1. Предмет на изпитването:

Изпитван детайл от системата: херметичен проход BKD 150-K/150
капачка BKD 150-D3/60

Подготовка на изпитването: виж рисунка приложение 1

Провеждане на изпитването: Подготовката на изпитването се осъществява от сътрудник на заявителя на измерването. След охлаждане съгласно изискването на изпитването до -25°C, системата е подложена на изпитване под водно налягане от 5 бара.
Силата на установеното водно налягане беше измерена и отчетена за период от 24 часа.

Измервателна техника: Измервателен усилвател тип MGC/MC55

Датчик за налягане тип P8AP/10

Дата на изпитването: 29.06.2001 до 02.07.2001

Провел изпитването: Миахел Гом

2. Резултати от измерването:

Таблица с резултати:

Изпитване	Среда на изпитване	Налягане /бара/	Продължителност на изпитването /часа/	Налягане в началото на изпитването /бара/	Налягане в края на изпитването /бара/
1	Вода със защита от замръзване	5	60	5,11	4,99

През цялото време не се наблюдава изпускане на вода.

Лекото спадане на налягането е възстановено чрез охлаждане на средата на изпитването.

Графично изображение:

3. Забележки

Няма

Приложение № 1

Fraunhofer Institut
Fertigungstechnik
Materialforschung

Prüfbericht	WP-PB-A301033Go-002 (Abschrift) Der Prüfbericht umfasst 3 Blätter und 1 Anlage
Aufgabenstellung	Messung der Dichtigkeit einer Kabeldurchführung der Fa. Doyma GmbH & Co des Typs BKD 150 gegenüber Wasserdruck bei –25°C
Auftraggeber	DOYMA GmbH & Co Industriestraße 43-57 28876 Oyten
Auftrags/Lieferschein Nr.	vom 25.06.2001
Prüflabor	Fraunhofer - Institut für Fertigungstechnik und Angewandte Materialforschung (IFAM) Labor für Werkstoffprüfung, Metallographie und Analytik Wiener Straße 12 D - 28359 Bremen Tel. +49 (0) 4 21 / 22 46 - 4 00 Fax. +49 (0) 4 21 / 22 46 - 4 30
Prüfgegenstände	Kabeldurchführungssystem BKD 150
Eingangsdatum	25.06.2001
Hinweise	Das Prüfergebnis bezieht sich ausschließlich auf die genannten Prüfgegenstände. Ohne schriftliche Genehmigung des Prüflabors darf dieser Prüfbericht nicht auszugsweise vervielfältigt werden. Soll vom Auftraggeber auf die Inanspruchnahme des Prüflabors hingewiesen werden, muss die vollständige Anschrift des Prüflabors angegeben werden.
Ausstellungsdatum	Bremen, den 02.08.2001
Unterschrift	h. Brede

1. Prüfgegenstand

Zu prüfende Einzelteile des Systems:	Einfach-Dichtpackung Systemdeckel	BKD 150-K/150 BKD 150-D3/60
Prüfvorrichtung:	s. Zeichnung Anlage 1	
Versuchsdurchführung:	Die Prüfvorrichtung wurde von einem Mitarbeiter des Auftraggebers für die Messung vorbereitet. Nach Kühlung der Prüfanordnung auf –25°C wurde das System mit einem Wasserdruck von 5 bar beaufschlagt. Die Höhe des anstehenden Wasserdruckes wurde über einen Zeitraum von > 24 Stunden gemessen und aufgezeichnet.	
Messtechnik:	HBM-Messverstärker Typ MGC / MC55 (IFAM-Prüfmittel Nr.: A4.110-0001) HBM-Druckaufnehmer Typ P8AP/10 (IFAM-Prüfmittel Nr.: D2.2110-0002)	
Prüfdatum:	29.06.2001 bis 02.07.2001	
Prüfer:	Michael Gomm	

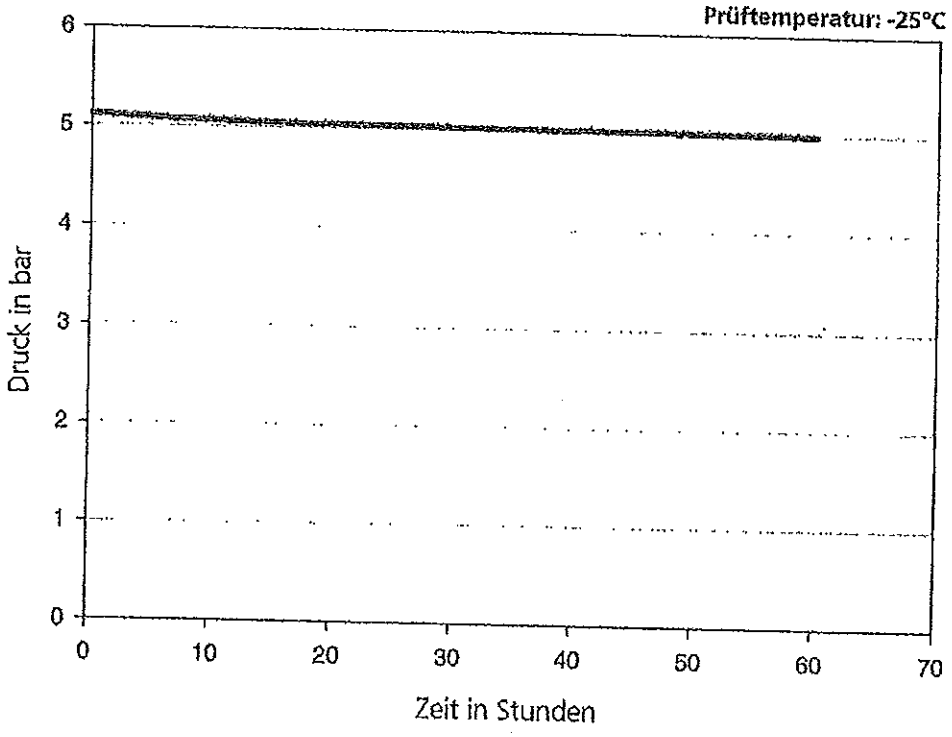
2. Messergebnisse

Ergebnistabelle:

Prüfung	Prüfmedium	Prüfdruck [bar]	Prüfdauer [Stunden]	Druck zu Beginn der Messung [bar]	Druck am Ende der Messung [bar]
1	Wasser mit Frostschutz	5	60	5.11	4.99

Es war zu keinem Zeitpunkt ein Wasseraustritt zu beobachten.
Der leichte Druckabfall ist durch die Abkühlung des Prüfmedium zurückzuführen.

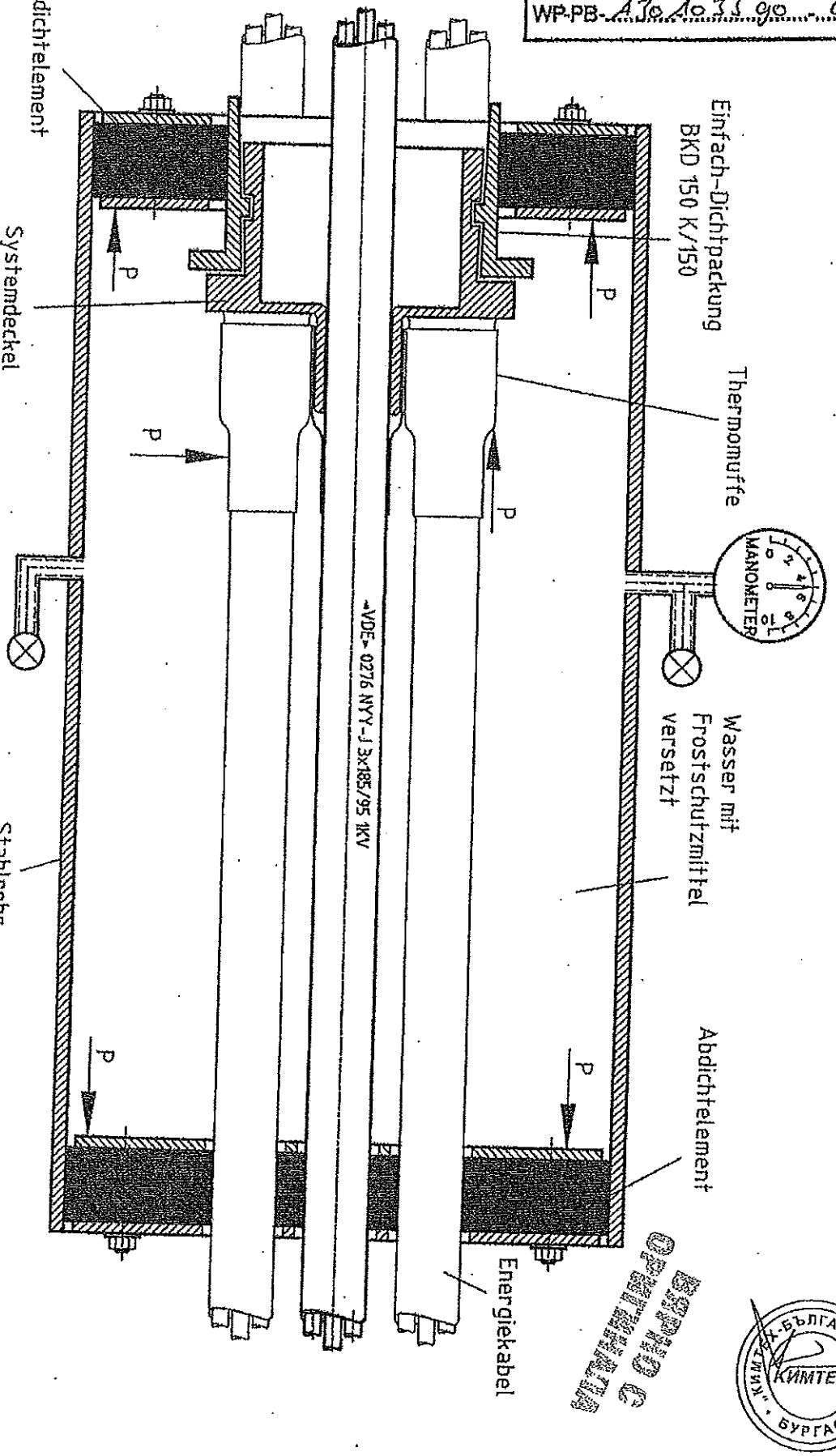
Graphische Darstellung:



3. Bemerkungen

keine

Anlage Nr. 1 zu IFAM Prüfbericht
WP-PB-AJo.Ao33 90 -002



ОТГОВАРЯ ОРИГИНАЛА

„КИМТЕХ-БЪЛГАРИЯ" ООД
КИМТЕХ
БУРГАС

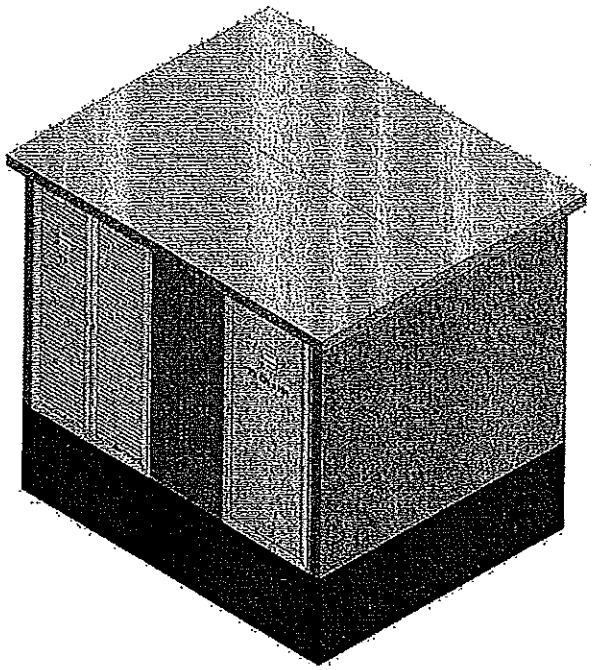
NG Technology

София, бул. Самоков 1, тел. +359 884 00 55 78, +359 884 00 55 79,

http://www.ngtechnology.org/, office@ngtechnology.org

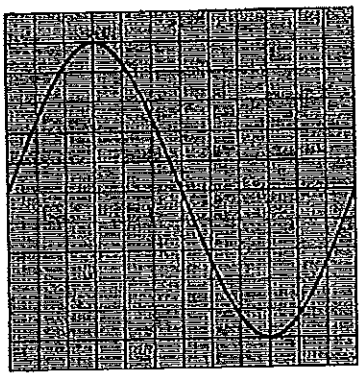
Инструктии за експлоатация и монтаж
на
БКТП 800kVA/20/0,4kV типово изпитано
тип

CTRS



БДС EN 62271-202:2007

2016г.



PPR 1410

Qualification of
Indoor Termination for
Single Core Polymeric
Insulated Cable 24 kV

Type: IXSU-F5131
(POLT-24D/1XI)

Pages: 17
Appendix: -

Tested by: FGH Mannheim-Germany
Date: 7.2.2000

Energy Division
tyco Electronics
AMP Raychem SIMEL
Tyco Electronics Raychem GmbH
Haldgraben 6
D-85521 Ottobrunn
München, Germany
Tel: +49 89 6089-0
Fax: +49 89 6089-345

FORSCHUNGSGEMEINSCHAFT FÜR
ELEKTRISCHE ANLAGEN UND STROMWIRTSCHAFT E.V.
Mannheim-Rheinau, Hallenweg 40

FGH

Accredited testing laboratory to DIN EN 45001 for subject

DAT-P-020/92-01	High-voltage apparatus, switchgear and controlgear
DAT-P-020/92-12	High-voltage cables and accessories
DAT-P-020/92-21	Voltage quality flicker

Test Certificate

No. : HV 00006/1 E

Reference: HV-K-9912

Apparatus: Indoor termination for screened single core polymeric insulated cables up to 24 kV
70 – 240 mm²
type: IXSU-F5131 equivalent to type: POLT-24D/1XI

Manufacturer: Tyco Electronics Raychem GmbH
Haidgraben 6
D – 85521 Ottobrunn / München

Customer: Tyco Electronics Raychem GmbH
Haidgraben 6
D – 85521 Ottobrunn / München

Test Specification: CENELEC HD 629.1 S1:1996 table 3 no. 1 – 8, 10 and 12 – 14 (page 12)

Tests performed:
D.C. voltage dry withstand
A.C. voltage dry withstand
partial discharge at ambient temperature
impulse voltage at elevated temperature
electrical heat cycling in air
partial discharge at elevated and ambient temperature
thermal short circuit (conductor)
impulse voltage at ambient temperature
A.C. voltage dry withstand
humidity

Test Results: The Tyco Electronics Raychem - Indoor termination, Type IXSU-F5131, passed successfully the testing as detailed further.

Forschungsgemeinschaft für Elektrische Anlagen und Stromwirtschaft e.V. FGH

Mannheim, 07.02.2000

FORSCHUNGSGEMEINSCHAFT FÜR
ELEKTRISCHE ANLAGEN UND STROMWIRTSCHAFT E.V.

i.V. Gl 1/3

Test Engineer:

Place and date of test:	FGH-test laboratory Mannheim-Rheinau, 19.8. – 30.11.1999
Number of sheets:	17

ВЯРНО С ОРИГИНАЛА

A Test Certificate
is issued for equipment having passed tests according to valid standards, accepted specifications or recommendations performed in order to prove ratings. It is also issued if the relevant standard considers the determination of characteristic data and this determination has been carried out according to valid standards, accepted specifications or recommendations.

Equipment to be tested must be clearly identified by a nameplate according to the relevant standard and by suitable drawings or, if the standard does not require a nameplate, by suitable drawings and, if necessary, descriptions. In certain cases lists of parts may be necessary.

The Test Certificate confirms that during the test of an equipment according to the applied test specification the criteria for the behaviour of the test object during the test and for its condition after the test have been fulfilled.

A Test Report
is issued for tests which do not meet all requirements for a Test Certificate. The Test Report indicates all conditions under which the test has been performed as well as information about the behaviour of the equipment during test and its condition after test.

A Report
is issued for investigations which do not have the character of proving tests.

Under reference to DIN EN 45001 FGH states the following:

- The accreditation of FGH or any of its test documents by themselves in no way constitute or imply product approval by DATech or any other body.
- If a client refers to the accreditation of FGH this reference shall include the accreditation body, i.e. DATech, the relevant scope of the accreditation of FGH and the appropriate registration number.
- The test results included in test documents issued by FGH relate only to the items tested.
- The test documents issued by FGH shall not be reproduced, except in full, without the written approval of FGH.

ВЯРНО С ОРИГИНАЛА

table of contents

1. Description of the test objects

Manufacturer: Tyco Electronics Raychem GmbH
Haidgraben 6
D – 85521 Ottobrunn / München

Type of the test objects: Indoor termination for screened single core polymeric insulated cables up to 24 kV
70 – 240 mm²
type: IXSU-F5131

kit content, manufacturer-drawing and assembly instructions
see page 11

Type of the cable: NA2XS2Y 12,7 / 22 kV
cable with aluminium conductors, cross-linked PE-insulation, screen of copper and thermoplastic PE-sheath
cross-section 150 mm²
all combinations of cables and terminations had a length of about 3,1 m
(cable-manufacturer : Kabelmetall)

Numbers and test sequences of the test objects:

cable sample FGH no.	test sequence according to HD 629.1 S1 table 3
2011	A1
2012	A1
2001	A2
2002	A2
2005	A3
2006	A3
2009	A3

Mounting: The assembling of the terminations was made at Tyco Electronics Raychem.

ВЯРНО С ОРИГИНАЛА

„КИМТЕХ-БЪЛГАРИЯ" ООД БУРГАС КИМТЕХ

2. Specification of the test routines according to CENELEC HD 629.1 S1:1996, table 3, test sequence A1, A2 and A3

The following tests were made in chronological order:

	Test	Test sequence and FGH cable no.			Test requirements
		A1	A2	A3	
1	D.C. voltage dry withstand	2011 2012	2001 2002		15 minutes at 6 U_0 (76 kV) negative polarity
2	A.C. voltage dry withstand	2011 2012	2001 2002		5 minutes at 4,5 U_0 (57 kV)
3	Partial discharge at ambient temperature	2011 2012			max. 10 pC at 1,73 U_0 (22 kV)
4	Impulse voltage at elevated temperature	2011 2012			10 impulses of each polarity
5	Electrical heat cycling in air	2011 2012			3 cycles at 2,5 U_0 (32 kV)
6	Partial discharge at elevated and ambient temperature	2011 2012			max. 10 pC at 1,73 U_0 (22 kV)
7	Electrical heat cycling in air	2011 2012			123 cycles at 2,5 U_0 (32 kV)
8	Partial discharge at elevated and ambient temperature	2011 2012			max. 10 pC at 1,73 U_0 (22 kV)
10	Thermal short circuit (conductor)		2001 2002		2 short circuits to raise conductor to θ_{sc} of the cable
12	Impulse voltage at ambient temperature	2011 2012	2001 2002		10 impulses of each polarity
13	A.C. voltage dry withstand	2011 2012	2001 2002		15 minutes at 2,5 U_0 (32 kV)
14	Humidity			2005 2006 2009	300 h duration at 1,25 U_0 (16 kV)

3. Test procedures

3.1. D.C. voltage withstand

The smoothing condenser in parallel to the test object had a capacitance of 300 nF. The ripple factor was less than 1%. The test voltage of 76 kV was applied to the test object during 15 min.

3.2. A.C. voltage withstand

The power frequency voltage was generated by a 10-kVA-transformer with a rated primary voltage of 220 V and a rated secondary voltage of 125 kV. The voltage measurement was carried out with a capacitive divider (100 pF, ratio = 1818) and a peak voltmeter reading $\hat{U}/\sqrt{2}$.

During the test a voltage of 57 kV was applied for 5 min.

3.3. Partial discharge measurement

The test was performed in accordance with IEC 270 using a partial discharge detector Tettex type 9126. The amplifier band width range of this measuring instrument covered 40 kHz through 200 kHz.
At a test voltage level of 22 kV the level of partial discharge was less than 10 pC.

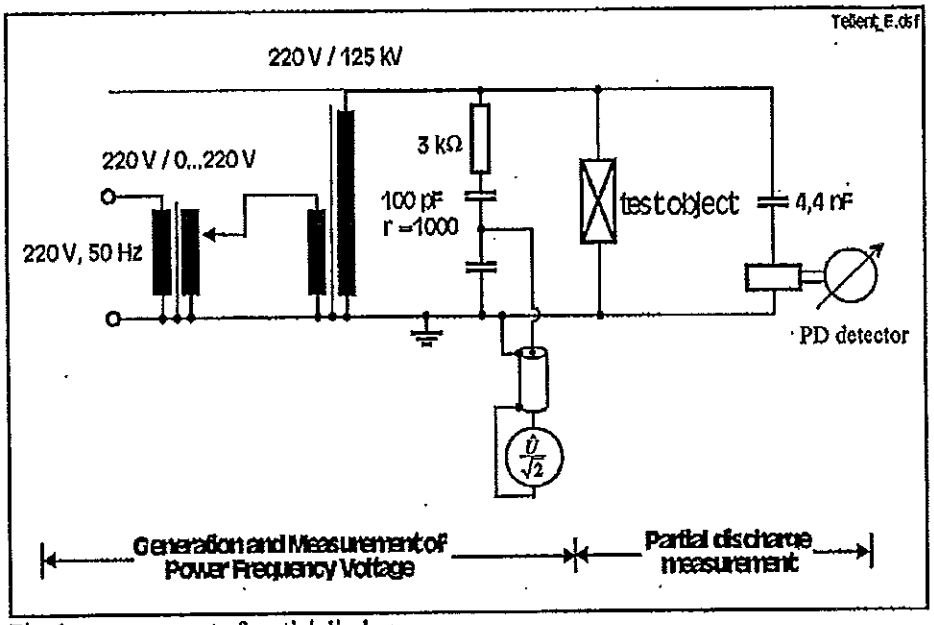


Fig. 1: measurement of partial discharge

3.4. Impulse voltage withstand test

The tests were performed in accordance with IEC 230.
The time between two impulses was approximately 20 s. The characteristics of the applied impulse voltage were within the limits (front time T_1 = 1...5 µs and time to half value T_2 = 40...60 µs). A digital impulse voltmeter was used to measure the peak values of the lightning impulses in combination with a ohmic voltage divider.
The tests were carried out by applying 10 consecutive impulses with a peak value of 125 kV, positive and negative polarity. T_1=1,51 µs T_2=52,63 µs

The athmospheric conditions were:
temperature: 15°C
air pressure: 1017 mbar
humidity: 43,5%

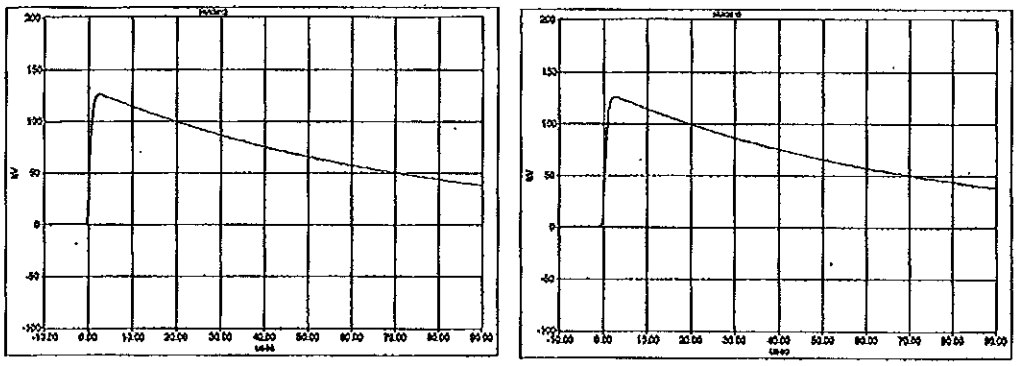


Fig. 2: impulse wave shape of the positive polarity (first and last of the 10 impulses)

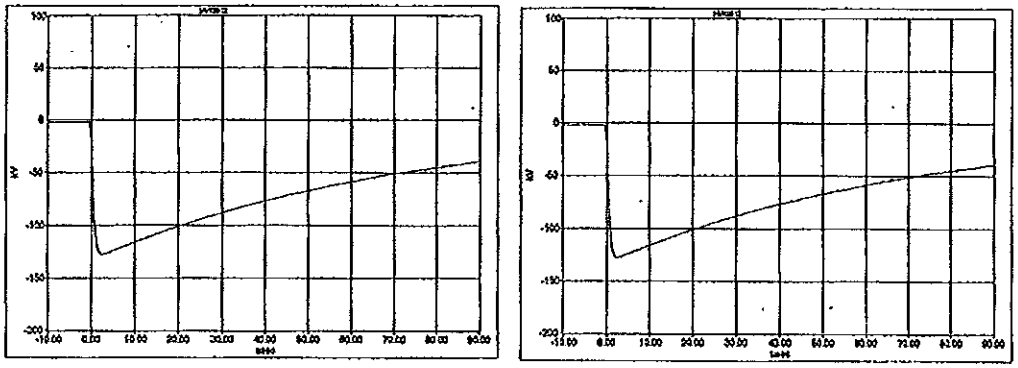


Fig. 3: impulse wave shape of the negative polarity (first and last of the 10 impulses)

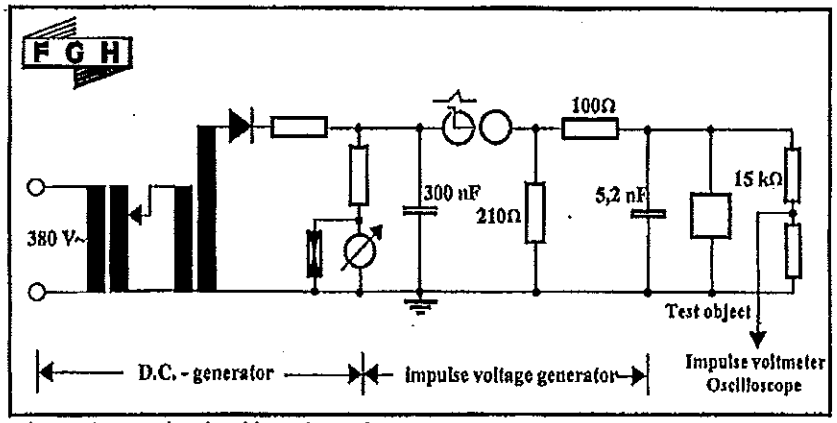


Figure 4: test circuit of impulse voltage test

3.5. Electrical heat cycling in air

The electrical cycling test comprises 126 heating cycles.
The tests were performed in accordance with HD 628 S1 : 1996, item 9.
Cycles of 5 hours heating and 3 hours cooling were carried out. The voltage is continuously applied during the cycling at a level of 32 kV (phase-earth).

All 126 cycles were carried out in air.

In order to heat the conductors to 95°C – 100°C, the cables were loaded to 482 A.
The conductor temperature was measured on an identical cable with the same current as the test loop. One record of the temperature-time-curve is shown in Fig. 5.

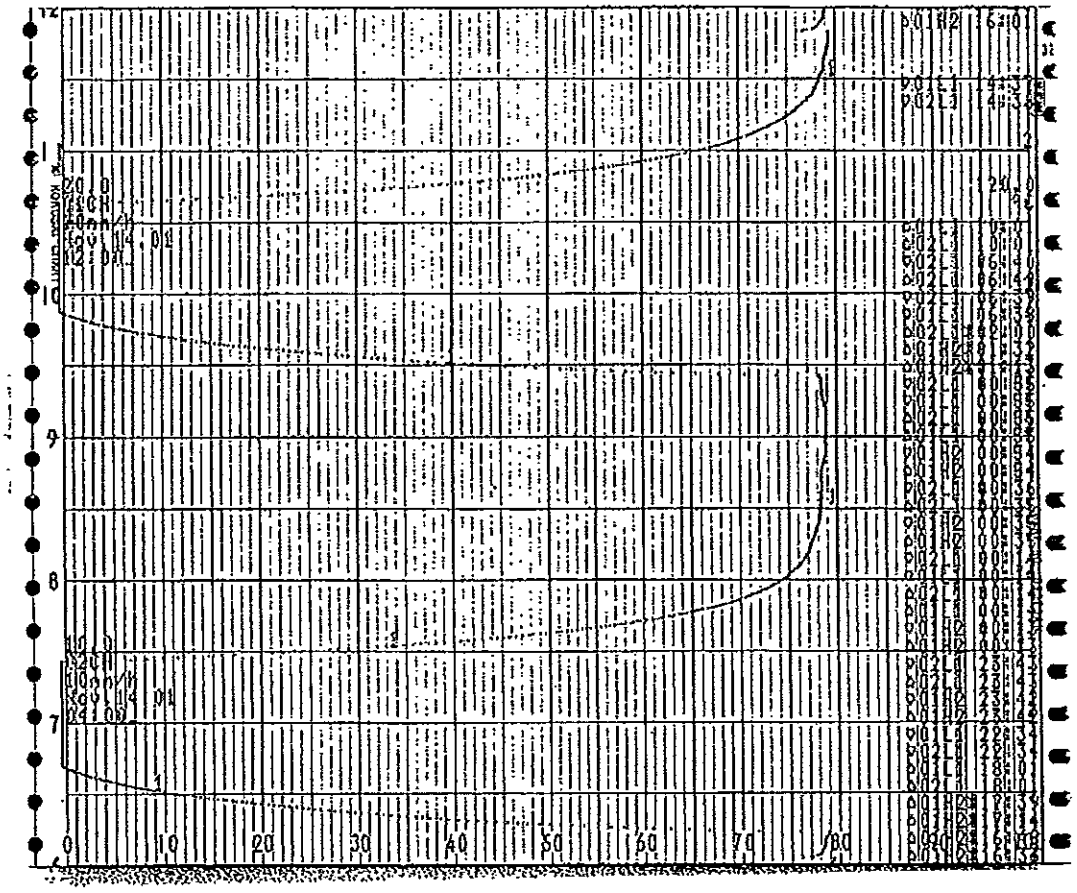


Fig. 5: temperature-time-curve of electrical heat cycling
scale division 0 ≙ 20 °C
scale division 80 ≙ 100 °C

3.6. Thermal short-circuit test (conductor)

The test was performed in accordance with HD 628 S1 : 1996, item 11.
By this test the samples were subjected to a symmetrical fault current of 1 sec. duration in order to heat the conductor up to 250°C. This procedure was carried out 2 times. Between the tests the samples had cooled down to ambient temperature.

1. short-circuit test: $I_{eff} = 18{,}5$ kA $t = 1$ s
2. short-circuit test: $I_{eff} = 18{,}5$ kA $t = 1$ s

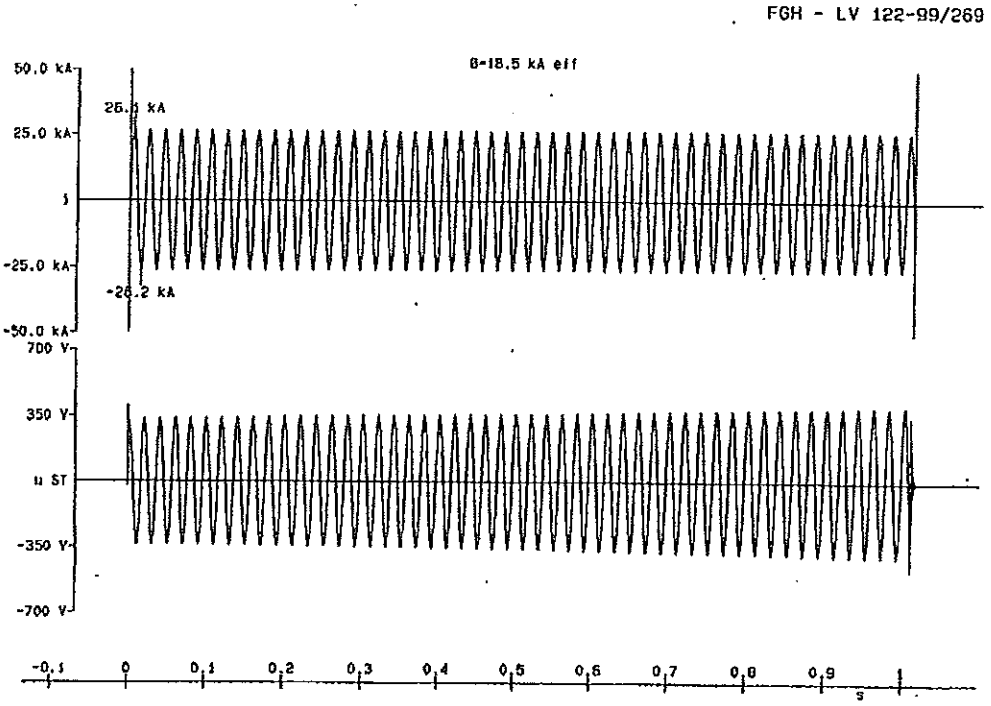


Fig. 6: current/time-curve, thermal short-circuit test (conductor)

3.7. Humidity test

The discharging rate of atomised water was 0,34 l/m³*h. Throughout the test duration, the spray water conductivity was (70±10) mS/m.
During the test a voltage of 16 kV was applied to the test objects.

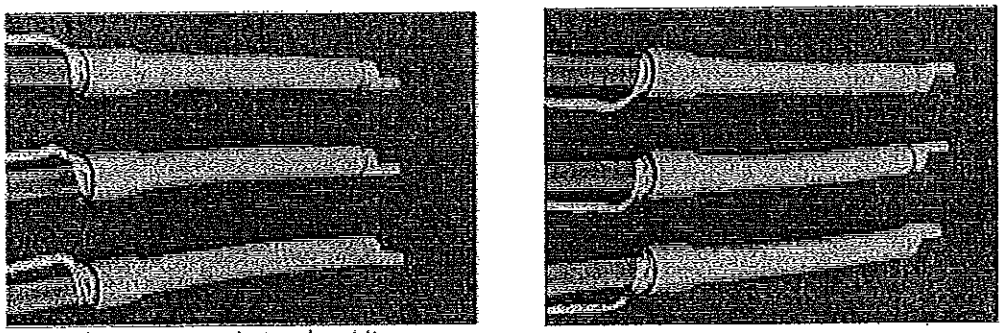


Fig. 7+8: terminations before humidity test

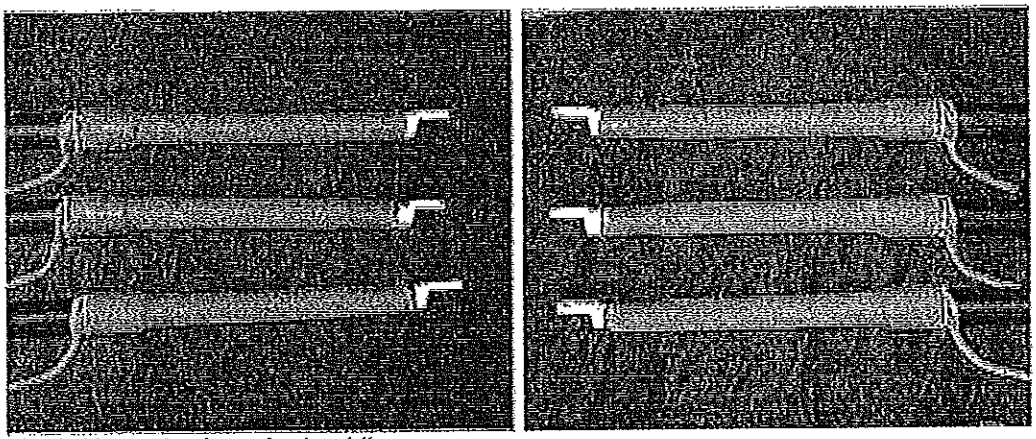


Fig. 9+10: terminations after humidity test

4. Table of test results

Tests according to CENELEC HD 629.1 S1:1996, table 3, test sequence A1, A2 and A3

The following tests were made in chronological order, cable sample FGH no.2001, 2002, 2005, 2006, 2009, 2011, 2012:

	Test	Test sequence and FGH cable no.			Test results	
		A1	A2	A3		
1	**D.C. voltage dry withstand** 15 minutes at 6 U_0 (76 kV) negative polarity	2011 2012	2001 2002		passed	
2	**A.C. voltage dry withstand** 5 minutes at 4,5 U_0 (57 kV)	2011 2012	2001 2002		passed	
3	**Partial discharge at ambient temperature** max. 10 pC at 1,73 U_0 (22 kV)	2011 2012			≤ 10 pC	
4	**Impulse voltage at elevated temperature** $t_{conducter}$ = 96,3 °C 10 impulses of each polarity, $\hat{U}$ = 125 kV	2011 2012			passed	
5	**Electrical heat cycling in air** 3 cycles, 5/3 h $t_{conducter}$ = 98 °C $U/\sqrt{2}$ = 32 kV	2011 2012			passed	
6	**Partial discharge at elevated and ambient temperature** max. 10 pC at 1,73 U0 (22 kV)	2011 2012			≤ 10 pC	
7	**Electrical heat cycling in air** 123 cycles, 5/3 h $t_{conducter}$ = 98 °C $U/\sqrt{2}$ = 32 kV	2011 2012			passed	
8	**Partial discharge at elevated and ambient temperature** max. 10 pC at 1,73 U_0 (22 kV)	2011 2012			≤ 10 pC	
10	**Thermal short circuit (conductor)** 2 short circuits to raise conductor to θ_{SC} of the cable		2001 2002		passed	
12	**Impulse voltage at ambient temperature** 10 impulses of each polarity, $\hat{U}$ = 125 kV	2011 2012	2001 2002		passed	
13	**A.C. voltage dry withstand** 15 minutes at 2,5 U_0 (32 kV)	2011 2012	2001 2002		passed	
14	**Humidity** 300 h duration at 1,25 U_0 (16 kV)			2005 2006 2009	passed	3 terminations in test room

The Tyco Electronics Raychem – Indoor termination, IXSU-F5131, passed successfully the testing as detailed above.

kit content of the indoor termination
for screened single core polymeric insulated cable 70-240 mm^2 up to 24 kV

QTY	description	
3	HVOT-50/16-340/242(S3)	insulating tubing with integrated stress control
3	S1189-1-100(A3)	filler tape for screen cut
3	S1085-3-200	sealant tape for screen wires
1	EPP-0778-8/99	installation instruction

Кimtech
Кимтех България ООД
1113 гр. София
ул. Акад. Георги Бончев № 20

официален дистрибутор на
tyco Electronics
кабели, трансформатори,
електрооборудване

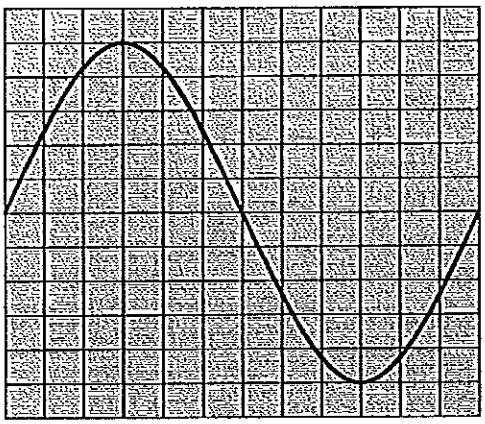
тел: 02 9733373
факс: 02 9733370
web:www.kimtech.bg
e-mail: office@kimtech.bg

Списък на проведените изпитвания на щепселна кабелна глава /адаптор/ тип RICS

1. Изпитване с променливо напрежение 50kV, 50Hz;
2. Изпитване частичен разряд;
3. Изпитване устойчивост при номинално импулсно напрежение;
4. Изпитване продължително променливо напрежение с циклични токови наторвания;
5. Изпитване комутация/включване/изключване;
6. Изпитване термично късо съединение;
7. Изпитване издръжливост с циклични токови натоварвания;
8. Изпитване циклично електрическо нагряване във въздух;
9. Изпитване импулсно напрежение при околна температура;
10. Изпитване частичен разряд при околна температура;
11. Влажност;

13.01.2016г.

Подпис и печат



PPR-2528

Test Report of screened seperable cable connector for single-core cables with extruded plastic Insulation Type: RSSS-52xx-R

Tested by: IPH Berlin

Date: 31. März 2008

Pages: 61

Appendix: —

Tyco Electronics Raychem GmbH
Energy Division
Finsinger Feld 1
D-85521 Ottobrunn
Munich, Germany
Tel.: +49-89-6089-0
Fax:+49-89-6096-345
http://energy.tycoelectronics.com

INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH

Independent, accredited testing station · Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1213.1607.6.939

Tyco Electronics Raychem GmbH Finsinger Feld 1 85521 Ottobrunn GERMANY	CLIENT
Tyco Electronics Raychem GmbH	MANUFACTURER
Screened separable cable connector for single-core cables with extruded plastic insulation	TEST OBJECT
RSSS-52xx-R	TYPE:
12 test samples	SERIAL NO.
Rated voltage U_0/U 12.7/22 kV Maximum value between two phase conductors U_m 24 kV Rated current 250 A Rated cross-section range 50 mm²	RATED CHARACTERISTICS GIVEN BY THE CLIENT
CENELEC Harmonization Document HD 629.1 S2: 2006-02 DIN VDE 0278-629.1 (VDE 0278 Teil 629-1): 2002-06 IEC 61442: 2005-04 DIN VDE 0278-442 (VDE 0278 Teil 442): 2006-01	NORMATIVE DOCUMENT
Test sequences D1 and D2 as well as Special tests Nos. 17 to 21	RANGE OF TESTS PERFORMED
22 May 2007 to 12 December 2007	DATE OF TEST
The type test of test sequences D1 and D2 as well as the Special tests 17, 18, 19, 20 and 21 have been PASSED.	TEST RESULT

PROF. DR. J. PANNICKE
Managing director

D. JEGUST
Test engineer in charge

Berlin, 31 March 2008

ВЯРНО С ОРИГИНАЛА

Contents

This test document consists of 61 sheets.

Distribution

Copy No. 1 In English: Tyco Electronics Raychem GmbH

ВЯРНО С ОРИГИНАЛА

Copy No. 1

1. Participants in the test

Mr.	Jegust	IPH test engineer in charge
Mr.	Moritz	IPH test engineer (short- circuit tests and screen fault current initiation test)
Mr.	Schad	Tyco Electronics Raychem GmbH (partially present)

2. Test performed

All tests of the test sequences D1, D2 as well as special tests Nos. 17 to 21 in the following order:

Test sequence	Test	Type of test
D1	1	DC voltage dry withstand test
	2	AC voltage dry withstand test
	3	Partial discharge test at ambient temperature
	4	Impulse voltage test at elevated temperature
	5	Electrical heat cycling test[1] in air
	6	Electrical heat cycling test[1] in water
	7	Disconnection/connection
	8	Partial discharge test at elevated and ambient temperatures
	9	Impulse voltage test at ambient temperature
	10	AC voltage dry withstand test

Test sequence	Test	Type of test
D2	1	DC voltage dry withstand test
	2	AC voltage dry withstand test
	3	Thermal short-circuit test of the conductor
	4	Dynamic short-circuit test of the conductor
	5	Disconnection/connection
	6	Impulse voltage test at ambient temperature
	7	AC voltage dry withstand test

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Test performed (continued)

Test sequence	Test	Type of test
Special tests	17	Screen resistance measurement
	18	Leakage current measurement[2)]
	19	Screen fault current initiation test[3)]
	20	Operating force test
	21	Test of capacitive test point performance [4)]

The thermal short-circuit test of the screen does not apply because the test object is equipped neither with a connection to the metal screen nor with an adapter for the metal screen of the cable.

Test sequence D3 does not apply, as the test specimen is not equipped with an operating eye. Special tests Nos. 17 to 19 and 21 have been carried out on separate test objects.

Note to the tests:
CENELEC Harmonization Document HD 629.1 S2: 2006-02 and IEC 61442: 2005-04 use different terms with regard to the types of test. Below you find the terms of the normative document of the test procedure:

1) Heating cycles voltage test
2) Screen leakage current measurement
3) Screen fault current initiation test
4) Test of capacitive test point performance

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3. Identity of the test object

3.1 Technical data and characteristics

The technical data and characteristics of the test object are defined by the following parameters and specified by the client.

Test object:	Screened separable cable connector for single-core cables with extruded plastic insulation		
Type:	RSSS-52xx-R		
Manufacturer:	Tyco Electronics Raychem GmbH		
Serial No:	12 test samples		
Year of manufacture:	2006		
Rated characteristics:	Rated voltage U_0/U	12.7/22	kV
	Maximum value between two phase conductors U_m	24	kV
	Rated current	250	A
	Rated cross-section range of the conductor	50	mm²
Design:	Type of cable connection	Screened separable straight connector, with capacitive test point	
	Cable	Screened single-core cable with extruded plastic insulation,	
	Cable marking	N2XS(F)2Y 1x50 RM/16 mm²	12/20 kV
	Designation of manufacturer		NEXANS
	Material of conductor		Cu
	Material of screen		Cu

3.2 Identity documents

The manufacturer confirms that the test object has been manufactured in compliance with the drawings given in this document. IPH did not verify this compliance in detail. The identity of the test object is fixed by the following drawings and data submitted by the client:

Name of drawing	Drawing No.	Date of drawing	Author	Notes
Installations Instruction Type RSSS	EPP-0579	1/01	Tyco Electronics	Sheets 35 to 60

Entry of test objects at IPH: 28 March 2007

ВЯРНО С ОРИГИНАЛА

4. Tests of test sequence D1

4.1 Test laboratory

High-voltage test laboratory, high-voltage hall 2

4.2 Normative document

CENELEC Harmonization Document HD 629.1 S2: 2006-02
DIN VDE 0278-629.1 (VDE 0278 Teil 629-1): 2002-06
IEC 61442: 2005-04
DIN VDE 0278-442 (VDE 0278 Teil 442): 2006-01

4.3 Required test parameters

Test No.	Type of test	Required test parameters	
1	DC voltage dry withstand test	Test voltage 6 x U_0: Duration of test: Polarity:	76 kV 15 min Negative
2	AC voltage dry withstand test	Test voltage 4.5 x U_0: Test frequency: Duration of test:	57 kV 50 Hz 5 min
3	Partial discharge test at ambient temperature	Prestress voltage 2.25 x U_0: Measuring voltage 2.00[1] x U_0: Prestress duration: Measuring time:	29 kV 25 kV 1 min 1 min
4	Impulse voltage test at elevated temperature	Front time: Virtual time to half value: Test voltage: Number of impulses: Polarity: Conductor temperature:	1.2 µs 50 µs 125 kV 10 impulses pos./neg. 95 _ 100 °C[2]
5	Electrical heat cycling test in air	• Continuous AC voltage Test voltage 2.5 x U_0: Test frequency: Duration of test: • Thermal cycles Number of cycles: Cycle (8 h): Conductor temperature during the last 2 hours of heating cycle:	 32 kV 50 Hz 21 day 63 5 hours of heating + 3 hours of cooling 95 _ 100 °C[2]
6	Electrical heat cycling test in water	See test No. 5, additionally Height of water:	 1 m
7	Disconnection/connection	Number of complete operations:	5
8	Partial discharge test at ambient temperature and elevated temperature	See test No. 3, except Conductor temperature:	 ϑ_U resp. 95_100 °C[2]
9	Impulse voltage test at ambient temperature	See test No. 4, except Conductor temperature: Duration of test:	 ϑ_U 5 min

ВЯРНО С ОРИГИНАЛА

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Required test parameters (continued)

Test No.	Type of test	Required test parameters	
10	AC voltage dry withstand test	Test voltage 2.5 x U_0: Test frequency: Duration of test:	32 kV 50 Hz 15 min

Notes to the table of required test parameters:

1) CENELEC Harmonization Document HD 629.1 S2: 2006-2, Table 7, requires the partial discharge to be measured at a measuring voltage of 1.73 x U_0 or 2.00 x U_0 respectively. The measurement was done at 2 x U_0 because the standard of the cable used for the test requires a test voltage > 1.73 x U_0.

2) Acc. to EN 61442: 2005-04, Clause 9, the heating current to be applied in this test depends on the set conductor temperature. HD 620 specifies that this shall be 5 K to 10 K above the maximum permissible cable conductor temperature of 90 °C for XLPE-insulated cables. In the given case this requirement resulted in a heating current, which exceeded the current carrying capacity respectively the rated current of the bushing. The resulting higher thermal load of the bushing was accepted and was agreed with the client before the test was started.

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4.4 Test arrangement

The client arranged each of the four cable connectors under test (test objects) on a test line. Every two of the test objects were connected by a coupling unit of DJ250-2 type (manufacturer: Cooper). The test objects were mounted on cable lines of approx. 3 m length and of N2XS(F)2Y-1x50 RM/16 mm²-12/20 kV type. To apply the test voltage, each of the test lines had additionally been equipped with one auxiliary sealing end of EPKT 24C1XI type (manufacturer Tyco Electronics Raychem). All test voltages were applied to the core against the cable screen, which was connected to the test earth.
The tests did not start earlier than 24 hours after the installation of the accessories on the cable lines.

4.4.1 DC voltage test (test 1)

Test arrangement to IEC 61442: 2005-04, Clause 5

4.4.2 AC voltage test (test 2)

Test arrangement to IEC 61442: 2005-04, Clause 4

4.4.3 Partial discharge test at ambient temperature (test 3)

Test arrangement to IEC 61442: 2005-4, Clause 7, with the following simplifications:

Due to the short cable lengths, neither double impulse diagram nor terminating impedance or reflexion suppressor were used. The PD calibrator was connected in parallel to the test object only at the detector-remote end.

4.4.4 Impulse voltage test at elevated temperature (test 4)

Test arrangement to IEC 61442: 2005-04, Clause 6

The conductors of the four test objects were connected in series. To obtain the necessary elevated (conductor) temperature, the conductor of the single-core cable was heated with single-phase AC on the basis of the induction principle by leading the conductor loop through a heating transformer. The supply voltage of the heating circuit was automatically controlled. So, the elevated conductor temperature remained constant ± 2 K during the last 2 hours of the 5-hour heating cycle.

4.4.5 Electrical heat cycling test in air (test 5)

Test arrangement to IEC 61442: 2005-04, Clauses 4 and 9

For the test arrangement of the heating circuit see Sub-clause 4.4.4. The ambient temperature was kept to 20 °C ± 5 K. The thermal cycling was implemented by a test cycle control facility.

Test arrangement (continued)

4.4.6 Electrical heat cycling test in water (test 6)

In addition to the test arrangement to Sub-clause 4.4.5, the test objects were arranged in a water-filled tank (water bath). The water-level was 1 m above the upper edge of the test objects (see Figure 1).

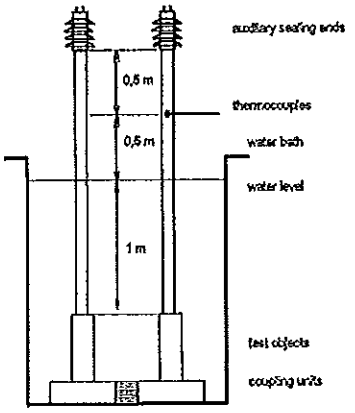


Figure 1: Test of the connectors in water bath (schematic diagram)

4.4.7 Disconnection/connection (test 7)

None

4.4.8 Partial discharge test at elevated and ambient temperatures (test 8)

See Sub-clause 4.4.3

For the test at elevated temperature see also Sub-clause 4.4.4.

4.4.9 Impulse voltage test at ambient temperature (test 9)

See Sub-clause 4.4.4, but without additional conductor heating

4.4.10 AC voltage test (test 10)

See Sub-clause 4.4.2

4.5 Test and measuring circuits

4.5.1 DC voltage test (test 1)

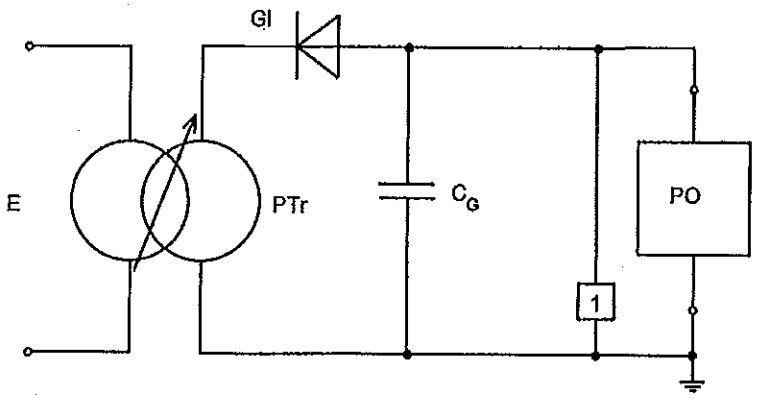
Technical data of test circuit

DC voltage source

Test transformer:	Rated voltage	100	kV
	Rated power	8	kVA
	Rated frequency	50	Hz
Rectifier:	Rated voltage	135	kV
	Rated current	15	mA
Smoothing capacitor:	Capacitance	10	nF

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	Ohmic divider with MU11 (TuRD) peak voltmeter	Ratio 560



E Supply
PTr Test transformer with variable transformer connected in series
GI Rectifier
C_G Smoothing capacitor
1 Measuring point
PO Test object

Figure 2: Test and measuring circuit for the DC voltage test

Test and measuring circuits (continued)

4.5.2 AC voltage test (tests 2 and 10)

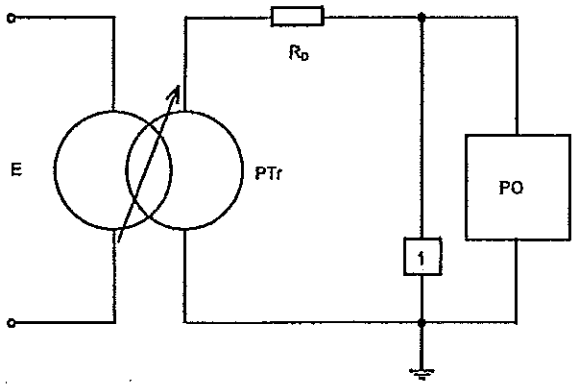
Technical data of test circuit

Single-phase AC voltage source

Test transformer:	Rated voltage	125	kV
	Rated power	100	kVA
	Rated frequency	50	Hz
	Damping resistance	0.67	kΩ

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	Capacitive divider with MU11 (TuRD) peak voltmeter	Ratio 864



E Supply
PTr Test transformer with variable transformer connected in series
R_D Damping resistance
1 Measuring point
PO Test object

Figure 3: Test and measuring circuit for the AC voltage test

Test and measuring circuits (continued)

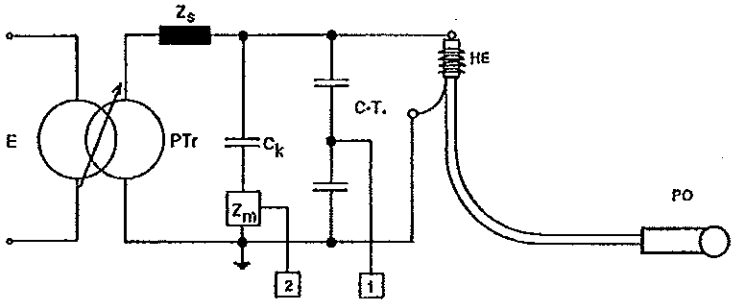
4.5.3 Partial discharge test at elevated and ambient temperatures (tests 3 and 8)

Technical data of test circuit

Test transformer:	Rated voltage	125	kV
	Rated power	100	kVA
	Rated frequency	50	Hz
	Damping resistance	0,67	kOhm

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	- Capacitive divider with MU11 peak voltmeter (TuRD)	Ratio 864
2	Partial discharges	- Coupling capacitor of WMCF type (TuRD)	C_k = 1 nF
		- Coupling four pole of COPL542A type	
		- PD measuring station of MPD540 type	Band width = 300 MHz
		- USB Interface 502	Center frequency 400 kHz
		- PD calibrator of CAL542 type (mtronix)	Output 10 pC



E Supply
PTr Test transformer with variable transformer connected in series
Z_s Blocking impedance
C_k Coupling capacitor
Z_m Coupling four pole (measuring impedance)
C-T. Capacitive divider
HE Auxiliary sealing end
1, 2 Measuring points
PO Test object

Figure 4: Test and measuring circuit for the partial discharge test (schematic without heating circuit, for the heating circuit see Figure 6/Sheet 15)

Test and measuring circuits (continued)

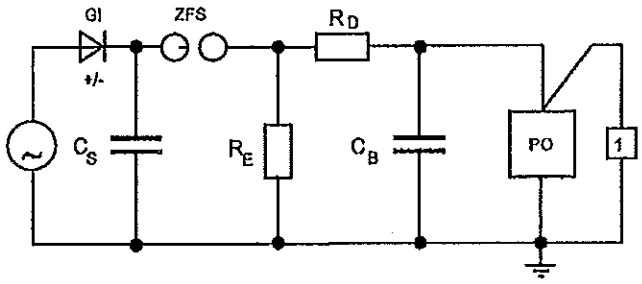
4.5.4 Impulse voltage test at elevated and ambient temperatures (tests 4 and 9)

Technical data of test circuit

Impulse circuit:	Number of stages	n	=	2	
	Impulse capacitance	C_S	=	70	nF
	Loading capacitance	C_B	=	1.5	nF
	Damping resistance	R_D	=	122	Ω
	Discharge resistance	R_E	=	1100	Ω

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	R divider of SMR 10/770 type (made by TuRD) with digital measuring instrument of DMI 551 type (made by Haefely) and TDS 220 digital oscilloscope (made by Tektronix)	Ratio 466.9



GI Rectifier
C_S Impulse capacitance
ZFS Spark gap
R_E Discharge resistance
R_D Damping resistance
C_B Loading capacitance
PO Test object
1 Measuring point

Figure 5: Test and measuring circuit for the impulse voltage test (without heating circuit, for this see Figure 6, but connection of impulse generator instead of single-phase AC voltage source)

Test and measuring circuits (continued)

4.5.5 Electrical heat cycling in air and in water, resp. (tests 5 and 6)

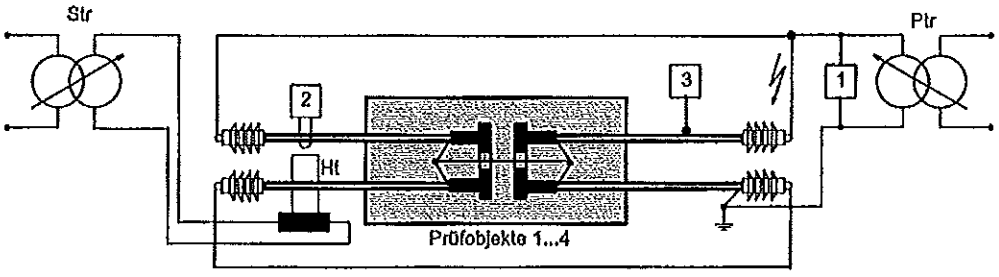
Technical data of test circuit

Single-phase continuous AC voltage source

Test transformer:	Rated voltage	125	kV
	Rated power	100	kVA
	Rated frequency	50	Hz
Heating circuit			
Heating transformers:	Rated primary voltage	380	V
	Rated power	57	kVA
	Max. secondary current	1000	A
	Rated frequency	50	Hz

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	Capacitive divider with MU11 peak voltmeter (TuRD)	Ratio 864
2	Heating current	LH 2040 prong-type ammeter	2000-A (AC) measuring range
3	Temperature	CoCo thermocouples in connection with Almeno temperature measuring system of 2290-3 type (made by Ahlborn)	--



Str Variable transformer
Ht Heating transformer
1 - 3 Measuring points
Ptr Test transformer with variable transformer connected in series

Figure 6: Test and measuring circuit for the electrical heat cycling tests in air and in water, resp. (schematic diagram)

4.5.6 Disconnection/connection (test 7)

None

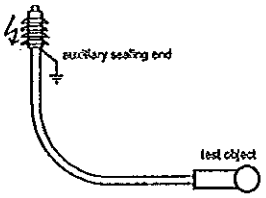
4.6 Test results

4.6.1 DC voltage test (test 1)

Polarity: Negative

Duration of test after having reached full voltage: 15 min

Test temperature: Ambient temperature 20 °C
Conductor temperature 20 °C

Test arrangement 			Test voltage	Result
No. of test object	Voltage applied to	Earthed	kV	
1	Conductor	Screen	-76	No disruptive discharge
2	Conductor	Screen		No disruptive discharge
3	Conductor	Screen	-76	No disruptive discharge
4	Conductor	Screen		No disruptive discharge

Notes:

Two test lines were tested together, they were connected by a coupling unit.

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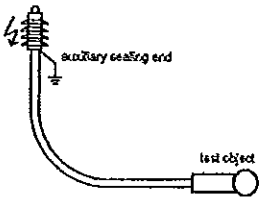
Test results (continued)

4.6.2 AC voltage test (test 2)

Duration of test after having reached full voltage: 5 min

Test frequency: 50 Hz

Test temperature: Ambient temperature 20 °C
Conductor temperature 20 °C

Test arrangement 			Test voltage	Result
No. of test object	Voltage applied to	Earthed	kV	
1	Conductor	Screen	57	No disruptive discharge
2	Conductor	Screen		No disruptive discharge
3	Conductor	Screen	57	No disruptive discharge
4	Conductor	Screen		No disruptive discharge

Notes:

Two test lines were tested together, they were connected by a coupling unit.

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Test results (continued)

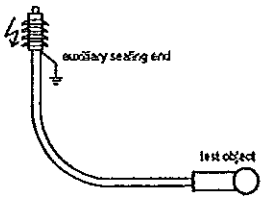
4.6.3 Partial discharge test at ambient temperature (test 3)

Test frequency: 50 Hz

Test temperature: Ambient temperature 20 °C
Conductor temperature 20 °C

Calibration of the test circuit by calibrator output 10 pC

Measured PD values

Test arrangement 			Prestress voltage (1 min)	Measuring voltage (1 min)	Measured PD value
No. of test object	Voltage applied to	Earthed	kV	kV	pC
1	Conductor	Screen	29	25	‹1 [1)]
2	Conductor	Screen			
3	Conductor	Screen	29	25	‹1 [1)]
4	Conductor	Screen			

Notes:

Two test lines were tested together, they were connected by a coupling unit

[1)] Basic disturbance level at same value

Test results (continued)

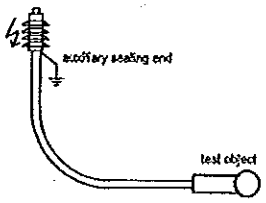
4.6.4 Impulse voltage test at elevated temperature (test 4)

Full wave:

Front time	T_1 = 2.92 µs
Virtual time to half value	T_2 = 50.4 µs

Test temperature:

Ambient temperature	18 °C
Conductor temperature	95..100 °C

Test arrangement 			Test voltage	Result
No. of test object	Voltage applied to	Earthed	kV	Number of impulses/disruptive discharges
1	Conductor	Screen		
2	Conductor	Screen	+125 [1] -125 [1]	10/0 [1] 10/0 [1]
3	Conductor	Screen		
4	Conductor	Screen		

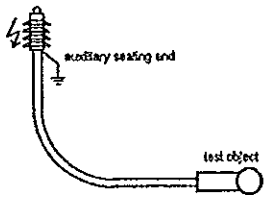
Notes:

[1] All four test lines were connected to form one closed conductor loop for heating the latter. Therefore, all test lines were simultaneously tested. Providing separate test results for each of the test lines is not possible.

Test results (continued)

4.6.5 Electrical heat cycling test in air (test 5)

Duration of test:		21 days
Test frequency:		50 Hz
Test temperature:	Ambient temperature	25 °C
	Conductor temperature	95..100 °C
Number of load cycles:		63

Test arrangement 			Continuous AC withstand voltage	Heating current	Result
No. of test object	Voltage applied to	Earthed	kV	A	
1	Conductor	Screen	32 [1]	341 [1],[2]	No disruptive discharge
2	Conductor	Screen			No disruptive discharge
3	Conductor	Screen			No disruptive discharge
4	Conductor	Screen			No disruptive discharge

Notes:

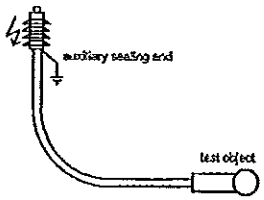
[1] All four test lines were connected to form one closed conductor loop for heating the latter. Therefore, all test lines were simultaneously tested. Providing separate test results for each of the test lines is not possible.

[2] The heating current was regulated in such a way that a constant conductor temperature was obtained after approx. 3 hours of heating. This was kept constant ± 2 K for the remaining 2 hours of the 5-hour heating period.

Test results (continued)

4.6.6 Electrical heat cycling test in water (test 6)

Duration of test:		21 days
Test frequency:		50 Hz
Test temperature:	Ambient temperature	20 °C
	Water temperature	21 °C
	Conductor temperature	95..100 °C
Number of load cycles:		63

Test arrangement 			Continuous AC withstand voltage	Heating current	Result
No. of test object	Voltage applied to	Earthed	kV	A	
1	Conductor	Screen	32 [1]	350 [1], [2]	No disruptive discharge
2	Conductor	Screen			No disruptive discharge
3	Conductor	Screen			No disruptive discharge
4	Conductor	Screen			No disruptive discharge

Notes:

[1] All four test lines were connected to form one closed conductor loop for heating the latter. Therefore, all test lines were simultaneously tested. Providing separate test results for each of the test lines is not possible.

[2] The heating current was regulated in such a way that a constant conductor temperature was obtained after approx. 3 hours of heating. This was kept constant ± 2 K for the remaining 2 hours of the 5-hour heating period.

4.6.7 Disconnection/connection (test 7)

Each of the four test objects was disconnected and connected altogether five times as specified by the manufacturer's assembly instructions. No visible damage was found on the contact.

Test results (continued)

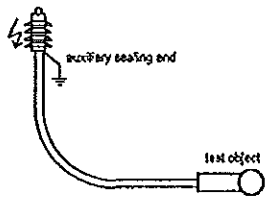
4.6.8 Partial discharge test at elevated and ambient temperatures (test 8)

Test frequency: 50 Hz

Test temperature: Ambient temperature 20 °C
Conductor temperature 20 °C and elevated, resp. 95..100 °C

Calibration of the test circuit by calibrator output 10 pC

Measured PD values

Test arrangement 			Prestress voltage (1 min)	Measuring voltage (1 min)	Measured PD value
No. of test object	Voltage applied to	Earthed	kV	kV	pC
Measured PD values at elevated temperature					
1	Conductor	Screen	29	25	< 3 [1]
2	Conductor	Screen			
3	Conductor	Screen	29	25	< 3 [1]
4	Conductor	Screen			
Measured PD values at ambient temperature					
1	Conductor	Screen	29	25	< 1,0 [1, 2]
2	Conductor	Screen			
3	Conductor	Screen	29	25	< 1,0 [1, 2, 3]
4	Conductor	Screen	29	25	< 1,0 [1, 2, 3]

Notes:

[1] Two of the respective test lines were connected to form one closed conductor loop for heating the latter. Thus, two test lines were simultaneously tested. Providing separate test results for each of the test lines is not possible.

[2] Basic disturbance level at same value

[3] The test lines were separated for the PD measurement

Test results (continued)

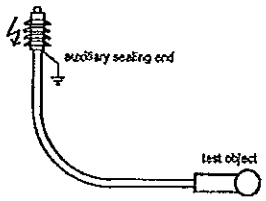
4.6.9 Impulse voltage test at ambient temperature (test 9)

Full wave:

Front time	T_1 = 1.25 µs
Virtual time to half value	T_2 = 55.0 µs

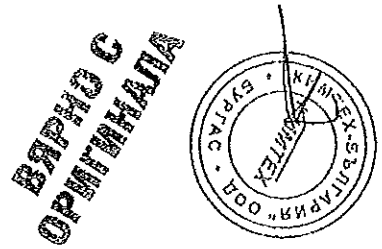
Test temperature:

Ambient temperature	20 °C
Conductor temperature	20 °C

Test arrangement 			Test voltage	Result
No. of test object	Voltage applied to	Earthed	kV	Number of impulses/disruptive discharges
1	Conductor	Screen		
2	Conductor	Screen	+125 -125	10/0 10/0
3	Conductor	Screen		
4	Conductor	Screen		

Notes:

All test lines were tested simultaneously.



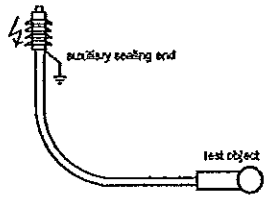
Test results (continued)

4.6.10 AC voltage test (test 10)

Duration of test after having reached full voltage: 15 min

Test frequency: 50 Hz

Test temperature: Ambient temperature 20 °C
Conductor temperature 20 °C

Test arrangement 			Test voltage	Result
No. of test object	Voltage applied to	Earthed	kV	
1	Conductor	Screen	32	No disruptive discharge
2	Conductor	Screen		
3	Conductor	Screen		
4	Conductor	Screen		

Notes:

All test lines were tested simultaneously.

ВЯРНО С ОРИГИНАЛА

4.7 Assessment of the results of test sequence D1

• Test 1

In the DC voltage test at -76 kV/15 min, no disruptive discharge occurred on any of the four test objects.

• Test 2

In the 50-Hz AC voltage test at 57 kV/5 min, no disruptive discharge occurred on any of the four test objects.

• Test 3

In the partial discharge test at ambient temperature and at 50-Hz AC voltage of 25 kV, none of the four test objects exceeded the permissible maximum partial discharge value of 10 pC. The partial discharge value measured was not higher than 1.0 pC.

• Test 4

In the impulse voltage test at elevated temperature with 10 test impulses of 125-kV lightning impulse voltage 1.2/50 of each polarity, no disruptive discharge occurred on any of the four test objects.

• Test 5

All of the four test objects were subjected to 63 electrical heat cycles in air. In the simultaneous 50-Hz continuous AC voltage test at 32 kV, no disruptive discharge occurred on any of the four test objects.

• Test 6

All of the four test objects were subjected to 63 electrical heat cycles in water. No disruptive discharge occurred on any of the four test objects, when they were tested simultaneously in water and by 50-Hz continuous AC voltage of 32 kV.

• Test 7

After 5 complete operations of disconnection and connection, no visible damage was found on the contact.

• Test 8

In the partial discharge test at elevated and ambient temperatures at 50-Hz AC voltage of 25 kV, none of the four test objects exceeded the permissible maximum partial discharge value of 10 pC. The partial discharge value measured was not higher than 3 pC.

Assessment of the results of test sequence D1 (continued)

• Test 9

In the impulse voltage test at ambient temperature with 10 test impulses of 125-kV lightning impulse voltage 1.2/50 of each polarity, no disruptive discharge occurred on any of the four test objects.

• Test 10

In the 50-Hz AC voltage test at 32 kV/15 min, no disruptive discharge occurred on any of the four test objects.

All of the four test objects meet the requirements specified by CENELEC Harmonization Document HD 629.1 S2 2006-2.

The tests of test sequence D1 have been PASSED.

5. Tests of test sequence D2

5.1 Test laboratory

High-voltage test laboratory, high-voltage hall 2 and
High-power test laboratory, high-current bay

5.2 Normative document

CENELEC Harmonization Document HD 629.1 S2: 2006-02
DIN VDE 0278-629.1 (VDE 0278 Teil 629-1): 2002-06
IEC 61442: 2005-04
DIN VDE 0278-442 (VDE 0278 Teil 442): 2006-01

5.3 Required test parameters

Test No.	Type of test	Required test parameters	
1	DC voltage test	Test voltage 6 x U_0: Duration of test: Polarity:	76 kV 15 min Negative
2	AC voltage test	Test voltage 4.5 x U_0: Test frequency: Duration of test:	57 kV 50 Hz 5 min
3	Thermal short-circuit test of the conductor	Short-circuit-conductor final temperature: Number of short-circuits:	250 °C 2
5	Disconnection/connection	Number of complete operations:	5
6	Impulse voltage test at ambient temperature	Front time: Virtual time to half value: Test voltage: Number of impulses: Polarity: Conductor temperature:	1.2 µs 50 µs 125 kV 10 Impulses pos/neg. ϑ_U
7	AC voltage test	Test voltage 2.5 x U_0: Test frequency: Duration of test:	32 kV 50 Hz 15 min

ВЯРНО С ОРИГИНАЛА

5.4 Test arrangement

Each of the three connectors under test was arranged on a test line by the client. The connectors were completed by bushings or terminations. The test objects were mounted on cable lines of approx. 3-m length and of N2XS(F)2Y-1x50 RM/16 mm²-12/20 kV type. To apply the test voltage, each of the test lines had additionally been equipped with one auxiliary sealing end of EPKT type (made by Tyco Electronics Raychem).
All test voltages were applied to the core against the cable screen, which was connected to the test earth. The tests did not start earlier than 24 hours after the installation of the accessories on the cable lines.

5.4.1 DC voltage test (test 1)

Test arrangement to IEC 61442: 2005-04, Clause 5

5.4.2 AC voltage test (test 2)

Test arrangement to IEC 61442: 2005-04, Clause 4

5.4.3 Thermal short-circuit test of the conductor (test 3)

Test arrangement to IEC 61442: 2005-04, Clause 11

The three test objects were arranged on an assembly plate on equal level with phase centres distances of 110 mm. Additionally the cables were fixed by cable clamps at a distance of 350 mm measured from the bushing end. For the test, a short-circuit bridge of 30 mm x 10 mm was connected at the three bushings, and the auxiliary sealing end sides of the three test lines were connected three-pole to the short-circuit current source.

5.4.4 Disconnection/connection (test 5)

None

5.4.5 Impulse voltage test at ambient temperature (test 6)

Test arrangement to IEC 61442: 2005-04, Clause 6

5.4.6 AC voltage test (test 7)

See Sub-clause 5.4.2

5.5 Test and measuring circuits

5.5.1 DC voltage test (test 1)

See Sub-clause 4.5.1

5.5.2 AC voltage test (test 2)

See Sub-clause 4.5.2

5.5.3 Thermal short-circuit test of the conductor (test 3)

See following sheet

5.5.4 Disconnection/connection (test 5)

None

5.5.5 Impulse voltage test at ambient temperature (test 6)

See Sub-clause 4.5.4

5.5.6 AC voltage test (test 7)

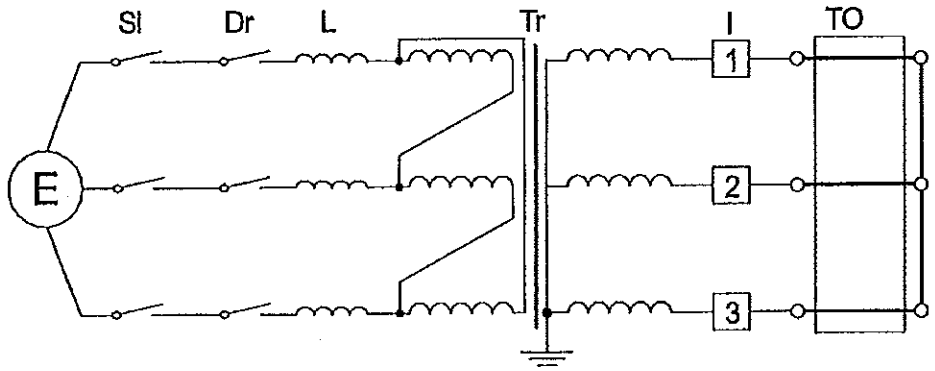
See Sub-clause 4.5.2

Test and measuring circuits (continued)

Thermal short-circuit test (test 3)

Technical data of test circuits

Test requirement		Short-circuit tests
Test No.		207 4195 and 207 4196
Number of phases (Test circuit)		3
Number of poles/phases (Test object)		3
Power frequency Hz		50
Power factor cos φ		0.015
Earthing conditions	Generator / grid	Not earthed
	Short-circuit transformer	Earthed
	Short-circuit point	Not earthed



E	Power supply (grid)	TO	Test object
SI	Master breaker	I	Current measurement
Dr	Making switch	U	Voltage measurement
L	Current-limiting reactor	1 - 3	Measuring points
Tr	Short-circuit transformer		

Figure 7: Test and measuring circuit for the thermal short-circuit test of the conductor

Technical data of measuring circuits

Measuring point	Symbol	Measured quantity	Measuring sensor/device
1	I L1	Current of conductor L1	Rogowski measuring device
2	I L2	Current of conductor L2	Rogowski measuring device
3	I L3	Current of conductor L3	Rogowski measuring device
Recording instrument: BE 256 transient recorder system			

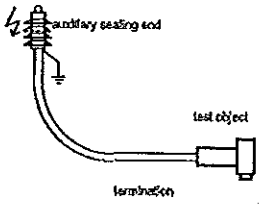
5.6 Test results

5.6.1 DC voltage test (test 1)

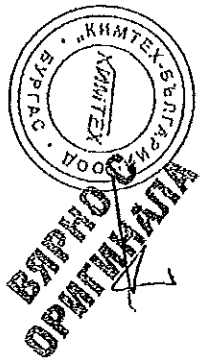
Polarity: Negative

Duration of test after having reached full voltage: 15 min

Test temperature: Ambient temperature 20 °C
Conductor temperature 20 °C

Test arrangement			Test voltage	Result
				
No. of test object	Voltage applied to	Earthed	kV	
5	Conductor	Screen	-76	No disruptive discharge
6	Conductor	Screen	-76	No disruptive discharge
7	Conductor	Screen	-76	No disruptive discharge

Notes: -



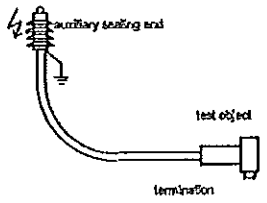
Test results (continued)

5.6.2 AC voltage test (test 2)

Duration of test after having reached full voltage: 5 min

Test frequency: 50 Hz

Test temperature: Ambient temperature 20 °C
Conductor temperature 20 °C

Test arrangement 			Test voltage	Result
No. of test object	Voltage applied to	Earthed	kV	
5	Conductor	Screen	57	No disruptive discharge
6	Conductor	Screen	57	No disruptive discharge
7	Conductor	Screen	57	No disruptive discharge

Notes: -

ВЯРНО С ОРИГИНАЛА

Test results (continued)

5.6.3 Thermal short-circuit test of the conductor (test 3)

Condition of test object before test:	Prestressed by previous tests
Connection of the test object:	By 50-mm² cable
Short-circuit point:	At the bushings
Ambient temperature:	16 °C

Test parameters:

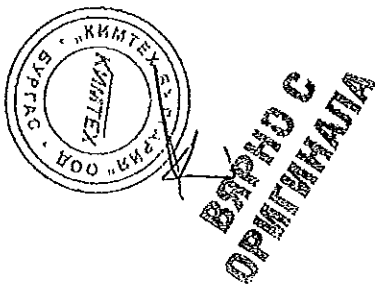
Test No.			207 4195	207 4196
Test voltage	V		455	455
Peak short-circuit current	kA	L1	16.7	16.9
		L2	12.1	12.0
		L3	15.9	16.0
Symmetrical short-circuit current	kA	L1	9.52	9.54
		L2	9.40	9.40
		L3	9.56	9.56
	Average		9.49	9.50
Duration of short-circuit	ms		909	916
Joule integral 10^6	A^2s	L1	82.9	83.7
		L2	81.7	82.8
		L3	83.5	84.5
Symmetrical short-circuit current 1 s	kA		9.05	9.09
Notes			-	-
Evaluation			OK	OK

Notes:

OK: The test object is able to carry the short-circuit current.

Condition of test object after test:

The test objects did not show any externally visible changes or damage.



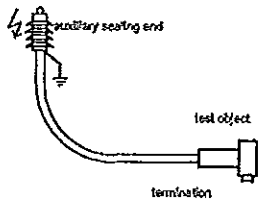
Test results (continued)

5.6.4 Disconnection/connection (test 5)

Each of the three test objects was disconnected and connected altogether five times as specified by the manufacturer's assembly instructions. No visible damage was found on the contact.

5.6.5 Impulse voltage test at ambient temperature (test 6)

Full wave:	Front time	T_1 = 1.46 µs
	Virtual time to half value	T_2 = 53 µs
Test temperature:	Ambient temperature	20 °C
	Conductor temperature	20 °C

Test arrangement			Test voltage	Result
				
No. of test object	Voltage applied to	Earthed	kV	Numbers of impulses/disruptive discharges
5	Conductor	Screen	+125	10/0
6	Conductor	Screen	-125	10/0
7	Conductor	Screen		

Notes:

All test lines were tested simultaneously.

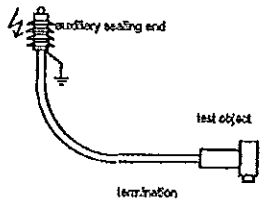
Test results (continued)

5.6.6 AC voltage test (test 7)

Duration of test after having reached full voltage: 15 min

Test frequency: 50 Hz

Test temperature: Ambient temperature 20 °C
Conductor temperature 20 °C

Test arrangement			Test voltage	Result
				
No. of test object	Voltage applied to	Earthed	kV	
5	Conductor	Screen	32	No disruptive discharge
6	Conductor	Screen		
7	Conductor	Screen		

Notes:

All test lines were tested simultaneously.

5.7 Assessment of the tests of test sequence D2

• Test 1

In the DC voltage test at -76 kV/15 min, no disruptive discharge occurred on any of the three test objects.

• Test 2

In the 50-Hz AC voltage test at 57 kV/5 min, no disruptive discharge occurred on any of the three test objects.

• Test 3

In the thermal short-circuit test of the conductor with a thermally equivalent current of 9.1 kA/1 s, no visible damage was detected on any of the three test objects.

• Test 5

After 5 complete operations of disconnection and connection, no visible damage was found on the contact.

• Test 6

In the impulse voltage test at ambient temperature with 10 test impulses of 125-kV lightning impulse voltage 1.2/50 of each polarity, no disruptive discharge occurred on any of the three test objects.

• Test 7

In the 50-Hz AC voltage test at 32 kV/15 min, no disruptive discharge occurred on any of the three test objects.

All of the three test objects meet the requirements specified by CENELEC Harmonization Document HD 629.1 S2 2006-2.

The tests of the test sequence D2 have been PASSED.

ВЯРНО С ОРИГИНАЛА

6. Special tests (tests Nos. 17 to 21)

6.1 Test laboratory

Low-voltage test laboratory, test room 7 (test No. 17)
High-voltage test laboratory, high-voltage hall 2 (tests Nos. 18, 20 and 21)
High-power test laboratory, test bay 3 (test No. 19)

6.2 Normative documents

CENELEC Harmonization Document HD 629.1 S2: 2006-02
DIN VDE 0278-629.1 (VDE 0278 Teil 629-1): 2002-06
IEC 61442: 2005-04
DIN VDE 0278-442 (VDE 0278 Teil 442): 2006-01

6.3 Required test parameters

Test No.	Type of test	Required test parameters	
17	Screen resistance measurement	Temperature during exposure to heat: Duration of thermal ageing:	(120±2) °C 168 h
18	Leakage current measurement	Test voltage U_m:	24 kV
19	Screen fault current initiation test	• Solidly earthed system Test voltage: Test current: Duration of current flow: Number of tests: • Unearthed or impedance-earthed system Test voltage: Test current: Test procedure:	 12.7 kV[1)] 10 kA 0.2 s 2 12.7 kV[1)] Minimum 10 A Start C-1 s O-2 min C-2 min O-2 min C 1 min O end
20	Operating force test	F ‹ 900 N	
21	Capacitive test point performance	-	-

Note:

1) Test parameter complies with normative document. If lower values are applied the test will become more severe.

6.4 Test arrangement

6.4.1 Screen resistance measurement (test No. 17)

Test arrangement to IEC 61442: 2005-04, Clause 15

Only one single connector body was used for the measurement. For the definite and reproducible measurement of the resistance on the screen two rings made of bare copper wire and of approx. 1-mm width were fixed to the screen. They served as fixed electrodes for the resistance measurement.

6.4.2 Leakage current measurement (test No. 18)

Test arrangement to IEC 61442: 2005-04, Clause 16

The client installed one test object on a short length of cable, which was equipped with an auxiliary sealing end on its other end, and completed it with a bushing. Subsequently, a square metal foil of 25 cm^2 was fitted to the outer conductive layer of the test object in the region of the bushing. When the AC test voltage was applied to the test object, the leakage current from metal foil to earth was measured.

6.4.3 Screen fault current initiation test (test No. 19)

Test arrangement to IEC 61442: 2005-04, Clause 17

A bushing was centrally arranged in a metal plate of 600 x 600 x 5, which was vertically fixed to a test rack. Each of the test objects, installed on a short length of cable by the client, was fixed to the bushing and the screen was earthed in accordance with the manufacturer's instructions. The other end of each length of cable was equipped with an auxiliary sealing end. For the test with solidly earthed system, a threaded rod of 10 mm Ø was arranged in the region of the transition from the conductor to the cable lug in the body of the connector under test so that a connection was established from the cable lug through a drilled hole to the inner and outer conducting layers of the connector body. For the test with unearthed or impedance earthed systems, a drilled hole was used instead of the rod. It had a copper wire of 0.2 mm Ø for bridging the insulation between the inner and outer screens and for initiating the arc. In both cases, neither the rod nor the wire protruded beyond the outer conducting layer of the connector body.

6.4.4 Operating force test of the cable connector (test No. 20)

Test arrangement to IEC 61442: 2005-04, Clause 18

One connector was assembled according to the client's instructions and was mounted on a bushing using a gliding agent provided by the client.

6.4.5 Capacitive test point performance (test No. 21)

Test arrangement to IEC 61442: 2005-04, Clause 20

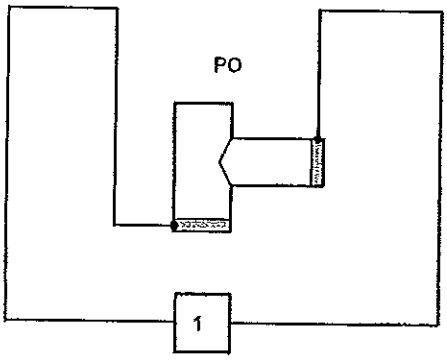
One connector was installed on a short length of cable by the client and the screen was earthed in accordance with the manufacturer's instructions. The test object was equipped with a mating bushing.

6.5 Test and measuring circuits

6.5.1 Screen resistance measurement (test No. 17)

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Resistance	Digital hand multimeter of 137 type (KEITHLEY)	Measuring range R - 2 kΩ



1 Measuring point
PO Test object

Figure 8: Measuring circuit for resistance measurement on the screen

Test and measuring circuits (continued)

6.5.2 Leakage current measurement (test No. 18)

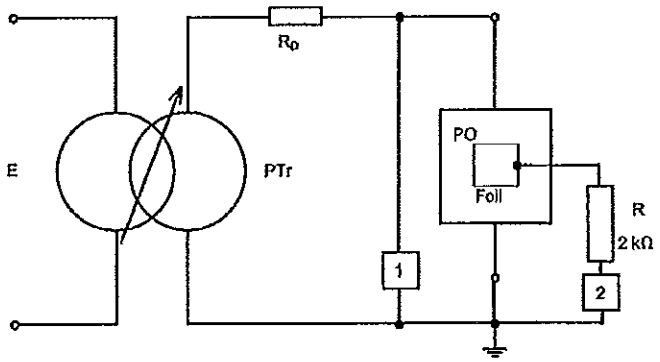
Technical data of test circuit

Single-phase AC voltage source

Test transformer:	Rated voltage	125	kV
	Rated power	100	kVA
	Rated frequency	50	Hz
	Damping resistance	0.67	kΩ

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	Capacitive divider with MU11 (TuRD) peak voltmeter	Ratio 864
2	Test current	Digital hand multimeter of 137 type (KEITHLEY)	MB 0.2 mA AC



E Supply
PTr Test transformer with variable transformer connected in series
R_D Damping resistance
R Resistance
1, 2 Measuring points
PO Test object

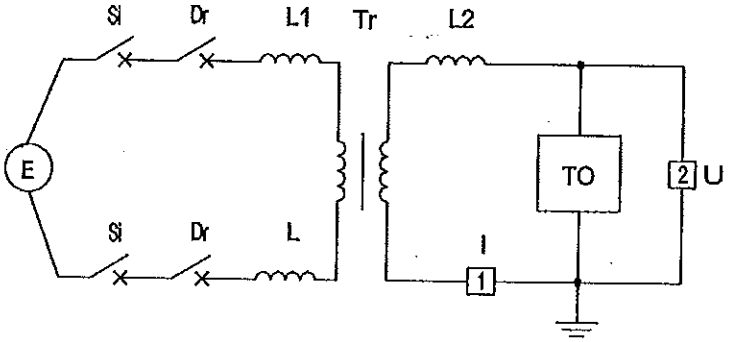
Figure 9: Test and measuring circuit for the leakage current measurement

Test and measuring circuits (continued)

6.5.3 Screen fault current initiation test (test No. 19)

Technical data of test circuit

Test requirement		Screen fault current test
Test No.		107 4009, 107 6200 and 107 6201
Number of phases	(Test circuit)	2
Number of poles/phases	(Test object)	1
Power frequency	Hz	50
Power factor cos φ		< 0.15
Connection of short-circuit transformers		I/I
Short-circuit power		120 MVA
Earthing conditions	Grid	Not earthed
	Short-circuit transformer	Earthed



E	Power supply (grid)	1, 2	Measuring points
Sl	Master breaker	I	Current measurement
Dr	Making switch	U	Voltage measurement
L1, L2	Current limiting reactors	TO	Test object
Tr	Short-circuit transformer		

Figure 10: Test and measuring circuit for the screen fault current initiation test

Technical data of measuring circuits

Test No.	Measuring point	Symbol	Measured quantity	Measuring sensor/device
107 4009, 107 6200 and 107 6201	1	I	Short-circuit current	Current transformer
	2	U	Test voltage	RC divider
Recording instrument: BE 256 transient recorder				

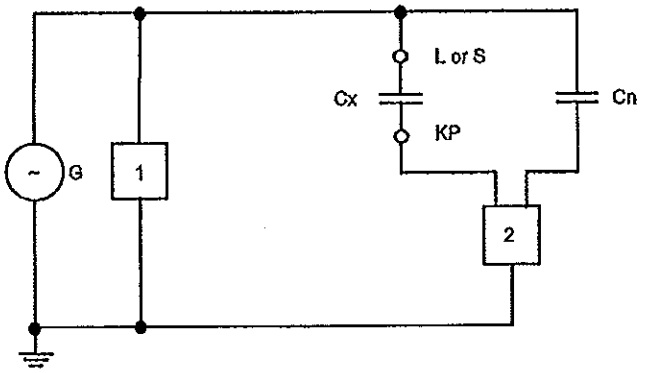
6.5.4 Capacitive test point performance (test No. 21)

Capacitance measurement by differential bridge

The capacitance Cx to be measured was connected to a capacitance measuring bridge together with the well-known capacitance Cn.

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Capacitance	C-tan δ measuring bridge of VFM type (made by MWB)	Measuring range x 100 pF
2	Test voltage	Capacitive divider with MU11 (made by TuRD) peak voltmeter	



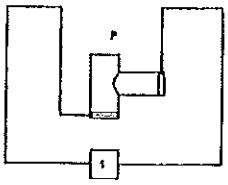
G Sine-wave generator
Cx Capacitance to be determined
L, S Cable conductor or cable screen
KP Capacitive test point
Cn Comparison capacitance
1, 2 Measuring points

Figure 11: Test and measuring circuit for determining the capacitive test point performance

6.6 Test results

6.6.1 Screen resistance measurement (test No. 17)

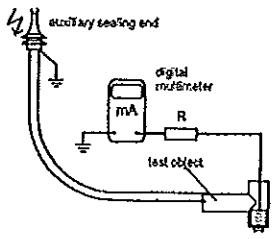
Test temperature: Ambient temperature 20 °C
Temperature during exposure to heat: 120 °C
Time of exposure to heat: 168 h

Test arrangement 		Resistance	Result
No. of test object	Condition of test object	Ω	
8	Before exposure to heat	164	OK
8	After exposure to heat	280	OK

OK: The resistance measured before and after the exposure to heat was significantly below the maximum permissible value of 5000 Ω.

6.6.2 Leakage current measurement (test No. 18)

Test temperature: Ambient temperature 20 °C

Test arrangement 			Test voltage	Leakage current	Result
No. of test object	Voltage applied to	Earthed	kV	µA	
9	Conductor	Screen	24	< 5	OK

OK: The leakage current was below the maximum permissible value of 0.5 mA.

Test results (continued)

6.6.3 Screen fault current initiation test (test No. 19)

Test requirement: Screen fault current test for impedance-earthed systems

Type of test object: RSSS-5225-R 250 A

Ambient temperature: 19 °C

Test No.	107 ...	4007	4009		
Test object	No.	-	10		
Cycle		-	C_{1s} - O_{2min} - C_{2min} - O_{2min} - C_{1min} - O		
Test voltage	kV	12.8	12.8	12.8	12.8
Test current	A	15.5	15.5	15.5	15.5
Time of test	s	0.2	1	120	60
Notes		1)	2)	2)	2)
Evaluation		-	OK	OK	OK

Notes:

1) Current setting

2) The test object is capable of properly carrying the fault current.

OK: During the making cycle the arc was ignited or re-ignited, respectively.
During the making time, the current flow was present.
A fault in the insulation is reliably detectable.

Test requirement: Screen fault current test for solidly earthed systems

Type of test object: RSSS-5225-R 250 A

Ambient temperature: 19 °C

Test No.	107	6199	6200	6201
Test object	No.	-	9	9
Test voltage	kV	12.8	12.8	12.8
Peak current	kA	29.5	27.5	24.5
Test current	kA	11.0	11.0	11.0
Time of test	s	210	200	200
Notes		1)	2)	2)
Evaluation		-	OK	OK

Notes:

1) Current setting

2) The test object is capable of properly carrying the fault current.

OK: For the case of a disruptive discharge the screen of the connector is able to carry a fault current which is sufficient to trip the protection device.

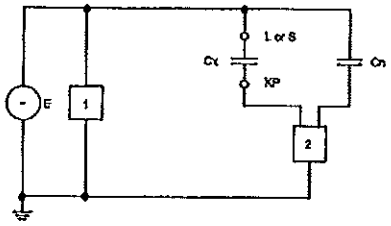
Test results (continued)

6.6.4 Operating force test (test No. 20)

Cold conditioning for 12 h at −20 °C, withdrawal force = 414 N

6.6.5 Capacitive test point performance (test No. 21)

Test temperature: Ambient temperature 23 °C

Test arrangement			Capacitance of test point KP		Notes
					
No. of test object	Voltage applied to	Earthed	Towards cable screen C_{te}	Towards cable conductor C_{tc}	
			pF	pF	
12	L (conductor)	Screen connection of the connector body	-	10.3	OK
12	S (screen)	Conductor	13.5	-	OK

Notes:

OK: The ratio of C_{te} to C_{tc} was 13.5 pF:10.3 pF ≈ 1.31, and thus ≤ 12 as specified by the normative document

6.7 Assessment of special tests

• Test 17

The resistance measured before and after the exposure to heat at 120 °C/168 h was 280 and 164 Ω, resp. This was significantly below the maximum permissible value of 5000 Ω.

• Test 18

The leakage current measured at an applied AC test voltage of 24 kV fell below the maximum permissible value of 0.5 mA with a measured value of 5 µA.

• Test 19

- Solidly earthed systems
For the case of a disruptive discharge the screen of the connector is able to carry a fault current which is sufficient to trip the protection device. The fault was reliably initiated within 3 s. The screen is able to discharge an arc to earth. The current is sufficient to operate the circuit protection.

- Unearthed or impedance-earthed systems
During the making cycle the arc was ignited or re-ignited, respectively. During the making time, the current flow was present. A fault in the insulation is reliably detectable. During the making cycle, the arc was ignited resp. re-ignited at 12.1 kV. During the making time, the current flow was present at 12.1 kV. A fault in the insulation is reliably detectable.

• Test 20

The withdrawal force was determined to be 414 N. Thus it is below the maximum permissible value of 900 N.

• Test 21

The ratio of C_{te} to C_{tc} was determined to be 1.31, which is ≤ 12 as specified by the normative document.

The test objects meet the requirements specified by CENELEC Harmonization Document HD 629.1 S2: 2006-2.

The special tests Nos. 17 to 21 have been PASSED.

7. Photos

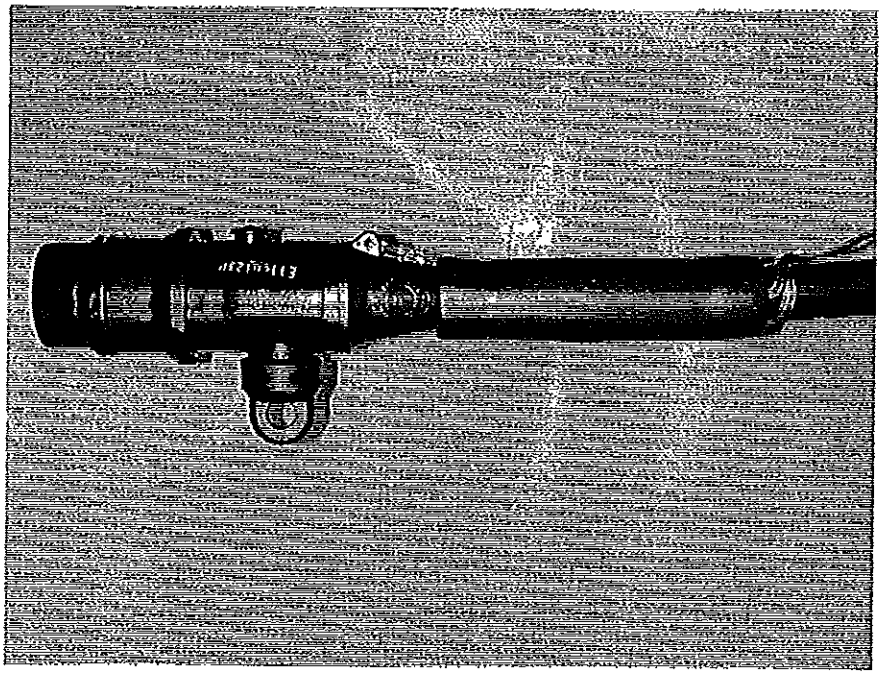


Figure 12: View of one test object

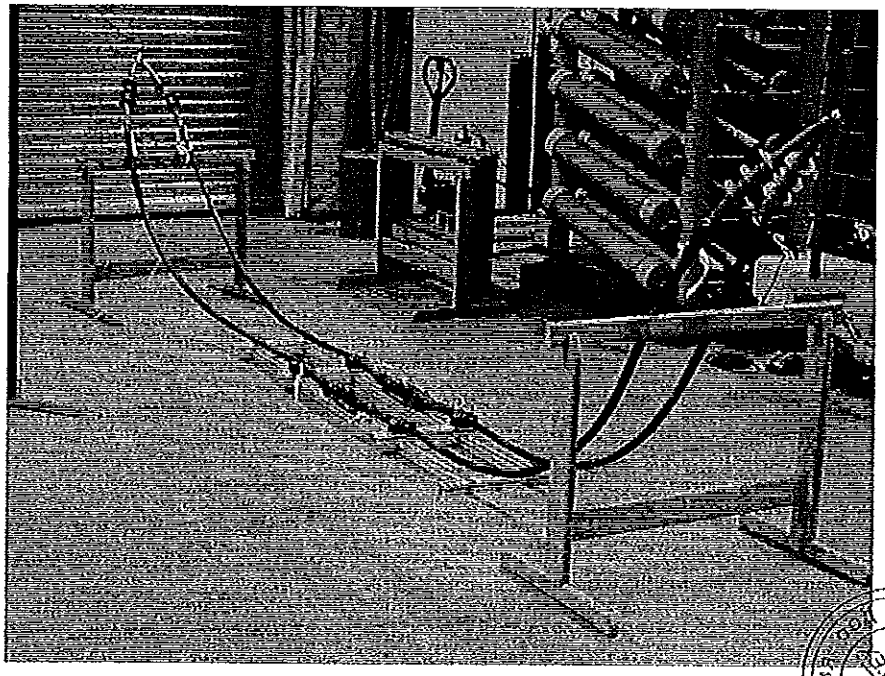


Figure 13: Arrangement for the electrical heat cycling test in air for test sequence D1

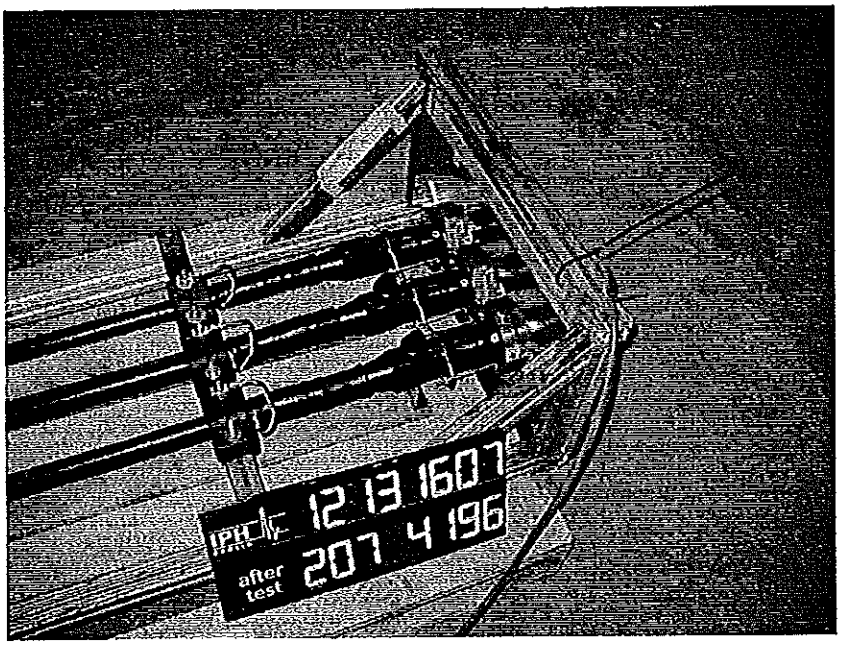


Figure 14: View of the test objects for the test sequence D2 (mounted on bushings)

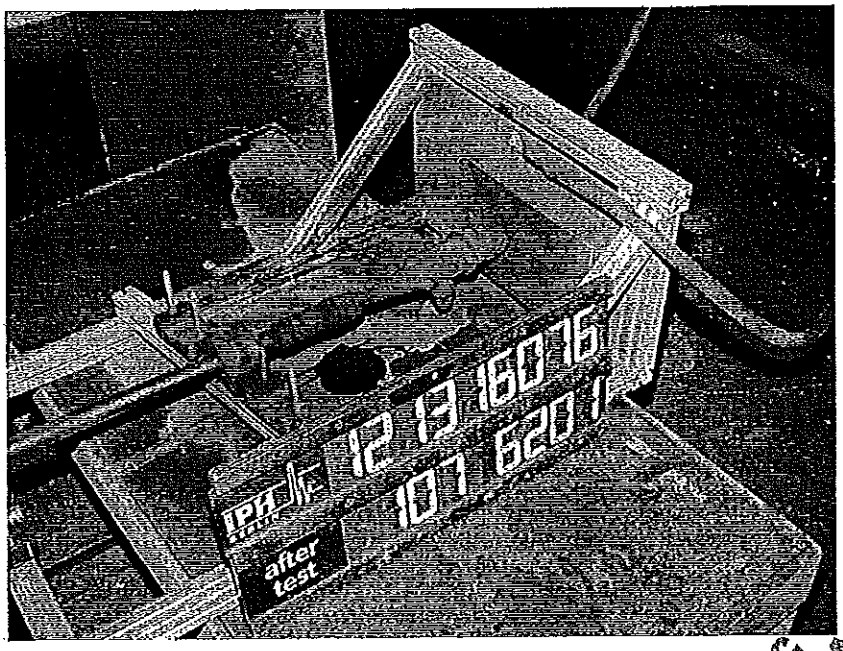


Figure 15: Test object No. 9 after the screen fault current initiation test (solidly earthed systems)

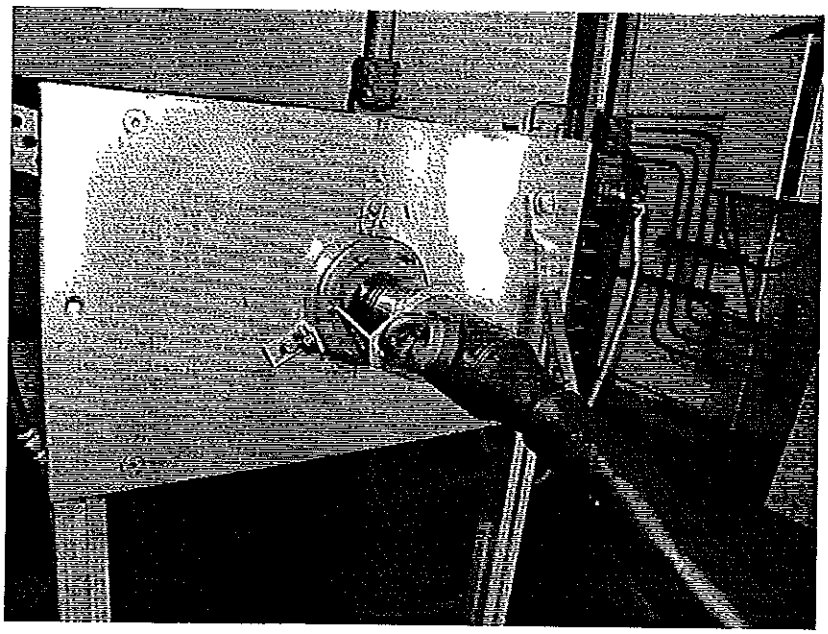
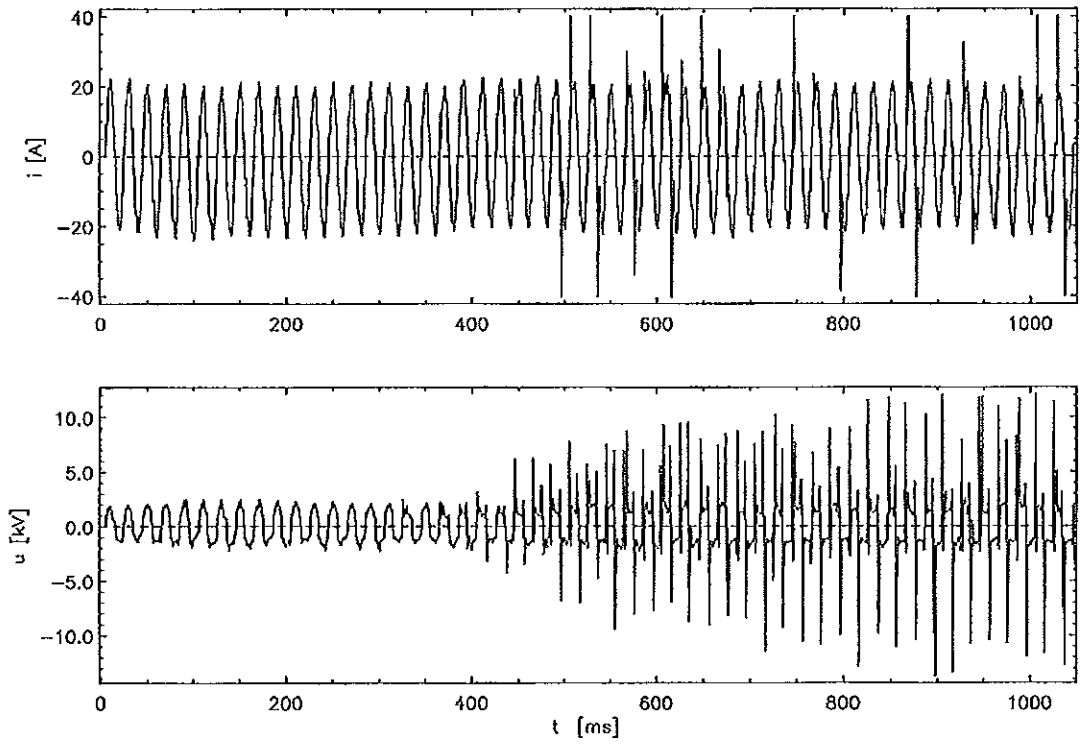


Figure 16: Test object No. 10 after the screen fault current initiation test (unearthed or impedance-earthed systems)

8. Oszillogramme

Test--No. 1074009



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Предназначение:

Комплектният бетонов трансформаторен пост CTRS е предназначен за захранване на битови и промишлени потребители от кабелни линии до 20 kV. Трансформаторната подстанция представлява самостоятелна постройка с възможност за външно обслужване.

Трансформаторната подстанция CTRS е напълно завършен в фабрични условия продукт включващ трансформатор, разпределителна уредба средно напрежение до 20 кУ, уредба ниско напрежение до 0,4 kV и всички необходими допълнителни устройства в съответствие с нормативните документи и изискванията на конкретния проект.

I. Изисквания за експлоатация:

Трансформаторната подстанция CTRS е предназначена за обслужване от правоспособен персонал на ЧЕЗ – България АД, притежаващ съответните квалификационни групи.

- Условия по експлоатация - за монтаж на открито.
- Температура на околната среда - от - 25°C до +40°C.
- Надморска височина - над 1000 м.
- Максимална влажност на въздуха - 96% при 20°C.
- Замърсяване - околната среда без токопроводими прахове, активни газове и пари.
- Околна среда - взривобезопасна и пожаробезопасна околна среда.
- Обвивка - моно блок от водоплътен бетон с топло изолирани врати за достъп към разпределителни уредби средно и ниско напрежение и две срещуположни врати на отделението за трансформатора с вентилационни решетки със специален профил осигуряващи охлаждане на трансформатора. Клас на обвивката съгласно БДС 133010.
- Защита от насекоми гризачи и птици - осигурява се посредством специални мрежи поставени зад вентилационните решетки на вратите.
- Заземление - всички метални части на комплектния трансформаторен пост са заземени посредством общ вътрешен заземителен контур, който се свързва с външния заземителен контур чрез болтове разположени от двете страни на БКТП.
- Осветление - трансформаторния пост има осветителни тела и ключове за тяхното управление във всяко

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помещение. Същите се захранват преди главния прекъсвач на уредба НН и са защитени с предпазител със стопяема вложка и с нужната комутационна възможност.

- Защита от конденз - конструкцията на обвивката, покрива, вратите и системата за вентилация на трансформаторния пост осигурява сигурна защита на стените и тавана от конденз.
- Безопасна работа - предвидени са всички мероприятия съгласно изискванията БДС 60439-1-2002 и Наредба № 3 от 9 юни 2004 г. за устройството на електрическите уредби и електропроводните линии.
- Трансформаторния пост CTRS се съпровожда от инструкция за експлоатация на български език независимо от фирмата производител на разпределителната уредба /КРУ/, която е вложена в него.

II. Монтаж

Трансформаторния пост CTRS не изисква фундамент за монтаж. Същият се монтира в изкоп с размери ....., с дълбочина мах-80см. На дъното предварително е подготвена трамбована пясъчна възглавница. При необходимост се извършва нивелация на трафопоста.

Присъединяват се изходните шини на предварително подготвения заземителен контур /К заземление < 4/ към заземителните болтове, намиращи се на страничтите стени на БКТП. По този начин се осъществява връзка между вътрешно изпълнения заземителен контур и външния и всички съоръжения на комплектния трансформаторен пост, както и всички метални части се заземяват.

- Отвори за кабели - в основата на обвивката, която представлява бетонов моно блок са предвидени до 5 броя отвори от към страна на уредба средно напрежение. При преминаване на захранващите кабели през тях е необходимо да се използва съответната кабелна арматура осигуряваща целостта на кабелната изолация. Всеки трансформаторен пост се окомплектована с необходимата кабелна арматура в зависимост от изискванията на конкретния проект.

III. Данни за конструкцията:

- Степен на защита - IP-33D

- Издръжливост на удар - 20 J

- Издръжливост на покрива - 3300 K/m^2

- Клас на обвивката – 10

- Устойчивост на огън - B

- Устойчивост на огън на стените и тавана - 120 мин

- Минимално разстояние от други сгради (зависи от типа на съседните постройки) - от 10 до 12 м.

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IV. Основни технически данни:

Стандарти :

БДС EN 62271-202:2007

БДС 60439-1-2002

Наредба № 3 от 9 юни 2004 г. за устройството на електрическите уредби и електропроводните линии

Наредба №2 "Противопожарни строителни норми"

Наредба №3 "Минимални изисквания за осигуряване на здравословни и безопасни условия на труд"

1. Напрежение на страна високо напрежение - 20 kV
2. Максимално работно напрежение на страна високо напрежение - 24 kV
3. Работно напрежение (Ие) на страна ниско напрежение - 0,4 kV
4. Номинална честота - 50 Hz
5. Брой фази - 3
6. Ниво на изолацията на страна високо напрежение - 50 kV
7. Напрежение на изолацията (Ц) на страна ниско напрежение - 690 V
8. Издържано импулсно напрежение (U1.2/50ms) на страна високо напрежение- 125 kV
9. Издържано импулсно напрежение (U;imp) на страна ниско напрежение - 6 kV
10. Номинален ток на мрежов мощностен Разединител ($1_{п}$) – 630 А
11. Номинален ток на входа на ККУ за разпределение и управление на страна Н.Н. ($1_{п}$) – 1250 А
12. Краткотрайно издържан ток (ток на термична устойчивост) на страна В.Н.- 16 кА/1§
13. Ток на динамична устойчивост на страна високо напрежение -50 кА
14. Максимална мощност на БКТП - 800 кVА
15. Мощност на трансформатора - 800 кVА
16. Краткотрайно издържан ток (ток на термична устойчивост) ($1_{сш}$) на страна Н.Н.- 17 кА/1§
17. Ток на динамична устойчивост ($1_{рк}$) на страна ниско напрежение : 50 кА
18. Клас на обвивка на БКТП: IP 33D

V. Характеристики на част средно напрежение:

„КИМТЕХ-БЪЛГАРИЯ" ООД ВАРНА КИМТЕХ

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В трансформаторния пост CTRS е предвидена възможност за монтаж на комплектни разпределителни устройства /КРУ/ с комбинация от 1 до 4 интегрирани функционални блока FlouFix на фирма EFACEC. Същите притежават следните основни характеристики:

- FlouFix е гама от фабрично сглобени, тествани и свободно стоящи шкафове с вградени в тях тоководещи части /шини/, комутационна защита и измервателна апаратура. Електрическите и механични работни механизми са разположени зад челна плоча, с визуално указване на мнемосхема на положението на комутационната апаратура (затворено, отворено и заземено).
- FlouFix са самостоятелни изцяло изолирани блокове. Състоят се от :
  - Хермитизиран метален корпус от неръждаема (без необходимост от поддръжка) стомана, където са групирани заедно частите под напрежение, мощностен разединител, земеместител, комбинация предпазител-мощностен разединител или прекъсвач.
  - Отделение за ниско напрежение.
  - Отделение за задвижващия механизъм.
  - Отделение за предпазители за функциите мощностен разединител-предпазители.
- Корпусът на уредбите FlouFix е напълнен с SF6 с манометрично налягане 0.5 bar. Херметичността му, която се проверява систематично в заводски условия, осигурява на комутационната апаратура очаквано време на живот от 30 години
- Работните характеристики, получени за уредбите FlouFix, съответстват на определението за "херметично затворена система под налягане" в съответствие с препоръките на IEC. Мощностния разединител и заземителят осигуряват на оператора всички необходими гаранции при работа.
- Уредбите FlouFix са предназначени за работа на закрито.
- В уредбите FlouFix са предвидени всички блокировки непозволяващи погрешни комутации.
- Уредбите FlouFix са с подвижни контакти с три стабилни положения (отворено, затворено и заземено) с вертикален ход. Конструкцията му прави едновременно затваряне на разединителя или на прекъсвача и заземителя *невъзможно*. Заземителят притежава включвателна способност за къси съединения, според изискванията на стандартите.
- Уредбите FlouFix притежават както изолираща, така и прекъсваща функция.
- Достъпът до кабелното отделение може да се блокира със заземителя и/или мощностния разединител или прекъсвача.
- Заземяване - специален работен лост затваря и отваря заземителните контакти. Отворът, позволяващ достъп до лоста се блокира от капак, който може да се отвори когато същностния разединител или прекъсвачът е отворен и остава блокиран, когато същия е затворен.
- Индикатори на положението на комутационната апаратура - поставени са директно върху работните валове на устройството с подвижни контакти. Дават определено показание на положението на комутационното устройство.
- Задействащ лост - същият е конструиран с анти-рефлектно устройство, предотвратяващо всякакъв опит за непосредствено повторно отваряне на мощностния разединител

или на зеземителя след затварянето.

- Заключващи устройства - могат да се използват от 1 до 3 ключалки за предотвратяване на :
  - Достъп до работния лост на мощностния разединител или на прекъсвача.
  - Достъп до работния лост на заземителя.
  - Задействуване на изключващия бутон с натискане.
- Здравата, устойчива, надеждна и нечувствителна към въздействията на околната среда конструкция на FlouFix води до много малка вероятност за повреда във вътрешността на комплекното комутационно устройство. Независимо от това, за да се гарантира максимална безопасност на персонала, устройствата FlouFix са конструирани да издържат, без опасност на оператора, вътрешна дъга предизвикана от номиналния ток на късо съединение за 1 секунда. Случайното свърхналягане в резултат на вътрешната дъга се ограничава от отварянето на предпазния клапан на дъното на металния кожух. Газът се отвежда до задната част на FlouFix без да засегне условията в предната част. Устройствата отговарят на шестте критерия, посочени в Приложение АА на БДС 60439-1-2002 след проведено изпитание за 20кУ стандартно изпитване.
- Дъгогасенето се осъществява на принципа на автопродухване в среда от 8Р6 газ.

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VI. Характеристики на част ниско напрежение:

Автоматичните прекъсвачи са със следната изключвателна възможност:

- за Авт. Прекъсвачи 1250К 3Р - 50 кА, 380/4V

Вертикалните разединители са със следната изключвателна възможност:

- за 400А 3Р - 50 кА, 400/230V.
- за 1000А 3Р - 50 кА, 400/230V.

Токовите трансформатори са с клас на точност - 0,5.

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ИЗПИТВАТЕЛЕН ЦЕНТЪР "МИНПРОЕКТ"

2351 с. Драгичево ☎ 077182911, 077182240

ЛАБОРАТОРИЯ ЗА ИЗПИТВАНЕ НА ВЗРИВОЗАЩИТЕНИ СЪОРЪЖЕНИЯ
☎ 077182340

ПРОТОКОЛ ОТ ИЗПИТВАНЕ
№ 07 от 10.07.2013 г.

Наименование на продукта (тип, марка, вид): Бетонен комплектен трансформаторен пост ТИП – CTRS.
Наименование на производителя: „ЕН ДЖИ ТЕХНОЛОДЖИ" ООД
Заявител на изпитването: „ЕН ДЖИ ТЕХНОЛОДЖИ" ООД
Заявка/писмо за изпитване: 08/28.06.2013 г. Изпитване за степен на защита IP 33D.
Методи за изпитване: БДС EN 60529+A1:2004.
№ на образеца по входящо изходящия дневник: Опитен образец.
Дата на получаване на образеца за изпитване: Образеца е изпитан на мястото на производство.
Количество на изпитваните образци: Един брой.
Данни на образците за изпитване: Посочените в конструктивната документация.
Документи придружаващи образците за изпитване: Конструктивна документация.
Дата на извършване на изпитването: 04.07.2013 г.

РЪКОВОДИТЕЛ НА ИЗПИТВАТЕЛНАТА ЛАБОРАТОРИЯ:
(инж. Е. Стоянов)

ИЗПИТВАТЕЛЕН ЦЕНТЪР МИНПРОЕКТ ЕАД

Виж Е. Стоянов

ИЗПИТВАТЕЛЕН ЦЕНТЪР МИНПРОЕКТ ЕАД КИНТЕХ БЪЛГАРИЯ

ИЗПОЛЗВАНИ ТЕХНИЧЕСКИ СРЕДСТВА ЗА ИЗМЕРВАНЕ

№ по ред	Техническо средство за измерване	Инв. №	№ на свидетелството за калибриране
1.	Термометър цифров №03	III-2-8	123D/19.04.2013г.
2.	Пробници към стенд за прахозащита	III-2-23	
3.	Приспособление от стенд за водозащита за втора характеристична цифра 3	V-2-7	

ВЕРНО С ОРИГИНАЛА

"МЕДИКО" ЕООД
гр.Севлиево ул."Хр. Спиридонов"№3, тел./факс:0675/3 53 87;
гр. Габрово ул. „Чумерна" №15А, тел/факс: 066/866 100;
тел/факс: 02/971 98 09; 0882/025 079

Акредитиран Орган за контрол от вид "С" "ФРС"
от ИА БСА, страна по ЕА MLA в областта Органи за контрол.
Сертификат за акредитация Рег. № 100 ОК от Вид "С"/13.02.2012г.
валиден до 31.12.2014г., съгласно изискванията на стандарт БДС EN ISO/IEC17020:2005

СЕРТИФИКАТ ЗА КОНТРОЛ

№3880/05.07.2013г.

1. Клиент: **"ЕН ДЖИ ТЕХНОЛОДЖИ" ООД**
Адрес: **гр. София, бул. „Самоков" №1**
2. Обект: **Трафопост**
Адрес: **гр. София, ул. „Капитан Любен Кондаков" №5**

3. Контролирани параметри:
3.1. Еквивалентно ниво на шум

4. Заключение.
4.5. **Еквивалентното ниво на шум, dBA,** съгласно протокол №3880-1/05.07.2013г. и №3880-2/05.07.2013г., съответства на изискванията на Наредба №6/ДВ бр.58/2006г. за ден.

Приложение: Протоколи от контрол №3880-1 (2 листа) и №3880-2 (2 листа) са неразделна част от Сертификат за контрол №3880/05.07.2013 г., общо 5 листа.

Извършил оценка на съответствието
Ръководител на звено: .....
(инж. Р. Панайотов)

Дата: 05.07.2013г.

Ръководител на органа за контрол: .....
/Д-р Кр. Стойнова/

"Медико" ЕООД
гр.Севлиево ул."Хр. Спиридонов"№3, тел./факс: 0675/3 53 87
гр. Габрово ул. „Чумерна" №15А, тел/факс: 066/866 100
тел/факс: 02/971 98 09; 0882/025 079
e-mail: mediko_stm@abv.bg, www.mediko.org

Акредитиран Орган за контрол от вид "С" "ФРС"
от ИА БСА, страна по ЕА MLA в областта Органи за контрол.
Сертификат за акредитация Рег. №100 ОК от Вид "С"/13.02.2012г.
валиден до 31.12.2014г., съгласно изискванията на стандарт БДС EN ISO/IEC17020:2005

ПРОТОКОЛ
ОТ КОНТРОЛ НА ШУМ В ЖИЛИЩНИ И ОБЩЕСТВЕНИ СГРАДИ
№3880-1/05.07.2013г.

1. Клиент: **"ЕН ДЖИ ТЕХНОЛОДЖИ" ООД**
   Адрес: **гр. София, бул. „Самоков" №1**
2. Обект: **Трафопост**
   Адрес: **гр. София, ул. „Капитан Любен Кондаков" №5**

3. Вид на обекта: **нов**
4. Основание за контрола: **Заявка – дата 01.07.2013г.**
5. Контролиран параметър:
   5.1. **Еквивалентно ниво на шум,** dBA

6. Нормативни актове:
   6.1. Метод на контрол: **БДС 15471-1982г.**
   6.2. Нормативни изисквания: **Наредба №6/ДВ бр.58/2006г.**

7. **УСЛОВИЯ ПРИ КОНТРОЛА:**
   7.1. Източници на шум: **Трансформатор.**
   7.2. Характер на шума: **Променлив.**

8. **РЕЗУЛТАТИ ОТ КОНТРОЛА:**

ВЯРНО С ОРИГИНАЛА

№ по ред	Място на измерване	Еквивалентно ниво на шум, dBA /ден/		Еквивалентно ниво на шум, dBA /вечер/		Еквивалентно ниво на шум, dBA /нощ/	
		Изчислено	Норма	Изчислено	Норма	Изчислено	Норма
1	2	3	4	5	6	7	8
1.	Трафопост /пред трансформатор/	58,9	60,0	-	-	-	-

9. ЗАБЕЛЕЖКА: Няма

10. ТЕХНИЧЕСКО СРЕДСТВО: Интегриращ шумомер NL–20, Идент. №01010829, свидетелство за калибр. № 068 –ИАВ/28.04.2011г.; Пистофон – PF 101, Германия, Идент.№31033, Свидетелство за калибриране №067-ИАВ/28.04.2011г.

Дата на извършване на контрола: 01.07.2013г.

Извършили контрола:

1.....
(инж. Пламен Симеонов)

2.....
(инж. Иван Иванов)

"КИМТЕХ-БЪЛГАРИЯ" ООД * КИМТЕХ * БУРГАС

ВЯРНО С ОРИГИНАЛА

"Медико" ЕООД
гр.Севлиево ул."Хр. Спиридонов"№3, тел./факс: 0675/3 53 87
гр. Габрово ул. „Чумерна" №15А, тел/факс: 066/866 100
тел/факс: 02/971 98 09; 0882/025 079
e-mail: mediko_stm@abv.bg, www.mediko.org

Акредитиран Орган за контрол от вид "С" "ФРС"
от ИА БСА, страна по ЕА MLA в областта Органи за контрол.
Сертификат за акредитация Рег. №100 ОК от Вид "С"/13.02.2012г.
валиден до 31.12.2014г., съгласно изискванията на стандарт БДС EN ISO/IEC17020:2005

ПРОТОКОЛ
ОТ КОНТРОЛ НА ШУМ В РАЗЛИЧНИ ТЕРИТОРИИ И УСТРОЙСТВЕНИ ЗОНИ В УРБАНИЗИРАНИ ТЕРИТОРИИ И ИЗВЪН ТЯХ

№3880-2/05.07.2013г.

1. Клиент: **"ЕН ДЖИ ТЕХНОЛОДЖИ" ООД**
   Адрес: **гр. София, бул. „Самоков" №1**
2. Обект: **Трафопост**
   Адрес: **гр. София, ул. „Капитан Любен Кондаков" №5**

3. Вид на обекта: **в експлоатация**
4. Основание за контрола: **Заявка – дата 01.07.2013г.**
5. Контролиран параметър:
   5.1. Еквивалентно ново на шум, dBA

6. Нормативни актове:
   6.1. Метод на контрол: **БДС 15471-1982г.**
   6.2. Нормативни изисквания: **Наредба №6/ДВ бр.58/2006г.**

7. **УСЛОВИЯ ПРИ КОНТРОЛА:**
   7.1. Източници на шум: **Трансформатор.**
   7.2. Характер на шума: **Променлив.**

8. **РЕЗУЛТАТИ ОТ КОНТРОЛА:**

ВЯРНО С ОРИГИНАЛА

№ по ред	Място на измерване	Еквивалентно ниво на шум, dBA /ден/		Еквивалентно ниво на шум, dBA /вечер/		Еквивалентно ниво на шум, dBA /нощ/	
		Изчислено	Норма	Изчислено	Норма	Изчислено	Норма
1	2	3	4	5	6	7	8
1.	Трафопост /1м. от трафопост/	50,3	70,0	-	-	-	-
2.	Трафопост /4,1м. от трафопост по посока на фасадите с вентилационни решетки/	33,8	70,0	-	-	-	-
3.	Трафопост /под 4,1м. от трафопост по посока на фасадите без вентилационни решетки/	34,1	70,0	-	-	-	-

9. ЗАБЕЛЕЖКА: Оценката на съответствието е извършена съгласно нормативните изисквания на Наредба №6/ДВ бр.58/2006г. /приложение №2 към чл. 5 – таблица №2, т. 6/

10. ТЕХНИЧЕСКО СРЕДСТВО: Интегриращ шумомер NL–20, Идент. №01010829, свидетелство за калибр. № 068 –ИАВ/28.04.2011г.; Пистофон – PF 101, Германия, Идент.№31033, Свидетелство за калибриране №067-ИАВ/28.04.2011г.

Дата на извършване на контрола: 01.07.2013г.

"КИМТЕХ БЪЛГАРИЯ" ООД "КИМТЕХ" БУРГАС

ВЯРНО С ОРИГИНАЛА

Извършили контрола:

1.....
(инж. Пламен Симеонов)

2.....
(инж. Иван Иванов)

„ЕЛКИП" ООД	Стр. 1 от 3

ИЗПИТВАТЕЛЕН ПРОТОКОЛ
БДС EN 62271 – 202:2007
Комплектни подстанции за високи / ниски напрежения
изработени в заводски условия

Протокол
Пореден № .....: 003
Изпитал (+подпис).....: К. Петров
Проверил (+подпис).....: Е. Александров
Ръководител (+подпис).....: А. Атанасов
Дата на издаване.....: 17.07.2013 г.
Съдържание.....: 3 страници

"ЕЛКИП" ООД
"ELKIP" Ltd.
ПОДДРЪЖКА ЕЛ КОНТРОЛ ИЗГРАЖДАНЕ

Изпитал:
Име.....: „ЕЛКИП" ООД
Адрес.....: Република България, гр. Радомир, ж.к. „Гърляница", бл. 1

Клиент:
Име.....: „Ен Джи Технолоджи" ООД
Адрес.....: Република България, гр. София, бул. Самоков № 1

Спецификация на изпитването:
Стандарт.....: БДС EN 62271 – 202:2007

Изпитван образец:
Описание.....: Комплектен трансформаторен пост с бетонов корпус изработен в заводски условия
Означение на модела и/или типа, №.....: CTRS до 800 kVA
Производител.....: „Ен Джи Технолоджи" ООД

Резултат от изпитването: Горепосоченият продукт: отговаря / ~~не отговаря~~

„КИМТЕХ-БЪЛГАРИЯ" ООД • БУРГАС •

Изпитвателен протокол № 003 от 17.07.2013 г.				Стр. 2 от 3	
Реултати от изпитването:					
Метод на изпитване съгласно клауза:	Кратко описание на изискването / изпитването:	Изискване съгласно клауза:	Норма / предписание:	Резултат Измерено / наблюдавано	Заключение (удовлетворява) да / не
1.	2.	3.	4.	5.	6.
6.3.БДС EN 62271 – 202:2007 Трансформаторът и комплектното комутационно устройство за разпределение и управление за ниско напрежение във вътрешността на обвивката от клас 10 на изработения в заводски условия комплектен трансформаторен пост с бетонов корпус за високи/ниски напрежения издържат изпитване за определяне превишенията на температурата			да	Да	да
6.3.2. БДС EN 62271 – 202:2007 Измерените прегрявания при температура на въздуха извън обвивката t ос = 15°C на:					
- Трансформатора:					
охлаждаща течност (маслото) в горните слоеве, К			≤ 60	58	да
намотките на трансформатора, К			≤ 70	67	да
- разглежданата част (5 вериги) от комплектното комутационно устройство за разпределение и управление за ниско напрежение при условна стойност на обявен коефициент на едновременност 0,8					
клеми на външни изолирани проводници			≤ 70	39	да
органи за ръчно задействане с изолационни повърхности, К			≤ 25	13	да
достъпни външни обвивки с метални повърхности, К			≤ 30	10	да

Изпитвателен протокол № 003 от 17.07.2013 г.	Стр. 3 от 3

1. Обявен клас на обвивката на БКТП – 10

Случай на заключение при изпитването
Изпитаният образец удовлетворява изискването – Да
Изпитаният образец не удовлетворява изискването – Не

Дата на заявяване на изпитването – 03.06.2013 г.
Дата (и) на провеждане на изпитването - 17.07.2013 г.

Протокол от изпитване: WP-PB-0301033 Go-001 /копие/

Предмет на изпитването: Измерване херметичност на кабелен проход на фирма Дойма тип BKD 150 срещу Хелий

Клиент: Дойма ГмбХ и Ко
Индустриштрасе № 43-57
28876 Ойтен

Поръчка/Док. за експедиция: от 25.06.2001 г.

Изпитвателна лаборатория: Фрауенхофер – Институт за технология и изследване на материали
Лаборатория за изпитаване на материал, металография и анализ
Винер Штрасе 12
D-28359 Бремен
Тел. +49 /0/4 21/2246-4 00
факс +49 /0/4 21/2246-4 30

Обект на изпитването: Уплътнителна система BKD 150

Начална дата: 25.06.2001

Указания: Резултатите се отнасят само за горепосочения обект на изпитване. Без писменото одобрение на изпитвателната лаборатория този протокол от изпитване не може да бъде частично разпространяван. Ако поръчителят на изпитването трябва да дава указания от името на изпитвателната лаборатория, трябва да се посочва пълния препис от изпитвателната лаборатория

Дата на издаване: Бремен, 02.08.2001

Подпис:

„КИМТЕХ-БЪЛГАРИЯ" ООД КИМТЕХ БУРГАС

1. Предмет на изпитването:

Изпитван детайл от системата: херметичен проход BKD 150-K/150
капачка BKD 150-D3/60

Подготовка на изпитването: виж рисунка приложение 1

Провеждане на изпитването: Подготовката на изпитването се осъществява от сътрудник на заявителя на измерването. След подлагане на изпитваните проходи с налягане от 5 бара с Хелий, беше измерено частично налягане на газа с помощта на Детектор за Хелий Leybold UL 200.

изискването на изпитването до -25°C, системата е подложена на изпитване под водно налягане от 5 бара.
Силата на установеното водно налягане беше измерена и отчетена за период от 24 часа.

Измервателна техника: Измервателен усилвател тип MGC/MC55

Датчик за налягане тип P8AP/10
Детектор за Хелий Leybold UL 200.

Дата на изпитването: 25.06.2001

Провел изпитването: Миахел Гом

2. Резултати от измерването:

Таблица с резултати:

Изпитване	Среда на изпитване	Налягане /бара/	Измерено частично налягане /mbar l/s/	Частично налягане на атмосферата /mbar l/s/
1	Хелий	5	4.8 E-6	4.8 E-6

Тъй като беше измерено само атмосферното частично налягане, от това може да се установи, че няма пропуск на Хелий.

3. Забележки

Херметичността при Хелий на проходната система KD, при изпитване в бетонова основа е представено в протокол от изпитване WP-PB-398012-007 от 28.01.1999 с измерено частично налягане от 5,4E-6 мбара.

Приложение № 1

Приложение № 2

Fraunhofer Institut
Fertigungstechnik
Materialforschung

Prüfbericht	WP-PB-A301033Go-001 (Abschrift) Der Prüfbericht umfasst 3 Blätter und 2 Anlage
Aufgabenstellung	Messung der Dichtigkeit einer Kabeldurchführung der Fa. Doyma GmbH & Co des Typs BKD 150 gegenüber Helium
Auftraggeber	DOYMA GmbH & Co Industriestraße 43-57 28876 Oyten
Auftrags/Lieferschein Nr.	vom 25.06.2001
Prüflabor	Fraunhofer - Institut für Fertigungstechnik und Angewandte Materialforschung (IFAM) Labor für Werkstoffprüfung, Metallographie und Analytik Wiener Straße 12 D - 28359 Bremen Tel. +49 (0) 4 21 / 22 46 - 4 00 Fax. +49 (0) 4 21 / 22 46 - 4 30
Prüfgegenstände	Kabeldurchführungssystem BKD 150
Eingangsdatum	25.06.2001
Hinweise	Das Prüfergebnis bezieht sich ausschließlich auf die genannten Prüfgegenstände. Ohne schriftliche Genehmigung des Prüflabors darf dieser Prüfbericht nicht auszugsweise vervielfältigt werden. Soll vom Auftraggeber auf die Inanspruchnahme des Prüflabors hingewiesen werden, muss die vollständige Anschrift des Prüflabors angegeben werden.
Ausstellungsdatum	Bremen, den 02.08.2001
Unterschrift	

1. Prüfgegenstand

Zu prüfende Einzelteile des Systems:	Einfach-Dichtpackung Systemdeckel	BKD 150-K/150 BKD 150-D3/60
Prüfvorrichtung:	s. Zeichnung Anlage 1	
Versuchsdurchführung:	Die Prüfvorrichtung wurde von einem Mitarbeiter des Auftraggebers für die Messung vorbereitet. Nach Beaufschlagung des Prüfdruckes von 5 bar mit Helium, wurde der Partikeldruck des Gases mit Hilfe eines Heliumdetektors Leybold UL 200 gemessen.	
Messtechnik:	HBM-Messverstärker Typ MGC / MC55 (IFAM-Prüfmittel Nr.: A4.110-0001) HBM-Druckaufnehmer Typ P8AP/10 (IFAM-Prüfmittel Nr.: D2.2110-0002) Leybold Heliumdetektor Typ UL 200	
Prüfdatum:	25.06.2001	
Prüfer:	Michael Gomm	

2. Messergebnisse

Ergebnistabelle:

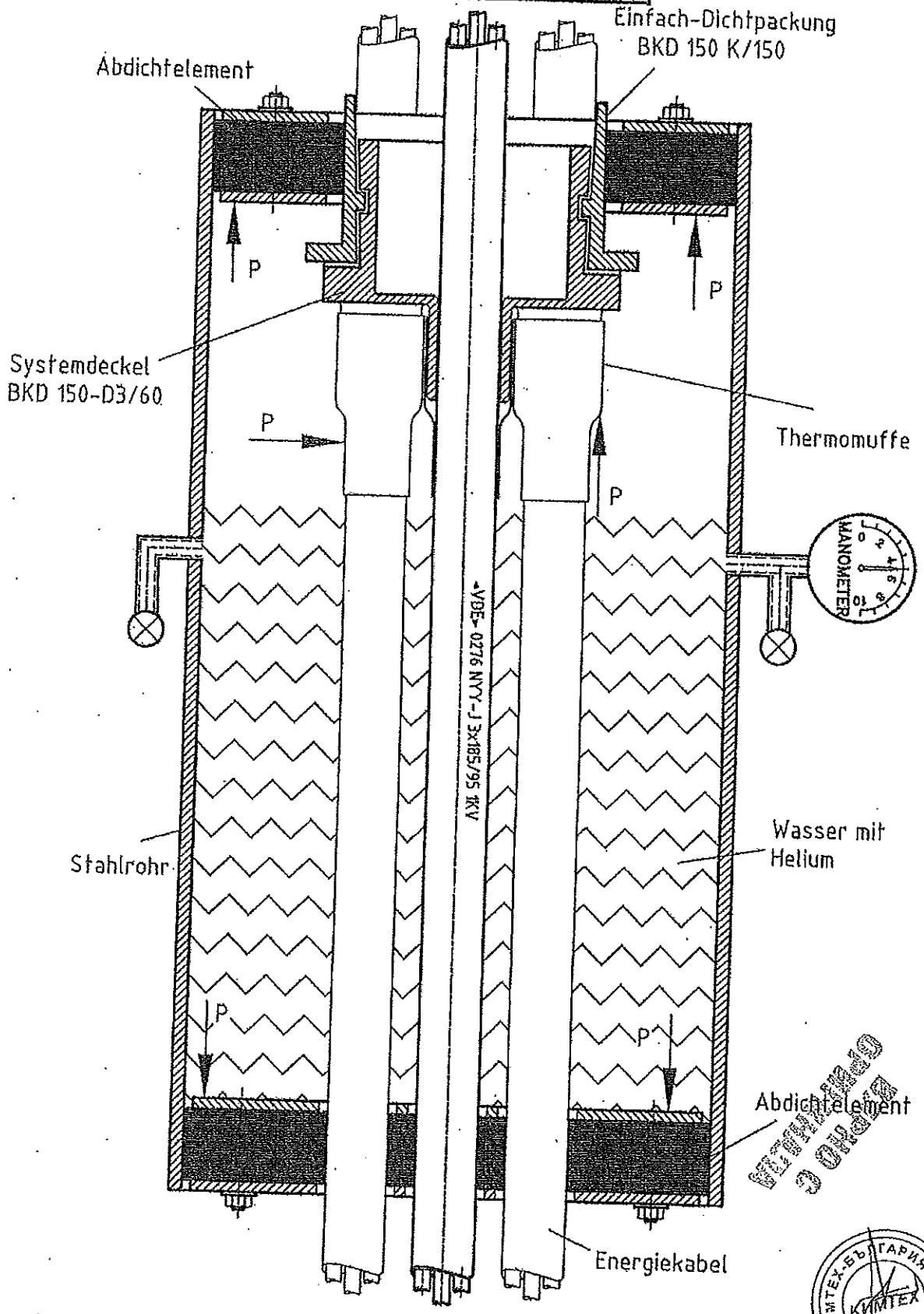
Prüfung	Prüfmedium	Prüfdruck [bar]	gemessener Partikeldruck [mbar l/s]	Partikeldruck der Atmosphäre [mbar l/s]
1	Helium	5	≈4.8 E-6	≈4.8 E-6

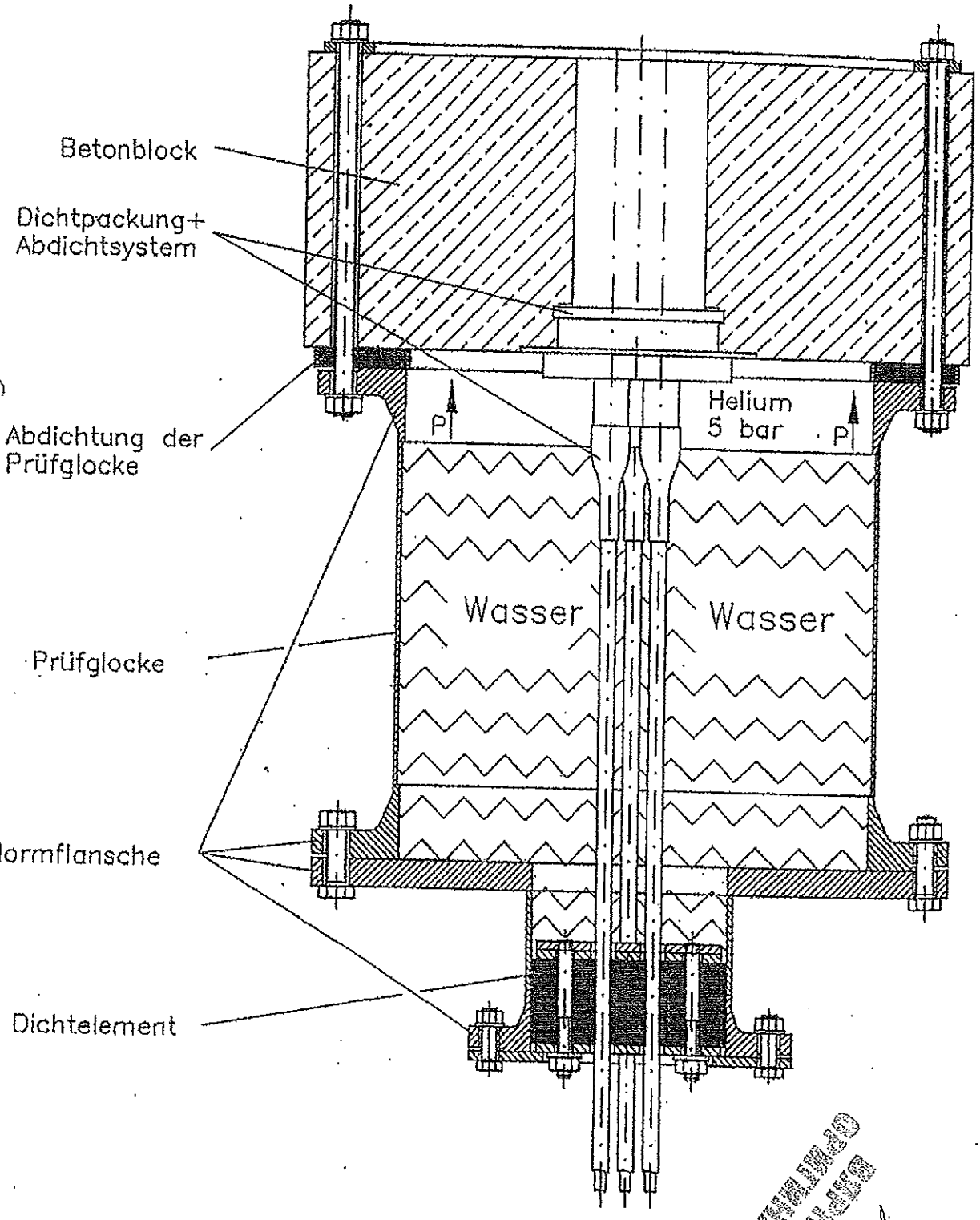
Da nur der atmosphärische Partikeldruck gemessen wurde, ist davon auszugehen, dass kein Helium aus der Prüfvorrichtung austrat.

3. Bemerkungen

Die Helium-Dichtigkeit der Dichtpackung des KD-Systems in einem Betonprüfkörper wird im Prüfbericht WP-PB-398012-007 der IFAM vom 28.01.1999 mit einem gemessenen Partialdruck von 5.4E-6 mbar nachgewiesen.
Der Versuchsaufbau ist in Form einer Skizze in Anlage 2 dargestellt.

Anlage Nr. 1 zu IFAM Prüfbericht
WP-PB-A3o.1o33go-oo1





Anlage Nr. 2 zu IFAM Prüfbericht
WP-PB 130 1033 90 - 001

Измерване херметичност на кабелен проход
тип KD 85 D1/75 срещу Хелий

копие

Протокол от изпитване: WP-PB-398012-007
Поръчка от: 19.08.1999

Дойма ГмбХ и Ко
Индустриштрасе № 43-57
28876 Ойтен

Фрауенхофер – Институт за технология и изследване на материали
Лаборатория за изпитаване на материал, металография и анализ
Винер Штрасе 12
D-28359 Бремен
Тел. +49 /0/4 21/2246-4 00
факс +49 /0/4 21/2246-4 30

М. Бреде

М. Гом

Бремен, 03.09.2002

1. Задача:

Предмет на изследването беше кабелен проход тип KD 85/D1-75, който беше предоставен за изпитване от Дойма ГмбХ и Ко, Ойтен /заявител/.

Целта на изследването беше измерване на интензивността на теч, която има кабелния проход при подлагане на налягане с Хелий от 5 бара.

2. Провеждане на изследването:

Изпитваният обект беше подготвен от сътрудник на заявителя в института за измервания /Приложение WP-PB-398012-007-01/. След подлагане на налягане от 5 бара с Хелий, беше измерено частичното налягане на Хелия с помощта на Детектор за Хелий тип Leybold UL 200.

Следното изследване с изпитван обект тип KD беше проведено:

Изпитване	Изпитван обект	Брой	Период на изпитването	Среда на изпитването	Налягане при t_0
			/h/		/bar/
	KD 85-D1/75	1	-	Хелий	5

3. Резултати
При този изпитван обект беше измерено частично налягане от максимално 5,4E-6 мбара. Нормалното частично налягане на Хелий във въздух е 4,8E-6мбара.

Дейностите бяха проведени в съответствие с общите търговски условия на дружеството Фрауенхофер.

Fraunhofer Institut
Fertigungstechnik
Materialforschung

Messung der Dichtigkeit einer Kabeldurchführung des Typs KD 85 D1/75 gegenüber Helium

Abschrift

Kurzbericht WP-PB-398012-007 zum
Angebot Nr. 398012
Auftragseingang: 19.08.1998

DOYMA GmbH & Co
Industriestraße 43-57

D-28876 Oyten

Fraunhofer - Institut für Fertigungstechnik und Angewandte Materialforschung (IFAM)
Labor für Werkstoffprüfung, Metallographie und Analytik
Wiener Straße 12
D – 28359 Bremen

M. Brede

M. Gomm

„КИМТЕХ-БЪЛГАРИЯ" ООД КИМТЕХ БУРГАС

Bremen, 03.09.2002

1 Aufgabenstellung

Gegenstand der Untersuchung war eine Kabeldurchführung des Typ KD 85-D1/75, die von DOYMA GmbH & Co, Oyten (Auftraggeber AG) zur Prüfung beigestellt worden waren.

Ziel der Untersuchung war die Messung der Leckrate, die diese Kabeldurchführung bei Beaufschlagung mit Helium unter einem Druck von 5 bar erreicht.

2 Durchführung des Versuches

Der Versuchskörper wurde von Mitarbeitern des AG im Institut für die Messung in die entsprechende Versuchsvorrichtung (Anlage WP-PB-398012-007-1) eingebaut. Nach Beaufschlagung mit Helium unter einem Druck von 5 bar wurde der Partialdruck des Heliums mit Hilfe eines Heliumdetektors Leybold UL 200 gemessen.

Folgender Versuch mit einem Prüfkörper des Typs KD wurde durchgeführt:

Prüfung	Prüfkörper	Anzahl	Sollprüf-zeitraum	Prüfme-dium	Druck bei t_0
			[h]		[bar]
	KD 85-D1/75	1	-	Helium	5

3 Ergebnis

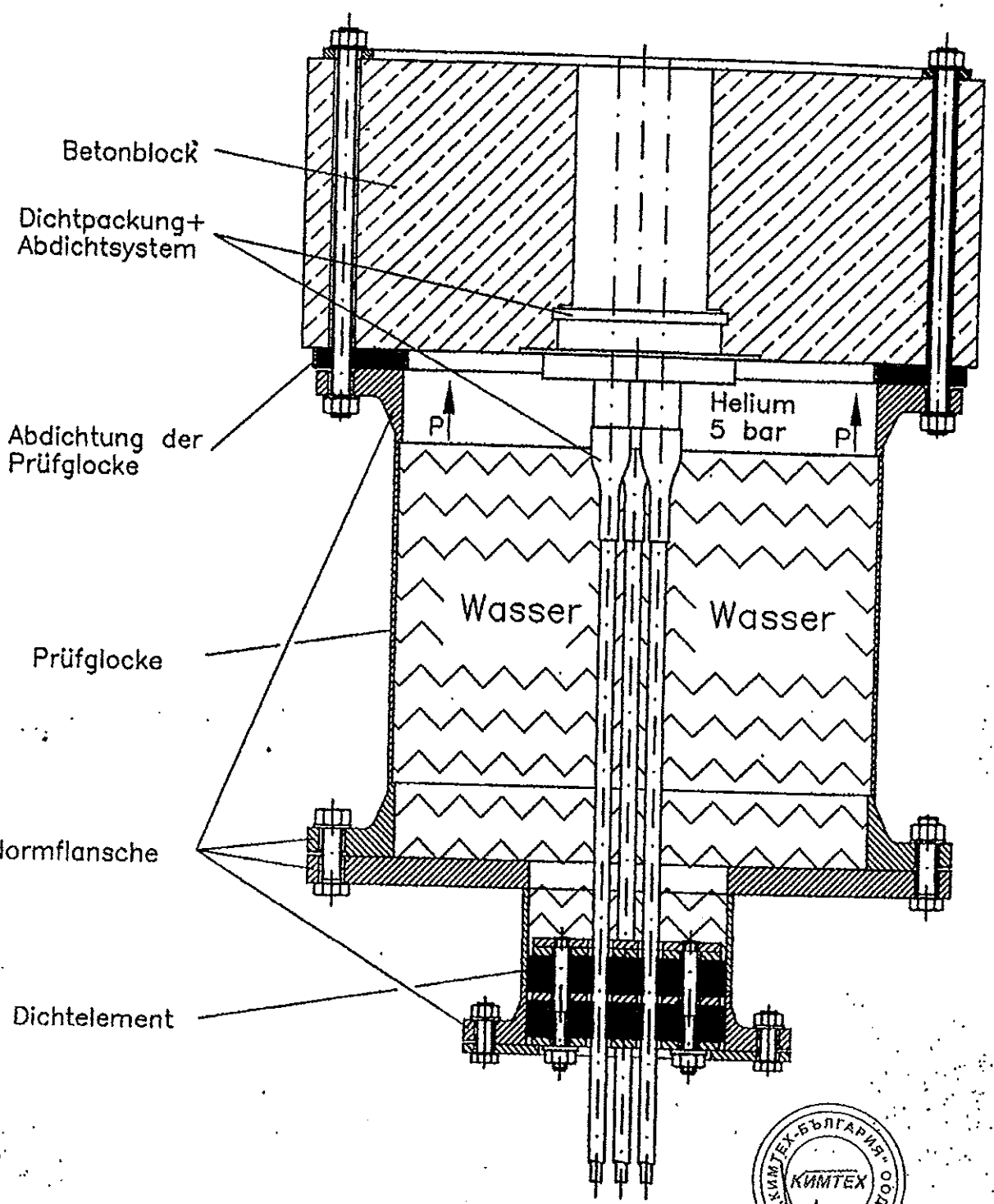
Bei diesem Prüfkörper wurde ein Partialdruck von maximal 5.4E-6 mbar gemessen. Der normale Partialdruck von Helium in der Luft beträgt 4.8E-6 mbar.

Die Arbeiten werden unter Zugrundelegung der allgemeinen Geschäftsbedingungen der Fraunhofer-Gesellschaft durchgeführt.

Bremen, 28.01.99/Wu

КИМТЕХ-БЪЛГАРИЯ-ООД КИМТЕХ БУРГАС

Aufbau Heliumprüfung



КИМТЕХ-БЪЛГАРИЯ ООД
КИМТЕХ
БУРГАС

Anlage Nr. ...1... zu IFAM Prüfbericht
WP-PB-.....398012_007.....

БЪЛГАРСКА СЛУЖБА ЗА АКРЕДИТАЦИЯ

СЕРТИФИКАТ ЗА АКРЕДИТАЦИЯ

„МЕДИКО" ЕООД
ОРГАН ЗА КОНТРОЛ
„ФАКТОРИ НА РАБОТНАТА СРЕДА" ОТ ВИД С

ЕИК: 107518480

Адрес на управление:
5400 гр. Севлиево, ул. „Христо Спиридонов" № 3

Адрес на офис:
5300 гр. Габрово, ул. „Чумерна" № 15А

ОБХВАТ НА АКРЕДИТАЦИЯ:

Контрол на:
Електрически уредби и съоръжения до 1000 V
Климатични и вентилационни инсталации
Химични агенти във въздуха на работна среда
Физични фактори на работна и битова среда
Вибрации предавани на системата ръка-рамо и на цялото тяло
Електромагнитни полета
Физическо натоварване

АКРЕДИТИРАН СЪГЛАСНО БДС EN ISO/IEC 17020:2005

Заповед № 183/13.02.2012г е неделима част от сертификата за акредитация,

общо .....5.... страници.

Валиден до: .....31.12.2014г. БСА рег. № .....100 акс.....

Изпълнителен директор:

Инж. Елза Янева

Дата на първоначална акредитация: 27.06.2003 г.

Дата на преакредитация: 23.12.2010 г.

София ..... 13.02.2012 г.

БЪЛГАРСКА СЛУЖБА ЗА АКРЕДИТАЦИЯ
РЕПУБЛИКА БЪЛГАРИЯ

1797 София, бул. „Д-р Г.М. Димитров" 52А, тел.: 02 873 5302; факс: 02 873 5303

ROMANIAN ACCREDITATION ASSOCIATION - RENAR

Bucharest, Calea Vitan no. 242, sector 3, zip code 031301
CIF RO 4311980

RENAR is EA-MLA signitory for Testing.

ACCREDITATION CERTIFICATE
No. LI 004

Romanian Accreditation Association – RENAR, being recognized as National Accreditation Body by OG 23/2009, herewith attests that the organization:

NATIONAL INSTITUTE FOR RESEARCH-DEVELOPMENT AND TESTING IN ELECTRICAL ENGINEERING – ICMET CRAIOVA

Decebal Avenue no. 118A, Craiova, county Dolj

through

HIGH POWER TESTING LABORATORY FOR ELECTRICAL EQUIPMENT (HPTL)

fulfills the requirements of **SR EN ISO/CEI 17025:2005** and is competent to carry on **TESTING** activities, as it is detailed in the Annex of the present accreditation certificate.

This accreditation is maintained provided that the accreditation criteria established by the Romanian Accreditation Association – RENAR are met continuously.

The present certificate includes Annex no. 1 (9 pages), which is an integrated part of this certificate.

In order to check the validity of the accreditation certificate, including the Annex, the website of RENAR shall be consulted: www.renar.ro.

Date of initial accreditation: 22.11.2010
Date of accreditation renewal: 21.11.2014
The accreditation is valid until: 20.11.2018

GENERAL DIRECTOR
Cătălina Viorica NEAGUE

PRESIDENT OF THE ACCREDITATION COUNCIL
PhD. Eng. Dumitru DINU

ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ

Долуподписаната, Мария Цветкова в качеството си на Управител на „Ен Джи Технолоджи" ООД, декларирам на собствена отговорност, че продуктът:

Стоманобетонова кострукция за бетонов комплектен трансформаторен пост

произведен от „Ен Джи Технолоджи" ООД
с адрес: гр. София 1528, НПЗ Искър,
ул. „Кап. Любен Кондаков" № 5
за който се отнася тази декларация, е в съответствие с изискванията на:

БДС EN 13670-1:2009
и Наредба за съществените изисквания към строежите и оценяване съответствието на строителните продукти.

Декларацията се издава въз основа на:

Сертификат за производствен контрол
№ НСИСОССП-3288 от 05.07.2013 г.

Издаден от:

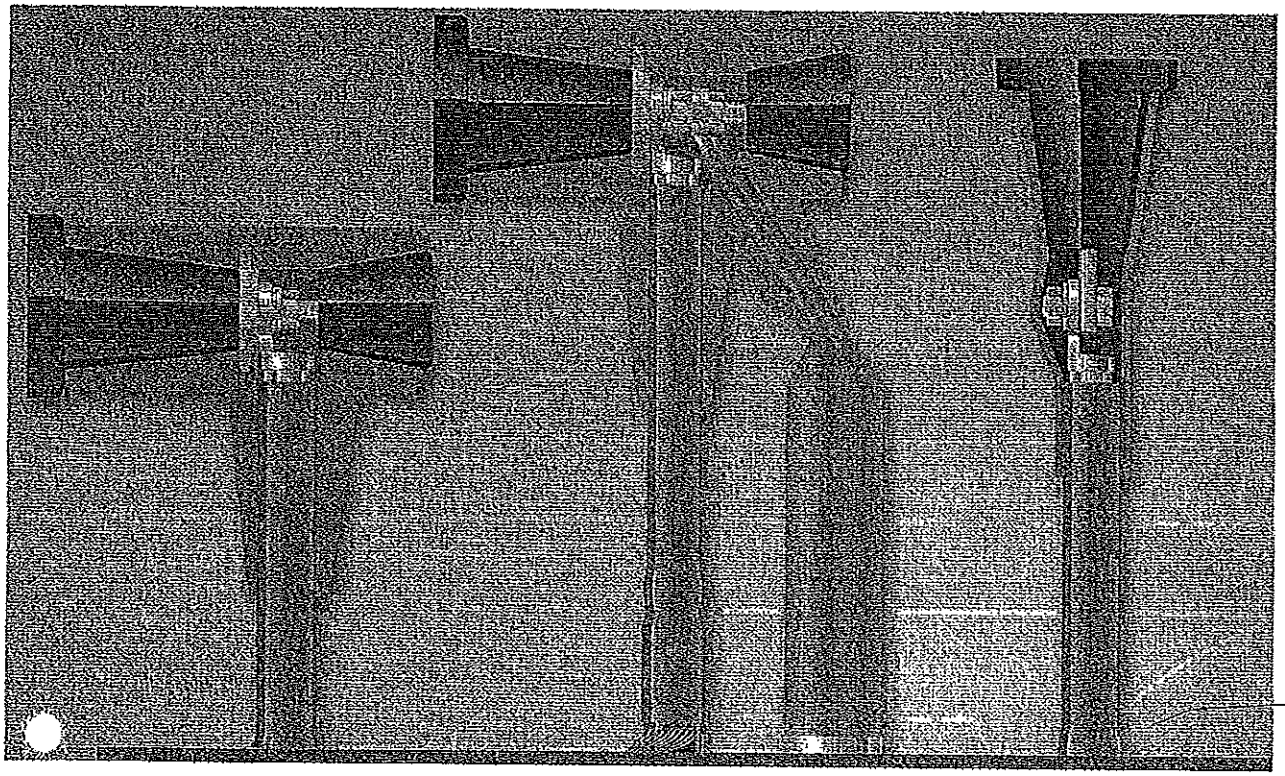
"Ен Джи Ен" ООД - гр. Хасково

с адрес: гр. Хасково 6300, Търговски комплекс XXI век, ет. 4 офис 5,
Разрешение РОССП-05 от 12.11.2007 г. и Нотифициран орган от Европейската комисия NB 1888.

Декларирам, че ми е известна отговорността, която нося съгласно чл. 313 от НК.

дата: 08.08.2013 г.
гр. София

Управител:



INSULATED ADAPTER TERMINATION SYSTEM (RICS)

FOR SF6-INSULATED SWITCHGEAR UP TO 24 kV

KEY FEATURES

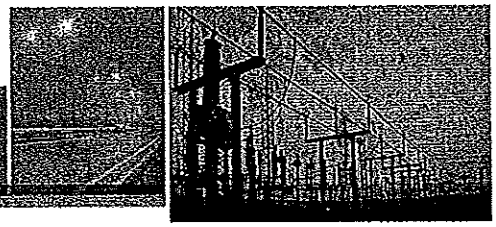
- Perfect sealing, electrical insulation and electrical connection
- Connection to bushing Type C according EN80181
- Insulating adapter is compatible with all Raychem terminations
- Adapters are water tight
- Universal technology increasing the reliability, irrespective of the type of cable used in the network

TE Connectivity's (TE) Raychem insulating adapter RICS (630 A) is for the connection on outer cone bushings Type C according to EN-50181. It is compatible with all Raychem terminations and can thus be used to connect any type of cable, irrespective of whether it is paper or plastic insulated or has one or three cores.

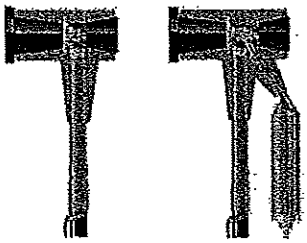
The insulated adapter termination system provides perfect sealing, electrical insulation and an electrical connection between Raychem terminations and SF6-insulated switchgear up to 24 kV. The compact design of the adapters and their clear cut profiles simplify installation. The electrical connection with the aid of a stud renders additional fastening systems unnecessary.

TE Energy has several decades of experience in the field of hermetically insulated termination systems for medium voltage applications. The adapters are watertight and can operate under extreme environmental conditions with severe pollution.

Customers can count on consistent, high-quality products, driven by TE's proven innovation and backed by our extraordinary customer support.



RICS adapters come in various types



T-adapter with or without surge arrester

Thick walled insulator made of high quality elastomer with sealing face over the termination, bushing cone and plug. The electrical connection is made with a terminal stud and the cable lug of the termination. Two cable connection is possible. A special plug which allows cable testing without disconnecting the adapter is also offered. The design of the adapter for connecting the RDA surge arrester is basically identical. The elastomer insulator has an additional lead-in duct for the surge arrester. Scope of supply (for three phases) insulator, plug, terminal stud, small accessories and installation instructions.

Straight adapter

A thick walled, heat-shrinkable insulating sleeve provides a hermetic seal over the cone of the bushing and the termination. The adapter area is smoothed with a meltable filler strip. Scope of supply (for three phases) heat-shrinkable insulating sleeving, filler strip, small accessories and installation instructions. Terminal stud and lug must be enclosed.

PRODUCT SELECTION INFORMATION			
Description	System Voltage (kV)	Cross Section (mm²)	Diameter of Termination (mm)
RICS-5113	12	25 - 50	17,5 - 24
RICS-5123	12	70 - 150	21,5 - 28
RICS-5133	12	185 - 240	27 - 35
RICS-5143	12	300	32,5 - 42
RICS-5123	24	25 - 70	21,5 - 28
RICS-5133	24	95 - 185	27 - 35
RICS-5143	24	240 - 300	32,5 - 92
Kits to connect surge arrester RDA:			
RICS-5139	12	185 - 240	27 - 35
RICS-5149	12	300	32,5 - 42
RICS-5139	24	185 - 240	27 - 35
RICS-5149	24	300	32,5 - 42

TESTING

The adapters conform to IEC 540, and VDE 0278 specifications, as well as to the Raychem specification PPS 3013. The test requirements and results are summarized in Raychem Test Report PPR 1106, which is available on request.

te.com/energy

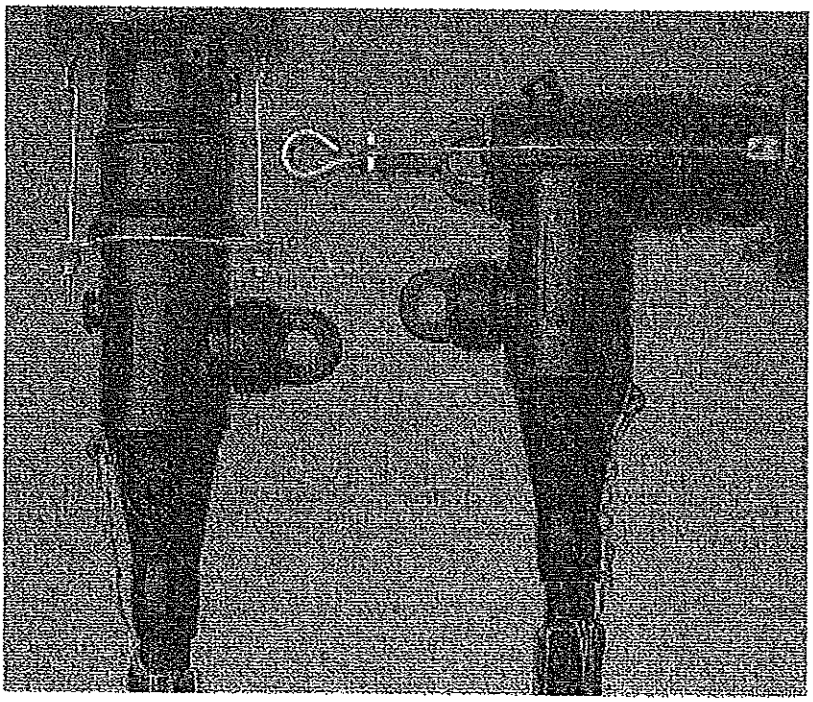
FOR MORE INFORMATION: TE Technical Support Centers

USA:	+ 1 800 327 6996
France:	+ 33 380 583 200
UK:	+ 44 0870 870 7500
Germany:	+ 49 896 089 903
Spain:	+ 34 916 630 400
Benelux:	+ 32 16 351 731
Canada:	+ 1 (905) 475-6222
Mexico:	+ 52 (0) 55-1106-0800
Latin/S. America:	+ 54 (0) 11-4733-2200
China:	+ 86 (0) 400-820-6015

tyco

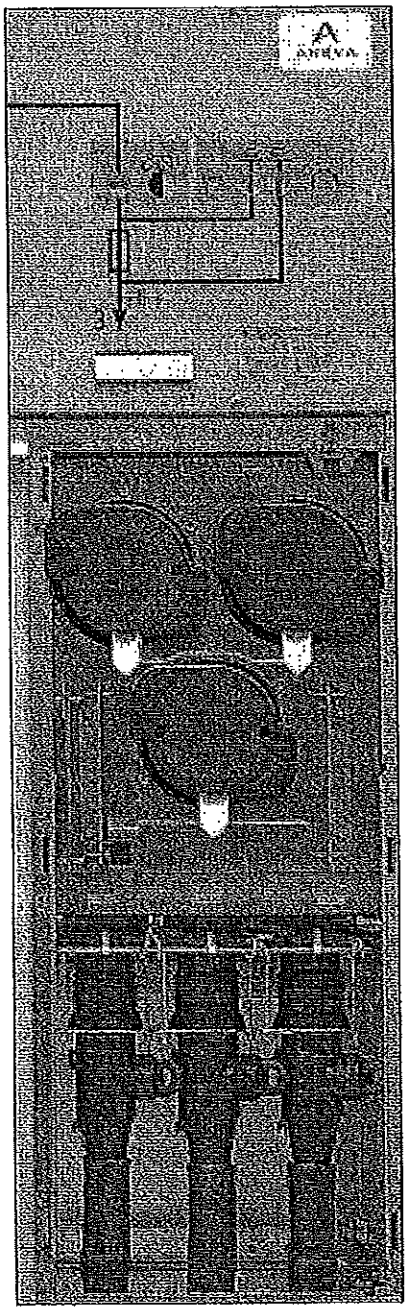
Electronics

RSES/RSSS
Screened Adaptor System
250 A, 24 kV



ENERGY DIVISION

RSES/RSSS **Screened Adaptor System 250 A, 24 kV**

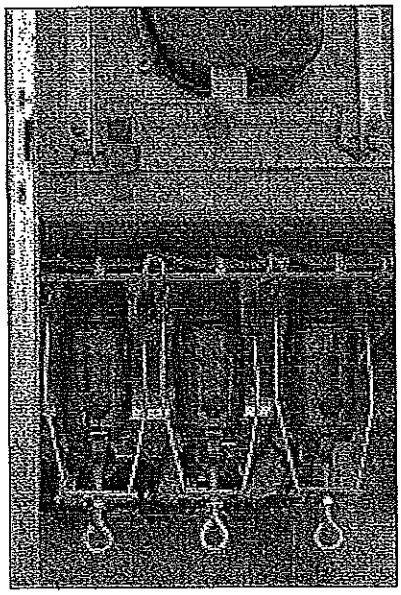


Raychem separable Screened Adaptors are designed to connect single-core polymeric cables to medium voltage equipment (transformers, switchgears, motors etc.) up to 24 kV.

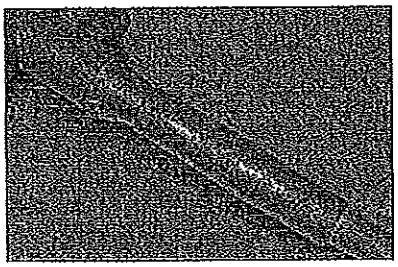
Made of crosslinked EPDM and protected with a minimum 3 mm moulded conductive shield connected to earth, Raychem deadbreak adaptors are suitable for both indoor and outdoor installations.

Their wide application range allows a minimum number of bodies to cover several different cable cross-sections without the need for additional cable adaptors. The cut-back dimensions for all cable sizes are the same for RSSS and RSES.

Raychem Screened Adaptors are equipped with a capacitive test point to ensure that the circuit is not energised before disconnection. The capacitive test point is protected by a conductive cap. A range of high strength bimetallic compression connectors tested to VDE 0220 are offered to connect both aluminium and copper conductor cables.
After cable preparation and lubrication, the Raychem Screened Adaptors can simply be slid into place under virtually all conditions. A separable mounting system provides for an easy installation of the adaptor onto the bushing.



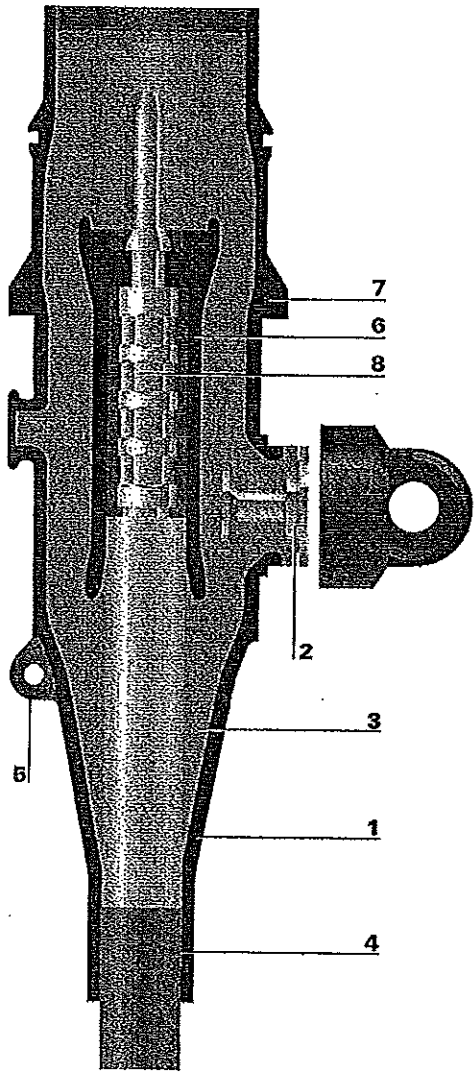
In addition, Rayvolve tubing or heat-shrink phase-marking sleeves are offered as an option, to provide a superior environmental seal.

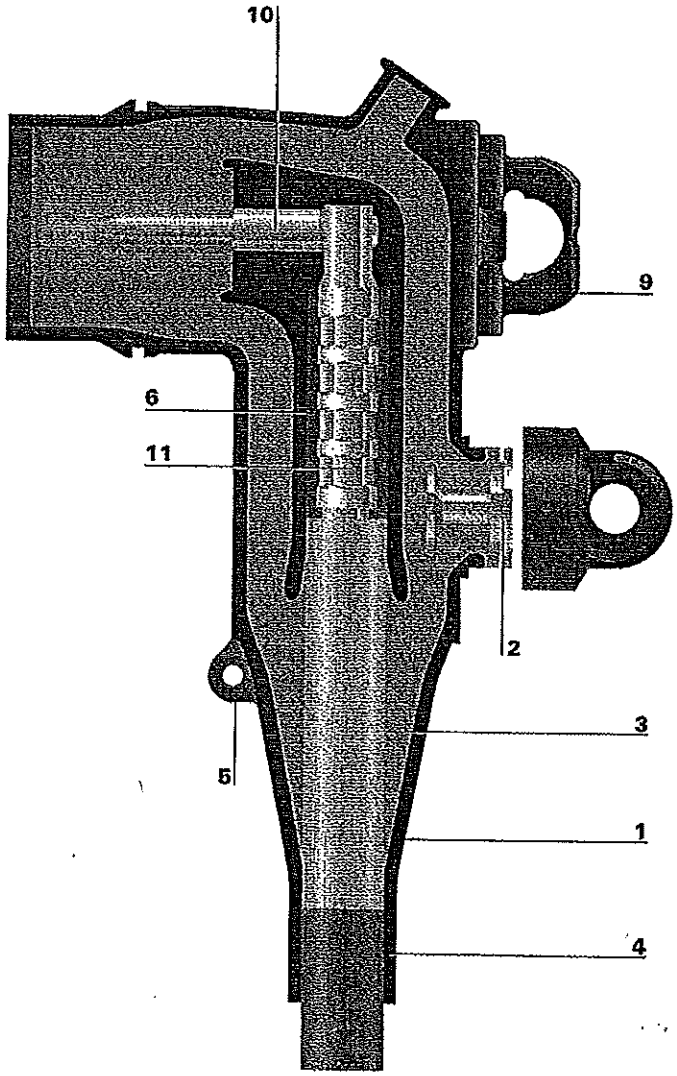


Rayvolve Sealing
Cold applied technology.
Rayvolve is used in conjunction with a pressure sensitive mastic and is simply rolled into place. Thus a reliable moisture seal is achieved. The use of Rayvolve is particularly recommended for applications where a torch is unavailable or cannot be used.

Heat-Shrinkable Sealing
Moisture seal and phase marking.
A reliable moisture can also be produced by using a mastic in conjunction with a heat-shrinkable sleeve. This solution has the additional advantage of providing phase marking. A standard torch carried by most jointers is used.

Construction and Design





1 Screened Body
A 3 mm conductive moulded outer screen is permanently bonded to the EPDM insulating material of the body.

2 Capacitive Test Point
Used to determine if the circuit is energised; can also be used for phasing. Electrically protected by a cap made of EPDM.

3 Stress cone
Computer designed, it relieves electrical stress at the cable screen cut of the termination.

4 Conductive Cable Entrance
The 25 mm conductive end provides a connection to the cable screen.

5 Earthing Eye
Provides a connection point for the screen of the body to the earth.

6 Inner Screen
Conductive insert provides a "Faraday cage" around the compression connector and eliminates corona at rated voltage.

7 Retaining Shoulder
To fix a retaining collar onto the adaptor for easy installation with two screws.

8 Compression Pin-Connector
Bimetallic compression pin-connector designed with locking ring, to connect both aluminium and copper conductor cables.

9 Lifting Eye
A lifting eye firmly attached to a moulded-in insert provides a secure connection point.

10 Pin
Tin plated copper electrode, designed and tested to carry 250 A continuous current.
The hexagonal wrench to fix the pin onto connector is supplied with each kit.

11 Compression Connector
Bimetallic compression connector to connect both aluminium and copper conductor cables.

RSES/RSSS Screened Adaptor System 250 A, 24 kV

Technical data	RSES	RSSS
Cable Insulation Diameter Range	13.5 - 33.5 mm	13.5 - 26.5 mm
Connector Cross section Range	16 - 120 mm²	16 - 95 mm²
Maximum System Voltage	24 kV	24 kV
Continuous Current Rating	250 A	250 A
Basic Impulse Level	125 kV	125 kV
Partial Discharge at 2 U_0	< 5 pc	< 5 pc
AC Voltage Withstand, 1 min	50 kV	50 kV
DC Voltage Withstand, 30 min	96 kV	96 kV

The adaptors have been tested in accordance with the international specifications (e.g. ANSI/IEEE 386, IEC 540, VDE 0278).
The bimetallic connectors have been tested in accordance with VDE 0220 on aluminium and copper conductors.
All adaptors pass the routine tests including: AC Voltage Withstand, Partial Discharge Extinction and Test Point Voltage Test.

Selection Table

Screened Elbow Adaptors

Diameter over insulation	Cross section (Al or Cu conductor) 16 mm²	25 mm²	35 mm²	50 mm²	70 mm²	95 mm²	120 mm²
13.5 - 17.4 mm	RSES 5201	RSES 5202	RSES 5203	RSES 5205	–	–	–
16.3 - 20.8 mm	RSES 5211	RSES 5212	RSES 5213	RSES 5215	RSES 5217	RSES 5219	–
19.6 - 24.1 mm	–	–	RSES 5223	RSES 5225	RSES 5227	RSES 5229	RSES 5224
23.1 - 27.7 mm	–	–	–	RSES 5235	RSES 5237	RSES 5239	RSES 5234
27.9 - 33.5 mm	–	–	–	–	–	RSES 5249	RSES 5244

Screened Straight Adaptors

Diameter over insulation	Cross section (Al or Cu conductor) 16 mm²	25 mm²	35 mm²	50 mm²	70 mm²	95 mm²
13.5 - 17.4 mm	RSSS 5201	RSSS 5202	RSSS 5203	RSSS 5205	–	–
16.3 - 20.8 mm	RSSS 5211	RSSS 5212	RSSS 5213	RSSS 5215	RSSS 5217	RSSS 5219
19.6 - 24.1 mm	–	–	RSSS 5223	RSSS 5225	RSSS 5227	RSSS 5229
21.0 - 26.5 mm	–	–	–	RSSS 5255	RSSS 5257	RSSS 5259

Add mod. code -R to kit number for cold applied tubing Rayvolve.
Add mod. code -P to kit number for heat shrink tubing with phase marking.

tyco Electronics

Tyco Electronics Raychem GmbH
Finsinger Feld 1, 85521 Ottobrunn/Munich, Germany
Phone: +49-89-6089-0, Fax: +49-89-6096345
http://energy.tycoelectronics.com

a vital part of your world

Energy Division – economical solutions for the electrical power industry: cable accessories, connectors & fittings, electrical equipment, instruments, lighting controls, insulators & insulation enhancement and surge arresters.

Универсални адаптори за КРУ с вакуум или елегаз

Нарастващата популярност на SF_6-КРУ (Комплексни разпределителни устройства с изолация от елегаз) определи разработването на съединителна система към проходните изолатори. Raychem разработи за тази цел две системи: EN-50181 тип C (400/630 A) и тип A (250 A).

За проходни изолатори по EN-50181 тип C (400/630 A):
Изолираните адаптори RICS и RCAB (630 A) са съвместими с кабелните глави на Raychem и могат да се прилагат при кабели с пластмасова и хартиено-импрегнирана изолация, едножилни и трижилни кабели.
За повече информация – Стр. 42.

Екранираните адаптори RSTI са предназначени за присъединяване на кабели с пластмасова изолация, без използване на кабелни глави – подробности на стр. 44.

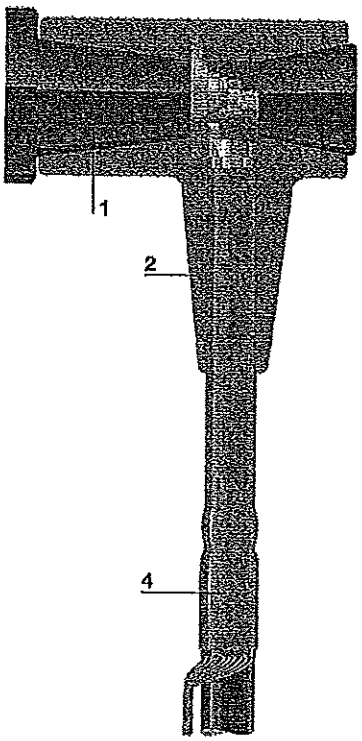
За проходни изолатори по EN-50181 тип A (250 A):
Екранираните адаптори RSES и RSSS (250A) са напъхваеми кабелни глави за кабели с пластмасова изолация, проектирани за връзка между КРУ и трансформатор. Подробности са дадени на стр. 44.

Опростен монтаж
Компактният дизайн на адаптерите и изчистен профил улесняват монтажа. Стандартният шкаф не изисква скъпоструващи модификации за присъединяване на хартиено-маслен кабел или импулсен разрядник.

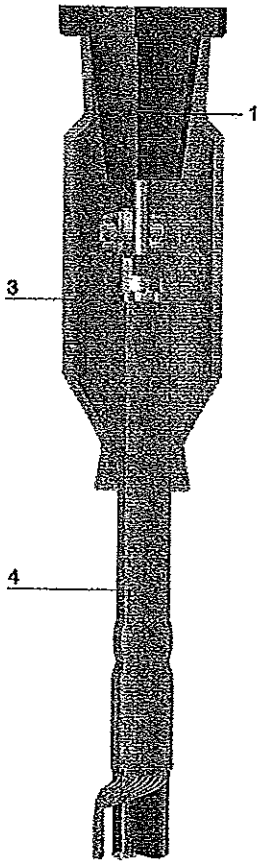
Надеждност
Raychem има опит от няколко десетилетия в областта на херметично изолираните кабелни глави за средно напрежение. Адаптерите са водонепроницаеми и с гарантирано непрекъсваемо действие, дори при сурови климатични условия и в силно замърсени райони.

Изпитвания
Адаптерите отговарят на CENELEC HD629.1S, IEC 540, VDE 0278 и ANSI IEEE 386, както и на вътрешен стандарт на Raychem PPS 3013, освен това те са изпитвани едновременно с различни типове КРУ. Условията на изпитване и резултатите са обобщени в доклади, които могат да се предоставят при поискване.

Изолиран T-адаптор RICS



Изолиран прав адаптор RCAB



1 Конусовиден проходен изолатор
2 RICS-адаптор
3 RCAB- адаптор
4 Кабелна глава Raychem

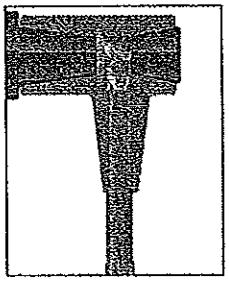
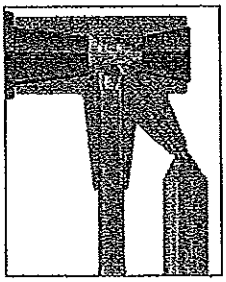
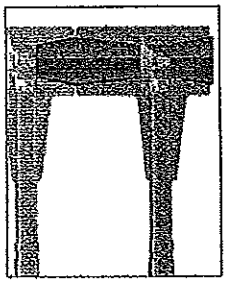
Изолирана система глава-адаптор за КРУ до U_m 24 kV

Изолираната система глава-адаптор осигурява абсолютна херметичност, електрическа изолация и електрическа връзка между кабелната глава на Raychem и SF_6-КРУ за напрежение до 24 kV. Проходният изолатор (630 A) отговаря на EN-50181 тип C (400/630 A). Изолираните адаптори са съвместими с всички кабелни глави на Raychem. Кутията на КРУ трябва да бъде снабдена с подходяща защита срещу електрически шок. Обикновено това се постига със самозаключващ се метален капак, който е монтиран към КРУ. Освен това той предпазва персонала от работа под напрежение.

RICS – Изолиран T-адаптор с или без импулсен разрядник
Дебелостенен изолатор, направен от висококачествен еластомер с херметизираща част върху главата, конусовидната втулка и запушалка. Електрическата връзка се осигурява от клема-щифт и кабелната обувка на главата. Предлага се специална кабелна обувка, която позволява изпитване на кабела без разкачване. Конструкцията на адаптор с импулсен разрядник е идентична. Изолаторът еластомер има допълнителен проходен отвор за присъединяване на разрядник тип RDA. Предлагат се адаптори и за два кабелни входа.

RCAB – Изолиран прав адаптор
Много гъвкав изолатор, направен от висококачествен еластомер, осигурява херметична връзка върху втулката и кабелната глава. Кабелната обувка на главата се присъединява просто към клема-щифт на адаптора чрез болт и гайка. Дори при ограничени пространства адаптерът може да се напъхва върху втулката, като дава достъп при изпитване на кабела. Високата гъвкавост на тялото на адаптора обуславя херметична връзка и позволява използването му при различни типове кабели при еднакво сечение.

RICS, RCAB – Изолирани Т-образни адаптори и прави адаптори за SF_6-КРУ с проходни изолатори съгласно EN-50181 тип С (400/630 А), 10 kV и 20 kV

Тип кабелна глава		RICS – Т-адаптор		RICS – Т-адаптор за паралелно свързване На ОПН тип RDA		RICS – двоен-Т-адаптор	
							
		Сечение (mm^2)	Обозначение за поръчка	Сечение (mm^2)	Обозначение за поръчка	Сечение (mm^2)	Обозначение за поръчка
Кабели с пластмасова изолация							
1- и 3-жилни кабели		25– 50	RICS-5113				
10 kV с кабелни обувки		70–150	RICS-5123				
Тип POLT, TFTI		185–240	RICS-5133	185–240	RICS-5139	185–240	RICS-5137
		300	RICS-5143	300	RICS-5149	300	RICS-5147
1- и 3-жилни кабели		10– 70	RICS-5123				
20 kV с пресова обувка		95–185	RICS-5133	95–185	RICS-5139	95–185	RICS-5137
Тип POLT, TFTI		240–300	RICS-5143	240–300	RICS-5149	240–300	RICS-5147
1- и 3- жилни кабели	ML-1-13	50– 95*	RICS-5123				
10 kV, с винтова	ML-2-17	95–150	RICS-5133	95–150	RICS-5139	95–150	RICS-5137
кабелна обувка тип	ML-4-17	150–240	RICS-5143	150–240	RICS-5149	150–240	RICS-5147
POLT, TFTI	ML-5-17	240–300	RICS-5143	240–300	RICS-5149	240–300	RICS-5147
1- и 3- жилни кабели	ML-1-13	25– 70	RICS-5123				
20 kV, с винтова	ML-2-17	70–150	RICS-5133	70–150	RICS-5139	70–150	RICS-5137
кабелна обувка	ML-4-17	150–240**	RICS-5143	150–185	RICS-5149	150–185	RICS-5147
тип POLT	ML-5-17	240–300	RICS-5143	240–300	RICS-5149	240–300	RICS-5147
Хартиено-маслени кабели							
Поясна изолация 3-жилни к-ли		35	RICS-5113				
(MI and MIND) 10 kV		50– 95	RICS-5123				
Тип GUST, EPKT-45		120–185	RICS-5133	120–185	RICS-5139	120–185	RICS-5137
		240	RICS-5143	240	RICS-5149	240	RICS-5147
с винтови каб.обувки		35– 50	RICS-5123				
Тип GUST–L16		70–120	RICS-5133	70–120	RICS-5139	70–120	RICS-5137
		150–240	RICS-5143	150–240	RICS-5149	150–240	RICS-5147
Екранирани 1- и 3-жилни		35– 70	RICS-5133-01-12				
кабели 20 kV		95–150	RICS-5133-01				
Тип IDST		150–240	RICS-5143-01				

* За 3-жилни глави 10 kV с винтови обувки ML-1-13, RICS-5123 е подходящ до max. 70 mm^2.
** За 3-жилни глави 20 kV с винтови обувки ML-4-17, RICS-5143 е подходящ до max. 185 mm^2.

Забележка: Всички адаптори RICS-5113 и RICS-5123 са конструирани за работа с кабелни обувки с диаметър на отвора 13 mm.
Всички други типове са конструирани за работа с отвор на обувката 17 mm. Ако е добавен код -12 към обозначението за поръчка, може да се използват кабелни обувки с диаметър на отвора 13 mm, например – RICS-5133-12.
Изделия с код -12 не се доставят за комплекти с импулсни разрядници и за двойни адаптори.
Адаптори RICS с капацитивна букса се доставят по заявка.

Други типове адаптори се доставят по заявка.

RSES, RSSS – Екранирани Г-образни и прави адаптори КРУ с вакуум или елегаз и трансформатори с проходни изолатори съгласно EN-50181 тип A (250 A), 10 kV и 20 kV

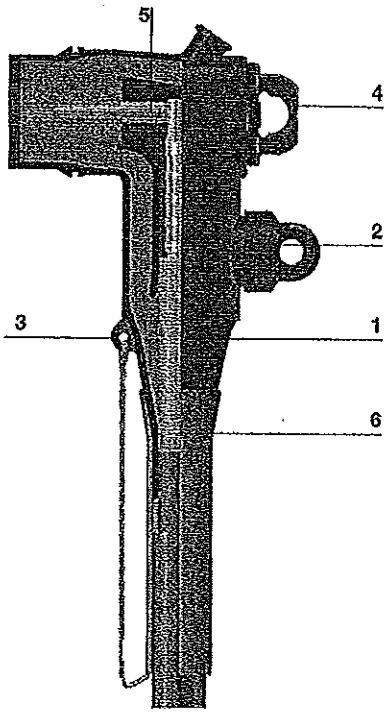
Екранираните адаптори на Raychem са конструирани за свързване на едножилни кабели с пластмасова изолация към SF_6-КРУ или трансформатори за напрежение до 24 kV. Адапторите херметизират проходния изолатор според изискванията на EN 50181 тип A (250A). Връзката може да се изпълни като права или правоъгълна.

Конструкция
Дебелостенният адаптор с вграден стрес-контрол осигурява херметичност и електрическа връзка на втулката и кабела. Произведен от омрежен EPDM и защитен чрез заземен залепен проводим екран с дебелина минимум 3 mm, адапторът е подходящ за монтаж на открито и закрито. Специалната конструкция и подборът на материалите позволяват използването на широка гама кабели. Така адапторите са независими от допуските в размерите и не изискват специални кабелни адаптори. Подготовката на кабела и размерите на разделката са еднакви за Г-образния адаптор и за правия адаптор.

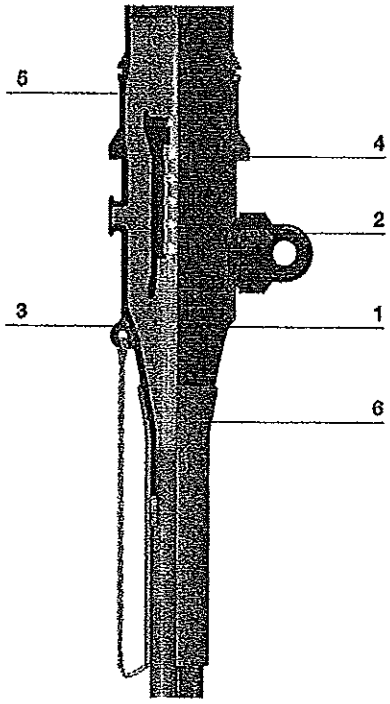
Адапторите са снабдени с капацитивен датчик, за предпазване от работа под напрежение. Датчикът е защитен от капачка.

В комплекта се доставят биметални висококачествени съединители, изпитани по VDE 0220 за присъединяване на кабели с алуминиеви или медни жила.

Екраниран Г-образен адаптор

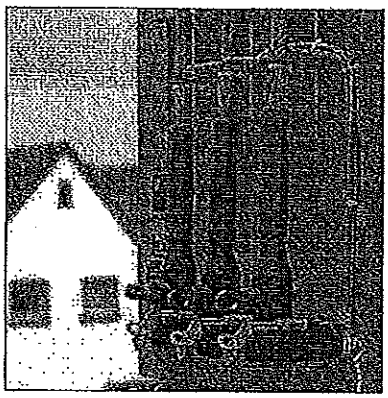


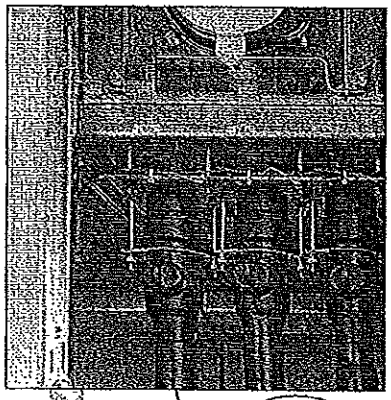
Екраниран прав адаптор

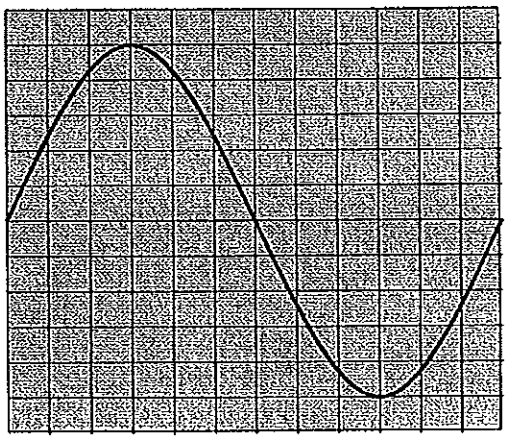


1 Екранирано тяло с вграден стрес-контрол
2 Капацитивен датчик
3 Заземително ухо
4 Допълнителна присъединителна точка
5 Съединителен болт
6 Херметизираща тръба Rayvolve

Монтаж
След подготовката на кабела и пресоване на кабелната обувка, адапторът леко се напъхва на мястото си. При Г-образния адаптор съединителният болт се завива през обувката с шестостранен ключ, доставен в комплекта. Етапният монтаж позволява лесно инсталиране на адаптора върху втулката. За осигуряване на херметичност между адаптора и кабелната обвивка се препоръчва Rayvolve – тръба или термосвиваема тръба за обозначаване на фазите.







PPR-2857

Изолирана система глава адаптор за SF6 КРУ до 24 kV

RICS

Изпитано от: **DET NORSKE VERITAS AS, Норвегия**

Дата: Издаден **2014-12-23, валиден до 2018-12-31**

Стр.: 3

Приложение: -

Tyco Electronics Raychem GmbH
a TE Connectivity Ltd. Company
TE Energy
Finsinger Feld 1
85521 Ottobrunn/Munich, Germany
Tel: +49-89-6089-0
Fax: +49-89-6096-345
energy.te.com

DNV·GL

Сертификат No:
E-13892
Док. No:
828.20
Id:
262.1-009445-2

Сертификат за типово одобрение

Това удостоверява, че:

Глава и муфа за кабел

с тип и обозначение
RICS изолирана система глава адаптор 24kV

Издадено на:
Tyco Electronics Raychem GmbH
Отобрун, Германия

е в съответствие с
Правилата на Норске Веритас за класификация на кораби, високо скоростни и плавателни съдове и на Норске Веритас стандарти

Приложение :

Изолирана система глава адаптор RICS за SF6 КРУ до 24 kV.

Този сертификат е валиден до: **2018-12-31.**
Издаден на **2014-12-23**

DNV GL място: Есен

за **DNV GL**

Одобрил инженер: Ивар Бул

Марит Лауман
Директор отдел

Този сертификат е предмет на сроковете и условията на гърба на документа. Всяка съществена промяна или конструкция може да направи този сертификат е невалиден. Срокът на валидност се отнася до сертификата за типово одобрение, а не до одобрението на оборудването.

Описание на продукта

Изолирана глава (RICS адаптори) за едножилни и 3-жилни пластмасови кабели до 24 kV

Напрежение kV	Ток [A]	Изолация на жилата Диаметър [mm]	Референтен номер Материал на проводника
Единична връзка:			
24	630	17,5 – 24	RICS-5113
24	630	21,5 – 28	RICS-5123
24	630	27 – 35	RICS-5133
24	630	32,5 – 42	RICS-5143
Двойна връзка:			
24	95	27 – 35	RICS-5137
24	120	27 – 35	RICS-5733
24	150	32,5 – 42	RICS-5147
24	185	32,5 – 42	RICS-5743

Приложение/Ограничение

Монтажът трябва да се извърши в съответствие с инструкцията за монтаж на производителя. В съответствие с правилата на DNV, максималното напрежение е 15kV. DNV може да приеме по-високо напрежение при специални приложения.

Одобрена документация

Брошура EPP 0532 1/10

Инструкция за монтаж:
EPP 0270 T адаптор 400A 24kV EN50181 "тип B"
EPP 0271 T адаптор 400/630A 24kV EN50181 "тип C"
EPP 0280 Двоен T Adaptor 400/630A 24kV EN50181
Протоколи от изпотвания:
PPR 866: Квалификация от 630A RICS двоен T-адаптор за напрежение клас 12.7/22(24)kV с два кабела на фаза
PPR 1106: Пре-квалификация на изолирана система адаптор 400/630A до 24kV в съответствие с VDE 0278, частt 6
PPR 787: Квалификация на кабелни глави за хартиени и пластмасови кабели до клас 12.7/22(24)kV
PPR 865
Дългосрочно изпитване на RICS адаптор по ANSI/IEEE-386 Проходен профил и на 630A HN 52-S61 and DIN47636 проход

Изпитването проведено

Изпитването проведено в съответствие с CENELEC HD 629.1 S21 (2006-02), VDE 0278 Part 6. ANSI/IEEE-386.

Маркиране на продукта

Raychem – RICS no – Напрежение– Партида №

Периодична оценка

Обхватът на периодична оценка е да се провери, че условията, посочени в типовото одобрение са спазени и че не са направени изменения в дизайна на продукта или избора на материали.

Одновни елементи на проучването са:

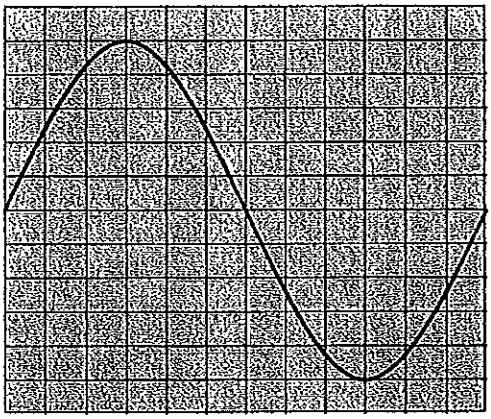
- Проверка на фабричната моста, избрана на случаен принцип от производствената линия

- Проверка на резултати от изпитването на мострата и рутинните изпитвания. Ако протоколите от изпитвания не са на разположение, ще се проведат изпитвания в съответствие с изпитването на мострата и рутинните изпитвания.
- Преглед на документацията за типово одобрение
- Преглед на възможна промяна в дизайн, материали и изпълнение .
- Осигуряване проследяване на маркировка на производителя и на сертификата за типово

одобрение

Изследването да се извършва най-малко веднъж на две години.

Край на сертификата



PPR-2857

Insulated Adapter Termination System for SF6 Insulated Switchgear up to 24 kV

RICS

Tested by: **DET NORSKE VERITAS AS, Norway**

Date: Issued **2014-12-23, valid until 2018-12-31**

Pages: 3

Appendix: —

Tyco Electronics Raychem GmbH
a TE Connectivity Ltd. Company
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Finsinger Feld 1
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Tel: +49-89-6089-0
Fax: +49-89-6096-345
energy.te.com

DNV·GL

TYPE APPROVAL CERTIFICATE

Certificate No:
E-13892
File No:
828.20
Job Id:
262.1-009445-2

This is to certify:

That the Termination and Joint for Cable

with type designation(s)
RICS insulated adapter termination system 24kV

Issued to
Tyco Electronics Raychem GmbH
OTTOBRUNN, Germany

is found to comply with
Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards

Application :

Insulated adapter termination system RICS for SF6 insulated switchgear up to 24 kV.

This Certificate is valid until **2018-12-31.**
Issued at **Høvik** on **2014-12-23**

DNV GL local station: **Essen**

Approval Engineer: **Ivar Bull**

for **DNV GL**

Marit Laumann
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Certificate No: **E-13892**
File No: **828.20**
Job Id: **262.1-009445-2**

Product description

Shrouded terminations (RICS adaptors) for single and 3-Core Medium Voltage Terminations up to 24 kV Plastic Cables

Voltage class kV	Current [A]	Core Insulation Diameter [mm]	Reference number Conductor material: Copper
SINGLE CONNECTION:			
24	630	17,5 – 24	RICS-5113
24	630	21,5 – 28	RICS-5123
24	630	27 – 35	RICS-5133
24	630	32,5 – 42	RICS-5143
DOUBLE CONNECTION:			
24	95	27 – 35	RICS-5137
24	120	27 – 35	RICS-5733
24	150	32,5 – 42	RICS-5147
24	185	32,5 – 42	RICS-5743

Application/Limitation

Installation to be done in accordance with manufacturer's installation instructions.
According to DNV Rules, maximum voltage is 15kV. DNV may accept higher voltages for special applications.

Type Approval documentation

Brochure EPP 0532 1/10

Installation Instructions:
EPP 0270 T Adaptor 400A 24kV EN50181 "Type B"
EPP 0271 T Adaptor 400/630A 24kV EN50181 "Type C"
EPP 0280 Double T Adaptor 400/630A 24kV EN50181
Test reports:
PPR 866: Qualification of 630A RICS double T-adaptor for the voltage class 12.7/22(24)kV with two cables per phase
PPR 1106: Re-qualification of Insulated adaptor system 400/630A up to 24kV according to VDE 0278 Part 6
PPR 787: Qualification of separable plant termination fore paper and polymeric cable up to the voltage class 12.7/22(24)kV
PPR 865
Long term testing of RICS adaptor on ANSI/IEEE-386 Bushing profile and on 630A HN 52-S61 and DIN 47636 Bushing

Tests carried out

Tested according to CENELEC HD 629.1 S21 (2006-02), VDE 0278 Part 6. ANSI/IEEE-386.

Marking of product

Raychem – RICS no – Voltage class – Batch no.

Periodical assessment

The scope of the Periodical assessment is to verify that the conditions stipulated for the Type approval is complied with and that no alterations are made to the product design or choice of materials.

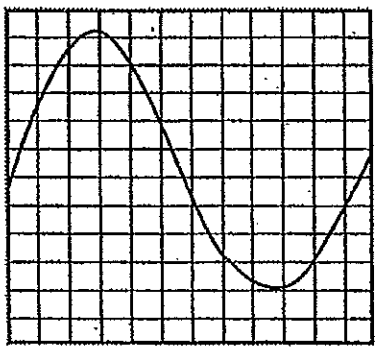
The main elements of the survey are:

- Inspection on factory samples, selected at random from the production line (where practicable)

- Check results from Production Sample Tests (PST) and Routine tests (RT). If test reports are not available, tests according to PST and RT shall be carried out
- Review of type approval documentation
- Review of possible change in design, materials and performance
- Ensurin traceability between manufacturer's product type marking and Type Approval Certificate.

Survey to be performed at least every second year.

END OF CERTIFICATE



Test Report

P P R 1106

Requalification
of Insulated Adaptor System
400 / 630 A up to 24 kV
according to
VDE 0278 Part 6

Type: RICS

Pages: 16

Appendices: 2

Date: 27.09.94

Tested by: Ernst Liegl	Signature: Ernst Liegl	Date: 27.09.94
Prepared by: Ernst Liegl	Signature: Ernst Liegl	Date: 27.09.94
Approved by: Thomas Escherich	Signature:	Date: 29.9.94

Raychem

Raychem GmbH
Electrical Products Division
Haidgraben 6
D-85521 Ottobrunn
Munich, Germany
Tel. (089) 6089-0
Fax (089) 6096345
(re-order point)

PPR 1106

Test Object:	Insulated Adaptor System Type RICS for outer cone connection (DIN 47636 Part 5).
Date:	26. September 1994
Requirements:	DIN VDE 0278 Part 6/2.91 and Part 1/2.91
Conclusion:	The insulated Adaptors RICS 5133 400 / 630 A 24 kV, have passed the test according to DIN VDE 0278 Part 6/2.91
Manufacturer:	Raychem GmbH Electrical Products Division Haidgraben 6 D-85521 Ottobrunn
Location of Test:	Raychem Ottobrunn EPM Testfield, Munich
Test Purpose:	Requallification

PPR 1106

Preparation of Test Objects:

Preparation

The Raychem Terminations EPKT 24C1X1 were installed according to the enclosed Raychem installation instruction EPP 0275 8/92. According to EPP 0271 9/93, the sheds provided with the termination kit, were not installed.

The insulated Adaptors RICS 5133 were installed according to the enclosed Raychem installation instruction EPP 0271 9/93 and connected to a bushing (DIN 47636 Part 5).

Number of samples:	4
Cables:	XLPE Insulated Al-cable NA2XS2Y 150 mm^2 24 kV
Cable Length:	Approx. 2,5 m

Test: Test according to DIN VDE 0278:
VDE Specifications for Power Cable Accessories, with rated voltages U up to 30 kV (U_m up to 36 kV).
Part 1/2.91 "Requirements and Test Procedures",
Part 6/2.91 "Plug-in Type or Screw-Type Encapsulated Cable Connections above 1 kV (U_m > 1.1 kV)".

"КИМТЕХ-БЪЛГАРИЯ" ООД КИМТЕХ БУРГАС

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Test procedure and results according to VDE 0278 Part 6 :

Test No.	Type of Test	described in VDE 0278 Part 1 Section	Page
1	A.C. Voltage Test 50 kV, 50 Hz, 1 min.	3.1	5
2	Partial Discharge Test (pC) at 24 kV	3.6	6
3	Nominal Impulse Voltage Withstand Test, 10 pulses each of positive and negative polarity, 125 kV	3.3	8
4	Continous A.C. Voltage Test with cyclic current loads; 30 kV, 483 A, 2 load cycles	3.5	10
5	Test of detachability, 5 times	3.17	10
6	Continous A.C. Voltage Test, same as 4, but 1 load cycle	3.5	10
7	Partial Discharge, same as 2	3.6	11
8	Continous A.C. Voltage Test, same as 4, but 60 load cycles	3.5	11
9	Thermal Short-Circuit Test, 17,8 kA/1 sec (6 load applications)	3.7	12
10	Test of detachability, 5 times	3.17	12
11	Continous A.C. Voltage Test, same as 4, but 54 load cycles	3.5	13
12	Partial Discharge Test, same as 2	3.6	13
13	Tightness Test with cyclic current loads, 483 A, 9 load cycles	3.11.2	14
14	Nominal Impulse Voltage Withstand Test, same as 3	3.3	14
15	D.C. Voltage Test 96 kV, 30 min.	3.2	15

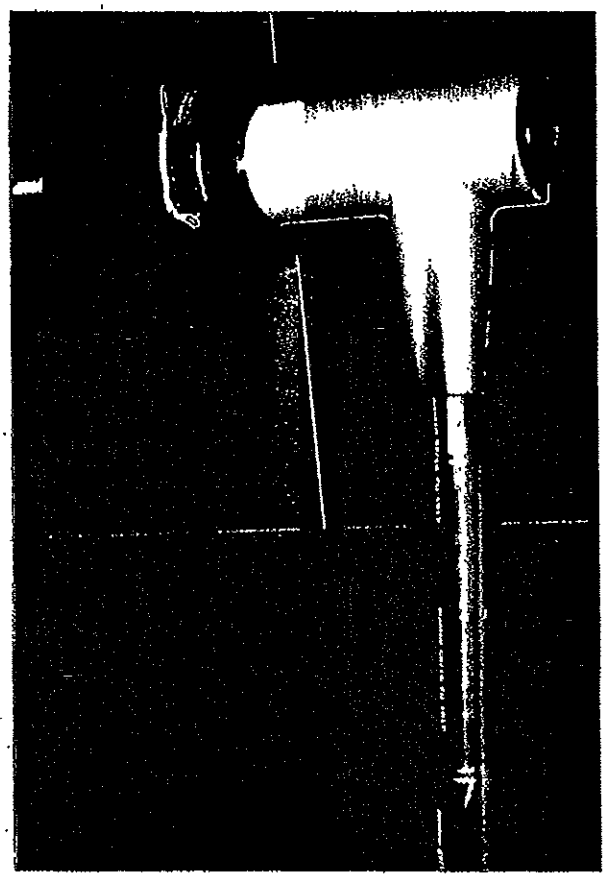


Photo of a Test Specimen

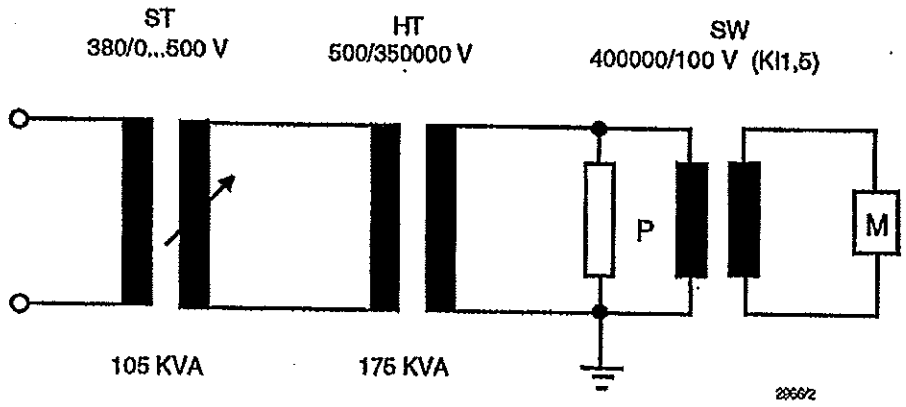
1. A.C. Voltage Test according to Section 3.1

An effectively sinusoidal a.c. voltage of 50 kV_{rms}, 50 Hz was applied between the conductor and the grounded screen for 1 min.
The voltage was continuously increased within 10 seconds to the specified value and was then held constant during the required duration of the test.

relative humidity of air	atmospheric pressure	temperature
43%	1016 mbar	24°C

Result

No breakdown occurred on any of the test loops.



ST = Regulating Transformer
HT = High-Voltage Transformer
P = Test Specimen
SW = Measuring Transformer
M = Voltage Measuring Instrument

Fig. 2 Connection Diagram for A.C. Voltage Test

2. Partial Discharge Test according to Section 3.6

Test connection, coupling quadripole series connected with test loops (see Fig. 3).

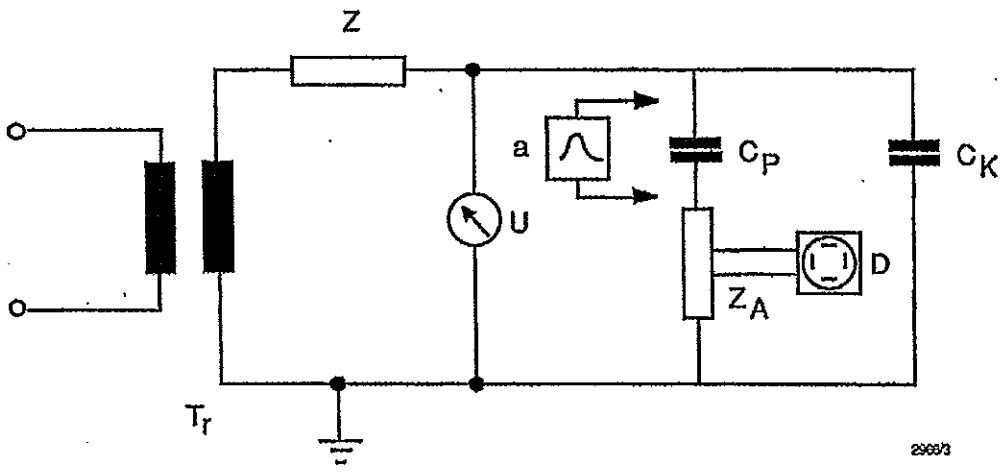


Fig. 3 Connection Diagram for Partial Discharge Test

T_r	: High-Voltage Source
U	: High-Voltage Measuring System
Z	: Impedance
Z_A	: Coupling Quadripole
C_P	: Test Specimen
C_K	: Coupling Capacitor
D	: Detector
Q	: Calibrating Unit

Performance of Test

The bushings were made corona-free by using ball electrodes, and an a.c. test voltage of 28.8 kV was applied for 1 min.
Then the voltage was decreased to the a.c. test voltage U_{PD} = 24 kV, and within 1 minute the maximum value of the partial discharge magnitude was measured.

relative humidity of air	atmospheric pressure	temperature
43 %	1016 mbar	24°C

Result of Partial Discharge Test

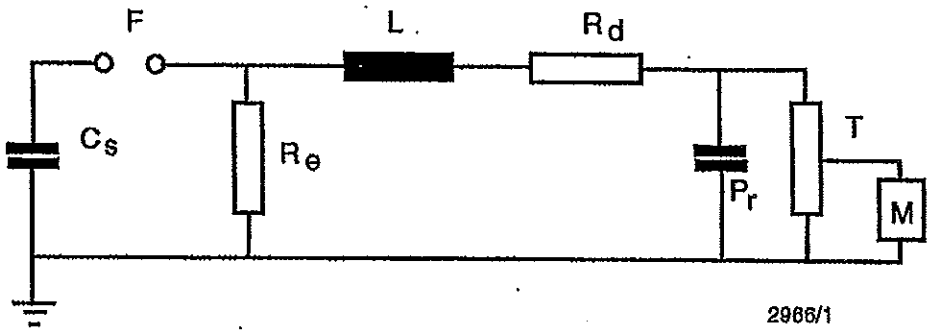
Test Loop No.	Partial Discharge (pC)
1	< 5
2	< 5
3	< 5
4	< 5

Admissible Partial Discharge Magnitude: 20 pC

3. Nominal Impulse Voltage Withstand Test according to Section 3.3

The test was performed with an impulse voltage of which the rise time was approx. 1.2 µs and the half-value decay time was approx. 50 µs.
The test loops were exposed to 10 impulses each of an impulse voltage of 125 kV of positive and negative polarity between the conductor and the grounded screen.
Subsequently the equivalent connection diagram of the impulse voltage circuit is shown (see Fig. 4).

Fig. 4 Test with Impulse Voltage
Schematic Equivalent Diagram of the Impulse Circuit



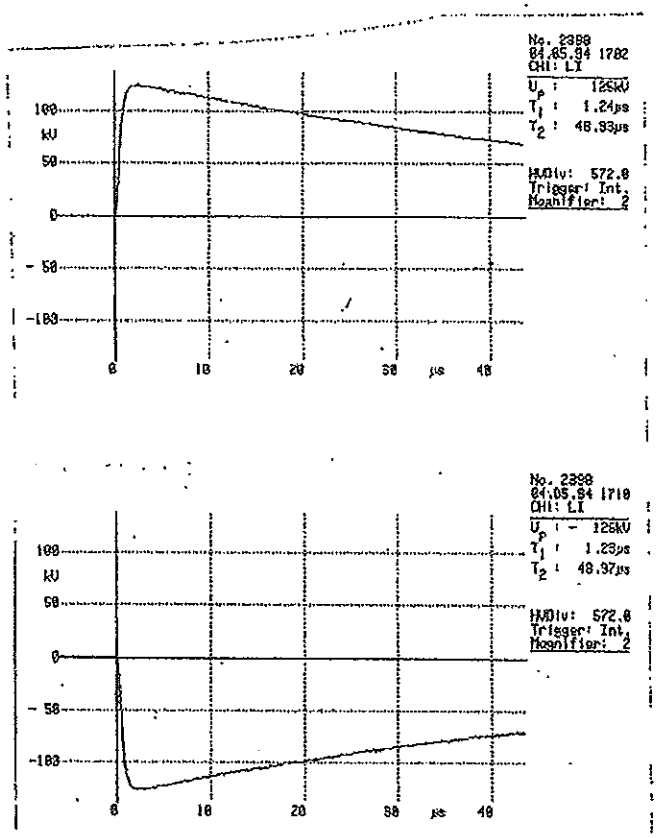
C_s = Impulse Capacity
F = Spark Gap Discharger
R_e = Discharge Resistor
L = Impulse Circuit Inductive Resistor
R_d = Damping Resistor
P_r = Test Specimen
T = Impulse Voltage Divider
M = Impulse Voltage Measuring Instrument

relative humidity of air	atmospheric pressure	temperature
43 %	1016 mbar	24°C

Result

No breakdown occurred on any of the test loops.

The following impulse oscillograms of the Test Loop No. 1 do not show any discrepancy from the calibration oscillogram.
The oscillograms of the Test Loops No. 2 to 4 were identical to that of Test Loop No. 1.



"КИМТЕХ-БЪЛГАРИЯ" ООД КИМТЕХ БУРГАС

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4. **Continuous A.C. Voltage Test with Cyclic Current Load according to Section 3.5**

The test loops, suspended free in the air, according to DIN VDE 0278 Part 1/2.91 Section 3.5a, were subjected to 2 load cycles with a continuously applied a.c. test voltage of 30 kV. Each load cycle consisted of a 5 hours' load period and a 3 hours' cooling-down period.
The current was calculated with the conversion factor 1.33 (according to DIN VDE 0278 Part 1/2.91 Table 1 Page 3 and DIN VDE 0298 Part 2 Draft 7.90 Table 12 Column 8), it amounted to 483 A at a conductor temperature of 95°C.
Ambient temperature during the load cycles: approx. 20°C.

Result

No breakdown occurred on any of the test loops.

5. **Test of Detachability according to Section 3.17**

The adaptors were disconnected and connected 5 times.

6. **Continuous A.C. Voltage Test with Cyclic Current Load according to Section 3.5**

Same as Test No. 4, but one load cycle only.

Result

No breakdown occurred on any of the test loops.

7. Partial Discharge Test according to Section 3.6

After the 3rd load cycle the Partial Discharge Test as per Test No. 2 was repeated.

relative humidity of air	atmospheric pressure	temperature
56 %	1017 mbar	25°C

Result of Partial Discharge Test

Test Loop No.	Partial Discharge (pC)
1	< 5
2	< 5
3	< 5
4	< 5

Admissible Partial Discharge Magnitude: 20 pC

8. Continuous A.C. Voltage Test with Cyclic Current Load according to Section 3.5

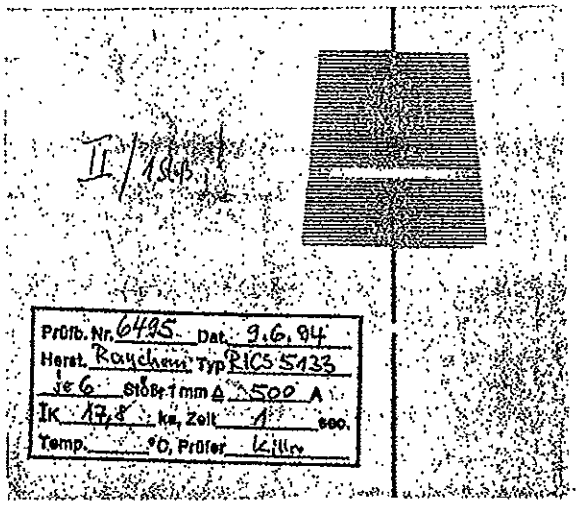
Same as Test No. 4, but 60 load cycles

Result

No breakdown occurred on any of the test loops.

9. Thermal Short Circuit Test according to Section 3.7

The thermally equivalent short circuit current during one second according to DIN VDE 0278 Part 1/2.91 Table 2 is: 17.8 kA.
This short circuit load application was repeated five times, each time after the conductor had cooled down to ambient temperature.
(Ambient temperature 20°C)..



Result

The oscillograms of the test loops No. 2 to 4 were identical to that of test loop No. 1.
A visual check did not show any deterioration on the test loops.

10. Test of Detachability according to Section 3.17

Same as Test No. 5.

11. Continuous A.C. Voltage Test with Cyclic Current Load according to Section 3.5

Same as Test No. 3, but 54 load cycles.

Result

No breakdown occurred on any of the test loops.

12. Partial Discharge Test according to Section 3.6

After the 117th load cycle the Partial Discharge Test as per Test No. 2 was repeated.

relative humidity of air	atmospheric pressure	temperature
45 %	1029 mbar	29°C

Result of Partial Discharge Test

Test Loop No.	Partial Discharge (pC)
1	< 5
2	< 5
3	< 5
4	< 5

Admissible Partial Discharge Magnitude: 20 pC

13. Tightness Test according to Section 3.11.2 with Cyclic Current Load according to Section 3.4

The test loops were arranged in a water-filled tank in such a way that the cable plug was submerged in the water.
Arranged in this way they were exposed to 9 load cycles according to Section 3.4.

14. Nominal Impulse Voltage Withstand Test according to Section 3.3

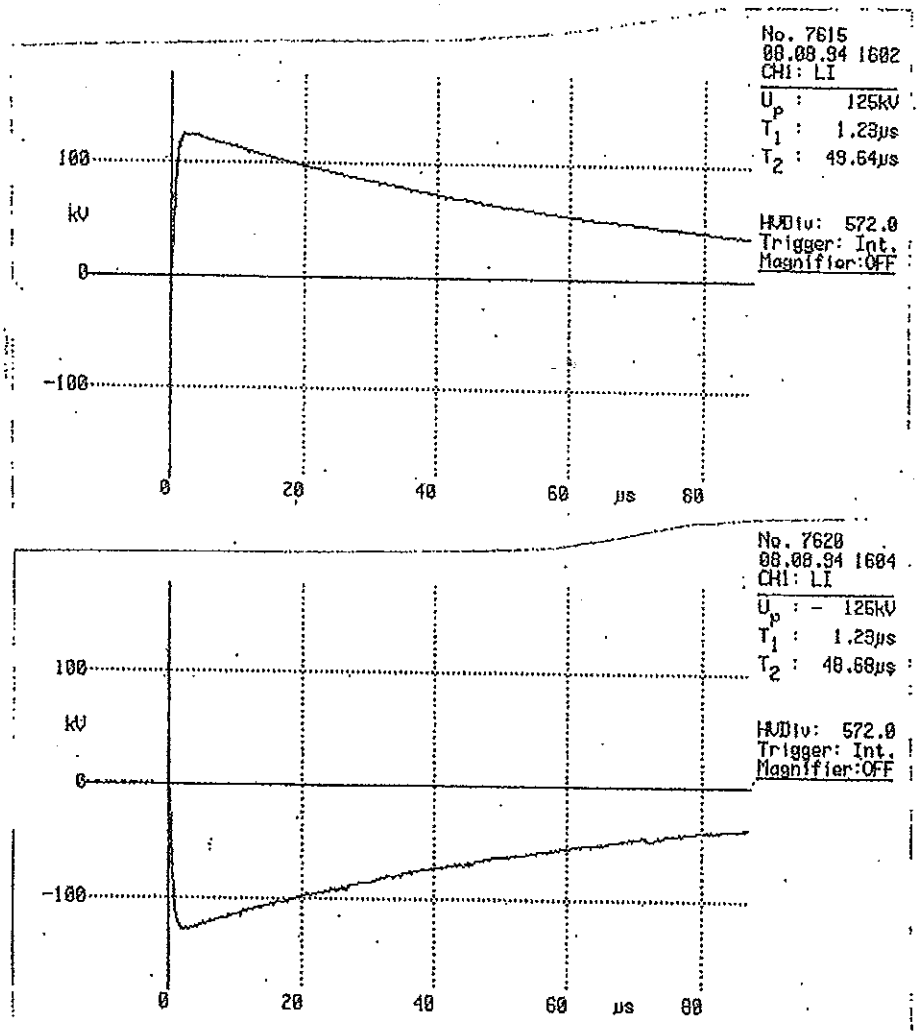
Same as Test No. 3.

relative humidity of air	atmospheric pressure	temperature
45 %	1024 mbar	28°C

Result

No breakdown occurred on any of the test loops.

The following impulse oscillograms of the Test Loop No. 1 do not show any discrepancy from the calibration oscillogram.
The oscillograms of the Test Loops No. 2 to 4 were identical to that of Test Loop No. 1.



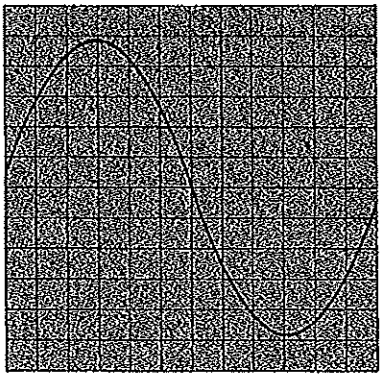
15. D.C. Voltage Test according to Section 3.2

The test loops were subjected to a d.c. voltage of 96 kV for 30 minutes.
The a.c. voltage content of the d.c. voltage amounted to approx. 3%.

Result

No breakdown occurred on any of the test loops.

ENERGY DIVISION



Test Report

PPR 866

Qualification of RICS
Double-T-Adaptor
630 A, 24 kV
according to PPS 3013

Pages:	Appendices:
4	1

Prepared by:
Johanna Wachter

Signature:

Approved by:
Stephen Hey

Signature:

Date:
3. 11. 1989

Raychem

ВЯРНО С ОРИГИНАЛА

"ХИМТЕХ-БЪЛГАРИЯ" ООД
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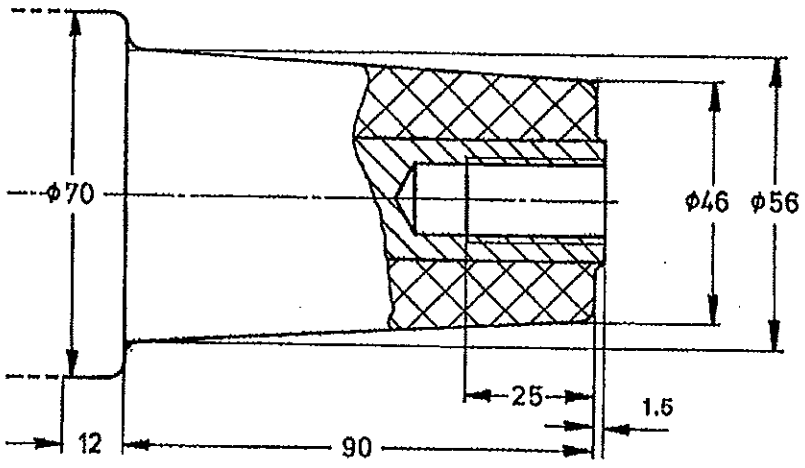
Introduction

This report gives qualification details of the RICS-Double-T-Adaptor system with two cables per phase for 630 A bushings with profiles according to DIN 47636 (Figure 1). The test sequence is detailed on page 3 and is based on the Raychem Master Specification PPS 3013. This latter specification contains more detailed test information.

The cables used were single-core 24 kV, 150 mm², aluminium stranded conductors, with cross-linked polyethylene insulation. RICS 5733 + RICS 5137 were installed according to Installation Instruction EPP 0280 7/89 (Appendix I). The cables were terminated with EPKT 24C1XI. The 3 RICS-Double-T-Adaptor were installed with a minimum phase spacing of 90 mm and minimum distance to earth of 25 mm.

The location of parts in completed Double-T-Adaptor are shown in Fig. 3.

Figure 1: Bushing Profile



Test Sequence

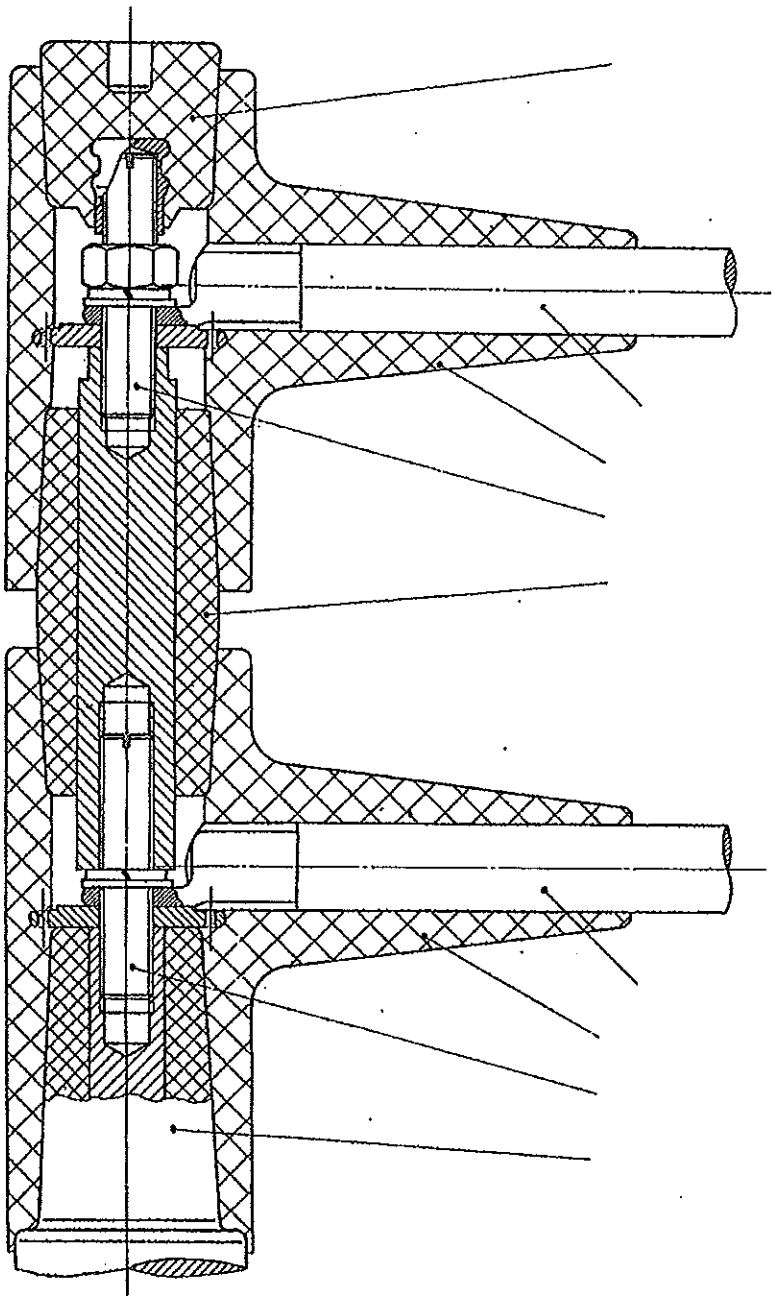
Test	Method	Conditions	Requirement
A.C. Voltage Withstand	IEC 60	55 kV for 1 minute	No breakdown and no flashover
Partial Discharge	IEC 270	15 kV 24 kV	< 3 pC <20 pC
Impulse Voltage Withstand	IEC 60 IEC 230	125 kVp 10 positive and 10 negative 1.2/50 μS	No breakdown and no flashover
Load Cycling	VDE 0278	63 load cycles (5h/3h) 565 Amps, 30 kV max. cable conductor temp. 95°C to VDE	No breakdown and no flashover
Partial Discharge	IEC 270	as above	
Thermal Short Circuit* (Fig. 2)	VDE 0278	17.4 kA per cable two 1 sec shots	
Load Cycling	VDE 0278	as above	
Partial Discharge	IEC 270	as above	
A.C. Voltage Withstand	IEC 60	48 kV for 4 hours	No breakdown and no flashover
Impulse Voltage Withstand	IEC 60 IEC 230	as above	
D.C. Voltage Withstand	IEC 60	96 kV for 30 minutes	No breakdown and no flashover
Humidity	IEC 466 VDE 0278	100 h at 15 kV water conductivity 800 μS/cm	No breakdown No flashover No visible tracking
Submersion Test	Load Cycling under water	100 hours 15 kV, 565 Amps	No breakdown

*Thermal short circuit tests performed at EPM, Independent Test Laboratory, Munich.

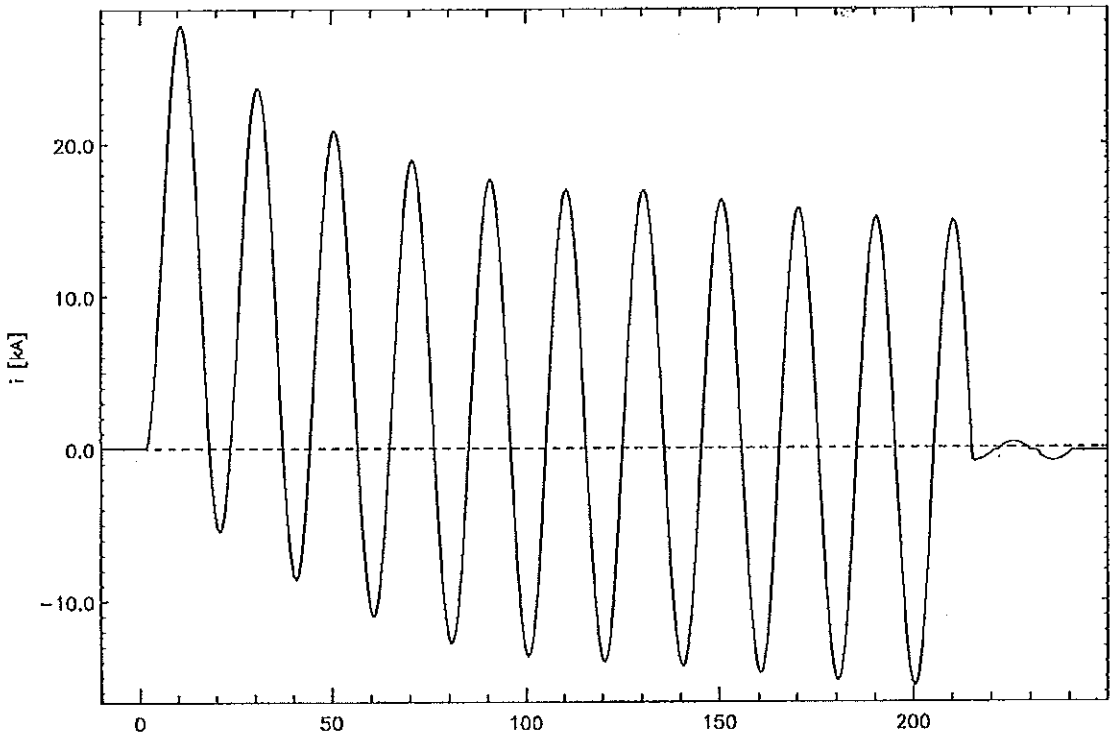
Conclusion

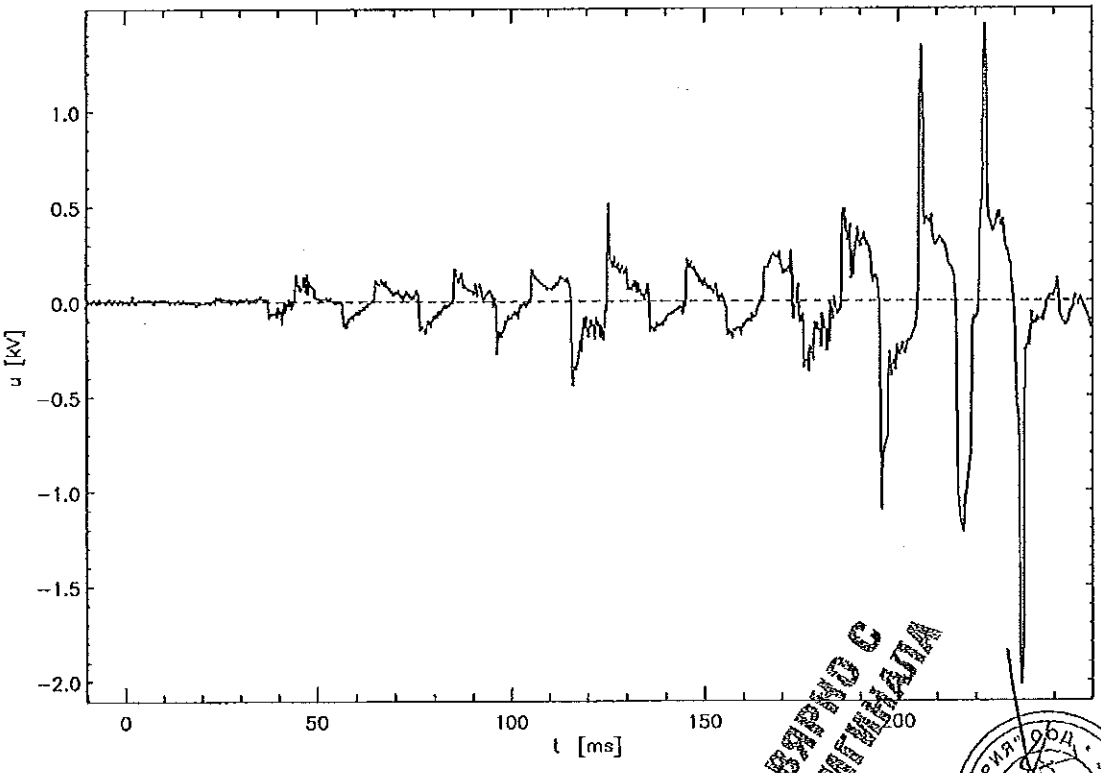
The three Double-T-Adaptors, each with two cables per phase, successfully completed the test sequence.

Figure 3: Location of parts in completed Double-T-Adaptor



Test-No. 1076200

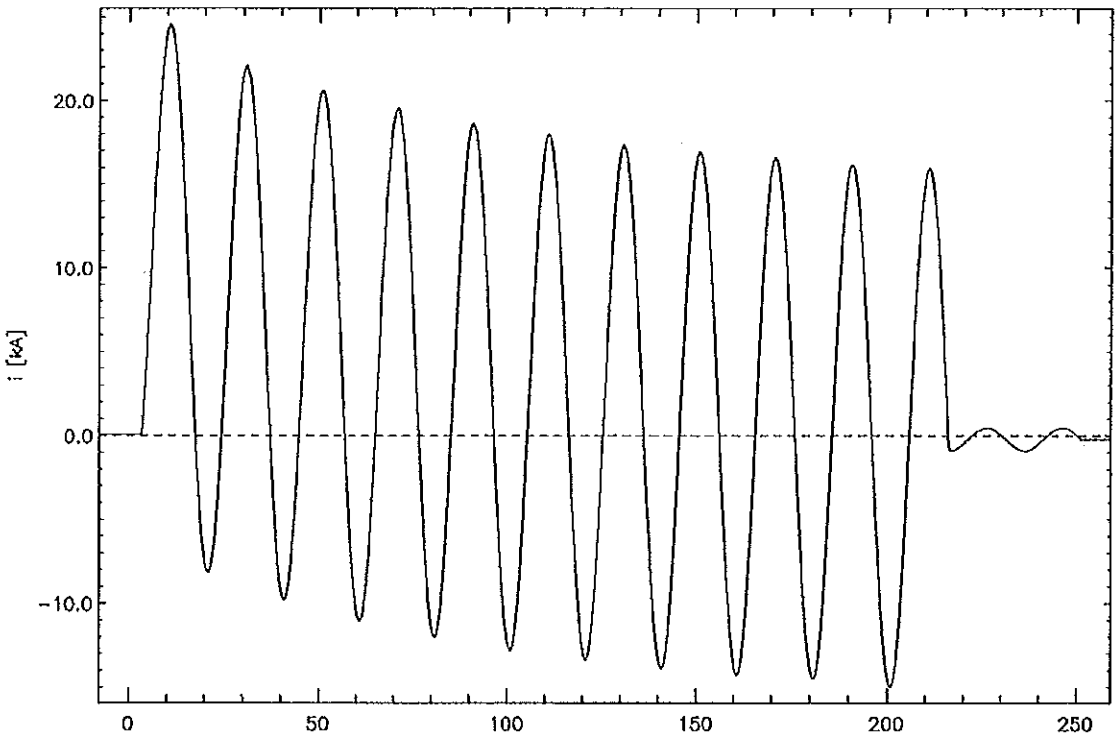


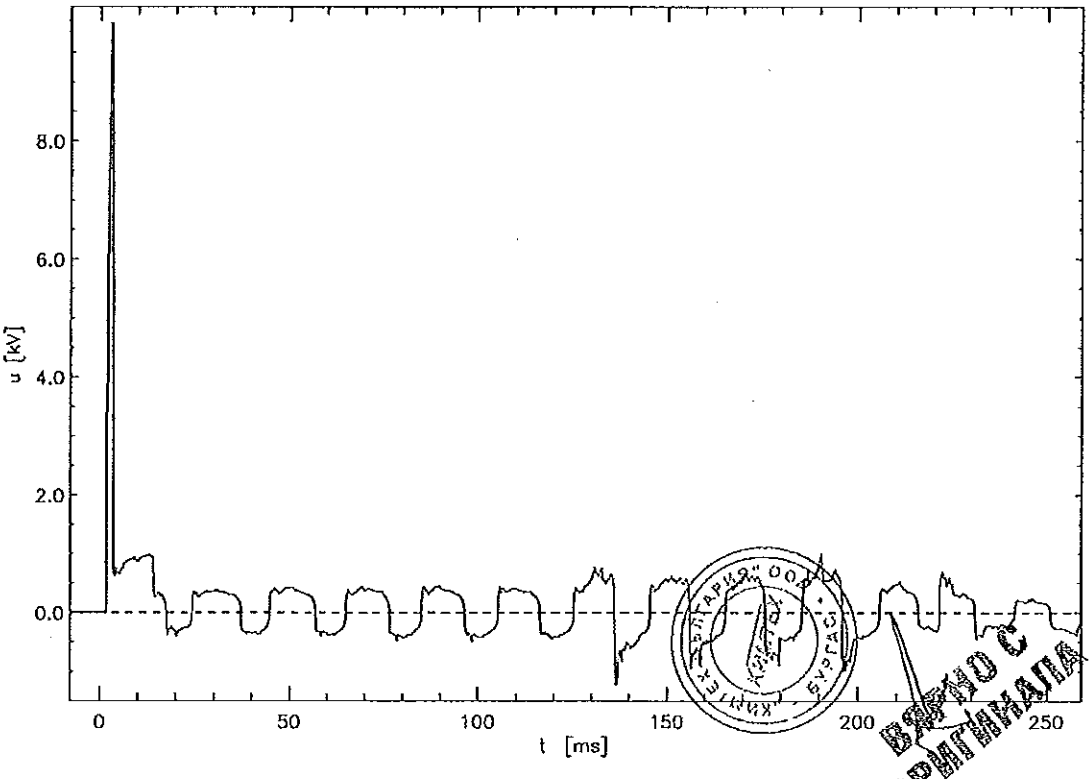


ВЯРНО С ОРИГИНАЛА

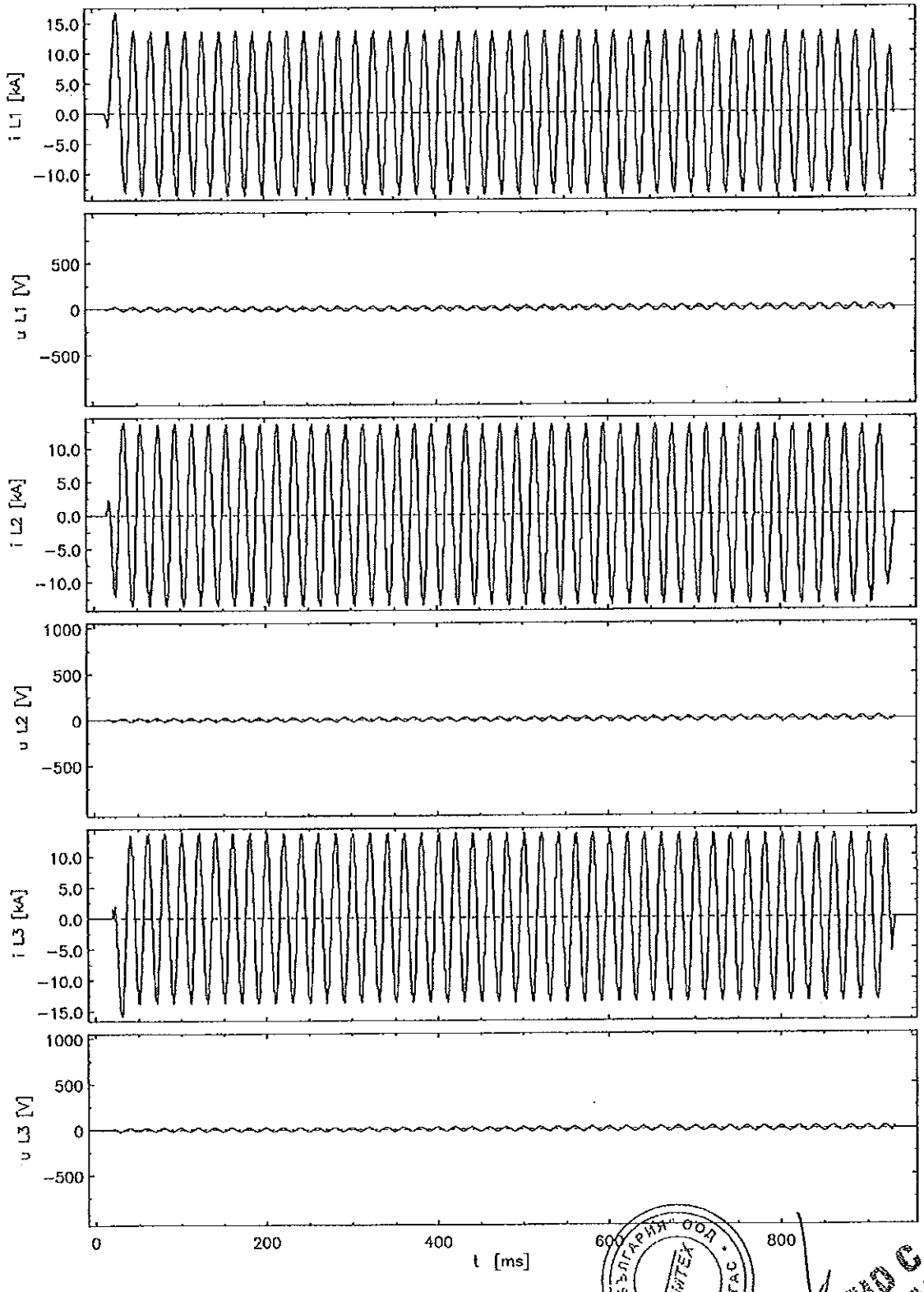
"КИНТЕХ" БЪЛГАРИЯ ЛТД. БУРГАС

Test-No. 1076201

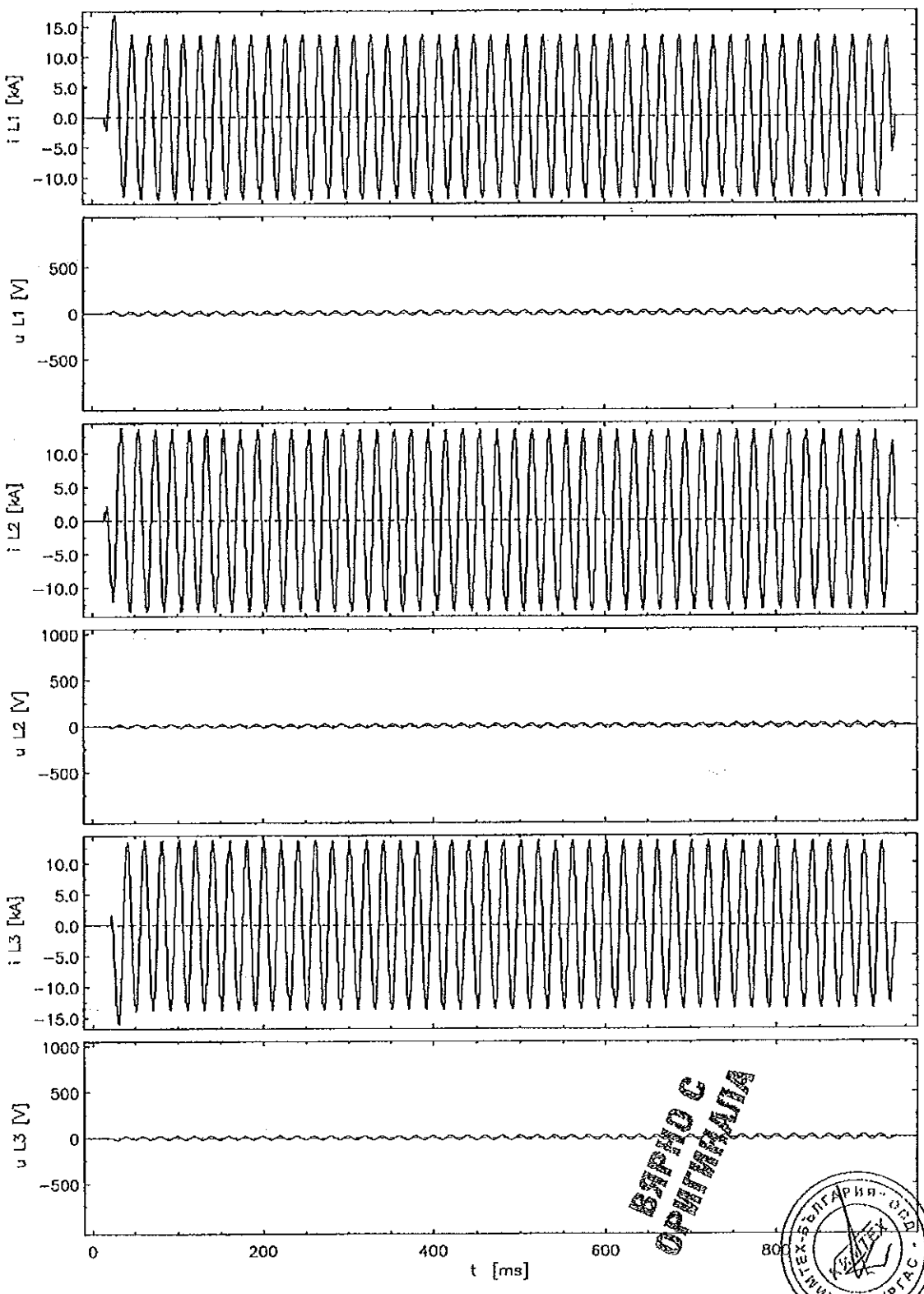




Test-No. 2074195



Test--No. 2074196



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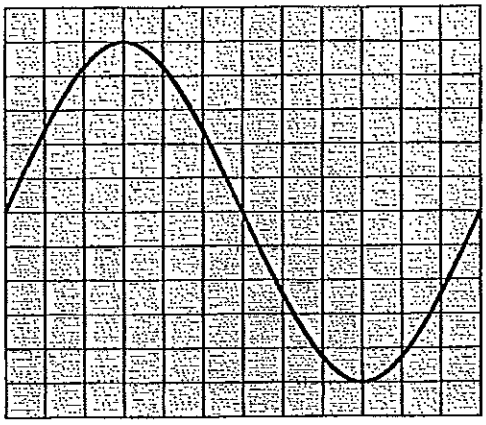
Списък на проведените изпитвания на щепселна кабелна глава, права/адаптор/ тип RSSS

1. Изпитване издръжливост с постоянно напрежение;
2. Изпитване издръжливост с променливо напрежение;
3. Изпитване частичен разряд при околна температура;
4. Изпитване импулсно напрежение при околна температура;
5. Изпитване циклично електрическо нагряване във въздух;
6. Изпитване циклично електрическо нагряване във вода;
7. Изпитване комутация/включване/изключване;
8. Изпитване частичен разряд при околна температура;

13.01.2016г.

Подпис и печат:



PPR-2527

Test Report of screened seperable cable connector for single-core cables with extruded plastic insulation Type: RSES-52xx-R

Tested by: IPH Berlin

Date: 01. April 2008

Pages: 66

Appendix: —

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