

VERIFICATION OF TEMPERATURE RISE LIMITS

Test arrangement

- The apparatus tested was placed on the floor of the test room in the same conditions as in normal service.
- The three phase a.c. low-voltage supply was connected to the incoming terminals of the apparatus tested by means of one flexible aluminium conductor per phase having a cross-sectional area of 95 mm² and 2 meters in length.

Measurement of the temperature

- The ambient air temperature was obtained from the average of the temperatures measured by means of three copper-constantane thermocouples immersed inside oil pumps containing about half a litre of oil, distributed around the apparatus tested at about its average height and at a distance of about 1m.
- The temperature of all other parts were measured by copper-constantane thermocouples.

Test currents

- The test was carried out with a three-phase current having a r.m.s. value of 166 A - 50 Hz.

Test results

The maximum temperature rise at the thermal steady state ($\Delta t \approx 1^\circ\text{C/h}$) with an ambient air temperature of 22.3°C were:

| MEASURED PARTS | TEMPERATURE RISE K | |
|---|--------------------|----------|
| | Measured | Admitted |
| - Incoming terminal, phase 1 | 20.5 | 65 |
| - Incoming terminal, phase 2 | 19.0 | 65 |
| - Incoming terminal, phase 3 | 19.5 | 65 |
| - Upper fixed contact of the switch-disconnector, phase 1 | 12.8 | 65 |
| - Upper fixed contact of the switch-disconnector, phase 2 | 12.9 | 65 |
| - Upper fixed contact of the switch-disconnector, phase 3 | 12.5 | 65 |
| - Upper moving contact of the switch-disconnector, phase 1 | 14.4 | 65 |
| - Upper moving contact of the switch-disconnector, phase 2 | 14.7 | 65 |
| - Upper moving contact of the switch-disconnector, phase 3 | 14.4 | 65 |
| - Lower moving contact of the switch-disconnector, phase 1 | 17.6 | 65 |
| - Lower moving contact of the switch-disconnector, phase 2 | 17.3 | 65 |
| - Lower moving contact of the switch-disconnector, phase 3 | 17.5 | 65 |
| - Lower fixed contact of the switch-disconnector, phase 1 | 19.3 | 65 |
| - Lower fixed contact of the switch-disconnector, phase 2 | 19.5 | 65 |
| - Lower fixed contact of the switch-disconnector, phase 3 | 19.2 | 65 |
| - Ambient SF6 temperature inside the pole of the switch-disconnector, phase 1 | 12.1 | - |
| - Ambient SF6 temperature inside the pole of the switch-disconnector, phase 2 | 12.2 | - |
| - Ambient SF6 temperature inside the pole of the switch-disconnector, phase 3 | 12.4 | - |
| - Upper blade contact of the fuse-base, phase 1 | 25.8 | 65 |
| - Upper blade contact of the fuse-base, phase 2 | 26.2 | 65 |
| - Upper blade contact of the fuse-base, phase 3 | 27.7 | 65 |
| - External enclosure of the fuse-link, phase 1 | 30.3 | - |
| - External enclosure of the fuse-link, phase 2 | 32.3 | - |
| - External enclosure of the fuse-link, phase 3 | 32.7 | - |

MP-91/013008
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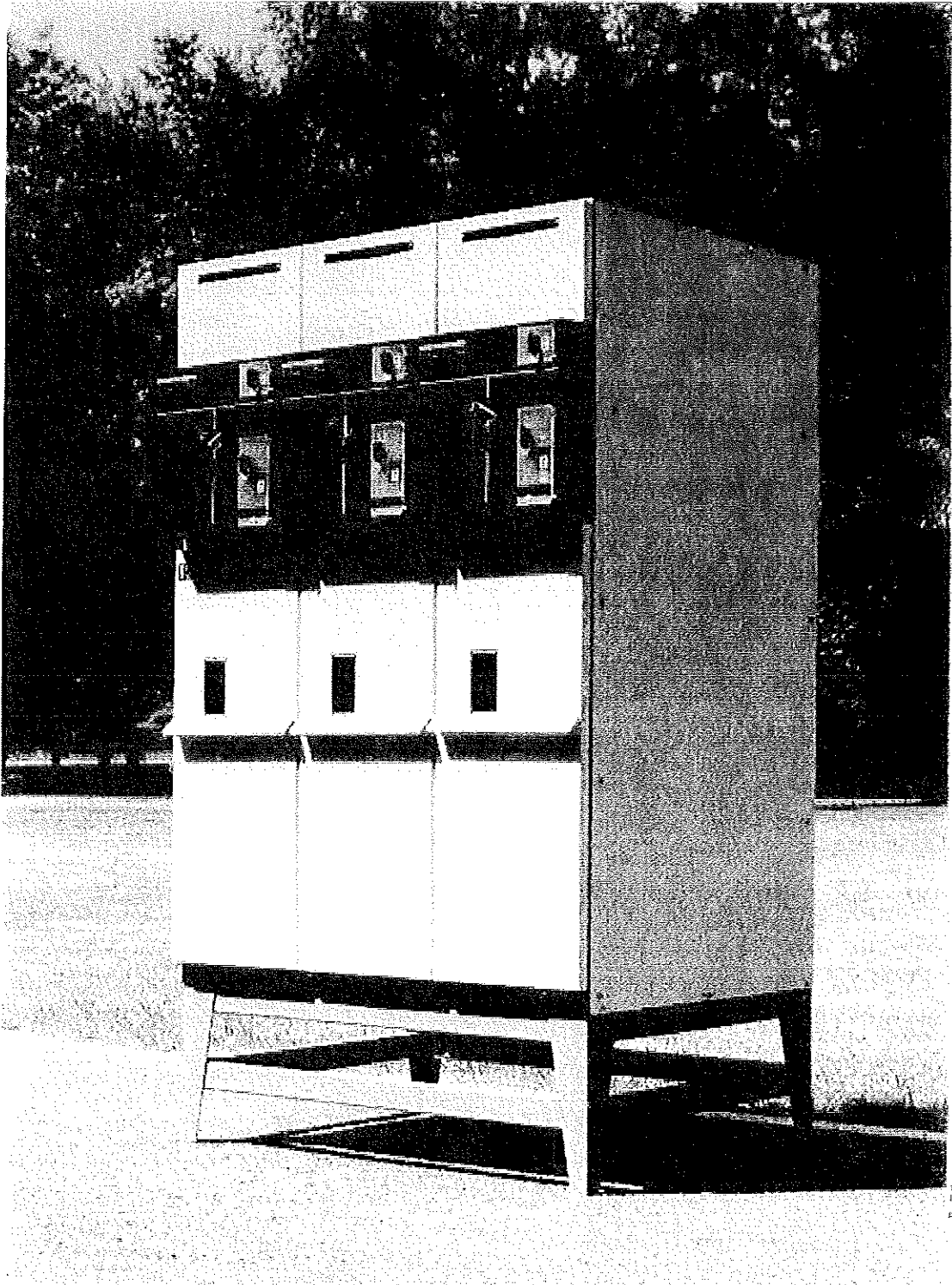


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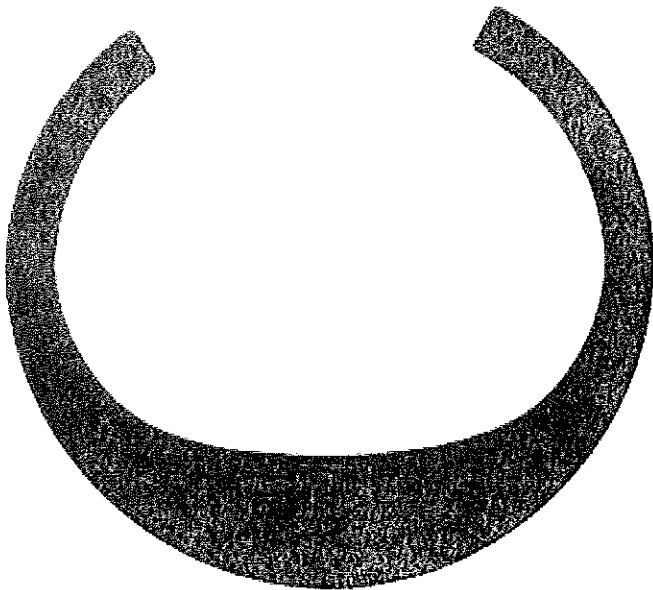
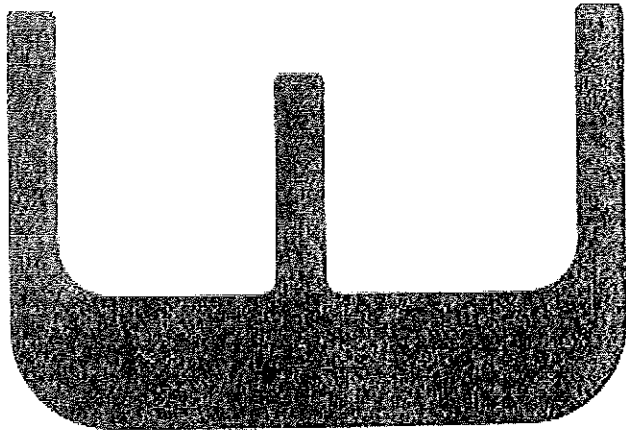
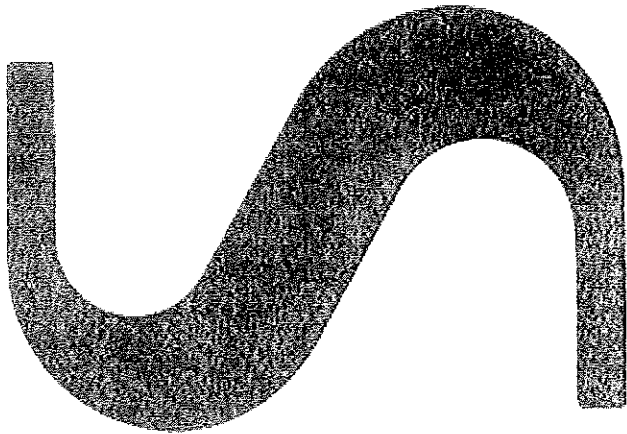
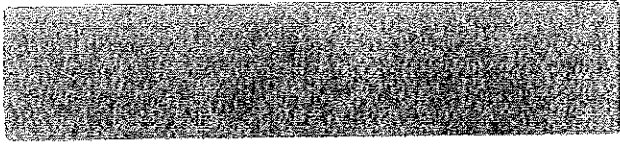
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client MERRIN GERIN - GRIGNOLE
object THREE POLE METAL ENCLOSED AIR INSULATED SWITCHGEAR SM6 SYSTEM TYPE IM AND QM.
Fitted with an increased operating frequency SF6 gas insulated switch type I SM6 and Q SM6

characteristics of the tested object assigned by Client

rated voltage 24 kV rated current 630-700 A rated frequency 50 Hz
other characteristics listed on page 3

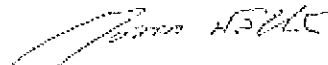
tests have been made in accordance with client's instructions
test date June, 19th - 27th 1991

The performance of the apparatus tested and the observations made during the tests, have been recorded in the following pages.

This document is composed by 8 pages

Milan, September 1991

Test engineer



CERTIFICATO
D'ACCREDITAZIONE
N. 1000

Keywords: 120100L 23E10S 31020W 41030P 53001E 62501B

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Table of the tests performed

no page

| | |
|--|---|
| - lightning impulse voltage tests | 5 |
| - Power frequency voltage withstand test in dry conditions | 6 |
| - Partial discharge test | 7 |

REPRODUCTION
CIVILISATION

tests witnessed by

Mr. Laurens - MERLIN GERIN
 Mr. Druven - MERLIN GERIN

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1. TEST OBJECT

THREE POLE METAL ENCLOSURE AIR INSULATED SWITCHGEAR SMS SYSTEM
 TYPE IM AND QM.
 Filled with an increased operating frequency SF6 gas insulated switch
 type I SMs and Q SMs.

| | |
|------------------------------|----------------|
| - Manufacturer | KERLITE GERLEN |
| Rated voltage | 24 kV |
| Rated current (IM) | 630 A |
| Rated current (QM) | 200 A |
| Short-time withstand current | 15 kA |

2. Identification of the object: effected

The tested object truly conforms to the drawings of its type supplied by the client. These drawings, identified by CESI with embossing press and numbered GPS 91/015161 1 to 12 and GPS 91/015162 1 to 13 are assembled in a folder.

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3. TEST CONFIGURATIONS.

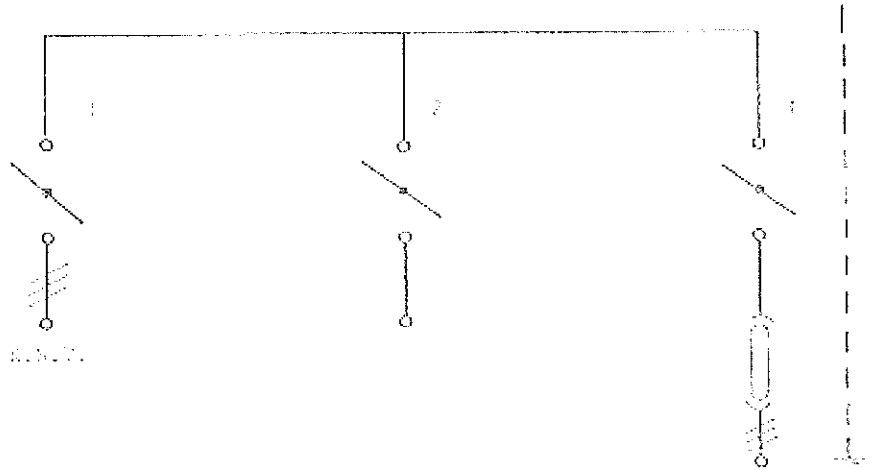


Fig. 3.1.

| Test configurations nr | Position switchgear 1 | Position switchgear 2 | Position switchgear 3 | Voltage applied to | Earth connected to | Insulate connected to |
|------------------------|-----------------------|-----------------------|-----------------------|--------------------|--------------------|-----------------------|
| 1 | Closed | Open | Closed | Rr | Ss-Tt-F | |
| 2 | Closed | Open | Closed | Ss | Rr-Tt-F | |
| 3 | Closed | Open | Closed | Tt | Rr-Ss-F | |
| 4 | Open | Open | Closed | R | r-Ss-Tt-F | |
| 5 | Open | Open | Closed | S | s-Rr-Tt-F | |
| 6 | Open | Open | Closed | T | t-Rr-Ss-F | |
| 7 | Open | Open | Closed | r | R-Ss-Tt-F | |
| 8 | Open | Open | Closed | s | S-Rr-Tt-F | |
| 9 | Open | Open | Closed | t | T-Rr-Ss-F | |
| 10 | Closed | Open | Open | R | r-Ss-Tt-F | |
| 11 | Closed | Open | Open | S | s-Rr-Tt-F | |
| 12 | Closed | Open | Open | T | t-Rr-Ss-F | |
| 13 | Closed | Open | Open | r | R-Ss-Tt-F | |
| 14 | Closed | Open | Open | s | S-Rr-Tt-F | |
| 15 | Closed | Open | Open | t | T-Rr-Ss-F | |
| 16 | Open | Open | Closed | R | r | Ss-Tt-F |
| 17 | Open | Open | Closed | S | s | Rr-Tt-F |
| 18 | Open | Open | Closed | T | t | Rr-Ss-F |
| 19 | Open | Open | Closed | r | R | Ss-Tt-F |
| 20 | Open | Open | Closed | s | S | Rr-Tt-F |
| 21 | Open | Open | Closed | t | T | Rr-Ss-F |

INSTITUTO TECNOLÓGICO DE AERONÁUTICA
 DEPARTAMENTO DE ENGENHARIA DE SISTEMAS
 LABORATÓRIO DE ENGENHARIA DE SISTEMAS

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4. TESTS PERFORMED AND TEST PROCEDURES

4.1 Lightning impulse voltage tests

For every test configuration indicated on page 4 the object was submitted to 15 successive negative impulse followed by 15 successive positive impulses at 125 kV crest level. The insulating distance was tested at 145 kV crest level.

The test was performed according to IEC standard, Publication 299, 1981 item 6.1.6

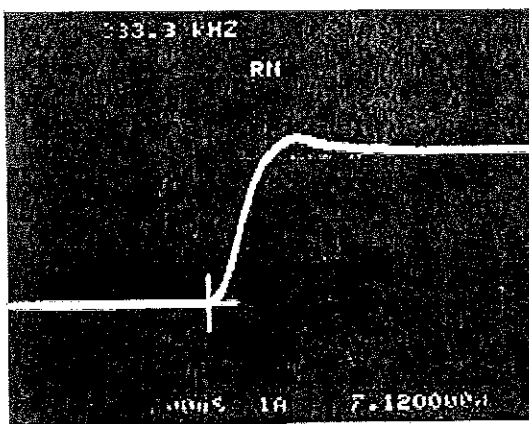
Atmospheric conditions during the tests

$D = 100,2 \text{ kPa}$
 $t = 20 \text{ } ^\circ\text{C}$
 $h = 9,6 \text{ g/m}^3$

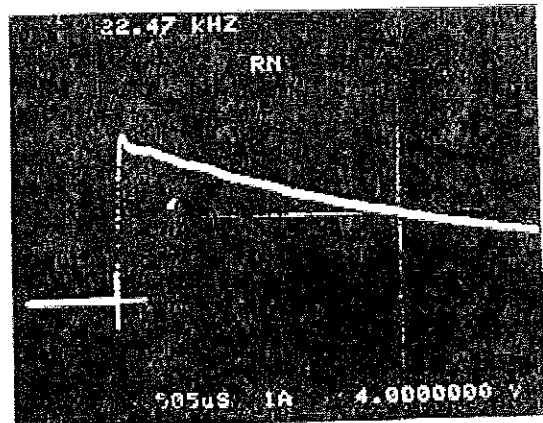
Test result : Positive

During the tests, no disruptive discharges or self-restoring insulation occurred.

Obtained wave shapes



1.2 μs



45 μs

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4.7 Power Frequency Voltage Withstand Dry Tests

For every test configuration indicated on page 4 object was submitted to 50 kV r.m.s. for 1 minute and 60 kV r.m.s. for across the insulating distance.
The test was made in according to IEC Standard, Publication 298, 1981 item 5.1.7.

Atmospheric conditions during the tests:

$p = 99,6 \text{ kPa}$

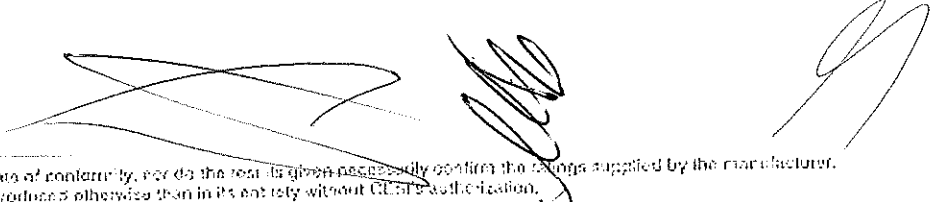
$t = 23 \text{ } ^\circ\text{C}$

$h = 15,6 \text{ g/m}^3$

Test result : Positive

During the tests, no disruptive discharges or self-restoring insulation occurs.

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2003-08-29



4.3 Partial discharge test

For the test configuration 1 - 2 - 3 indicated on page 4, each phase was connected, alternatively, to the power supply during the measurement of the partial discharge level. The other phases were grounded together with the parts normally grounded during service.

Prestand voltage : 31,7 kV (1.3 U) for 10"

Test voltage : 25,4 kV (1.1 U) for 1"

Atmospheric conditions during the test:

p = 100.6 kPa

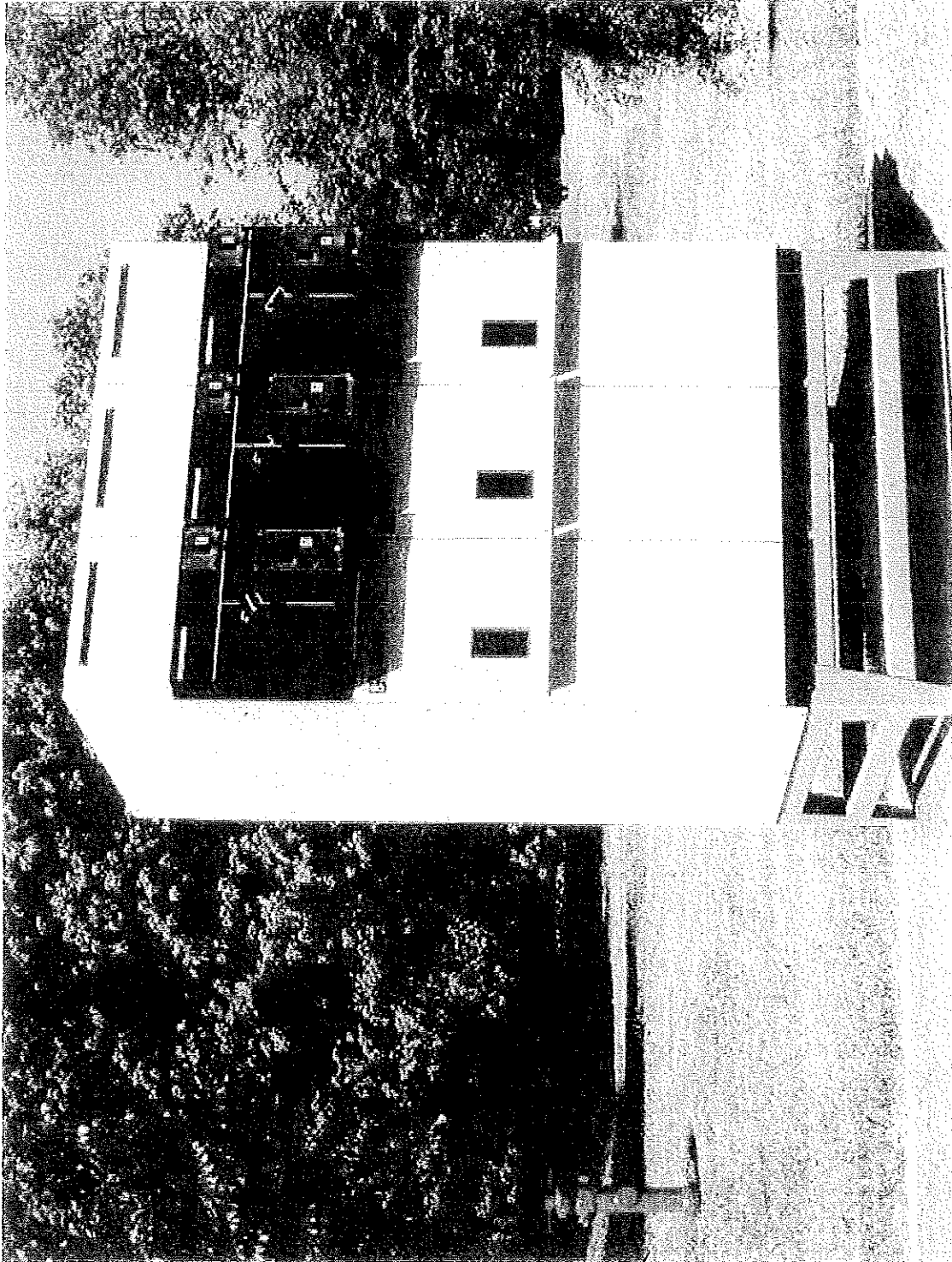
t = 23 °C

h = 6.4 g/m³

Test result : The measured partial discharge level, during the test, was less than 10 pC.

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TEST OBJECT



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 OF CONFORMITY
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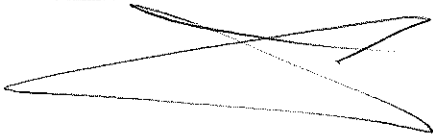
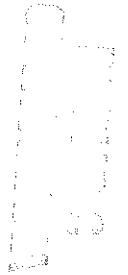
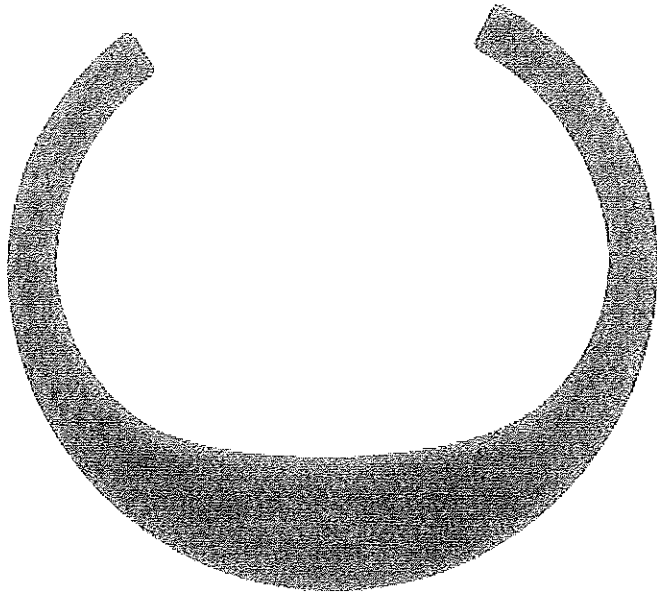
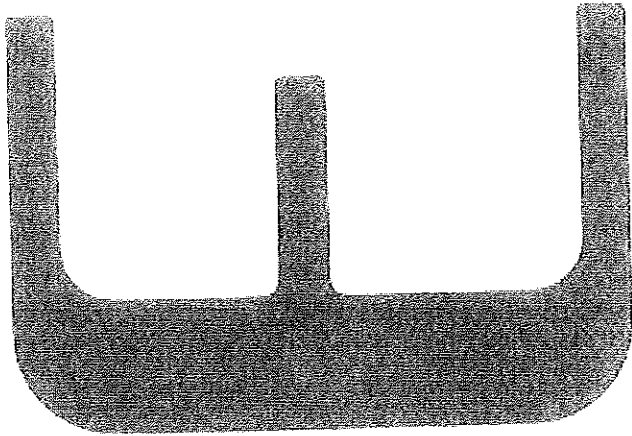
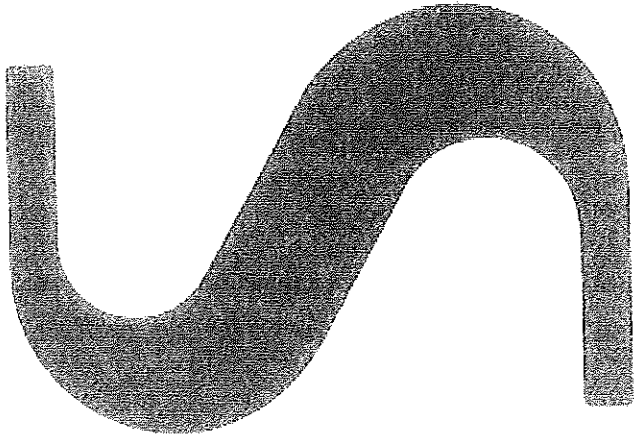
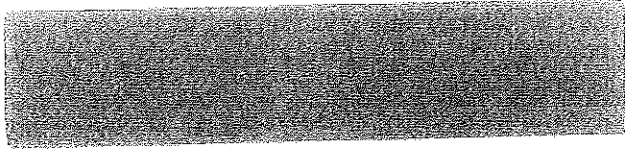
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AT91/015702



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client MERLIN GERIN - GRENOBLE
 object THREE POLE METAL ENCLOSED AIR INSULATED SWITCHGEAR SM6 SYSTEM
 TYPE IM AND QM.
 Fitted with an increased operating frequency SF6 gas insulated
 switch type I SM6 and Q SM6

characteristics of the tested object assigned by Client

rated voltage 17.5 kV rated current 630-250 A rated frequency 50 Hz
 other characteristics listed on page J

tests have been made in accordance with client's instructions
 test date June, 19th - 25th 1991

The performance of the apparatus tested and the observations made during the tests, have been recorded in the following pages.

this document is composed by 5 pages

Milan, September 1991

test engineer

Vertical stamp or stamping area on the right side of the page.

Keywords: ~~126100L~~ 23510S 31020R 41030F 53001B 62501H

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CESI

test report

AT-91/015702 page 2

Table of the tests performed

see page

- Lightning impulse voltage tests 5
- Power frequency voltage withstand test in dry conditions 6
- Partial discharge test 7
- Combined test (DCIAS) 8

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Tests witnessed by

Mr. Laurens - MERLEK GERTE
 Mr. Drevén - MERLEK GERTE

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1. TEST OBJECT

THREE POLE METAL ENCLOSED AIR INSULATED SWITCHGEAR SM6 SYSTEM
TYPE IM AND OM.

Fitted with an increased operating frequency SF6 gas insulated
switch type I SM6 and O SM6.

- Manufacturer MERLIN GERIN
- Rated voltage 17.5 kV
- Rated current (IM) 630 A
- Rated current (OM) 200 A
- Short time withstand current 20 kA

2. Identification of the objects effected

The tested object truly conforms to the drawings of its type supplied by
the client. These drawings, identified by CESI with embossing press and
numbered GRS 91/015161 1 to 12 and GRS 91/015162 1 to 13 are assembled
in a folder.

3. TEST CONFIGURATIONS.

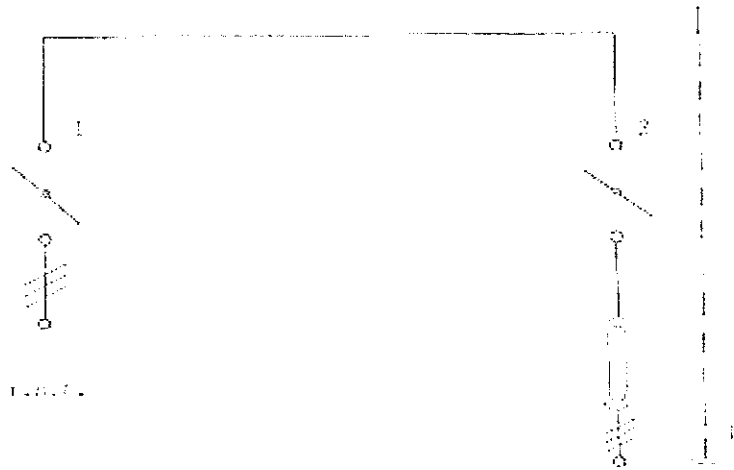


Fig. 1.

R.S.M.

| Test configurations q ⁿ | Position switchgear 1 | Position switchgear 2 | Voltage applied U _e | Earth connected I _a | Insulate connected to |
|---------------------------------------|-----------------------------|-----------------------------|--------------------------------------|--------------------------------------|-----------------------------|
| 1 | Closed | Closed | Rr | Ss-Tt-F | |
| 2 | Closed | Closed | Ss | Rr-Tt-F | |
| 3 | Closed | Closed | Tt | Rr-Ss-F | |
| 4 | Closed | Open | r | R-Ss-Tt-F | |
| 5 | Closed | Open | s | S-Rr-Tt-F | |
| 6 | Closed | Open | t | T-Rr-Ss-F | |
| 7 | Closed | Open | x | r-Ss-Tt-F | |
| 8 | Closed | Open | s | S-Rr-Tt-F | |
| 9 | Closed | Open | t | T-Rr-Ss-F | |
| 10 | Open | Closed | r | R-Ss-Tt-F | |
| 11 | Open | Closed | s | S-Rr-Tt-F | |
| 12 | Open | Closed | t | T-Rr-Ss-F | |
| 13 | Open | Closed | R | r-Ss-Tt-F | |
| 14 | Open | Closed | S | s-Rr-Tt-F | |
| 15 | Open | Closed | T | T-Rr-Ss-F | |
| 4a | Closed | Open | r | R | Ss-Tt-F |
| 5a | Closed | Open | s | S | Rr-Tt-F |
| 6a | Closed | Open | t | T | Rr-Ss-F |
| 7a | Closed | Open | R | r | Ss-Tt-F |
| 8a | Closed | Open | S | s | Rr-Tt-F |
| 9a | Closed | Open | T | t | Rr-Ss-F |

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4. TESTS PERFORMED AND TEST PROCEDURES

4.1 Lightning impulse voltage tests

For every test configuration indicated on page 4 the object was submitted to 15 successive negative impulse followed 15 successive positive impulses at 95 kV crest level. The isolating distance was tested at 110 kV crest level.

The test was made in according to IEC Standard, Publication 298, 1981 (Annex C.1.5)

Atmospheric conditions during the tests

P = 103,4 kPa

t = 23 °C

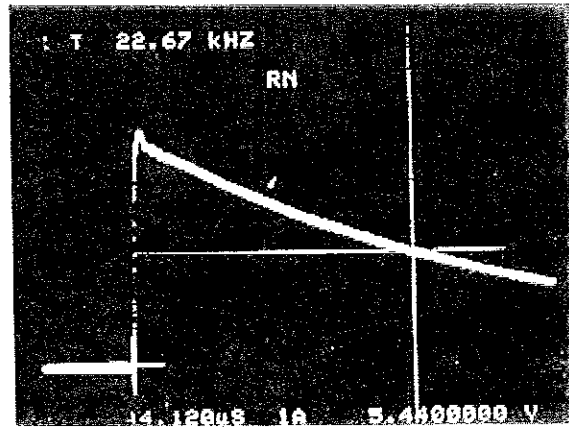
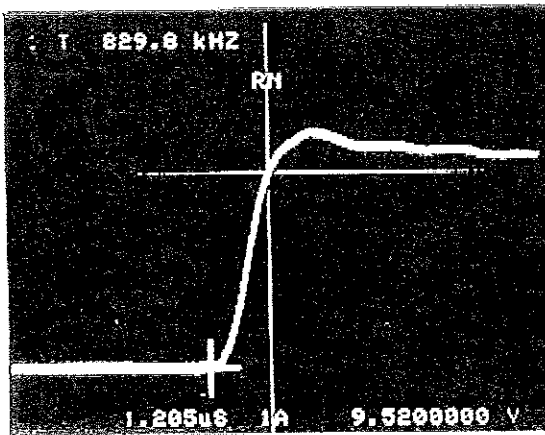
h = 23 q/m'

Test result : Positive

During the tests, no disruptive discharges on self-restoring insulation occurred.

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Obtained wave shape



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4.2 Power Frequency Voltage Withstand Dry Test

For every test configuration indicated on page 4 object was submitted to 38 kV r.m.s. for 1 minute and 45 kV r.m.s. for across the isolating distance.

The test was made in according to IEC Standard, Publication 298, 1981 item 6.1.7.

Atmospheric conditions during the tests:

b = 100,4 kPa

L = 22 °C

h = 12,5 g/m³

Test result : Positive

During the tests, no disruptive discharges on self-restoring insulation nature.

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4.3 Partial Discharge Test

For the test configuration 1 - 2 - 3 indicated on page 4, each phase was connected, alternatively, to the power supply during the measurement of the partial discharge level. The other phases were grounded together with the parts normally grounded during service.

Prestress voltage : 22,75 kV (1.3 U) for 10"

Teste voltage : 19,25 kV (1.1 U) for 1"

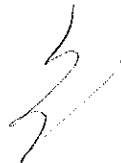
Atmospheric conditions during the tests:

b = 100,3 kPa

c = 23 °C

h = 6,4 g/m³

Test result : The measured partial discharge level, during the test, was less than 10 pC.



4.4 Combined tests

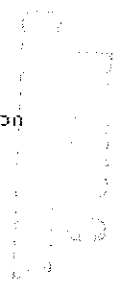
Withstand combined tests (DC/AC) were performed. Each test consisted in applying a 75 kV DC voltage to a phase of side 1 of the switchgear and a 11.55 kV r.m.s. (20kV/√3) AC voltage to the corresponding phase of side 2. The other phases and the metal enclosure were connected to ground. The test duration was 15". Tests were performed on each phase and with positive and negative DC voltage.

Atmospheric conditions during the tests

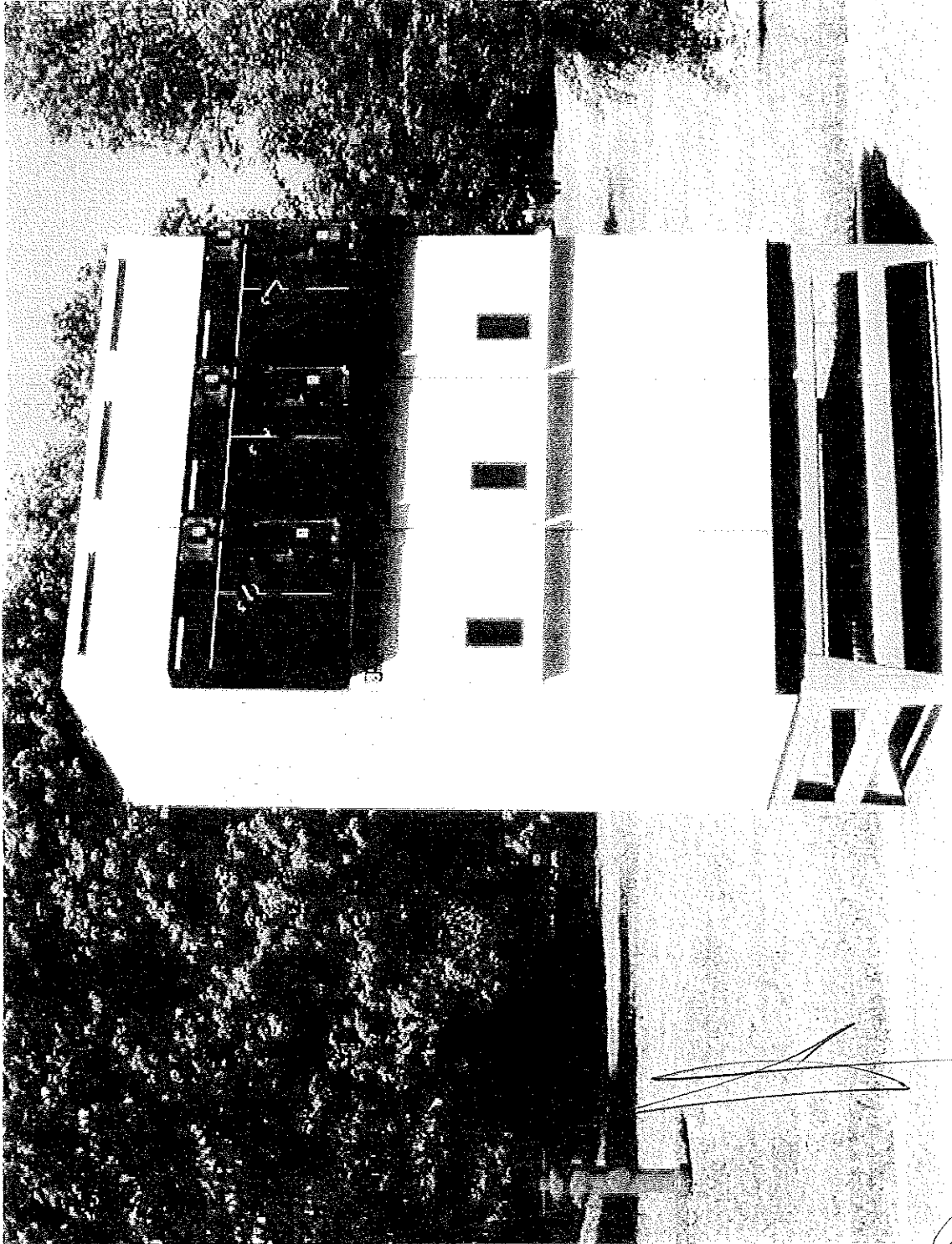
- b = 100,4 kPa
- t = 23 °C
- h = 13 g/m³

Test result : Positive

During the tests, no disruptive discharges on self-restoring insulation occurred.



TEST OBJECT



UNIVERSITÄT
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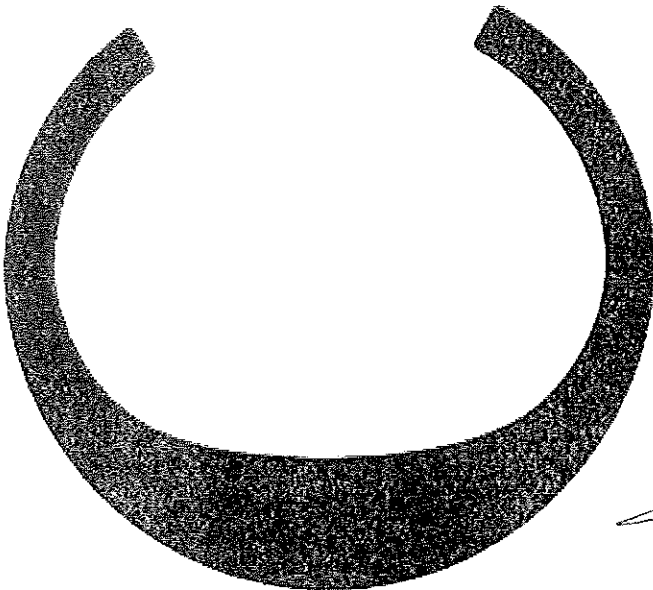
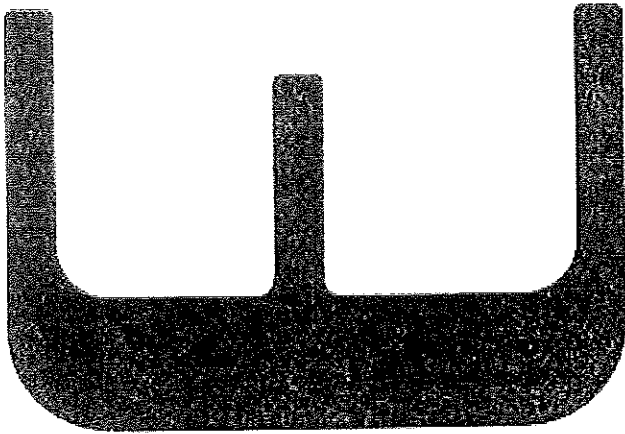
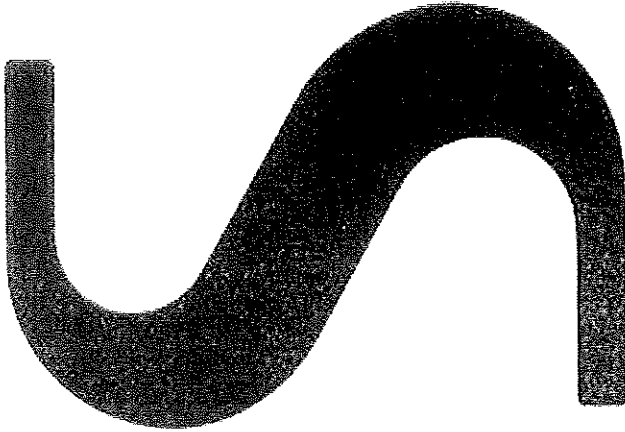
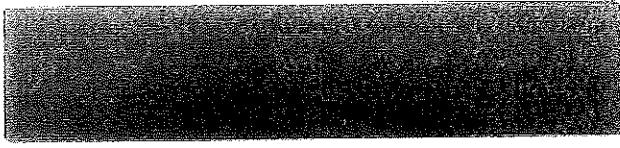
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AT91/015708



CHINA

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client MERLIN GERIN - GRENOBLE
 object THREE POLE METAL ENCLOSED AIR INSULATED SWITCHGEAR SM6 SYSTEM
 TYPE IM AND QM.
 Fitted with an increased operating frequency SF6 gas insulated
 switch type I SM6 and Q SM6

characteristics of the tested object assigned by Client

rated voltage 12 kV rated current 630-200 A rated frequency 50 Hz
 other characteristics listed on page 3

tests have been made in accordance with client's instructions
 test date June, 20th - 21th 1991

the performance of the apparatus tested and the observations made during the
 tests, have been recorded in the following pages.

this document is composed by 6 pages

Milan, September 1991

test engineer

Keywords: 12S100L 25S10S 31020R 41020R 52001D 62501B

Stamp: 01/019703
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Table of the tests performed

see page

- Lightning impulse voltage tests 5
- Power frequency voltage withstand test in dry conditions 6
- Partial discharge Test 7

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tests witnessed by

Mr. Laurens - MERLIN GERIN
 Mr. Drevon - MERLIN GERIN

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1. TEST OBJECT

THREE POLE METAL ENCLOSED AIR INSULATED SWITCHGEAR SM6 SYSTEM
TYPE IM AND QM.

Fitted with an increased operating frequency SF6 gas insulated
switch type I SM6 and Q SM6.

| | |
|-----------------------------------|--------------|
| - Manufacturer | MERLIN GERIN |
| - Rated voltage | 12 KV |
| - Rated current (IM) | 530 A |
| - Rated current (QM) | 200 A |
| - Short-circuit withstand current | 25 KA |

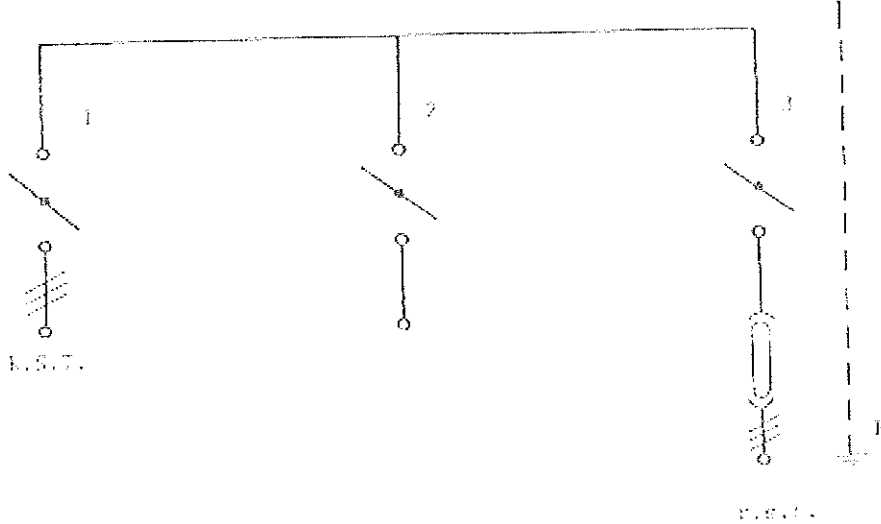
2. Identification of the object: affected

The tested object truly conforms to the drawings of its type supplied by
the client. These drawings, identified by CESI with embossing green and
numbered GPS 91/015161 1 to 17 and GPS 91/315162 1 to 13 are assembled
in a folder.



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3. TEST CONFIGURATIONS.



| Test configuration | Position switchgear 1 | Position switchgear 2 | Position switchgear 3 | Voltage applied to | Earth connected to | Insulate connected to |
|--------------------|-----------------------|-----------------------|-----------------------|--------------------|--------------------|-----------------------|
| 1 | Closed | Open | Closed | Rr | Ss-Tt-F | |
| 2 | Closed | Open | Closed | Ss | Rr-Tt-F | |
| 3 | Closed | Open | Closed | Tt | Rr-Ss-F | |
| 4 | Open | Open | Closed | R | r-Ss-Tt-F | |
| 5 | Open | Open | Closed | S | R-Rr-Tt-F | |
| 6 | Open | Open | Closed | T | r-Rr-Ss-F | |
| 7 | Open | Open | Closed | r | R-Ss-Tt-F | |
| 8 | Open | Open | Closed | s | S-Rr-Tt-F | |
| 9 | Open | Open | Closed | t | T-Rr-Ss-F | |
| 10 | Closed | Open | Open | R | r-Ss-Tt-F | |
| 11 | Closed | Open | Open | S | R-Rr-Tt-F | |
| 12 | Closed | Open | Open | T | r-Rr-Ss-F | |
| 13 | Closed | Open | Open | r | R-Ss-Tt-F | |
| 14 | Closed | Open | Open | s | S-Rr-Tt-F | |
| 15 | Closed | Open | Open | t | T-Rr-Ss-F | |
| 16 | Open | Open | Closed | R | r | Ss-Tt-F |
| 17 | Open | Open | Closed | S | r | Rr-Tt-F |
| 18 | Open | Open | Closed | T | r | Rr-Ss-F |
| 19 | Open | Open | Closed | r | s | Ss-Tt-F |
| 20 | Open | Open | Closed | s | r | Rr-Tt-F |
| 21 | Open | Open | Closed | t | r | Rr-Ss-F |

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1887

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4. TESTS PERFORMED AND TEST PROCEDURES

4.1 Lightning impulse voltage tests

For every test configuration indicated on page 4 the object was submitted to 15 successive negative impulse followed by 15 successive positive impulses at 75 kV crest level. The isolating distance was tested at 85 kV crest level.

The test was performed according to IEC standard, Publication 298, 1991 iter 6.1.6

Atmospheric conditions during the tests

h = 120,7 kPa

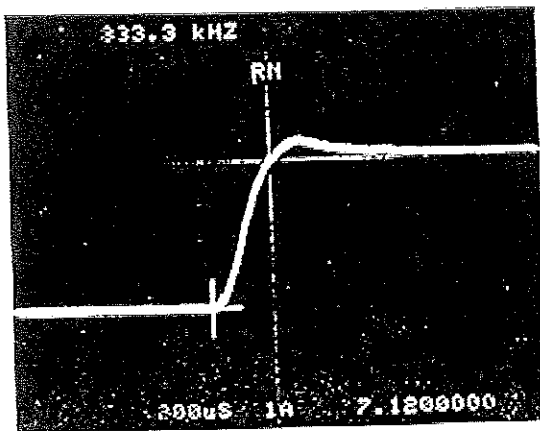
t = 22 °C

ρ = 13.4 g/m³

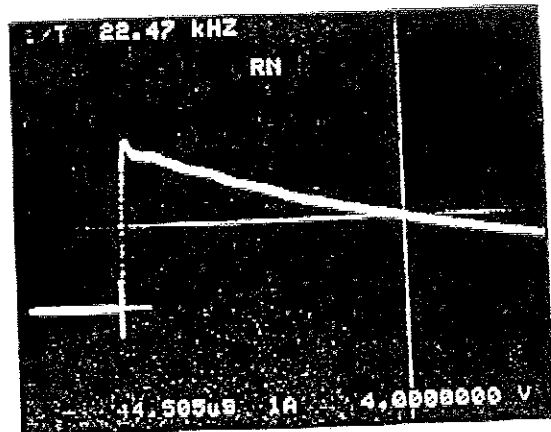
Test result : Positive

During the tests, no disruptive discharges on self-restoring insulation occurred.

obtained wave shapes



1.2 μs



45 μs

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1882

4.2 Power Frequency Voltage Withstand Dry Tests

For every test configuration indicated on page 4 the object was submitted to 28 kV r.m.s. for 1 minute, and to 32 kV r.m.s. across the isolating distance.
 The test was made according to IEC Standard, Publication 298, 1981 item 6.1.2.

Atmospheric conditions during the tests:

p = 100,6 kPa

t = 20 °C

h = 11 g/m³

Test result : Positive

During the tests, no disruptive discharges on self-restoring insulation occurs.

03
 10
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4.2 Partial discharge test

For this test configuration 1 - 2 - 3 indicated on page 4, each phase was connected, alternatively, to the power supply during the measurement of the partial discharge level. The other phases were grounded together with the parts normally grounded during service.

Pretest voltage : 15,6 kV (1.3 U) for 10"

Test voltage : 13,5 kV (1.1 U) for 1"

Atmospheric conditions during the test:

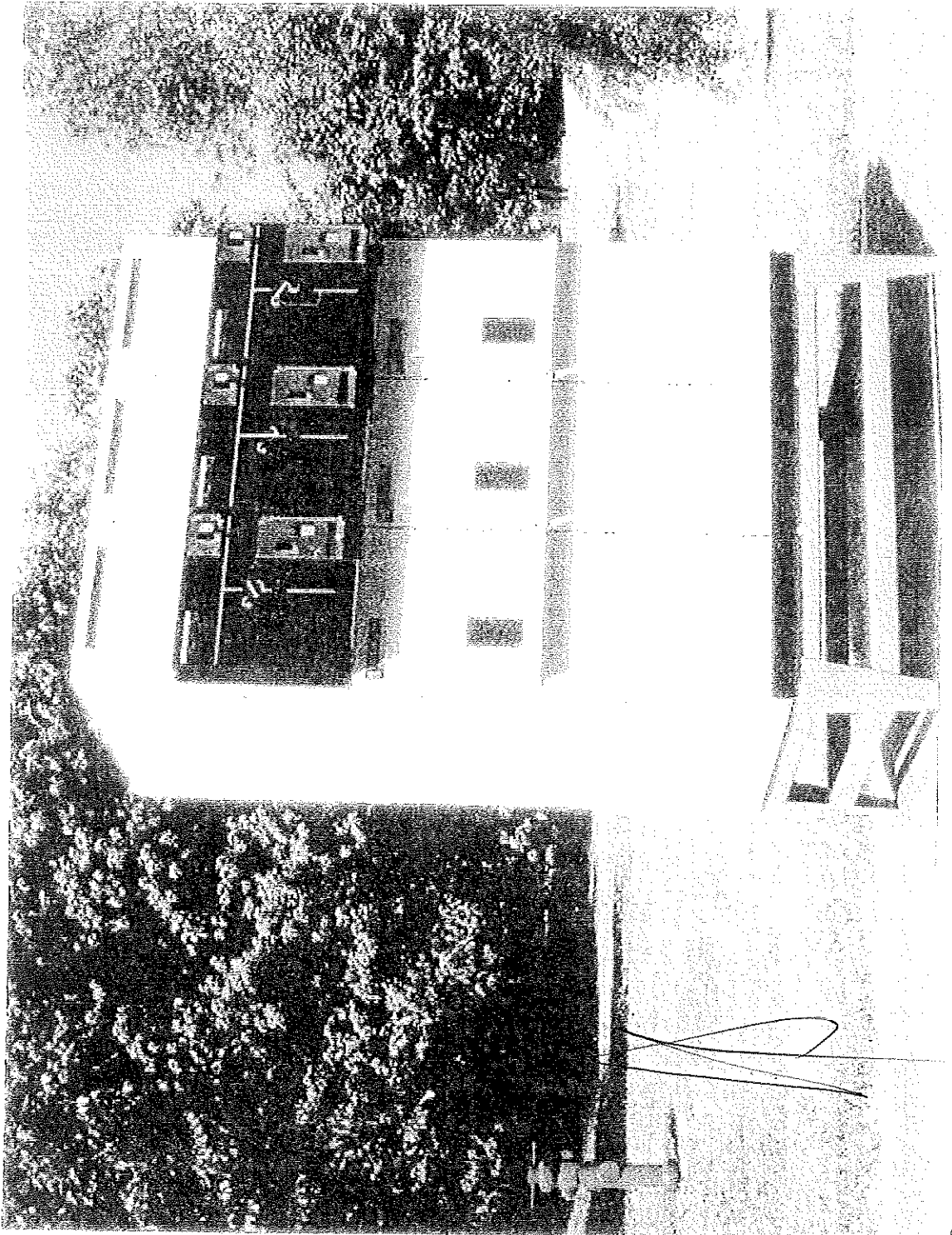
$p = 102.3 \text{ kPa}$

$t = 23 \text{ } ^\circ\text{C}$

$\rho = 1.2 \text{ g/m}^3$

Test result : The measured partial discharge level, during the test, was less than 10 pC.

TEST OBJECT



Prüfung
Geotechnik

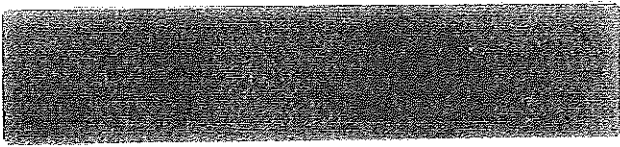
This test report is not a certificate of conformity, nor do the results given herein confirm the ratings supplied by the manufacturer. This document may not be reproduced otherwise than in its entirety and with CESI's authorization.

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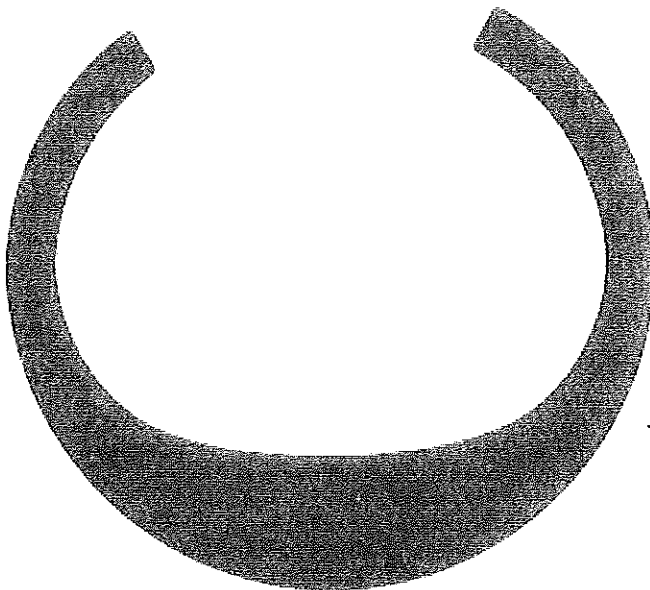
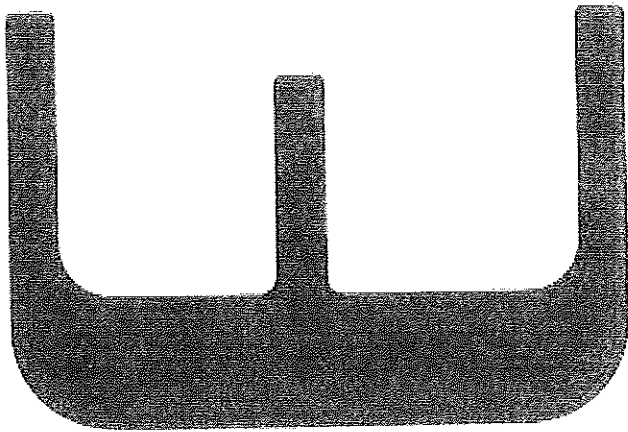
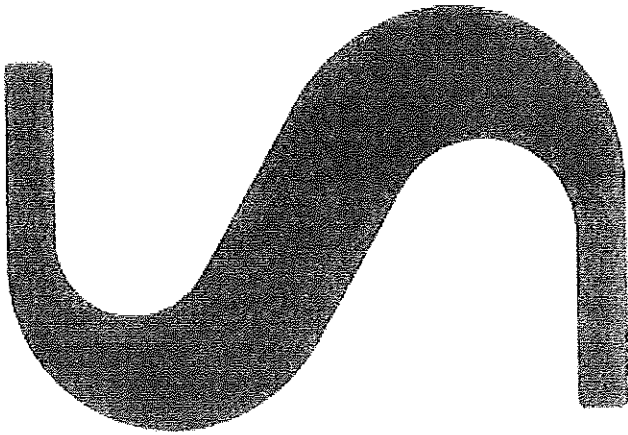
1885

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GPS91/14806



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1986

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1886

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client MERLIN GERIN S.A. - Grenoble (France)

object Three pole metal enclosed air insulated switchgear SM6 system type IM.
Fitted with an increased operating frequency SF6 gas insulated switch
type I SM6.

characteristics of the tested object assigned by the Client

rated voltage 12 kV rated current 400 A rated frequency 50 Hz

other characteristics listed on page 2

the tests have been made in accordance with client's instructions
based on IEC 265 (1982)

test date June 21st, 1991
June 24th, 1991

the performance of the apparatus tested and the observations made during the
tests have been recorded in the table with the test results and oscillograms

this document is composed by 8 pages, 239 oscillograms

milan, August 22th, 1991

test engineer

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Handwritten signature: Folokanov
P. La Monaco

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91/012284
keywords : 120100 234308 360208 450707 530018

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rated characteristics of the tested object assigned by the client

| | |
|-------------------------------------|--------------|
| voltage | 12 kV |
| frequency | 50 Hz |
| normal current | 400 A |
| short-circuit making current | 50 kA |
| short-time withstand current | 20 kA |
| short-circuit duration | 1 s |
| mainly active load breaking current | 400 A |
| gas pressure for interruption | 1.4 bar abs. |

Identification of the object effected.

The tested object truly conforms to the drawings of its type supplied by the client. These drawings identified by CESI with embossing press and numbered GPS- 91/015161 1 to 12 are assembled in a folder.

91/014806
 Page 2
 CESI

Two handwritten signatures are present. The one on the left is a cursive signature, and the one on the right is a stylized signature with a large 'A' shape.

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1888

2/

table of tests performed

| date | type of test | see page |
|----------------------------|---|----------|
| June 21st, 24th 1991 | THRES-PHASE MAINLY ACTIVE LOAD CURRENT SWITCHING TESTS No. 100 tests with 420 A at 12 kV | 6 |
| June 24th 1991 | No. 20 tests with 21 A at 12 kV | 6 |

100 tests with 420 A at 12 kV
 20 tests with 21 A at 12 kV

tests witnessed by

Mr. Laurens - MERLIN GERIN S.A.
 Mr. Dubroquis - MERLIN GERIN S.A.

[Signature]

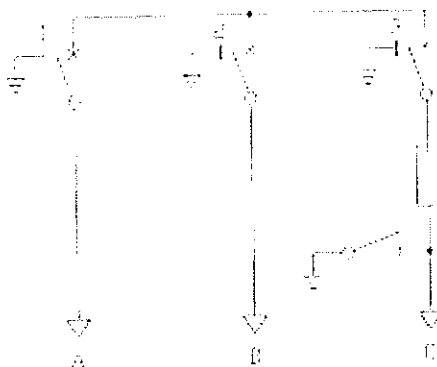
This test report is not a certificate of conformity, nor do the results given necessarily confirm the ratings supplied by the manufacturer.
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[Signature]

1889

arrangement of the object for the tests

The tested apparatus was assembled with two other apparatus of SM6 system (see photo on page 11).
The figure below shows the electric diagram of the complete setting (single phase diagram of a three phase circuit) :



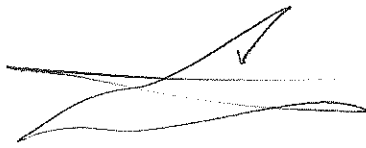
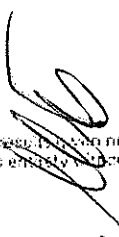


- 1 : switch under test
2-3 : auxiliary switches
A-B-C : cables

During the tests the cables A were connected to the supply, the switch 2 was in closed position and the cables B were connected to the load. The switch 3 was in open position.

The metal enclosure was insulated from earth but connected thereto by a copper wire 0.1 mm in diameter and 30 cm long to indicate any significant leakage current to earth.

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three-phase mainly active load current switching tests

test duty _____ with 420 A at 12.5 kV

test circuit conditions

circuit diagram see page: 7

| | | | |
|--------------------|-----------------------|--|-------|
| supply circuit | | impedance | 3.5 Ω |
| power factor: | < 0.2 | [20 % of the total impedance of the circuit] | |
| frequency: | 50 Hz | | |
| neutral condition: | earthed | | |
| TRV : | up 21 kV 0.1 59 μs | | |

| | | | |
|--------------------|-----------|-----------------|------|
| load circuit | | frequency: | - Hz |
| power factor: | 0.73 | damping factor: | - |
| neutral condition: | insulated | | |

| | | | |
|---|-----------|-----|----------|
| control voltage of operating devices for: | closing | - | V |
| | opening | - | V |
| | motor | - | V |
| | operation | - | bar abs. |
| gas operating pressure for : | breaking | 1.4 | bar abs. |

conditions of the apparatus before the tests : new

| | |
|---------------------|---|
| tests performed | no.100 tests with operating sequence C0 |
| test no. | 1 to 100 |
| oscillograms no. | 3 to 102 |
| test voltage | 12 kV |
| test current | 420 A |
| minimum arcing time | 6 ms |
| maximum arcing time | 11 ms |

The tested switch has always cleared the current.
No overvoltage was observed on supply and load side of the circuit.

conditions of the apparatus after the tests: external parts as before the tests
internal parts not inspected.

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Three-phase mainly active load current switching tests

Test duty with 21 A at 12.3 kV

test circuit conditions

circuit diagram see page: 7

| | | | |
|--------------------|----------|-----------|-------|
| supply circuit | | Impedance | 1.5 Ω |
| power factor: | < 0.2 | | |
| frequency: | 50 Hz | | |
| neutral condition: | earthed | | |
| TRV : | uc 21 kV | LS | 59 μs |

| | | | |
|--------------------|-----------|-----------------|------|
| load circuit | | frequency: | - Hz |
| power factor: | 0.73 | damping factor: | - |
| neutral condition: | insulated | | |

| | | | |
|---|-----------|-----|----------|
| control voltage of operating devices for: | closing | - | V |
| | opening | - | V |
| | motor | - | V |
| gas operating pressure for : | operation | - | bar abs. |
| | breaking | 1.4 | bar abs. |

conditions of the apparatus before the tests : as after the test no. 100

| | |
|---------------------|--|
| tests performed | no.20 tests with operating sequence CO |
| test no. | 101 to 120 |
| oscillogram no. | 105 to 122 |
| test voltage | 12 kV |
| test current | 21 A |
| minimum arcing time | 5 ms |
| maximum arcing time | 0 ms |

The tested switch has always cleared the current.
No overvoltage was observed on supply and load side of the circuit.

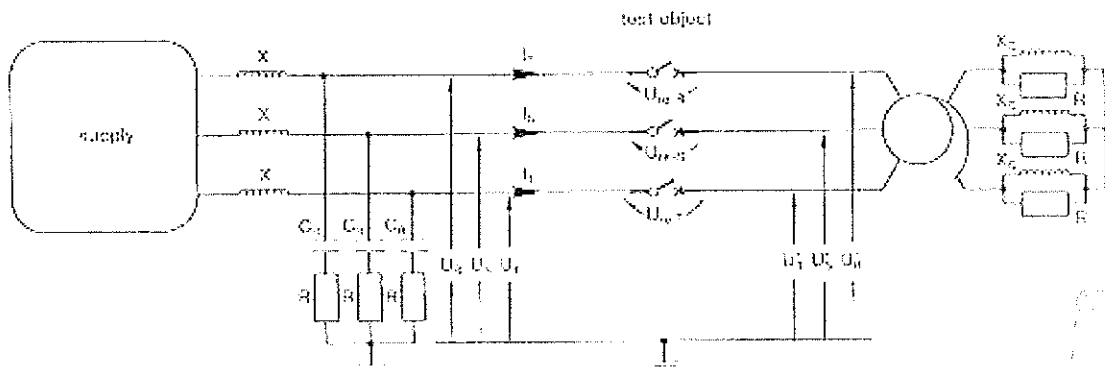
conditions of the apparatus after the tests: external parts as before the tests
internal parts not inspected.

note after all the tests : the performance of the apparatus is considered
satisfactory for the tests performed.

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91

circuit-diagram

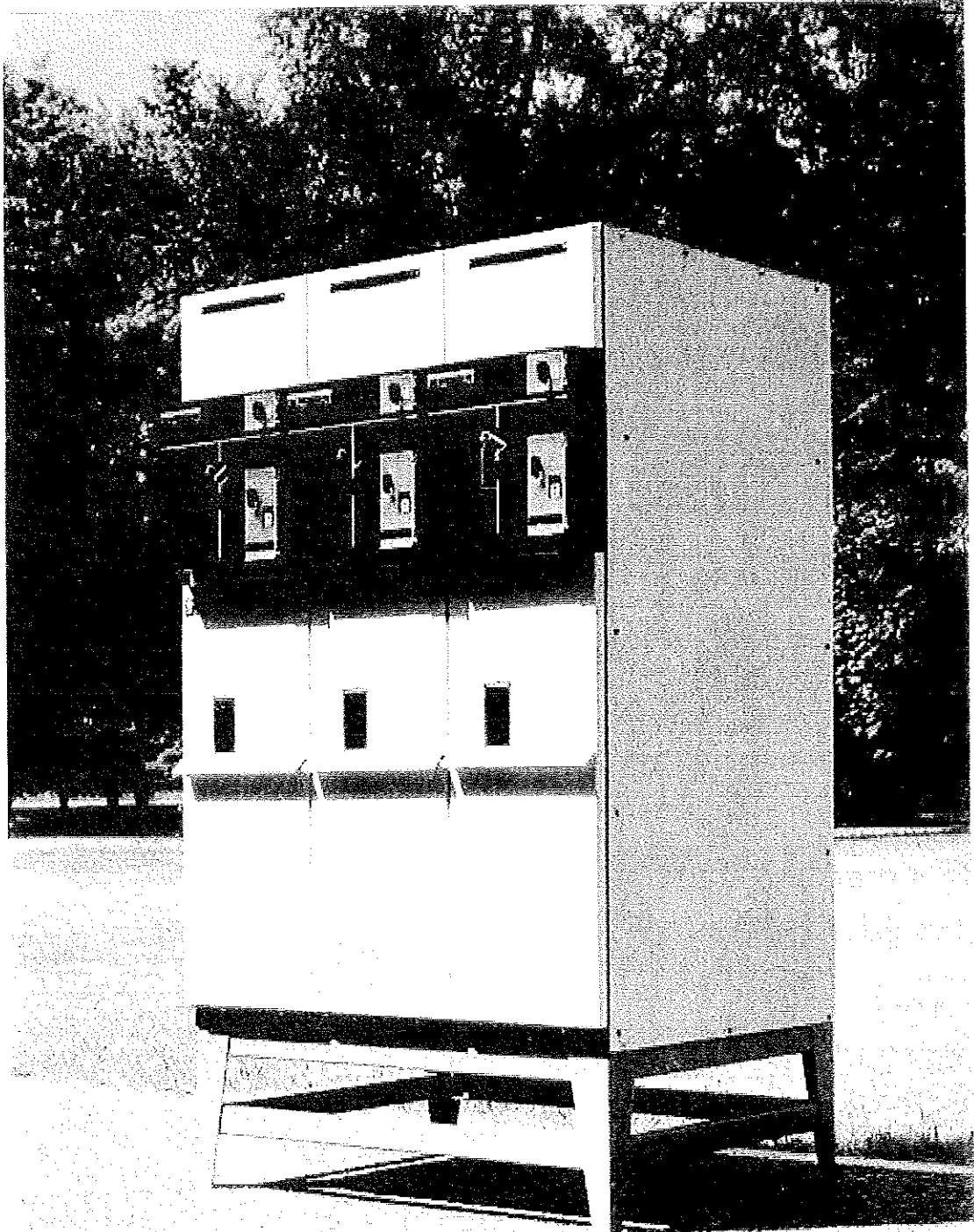


(Handwritten notes)

symbols used in this diagram are the same as on the test diagrams

(Three handwritten signatures)

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10/10/83

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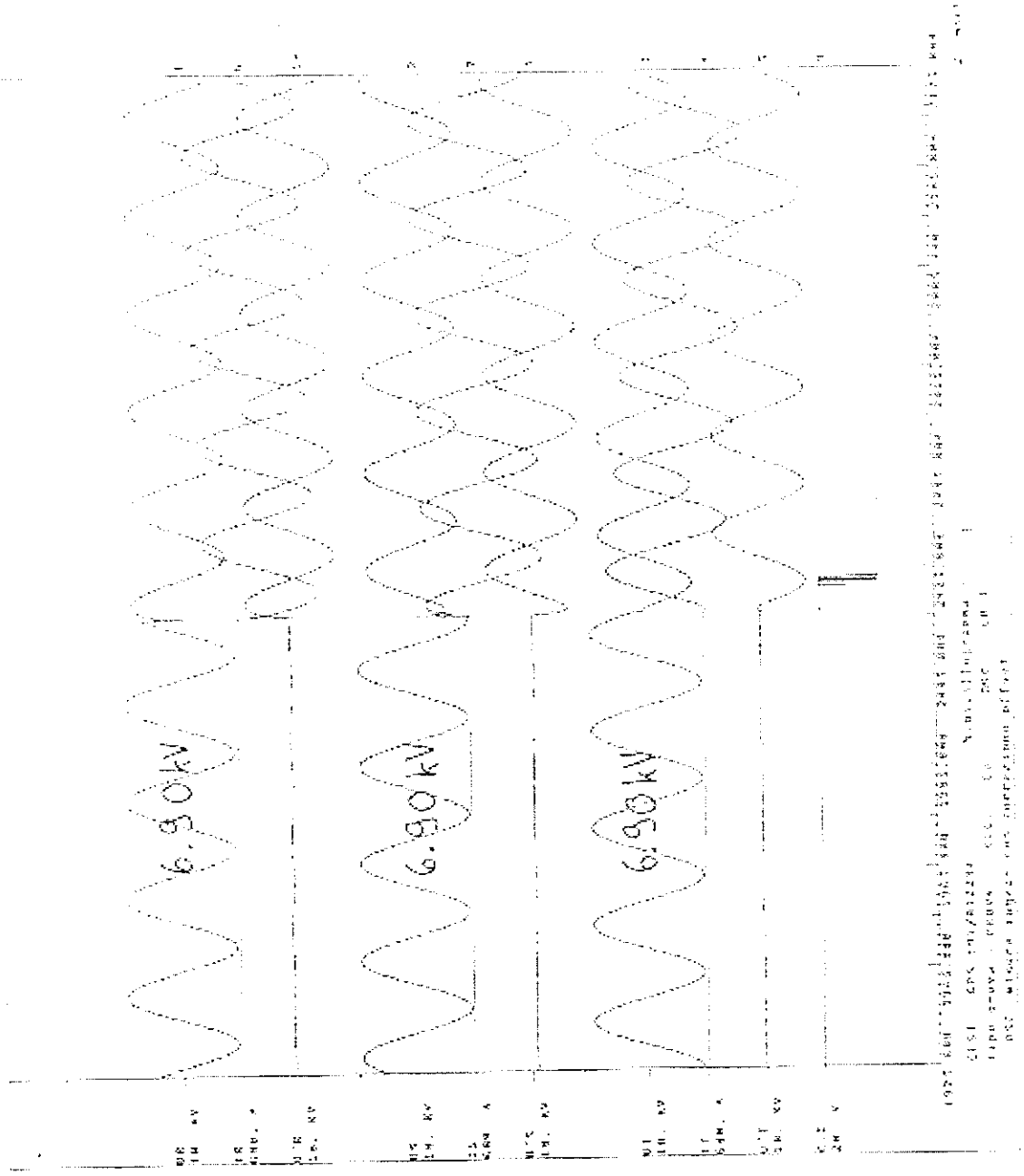
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1894

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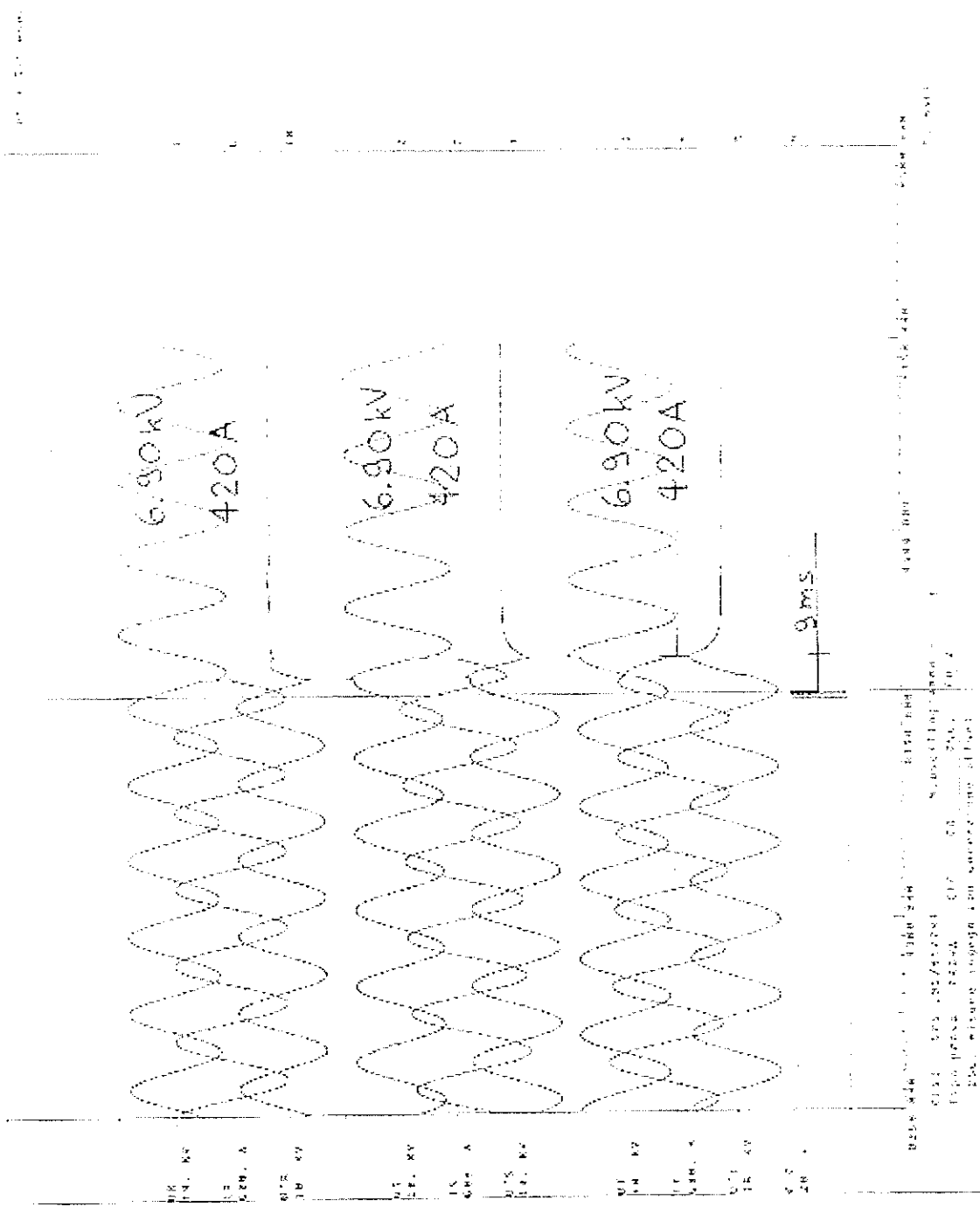
6.90 kW

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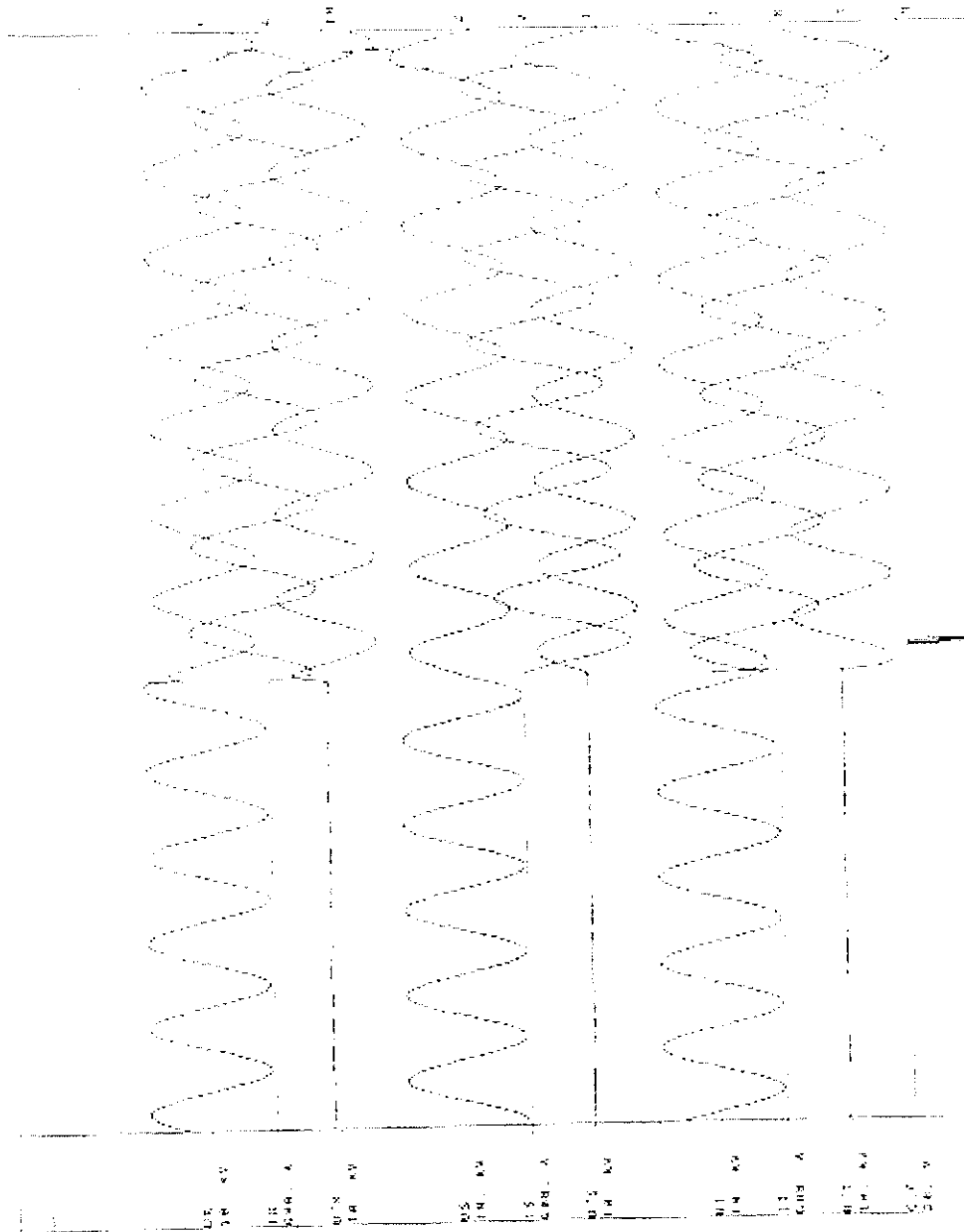


db

X

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22



LEAD I
 2.5 mV
 1 sec
 LEAD II
 2.5 mV
 1 sec
 LEAD III
 2.5 mV
 1 sec

RITZ
 1897

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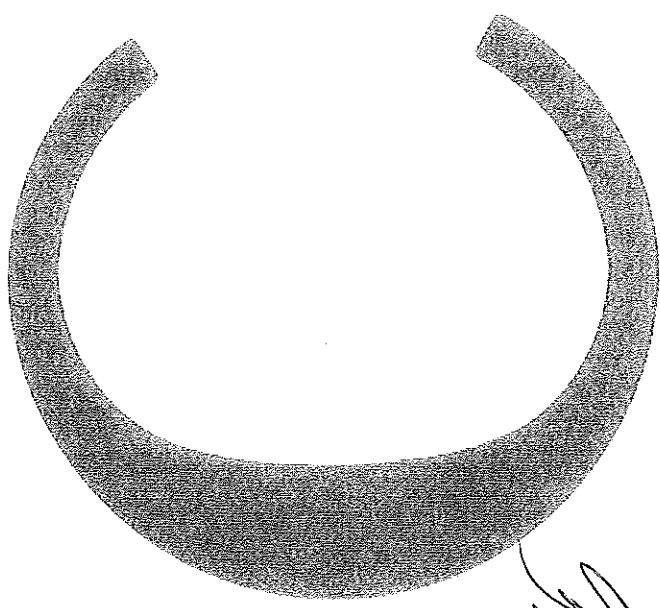
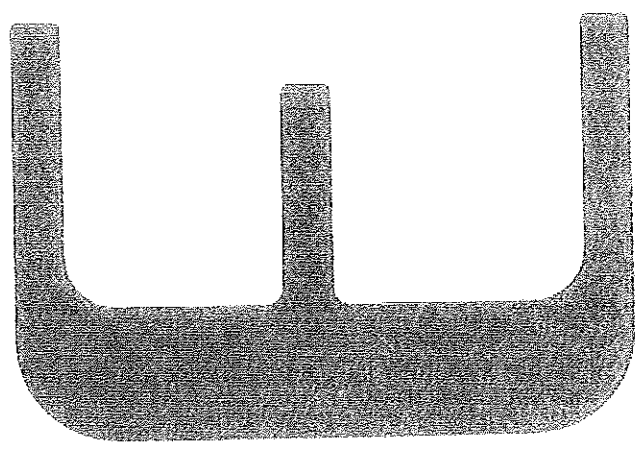
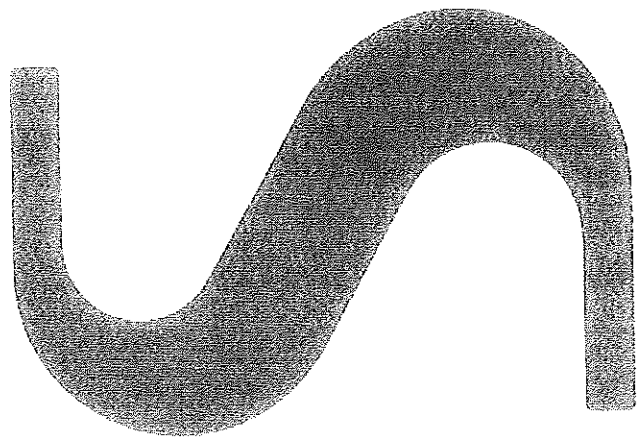
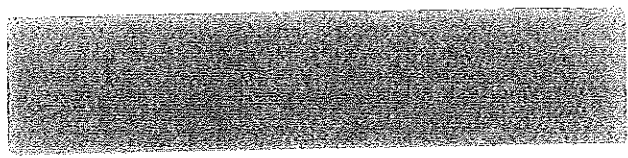
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client MERLIN GERIN S.A. - Clichy (France)

object Three pole metal enclosed air insulated switchgear SM6 system type QM.
Fitted with an increased operating frequency SF6 gas insulated switch
type IQ SM6.

characteristics of the tested object assigned by the Client

rated voltage 24 kV rated current 200 A rated frequency 50 Hz

other characteristics listed on page 2

the tests have been made in accordance with client's instructions
based on IEC 420 (1990)

test date June 25th, 1991

The performance of the apparatus tested and the observations made during the
tests have been recorded in the table with the test results and oscillograms

this document is composed by 7 pages, 9 oscillograms

Milan, August 21st, 1991 Test engineer

F. Lo Monaco

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91/012284
keywords : 120100 234300 300200 430700 530010

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1899

9/2

rated characteristics of the tested object assigned by the client

| | |
|---|--------------|
| voltage | 24 kV |
| frequency | 50 Hz |
| normal current | 200 A |
| short-circuit making current | 50 kA |
| short-time withstand current | 20 kA |
| short-circuit duration | 1 s |
| rated transfer current of the switch-fuse combination | 1400 A |
| gas pressure for interruption | 1.4 bar abs. |

identification of the object affected.

The tested object truly conforms to the drawings of its type supplied by the Client. These drawings identified by CESI with embossing press and numbered GPS- 91/015162 1 to 13 are assembled in a folder.

RECEIVED
1991
SEP 10 10 30

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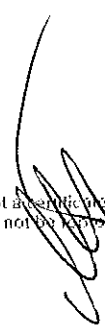
table of tests performed

| date | type of test | see page |
|-------------------|--|----------|
| June 25th 1991 | <p>BREAKING TESTS AT THE RATED TRANSFER CURRENT</p> <p>No.3 tests with 1400 A at 24 kV</p> | 5 |

C
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tests witnessed by

Mr. Laurens - MERLIN GERIN S.A.
 Mr. Dubroqua - MERLIN GERIN S.A.

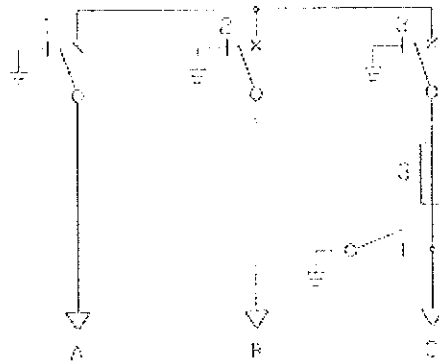




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arrangement of the object for the tests

The tested apparatus was assembled with two other apparatus of SM6 system (see photo on page 7).
The figure below shows the electric diagram of the complete setting (single phase diagram of a three phase circuit) :



- 3 : switch-fuse combination under test
- 1-2 : auxiliary switches
- A-B-C : cables

During the tests the cables B were connected to the supply, the switch 2 was in closed position and the cables C were connected to the load. The earthing switch downstream the fuse and the switch 1 were in open position.

The metal enclosure was insulated from earth but connected thereto by a copper wire 0.1 mm in diameter and 30 mm long to indicate any significant leakage current to earth.

During each test the fuses of two poles were replaced by cylindric copper connections having the same dimensions of fuses.

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three-phase breaking tests at the rated transfer current

test duty _____ with 1500 A at 24.0 kV

test circuit conditions

circuit diagram see page: 6

supply circuit
 power factor: < 0.1 impedance 1.5 Ω
 frequency: 50 Hz [15 % of the total impedance of the circuit]
 neutral condition: insulated

TRV : uc 41 kV L3 88 μs

load circuit
 power factor: 0.27
 neutral condition: earthed

TRV : uc 42 kV L3 175 μs

conditions of the apparatus before the tests : new

| test | no. | 1 | 2 | 3 | | |
|-----------------------------------|------------------------------------|----------------------|----------------------|----------------------|--|--|
| oscillograms | no. | 135 | 136 | 137 | | |
| operating duty | | 0 | 0 | 0 | | |
| recovery voltage (phase value) | kV | 13.9 13.9 13.9 | 13.9 13.9 13.9 | 13.9 13.9 13.9 | | |
| phase-to-phase voltage | kV | 24.0 | 24.0 | 24.0 | | |
| prospective current | A | 1400 1400 1400 | 1400 1400 1400 | 1400 1400 1400 | | |
| fuse link size | A | 80 | 80 | 30 | | |
| phase with the fuse | | T | S | R | | |
| duration of interruption | by the fuse μs by the switch ms | 27 38 | 23 37 | 55 37 | | |
| gas operating pressure for | operation bar interruption bar | - 1.4 | - 1.4 | - 1.4 | | |

conditions of the apparatus after the tests: external parts as before the tests, internal parts not inspected.

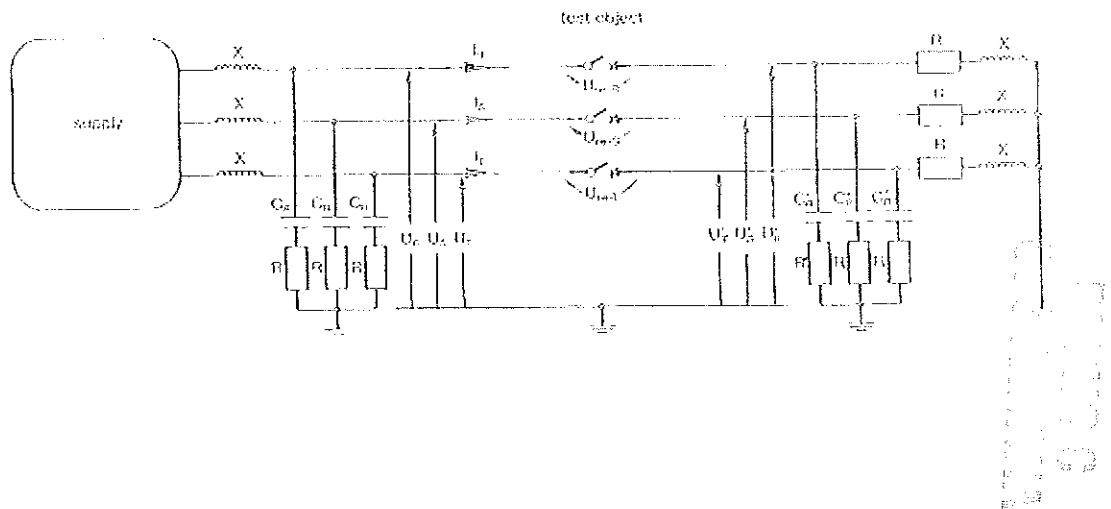
note after the tests : the performance of the apparatus is considered satisfactory for the tests performed.

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1903

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circuit-diagram



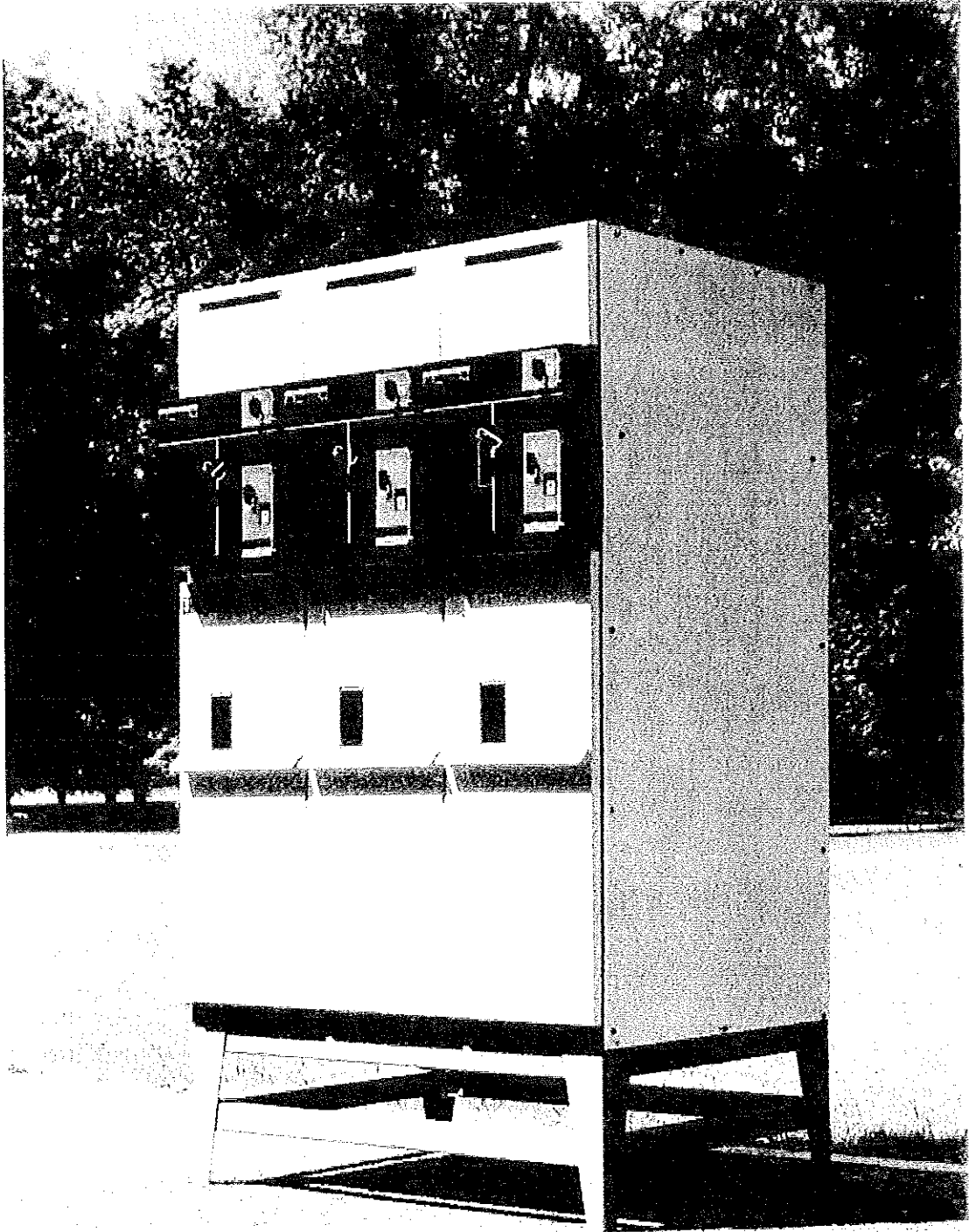
symbols used in the diagram are the same as on the explanations

[Three handwritten signatures]

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1904

2/2



PROTECTOR
CORPORATION

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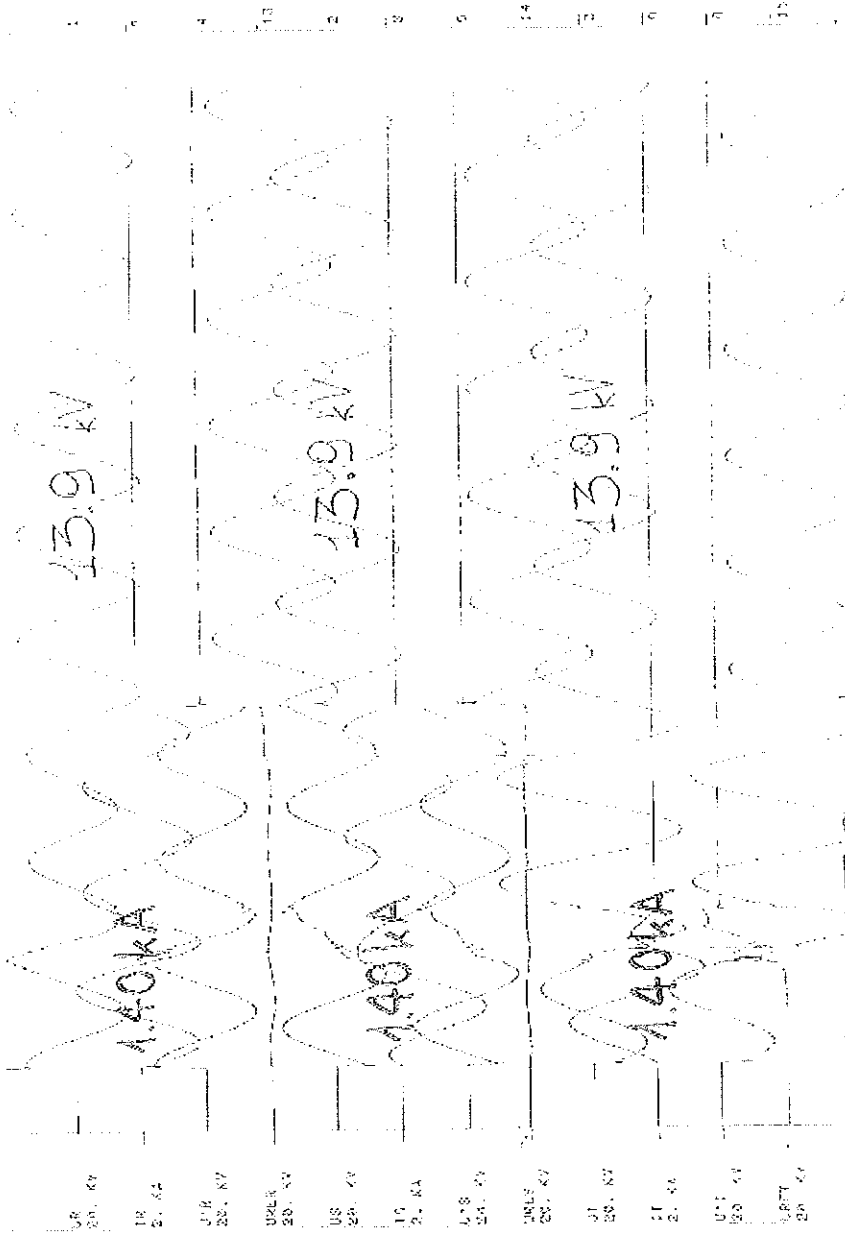
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1905

22

00007.3708 8000
0-00000.0000 8000
00000.0000 8000
00000.0000 8000



044.0000 004.0000 004.0000 004.0000 004.0000 004.0000 004.0000
 000.0000 000.0000 000.0000 000.0000 000.0000 000.0000 000.0000
 000.0000 000.0000 000.0000 000.0000 000.0000 000.0000 000.0000
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0001 - 000 000000000
 Tips mode = 200V - 010 0.0000 - 200.0 0000
 - 010.0000 00000.0000 00000.0000

0000000000
 0000000000

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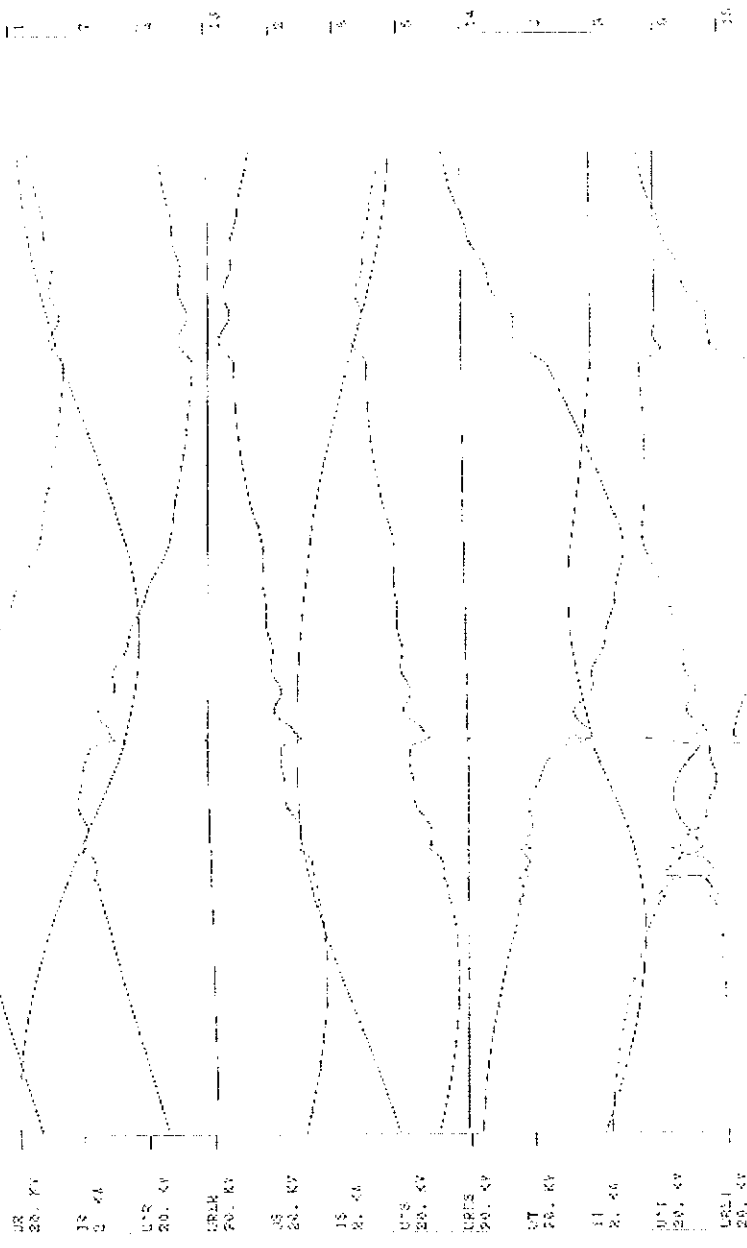
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1902

22

URS11060-1#
34.158 KV



282.000 27.000 25.000 23.000 21.000 19.000 17.000 15.000 13.000 11.000 9.000 7.000 5.000 3.000 1.000
UR 20. KV JS 20. KV U'S 20. KV URAR 20. KV JS 20. KV JS 20. KV U'S 20. KV URPS 20. KV UT 20. KV U'S 20. KV U'S 20. KV URS 20. KV
340 KV
34.158 KV
25

282.000 27.000 25.000 23.000 21.000 19.000 17.000 15.000 13.000 11.000 9.000 7.000 5.000 3.000 1.000

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For 1

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JCS: pwb:z
21.474 CV
22.036 CV



220.750
208.140
0.9 400

220.750

220.750

0801 - 029 141012284 N. 66011 Lograman - 133
1100 pava - 09272 - 210. 5 1051 - 210. - 02-1
- 000. 21000. 10000. 000. 000. 000.

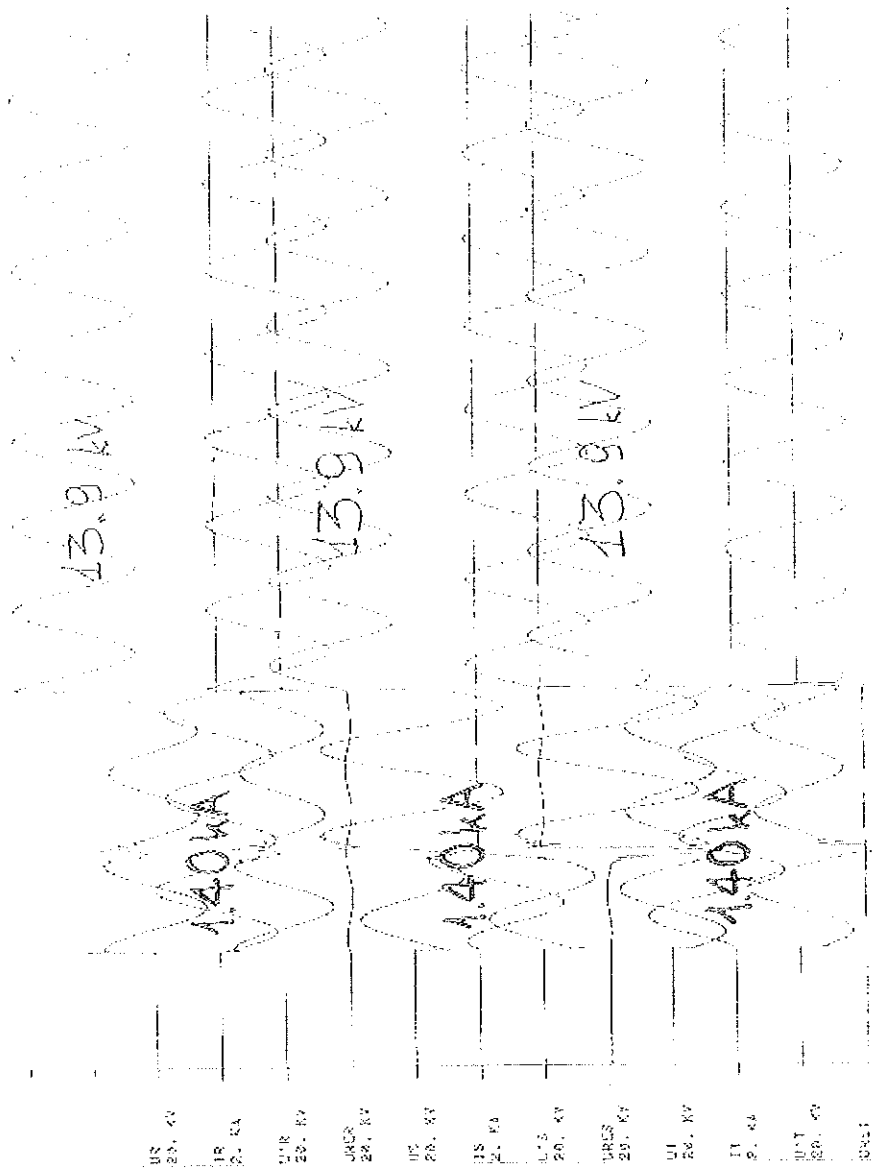
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1908

01-22-813 wsc
01-22-802 wsc
01-22-802 wsc
20 2 5V



25 ms 37 mV

01-22-813 wsc
01-22-802 wsc
01-22-802 wsc
20 2 5V

01-22-813 wsc
01-22-802 wsc
01-22-802 wsc
20 2 5V

01-22-813 wsc
01-22-802 wsc
01-22-802 wsc
20 2 5V

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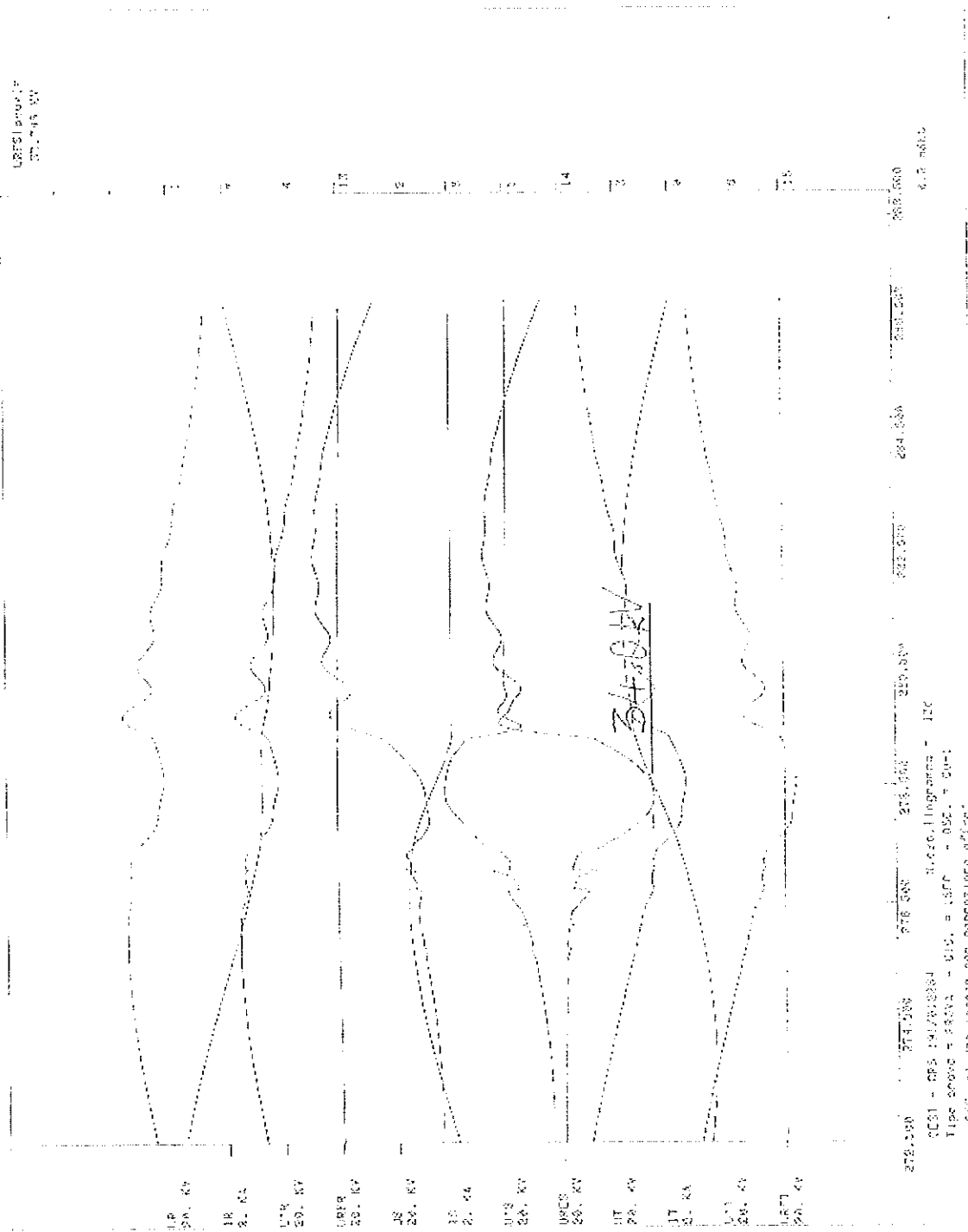
[Handwritten signature]

1902

[Handwritten signature]

LORESI amox 10
27.04.95 10V

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272.330V 274.330V 276.330V 278.330V 280.330V 282.330V 284.330V 286.330V 288.330V
 4.7 mV/1.5

CCSI - OPS 191/20/2084 0.020.11programma - 115
 Tipo onda = 250V - 115, = 15FF - 0.05, = 0.1
 - Sec. 1.14000 con abbreviazione.

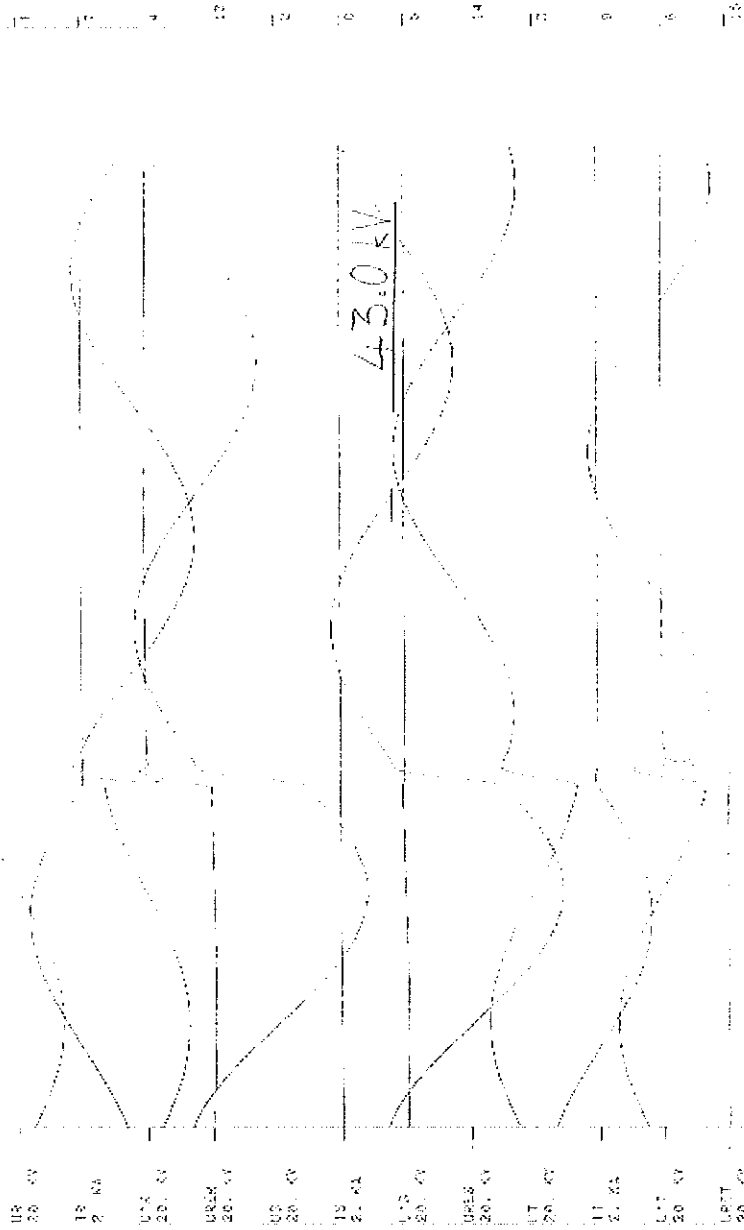
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USSI:pepki= 49.543 kv
 USSV:pepki= 49.543 kv



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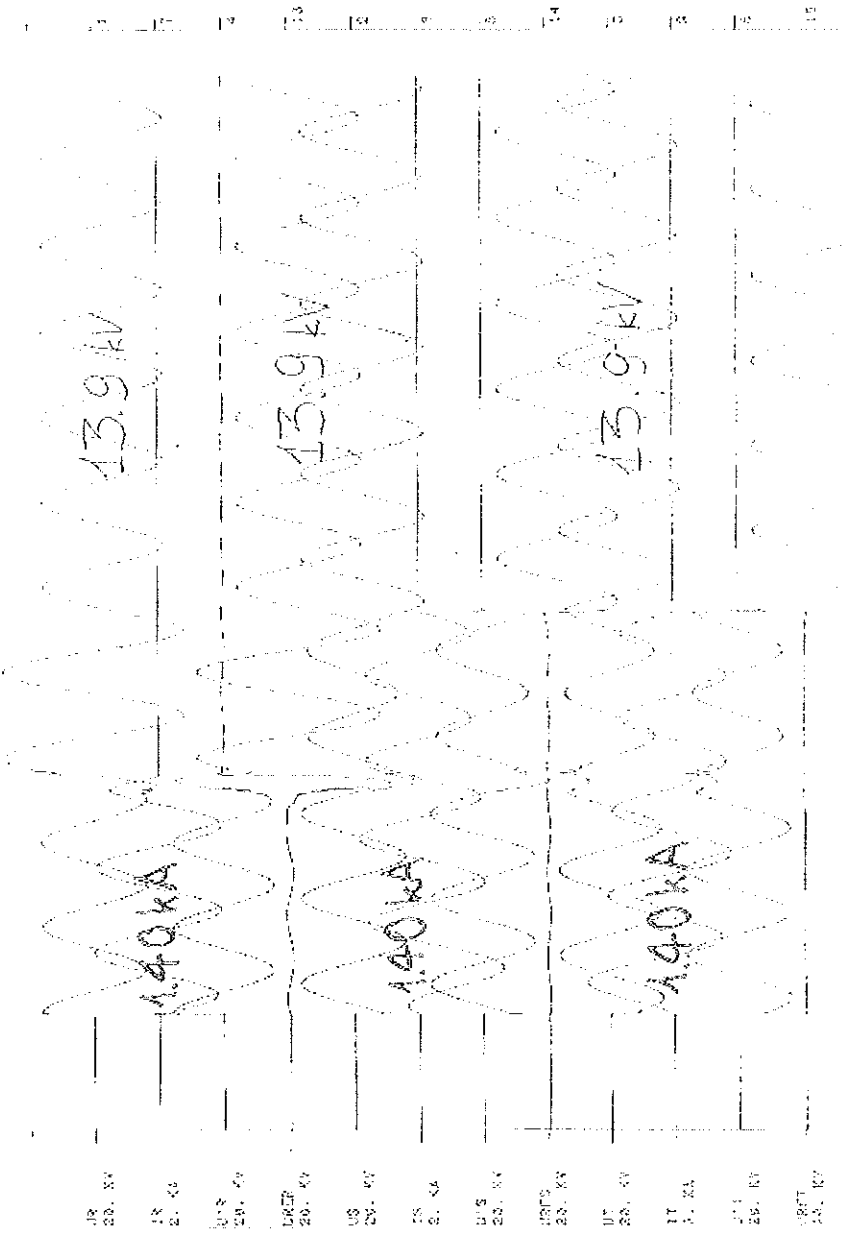
USSV:pepki= 49.543 kv
 USSV:pepki= 49.543 kv

USSV:pepki= 49.543 kv
 USSV:pepki= 49.543 kv

[Handwritten signature]

DTIC: 1001 1000
DTIC: 1001 1000
DTIC: 1001 1000
DTIC: 1001 1000

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155 ms | 37 ms

200.00V 200.00V 200.00V 200.00V 200.00V 200.00V
200.00V 200.00V 200.00V 200.00V 200.00V 200.00V
200.00V 200.00V 200.00V 200.00V 200.00V 200.00V
200.00V 200.00V 200.00V 200.00V 200.00V 200.00V

100.00V 100.00V 100.00V 100.00V 100.00V 100.00V
100.00V 100.00V 100.00V 100.00V 100.00V 100.00V
100.00V 100.00V 100.00V 100.00V 100.00V 100.00V
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