PIRO'Y S.A.

Nota: CEO N° 05

Fecha: 07/07/2022

Solicitud de Aclaraciones – Comité de Evaluación de Ofertas

Remitente: Comité de Evaluación de Ofertas (ANDE) – CD ANDE 6538/2022

Destinatario: PIRO'Y S.A.

At. Sr/Sra: Lic. Abelardo Brugada - Representante Legal

Referencia: Contratación Directa N° 6538/2022 "Adquisición de Descargadores De Sobretensión para Media Tensión" **ID:** 414005

Nos dirigimos a ustedes con relación a sus Notas presentadas en el llamado de referencia, a fin de aclarar que los documentos deben estar firmados por el **Representante Legal de la firma PIRO'Y S.A.** (Constancia SIPE N° 1697302).

- Nota PIRO'Y S.A. N° 156/2022, de fecha 30/06/2022 (CEO N° 1)
- Nota PIRO'Y S.A. N° 164/2022, de fecha 05/07/2022 (CEO N° 4)

Esta solicitud obedece a la necesidad de dar cumplimiento a lo establecido en los artículos 59 y 62 del Decreto Reglamentario N° 2992/2019 de la Ley N° 2051/2003 de Contrataciones Públicas y su modificatoria la Ley N° 3439/2007.

Plazo para presentación: 24 horas a partir de la fecha de recepción del presente documento (Art.7 de la Resolución DNCP N° 2490/2019).

Lugar de presentación: Sede Central de la ANDE, sito en Avda. España N° 1268 y Padre Cardozo, directamente en: Dpto. Suministro de Materiales de Distribución - Oficina D 12 Sección Evaluación de Oferta de Suministro de Materiales de Distribución (Edificio antiguo).

Les saludamos muy atentamente.-

ADMINISTRACIÓN NACIONAL DE ELECTRICIDAD

Ing. Jorge G. Britos C.
DD/DSM

Nota: CEO N° 04

Fecha: 04/07/2022

Solicitud de Aclaraciones – Comité de Evaluación de Ofertas

Remitente: Comité de Evaluación de Ofertas (ANDE) – CD N° 6537/2022

Destinatario: PIRO'Y S.A.

At. Sr/Sra: Lic. Abelardo Brugada

Referencia: Contratación Directa N° 6537/2022 "Adquisición de Seccionador fusible unipolar tipo expulsión para intemperie en M.T." **ID:** 414020

Nos dirigimos a ustedes con relación a su oferta presentada en el llamado de referencia, a fin de solicitarles la presentación de lo siguiente:

Protocolo de Ensayo de Tipo, de acuerdo a la EE.TT. N° 02.24.21 – Rev.5, en el punto **6. ENSAYOS DE TIPO, DE RUTINA Y DE RECEPCIÓN** en la sección **6.2 Aceptación o rechazo de los ensayos de tipo** en el punto **6.2.3.**

Esta solicitud la realizamos conforme a los artículos 59 y 62 del Decreto Reglamentario N° 2992/2019 por el cual se reglamenta la Ley N° 2051/2003 de Contrataciones Públicas y su modificatoria la Ley N° 3439/2007.

Plazo para presentación: 24 horas a partir de la fecha de recepción del presente documento (Art..7 de la Resolución DNCP N° 2490/2019).

Lugar de presentación: Sede Central de la ANDE, sito en Avda. España N° 1268 y Padre Cardozo, directamente en: Dpto. Suministro de Materiales de Distribución - Oficina D 12 Sección Evaluación de Oferta de Suministro de Materiales de Distribución (Edificio antiguo).

Les saludamos muy atentamente.-

ADMINISTRACIÓN NACIONAL DE ELECTRICIDAD

Ing. Jorge G. Britos
DD/DSM

GRUPO LUMINOTECNIA
Pasión por crecer juntos

Nota Piro´y N° 170/2022

Asunción, 7 de Julio del 2022

Señores
ADMINISTRACIÓN NACIONAL DE ELECTRICIDAD (ANDE)
Avda. España No. 1268
Asunción – Paraguay

Ref.: CONTRATACIÓN DIRECTA ANDE N° 6537/2022 "ADQUISICIÓN DE SECCIONADOR FUSIBLE UNIPOLAR TIPO EXPULSIÓN PARA INTEMPERIE EN MT" ID N° 414.020

De nuestra mayor consideración:

Nos es grato dirigirnos a usted y por vuestro digno intermedio a donde corresponda, en el marco del llamado de referencia, y en respuesta a la **NOTA CEO Nº 05**, recibida en fecha 07/07 a fin de hacer entrega de lo solicitado en la misma.

En espera de una atención favorable a esta presentación, aprovechamos la oportunidad para saludarle con nuestra mayor estima y consideración.

Muy atentamente.

Lic. Abelardo Brugada
Representante Legal
Piro'y S.A.

Firma.....
Lic. Abelardo Brugada Ferrari
En Calidad de Representante Legal
PIRO`Y S.A.
::::::::::::::::::::::::::::::::
Tel.: (021) 249 2000
Avda. Artigas 988 c/ Cusmanish
Asunción, Paraguay
PIRO'Y S.A.

GRUPO LUMINOTECNIA
Pasión por crecer juntos

Nota Piro´y N° 164/2022

Asunción, 5 de Julio del 2022

Señores
ADMINISTRACIÓN NACIONAL DE ELECTRICIDAD (ANDE)
Avda. España No. 1268
Asunción – Paraguay

Ref.: CONTRATACIÓN DIRECTA ANDE N° 6537/2022 "ADQUISICIÓN DE SECCIONADOR FUSIBLE UNIPOLAR TIPO EXPULSIÓN PARA INTEMPERIE EN MT" ID N° 414.020

De nuestra mayor consideración:

Nos es grato dirigirnos a usted y por vuestro digno intermedio a donde corresponda, en el marco del llamado de referencia, y en respuesta a la **NOTA CEO N° 04**, recibida en fecha 04/07 a fin de hacer entrega de los documentos solicitados en la misma.

En espera de una atención favorable a esta presentación, aprovechamos la oportunidad para saludarle con nuestra mayor estima y consideración.

Muy atentamente

Lic. Abelardo Brugada
Representante Legal
Piro'y S.A.

Firma.....
Lic. Abelardo Brugada
En Calidad de Representante Legal
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::::::::::::::::::::::::::::::::
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GRUPO LUMINOTECNIA
Pasión por crecer juntos

Nota Piro´y N° 164/2022

Asunción, 5 de Julio del 2022

Señores
ADMINISTRACIÓN NACIONAL DE ELECTRICIDAD (ANDE)
Avda. España No. 1268
Asunción – Paraguay

Ref.: CONTRATACIÓN DIRECTA ANDE N° 6537/2022 "ADQUISICIÓN DE SECCIONADOR FUSIBLE UNIPOLAR TIPO EXPULSIÓN PARA INTEMPERIE EN MT" ID N° 414.020

De nuestra mayor consideración:

Nos es grato dirigirnos a usted y por vuestro digno intermedio a donde corresponda, en el marco del llamado de referencia, y en respuesta a la **NOTA CEO N° 04**, recibida en fecha 04/07 a fin de hacer entrega de los documentos solicitados en la misma.

En espera de una atención favorable a esta presentación, aprovechamos la oportunidad para saludarle con nuestra mayor estima y consideración.

Muy atentamente.

Justa E. Leite Figueredo
Representante Legal
Piro'y S.A.

Firma.....

Lic. Justa Elizabeth Leite Figueredo
En Calidad de Representante Legal
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PIRO'Y S.A.

KEMA

28371111.000-HVL 04-1137 2004-06-16

Test on a outdoor distribution fuse cut-out, 25 kV, type YKFCO-25

KEMA T&D TESTING SERVICES

www.pdffactory.com

TEST REPORT

Report no.	70371111.000-HVL 04-1137
Client	Whenzhou Yikun Electric Co., Ltd. Hexiang road, Aojiang, Pingyang, Whenzhou 325401 Zhejiang P.R. of China
Reference	-
Concerning	test
Date	25 up to and including 30 March 2004
Place	KEMA High-Voltage Laboratory, Arnhem, the Netherlands
Object	25 kV outdoor distribution fuse cut-out
Type	YKFCO-25
Manufacturer	Whenzhou Yikun Electric Co., Ltd.

REQUIREMENTS
The requirements as specified in the standard ANSI/IEEE C37.41 (1988).

TEST PROGRAMME
The programme was specified by the client and was as follows:

1	dielectric tests	ANSI/IEEE C37.41 (1988) clause 4
1.1	impulse withstand voltage tests	ANSI/IEEE C37.41 (1988) clause 4.2.4
1.2	normal frequency dry withstand voltage tests	ANSI/IEEE C37.41 (1988) clause 4.2.1
1.3	normal frequency wet withstand voltage tests	ANSI/IEEE C37.41 (1988) clause 4.2.2
2	temperature-rise test	ANSI/IEEE C37.41 (1988) clause 11
3	radio influence test	ANSI/IEEE C37.41 (1988) clause 9.

SUMMARY AND CONCLUSION
The results obtained relate only to the work ordered and to the material tested.
The tests were passed.

Author L. Scheltinga

KEMA Nederland B.V.

This B-report consists of:
18 pages
1 appendix

S.A.M. Verhoeven
KEMA High-Voltage Laboratory

Arnhem, 16 June 2004

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Utrechtseweg 310, 6812 AR Arnhem, Telephone +31 26 4 56 31 65, Telefax +31 26 4 43 38 43

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MATERIAL DATA

Manufacturer	Whenzhou Yikun Electric Co., Ltd.
Type	YKFCO-25
Rated voltage	25 kV
Power frequency withstand voltage:	
dry: 1 minute	42 kV
wet: 10 seconds	36 kV
Basic Impulse Insulation Level	150 kV
Max. radio influence voltage	250 µV at 15,7 kV
Rated current	100 A
Rated frequency	50/60 Hz
Symmetric current	8,0 kA
Asymmetric current	12 kA
X/R ratio	12
Standard	ANSI/IEEE C37.41 (1988)
Number of samples	1
Sampling procedure	by the manufacturer
Drawing nos.	6257.0, see appendix A page 1
	6257.1, see appendix A page 2
	6257.2, see appendix A page 3

SUBCONTRACTING

The radio influence test, as mentioned in the Test Programme, was subcontracted to:
KEMA T&D Consulting, department Proctection and Substation Automation Laboratory.

PERSONS ATTENDING THE TEST

Mr D.Yu	Whenzhou Yikun Electric Co., Ltd.
Mr T. Wang	Whenzhou Yikun Electric Co., Ltd.

THE TEST WAS CARRIED OUT BY

Mr L. Scheltinga	KEMA Nederland B.V.
Mr T.R. Hiddink	KEMA Nederland B.V.

PURPOSE OF THE TEST

Purpose of the test was to verify whether the material complies with the specified requirements.

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DESCRIPTION AND RESULTS OF THE TEST

MEASUREMENT UNCERTAINTY

The last page of this report contains a table with measurement uncertainties. Unless otherwise indicated in the report, the measurement uncertainties of the results presented are as indicated in this table.

1 DIELECTRIC TESTS

All dielectric tests were performed in a single pole configuration.
The fuse was mounted on a rigid structure in the normal service position for which it is designed. The connections were positioned in a way that the normal clearances were not reduced. The electrical connections were made by means of bare copper conductors in accordance with clause 4.1.1 of ANSI/IEEE C37.41 (1988).
The tests were carried out in accordance with the ratings as specified by the manufacturer.

1.1 Impulse withstand voltage tests

The test object was subjected to lightning impulse voltage dry tests in accordance with ANSI/IEEE C37.41 (1988) clause 4.2.4
The test situations are described in appendix 1 page 1 (situations 1-4)
The specified lightning impulse test voltage between the terminals and the metal support base is 150 kV. The specified lightning impulse test voltage across the insulating distance is 165 kV.
In each of the test conditions 3 impulses with positive and 3 impulses with negative polarity were applied. The waveshape of the lightning impulses was within the tolerances as specified in ANSI/IEEE 4 (1978). During the test the atmospheric conditions were taken into account.
The results are presented in appendix 1 page 2. The oscillograms of the impulses applied are presented in appendix 1 pages 3- 5.
The tests were passed.

1.2 Power-frequency voltage dry tests

The test object was subjected to power-frequency voltage dry tests in accordance with ANSI/IEEE C37.41 (1988) clause 4.2.1.
The test situations are described in appendix 1 page 1.
The specified power-frequency test voltage between the terminals and the metal support base is 42 kV, 60 Hz, during 1 minute. The specified test voltage across the insulating distance is 46 kV.

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During the test the atmospherical conditions were taken into account.
The results are presented in appendix 1 page 6.
The tests were passed.

1.3 Power-frequency voltage wet tests

The test object was subjected to a power-frequency voltage wet test in accordance with ANSI/IEEE C37.41 (1988) clause 4.2.2
The test situations are described in appendix 1 page 1.
The specified power-frequency test voltage between the terminals and the metal support base is 36 kV, 50 Hz, during 10 s. During the test the atmospheric conditions were taken into account.
The characteristics of the rain and the results are presented in appendix 1 page 7.
The tests were passed.

2 TEMPERATURE-RISE TEST

The test object was subjected to a temperature-rise test. The test was carried out in accordance with ANSI/IEEE C37.41 (1988) clause 11.
The fuse was mounted in the most unfavourable position within the instructions specified by the manufacturer and connected to the test circuit by bare copper conductors with a cross-section of 135 mm^2. Each conductor was approximately 1 m long. The test was carried out at 100 A, the rated current of the fuse-link and at a frequency of 60 Hz.
The ambient temperature was measured at three locations at a distance 1 m from the test object and at the average height of its current-carrying parts.
After achieving thermal equilibrium the temperature values were recorded and the current was switched-off.
The temperatures were measured using thermocouples of the T-type. The thermocouple locations are presented in the drawing in appendix 2 page 2. The results and the requirements are presented in appendix 2 page 1.
Photographs of the test set-up and the sample are given in appendix 2 pages 3 and 4.
The test was passed.

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3 RADIO INFLUENCE TEST

This test was carried out by KEMA T&D Consulting, department Proctection and Substation Automation Laboratory.

The test object was subjected to a measurement of the radio interference voltage in accordance with clause 9 of ANSI/IEEE C37.41 (1988) clause 9.

The test voltage was applied in test situations 1, 2 and 3 as given in appendix 1 page 1.

The pre-stress voltage amounted to 17,2 kV, for a duration of 30 s.

After the application of the pre-stress voltage the voltage was decreased to 15,7 kV, during 1 minute. During this minute the radio interference voltage was measured.

The results are presented in appendix 3 page 1.

The test was passed.

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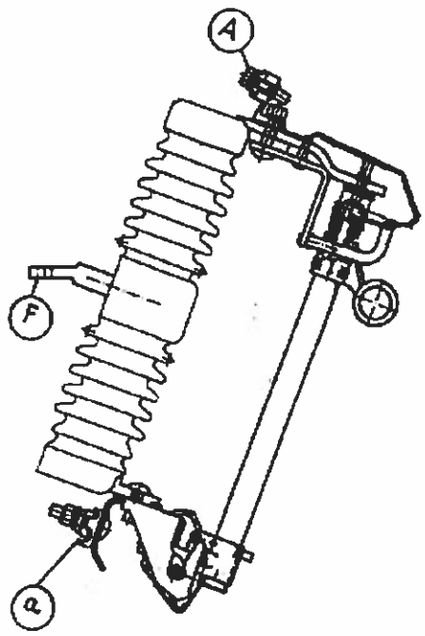
Appendix 1 page 1

Manufacturer	Whenzhou Yikun Electric Co., Ltd.
Object	25 kV outdoor distribution fuse cut-out, in fuse holder
Type	YKFCO-25
Dates of test	25 and 26 March 2004

TEST SITUATIONS FOR DIELECTRIC TESTS



situation no.	device status	test voltage connected to	terminals connected to earth
1	closed	A	F
2	open	A	F and a
3	open	a	F and A
4	open	A	a, F not connected

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Manufacturer	Whenzhou Yikun Electric Co., Ltd.
Object	25 kV outdoor distribution fuse cut-out, in fuse holder
Type	YKFCO-25
Requirements	ANSI/IEEE C37.41 (1988) clause 4.2.4
Date of test	25 March 2004

1.1 RESULTS OF THE LIGHTNING IMPULSE VOLTAGE DRY TESTS

Atmospheric conditions

Temperature	18	°C
Pressure	1016	hPa
Humidity	6,3	g/m^3

Correction factor for the test voltages: positive polarity $K_t = k_d/k_h$ = 1,0099/1,04 = 0,971
negative polarity $K_t = k_d/k_h$ = 1,0099/1,00 = 1,0099

Corrected and applied test voltage = specified test voltage x correction factor

situation no.	specified test voltage (kV)	corrected and applied test voltage (kV)	no. of impulses applied	figure no.	breakdowns or flashovers	results
1	+150	+146	3	2	no	passed
1	- 150	- 151	3	3	no	passed
2	+150	+146	3	4	no	passed
2	- 150	- 151	3	5	no	passed
3	+150	+146	3	6	no	passed
3	- 150	- 151	3	7	no	passed
4	+165	- 167	3	8	no	passed
4	- 165	- 160	3	9	no	passed

The waveshape amounted to 1,12/55,7 µs (appendix 1 page 3, figure 1).
For the oscillograms and the corresponding figure nos. reference is made to appendix 1 pages 3-5.

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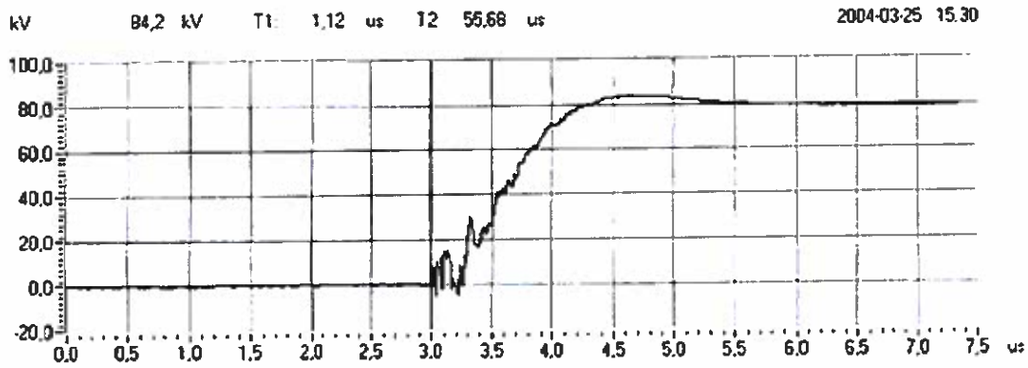

Fig. 1: Waveshape YKFCO-25 sit 1 wave shape

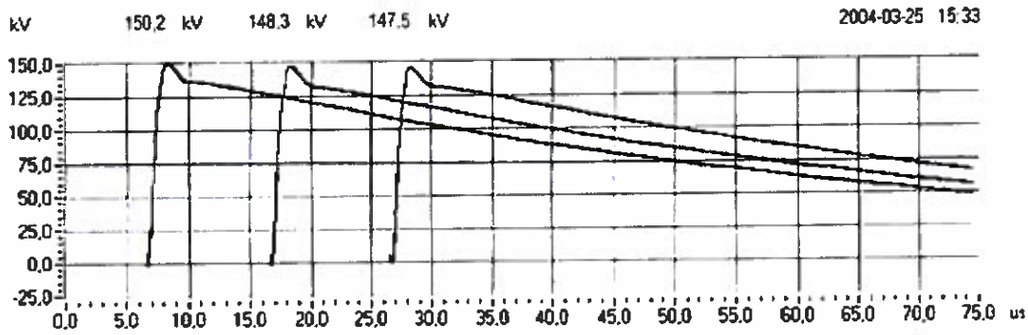

Fig. 2: YKFCO-25 sit 1 impulses 1 - 3 pos

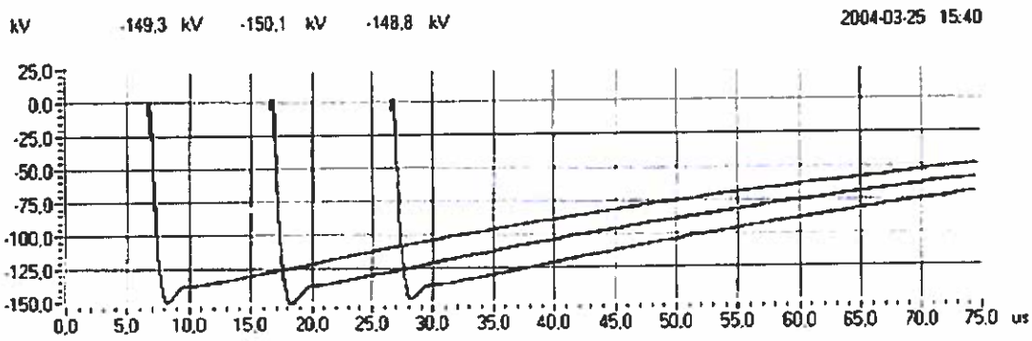

Fig. 3: YKFCO-25 sit 1 impulses 1 - 3 neg

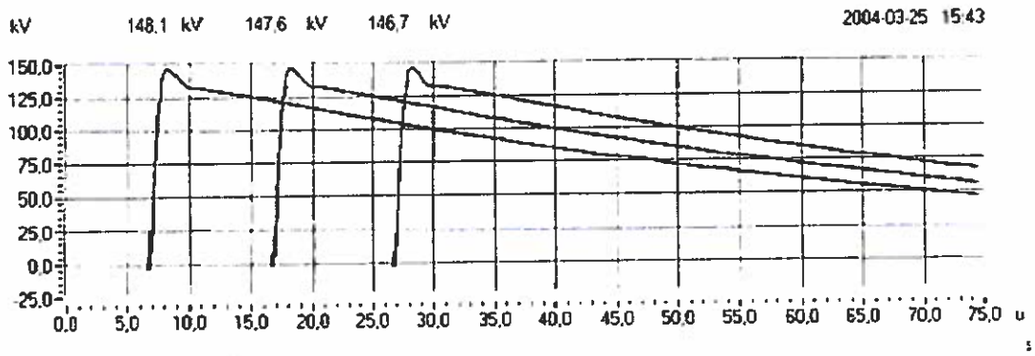

Fig. 4: YKFCO-25 sit 2 impulses 1 - 3 pos

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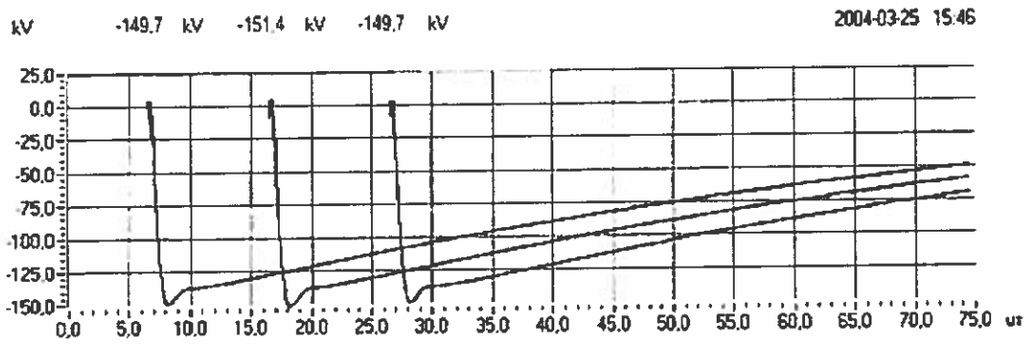

Fig. 5: YKFCO-25 sit 2 impulses 1 - 3 neg

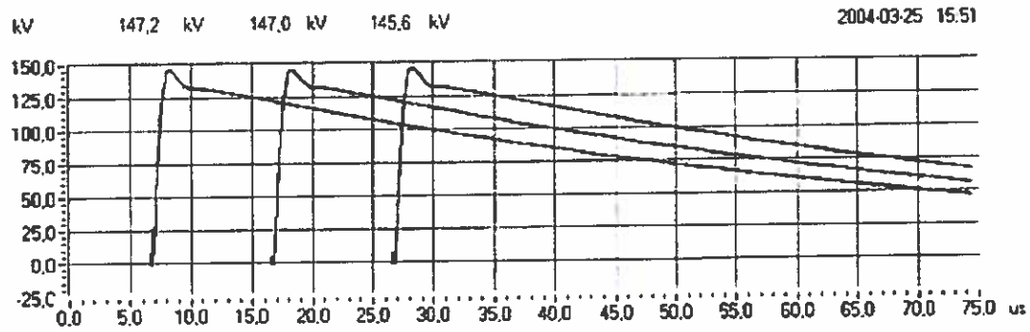

Fig. 6: YKFCO-25 sit 3 impulses 1 - 3 pos

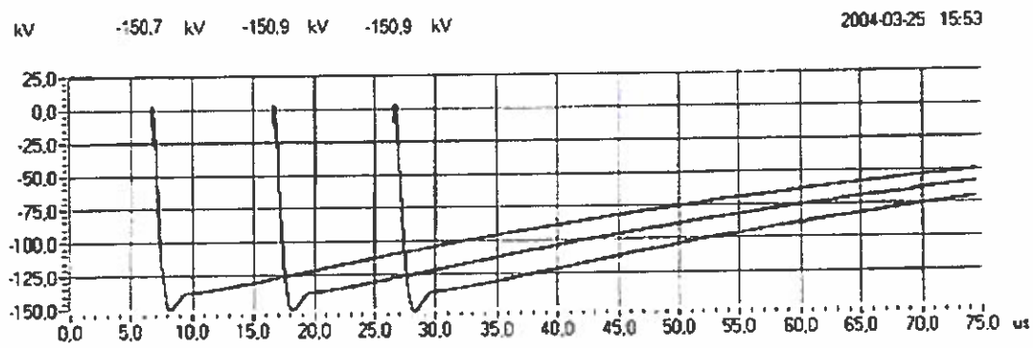

Fig. 7: YKFCO-25 sit 3 impulses 1 - 3 neg

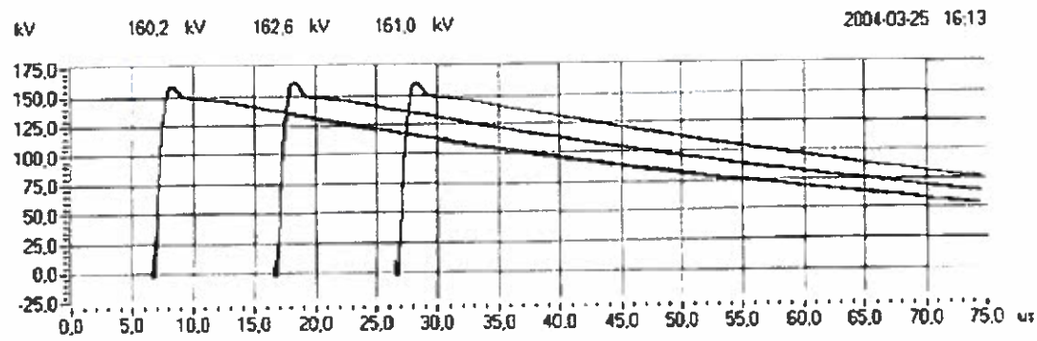

Fig. 8: YKFCO-25 sit 4 impulses 1 - 3 pos

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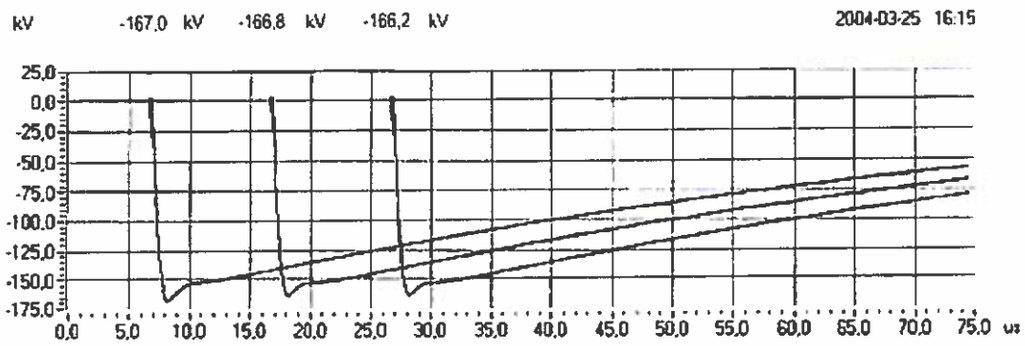

Fig. 9: YKFCO-25 sit 4 impulses 1 - 3 neg

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Manufacturer	Whenzhou Yikun Electric Co., Ltd.
Object	25 kV outdoor distribution fuse cut-out, in fuse holder
Type	YKFCO-25
Requirements	ANSI/IEEE C37.41 (1988) clause 4.2.1
Date of test	26 March 2004

1.2 RESULTS OF THE POWER-FREQUENCY VOLTAGE DRY TESTS

Atmospheric conditions

Temperature	18	°C
Pressure	1016	hPa
Humidity	6,5	g/m^3

Correction factor for the test voltages $K_t = k_d/k_h = 1{,}0099/1{,}055 = 0{,}957$

Corrected and applied test voltage = specified test voltage x correction factor
Frequency of the test voltage 60 Hz

situation no.	specified test voltage (kV)	corrected and applied test voltage (kV)	duration (minute)	results
1	42	40	1	passed
2	42	40	1	passed
3	42	40	1	passed
4	46	44	1	passed

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Manufacturer	Whenzhou Yikun Electric Co., Ltd.
Object	25 kV outdoor distribution fuse cut-out, in fuse holder
Type	YKFCO-25
Requirements	ANSI/IEEE C37.41 (1988) clause 4.2.2
Date of test	26 March 2004

1.3 RESULTS OF THE POWER-FREQUENCY VOLTAGE WET TESTS

Atmospheric conditions

Temperature	18	°C
Pressure	1016	hPa
Humidity	6,5	g/m³

Correction factor for the wet test voltages $K_t = k_d = 1{,}0099$

Corrected and applied test voltage = specified test voltage x correction factor

Frequency of the test voltage 60 Hz

Characteristics of the artificial rain

(revised method of ANSI/IEEE 4 (1978) clause 1.3.3)

Resistivity	100	Ωm at 20 °C
Horizontal precipitation rate	1,5	mm/min
Vertical precipitation rate	1,5	mm/min

situation no.	specified test voltage (kV)	corrected and applied test voltage (kV)	duration (s)	results
1	36	37	10	passed
2	36	37	10	passed
3	36	37	10	passed

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Manufacturer	Whenzhou Yikun Electric Co., Ltd.
Object	25 kV outdoor distribution fuse cut-out, in fuse holder
Type	YKFCO-25
Requirements	ANSI/IEEE C37.41 (1988) clause 11
Date of test	29 March 2004

2 RESULTS OF THE TEMPERATURE-RISE TEST

Atmospheric conditions

Temperature	19,5	°C
Pressure	1023	hPa
Humidity	6,0	g/m³

Current	100	A
Frequency	60	Hz

no.	description, location	material	max. temperature		max. temperature-rise	
			measured (°C)	allowed (°C)	measured (K)	allowed (K)
1	upper contact at terminal	silver coated	32,8	105	13,3	65
2	upper contact at spring	silver coated	44,6	105	25,1	65
3	bolted connection of fuse wire	copper	27,8	90	8,3	50
4	crank shaft/lower contact	copper alloy	32,7	75	13,2	35
5	lower terminal	copper alloy	39,0	90	19,5	60
6	fuse-base body	class H	37,8	180	18,3	140
	ambient temperature		19,5	-	-	-
	ambient temperature		19,6	-	-	-
	ambient temperature		19,5	-	-	-

Result

The test was passed.

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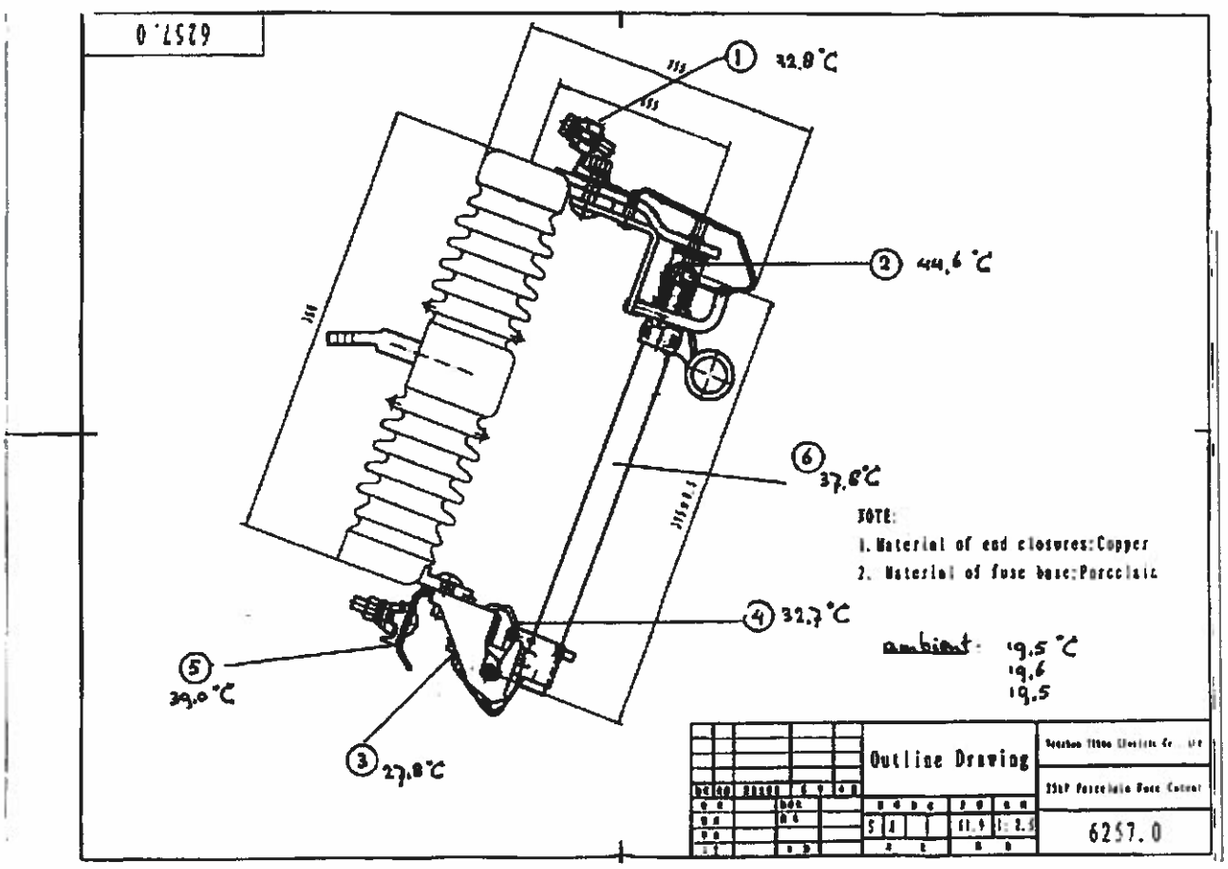
Appendix 2 page 2

Manufacturer	Whenzhou Yikun Electric Co., Ltd.
Object	25 kV outdoor distribution fuse cut-out, in fuse holder
Type	YKFCO-25
Requirements	ANSI/IEEE C37.41 (1988) clause 11
Date of test	26 March 2004

SCHEMATIC DRAWING OF THERMOCOUPLE LOCATIONS



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Photograph of the test set-up for temperature-rise.

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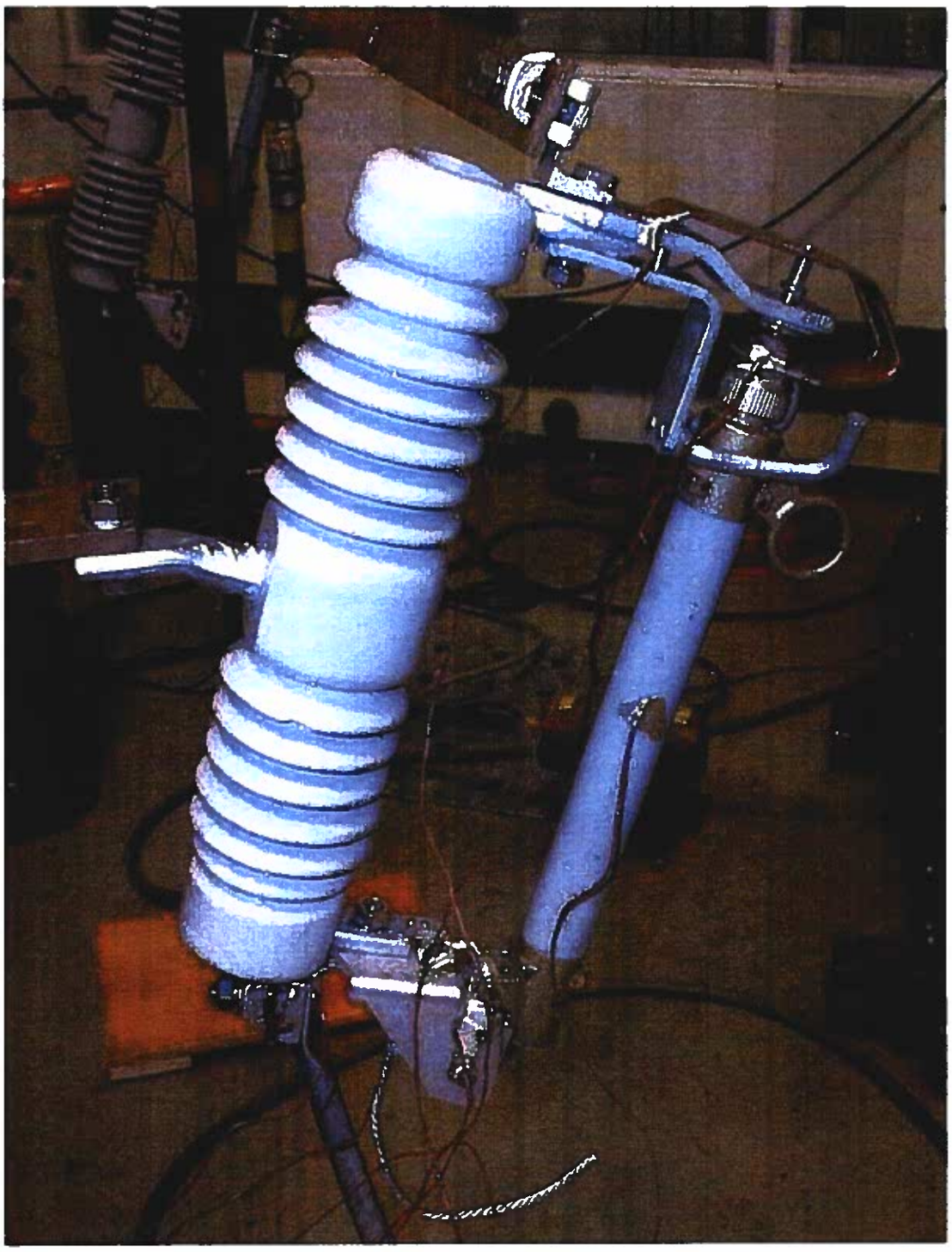

Photograph of the expulsion fuse in temperature-rise test.

PDF created with pdfFactory trial version www.pdffactory.com

Manufacturer	Whenzhou Yikun Electric Co., Ltd.
Object	25 kV outdoor distribution fuse cut-out, in fuse holder
Type	YKFCO-25
Requirements	ANSI/IEEE C37.41 (1988) clause 9
Date of test	30 March 2004

3 RESULTS OF THE RADIO INFLUENCE TEST

tested configuration	test voltage kV/(xUtest)	receiver reading (dB(µV))	correction factor (dB(µV))	actual RIV value (dB(µV))	remark
1	17,2 (1,1) 15,7 (1,0)	< -5 < -5	10 10	< 5 < 5	background background
2	17,2 (1,1) 15,7 (1,0)	< -5 < -5	10 10	< 5 < 5	background background
3	17,2 (1,1) 15,7 (1,0)	< -5 < -5	10 10	< 5 < 5	background background

PDF created with pdfFactory trial version www.pdffactory.com

The measurement uncertainties in the results presented are as specified below unless otherwise indicated.

measurement	measurement uncertainty
dielectric tests and impulse current tests	peak value: ≤ 3% time parameters: ≤ 10%
capacitance measurement tan δ measurement	0,3% ± 0,5% ± 5×10^{-5}
partial discharge measurement	< 10 pC : 2 pC 10 - 100 pC : 5 pC > 100 pC : 20 %
measurement of impedance a.c. resistance measurement	≤ 1%
measurement of losses	≤ 1%
measurement of insulation resistance	≤ 10%
measurement of d.c. resistance	1 μΩ - 5 μΩ : 1% 5 μΩ - 10 μΩ : 0,5% 10 μΩ - 200 μΩ : 0,2%
radio interference test	2 dB
calibration of current transformers	2,2 x 10^{-4} Ii/Iu and 290 μrad
calibration of voltage transformers	1,6 x 10^{-4} Ui/Uu en 510 μrad
measurement of conductivity	5%
measurement of temperature	-50 °C - -40 °C : 3 K -40 °C - 125 °C : 2 K 125 °C - 150 °C : 3 K
tensile test	1%
sound level measurement	type 1 meter as per IEC 651 and ANSI S1.4.1971
measurement of voltage ratio	0,1%

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Appendix A

Drawing of

Whenzou Yikun Electric Co., Ltd.

(No. of pages: 3)

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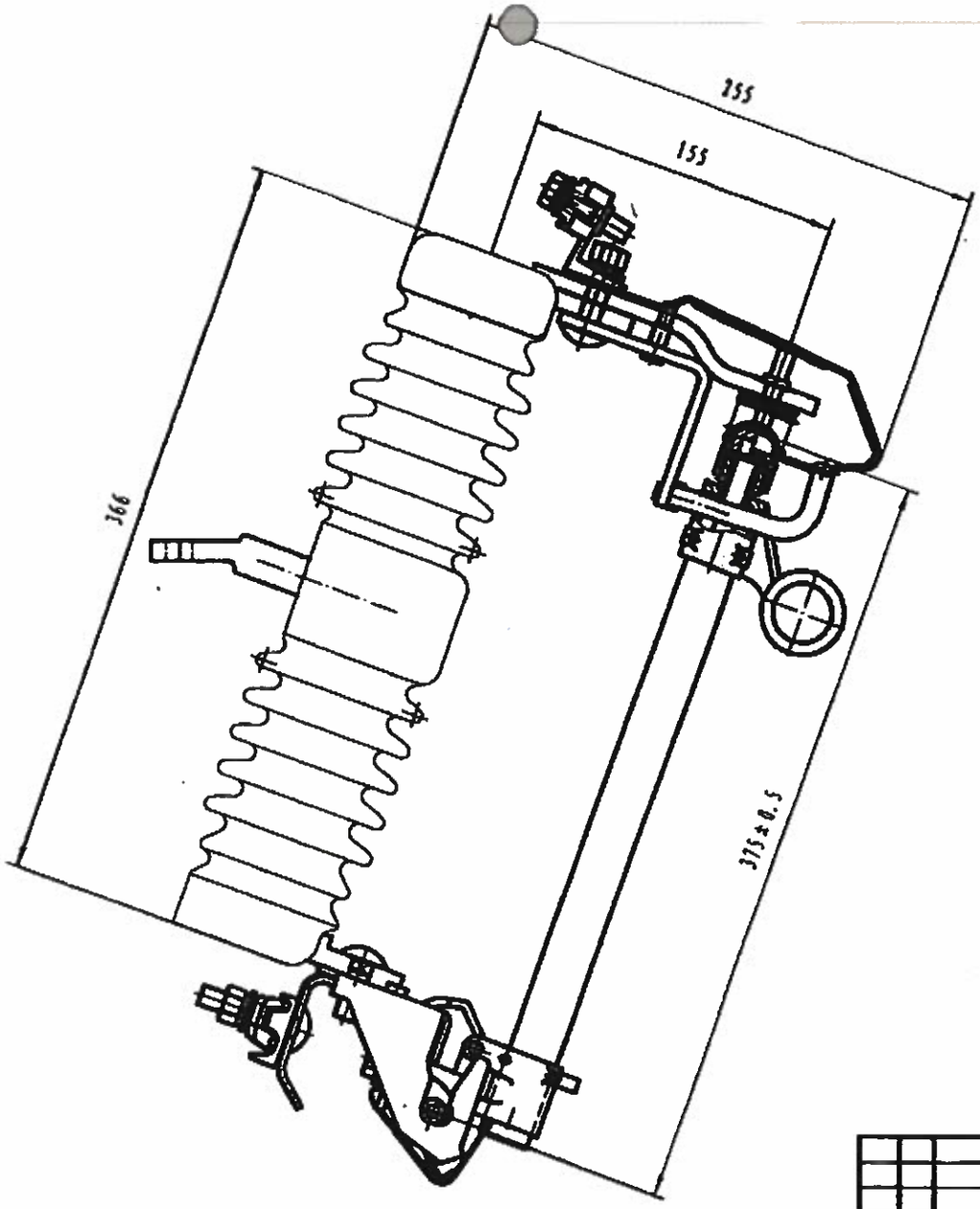


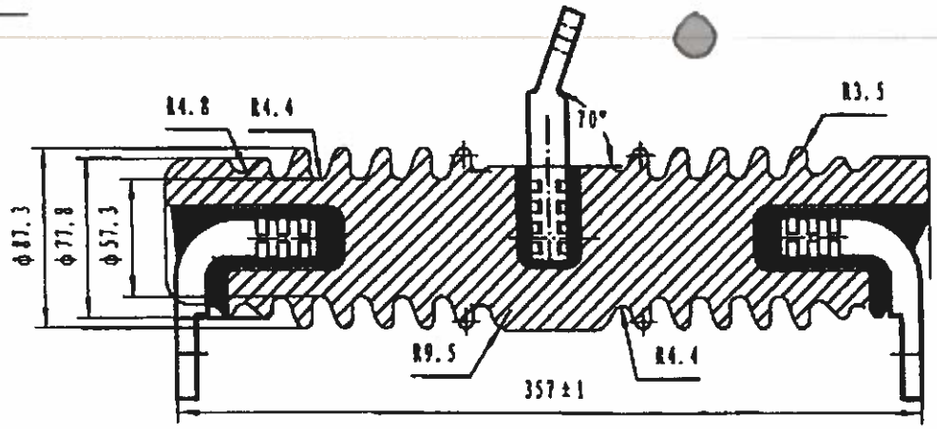
NOTE:

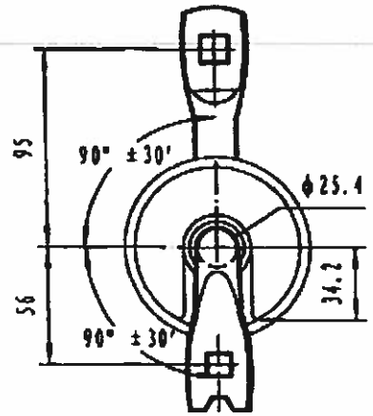
1. Material of end closures: Copper
2. Material of fuse base: Porcelain

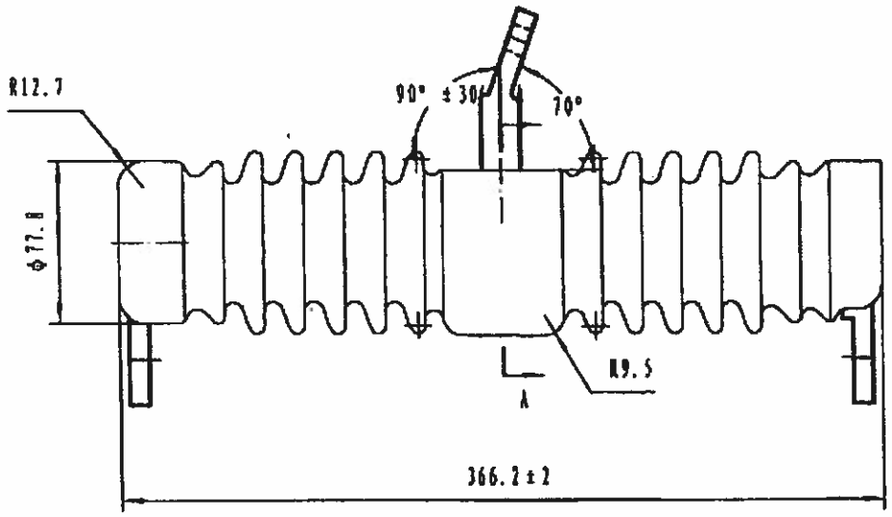
					Outline Drawing			Wenzhou Yikun Electric Co., Ltd
标记	处数	更改文件号	签字	日期				25kV Porcelain Fuse Cutout
设计		标准化			图样标记	重量	比例	
校对		批准			S A	kg	1: 2.5	6257.0
审核								
工艺		日期			共 张	第 张		

PDF created with pdfFactory trial version www.pdffactory.com

PDF created with pdfFactory trial version www.pdffactory.com







NOTE:

1. Material of fuse base :Porcelain
2. Material of inserts:Hot-galvanized steel

					Component			Wenzhou Yikun Electric Co.,Ltd
标记	处数	更改文件名	签字	日期				25KV Porcelain fuse base
设计		标准化			图样标记	重量	比例	
校对		批准			S A	4.43	1: 2.5	6257.1
审核								
工艺		日期			共 张	第 张		

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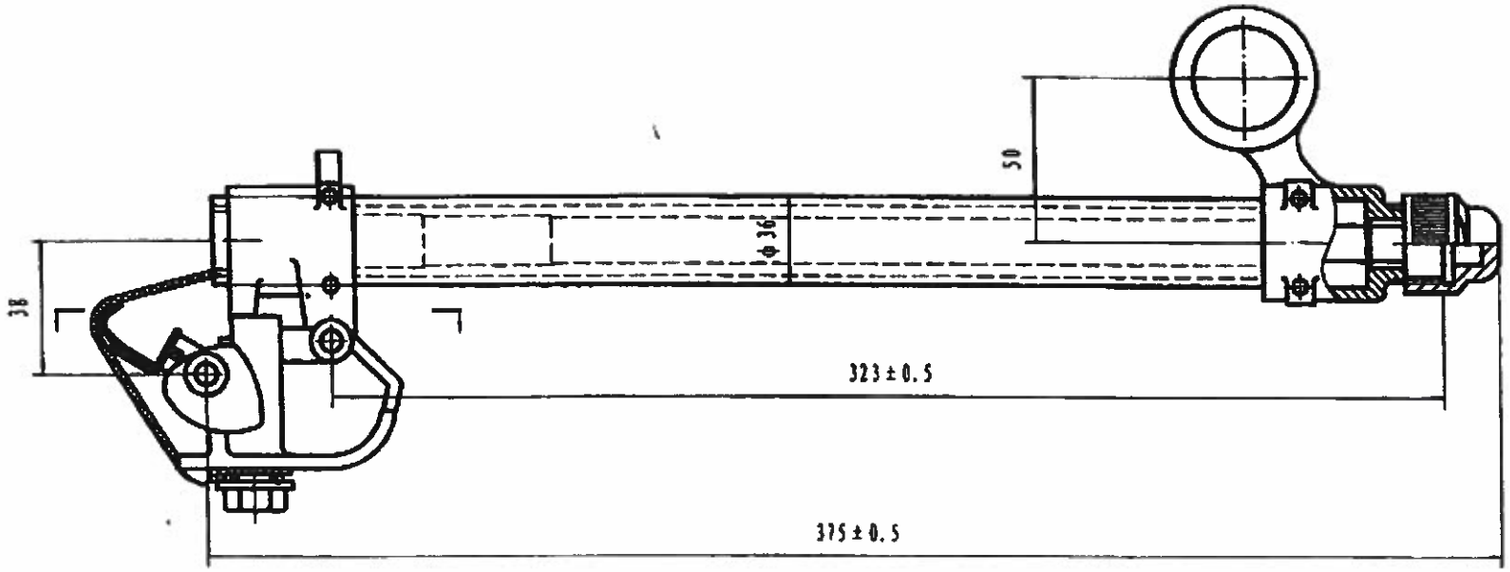

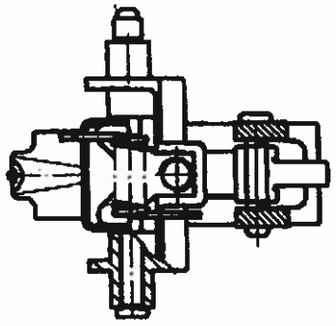

NOTE:

Material: Epoxy glass fiber

标记	处数	更改文件号	签字	日期	component			Wenzhou Tikon Electric Co., Ltd
设计		标准化			阶段标记	重量	比例	25KV Fuse Holder Assembly
校对						1	1: 1.5	6257.2
审核								
工艺		日期			共 张	第 张		

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KEMA

TYPE TEST CERTIFICATE OF INTERRUPTING PERFORMANCE

APPARATUS Cut-out fuses

DESIGNATION YKFCO-25

Rated voltage	**27 kV**	**Rated current**	**100 A (1)**
Rated breaking capacity	**8 kA**	**Rated frequency**	**60 Hz**

(1) See note (1) on page 3.

MANUFACTURER Wenzhou Yikun Electric Co., Ltd.,
Wenzhou, Zhejiang, China

TESTED FOR Wenzhou Yikun Electric Co., Ltd.,
Wenzhou, Zhejiang, China

TESTED BY KEMA HIGH-POWER LABORATORY
Utrechtseweg 310 - 6812 AR Arnhem - The Netherlands

DATE(S) OF TESTS 23rd, 24th and 25th June 2004

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this Certificate, has been subjected to the series of proving tests in accordance with

IEEE Std C37.42 sub-clause 3.3.2.

The results are shown in the record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standard and to justify the ratings assigned by the manufacturer as listed on page 3.

The Certificate applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designations with that tested rests with the Manufacturer.

This Certificate consists of 59 sheets in total.

This Certificate falls under the scope of the accreditation certificate L 020 of the Dutch Council for Accreditation.
See information sheet (page 1).

© Copyright: Only integral reproduction of this Certificate, or reproductions of this page accompanied by any page(s) on which are stated the endorsed ratings of the apparatus tested, are permitted without written permission from KEMA. Electronic copies in e.g. PDF-format or scanned version of this Certificate may be available and have the status "for information only". The sealed and bound version of the Certificate is the only valid version.

KEMA Nederland B.V.

P.P. Leufkens
Manager High-Power Laboratory

Arnhem, 22nd September 2004

F1-6-1

1 Certificate

A Certificate contains a record of a series of type tests carried out strictly in accordance with a recognized standard. The equipment tested has fulfilled the requirements of this standard and the relevant ratings assigned by the manufacturer are endorsed by KEMA. The Certificate is applicable only to the equipment tested. KEMA is responsible for the validity and the contents of the Certificate.
The responsibility for conformity of any apparatus having the same designation as the one tested rests with the manufacturer. The Certificate contains the essential drawings and a description of the equipment tested.
Detailed rules are given in KEMA's Certification procedure.

2 Report of Performance

A Report of Performance contains a record of one or more tests which have been carried out according to the client's instructions. These tests are not necessarily in accordance with a recognized standard. The test results do not verify ratings of the test object.

KEMA issues three types of Reports of Performance:

2.1 *The tests have been carried out strictly in accordance with .... The apparatus has complied with the relevant requirements.*

This sentence will appear on the front page of a Report of Performance if the tests have been performed in accordance with a recognized standard, but the series of tests does not completely fulfil the requirements for a Certificate of Compliance (for example, if the number of test duties is not a complete series of type tests). The Report contains verified drawings and a description of the equipment tested. Detailed rules are given in KEMA's Certification procedure. The condition of the test object after the tests is assessed and recorded in the Report.

2.2 *The tests have been carried out in accordance with the client's instructions. Test procedure and test parameters were based on ....*

This sentence will appear on the front page of a Report of Performance if the number of tests, the test procedure and the test parameters are based on a recognized standard and related to the ratings assigned by the manufacturer. If the apparatus does not pass the tests such behaviour will be mentioned on the front sheet. Verification of the drawings (if submitted) and assessment of the condition after the tests is only done on the client's request.

2.3 *The tests have been carried out according to the client's instructions.*

This sentence will appear on the front page of a Report of Performance if the tests, test procedure and/or test parameters are not in accordance with a recognized standard.

3 Standards

When reference is made to a standard, and the date of issue is not stated, this applies to the latest issue, including amendments which have been officially published prior to the date of the tests.

4 Official and uncontrolled test documents

The official test documents of KEMA High-Power Laboratory are issued in bound form. Uncontrolled copies may be provided as loose sheets or as a digital file for convenience of reproduction by the client. The copyright has to be respected at all times.

5 Accuracy of measurement

In the table of test results the measured quantities are given in three digits. This method of presentation does not indicate an accuracy. The guaranteed uncertainty in the figures mentioned, taking into account the total measuring system, is less than 5%, unless mentioned otherwise.

6 Qualified by RvA (Dutch Council for Accreditation)

KEMA High-Power Laboratory and High-Voltage Laboratory have been entered in the RvA-register for laboratories under resp. Nrs. L 020 and L 218 for the testing services as defined in the Field of Accreditation.
The accreditation is carried out in accordance with ISO/IEC 17025.

TESTING
RvA L 020

M4

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G1

RATINGS ASSIGNED BY THE MANUFACTURER

Voltage	27 kV
Current	100 A (1)
Frequency	60 Hz
Breaking capacity	8 kA

(1) The tests have been performed on the 6 A and 100 A fuse-link.

DESCRIPTION OF APPARATUS TESTED

Cut-out fuses

DRAWINGS

The manufacturer has guaranteed that the equipment submitted for tests has been manufactured in accordance with the following drawings.
KEMA has verified that these drawings adequately represent the equipment tested.

Time-current characteristics curves (T)
Time-current characteristics curves (K)
6256.2-2 Rev. -
6256.2-3 Rev. -
6257.0 Rev. -
6257.1 Rev. -
6257.2 Rev. -

THE TESTS WERE WITNESSED BY

Name	Company
Yu, D.	Wenzhou Yikun Electric Co., Ltd., Wenzhou, Zhejiang, China

THE TESTS WERE OBSERVED BY

Name	Company
Visser, B.	KEMA, Arnhem, The Netherlands

PHASE INDICATIONS

If more than one phase is recorded on oscillogram, the phases are indicated by the digits 1, 2 and 3. These phases 1, 2 and 3 correspond to the phase values in the columns of the accompanying table, respectively from left to right.

EXPLANATION OF THE LETTER SYMBOLS AND ABBREVIATIONS ON THE OSCILLOGRAMS

pu	Per unit (the reference length of one unit is represented by the black bar on the oscillogram)
ITO	Current through test object
Ishield	Current via shield to earth
UTO	Voltage across test object
Uarc	Arc voltage
Uref	Reference voltage

TEST NUMBERS

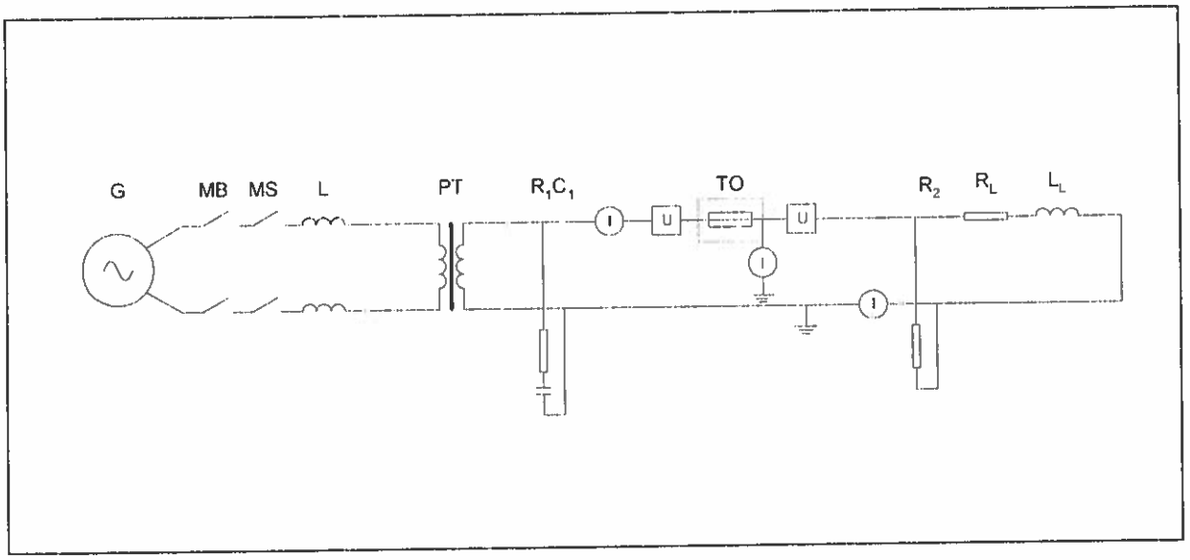
040624-6020
040624-6023
040624-6024

CONDITION BEFORE TESTS

Fuse-base new.
Fuse-carrier new.
Before each test new fuse-link.

Metallic screens placed at the top and bottom of the unit at a distance of 100 cm and connected to the neutral of the supply with an earth fault current indicating CT.

TEST-CIRCUIT S06



G	= Generator	TO	= Test Object	U	= Voltage Measurement to earth
MB	= Master Breaker	L	= Reactor	I	= Current Measurement
MS	= Make Switch	R	= Resistor		
PT	= Power Transformer	C	= Capacitor		

Supply		
Power	MVA	216
Frequency	Hz	60
Phase(s)		1
Voltage	kV	27
Current	kA	8
Impedance	Ω	3,375
Power factor		< 0,1
Neutral		not earthed

TRV control elements added (supply)		
C_1	µF	0,09
R_1 (in parallel)	Ω	
R_1 (in series)	Ω	280
L_1	mH	
C_d	nF	
Neutral		earthed

Load		
Impedance	Ω	56,6
Cos phi		0,24
Neutral		earthed

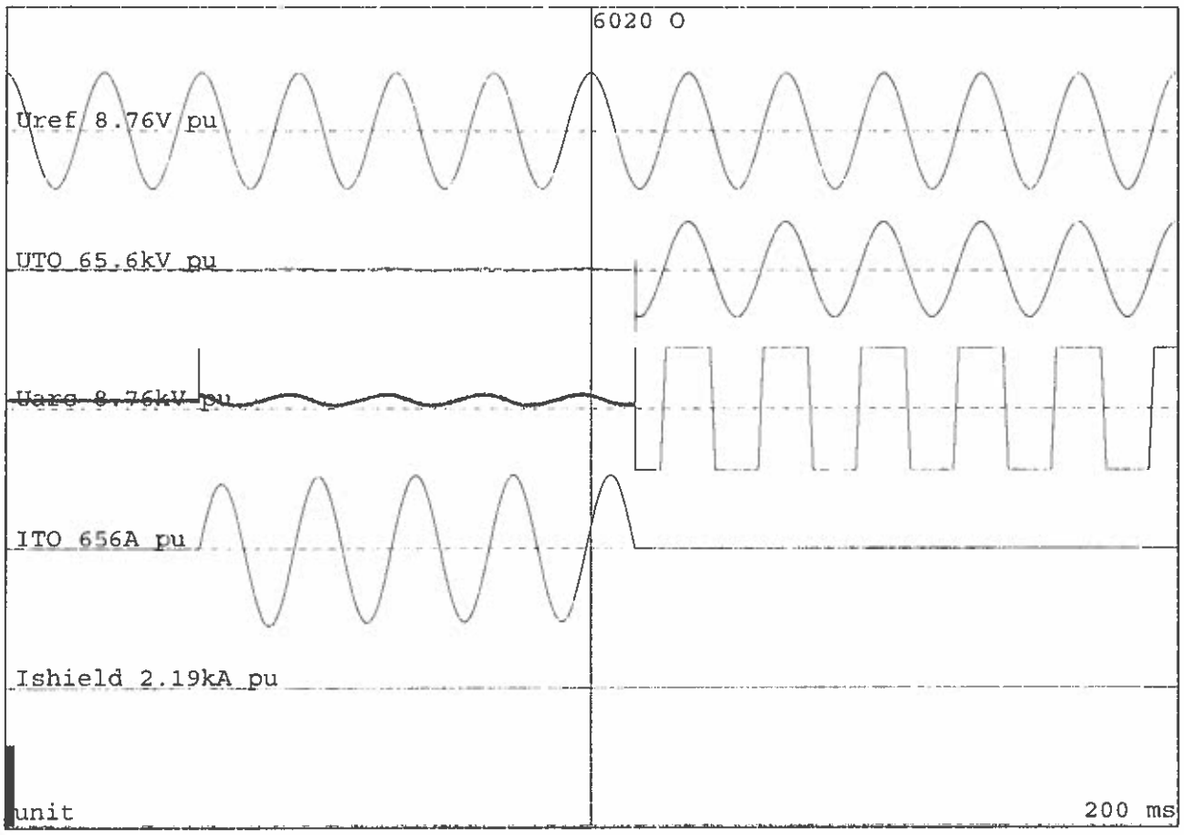
TRV control elements added (load)		
C_2	nF	
R_2 (in parallel)	Ω	55000
Neutral		earthed

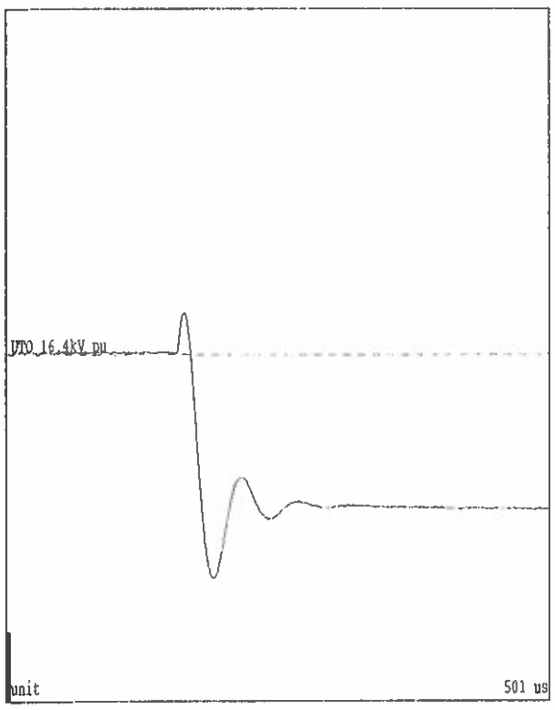
Prospective TRV of load		
E_2	kV	61,6
T_2	µs	28
t_d	µs	< 3,61
Rate of rise	kV/µs	2,56

Inductive load element		
X_L (L_L)	Ω	50,5
R_L	Ω	12

Remarks: -

C1





TEST NUMBER: 040624-6020

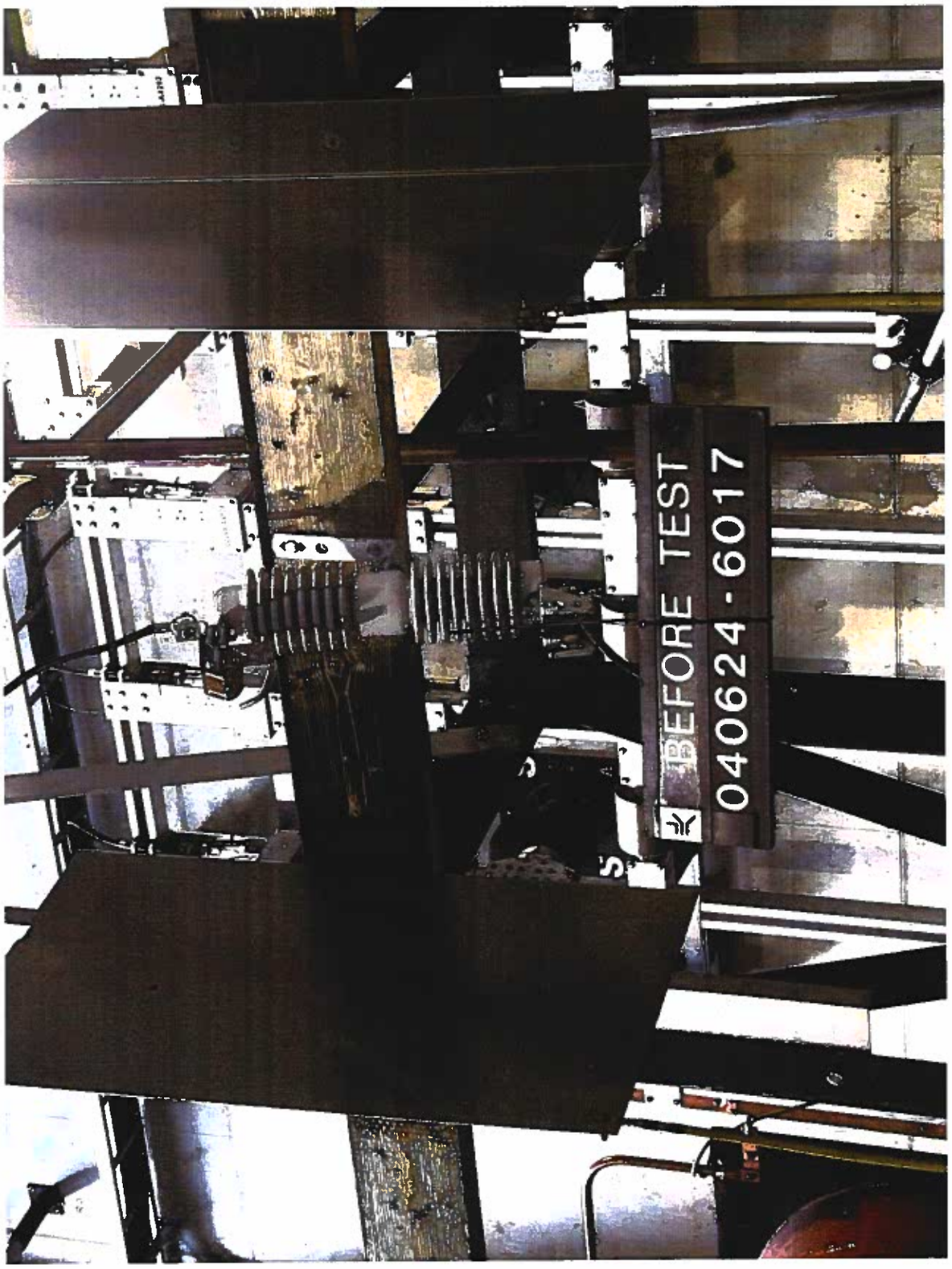
Time interval since previous test	min	
Operation		O_{ab}
Phase		1
Breaking current, phase value	A	412
Breaking current, DC-component	%	0,070
Recovery voltage, phase value	kV	27,1
TRV, peak	kV	62,6
Arc duration	ms	7,60
Opening time	ms	36,3
Break time	ms	43,9

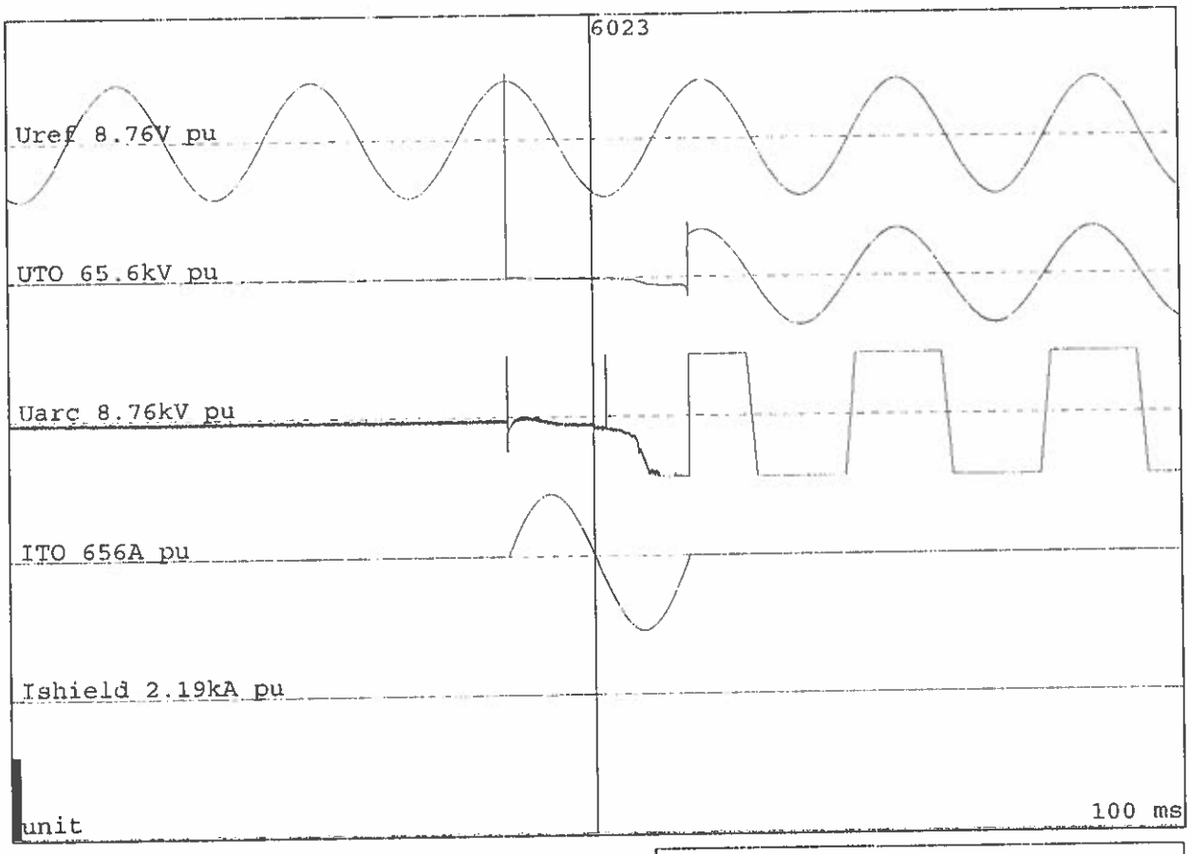
Voltage opening coil	Gas pressure at 20 °C Operating pressure

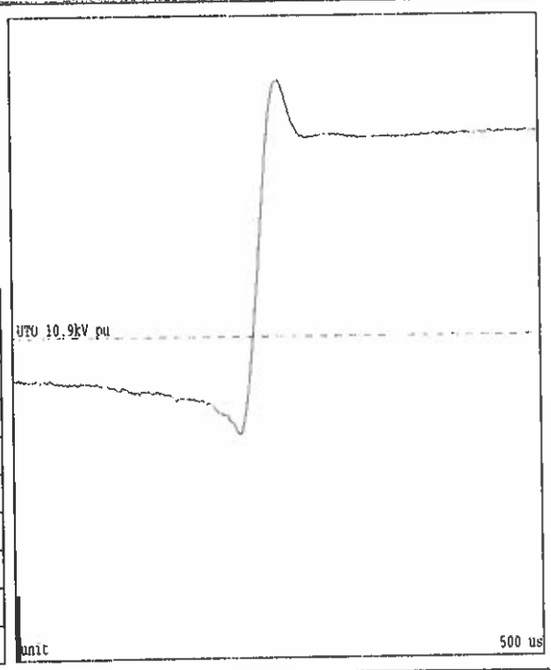
Remarks: Auxiliary breaker cleared.

T45

Note: "6017" is incorrect, please read "6023"







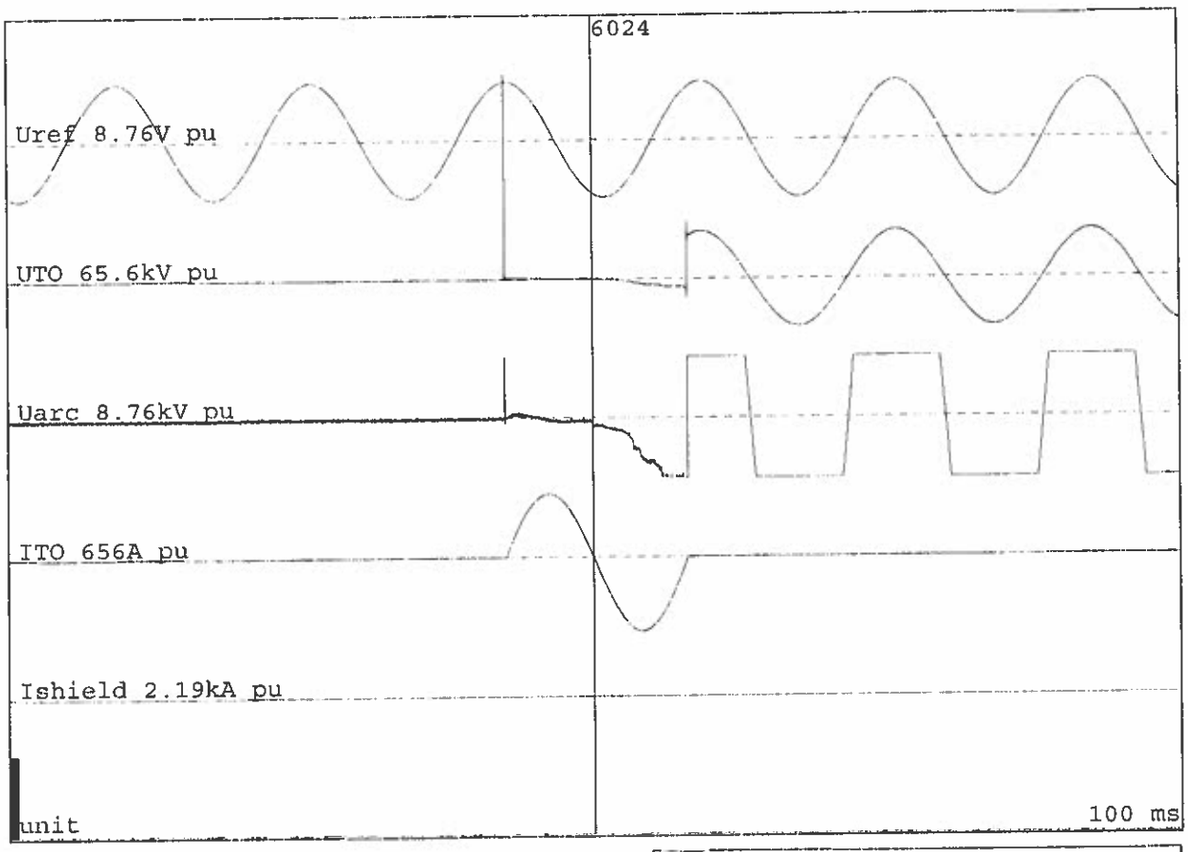
TEST NUMBER: 040624-6023

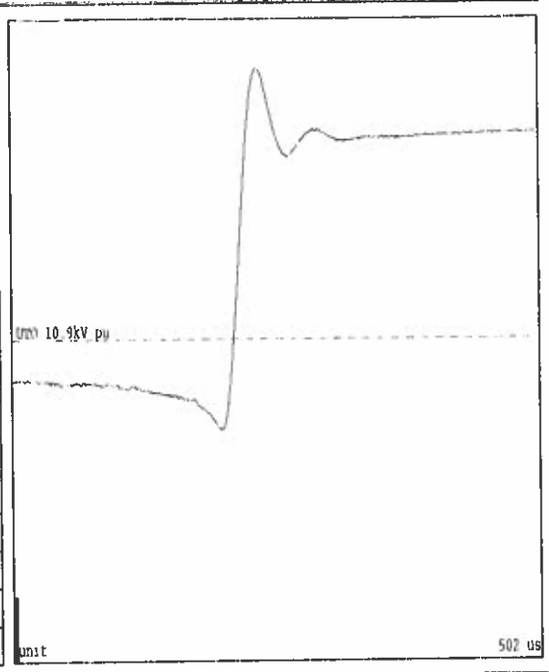
Applied voltage	kV	27,1
Prospective current	A	412
Making angle related to voltage zero	°	88,0
Cut-off current	A	-603
Pre-arcing time	ms	7,35
Arcing time	ms	8,10
Total operating time	ms	15,4
Recovery voltage	kV	27,3
TRV, peak	kV	43,9
Total I^2t	$x10^3$ A^2s	2,371

Rated voltage	27 kV	Rated current	6 A
Duration of recovery voltage	0,5 s	Ambient temperature	17 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	K

Remarks: Fuse cleared.

T91





TEST NUMBER: **040624-6024**

Applied voltage	kV	27,1
Prospective current	A	412
Making angle related to voltage zero	°	88,4
Cut-off current	A	-595
Pre-arcing time	ms	7,41
Arcing time	ms	8,02
Total operating time	ms	15,4
Recovery voltage	kV	27,3
TRV, peak	kV	46,2
Total I^2t	$x10^3$ A^2s	2,384

Rated voltage	27 kV	Rated current	6 A
Duration of recovery voltage	0,5 s	Ambient temperature	18 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	K

Remarks: Fuse cleared.

T91

CONDITION / INSPECTION AFTER TEST

After each test fuse-carrier dropped out.

AFTER TEST
040624-6024

TEST NUMBERS

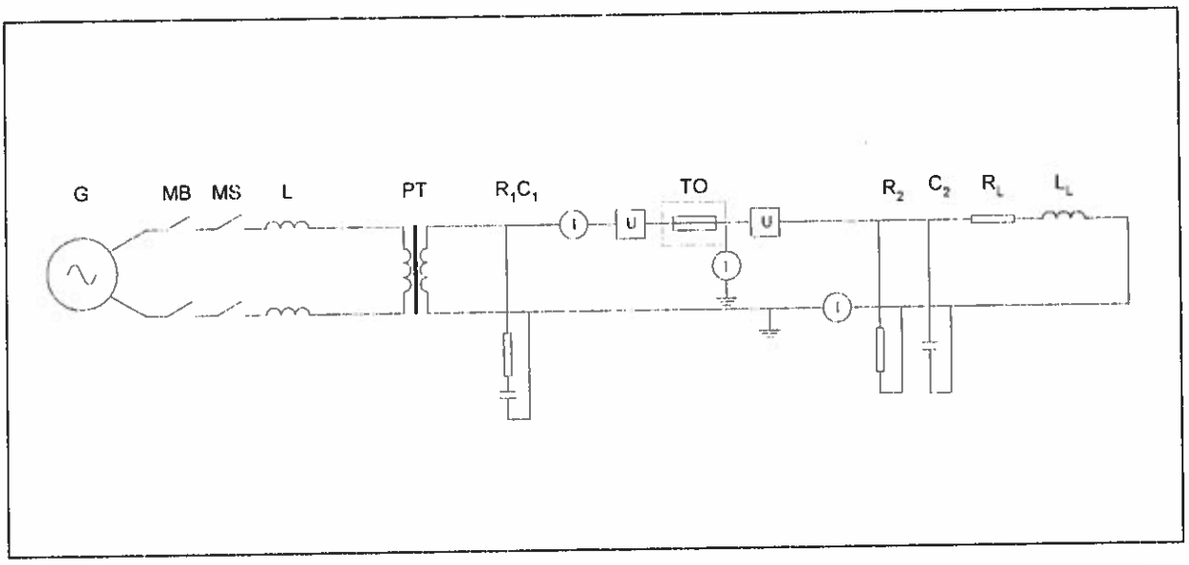
040624-6025
040624-6026
040624-6027

CONDITION BEFORE TESTS

Fuse-base in same condition.
Fuse-carrier in same condition.
Before each test new fuse-link.

Metallic screens placed at the top and bottom of the unit at a distance of 100 cm and connected to the neutral of the supply with an earth fault current indicating CT.

TEST-CIRCUIT S07



G	= Generator	TO	= Test Object	U	= Voltage Measurement to earth
MB	= Master Breaker	L	= Reactor	I	= Current Measurement
MS	= Make Switch	R	= Resistor		
PT	= Power Transformer	C	= Capacitor		

Supply		
Power	MVA	216
Frequency	Hz	60
Phase(s)		1
Voltage	kV	27
Current	kA	8
Impedance	Ω	3,375
Power factor		< 0,1
Neutral		not earthed

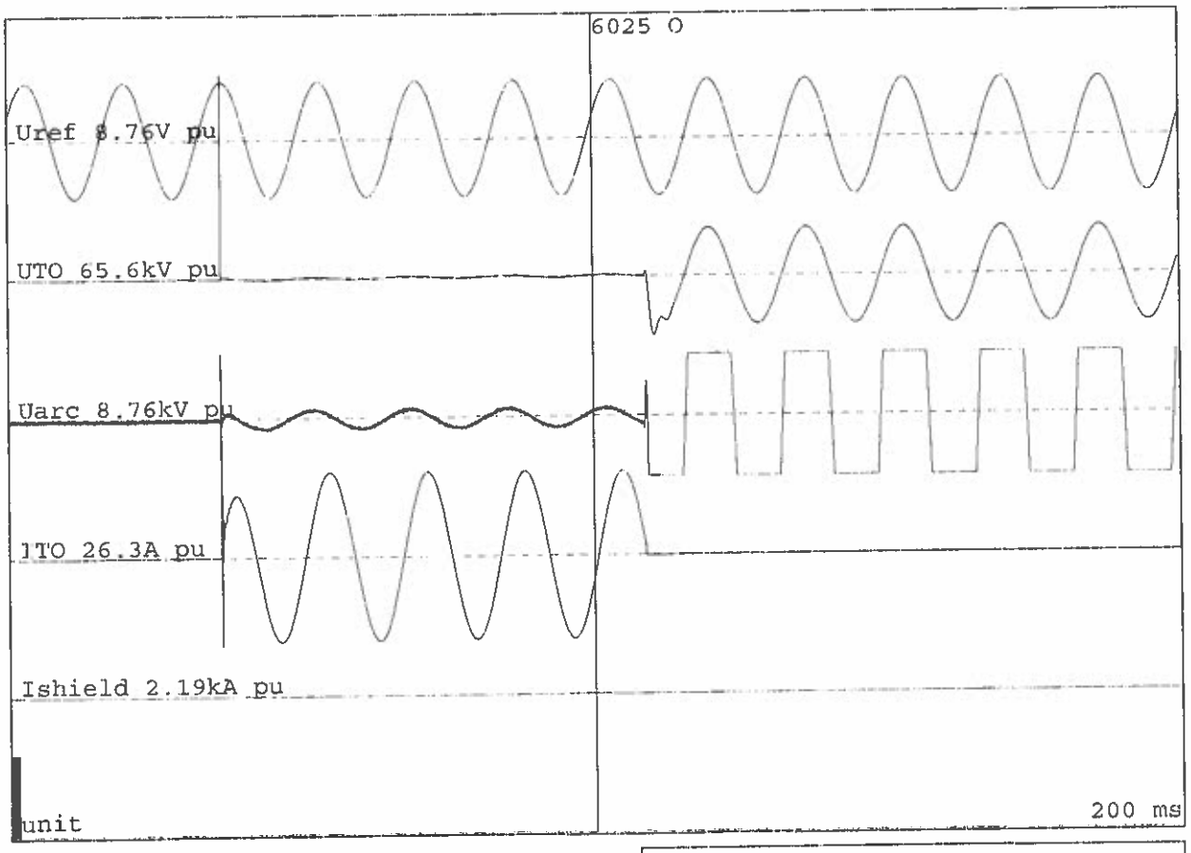
TRV control elements added (supply)		
C_1	µF	0,09
R_1 (in parallel)	Ω	
R_1 (in series)	Ω	280
L_1	mH	
C_d	nF	
Neutral		earthed

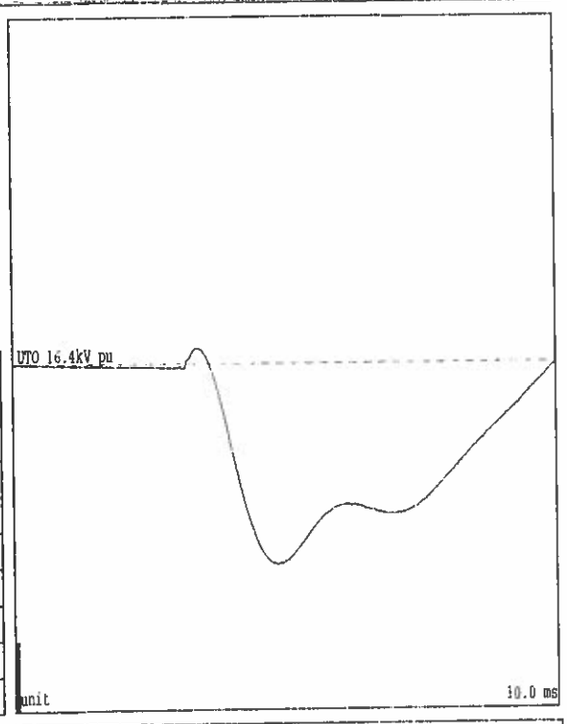
Load		
Impedance	Ω	1496
Cos phi		0,7
Neutral		earthed

TRV control elements added (load)		
C_2	nF	0,06
R_2 (in parallel)	Ω	8800
Neutral		earthed

Inductive load element		
X_L (L_L)	Ω	1047
R_L	Ω	1056

Remarks: -





TEST NUMBER: 040624-6025

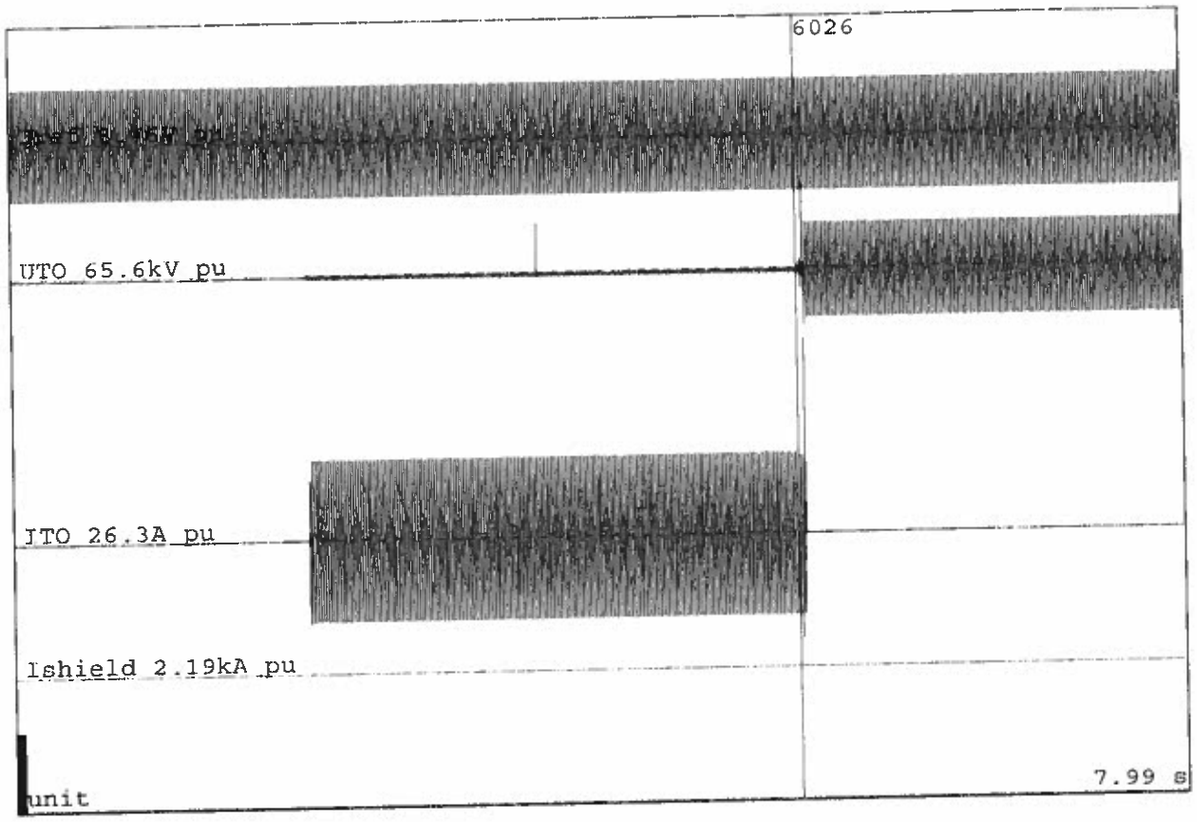
Time interval since previous test	min	
Operation		O_{ab}
Phase		1
Breaking current, phase value	A	18,9
Breaking current, DC-component	%	0,131
Recovery voltage, phase value	kV	27,3
TRV, peak	kV	-47,7
Arc duration	ms	8,13
Opening time	ms	33,0
Break time	ms	41,1

Voltage opening coil

Gas pressure at 20 °C
Operating pressure

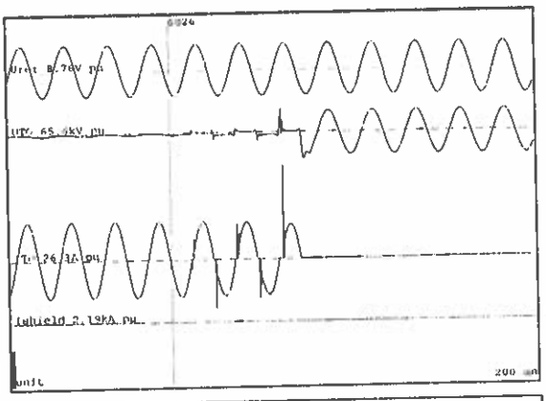
Remarks: Auxiliary breaker cleared.

T45



TEST NUMBER: 040624-6026

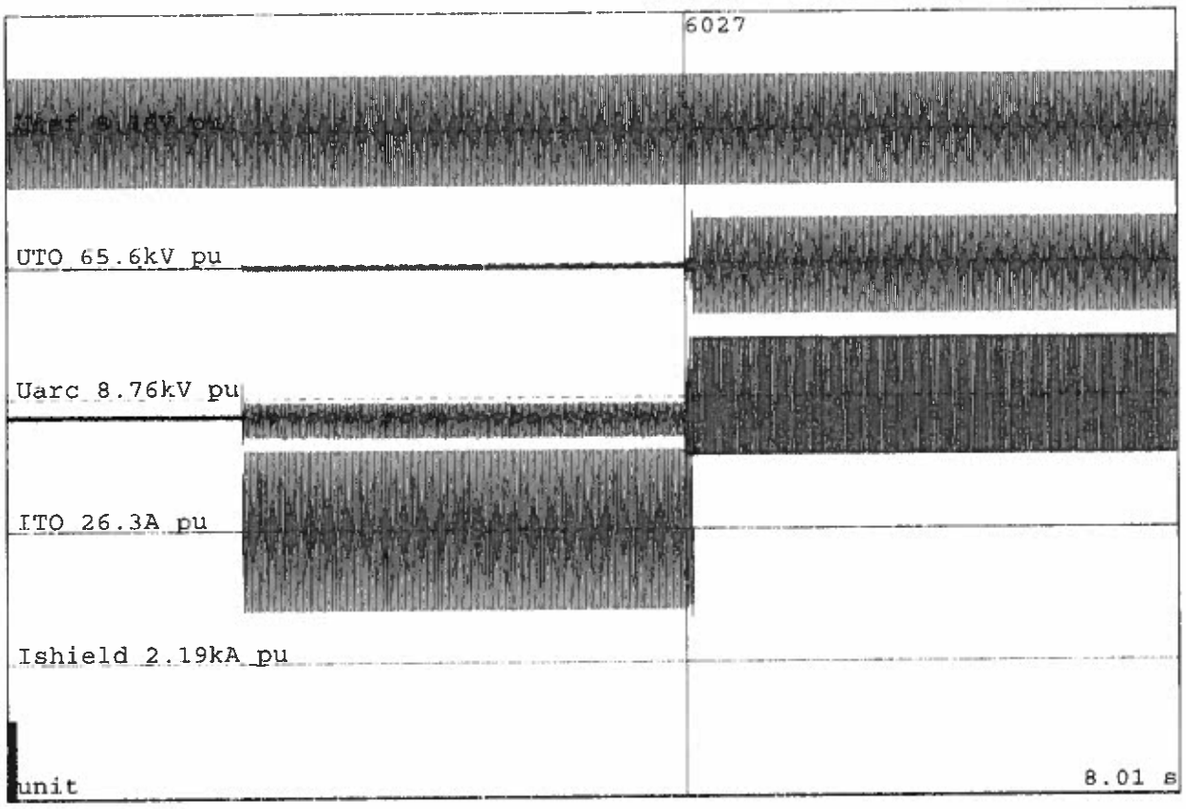
Applied voltage	kV	27,1
Prospective current	A	18,9
Making angle related to voltage zero	°	-
Cut-off current	A	-
Pre-arcing time	ms	3348
Arcing time	ms	49,7
Total operating time	ms	3397
Recovery voltage	kV	27,9
TRV, peak	kV	-48,4
Total I^2t	$x10^3$ A^2s	1,238



Rated voltage	27 kV	Rated current	6 A
Duration of recovery voltage	0,5 s	Ambient temperature	17 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	K

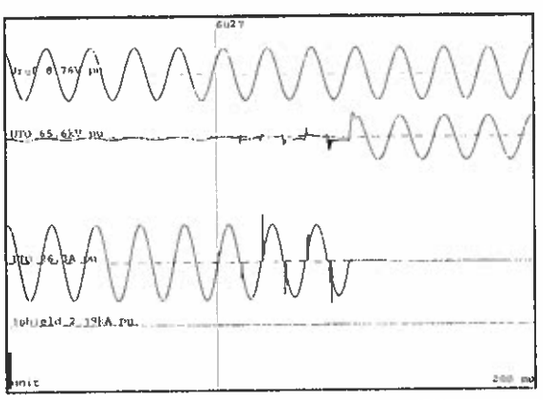
Remarks: Fuse cleared.

T91



TEST NUMBER: 040624-6027

Applied voltage	kV	27,3
Prospective current	A	18,9
Making angle related to voltage zero	°	-
Cut-off current	A	-
Pre-arcing time	ms	3036
Arcing time	ms	50,1
Total operating time	ms	3086
Recovery voltage	kV	28,0
TRV, peak	kV	43,7
Total I^2t	$x10^3$ A^2s	1,123



Rated voltage	27 kV	Rated current	6 A
Duration of recovery voltage	0,5 s	Ambient temperature	17 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	K

Remarks: Fuse cleared.

T91

CONDITION / INSPECTION AFTER TEST

After each test fuse-carrier dropped out.

AFTER TEST
040624-6027

TEST NUMBERS

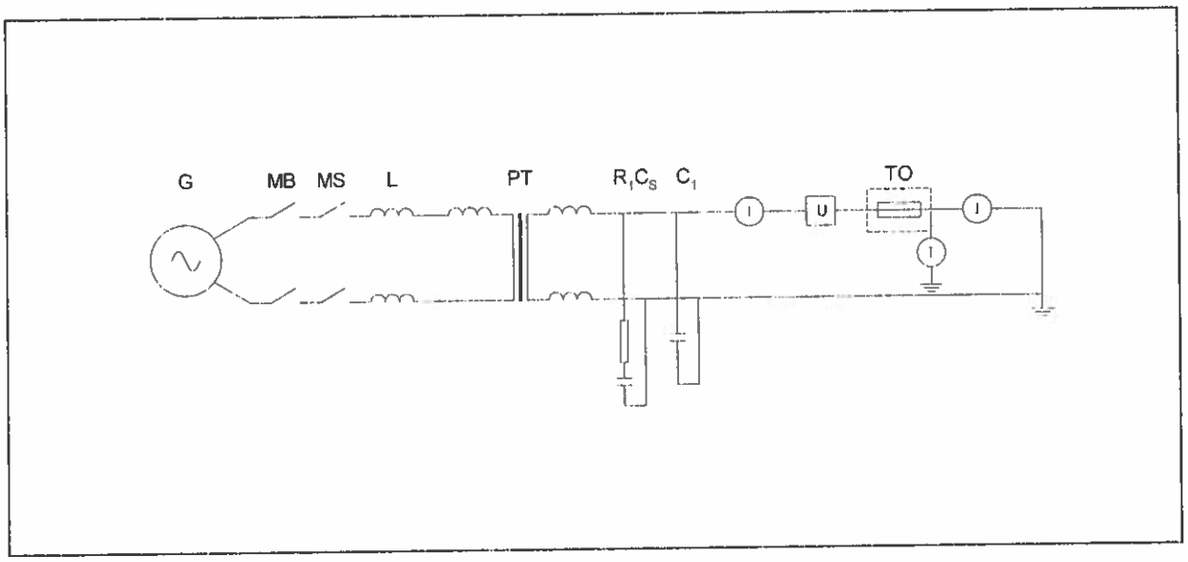
040625-6001
040625-6002
040625-6003
040625-6004
040625-6005
040625-6006
040625-6007

CONDITION BEFORE TESTS

Fuse-base in same condition.
Before test 040625-6002 and 6005 fuse-carrier new.
Before each test new fuse-link.

Metallic screens placed at the top and bottom of the unit at a distance of 100 cm and connected to the neutral of the supply with an earth fault current indicating CT.

TEST-CIRCUIT S08



G	= Generator	TO	= Test Object	U	= Voltage Measurement to earth
MB	= Master Breaker	L	= Reactor	I	= Current Measurement
MS	= Make Switch	R	= Resistor		
PT	= Power Transformer	C	= Capacitor		

Supply		
Power	MVA	216
Frequency	Hz	60
Phase(s)		1
Voltage	kV	27
Current	kA	8
Impedance	Ω	3,375
X/R		> 8
Neutral		not earthed

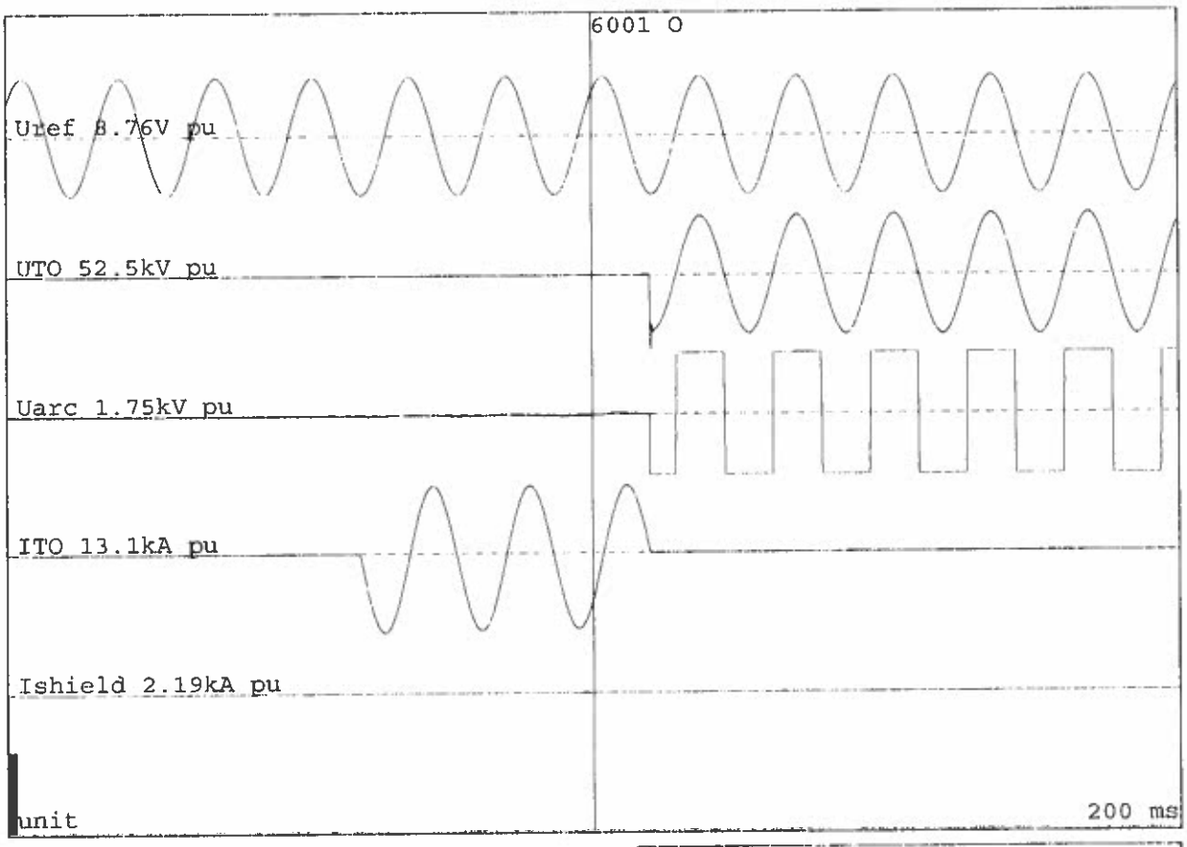
TRV control elements added (supply)		
C_1	µF	0,8
R_1 (in parallel)	Ω	250
C_s (in series)	µF	1,32
L_1	mH	
C_d	nF	
Neutral		earthed

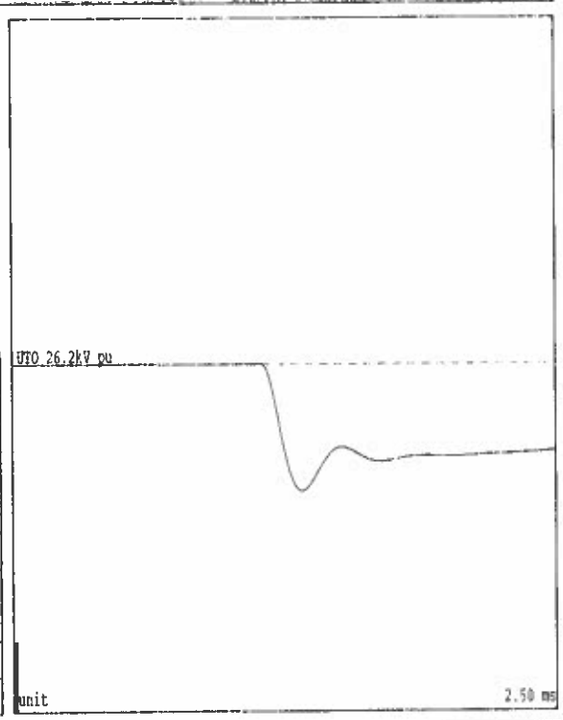
Prospective TRV of supply		
E_2	kV	53
T_2	µs	290
t_d	µs	< 0,37
Rate of rise	kV/µs	0,21

Load	
Short-circuit point	earthed

Remarks: -

C1





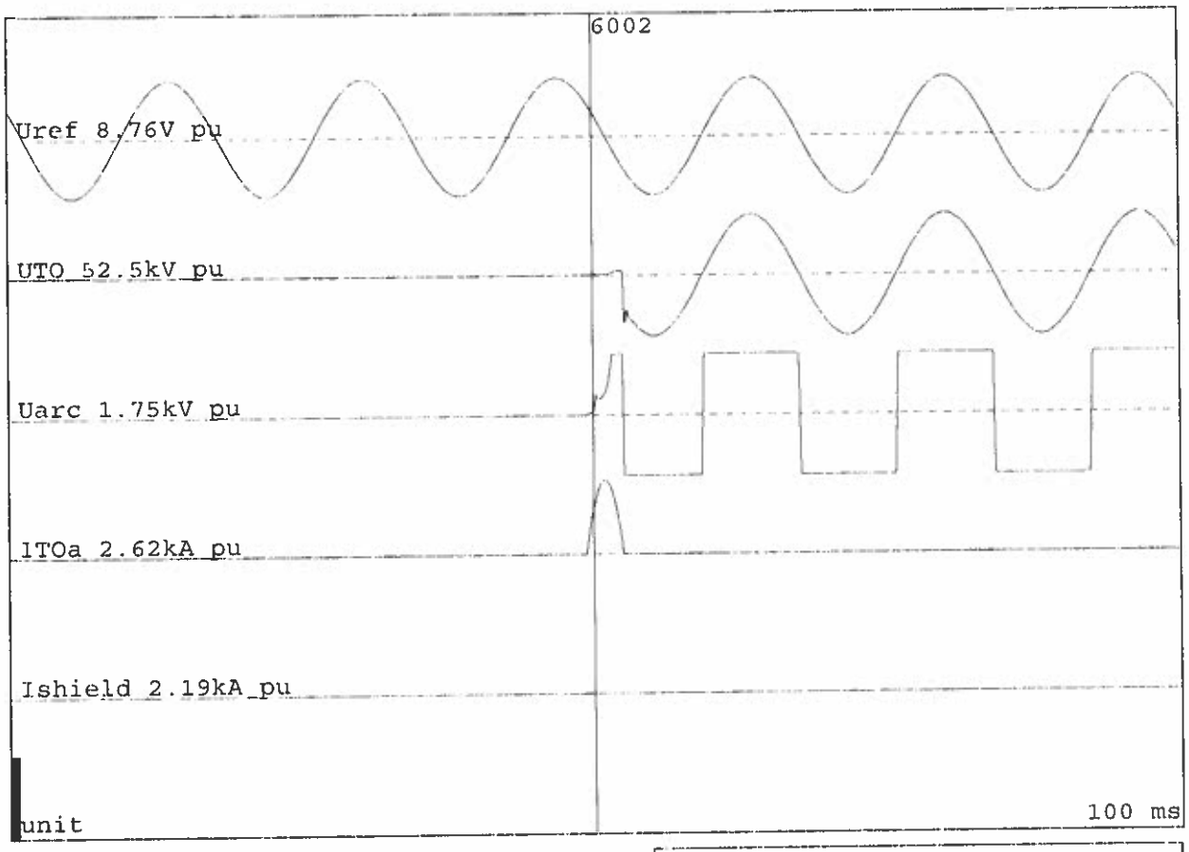
TEST NUMBER: 040625-6001

Time interval since previous test	min	
Operation		O_{nb}
Phase		1
Breaking current, phase value	kA	8,06
Breaking current, DC-component	%	4,71
Recovery voltage, phase value	kV	26,9
TRV, peak	kV	-48,4
Arc duration	ms	9,99
Opening time	ms	38,1
Break time	ms	48,1

Voltage opening coil	Gas pressure at 20 °C Operating pressure

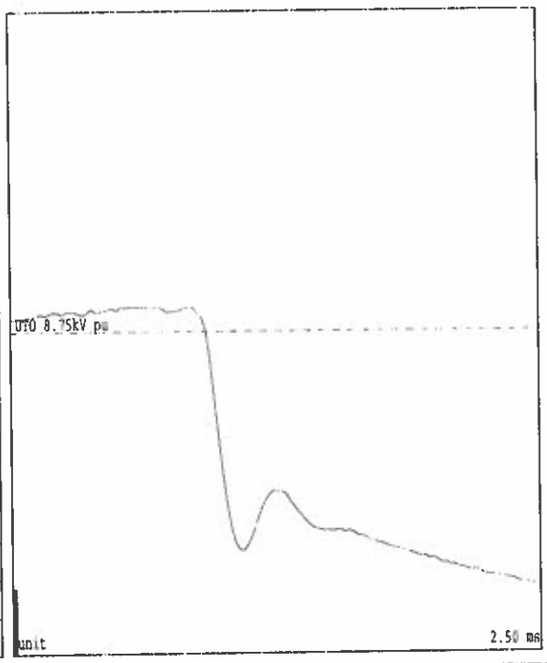
Remarks: Auxiliary breaker cleared.

T45



TEST NUMBER: 040625-6002

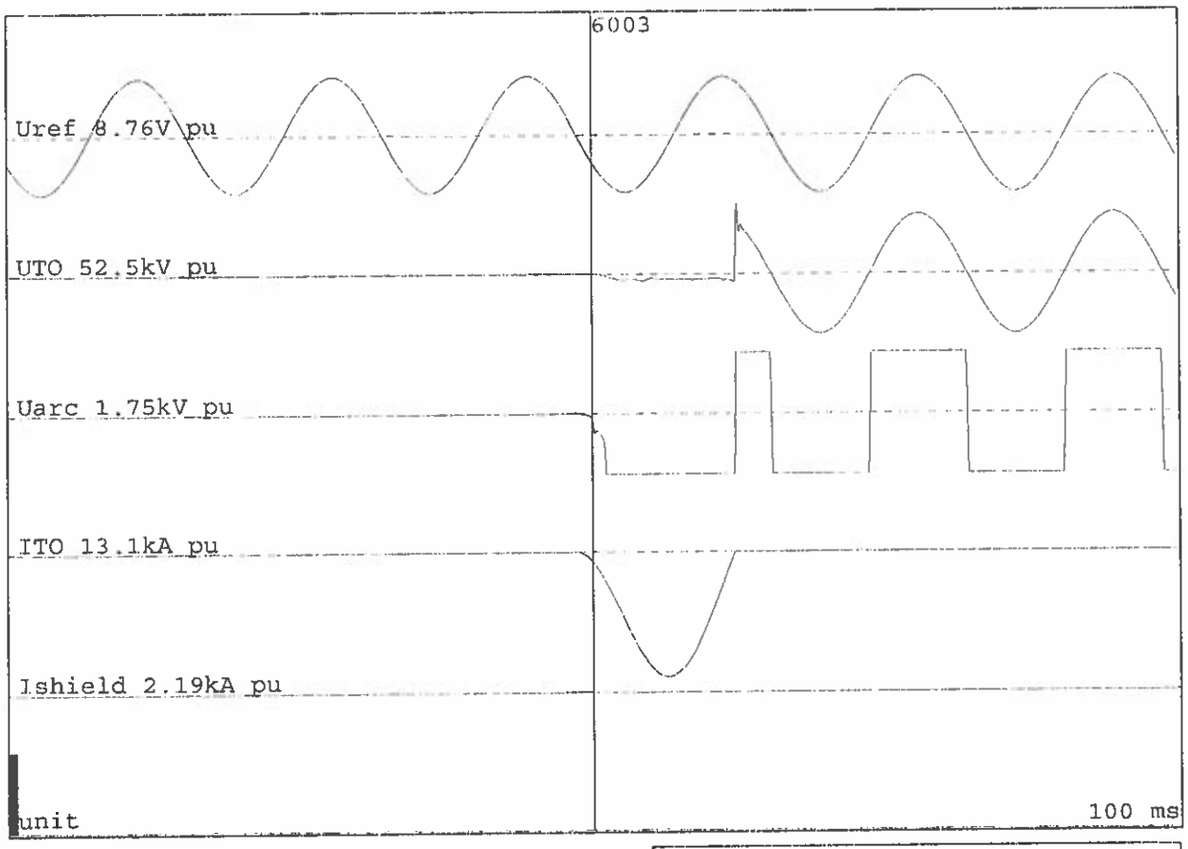
Applied voltage	kV	27,2
Prospective current	kA	8,10
Making angle related to voltage zero	°	142
Cut-off current	kA	2,30
Pre-arcing time	ms	0,600
Arcing time	ms	2,54
Total operating time	ms	3,14
Recovery voltage	kV	27,5
TRV, peak	kV	-38,5
Total I^2t	$x10^3$ A^2s	8,860

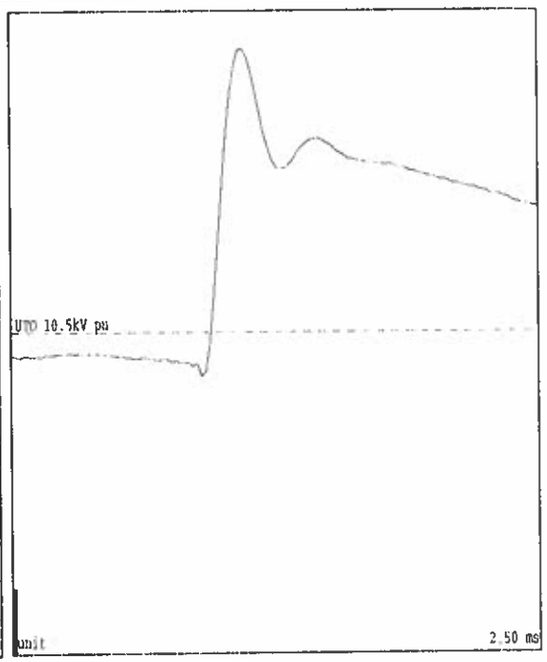


Rated voltage	27 kV	Rated current	6 A
Duration of recovery voltage	0,5 s	Ambient temperature	20 °C
Manufacturer of fuse-link	J&W	Type of fuse-link:	K

Remarks: Fuse cleared.

T91





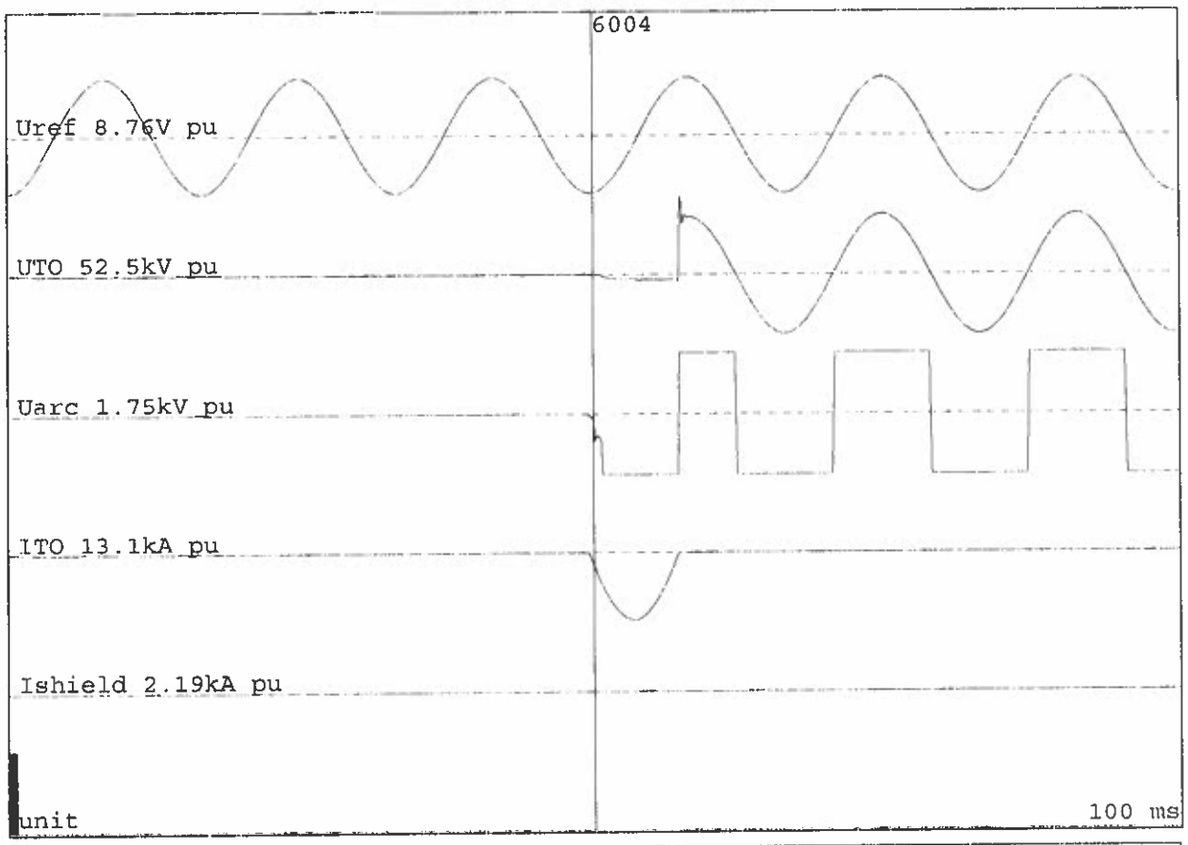
TEST NUMBER: 040625-6003

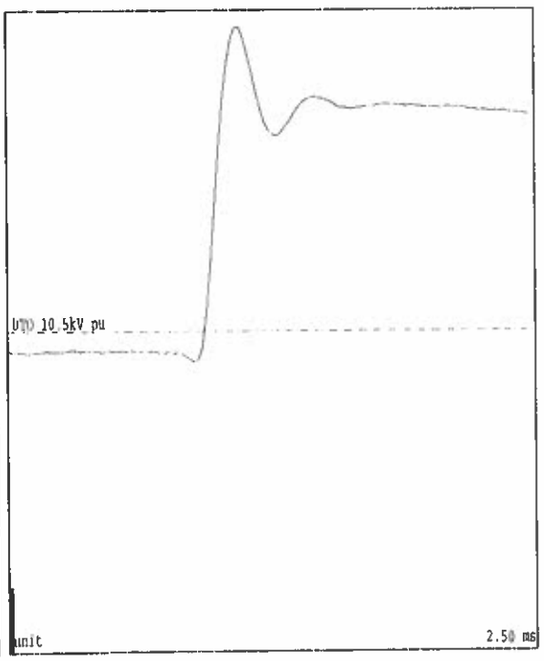
Applied voltage	kV	27,2
Prospective current	kA	8,10
Making angle related to voltage zero	°	12,5
Cut-off current	kA	-20,0
Pre-arcing time	ms	1,02
Arcing time	ms	12,2
Total operating time	ms	13,2
Recovery voltage	kV	27,2
TRV, peak	kV	46,5
Total I^2t	$x10^3$ A^2s	2267

Rated voltage	27 kV	Rated current	6 A
Duration of recovery voltage	0,5 s	Ambient temperature	20 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	K

Remarks: Fuse cleared

T91





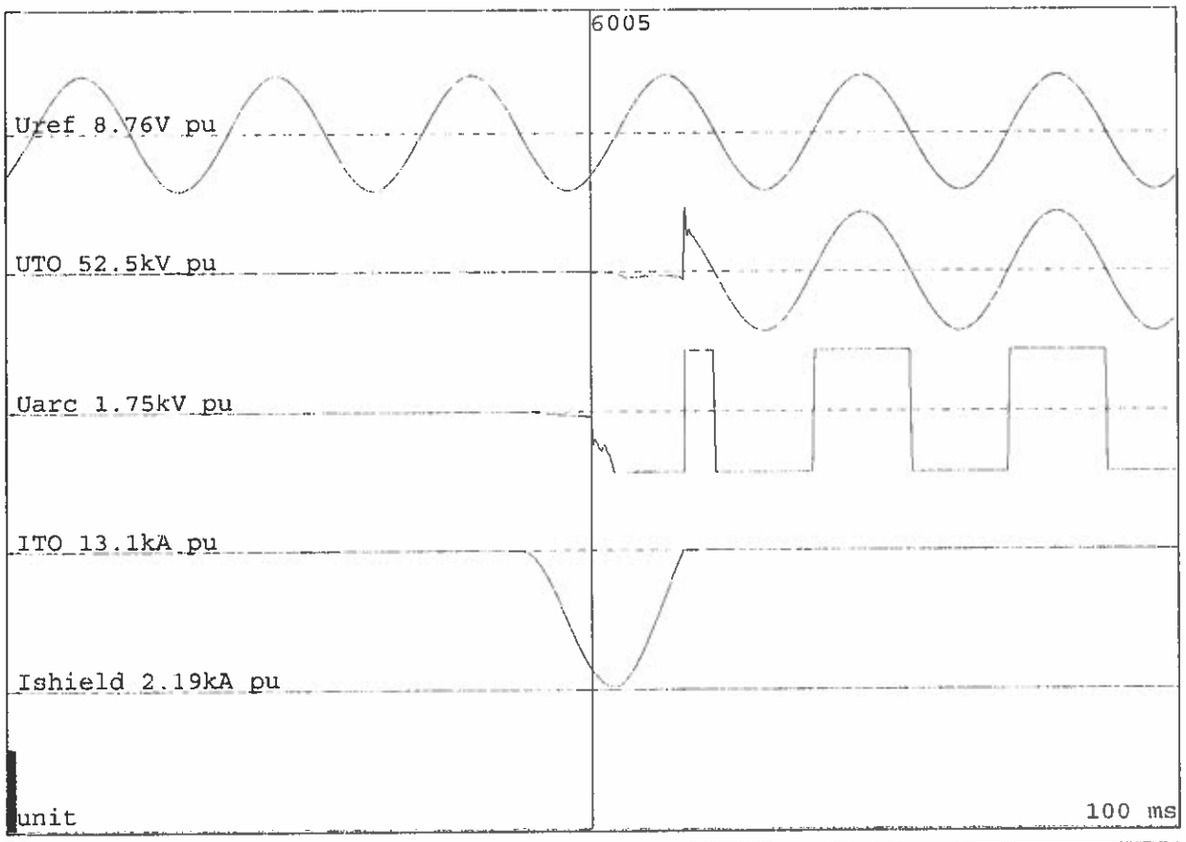
TEST NUMBER: 040625-6004

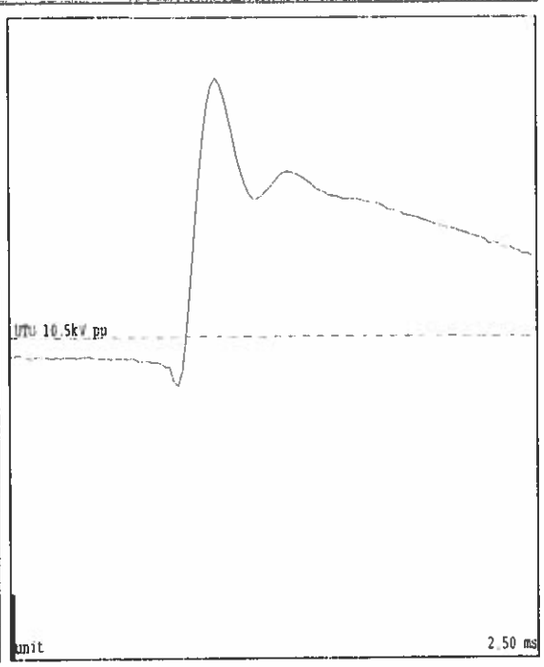
Applied voltage	kV	27,2
Prospective current	kA	8,10
Making angle related to voltage zero	°	86,0
Cut-off current	kA	-10,9
Pre-arcing time	ms	0,480
Arcing time	ms	7,28
Total operating time	ms	7,76
Recovery voltage	kV	27,1
TRV, peak	kV	49,7
Total I^2t	$x10^3$ A^2s	466,5

Rated voltage	27 kV	Rated current	6 A
Duration of recovery voltage	0,5 s	Ambient temperature	20 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	K

Remarks: Fuse cleared.

T61





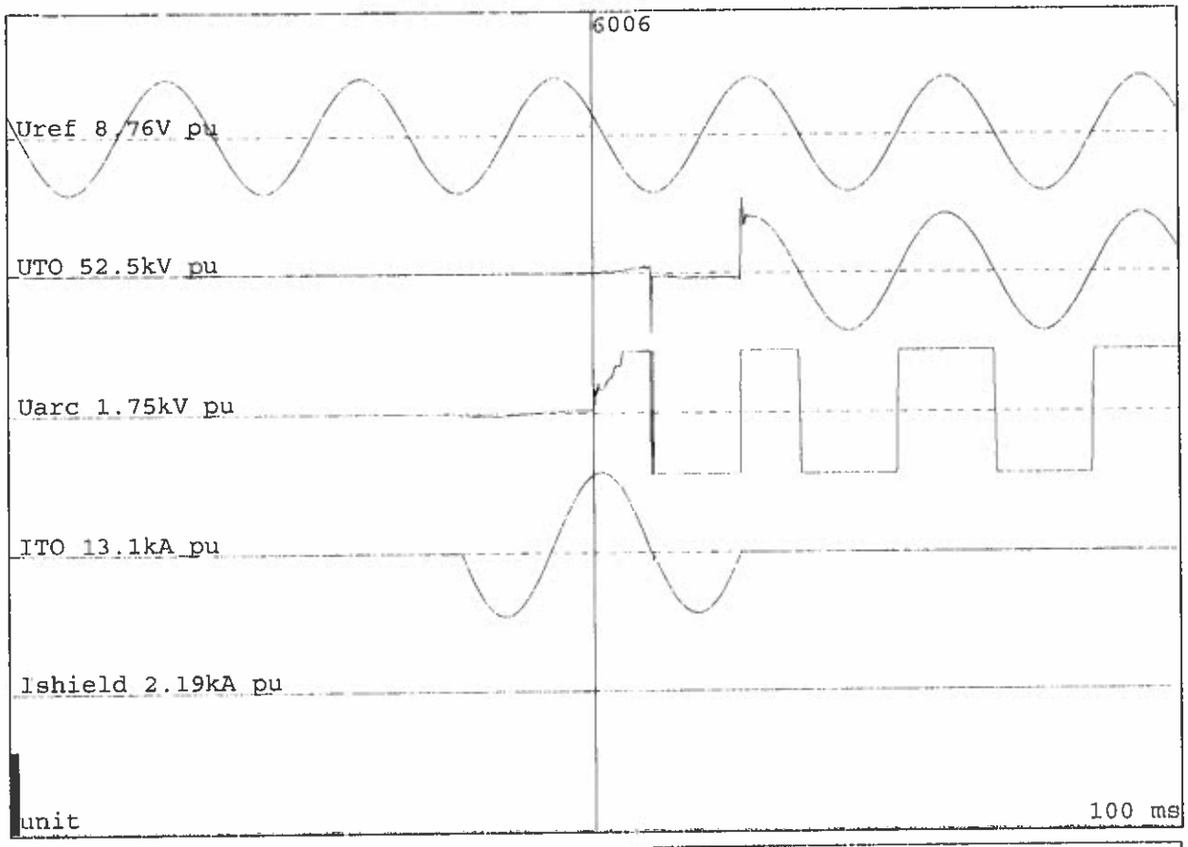
TEST NUMBER: 040625-6005

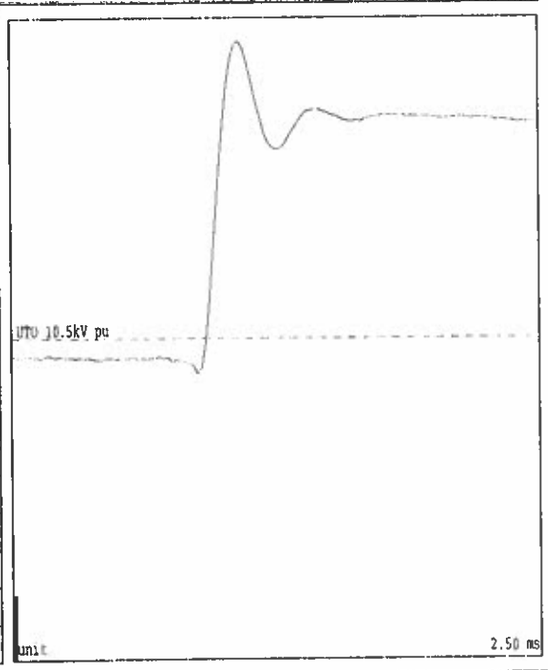
Applied voltage	kV	27,0
Prospective current	kA	8,10
Making angle related to voltage zero	°	13,0
Cut-off current	kA	-21,9
Pre-arcing time	ms	5,85
Arcing time	ms	7,84
Total operating time	ms	13,7
Recovery voltage	kV	26,9
TRV, peak	kV	40,9
Total I^2t	$x10^3$ A^2s	2752

Rated voltage	27 kV	Rated current	100 A
Duration of recovery voltage	0,5 s	Ambient temperature	20 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	T

Remarks: Fuse cleared.

T61



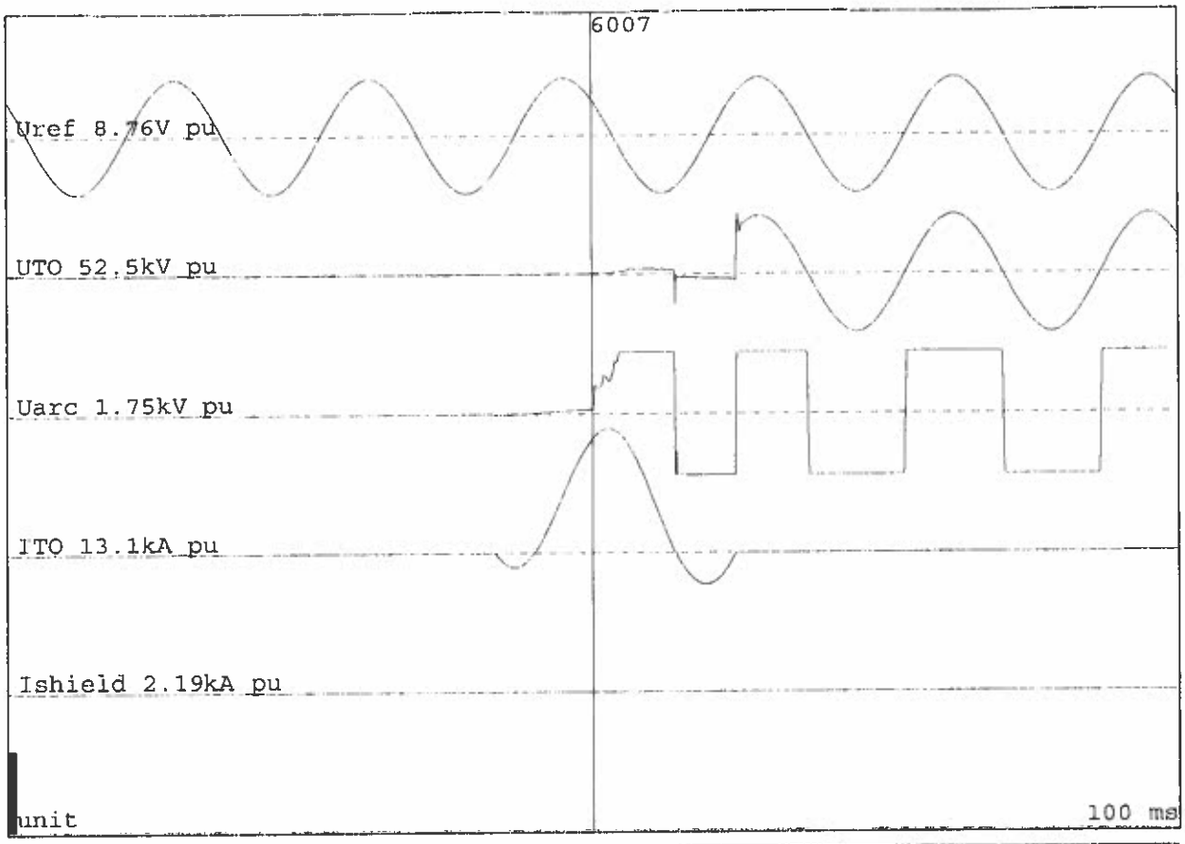


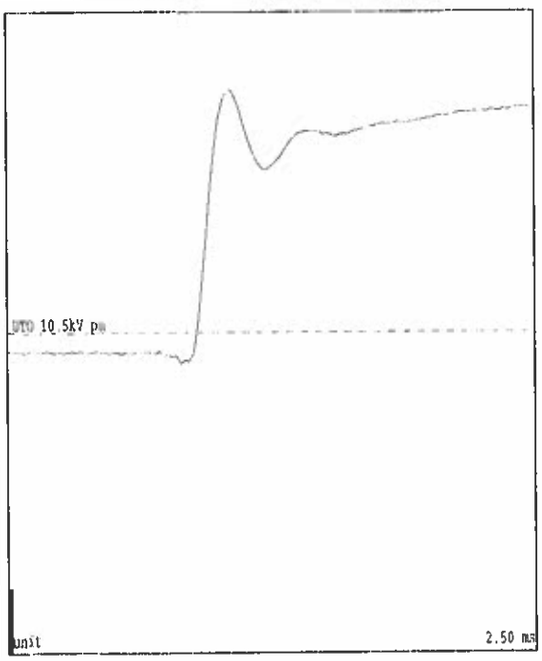
TEST NUMBER: 040625-6006

Applied voltage	kV	27,2
Prospective current	kA	8,10
Making angle related to voltage zero	°	92,9
Cut-off current	kA	12,8
Pre-arcing time	ms	11,4
Arcing time	ms	12,6
Total operating time	ms	24,0
Recovery voltage	kV	26,9
TRV, peak	kV	48,8
Total I^2t	$x10^3$ A^2s	1481

Rated voltage	27 kV	Rated current	100 A
Duration of recovery voltage	0,5 s	Ambient temperature	20 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	T

Remarks: Fuse cleared.





TEST NUMBER: 040625-6007

Applied voltage	kV	27,2
Prospective current	kA	8,10
Making angle related to voltage zero	°	141
Cut-off current	kA	19,8
Pre-arcing time	ms	8,36
Arcing time	ms	12,3
Total operating time	ms	20,6
Recovery voltage	kV	26,9
TRV, peak	kV	39,9
Total I^2t	$x10^3$ A^2s	2231

Rated voltage	27 kV	Rated current	100 A
Duration of recovery voltage	0,5 s	Ambient temperature	20 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	T

Remarks: Fuse cleared.

T91

CONDITION / INSPECTION AFTER TEST

After each test fuse-carrier dropped out.

AFTER TEST
040625 - 6004

AFTER TEST
040625-6007

TEST NUMBERS

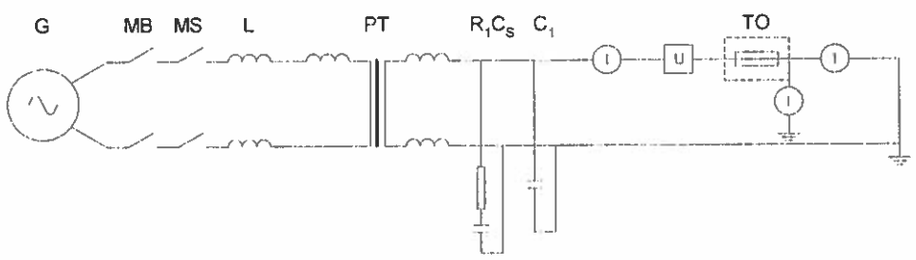
040625-6009
040625-6010
040625-6011
040625-6012
040625-6013
040625-6014
040625-6015

CONDITION BEFORE TESTS

Fuse-base in same condition.
Before test 040625-6010 and 6013 fuse-carrier new.
Before each test new fuse-link.

Metallic screens placed at the top and bottom of the unit at a distance of 100 cm and connected to the neutral of the supply with an earth fault current indicating CT.

TEST-CIRCUIT S09



G	= Generator	TO	= Test Object	U	= Voltage Measurement to earth
MB	= Master Breaker	L	= Reactor	I	= Current Measurement
MS	= Make Switch	R	= Resistor		
PT	= Power Transformer	C	= Capacitor		

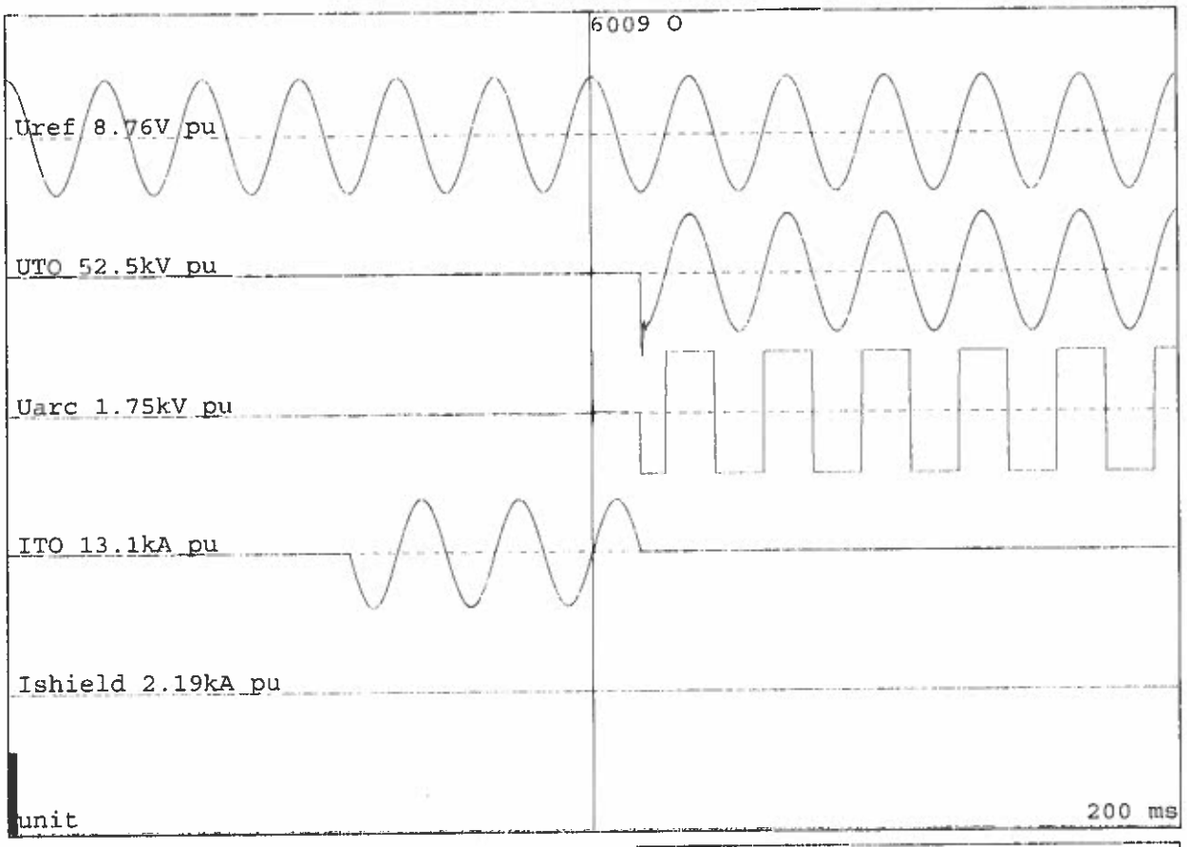
Supply		
Power	MVA	162
Frequency	Hz	60
Phase(s)		1
Voltage	kV	27
Current	kA	6
Impedance	Ω	4,5
X/R		> 12
Neutral		not earthed

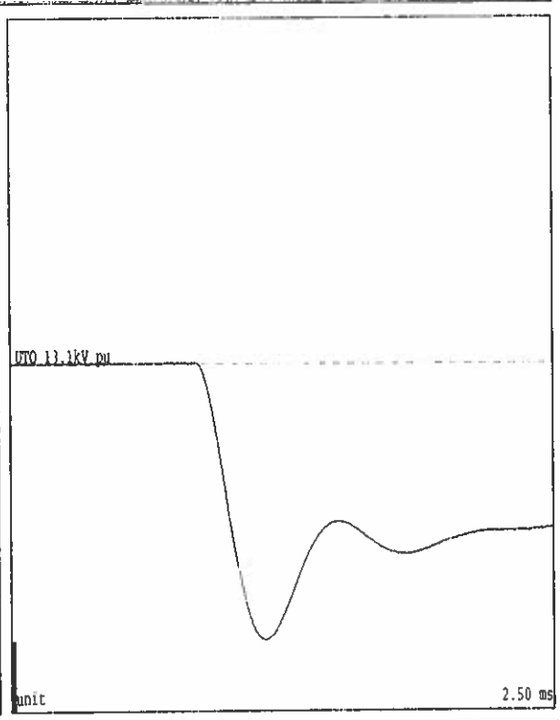
TRV control elements added (supply)		
C_1	µF	0,72
R_1 (in parallel)	Ω	200
C_s (in series)	µF	1,32
L_1	mH	
C_d	nF	
Neutral		earthed

Prospective TRV of supply		
E_2	kV	53
T_2	µs	292
t_d	µs	< 43,8
Rate of rise	V/µs	211

Load	
Short-circuit point	earthed

Remarks: -



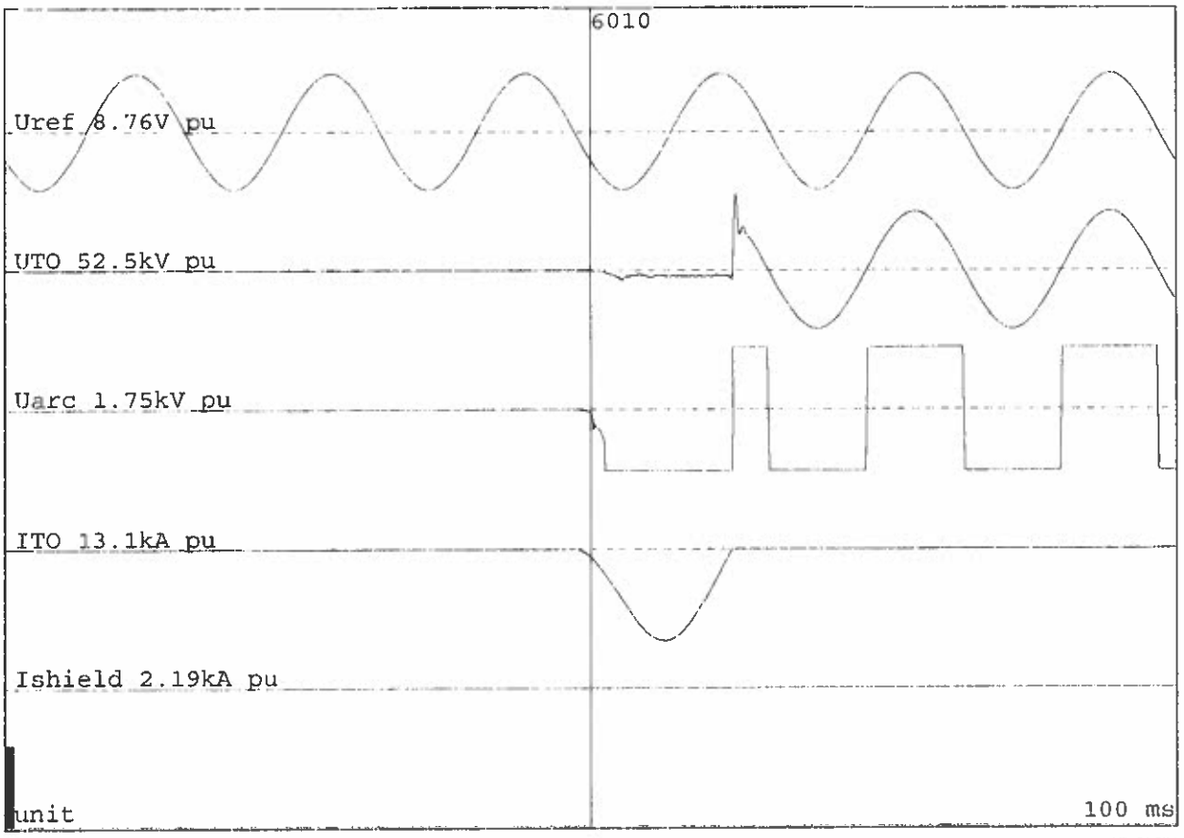


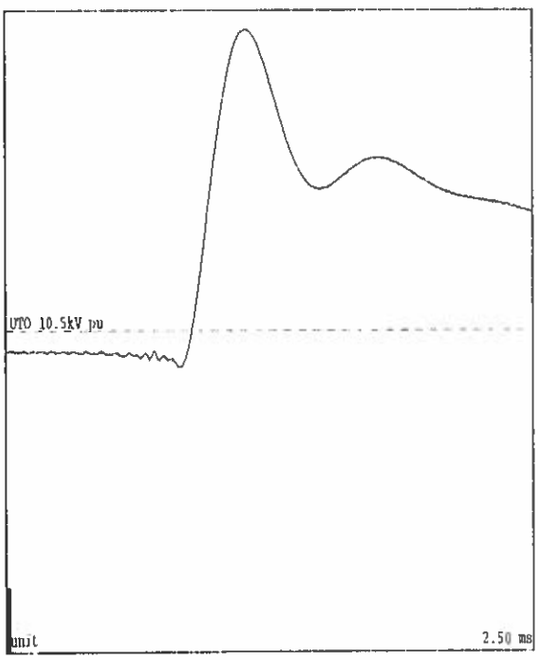
TEST NUMBER: **040625-6009**

Time interval since previous test	min	
Operation		O_{as}
Phase		1
Breaking current, phase value	kA	6,05
Breaking current, DC-component	%	0,067
Recovery voltage, phase value	kV	26,8
TRV, peak	kV	-52,5
Arc duration	ms	8,44
Opening time	ms	40,1
Break time	ms	48,5

Voltage opening coil	Gas pressure at 20 °C Operating pressure

Remarks: Auxiliary breaker cleared.





TEST NUMBER: 040625-6010

Applied voltage	kV	27,0
Prospective current	kA	6,00
Making angle related to voltage zero	°	11,9
Cut-off current	kA	-14,8
Pre-arcing time	ms	1,12
Arcing time	ms	12,1
Total operating time	ms	13,2
Recovery voltage	kV	27,0
TRV, peak	kV	49,5
Total I^2t	$x10^3$ A^2s	1243

Rated voltage	27 kV	Rated current	6 A
Duration of recovery voltage	0,5 s	Ambient temperature	20 °C
Manufacturer of fuse-link:	J&W	Type of fuse-link:	K

Remarks: Fuse cleared.

T91