ALSTOM

TRANSMISSION & DISTRIBUTION
Transformateurs de Mesure

CAPACITOR VOLTAGE TRANSFORMER

CCV 123

TYPE TEST CERTIFICATE N°13751

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ALSTOM T&D Transformateurs de Mesure SA
au capital de 14 000 000 F
343 074 092 RCS Nanterre
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APE 311 A - TVA FR 05 343 074 092

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CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

CAPACITOR VOLTAGE TRANSFORMER

Typ CCV 123

- Serial N° of apparatus tested	217 120
- Rated primary voltage	110/V3 kV
- Highest system voltage	125 kV
- Power frequency withstand voltage	230 kV
- Impulse withstand voltage	550 kV
- Rated capacitance	5 000 pF - 5 % + 10 %
- Rated secondary voltage	100/V3 V
- Burden and accuracy class	50 VA cl. 0.5
	150 VA cl. 3
- Thermal burden	500 VA
- Rated voltage factor	1.9 Un - 8 h
- Rated frequency	50 Hz
- Standard	IEC 186 - 358 and 44-4

MONTROUGE : October 5th 1988

Responsable for tests

R. TORRES

Quality Department

V. DENIZEAUX

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ESSAIS EFFECTUÉS DANS L'ORDRE INDIQUÉ CI-APRES : N° 13 751
TESTS DONE AS FOLLOWS :

Références *References*	Consistance des essais *Table of contents*	Lieu et date des essais (1) *Place and date*	N° des feuillets *No of sheets*	Conclusions des essais (2) *Conclusions*
CEI-IEC 186 Art. clause 21 - 56	Vérification du marquage des bornes Marquage des plaques signalétiques Verification of terminals markings Rating place markings	Plateforme H.T. 29/8/88		C
CEI-IEC 186 Art. clause 17 - 54	Essais diélectriques à fréquence industrielle. Power frequency tests	Plateforme H.T. 28/8/88	3	S
CEI-IEC 358 Art. clause 8	Mesure de la tangente et de la capacité à fréquence industrielle. Capacitance and tangent of the loss angle	Plateforme H.T. 28/08/88	4	C
CEI-IEC 44-4 270	Essais de décharges partielles Partial discharges tests	Plateforme H.T. 28/8/88	5-6	S
CEI-IEC 358 Art. clause 10	Mesure de la capacité et de la résistance série à 200 kHz et à fréquence industrielle 200 kHz and normal frequency capacitance and equivalent resistance	Plateforme H.T. 28/8/88	4	C
CEI-IEC 186 Art. clause 44	Essai de précision en régime établi Frequency accuracy tests	Plateforme H.T. 28/8/88	7 et 8 7 and 8	C
CEI-IEC 186 Art. clause 52	Essai en régime transitoire Transient response test	L.E.S. 31/8/88	9 à 14 9 to 14	C
CEI-IEC 358 Art. clause 10	Mesure de la capacité et de la résistance série en fonction de la fréquence High frequency capacitance and equivalent resistance	L.E.S. 3/8/88	15 à 17 15 to 17	C
CEI-IEC 358 Art. clause 10	Mesure de la capacité et de la conductance parasites vues de la borne H.F. Stray conductance and stray capacitance from H.F. terminal	L.E.S. 31/8/88	15-18 19	C
CEI-IEC 186 Art. clause 13	Essais de choc Impulse voltage tests	L.E.S. 29/8/88	20 à 25 20 to 25	S

(1) S : **satisfaisant** *satisfactory*

(2) C : **conforme** *conform*

NOTA : CEI 186 année 1987 - IEC 186 year 1987
CEI 358 année 1971 - IEC 358 year 1971

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N° 13 751

TESTS DONE AS FOLLOWS :

Références *References*	Consistance des essais *Table of contents*	Lieu et date des essais (1) *Place and date*	N° des feuillets *No of sheets*	Conclusions des essais (2) *Conclusions*
CEI-IEC 186 Article-clause 51	Essai de ferro-résonance Ferro-resonance test	L.E.S. 1/9/88	26 à 34 26 to 34	C
CEI-IEC 186 Article-clause 11	Essai d'échauffement Temperature rise test	L.E.S. 22/8 au (to) 26/8/88	35 à 38 35 to 38	C
	Bobine de drainage courbe d'impédance en fonction de la fréquence Drain coil impedance frequency curve	L.E.S.	40	

(1) S : satisfaisant *satisfactory*

(2) C : conforme *conform*

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CERTIFICAT D'ESSAI
TEST CERTIFICATE
PROTOCOLO DE PRUEBAS

N° 13 751

ESSAIS EFFECTUÉS - *TESTS DONE* - ENSAYOS EFFECTUADOS

Références *References* Referencias	Consistance des essais *Table of contents* Contenido de las pruebos	Tension en Kv *Voltage in Kv)* Tension en Kv	Fréquence d'essai en Hz *Test frequency* Frecuencia en Hz	Durée de l'essai en secondes *Duration of test in seconds* Duracion de la prueba en segundos	Conclusion des essais (1) *Conclusion* Conclusion
CEI-IEC 186 Art. clause 54	Entre la borne P2 et la masse Between P2 terminal and earth	10	50	60	S
	Entre la borne HF et la masse Between HF terminal and earth	10	50	60	S
CEI-IEC 186 Art. clause 54	Sur C total On C total	230	50	60	S
CEI-IEC 186 Article-clause 17	Essais dielectriques à fréquence industrielle des enroulements secondaires entre eux et masse Power frequency tests on secondaries windings between secondaries and to earth.	3	50	60	S
CEI-IEC 186 Art. clause 54	Essai à fréquence industrielle de l'élément électromagnétique. Electromagnetic unit power frequency test	31	175	35	S

(1) S : satisfaisant - *satisfactory* - satisfactorio C : conforme - *conform* - conforme

ÉTALONNAGE - CALIBRATION - CALIBRACION

Selon CEI 186 - 185. Erreur de rapport $\epsilon\ \% = 100 \frac{Kn\ Us\text{-}Up}{Up}$ ou $100 \frac{Kn\ Is\text{-}Ip}{Ip}$

IEC 186 - 185 *(Ratio error)* - Error de relacion

Kn — Rapport de transformation nominal - *(Rated transformation ratio)* - Relacion de transformacion nominal.

Up-Ip — Tension, courant primaire donné - *(actual primary voltage, current)* - Tension, corriente primaria.

Us-Is — Tension, courant secondaire correspondant à Up-Ip dans les conditions de mesure.
(Actual secondary voltage, current when Up-Ip applied of flowing under the conditions of measurement).
Tension, corriente segundaria correspondiente a Up-Ip dentro de las condiciones de medido.

Déphasage *(Phase displacement)* Desfase — Positif lorsque le vecteur de tension ou courant secondaire est en avance sur le vecteur tension ou courant primaire *(Positive when the secondary voltage or current leads the primary voltage or current vector).* Positivo cuando el vector de tension o corriente segundaria va adelantado sobre el vector tension o corriente primaria.

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CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

CAPACITANCE AND TANGENT OF THE LOSS ANGLE

200 kHz CAPACITANCE AND EQUIVALENT RESISTANCE

N° apparatus	50 Hz		200 kHz	
	Tg δ 10^{-3}	Rated Capacitance Pf	Résistance * Ω	Capacitance Pf
217 120	1.08	4 769	15	4 628

* Equivalent serie resistance (Ω)

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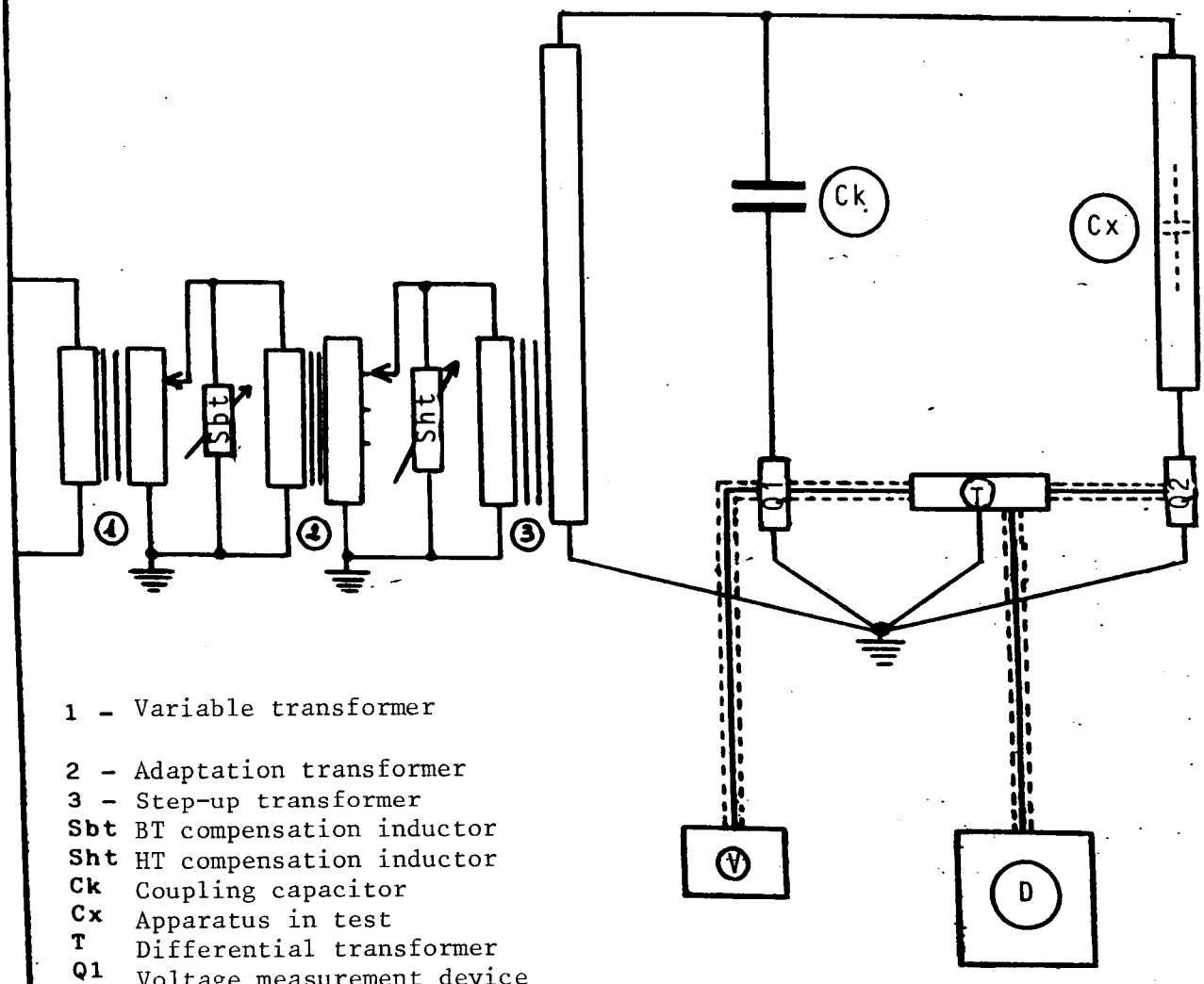
DECHARGES PARTIELLES
(partial discharges)

N° d'appareil (Serial N°)	U en kV (U in kV)	Niveau en pC (level in pC)
217 120	87	< 2

DIRECTIVES



1 - Variable transformer

2 - Adaptation transformer
3 - Step-up transformer
Sbt BT compensation inductor
Sht HT compensation inductor
Ck Coupling capacitor
Cx Apparatus in test
T Differential transformer
Q1 Voltage measurement device
Q2 DP measurement device
V Voltmeter
D DP detector (5 model Robinson)

Désignation : MESURE DE DECHARGES PARTIELLES

PARTIAL DISCHARGES MEASUREMENT

Date : 2/5/85

Visa G. NVS

Service concepteur 2,1,0,

0,0,7,

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X	Z	B			D			F			
A		C			E			G			

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CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

PRECISION EN REGIME ETABLI

FREQUENCY ACCURACY TESTS

	Fn %	99 %		100 %		101 %	
	F	49,5 Hz		50 Hz		50,5 Hz	
Un en %	Charge	ε en %	ψ en mn	ε en %	ψ en mn	ε en %	ψ en mn
1,2	50	- 0,13	+ 7,5	- 0,14	+ 3,5	- 0,16	- 2
1	VA	- 0,13	+ 8	- 0,14	+ 3,5	- 0,16	- 2
0,8	0,8	- 0,12	+ 8	- 0,14	+ 3,5	- 0,16	- 1,5
1,2	10	+ 0,20	+ 2	+ 0,22	- 0,5	+ 0,26	- 3
1	VA	+ 0,20	+ 2	+ 0,22	- 0,5	+ 0,26	- 3,5
0,8	0,8	+ 0,19	+ 2	+ 0,22	- 0,5	+ 0,26	- 3
VALEURS LIMITES CEI 1,2 / 1 / 0,8		± 0,5 %	± 20 '	± 0,5 %	± 20 '	± 0,5 %	± 20'

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CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

PRECISION EN REGIME ETABLI

FREQUENCY ACCURACY TESTS

	Fn %	96 %		100 %		102 %	
	F	48 Hz		50 Hz		51 Hz	
Un en %	Charge	ε en %	ψ en mn	ε en %	ψ en mn	ε en %	ψ en mn
1,9	150	- 0,47	+ 56	- 1,12	+ 10	- 1,48	- 11
1	VA	- 0,48	+ 55	- 1,1	+ 10	- 1,35	- 12
0,05		- 0,29	+ 65	- 1,02	+ 12	- 1,30	- 3
0,02	0,8	- 0,20	+ 70	- 0,07	+ 10	- 0,26	+ 3
1,9	30	+ 0,25	+ 20	+ 0,03	+ 1	+ 0,03	+ 2
1	VA	+ 0,18	+ 17	+ 0,03	+ 1	+ 0,06	- 6,5
0,05		+ 0,34	+ 32	+ 0,06	+ 3,5	+ 0,03	- 2
0,02	0,8	+ 0,46	+ 26	+ 0,08	+ 5	+ 0,03	+ 2
VALEURS LIMITES CEI 1,9 / 1 / 0,05		3 %	2°	3 %	2°	3 %	2°
0,02		6 %	4°	6 %	4°	6 %	4°

CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

TRANSIENT REPONSE TEST

The transient reponse test is made on the equivalent circuit (THEVENIN). The A marked terminal is connected at HF terminal. These terminals are connected to the step-up transformer.

A synchronous closer ensures the short circuiting of the high voltage at the zero passage or at the peak of the primary voltage. A HV resistance : RI in series with a IV resistance R2 allow to make a differential voltage : Up-Us.

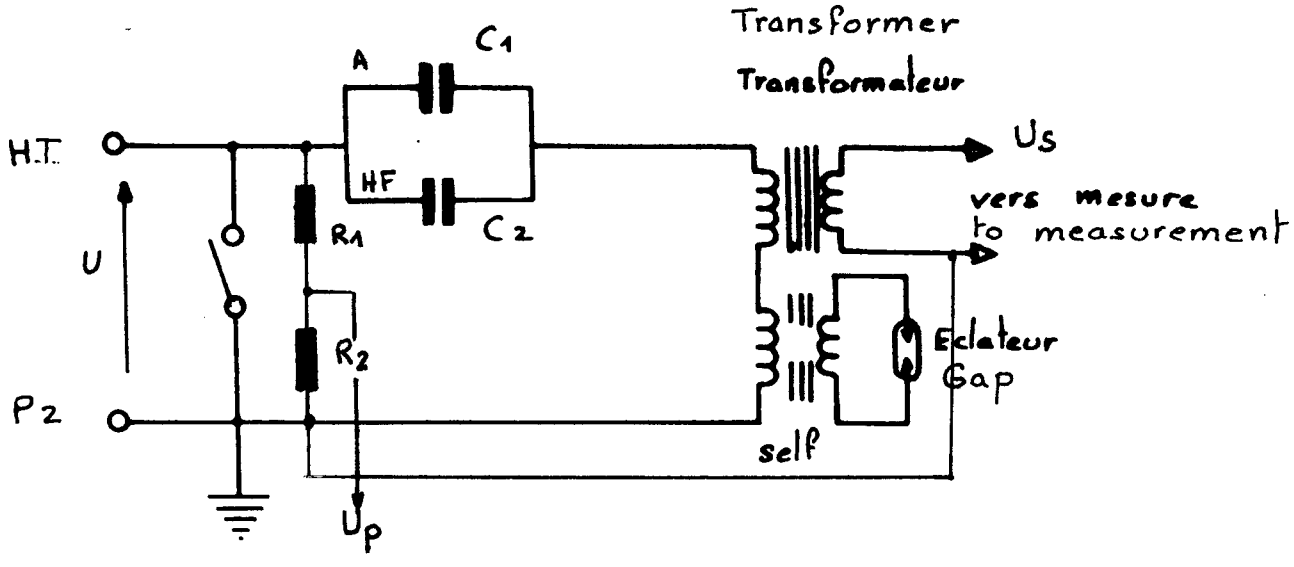
two signals are recorded.

- The differential voltage : Up - Us.
- The CCV secondary voltage.

Four tests are made for every burden value :

(burden's values are : 12,5 VA, 50 VA and 150 VA cos.φ 0.8).

- Two tests at the zero passage.
- Two tests at the peak value.



CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

TRANSIENT REPONSE TEST

The test is made on the equivalent circuit (THEVENIN). The test's results are in the following list.

The applied voltage is : 8 520 V.

It is the result of the C1 and C2 mesured values and represents the nominal voltage in the equivalent THEVENIN circuit.

	ε 20 ms en % CEI in % IEC	ε 40 ms en % CEI in % IEC	ε 60 ms en % CEI in % IEC	ε 90 ms en % CEI in % IEC
	(burden) charge 50 VA 0,8			
Maximum de U Maximum of U	8,43			
Zéro de U Zero of U	7,09			
	(burden) charge 12,5 VA 0,8			
Maximum de U Maximum of U	7,88			
Zéro de U Zero of U	9,47			
valeurs admissibles CEI Maximum IEC values	10 %	non précisé without value	non précisé without value	non précisé without value

CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

TRANSIENT REPONSE TEST

The test is made on the equivalent circuit (THEVENIN). The test's results are in the following list.

The applied voltage is : 8 520 V.

It is the result of the C1 and C2 mesured values and represents the nominal voltage in the equivalent THEVENIN circuit.

	ε 20 ms en % CEI	ε 40 ms en % CEI	ε 60 ms en % CEI	ε 90 ms en % CEI
	(burden) charge 150 VA 0,8			
Maximum de U (maximum of U)	6,55			
Zéro de U (zero of U)	8,46			
	charge VA 0,8			
Maximum de U (maximum of U)				
Zéro de U (Zero of U)				
valeurs admissibles CEI (maximum IEC value)	10 %			

CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

LABORATOIRE D'ESSAIS SPECIAUX

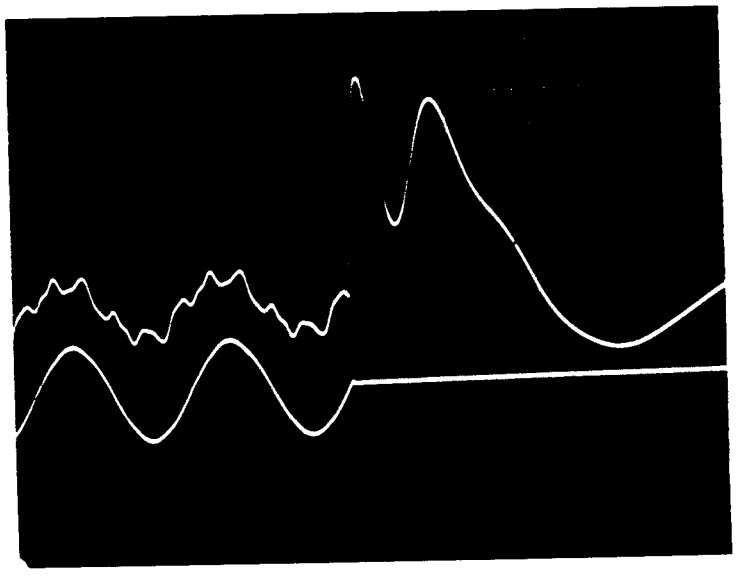
ESSAI DE COURT-CIRCUIT PRIMAIRE

Date de l'essai : 23/8/88

Type : CCV 123

N°

- Tension primaire : 8,52 kV
- Base de temps : 10 ms/carreau
- Δ U 50 mV/carreau



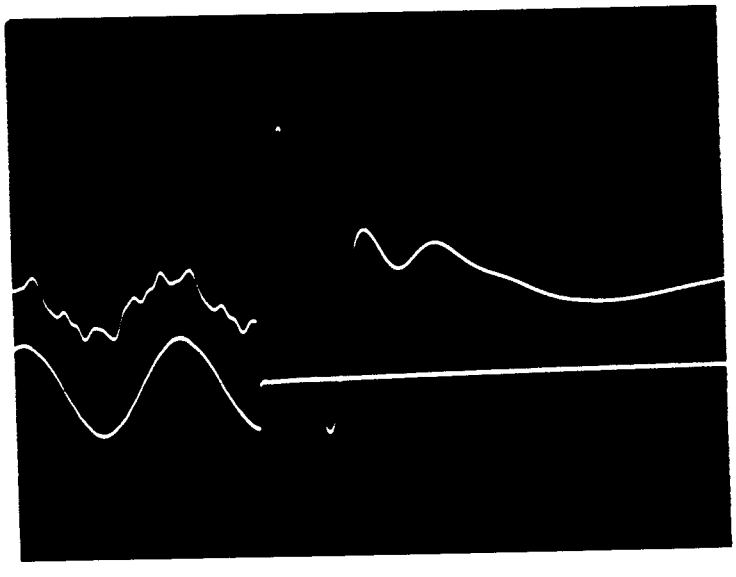
Charge 50 VA

Court-circuit au zéro de tension

ε 20 ms CEI : 8,43 %

ε ms CEI :

ε ms CEI :



Charge 50 VA

Court-circuit au maximum de tension

ε 20 ms CEI : 7,09 %

ε ms CEI :

ε ms CEI :

CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

TRANSIENT REPONSE TEST

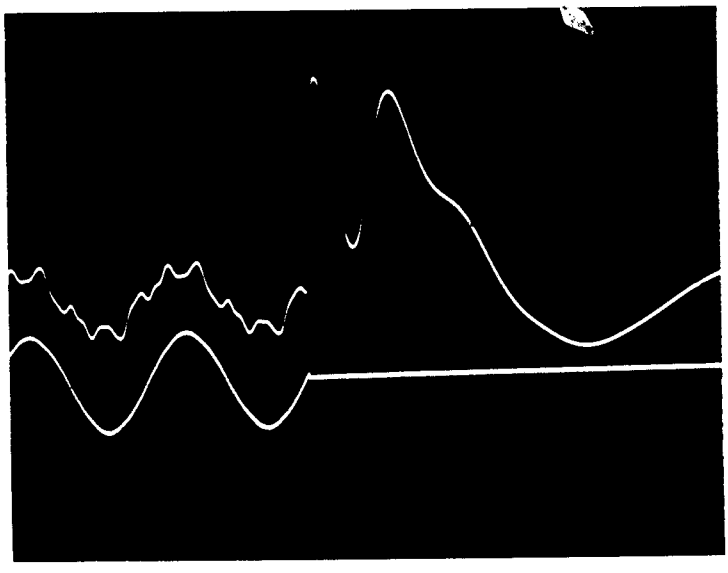
ESSAI DE COURT-CIRCUIT PRIMAIRE

Date de l'essai : 23/8/88

Date of test ;
Type : CCV 123

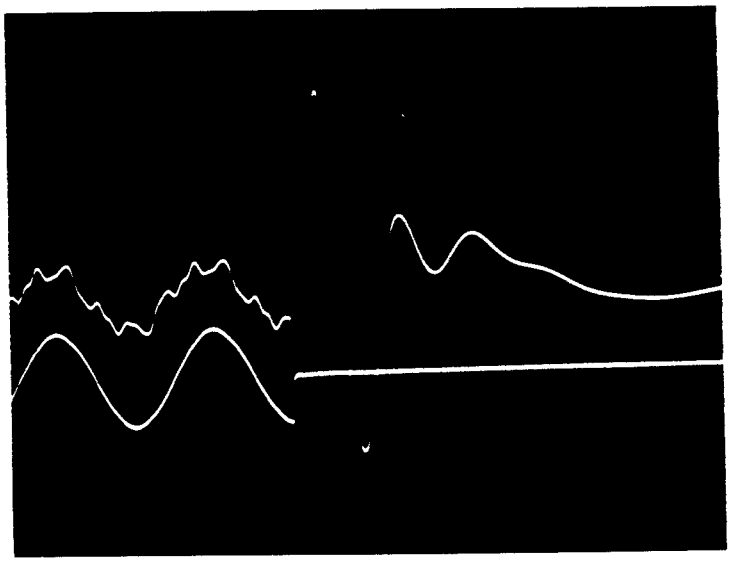
N°

- Tension primaire : 8,52 kV
- Primary voltage
- Base de temps : 10 ms/carreau
- Time mark
- Δ U 50 mV/carreau



Charge 12,5 VA
Burden 12.5 VA

Court-circuit au zéro de tension
Zero passage
ε 20 ms CEI : 9,47 %
ε ms CEI :
ε ms CEI :



Charge 12,5 VA
Burden 12.5 VA

Court-circuit au maximum de tension
Peak value
ε 20 ms CEI : 7,88 %
ε ms CEI :
ε ms CEI :

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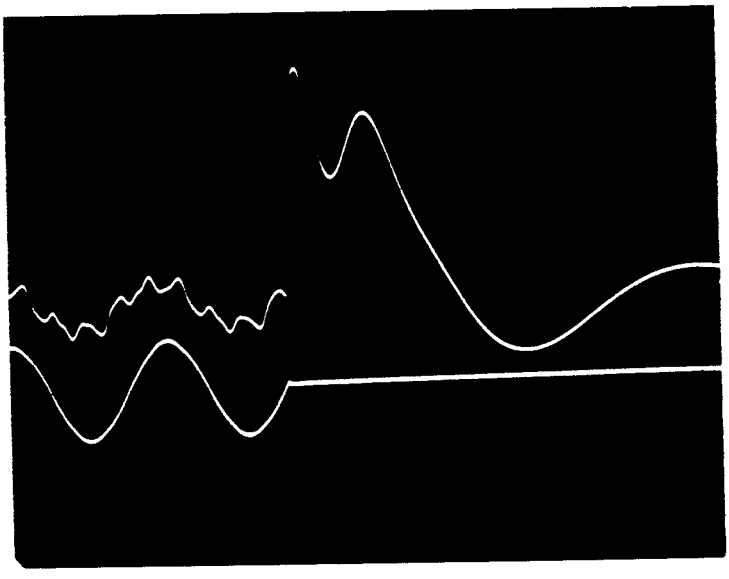
TRANSIENT REPONSE TEST

ESSAI DE COURT-CIRCUIT PRIMAIRE

Date de l'essai : 23/8/88
Date of test :
Type : CCV 123

N°

- Tension primaire : 8,52 kV
- Primary voltage
- Base de temps : 10 ms/carreau
- Time mark
- Δ U 50 mV/carreau



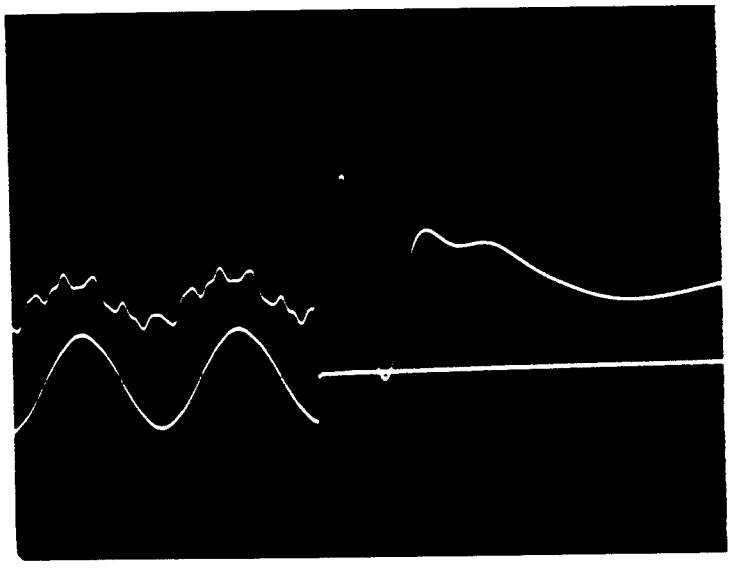
Charge 150 VA
Burden 150 VA

Court-circuit au zéro de tension
Zero passage

ε 20 ms CEI : 8,46 %

ε ms CEI :

ε ms CEI :



Charge 150 VA
Burden 150 VA

Court-circuit au maximum de tension
peak value

ε 20 ms CEI : 6,55 %

ε ms CEI :

ε ms CEI :

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CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

LABORATOIRE D'ESSAIS SPECIAUX

MESURE DE LA CAPACITE APPARENTE ET DE LA RESISTANCE EQUIVALENTE SERIE

A HAUTE FREQUENCE
(MEASUREMENT OF THE TOTAL CAPACITANCE AND SERIE RESISTANCE)

DATE DE L'ESSAI 31/8/1988
Date of test

TYPE CCV 123

N°

F kHz	R Ω	C pF
40	20	4 625
60	19	4 621
80	18	4 618
100	17	4 616
150	16	4 619
200	15	4 628
300	15	4 690
400	15	4 800
450	14	4 862
500	14	4 944
600	14	5 151

CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

CARRIER FREQUENCY TEST

1) Measurement of the total capacitance and série resistance

The total capacitance and the serie resistance are measured by a differential transformer bridge. A branch of this transformer is loaded by the CCV, the other branch, by a capacitor : Ca and an adjustable resistance : Ra.

For each frequency both elements Ca and Ra are fitted allowing so a minimal value of differential transformer secondary voltage.

2) Measurement of the stray capacitance and the stray conductance

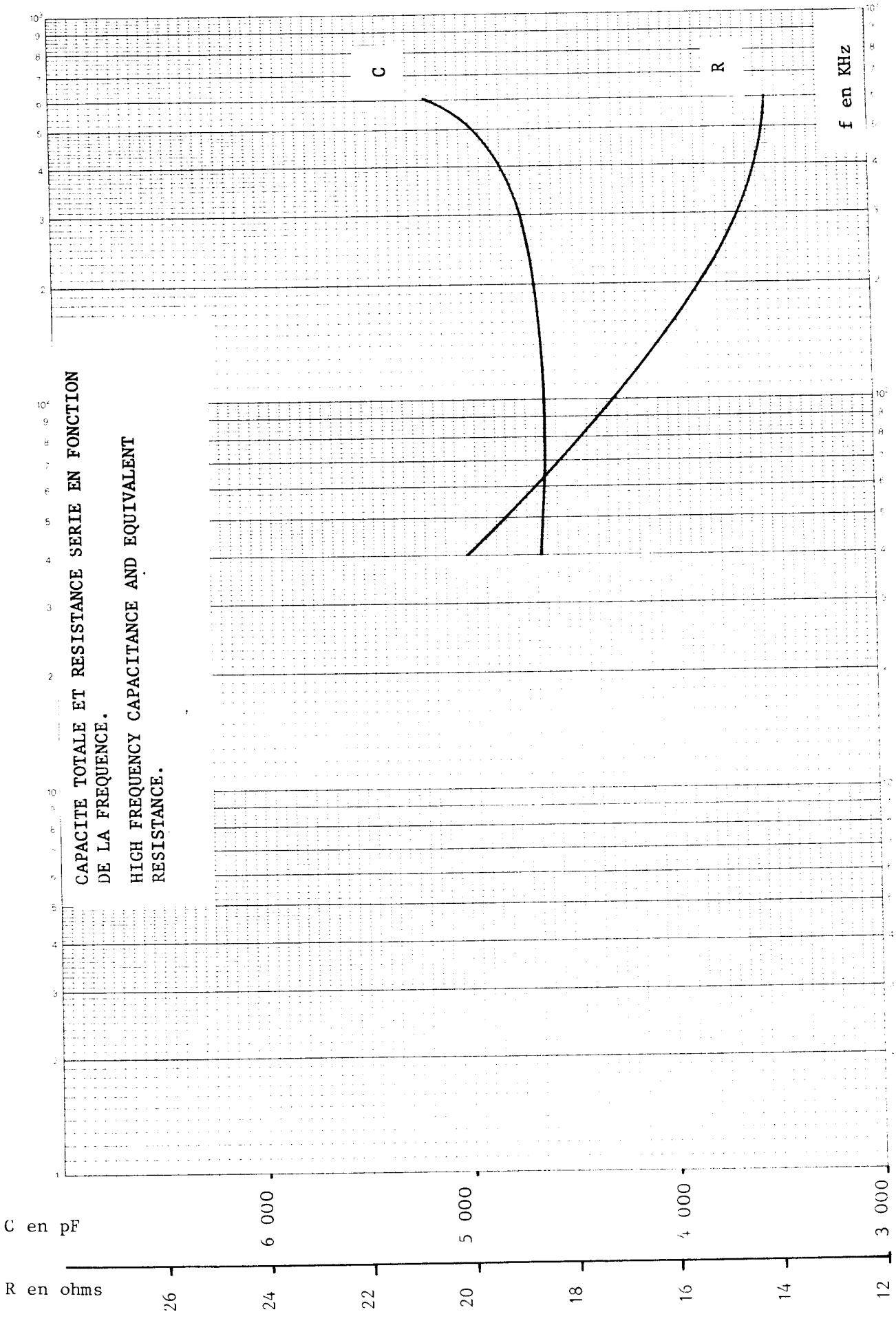
Which are seen from the H.F. terminal. The test is made between the HF. terminal and the ground terminal. This method uses the same differential transformer bridge that in item : 1

The values of series elements are transformed by anequation in parallel elements.

$$Rp = \frac{Rs \quad Cs^2 \quad \omega^2}{Rs^2 \quad Cs^2 \, \omega^2 + 1}$$

$$Cp = \frac{Cs}{Rs^2 \quad Cs^2 \, \omega^2 + 1}$$

CERTIFICAT D'ESSAI N° 13 751



CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

MESURE DE LA CAPACITE ET DE LA CONDUCTANCE PARASITES VUES DE LA BORNE HF

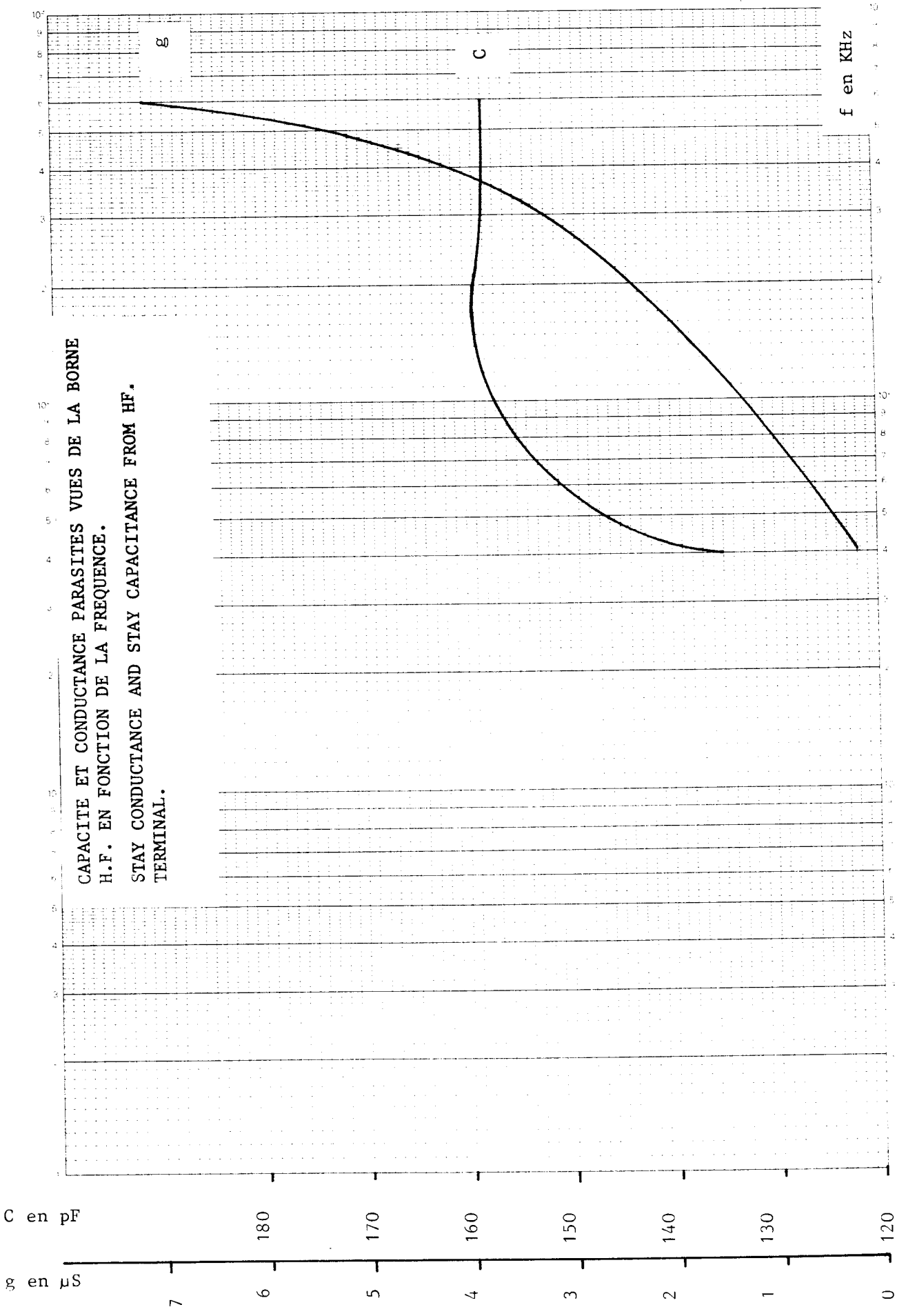
(MEASUREMENT OF THE STRAY CAPACITANCE AND THE STRAY CONDUCTANCE)

DATE DE L'ESSAI 31/8/1988
Date of test
TYPE CCV 123

N°

F kHz	Cp en pF	ε en µS
40	135	0,2
60	151	0,6
80	155	0,9
100	157	1,4
150	159	1,6
200	159	2,6
300	158	3,2
400	158	3,8
450	158	4,6
500	158	5,4
600	158	7,1

CERTIFICAT D'ESSAI N° 13 751



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IMPULSE TEST

- Test conditions

The wave form used is the conventional form about 1.2/50 µs of the IEC 186 Spécifications.

The high voltage is applied to the A primary terminals of the complete apparatus (capacitor with his electromagnetic unit).

The secondary terminals are grounded.

The impulse voltage is measured across a RC potentiometer by an impulse voltmeter.

The current is measured across a whide-band current transformer, and recorded.

- 15 positive full wave impulses and
- 15 negative full wave impulses

are applied to the apparatus.

The results of impulse test are satisfactory.

CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

ESSAIS DE CHOCS

IMPULSE TESTS

Générateur de chocs

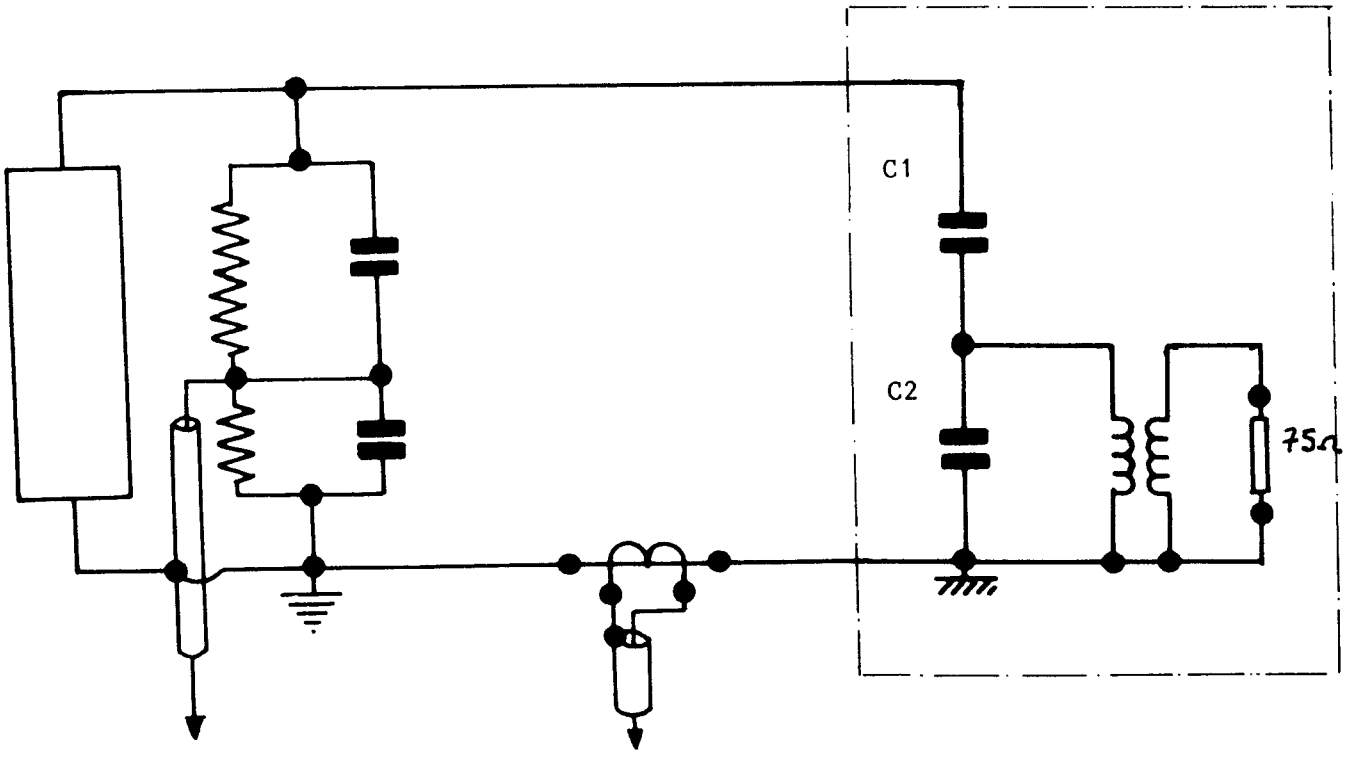
Impulse générator

Diviseur de choc

Impulse divider

Appareil en essai

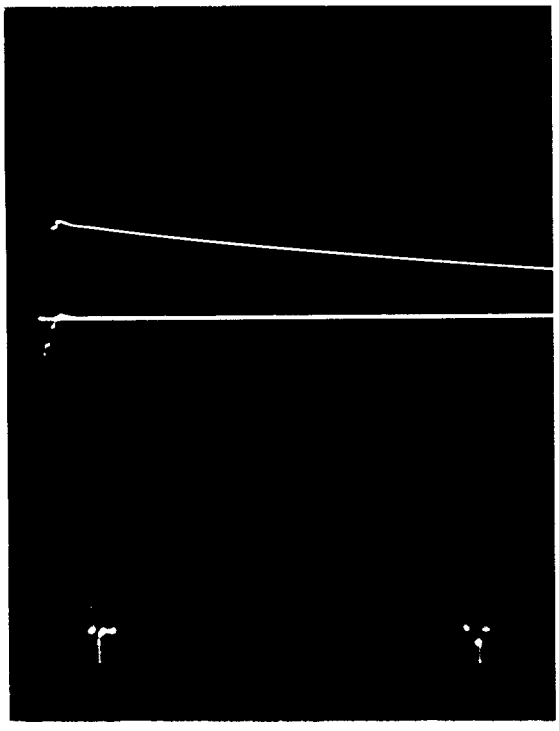
Apparatus in test



Vers centrale de mesure

To measurement

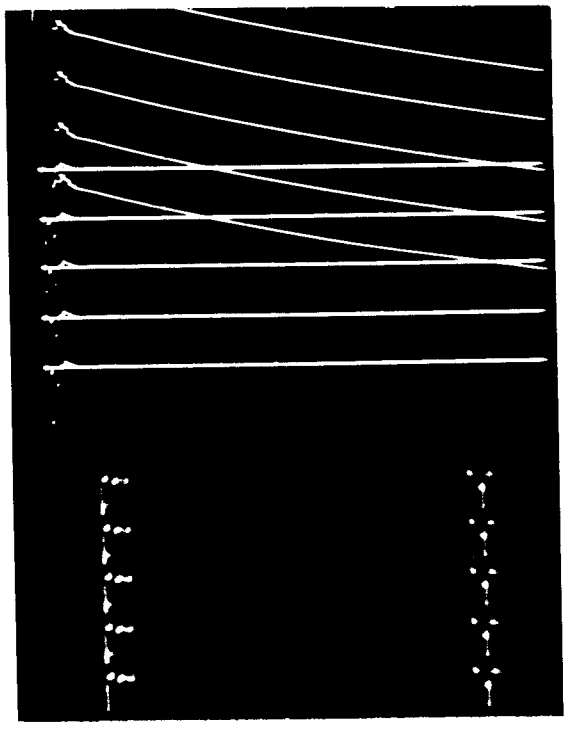
CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751



Onde à demi-tension positive
Positive half full wave

Tension de choc	275	kV
Impulse voltage	275	kV

Up	5	µs/marque tension primaire
Up	5	µs/division primary voltage
Is	5	µs/marque courant secondaire
Is	5	µs/division secondary current

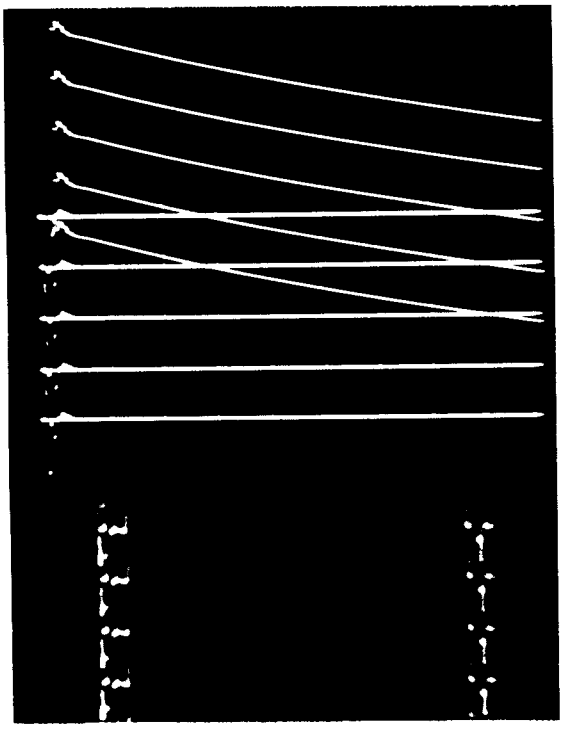


Onde à pleine tension
Full wave impulse

5 chocs	550	kV
5 impulses	550	kV

Up	5	µs/marque
Up	5	µs/division
Is	5	µs/marque
Is	5	µs/division

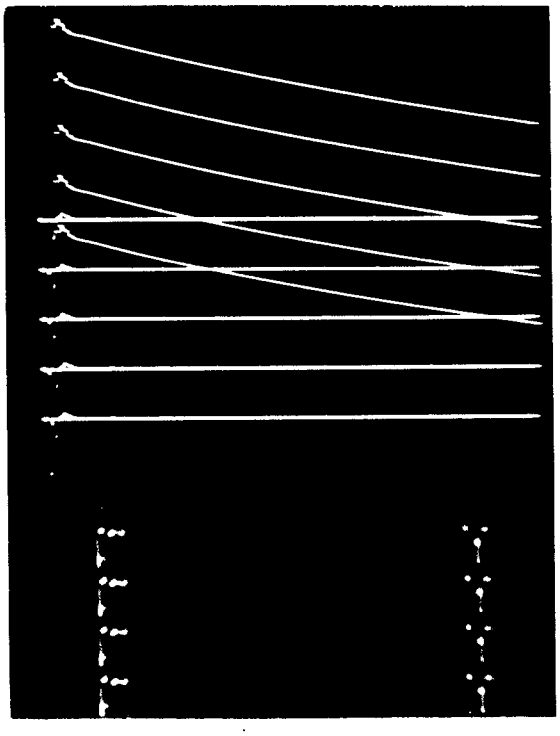
CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751



5 chocs	550	kV
5 impulses	550	kV

Up	5	µs/marque
Up	5	µs/division

Is	5	µs/marque
Is	5	µs/division

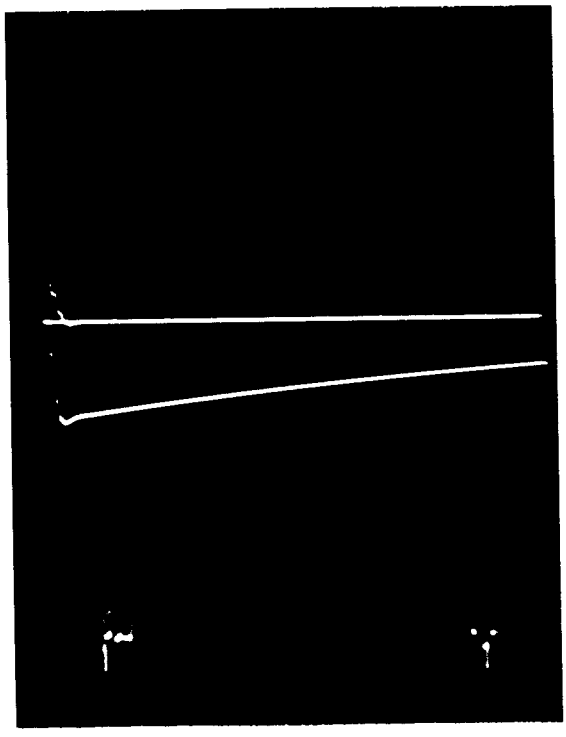


5 chocs	550	kV
5 impulses	550	kV

Up	5	µs/marque
Up	5	µs/division

Is	5	µs/marque
Is	5	µs/division

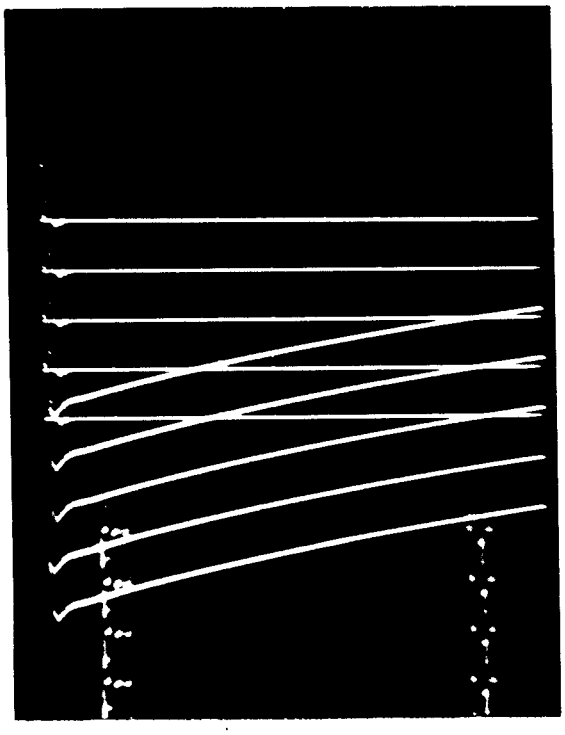
CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751



Onde à demi-tension positive
Positive half full wave

Tension de choc	275	kV
Impulse voltage	275	kV

Up	5	µs/marque tension primaire
Up	5	µs/division primary voltage
Is	5	µs/marque courant secondaire
Is	5	µs/division secondary current

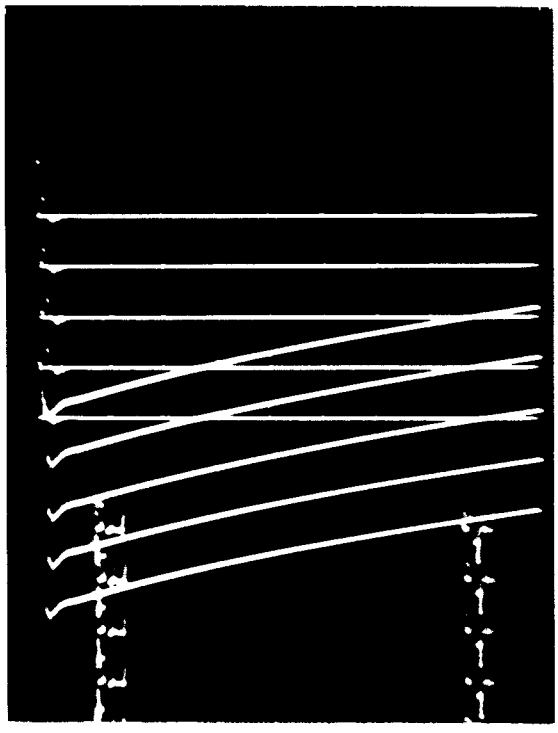


Onde à pleine tension
Full wave impulse

5 chocs	550	kV
5 impulses	550	kV

Up	5	µs/marque
Up	5	µs/division
Is	5	µs/marque
Is	5	µs/division

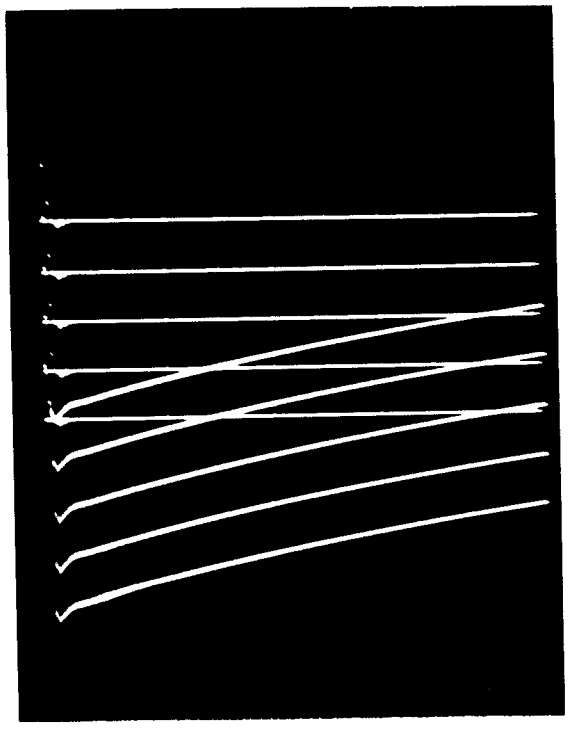
CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751



5 chocs	550	kV
5 impulses	550	kV

Up	5	µs/marque
Up	5	µs/division

Is	5	µs/marque
Is	5	µs/division



5 chocs	550	kV
5 impulses	550	kV

Up	5	µs/marque
Up	5	µs/division

Is	5	µs/marque
Is	5	µs/division

CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

FERRO-RESONANCE TESTS

Ferro-resonance tests are to be performed on a complete capacitive voltage transformer.

The secondary terminals are short-circuited atleast during 100 ms.
The openning device system is composed by a fuse of 5 A provided with CVT which assumed the protection of secondary winding.
The shunt (100 A, 100 mV) in series with L.V. fuse is located to permit recording of secondary current.

The total impedance of L.V. fuse and shunt is such a short-circuit voltage is lower than 10 % of the peak value before short-circuit.

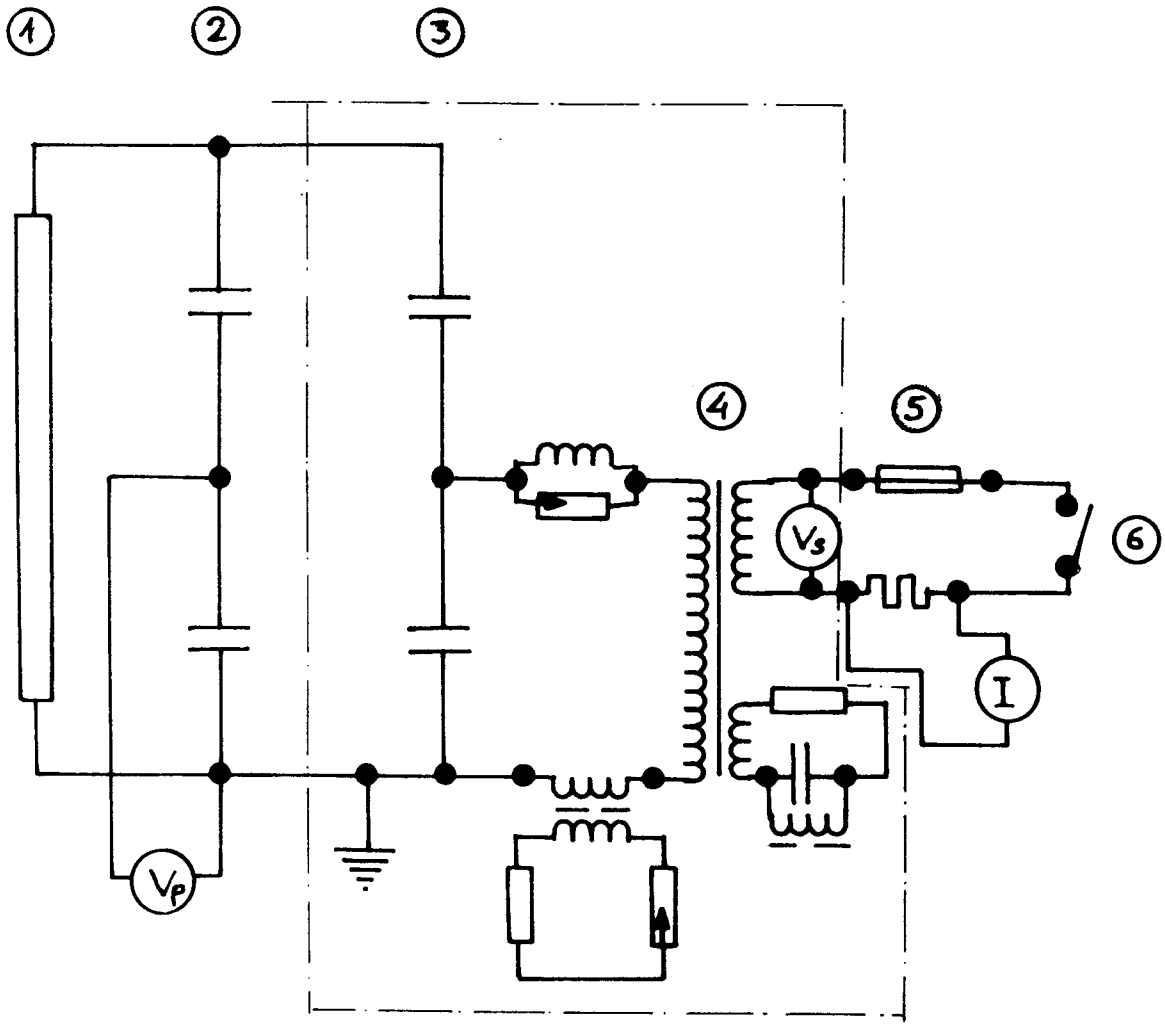
The recording device of the secondary voltage is a very high impedance and its burden is lower than 5 VA.

Applied voltage is recorded through a high voltage capacitive divider. During short-circuit the applied voltage must does not differ by more than 10 % of the peak value before short-circuit and must be approximatively sinusoïdal.

a) This test have been made thirty times at 120 % of rated primary voltage.

b) This test has been repeated ten times at a primary voltage corresponding to the voltage factor (1.9 Un).

c) All these tests have been recorded with a special recorder device.



1	Elévateur de tension	Step up transformer
2	Diviseur capacitif	Capacitor divider
3	Transformateur en essai	CVT under test
4	Transformateur	Transformer
5	Fusible 6 A	Fuse (6 A)
6	Court-circuiteur synchrone	Synchrone short-circuiter
Vp	Tension appliquée	Applied voltage
Vs	Tension secondaire	Secondary voltage
Is	Courant secondaire	Secondary current

Désignation : CCV 123
ESSAIS DE FERRO-RESONANCE
FERRO-RESONANCE TESTS

Date :
Visa
Service concepteur 2.1.0.8.

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X	Z	B			D			F			
A		C			E			G			

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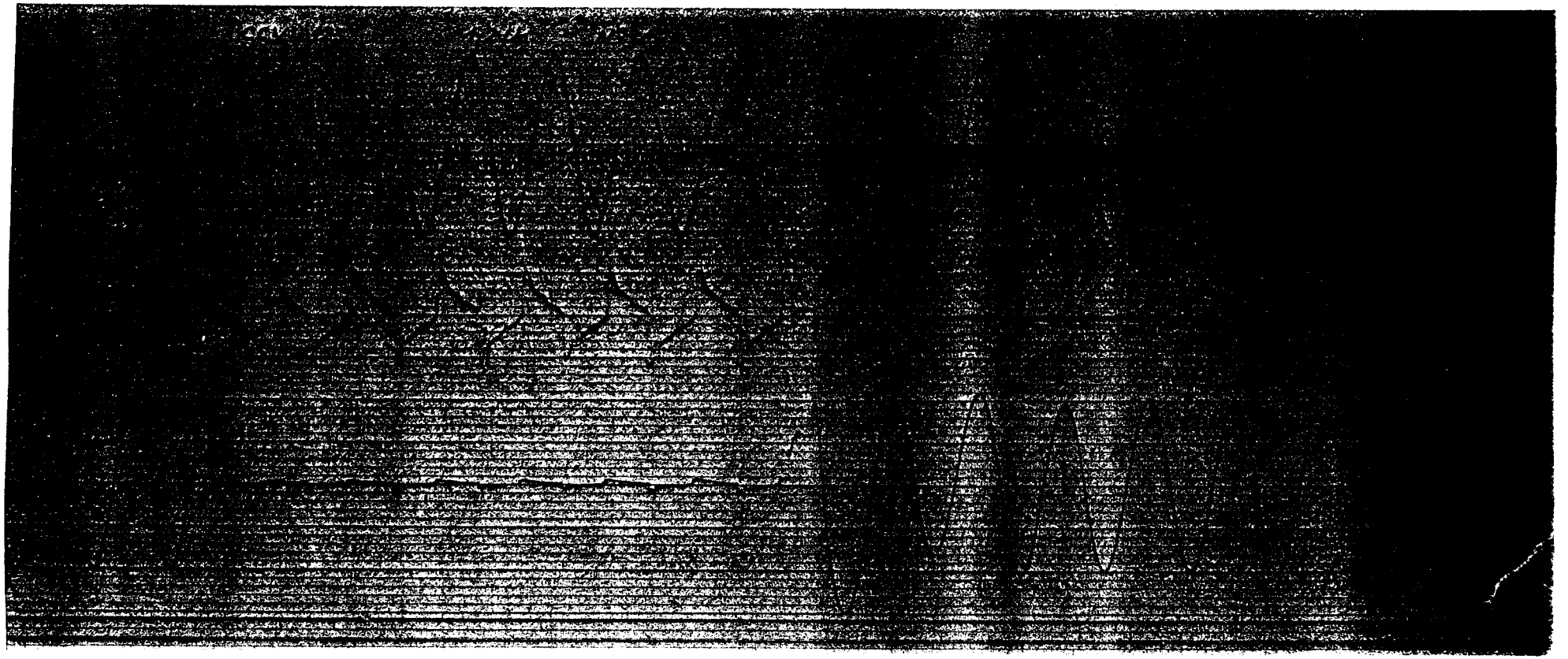
CERTIFICAT D'ESSAI N° 13 751

Up
53,9 kV/cm

Is
50 A/cm

Us
49 V/cm



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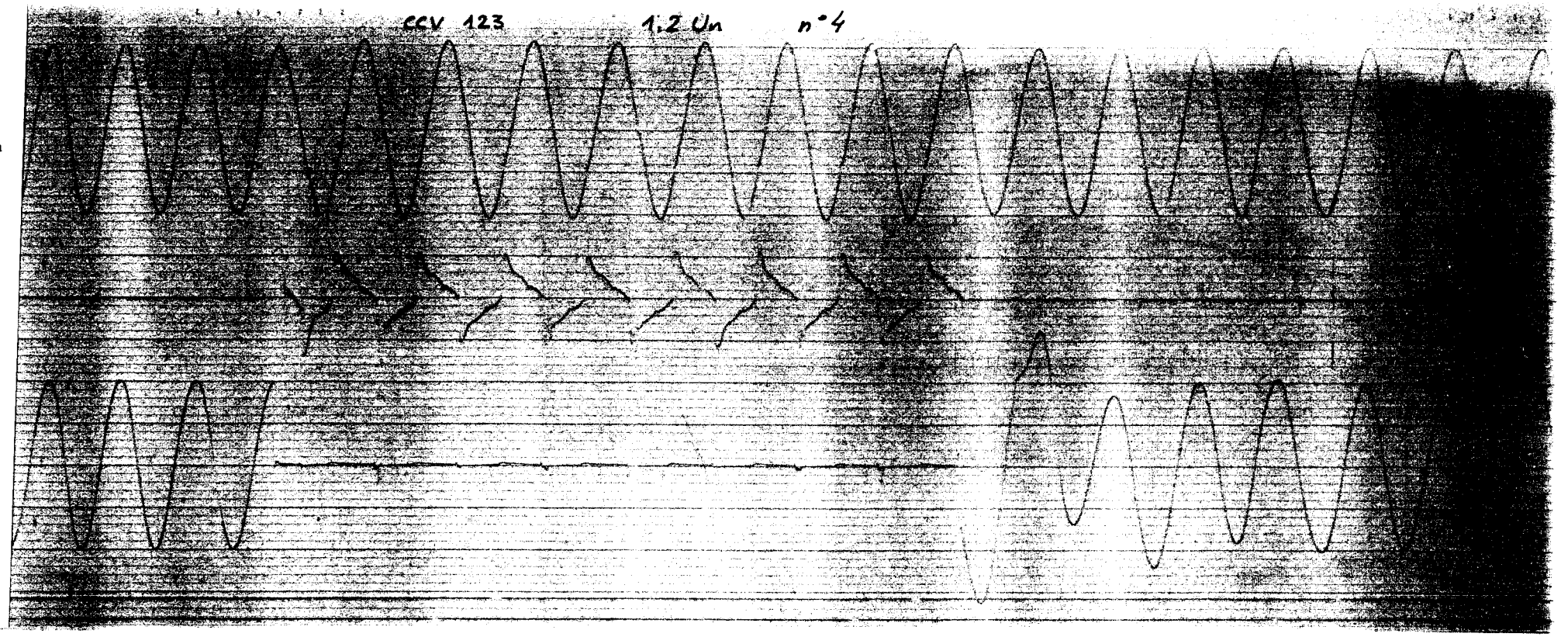
CERTIFICAT D'ESSAI N° 13 751



Up
53,9 kV/cm

Is
50 A/cm

Us
49 V/cm

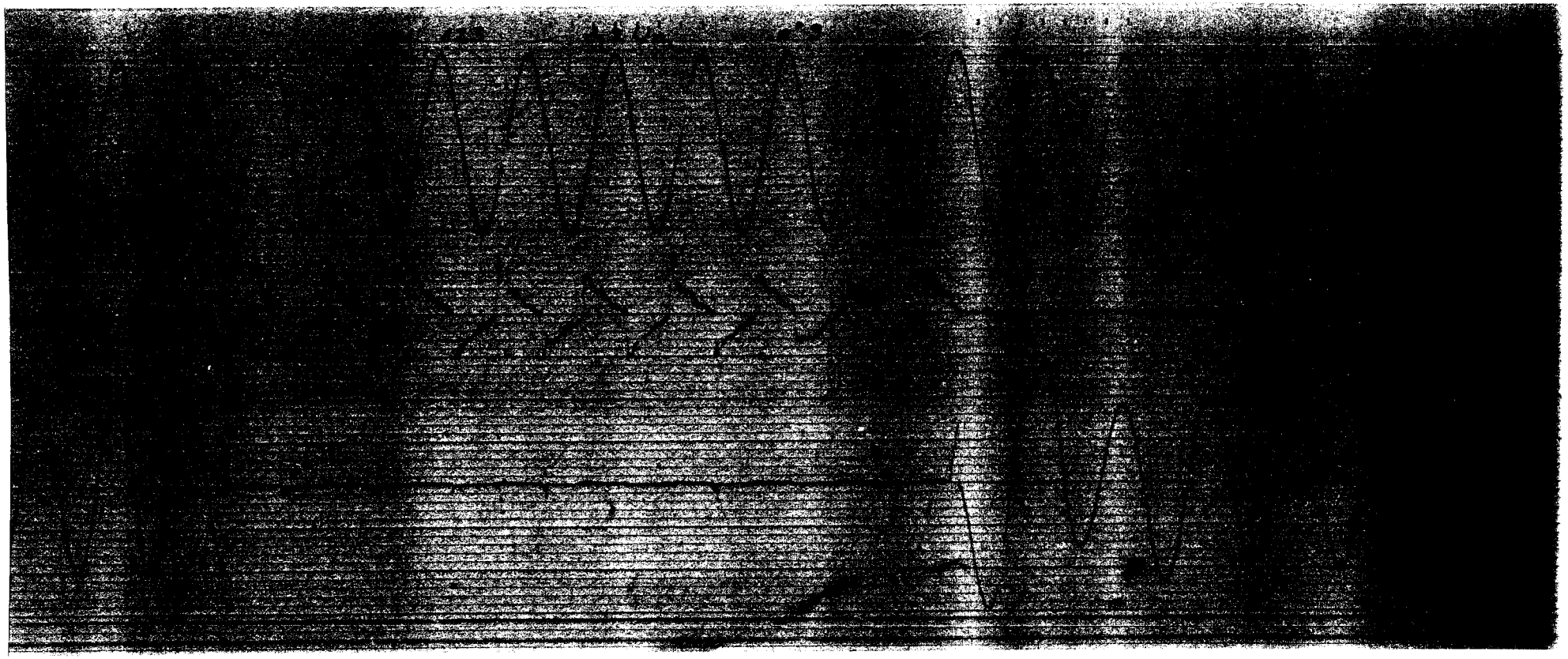
ALSTOM

CERTIFICAT D'ESSAI N° 13751

Up
53,9 kV/cm

Is
50 A/cm

Us
49 V/cm



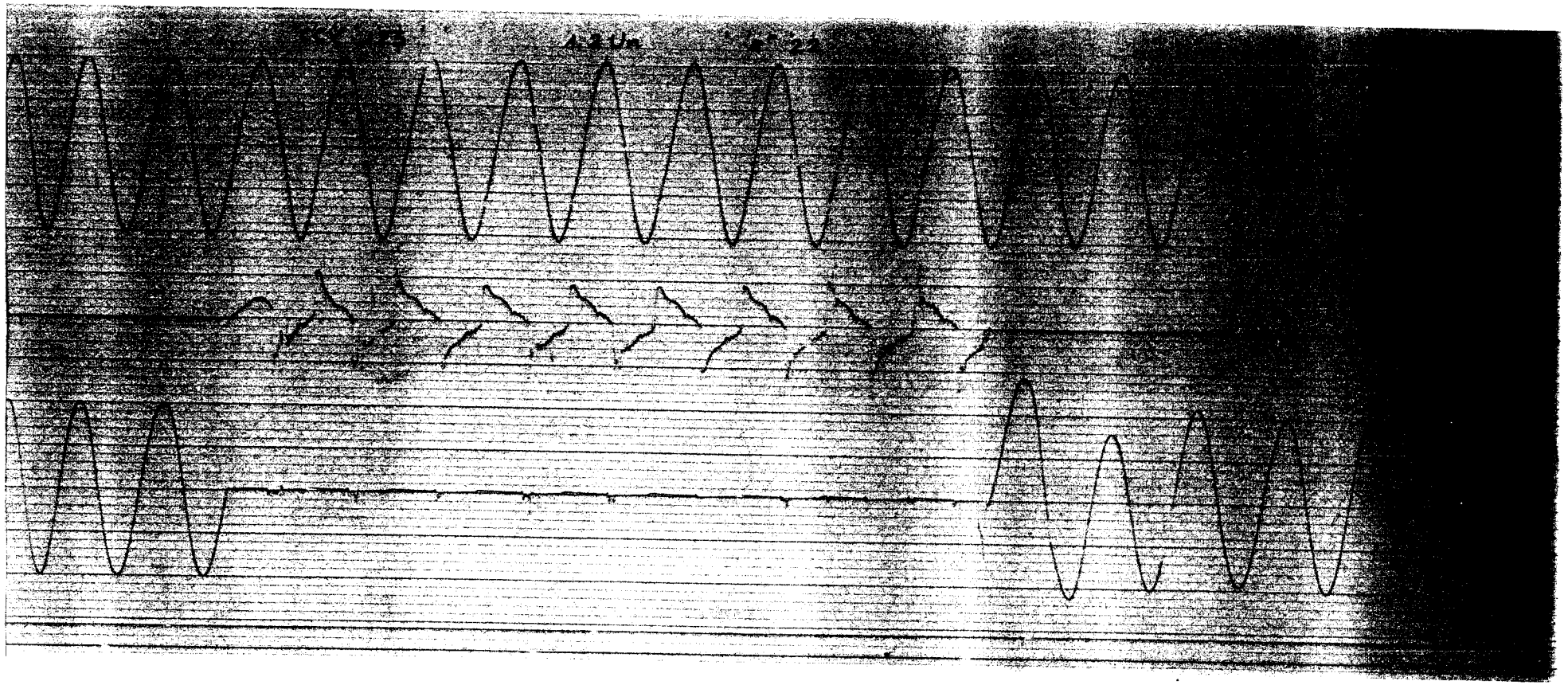
ALSTOM

CERTIFICAT D'ESSAI N° 13 751

Up
53,9 kV/cm

Is
50 A/cm

Us
49 V/cm



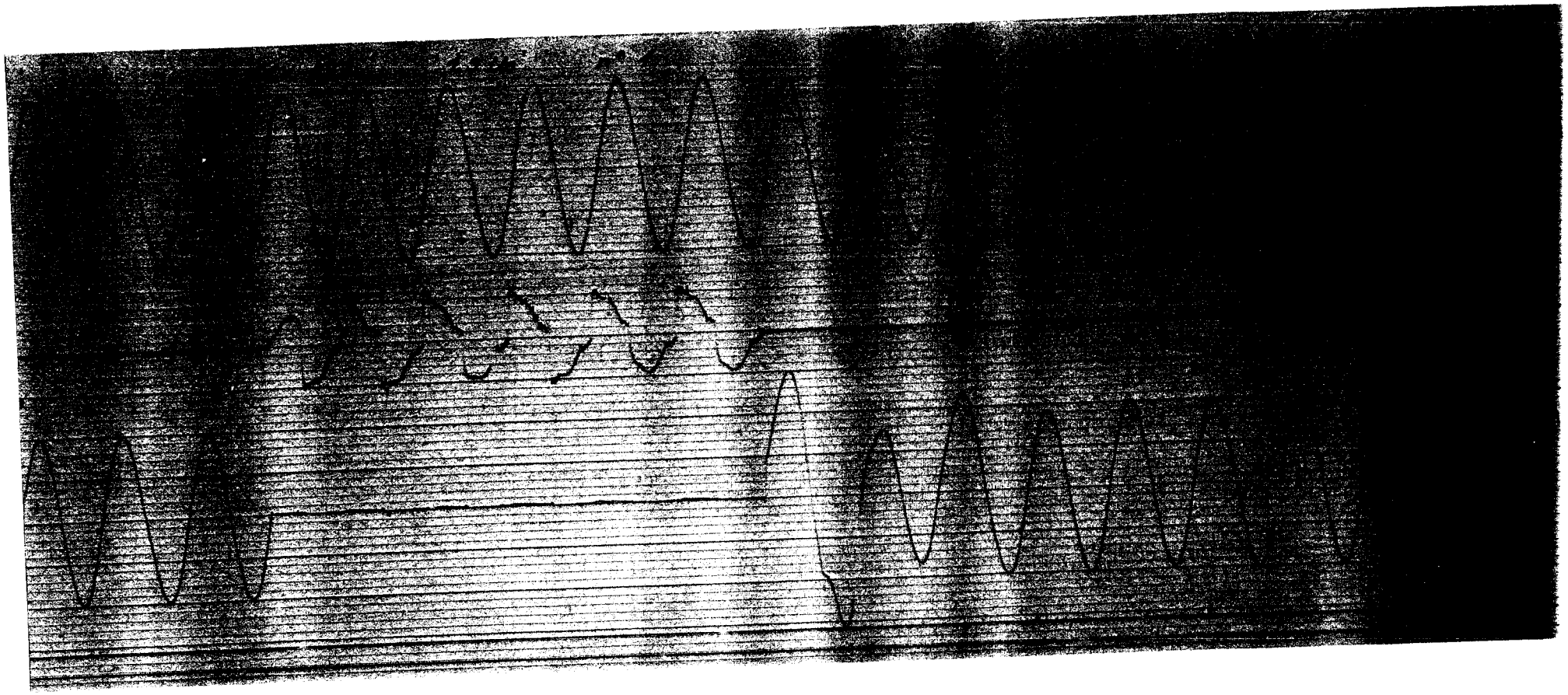
ALSTOM

CERTIFICAT D'ESSAI N° 13 751

Up
85,3 kV/cm

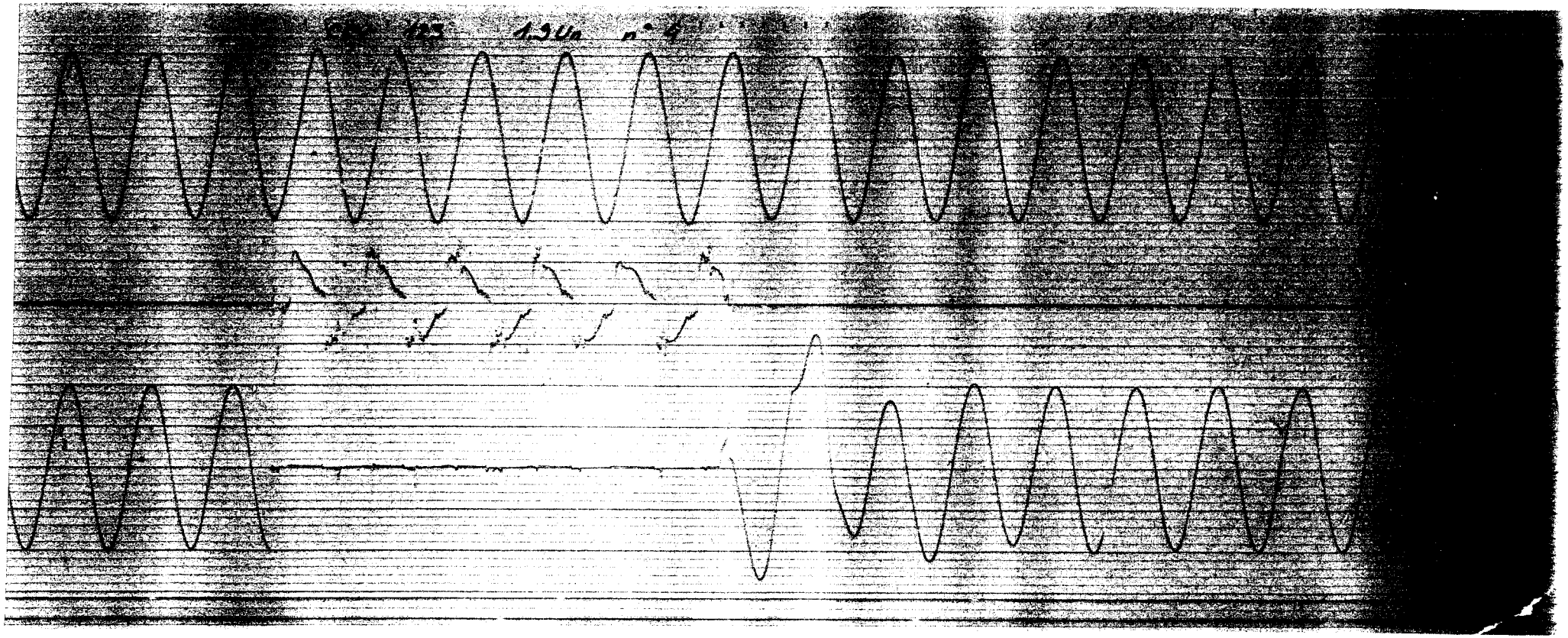
Is
50 A/cm

Us
77,6 V/cm



ALSTOM

CERTIFICAT D'ESSAI N° 13 751



Up
85,3 kV/cm

Is
50 A/cm

Us
77,6 V/cm

ALSTOM

CERTIFICAT D'ESSAI N° 13 751

Up
85,3 kV/cm

Is
50 A/cm

Us
77,6 V/cm

CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

TEMPERATURE RISE TEST

- 1.2 Un - 500 VA test

The temperature rise test is made on the equivalent circuit and the normal voltage, seen across C2, is applied (Un = 8 530 V).

The test is made at 1.2 Un (10 224 V) with a burden of 500 VA.

1 - Measure at the begenning of test.

- a-n secondary winding	R a-n	= 0.1 419	ohm
- Primary transformer resistance	Rp	= 1 361	ohms
- Inductor resistance	Rs	= 1 342	ohms
- Ambiant temperature	a	= 19.5°C	

Measures after 41 h 10 mn with $\theta'a$ = 20°C

- R an	= 0.1546	ohm
- Rp	= 1 454	ohms
- Rs	= 1 404	ohms

Temperature rise in °C

$$(\theta_2 - \theta_1) = \left[\frac{R_2 - R_1}{R_1} \times (234.5 + \theta_{a1})\right] + (\theta_{a2} - \theta_{a1})$$

. θ_2 = Temperature of the winding at the end of the test (hot)
. θ_{a1} = Ambient temperature at the begenning
. θ_{a2} = Ambinet temperature at the measure time
. θ_1 = Temperature of the winding at the moment of the initial resistance measurements (cold)
. Rs = Resistance of the winding at the temperature (θ_2) at the end of the test.
. R1 = Initial resistance of the winding (cold)

$\Delta\theta_{a-n}$		= 22.7°C
$\Delta\theta_p$	(primary winding)	= 17.3°C
$\Delta\theta_s$	(inductor)	= 11.7°C

.../...

CERTIFICAT D'ESSAI - *TEST CERTIFICATE* - PROTOCOLO DE PRUEBAS N° 13 751

2 - 1.9 Un - 150 VA test

After thermal stabilisation of the transformer at 1.2 Un, we applied a 1.9 Un voltage with a burden of 150 VA during 8 hours.

	θ_a = 20°C
Resistances measured	
- R a-n	= 0.1511 ohm
- R (primary winding)	= 1 427 ohms
- Rs (inductor)	= 1 392 ohms

The temperature rise are :

$\Delta\theta_{a-n}$	= 16.4°C
$\Delta\theta_p$ (primary winding)	= 12.3°C
$\Delta\theta_s$ (inductor)	= 9.5°C

3 - C1 and C2 values are

. C1	= 5 508 pF
. C2	= 35 544 pF

The voltage applied at 1.2 Un is :

$$1.2\ Un \times \frac{C1}{C1 + C2} = 10\ 224\ V$$

The voltage applied at 1.9 Un is :

$$1.9\ Un \times \frac{C1}{C1 + C2} = 16\ 188\ V$$

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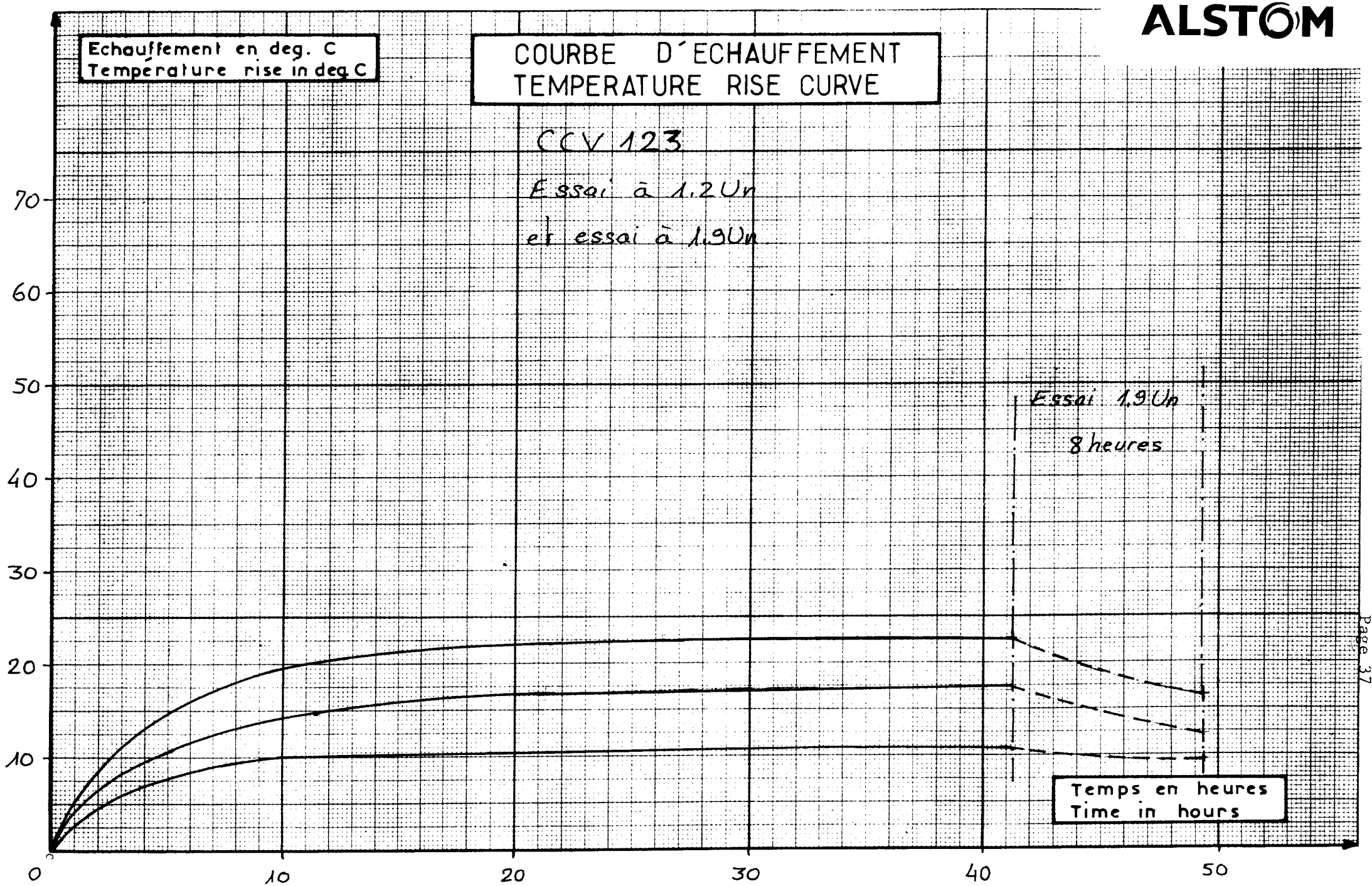
Echauffement en deg. C
Temperature rise in deg C
COURBE D'ECHAUFFEMENT
TEMPERATURE RISE CURVE
CCV 123
Essai à 1.2 Un
et essai à 1.9 Un
Essai 1.9 Un
8 heures
Temps en heures
Time in hours
70
60
50
40
30
20
10
0
10
20
30
40
50

CERTIFICAT D'ESSAI N° 13 751

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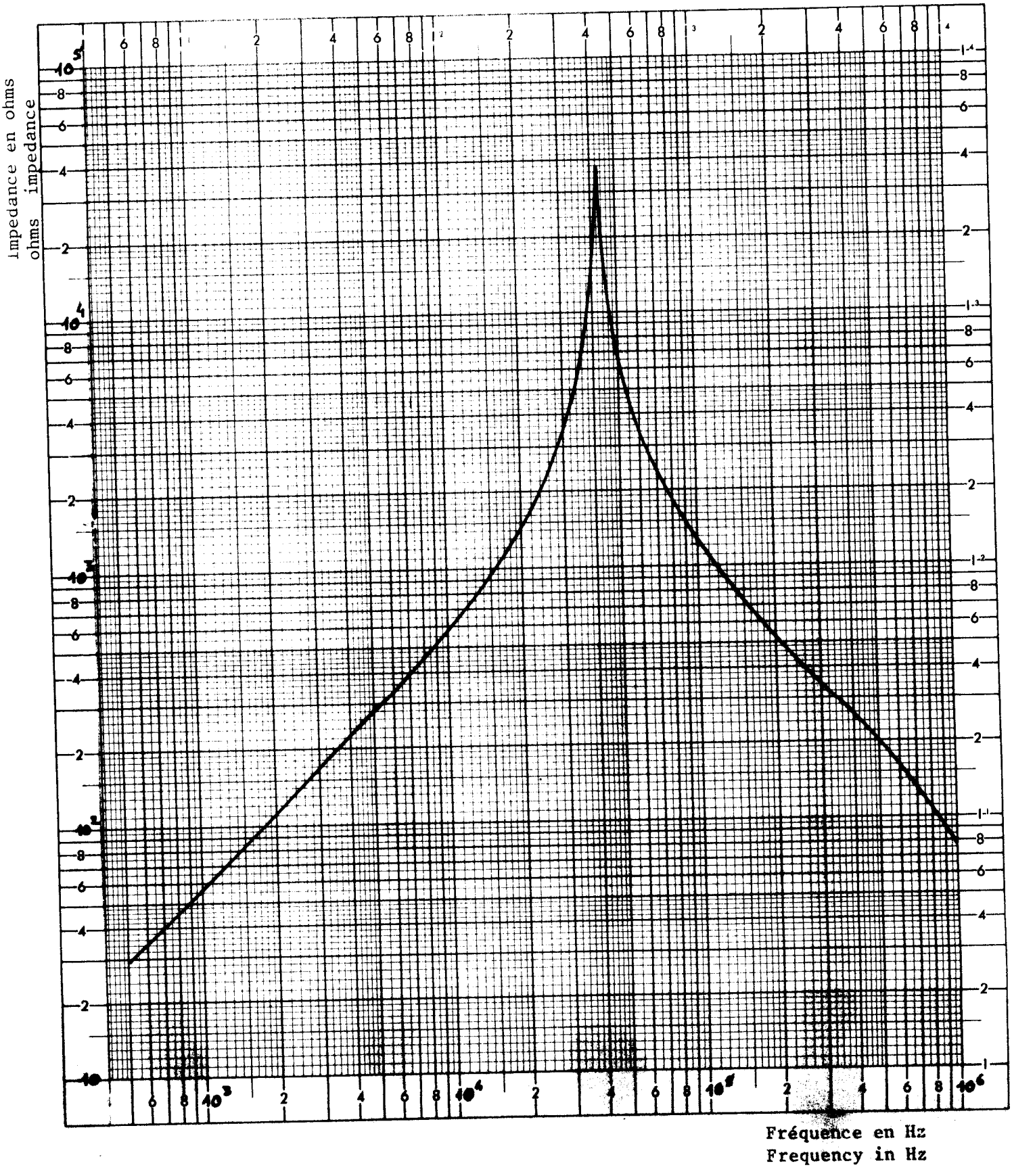
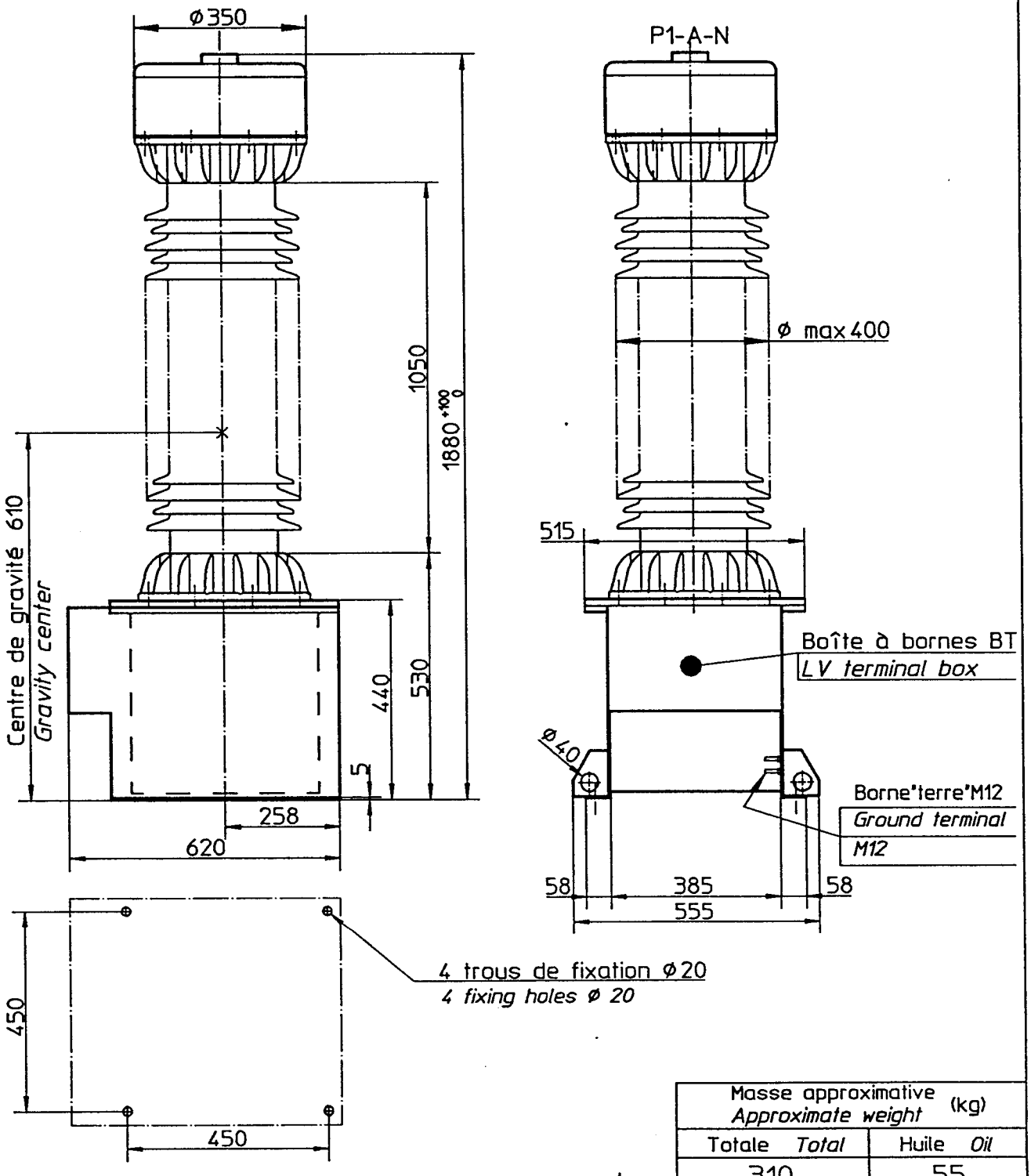
BOBINE DE DRAINAGE
Drain coil

Courbe d'impédance en fonction de la fréquence
Frequency impedance curve





Masse approximative *Approximate weight* (kg)	
Totale *Total*	Huile *Oil*
310	55

Nature des modifications	Dessiné	Vérifié	Validé	DEM N°	Date	Indice
Au lieu de ø 25 et 1820 lire ø 40 et 1880	G.Gousselot	A.Jounay		96168	2-05-96	B
Modification des cotes de la cuve	G.Gousselot	A.Jounay		95192	16-10-95	A
Création	G.Gousselot	A.Jounay			17-01-94	Z

ALSTOM

Désignation: TRANSFORMATEUR CONDENSATEUR DE TENSION
CAPACITOR VOLTAGE TRANSFORMER CCV 123

Emploi | Page

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A4	Sans	X 57	DEX	8162551

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