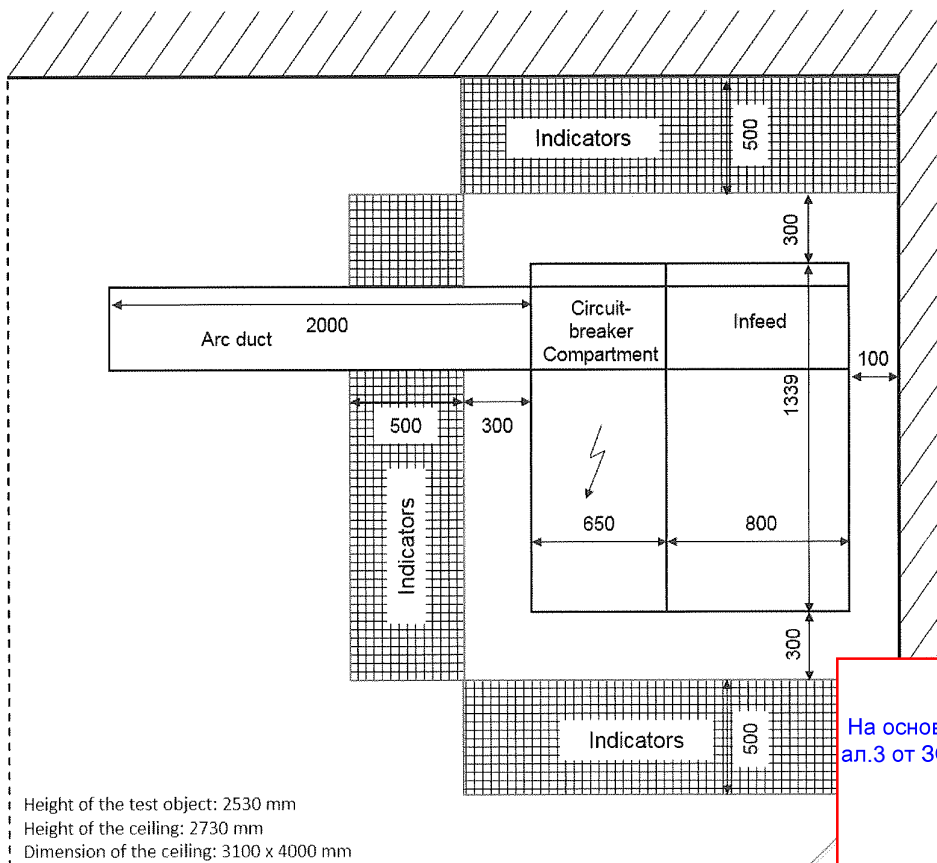
The three-phase infeed connection was made via cables to the cable terminals of the right hand side infeed panel and then via the busbars to the test panel.

Each panel was equipped with a common earthing bar.

For the test, indicators of black cretonne (cotton fabric approximately 150 g/m²) were placed in front, on the left-hand side and in the rear of the switchgear as stated in the relevant test specifications. Additional indicators were placed within the low-voltage compartment.

The test was filmed with a high-speed video camera with a frequency of 1000 frames/s and with two standard digital video cameras.

The evaluation of the RMS-value of the short-circuit current was made according to the Simpson-Formula.



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На основании чл.36а
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List of Test Participants

Representatives of Technical Committee:

Mr. Joachim Köhler PEHLA-Testing Laboratory Ratingen, Germany
Mr. Herbert Feld PEHLA-Testing Laboratory Berlin-Marzahn, Germany

Test Engineer / Test Operator:

Mr. Joachim Köhler PEHLA-Testing Laboratory Ratingen, Germany
(Test Engineer)
Mr. Uwe Lisseck PEHLA-Testing Laboratory Ratingen, Germany
(Measurement and Machine
Operator)

Representatives of Client:

Mr. Vladimir Taus ABB s.r.o. PPMV, Brno, Czech Republic
Mr. Jiri Prochazka ABB s.r.o. PPMV, Brno, Czech Republic
Mr. Karel Roubal ABB s.r.o. PPMV, Brno, Czech Republic
Mr. Pavel Hemek ABB s.r.o. PPMV, Brno, Czech Republic

Further Participants:

-

На основании чл.36а
ал.3 от ЗОП

**Technical Data of Test Object
Switchgear**

Test object: Metal-enclosed, air-insulated switchgear, outgoing panel in a two-panel arrangement

Designation: UniGear ZS1 (width 650 mm)

Manufacturer: ABB s.r.o. PPMV, Brno, Czech Republic

Serial No.: 1VLS1000031110 / 001 (left-hand side panel under test)

Year of manufacture: 2013

Drawing No.: See sheet 8

Ratings assigned by the manufacturer:

Rated voltage	12 kV	
Rated normal current	1000 A	
Rated frequency	50 Hz	
Rated lightning impulse withstand voltage	75 kV	
Rated switching impulse withstand voltage	- kV	
Rated power-frequency withstand voltage	28 kV	
Rated peak withstand current	80 kA	
Rated short-time withstand current	31.5 kA	
Rated duration of short-circuit	3 s	
Insulating medium	-	
Rated filling pressure for insulation	- kPa	abs. at 20 °C
Minimum functional pressure for insulation	- kPa	abs. at 20 °C

Permissible values for internal arc faults:

Peak current	80 kA
Short-circuit current	31.5 kA
Duration of short-circuit	1 s

Further data: -**Essential characteristics and installed devices:**

Tested configuration was fitted with IR window IRISS type VPFR-75.

На основании чл.36а
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Technical Data of Test Object Switchgear

Test object: Metal-enclosed, air-insulated switchgear, outgoing panel in a two-panel arrangement

Designation: UniGear ZS1 (width 800 mm)

Manufacturer: ABB s.r.o. PPMV, Brno, Czech Republic

Serial No.: 1VLS1000031110 / 016 (right-hand side infeed panel)

Year of manufacture: 2013

Drawing No.: See sheet 8

Ratings assigned by the manufacturer:

Rated voltage	12	kV
Rated normal current	1000	A
Rated frequency	50	Hz
Rated lightning impulse withstand voltage	75	kV
Rated switching impulse withstand voltage	-	kV
Rated power-frequency withstand voltage	28	kV
Rated peak withstand current	80	kA
Rated short-time withstand current	31.5	kA
Rated duration of short-circuit	3	s
Insulating medium	-	
Rated filling pressure for insulation	-	kPa abs. at 20 °C
Minimum functional pressure for insulation	-	kPa abs. at 20 °C

Permissible values for internal arc faults:

Peak current	80	kA
Short-circuit current	31.5	kA
Duration of short-circuit	1	s

Further data: -

Essential characteristics and installed devices: -

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List of Identified Drawings

The manufacturer has submitted to the testing laboratory drawings and other data containing sufficient information to unambiguously identify by type the essential details and parts of the test object presented for test.

The drawings have been stamped and signed by the manufacturer in order to guarantee that the drawings or data schedules truly represent the test object to be tested.

Further these drawings have been stamped and signed by PEHLA representatives and are kept at the client.

with the test documents at the test laboratory.

The testing laboratory has checked that drawings and data schedules adequately represent the essential details and parts of the test object to be tested, but is not responsible for the accuracy of the detailed information.

The drawing(s) contained in this document are identical with the checked, stamped and signed drawings.

Drawing No.	Rev.	P/D *)	Title	Additional remarks
1VL7625718R0101, Sheet 1/1	-	D	Testing arrangement Couple with side outlet	Included in this test Report
1VL7625718R0103, Sheet 1/1	-	D	Testing arrangement Couple with side outlet UG 12kV, 31,5kA	-
GCE8010473R5101, Sheet 1/1	01	D	FEEDER PANEL 12kV 1000A, 31,5kA, 650mm FEEDER PANEL 12kV 1000A, 31,5kA, 650mm	Included in this test Report
GCE8010473R5101, Sheet 1/1	01	D	FEEDER PANEL 12kV 1000A, 31,5kA, 650mm FEEDER PANEL 12kV 1000A, 31,5kA, 650mm	-
GCE8010461R5121, Sheet 9	02	D	Kabelanschluß 12kV, TLG.800 Cable connection/earthing 12kV, PW.800	-
1VL7605162P0101, Sheet 1/2	06	D	BOČNICE PŘEDNÍ LEVÁ SIDEWALL FRONT, LEFT	-
1VL7604765P0101, Sheet 1/1	13	D	BOČNICE PŘEDNÍ PRAVÁ SIDEWALL FRONT, RIGHT	-
1VL7605572P0101, Sheet 1/1	01	D	VÝZTUHA PŘEDNÍ LEVÁ PROFILE FRONT LEFT	-
1VL7604743P0102	01	D	VÝZTUHA PŘEDNÍ PRAVÁ SHEET PROFILE FRONT RIGHT	-
GCE8011713P0101, Sheet 1	09	D	Seitenwand, hinten links Sidewall, rear left	-
GCE8011714P0101, Sheet 1	09	D	Seitenwand, hinten rechts Sidewall, rear right	-
GCE8010045R0101, Sheet 1/10	00	D	Zwischenboden, vollst. T.650	-
1VL7622092P0101, Sheet 1/1	00	D	KLAPKA VENTILAČNÍ ZADNÍ 650mm PRESSURE RELIEF FLAP	-
GCE8008711P0101, Sheet 1/1	11 Z2204	D	Base 650 Bottom Plate 650	-
GCE8011132R0101, Sheet 1	01	D	Bodenabdeckung, vollst. Bottom plate, compl.	-

*) P: Parts list, D: Drawing

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List of Drawings and Parts Lists (2)

Drawing No.	Rev.	P/D *)	Title	Additional remarks
1VL7600414R0101, Sheet 1/1	03	D	MONTÁŽ PRO VYS. MĚŘENÍ V KABEL. PROSTORU MOUNTING FOR VT TRUCK IN CABLE COMPARTMENT	-
1VL7612981R0101, Sheet 1/1	02	D	VÝSUVNĚ MĚŘENÍ KABEL.PROSTOR V.T.TRUCK COMPL.12/17,5kV	-
1VL7601191R0101, Sheet 1/6	01	D	NOSNÍK TRANSFORMÁTORŮ TRANSFORMER PLATE COMPL.	-
GCE8010502R0102 , Sheet 2	01	D	Anschlussschienen-System 1000A cable connecting system 1000A	-
1VL7606112R0101, Sheet 1/1	04	D	MONTÁŽ ZADNÍHO KRYTU REAR COVER ASSEMBLY	-
1VL7606285R0101, Sheet 1/1	02	D	ZADNÍ KRYT s lemovkami REAR WALL w. protection	-
1VL7619372P0101, Sheet 1/1	00	D	KRYT ZADNÍ S IR OKNEM REAR COVER WITH IR WINDOW	-
1VL7619368R0101, Sheet 1/1	01	D	NOSNÍK IR OKNA IR WINDOW SUPPORT	-
-	-	-	Infrared Viewing Pane, Type VPFR-75 installed in 1VL7619368R0101	IRIS LTD Unit 2 Grafton Place Montrose Road Chelmsford Essex CM2 6TG Canada
1VL7604768R0102, Sheet 2/2	02	D	DVEŘE KABEL. PROSTORU S KLIKOU – OKNO CC DOOR COMPL.	-
1VL7609238R0101, Sheet 1/2	02	D	KANÁL ODFUKOVÝ KOMPAKTNÍ 12kV – 400mm COMPACT GAS DUCT	-
1VL7609240P0101, Sheet 1/1	-	D	BOČNÍ KRYT SIDE COVER	-
1VL7609790P0101, Sheet 1/1	01	D	KRYT KABELOVÉHO OTVORU CABLE SLOT COVER	-
1VL7620708R0101, Sheet 1/1	00	D	KRYT BOČNÍ SIDE COVER	-
1VL7607280R0101, Sheet 1/1	-	D	PANT bez spojov. Mater. HINGE without fasteners	-
1VL7603067P0101, Sheet 1/1	-	D	Outher hinge part UniGear MCC	-
1VL7605173P0101, Sheet 1/1	-	D	PANT VNITRNÍ INNER HINGE PART	-
1VL7603982P0101, Sheet 1/1	-	D	ČEP UZAVĚRU BLOCK PIN	-

*) P: Parts list, D: Drawing

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List of Drawings and Parts Lists (3)

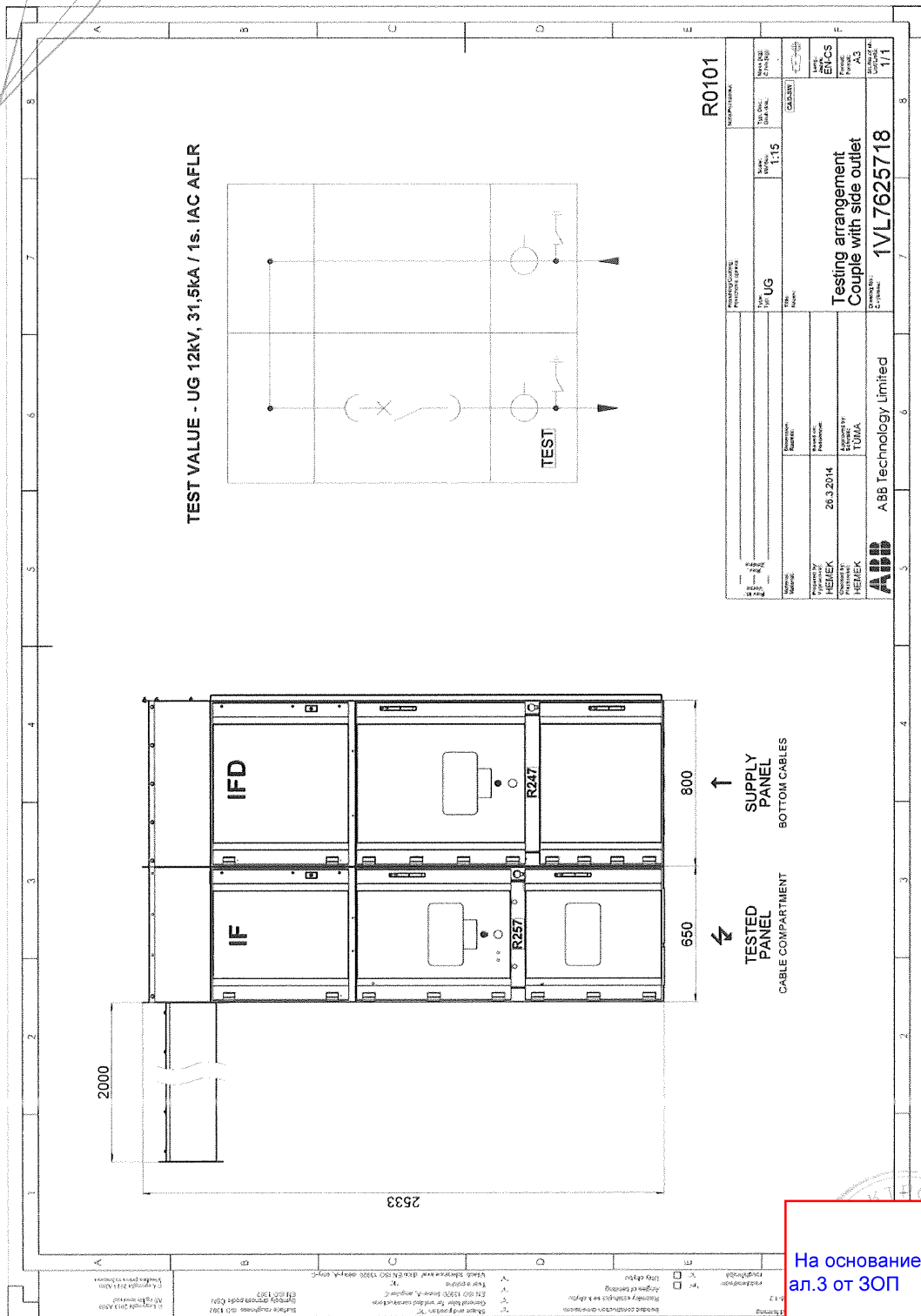
Drawing No.	Rev.	P/D *)	Title	Additional remarks
1VL7603069P0101, Sheet 1/1	01	D	ČEP PIN	-
1VL7601388P0101, Sheet 1/1	02	D	TÁHLO TIE ROD	-
1VL7605148P0101, Sheet 1/1	-	D	TÁHLO TIE ROD	-
1VL7619136R0101, Sheet 1/1	00	D	VÝVOD BOČNÍ Z ODFUK. KANÁLU 2000mm SIDE GAS DUCT OUTLET	-
1VL7601541R0103, Sheet 1/1	01	D	MONTÁŽ BOČNÍCH KRYTŮ-LEVÝ IP41-43,50-53 COVER SHEET COMPL.-LEFT IP41-43,50-53	-
1VL7601541R0104, Sheet 1/1	01	D	MONTÁŽ BOČNÍCH KRYTŮ-LEVÝ IP41-43,50-53 COVER SHEET COMPL.-LEFT IP41-43,50-53	-

*) P: Parts list, D: Drawing

Remarks: -

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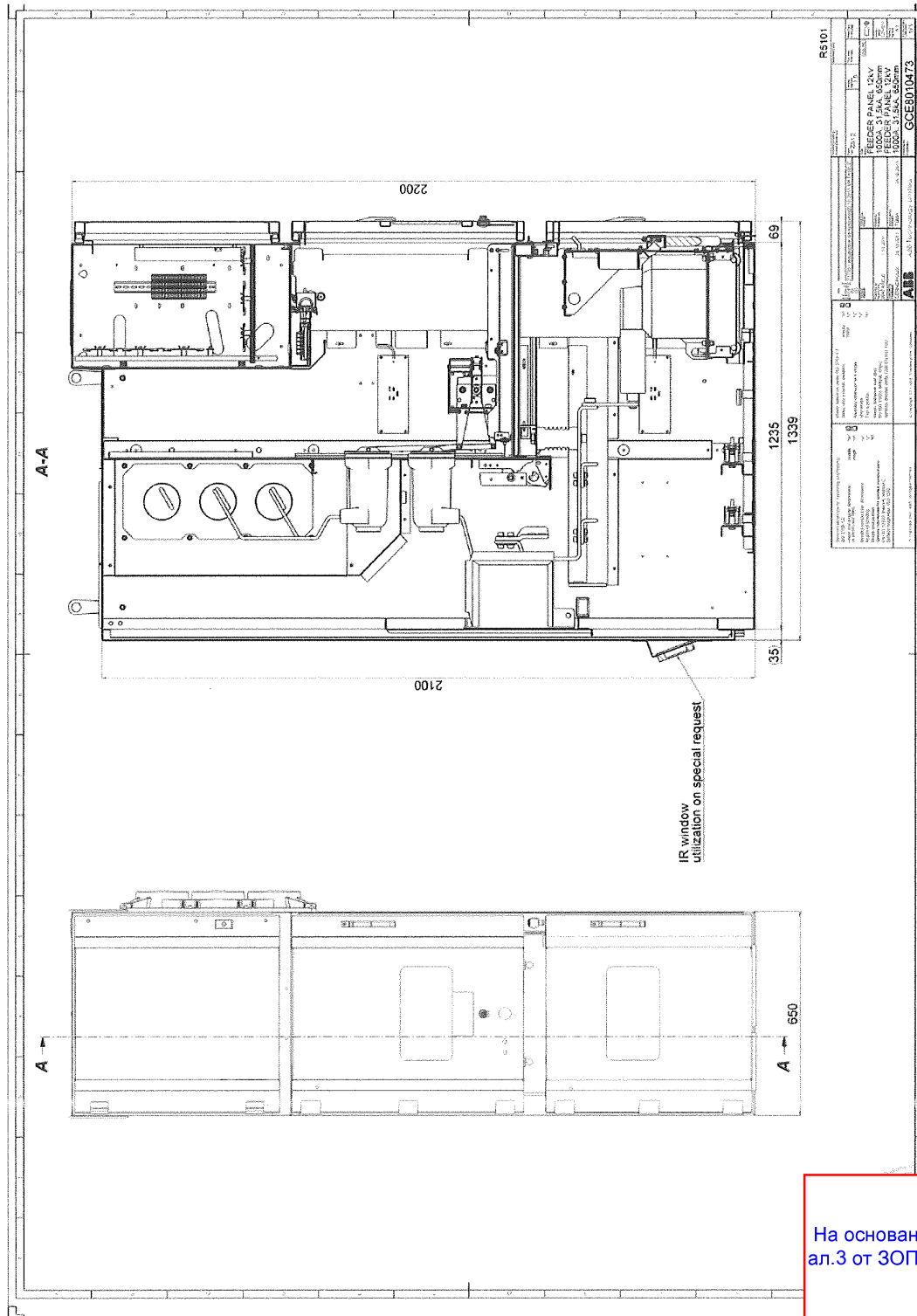
Drawing No. 1VL7625718R0101



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**Drawing No.
GCE8010473R5101**



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**Technical Data of Test Circuit
Internal Arc Test**

Test performed		Internal Arc Test	-
Test No.	PEHLA 14092Ra /	02 - 04	-
Test circuit		Direct	-
Circuit diagram	Sheet No.	14	-
Current circuit			-
Number of phases		3	-
Power frequency	Hz	50	-
Power factor		< 0.15	-
Earthing conditions			-
Generator / System		earthed via 5 kΩ	-
Transformer		-	-
Short-circuit point		not earthed	-
Test object		earthed	-
Test object (test values)			-
Number of phases		3	-
Measurement			-
Voltage measurement		Dividers 2500 V / 1 V	-
Current measurement		Shunts 4 μΩ	-

Remarks: -

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