

## ТОМ 4

Открита процедура за сключване на рамково  
споразумение с предмет: „Доставка на комплектни  
комутационни устройства“ Реф№ PPD 16-049

Възложител: „ЧЕЗ Разпределение България“ ЕАД



Предложение за изпълнение  
на поръчката

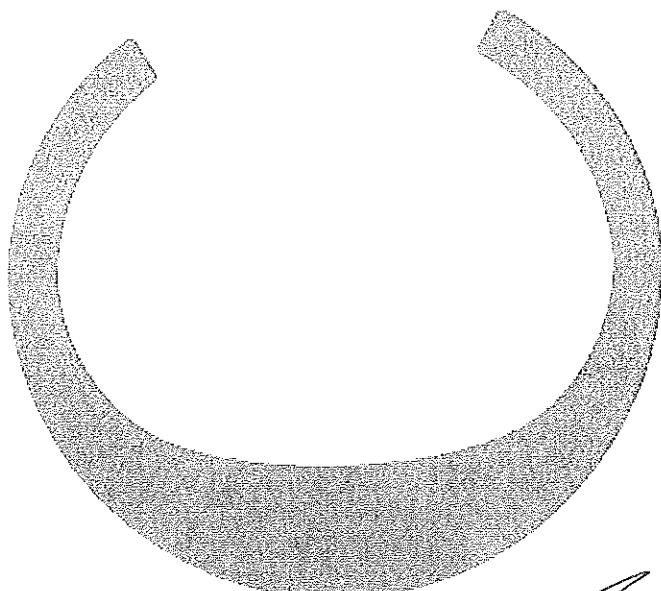
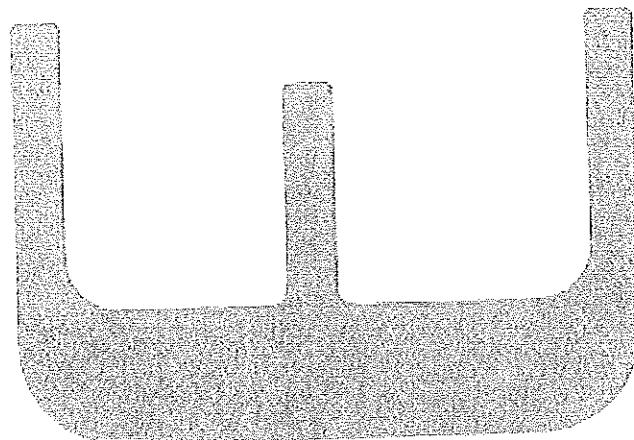
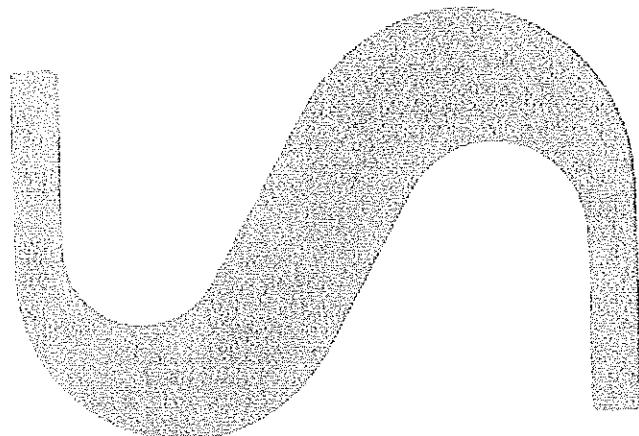


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CEC

# test report

1103-324615136

client: HOBUTH GIRON SAS - (French company)

object: Three pole main's enclosed air insulated switchgear CSA system type ID, fitted with an increased operating frequency and over insulated switch type 7-100.

characterisation of the tested object assigned by the client.

rated voltage: 17.3/11 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  
except IEC 655 (1988)

test date: June 16th, 1991  
June 17th, 1991

The performance of the apparatus tested and the observations made during the tests have been recorded in the tables with the test results and conclusions.

This document is composed by 12 pages, 153 and 154

in Lyon, Airport RLB, 1991 *Test supervisor*

Test supervisor

*Test supervisor*

1103-324615136 1215 17/06/91

This report is not a certificate of conformity, nor did the results given correspond to the range supplied by the manufacturer.  
The conclusions of the report and other comments may be found in the following section.

*GJ*  
1215

*3*

CEST

# test report

088-917616-186 - Page 3

rated characteristics of the tested object supplied by the client.

|                                       |         |           |
|---------------------------------------|---------|-----------|
| volts                                 | 17,5/24 | V         |
| frequency                             | 50      | Hz        |
| normal current                        | 430     | A         |
| short-circuit breaking current        | 50      | KA        |
| short-time withstand current          | 20      | KA        |
| electro-pullout protection            | 5       | A         |
| mainly active load breaking current   | 400     | A         |
| cable charging breaking current       | 25      | A         |
| residual transformer breaking current | 10      | A         |
| impedance for protection              | 1,4     | Impedance |

## identification of the object tested.

This tested object truly conforms to the drawings of the type supplied by the client. These drawings identified by CESE with enclosing prints and numbered 088-9176161-1 to 12 are enclosed in a folder.

*[Signature]*

This test report is not a certificate of conformity, nor do the results necessarily confirm the object to be valid by the manufacturer.  
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*[Signature]*  
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CH-63

test report

060-01/005100 - page 3

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Table of tests performed

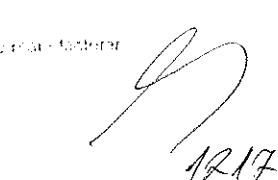
| date              | type of test  | result |
|-------------------|---|--------|
| June 18th<br>1931 | THREE-PHASE ACTIVE AND CURRENT SWITCHING TESTS<br>Ra. 100 tests with 400 A at 24 KV           | P      |
| June 18th<br>1931 | Ra. 20 tests with 20 A at 24 KV   | P      |
| June 19th<br>1931 | THREE-PHASE NO-LOAD TRANSFORMER CURRENT SWITCHING TESTS<br>Ra. 100 tests with 15 A at 24.4 KV | P      |
| June 19th<br>1931 | THREE-PHASE SINGLE-PHASE CURRENT SWITCHING TESTS<br>Ra. 20 tests with 20 A at 24.2 KV         | P      |

Witnessed by

Mrs. Laurens - MERLIN GENEVA S.A.  
Mr. Buthmann - MERLIN GENEVA S.A.



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9651

test report

693-91/010146 Page 4

connection of the object for the tests.

The tested apparatus was connected with two other apparatus of 965 series (see photo on page 12).

The figure below shows the electric diagram of the complete test set (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 1 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 m long to indicate any significant leakage current to earth.

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*C&S*

# test report

GB-91/015/86 Page 6

*[Signature]*

## Three-phase mainly active load current switching tests

test duty with 400 A at 24.0 kV

### test circuit conditions

circuit diagram see page 10

#### supply circuit

power factor: 0.92  
frequency: 50 Hz  
neutral condition: earthed  
TMR = inc 44 kV 0.5 ms

impedance 6.9 m  
(20 % of the total impedance of the circuit)

#### load circuit

power factor: 0.70  
neutral condition: insulated

frequency: 50 Hz  
damping factor:

control voltage of operating device: 240 V

closed

operating

motor

operation

break

breaking 0.4

bar abw.

breaking 0.4

bar abw.

conditions of the apparatus before the tests: new

tests performed no. 100 tests with operating sequence 60

test no. 1 to 100

oscillograms no. 4 to 10 s

test voltage 24 kV

test current 400A

minimum arcng time 3 ms

maximum arcng time 15 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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**CESI**

**test report**

625-91/015026 Page 6

Three-phase mainly active load current switching tests

Test duty:  $I_{max} = 20 \text{ A}$  at  $U_{L-N} = 240 \text{ V}$

**Test circuit conditions**

Circuit diagram see paper 10

|                                   |               |            |                         |
|-----------------------------------|---------------|------------|-------------------------|
| Supply circuit:                   | $\approx 0.2$ | Impedance: | $6.9 \text{ }\mu\Omega$ |
| Power factor:                     |               |            |                         |
| Frequency:                        | 50 Hz         |            |                         |
| Neutral condition:                | earthed       |            |                         |
| TRV: ac 44 kV L5-B4 $\mu\text{s}$ |               |            |                         |

|                    |           |                 |       |
|--------------------|-----------|-----------------|-------|
| Load circuit:      |           | Frequency:      |       |
| Power factor:      | 0.73      |                 | 50 Hz |
| Neutral condition: | insulated | Ramping factor: |       |

|  |           |   |          |
|--|-----------|---|----------|
| Control voltage of operating devices (DC): | clamping  | = | V        |
|  | operating | = | V        |
|  | motor     | = | V        |
| Gas operating pressure (bar):              | operation | = | bar/min. |
|  | breathing | = | bar/min. |

conditions of the apparatus before the test: (and after the limit no. 100)

|                      |  |
|----------------------|--|
| Tests performed:     | no 20 tests with operating sequence 30 |
| Test no.:            | 101 to 120                             |
| Oscillograms no.:    | 104 to 123                             |
| Test voltage:        | 24 kV                                  |
| Test current:        | 20A                                    |
| Minimum arcing time: | 6 ms                                   |
| Maximum arcing time: | 11 ms                                  |

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

Condition of the apparatus after the test: external parts as before the test,  
internal parts not impaired.

GES

## test report

ges-91/019106 Page 7

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## Three-phase no-load transformed current switching tests

load duty

voltage 15,0 A at 24,4 KV

## test circuit conditions

circuit diagram see page 10

## supply circuit

power factor: < 0,12  
 frequency: 50 Hz  
 neutral condition: earthed  
 TW: ac 44 KV L3 84 μs

impedance

6,5% 6

## load circuit

power factor: 0,12  
 neutral condition: insulated

frequency: 500 Hz  
 damping factor: 0,25

control voltage of operating devices for: closing - V

opening - V

motor - V

open operating pressure for: operation - bar abs.  
braking 1,4 bar abs.

conditions of the apparatus before the tests: as after the test no. 130

| test                           | no.                 | 121  | 122  | 123  | 124  | 125  | 126  | 127  | 128  | 129  | 130  |
|--------------------------------|---------------------|------|------|------|------|------|------|------|------|------|------|
| initialization                 | no.                 | 124  | 125  | 126  | 127  | 128  | 129  | 130  | 131  | 132  | 133  |
| operating duty                 |                     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| voltage with apparatus         | phase-to-neutral KV | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 |
| open                           | phase-to-neutral KV | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 | 14,1 |
| apparatus phase-to-phase KV    | 24,4                | 24,4 | 24,4 | 24,4 | 24,4 | 24,4 | 24,4 | 24,4 | 24,4 | 24,4 | 24,4 |
| brush making current           | mA                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| maximum closing supply side KV | -                   | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| overvoltage load side KV       | -                   | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| breaking current               | A                   | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 |
| average                        | A                   | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 | 15,0 |
| maximum opening supply side KV | 22,0                | 22,0 | 21,0 | 21,0 | 23,0 | 22,0 | -    | 21,0 | 23,0 | 23,0 | 23,0 |
| overvoltage load side KV       | 22,0                | 24,0 | 24,0 | 23,0 | 25,0 | 23,0 | 23,0 | 23,0 | 25,0 | 25,0 | 24,0 |
| switches                       | NO.                 | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| duration of                    | phases              | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| closing                        | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| opening                        | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| prearc                         | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| arc                            | ms                  | 11   | 11   | 10   | 10   | 12   | 11   | 10   | 12   | 11   | 13   |

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

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**QESI**

**test report**

099-91/015106 Page 3

**Three-phase cable charging current switching tests**

**Test duty**

with 79.0 A at 24.2 kV

**Test circuit conditions**

Circuit diagram see page 11

**Supply circuit**

power factor < 0.15

frequency: 50 Hz

TRV: up 44 kV ± 3 % pu

short-circuit current:

3 kA

**Load circuit**

capacitance of capacitor banks: CWD = 0.6  $\mu$ F (parallelized)

voltage decay at 100 ms after final arc extinction < 10 %

voltage with open apparatus: 14.0 kV phase-to-neutral - 24.2 kV phase-to-phase

control voltage of operating devices for: closing = V  
opening = V  
motor = V

out operating pressure for: operation = bar abs.  
breaking = bar abs.

conditions of the apparatus before the tests : as after the test no. 133

| test no.                                   | 131  | 132  | 133  | 134  | 135  | 136  | 137  | 138  | 139  | 140  |
|--|------|------|------|------|------|------|------|------|------|------|
| oscillations no.                           | 134  | 135  | 136  | 137  | 138  | 139  | 140  | 141  | 142  | 143  |
| <b>operating duty</b>                      |      |      |      |      |      |      |      |      |      |      |
| voltage with closed apparatus              | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| phase-to-neutral kV                        | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| phase-to-phase kV                          | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 |
| inrush making current kA                   | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| maximum closing overvoltage supply side kV | 34.0 | 37.0 | 34.0 | 35.0 | 37.0 | 36.0 | 35.0 | 35.0 | 35.0 | 34.0 |
| load side kV                               | 34.0 | 37.0 | 34.0 | 35.0 | 37.0 | 36.0 | 35.0 | 35.0 | 35.0 | 34.0 |
| breaking current A                         | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |
| average A                                  | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |
| maximum opening overvoltage supply side kV | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| load side kV                               | 27.0 | 28.0 | 27.0 | 27.0 | 27.0 | 28.0 | 27.0 | 28.0 | 28.0 | 27.0 |
| <b>overvoltage</b>                         |      |      |      |      |      |      |      |      |      |      |
| repetitions                                | no.  | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| phase                                      | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| duration of prearc sec                     | me   | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| arc sec                                    | me   | 9    | 8    | 8    | 8    | 8    | 8    | 9    | 7    | 9    |

conditions of the apparatus after the test:

cont'd.

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## Three-phase cable-charging current switching tests

Cont'd

| test                          | no.                 | 141  | 142  | 143  | 144  | 145  | 146  | 147  | 148  | 149  | 150  |
|-------------------------------|---------------------|------|------|------|------|------|------|------|------|------|------|
| oscillogram                   | no.                 | 144  | 145  | 146  | 147  | 148  | 149  | 150  | 151  | 152  | 153  |
| operating duty                |                     | 0-0  | 0-0  | 0-0  | 0-0  | 0-0  | 0-0  | 0-0  | 0-0  | 0-0  | 0-0  |
| voltage with closed apparatus | phase-to-neutral kV | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
|                               | phase-to-phase kV   | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 |
| through making current        | KA                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| maximum closing overvoltage   | supply side kV      | 35.0 | 35.0 | 41.0 | 35.0 | 33.0 | 34.0 | 35.0 | 35.0 | 34.0 | 35.0 |
|                               | load side kV        | 35.0 | 35.0 | 41.0 | 35.0 | 33.0 | 34.0 | 35.0 | 35.0 | 34.0 | 35.0 |
| breaking current              | A                   | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |
|                               | A                   | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |
|                               | Average             | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |
| maximum opening overvoltage   | supply side kV      | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                               | load side kV        | 28.0 | 30.0 | 27.0 | 29.0 | 28.0 | 26.0 | 29.0 | 29.0 | 26.0 | 28.0 |
| duration of prearc            | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| arc                           | ms                  | 5    | 9    | 9    | 10   | 9    | 8    | 10   | 8    | 8    | 8    |

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.

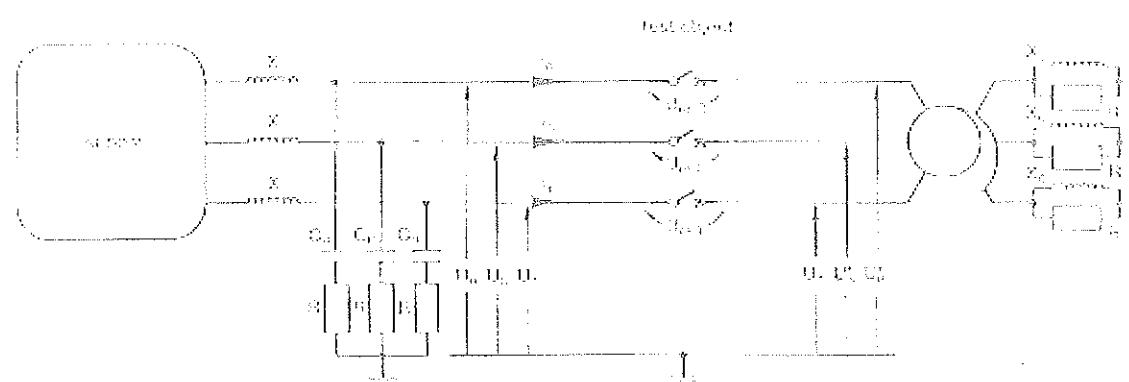
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# test report

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circuit-diagram



Approved by the engineer of the test object (signature)

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CEST

test report

GPS-91/015146 Page 11

circuit-diagram

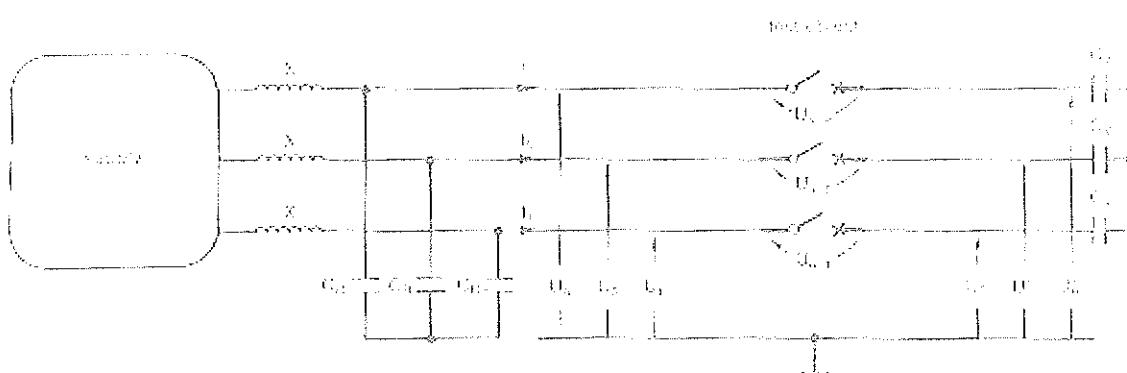


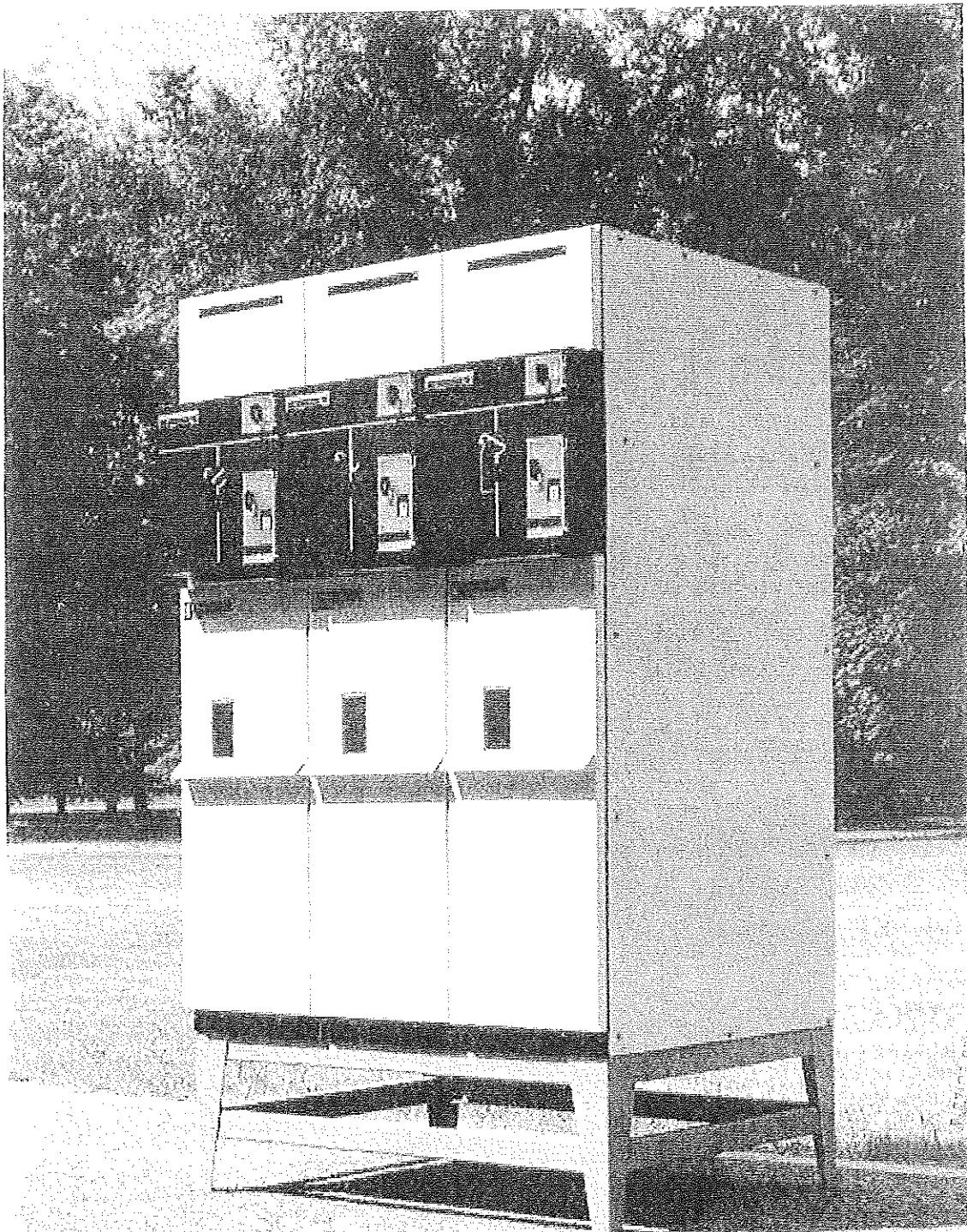
Fig. 1 - Block diagram of the power supply module (the switching circuit)

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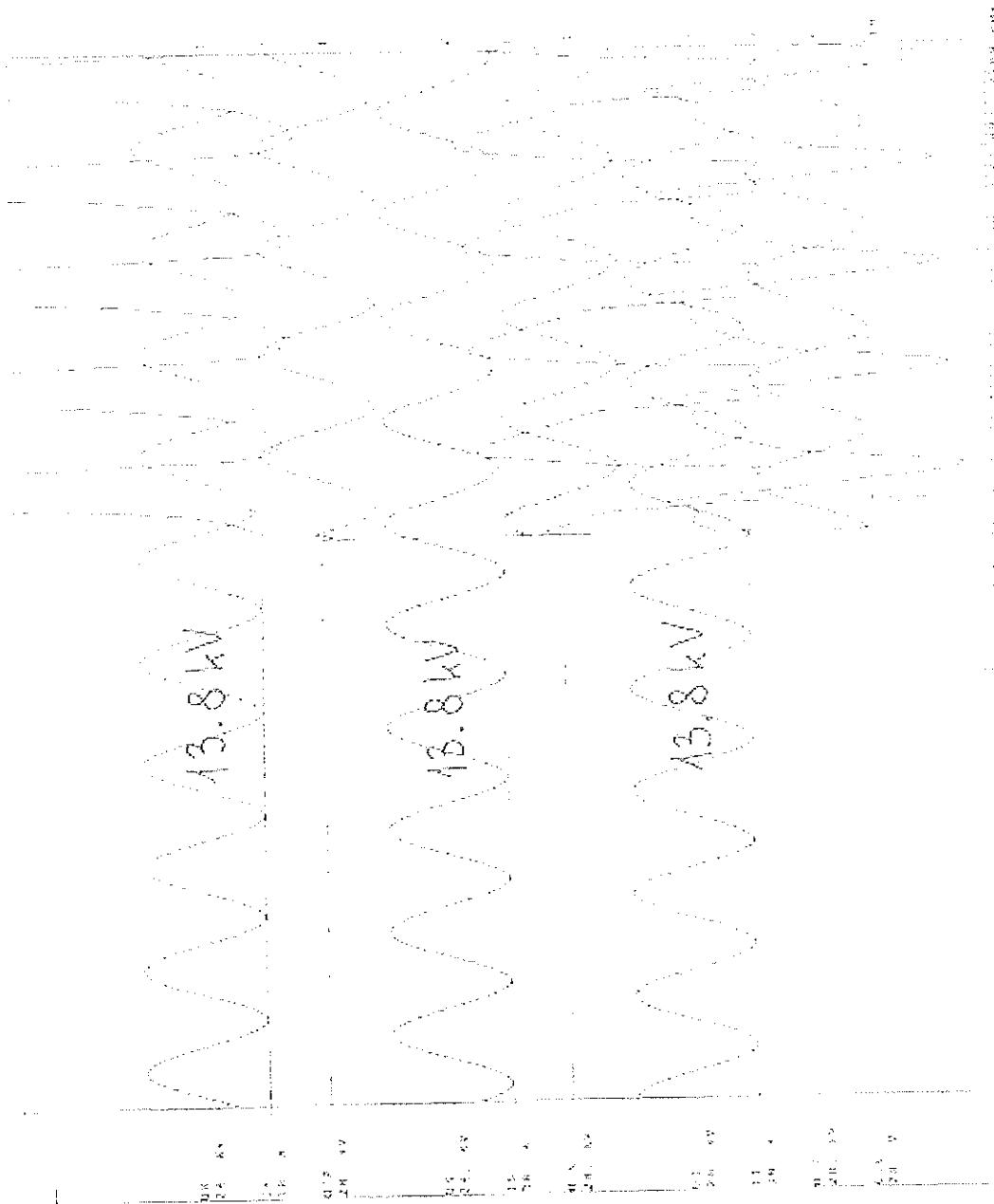
**test report**

CPS-91/C15156 Page 12

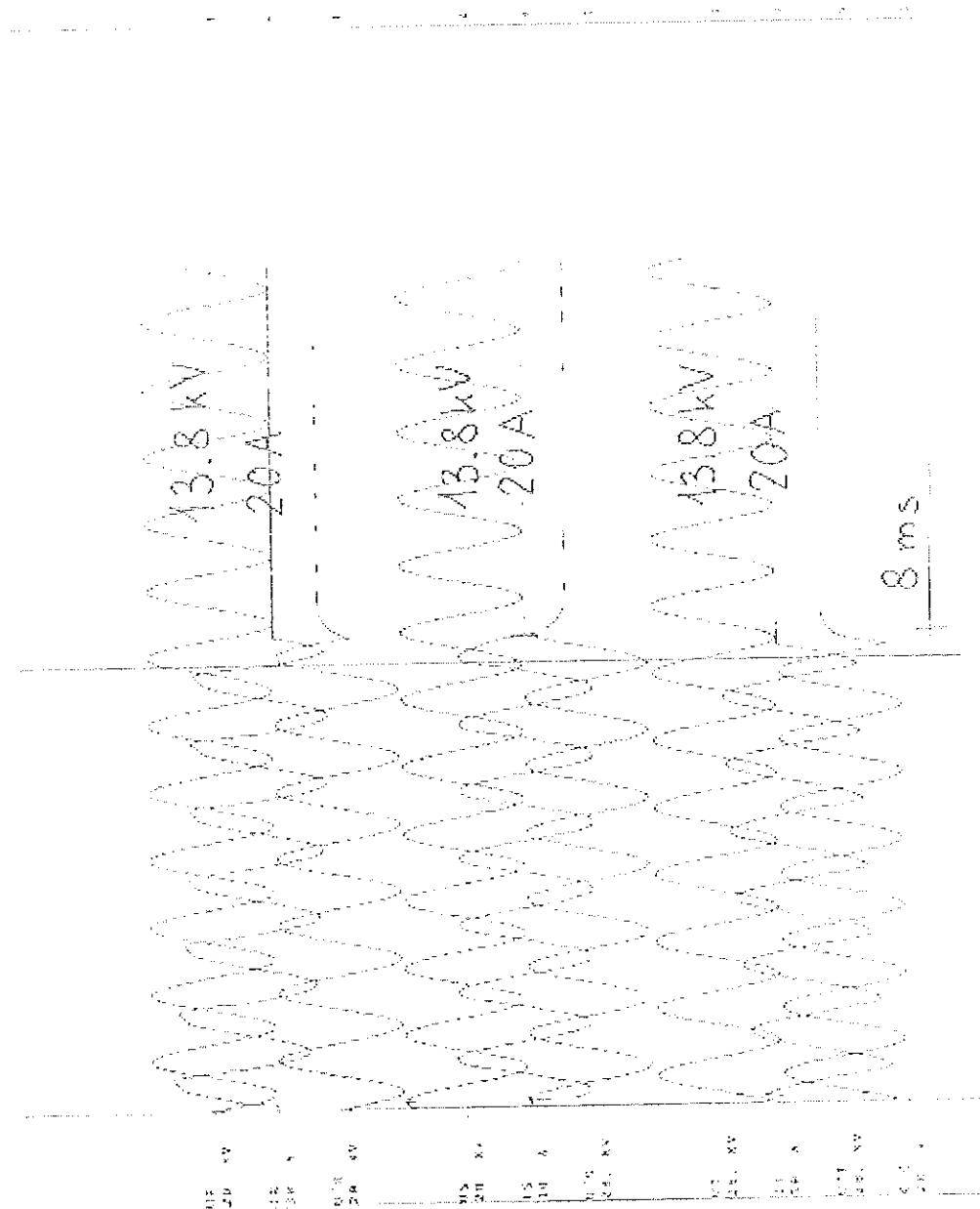


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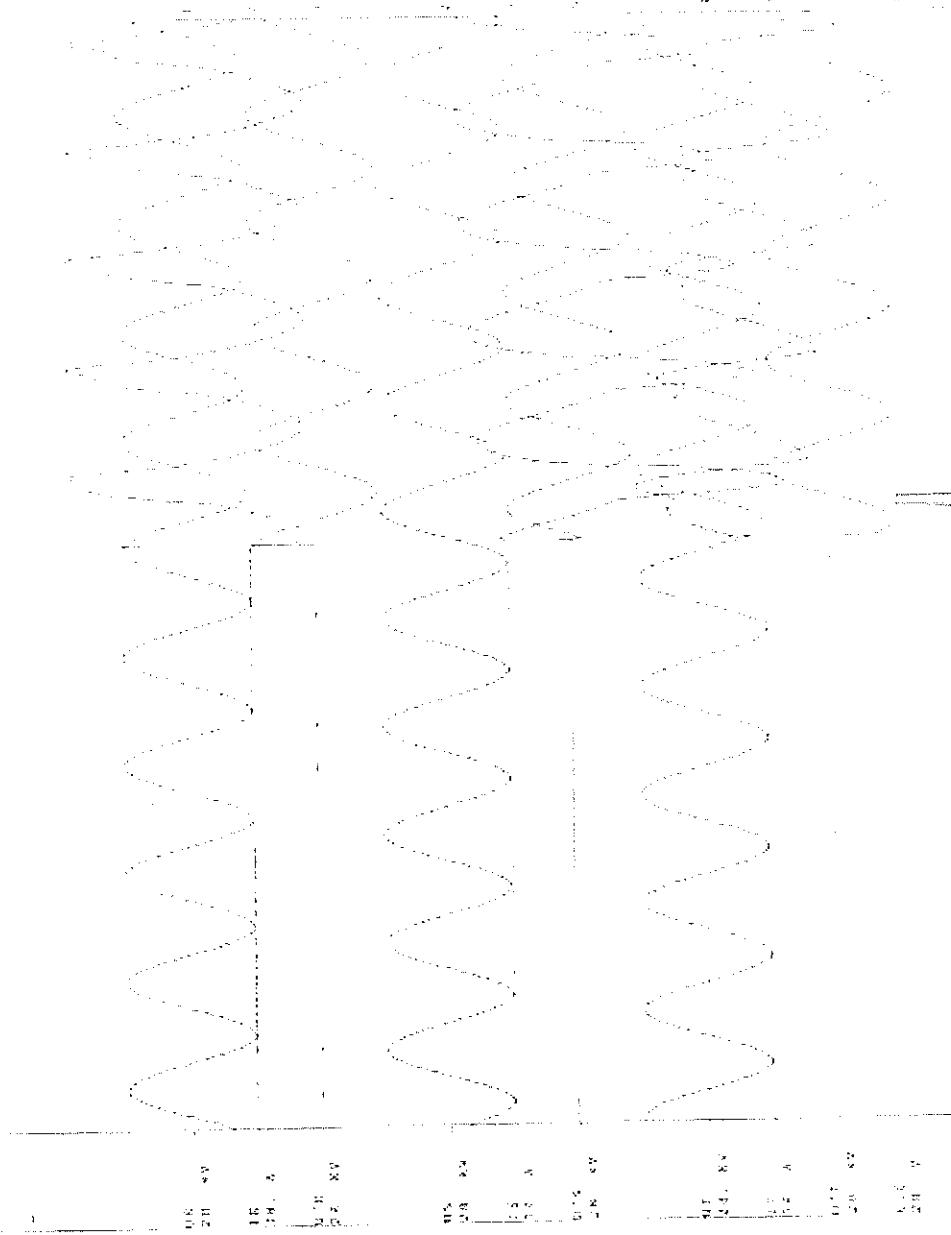
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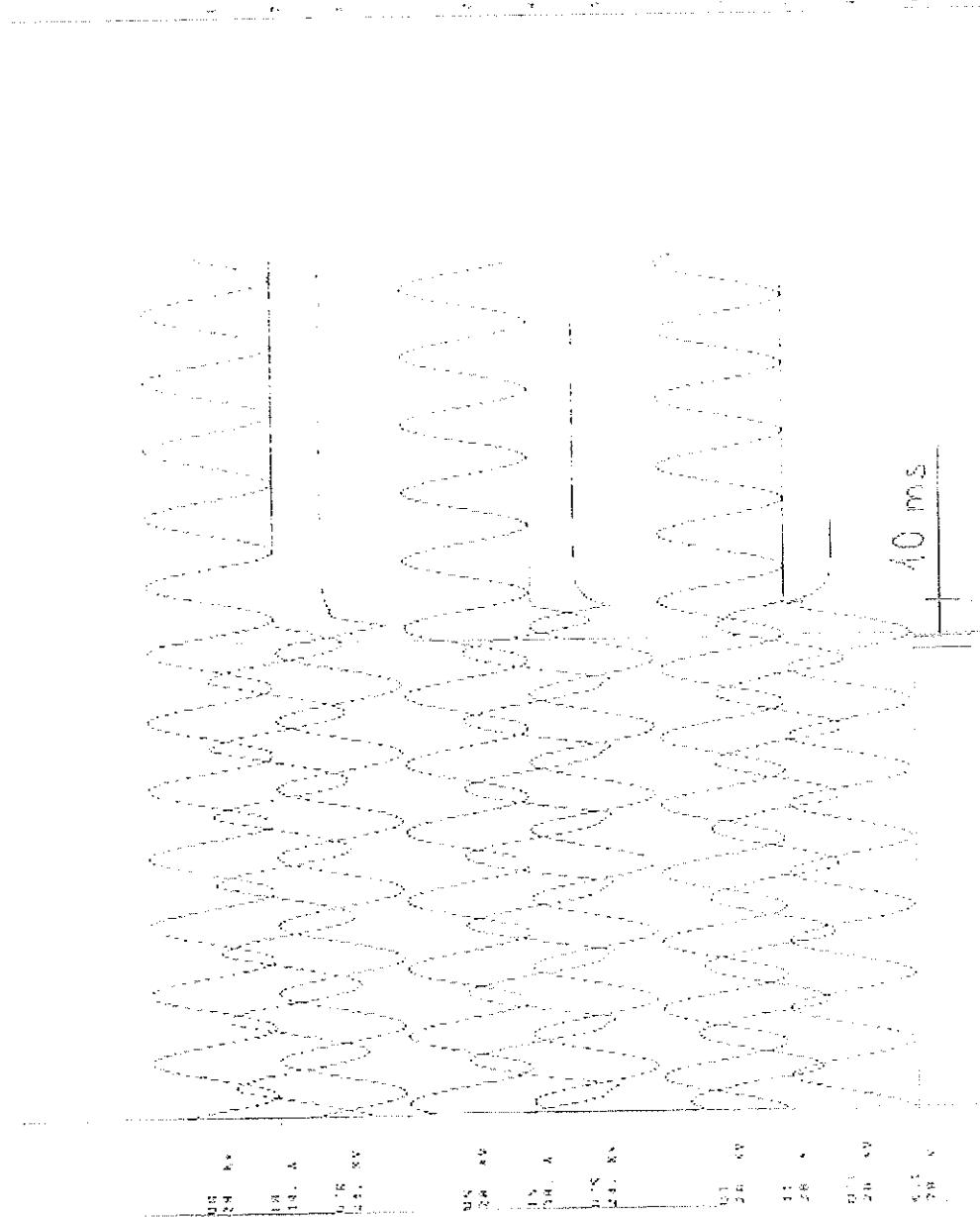
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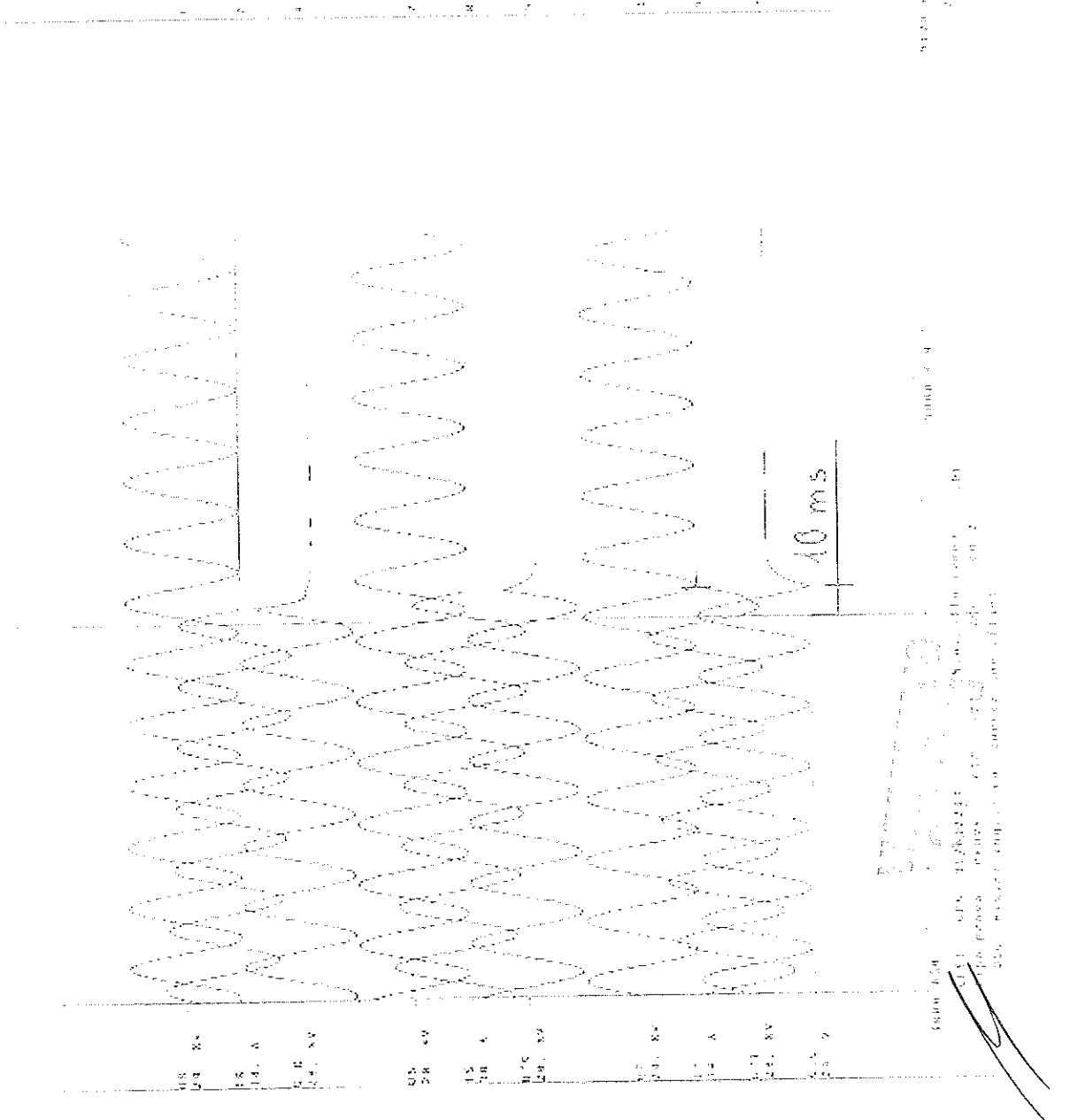
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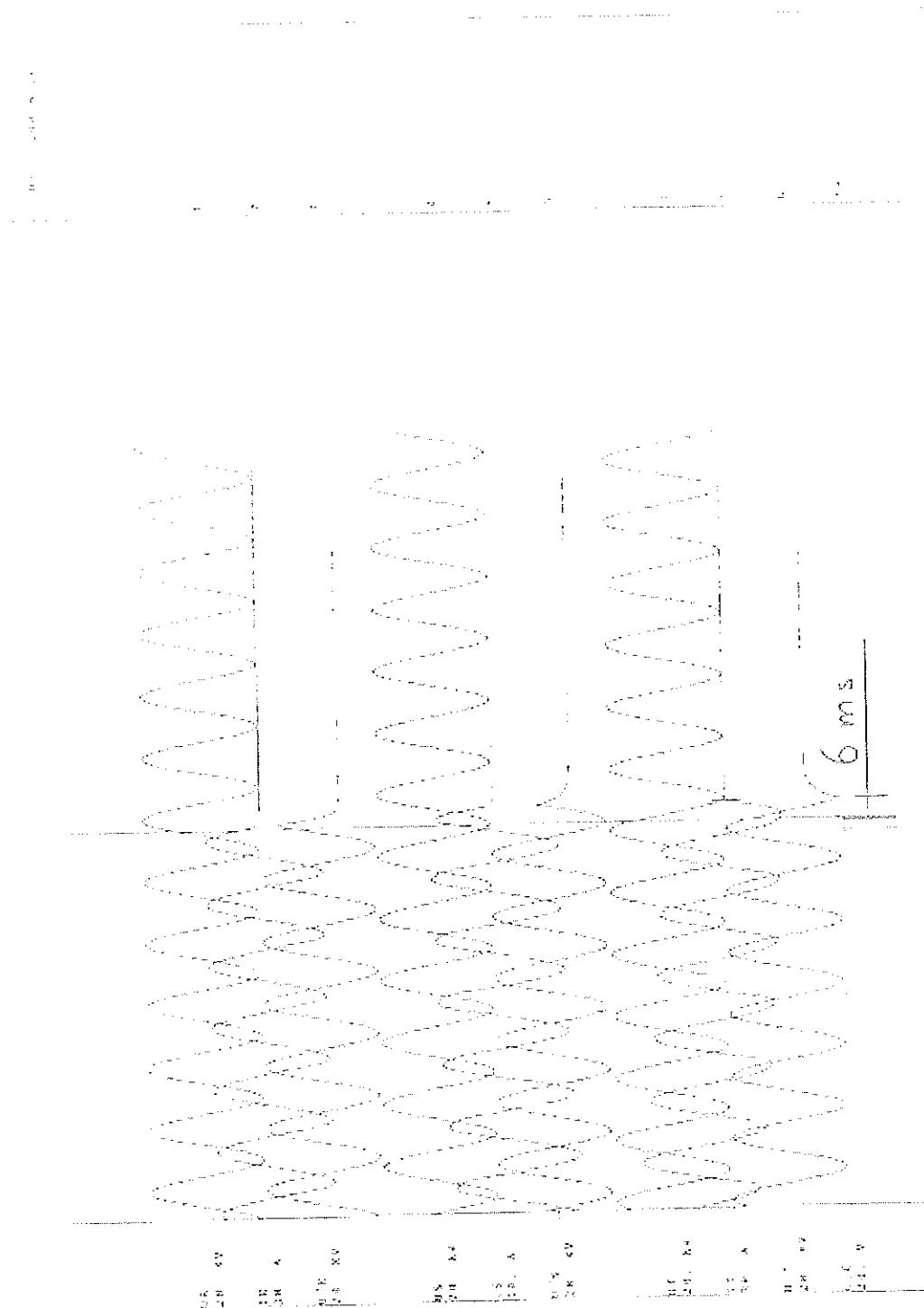
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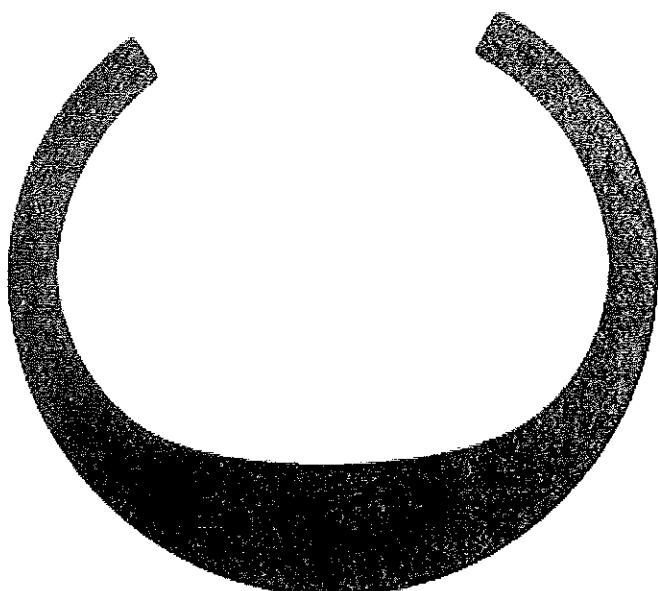
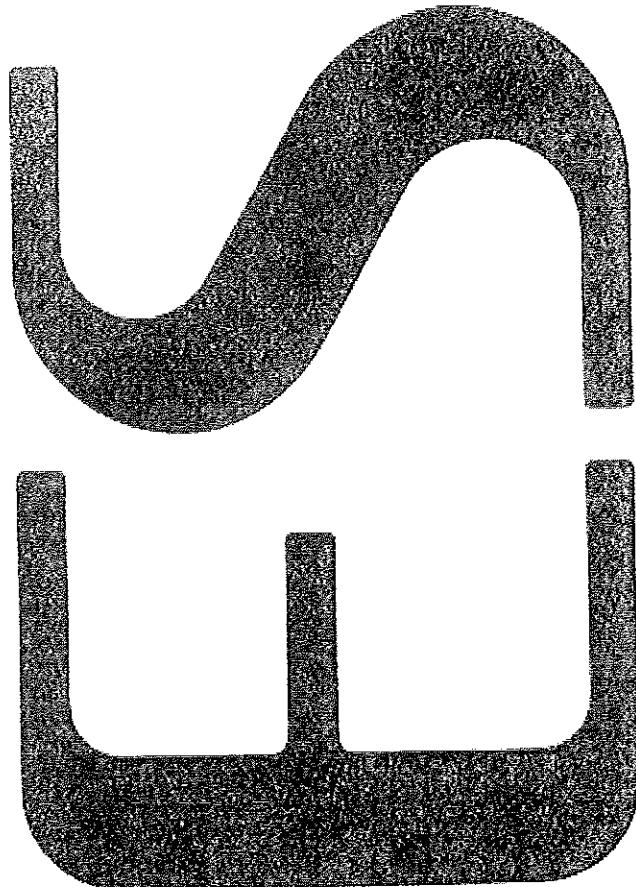
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**CESI**

**test report**

GPS-91/015151

client : MÉTALURGIE GÉRIN S.A. - Grenoble (France)

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

characteristics of the tested object assigned by the Client

rated voltage 17.5/24 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 265 (1982)

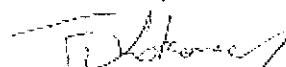
test date : June 19th, 1991  
June 20th, 1991

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 9 pages, 260 oscillograms

Editor, August 9th, 1991

test engineer

  
F. LO MORANO



91/012283  
Keywords : 120100 234300 360200 462700 530010

This test report is not a certificate of conformity, nor does it give any guarantee to confirm the ratings supplied by the manufacturer.  
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rated characteristics of the tested object assigned by the client

|                                      |         |          |
|--------------------------------------|---------|----------|
| voltage                              | 11,5/24 | 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        |
| mainly active load breaking current  | 200     | A        |
| no-load transformer breaking current | 5       | 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 CESt with embossing press and numbered GPs- 91/015191 1 to 13 are assembled in a folder.

  
**GES****test report**

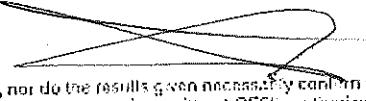
CPS-91/015191 Page 3

table of tests performed

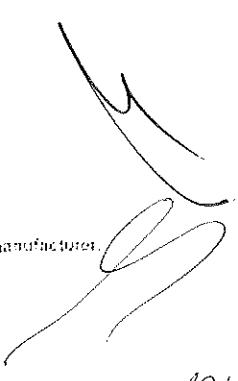
| date                       | type of test   | see page |
|----------------------------|--|----------|
| June 19th<br>1991          | THREE-PHASE MAINLY ACTIVE LOAD CURRENT SWITCHING TESTS<br>No.100 tests with 200 A at 24 KV   | 5        |
| June<br>19th, 26th<br>1991 | No.20 tests with 10.5 A at 24 KV   | 6        |
| June 26th<br>1991          | THREE-PHASE NO-LOAD TRANSFORMER CURRENT SWITCHING TESTS<br>No.10 tests with 3.7 A at 24.4 KV | 7        |

## tests witnessed by

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

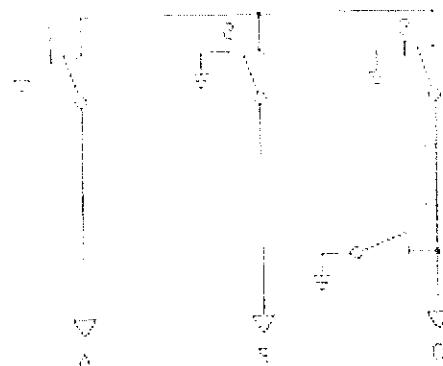


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## arrangement of the object for the tests

The treated apparatus was assembled with two other apparatus of SMS system (see photo on page 91).  
The figure below shows the electric diagram of the complete setting (single phase diagram of a three phase circuit) :



3 : switch under test.

1-2 : auxiliary switches

A-B-C : cables

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

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

The fuses were replaced by cylindritic copper connections having the same dimensions of fuses.

## three-phase mainly active load current switching tests

short duty with 200 A at 24.0 kV

## test circuit conditions

circuit diagram see page: 8

## supply circuit

power factor: < 0.2  
frequency: 50 Hz  
neutral condition: earthed  
TRV : ac 42 kV t3 9.3  $\mu$ s

impedance 13.9  $\Omega$   
(20 % of the total impedance of the circuit)

## load circuit

power factor: 0.73  
neutral condition: insulated

frequency: 50 Hz  
damping factor:

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: new

tests performed no. 100 tests with operating sequence 00

test no. 1 to 100

oscillograms no. 154 to 253

test voltage 24 kV

test current 200 A

minimum arcing time 7 ms

maximum arcing time 14 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.

## three-phase mainly active load current switching tests

short time duty with 10.5 A at 24.3 kV

test circuit conditions

circuit diagram see page 10

|                    |                        |           |        |
|--------------------|------------------------|-----------|--------|
| supply circuit     |                        | impedance | 13.9 n |
| power factor:      | < 0.2                  |           |        |
| frequency:         | 50 Hz                  |           |        |
| neutral condition: | earthed                |           |        |
| TRV:               | dc 42 kV tL 93 $\mu$ s |           |        |

|                    |           |                  |      |
|--------------------|-----------|------------------|------|
| load circuit       |           | frequency:       | - Hz |
| power factor:      | 0.73      | damaging 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

oscillogramm no. 254 to 273

test voltage 24 kV

test current 10.5 A

minimum arcing time 5 ms

maximum arcing time 10 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.

## three-phase no-load transformer current switching tests

with 3.70 A at 24.2 kV

## test circuit conditions

circuit diagram see page 8

|                         |           |                 |        |
|-------------------------|-----------|-----------------|--------|
| supply circuit          |           | impedance       | 6.3 Ω  |
| power factor:           | < 0.2     |                 |        |
| frequency:              | 50 Hz     |                 |        |
| neutral condition:      | earthed   |                 |        |
| TRV : uc 43 kV tD 89 μs |           |                 |        |
| load circuit            |           | frequency:      | 600 Hz |
| power factor:           | 0.12      | damping factor: | 0.15   |
| neutral condition:      | insulated |                 |        |

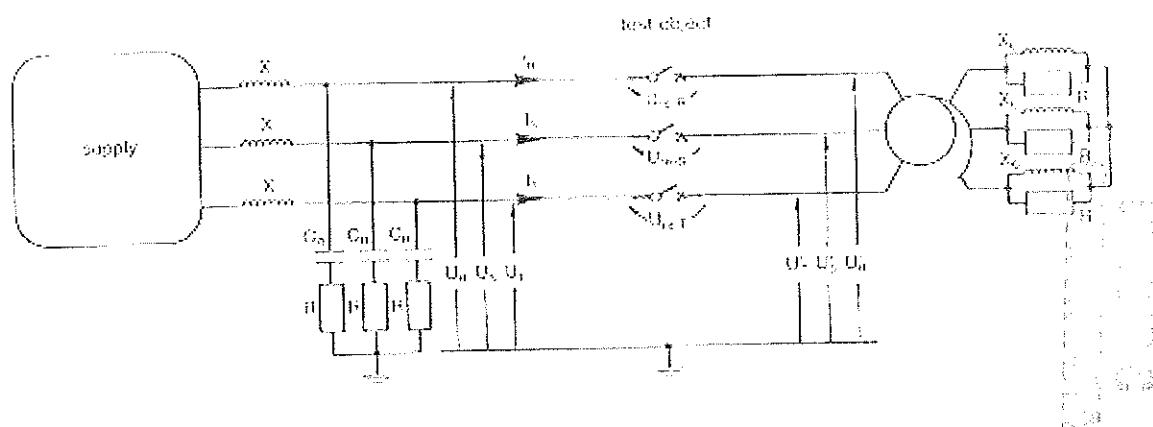
|   |           |     |          |
|---|-----------|-----|----------|
| control voltage of operating devices for: | closing   | -   | V        |
|   | opening   | -   | V        |
|   | motor     | -   | V        |
| gas operating pressure for:               | operation | -   | bar abs. |
|   | breaking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

conditions of the apparatus before the tests : as after the test no. 120

| test                        | no.                 | 121  | 122  | 123  | 124  | 125  | 126  | 127  | 128  | 129  | 130  |
|-----------------------------|---------------------|------|------|------|------|------|------|------|------|------|------|
| oscillogram                 | no.                 | 274  | 275  | 276  | 277  | 278  | 279  | 280  | 281  | 282  | 283  |
| operating duty              |                     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| voltage with open apparatus | phase-to-neutral kV | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
|                             | phase-to-phase kV   | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 | 24.2 |
| inrush making current       | KA                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| maximum closing overvoltage | supply side kV      | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                             | load side kV        | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| breaking current            | A                   | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
|                             |                     | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
|                             | average             | A    | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 | 3.70 |
| maximum opening overvoltage | supply side kV      | 24.0 | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                             | load side kV        | 31.0 | 34.0 | 33.0 | 31.0 | 33.0 | 27.0 | 26.0 | 32.0 | 30.0 | 29.0 |
| duration of                 | no.                 | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                             | phase               | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                             | closing             | ms   | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                             | opening             | ms   | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                             | arc                 | ms   | 5    | 7    | 7    | 6    | 8    | 6    | 8    | 9    | 6    |

conditions of the apparatus after the tests: external parts ok before the tests,  
internal parts not inspectednote after all the tests : the performance of the apparatus is considered  
satisfactory for the tests performed.

## circuit-diagram

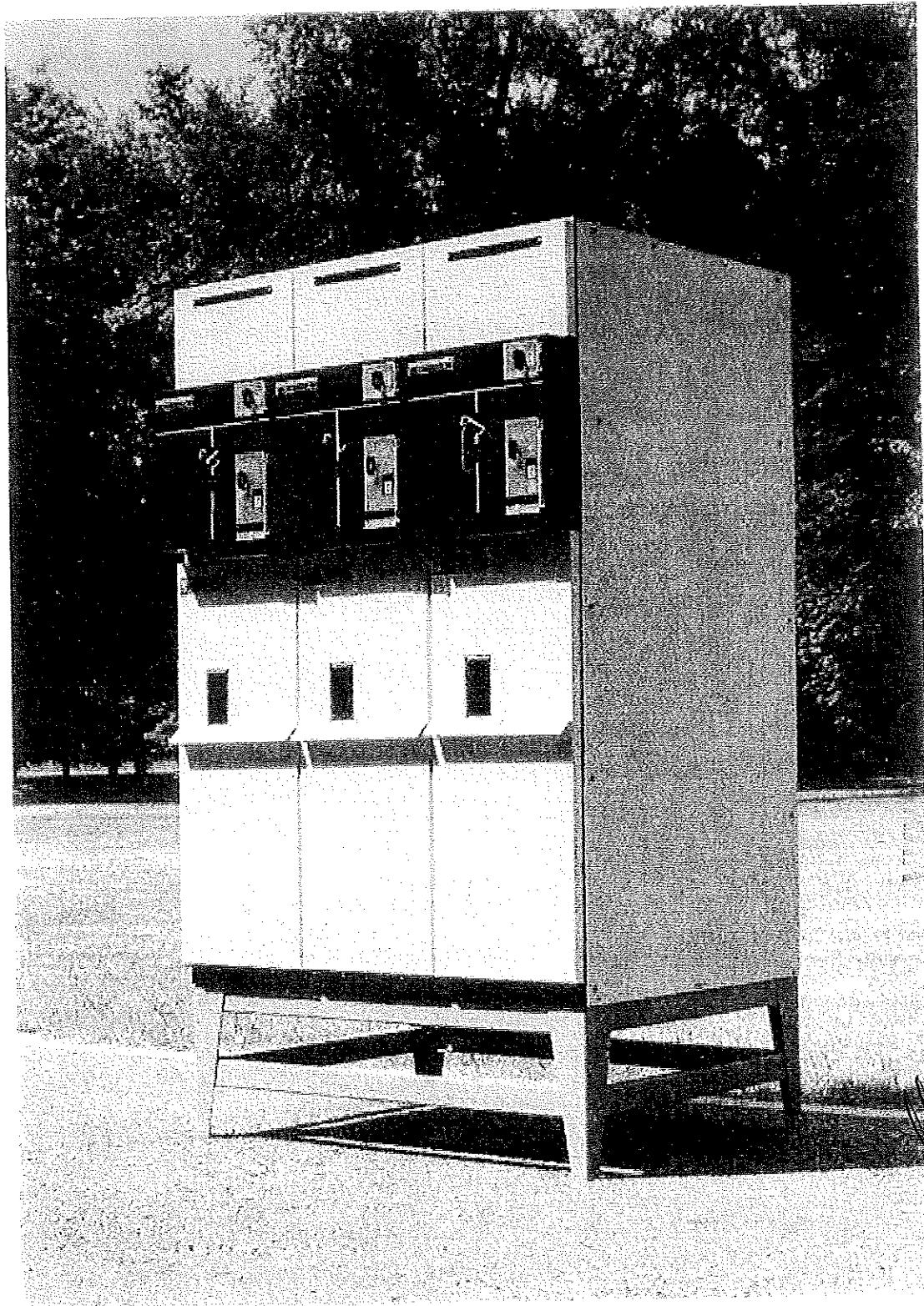


signature placed on the diagram are the same as on the overall print.

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**test report**

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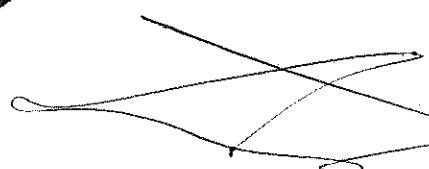
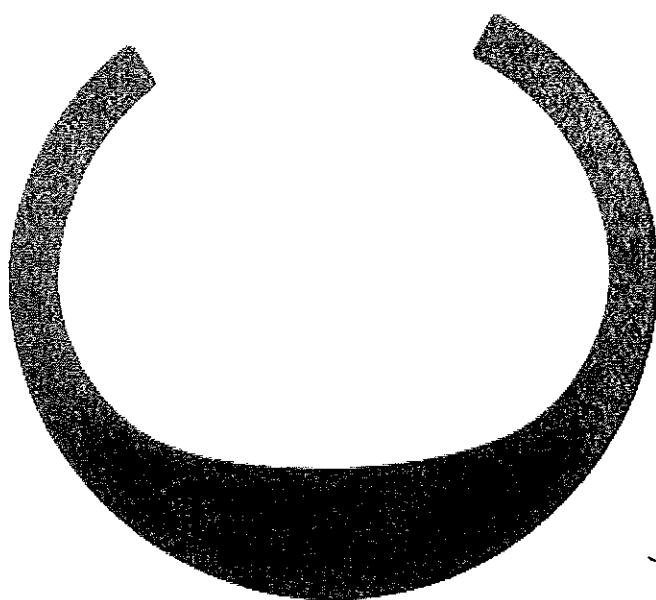
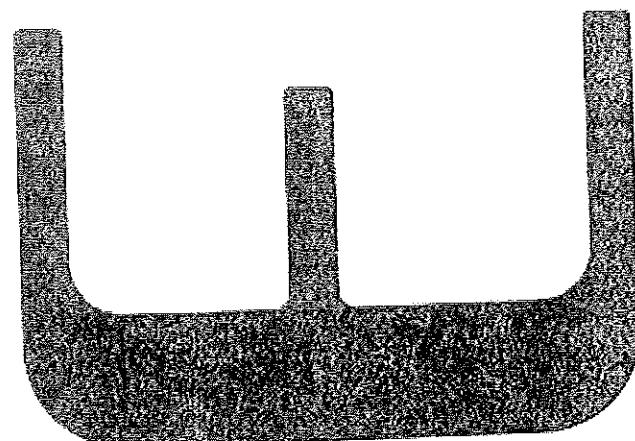
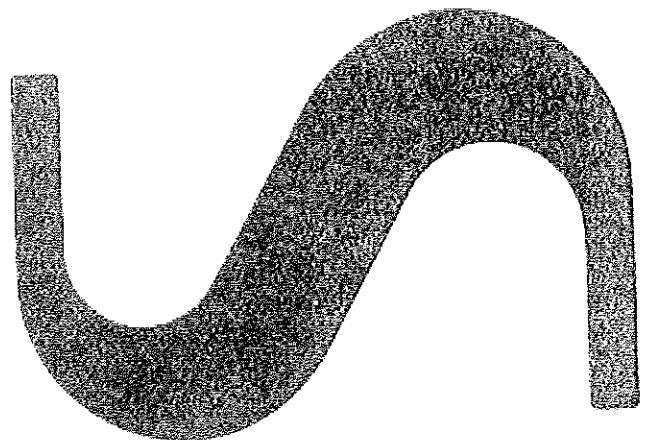
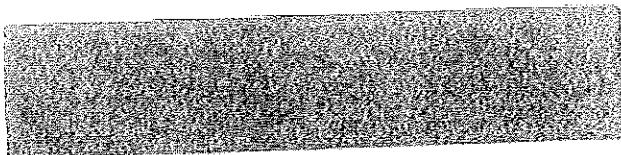


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*3*  
51249036XA

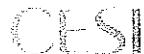
GPS91/15199



*3*  
51249036XA  
*3*

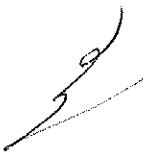
*3*  
*3*

1242

 CE-SI

test report

GPS 91/015199



client: MERLIN GERIN S.A. - Granville (France)

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

characteristics of the tested object assigned by the client

rated voltage 17.5/25 kV rated current 630 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 (1985)

test date: June 19th, 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 10 pages, 30 oscillograms.

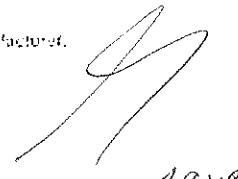
client, August 19th, 1991 test engineer

  
F. L. G. Moncada

  
F. L. G. Moncada

91/012283  
Keywords : 120100 234308 35020L 45070T 53001D

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**GESI**

**test report**

GPK-91/015199 Page 2

rated characteristics of the tested object assigned by the client

|                                      |              |
|--------------------------------------|--------------|
| voltage                              | 17.5/24 kV   |
| frequency                            | 50 Hz        |
| normal current                       | 620 A        |
| short-circuit making current         | 50 kA        |
| short-line withstand current         | 20 kA        |
| short-circuit duration               | 1 s          |
| cable charging breaking current      | 25 A         |
| no-load transformer breaking current | 16 A         |
| gas pressure for interruption        | 1.4 bar atm. |

**Identification of the object affected.**

The tested object truly conforms to the drawings of its type supplied by the client. These drawings identified by GESI with embossing press and numbered GPK-91/015199 1 to 12 are assembled in a folder.

**CEI**

**test report**

CPS-31/015109 - Page 1

table of tests performed

| date              | type of test  | see page |
|-------------------|---|----------|
| June 19th<br>1981 | THREE-PHASE NO-LOAD TRANSFORMER CURRENT SWITCHING TESTS<br>No.10 tests with 16 A at 24.4 KV | 5        |
| June 19th<br>1981 | THREE-PHASE CABLE-CHARGING CURRENT SWITCHING TESTS<br>No.20 tests with 29 A at 34.2 KV      | 6-7      |

tests witnessed by

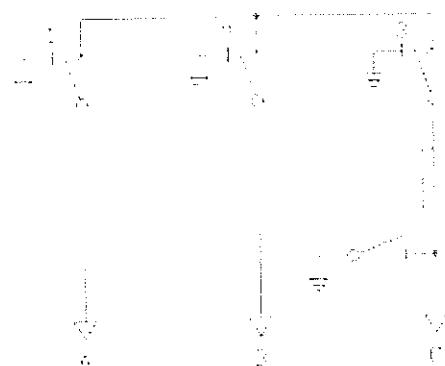
Mr. Laurens - MERLIN GERIN S.A.  
Mr. Dubreuil - MERLIN GERIN S.A.

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## arrangement of the object for the tests

The tested apparatus was associated with two other apparatus of SME system (see photo on page 8).  
The figure below shows the electric diagram of the complete setting (single phase diagram of a three phase circuit) :



1 : switch under load

2-3 : auxiliary switches

A-B-C : cables

During the tests the cables A were connected to the supply, the switch 1 was 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 mm long to indicate any significant leakage current to earth.

**OESI****test report**

GPS-31/015199 Page 8

three-phase no-load transformer current switching tests

test duty

with 15.0 A at 24.4 kV

test circuit conditions

circuit diagram see page 6

|                    |                 |       |
|--------------------|-----------------|-------|
| supply circuit     | impedance       | 6.0 % |
| power factor:      | < 0.2           |       |
| frequency:         | 50 Hz           |       |
| neutral condition: | earthed         |       |
| ctv : no 44 kV     | 23 - 84 $\mu$ s |       |

|                    |            |        |
|--------------------|------------|--------|
| load circuit       | frequency: | 500 Hz |
| power factor:      | 0.12       |        |
| neutral condition: | isolated   |        |
| damping factor:    | 0.25       |        |

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

conditions of the apparatus before the tests is now

| test                        | no.                 | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   |
|-----------------------------|---------------------|------|------|------|------|------|------|------|------|------|------|
| outfit diagram              | no.                 | 124  | 125  | 126  | 127  | 128  | 129  | 130  | 131  | 132  | 133  |
| operating duty              |                     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| voltage with open apparatus | phase-to-neutral kV | 14.1 | 14.1 | 14.1 | 14.1 | 24.4 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| inrush making current       | A                   | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| maximum closing overvoltage | supply side kV      | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| breaking current            | A                   | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| average                     | A                   | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| maximum opening overvoltage | supply side kV      | 22.0 | 22.0 | 21.0 | 21.0 | 23.0 | 22.0 | -    | 21.0 | 24.0 | 23.0 |
| duration of arc             | ms                  | 11   | 11   | 10   | 10   | 12   | 11   | 10   | 12   | 11   | 10   |

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

*J*  
CESI

# test report

CEB 91/315-199 Page 6

## three-phase cable-charging current switching tests

test duty

with 10.0 A at 24.2 kV

test circuit conditions

circuit diagram see page 9

supply circuit  
power factor: < 0.15  
frequency: 50 Hz  
TRV: up 44 kV t<sub>d</sub> 86 μs

short-circuit current: 2 kA

load circuit  
capacitance of capacitor banks: CVL = 6.6 μF (insulated)  
voltage decay at 100 ms after final arc extinction < 10 %

voltage with open apparatus 14.0 kV phase-to-neutral 24.2 kV phase-to-phase

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

conditions of the apparatus before the tests + as after the test no. 16

| test                          | no.                 | 11   | 12   | 13   | 14   | 15   | 16   | 17   | 18   | 19   | 20   |
|-------------------------------|---------------------|------|------|------|------|------|------|------|------|------|------|
| oscilloscope                  | no.                 | 134  | 135  | 136  | 137  | 138  | 139  | 140  | 141  | 142  | 143  |
| operating duty                |                     | C-O  | C-O  | C-O  | O-O  | C-O  | C-O  | C-O  | C-O  | C-O  | C-O  |
| voltage with closed apparatus | phase-to-neutral kV | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
|                               | phase-to-phase kV   | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| through making current        | kA                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| maximum closing overvoltage   | supply side kV      | 24.0 | 37.0 | 34.0 | 35.0 | 37.0 | 35.0 | 37.0 | 35.0 | 37.0 | 37.0 |
|                               | load side kV        | 34.0 | 37.0 | 34.0 | 35.0 | 37.0 | 35.0 | 37.0 | 35.0 | 37.0 | 37.0 |
| breaking current              | A                   | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |
|                               | average             | A    | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |
| maximum opening overvoltage   | supply side kV      | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                               | load side kV        | 27.0 | 28.0 | 29.0 | 27.0 | 27.0 | 28.0 | 27.0 | 26.0 | 28.0 | 27.0 |
| restrikes                     | no.                 | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| duration of                   | phase               | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                               | closing ms          | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                               | opening ms          | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                               | prolong ms          | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
|                               | arc ms              | 9    | 8    | 8    | 8    | 8    | 8    | 8    | 9    | 9    | 9    |

conditions of the apparatus after the tests +

cont'd.

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**test report**

6P9-81/C15193 Page 7

Three-phase cable-charging current switching tests

cont'd

| test no.                      | 21                  | 22   | 23   | 24   | 25   | 26   | 27   | 28   | 29   | 30   |      |
|-------------------------------|---------------------|------|------|------|------|------|------|------|------|------|------|
| oscillogram no.               | 144                 | 145  | 146  | 147  | 148  | 149  | 150  | 151  | 152  | 153  |      |
| operating duty                | C-O                 | C-O  | C-O  | C-O  | C-O  | C-O  | C-O  | C-O  | C-O  | C-O  |      |
| voltage with closed apparatus | phase-to-neutral KV | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |      |
|                               | phase-to-phase KV   | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |      |
| inrush making current         | A                   | -    | -    | -    | -    | -    | -    | -    | -    | -    |      |
| maximum closing overvoltage   | supply side KV      | 35.0 | 36.0 | 41.0 | 35.0 | 31.0 | 34.0 | 35.0 | 35.0 | 34.0 |      |
|                               | load side KV        | 35.0 | 36.0 | 41.0 | 35.0 | 31.0 | 34.0 | 35.0 | 35.0 | 34.0 |      |
| breaking current              | A                   | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |      |
|                               | A                   | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |      |
| average                       | A                   | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 | 29.0 |      |
| maximum opening overvoltage   | supply side KV      | -    | -    | -    | -    | -    | -    | -    | -    | -    |      |
|                               | load side KV        | 26.0 | 30.0 | 27.0 | 29.0 | 26.0 | 26.0 | 26.0 | 27.0 | 26.0 | 28.0 |
| duration of                   | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    |      |
| duration of                   | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    |      |
| duration of                   | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    |      |
| duration of                   | ms                  | 5    | 5    | 9    | 10   | 9    | 8    | 10   | 8    | 8    |      |

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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11254

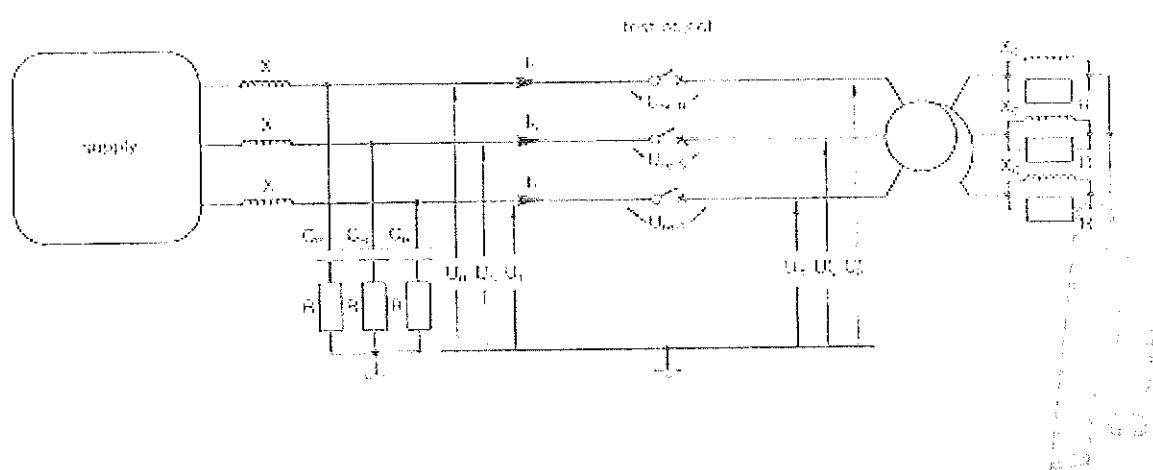
CEC

test report

308-01/015199 Page 6

*[Signature]*

circuit diagram



parts listed in this diagram are the subject of the oscillographs



*[Signature]*

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1265

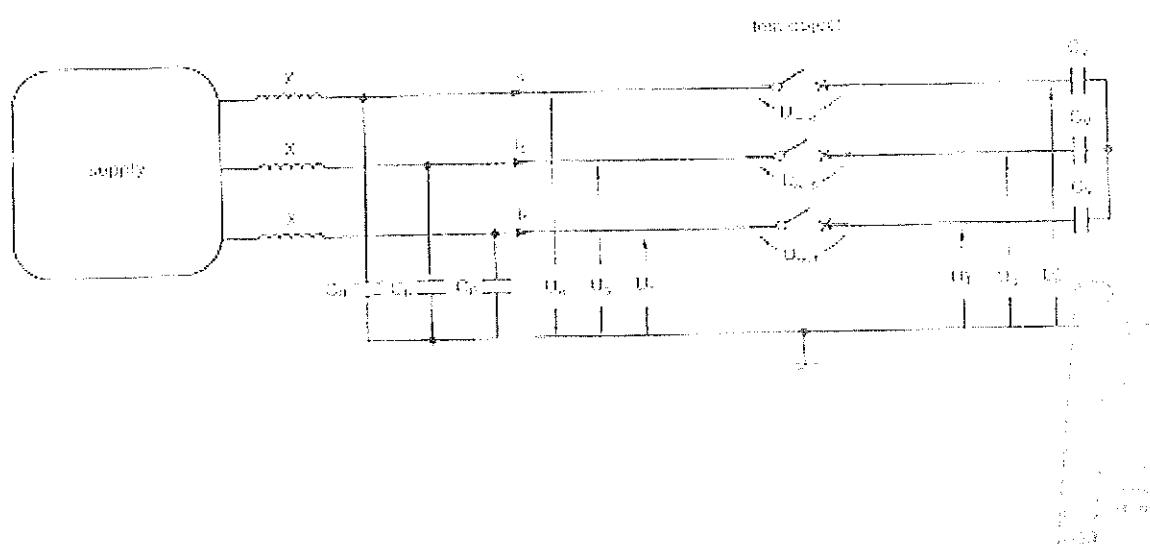
*[Signature]*

CESI

test report

GVS-91/015109 Page 9

circuit-diagram



parameters used in this circuit are the same as on the GVS-91/015109

*[Signature]*

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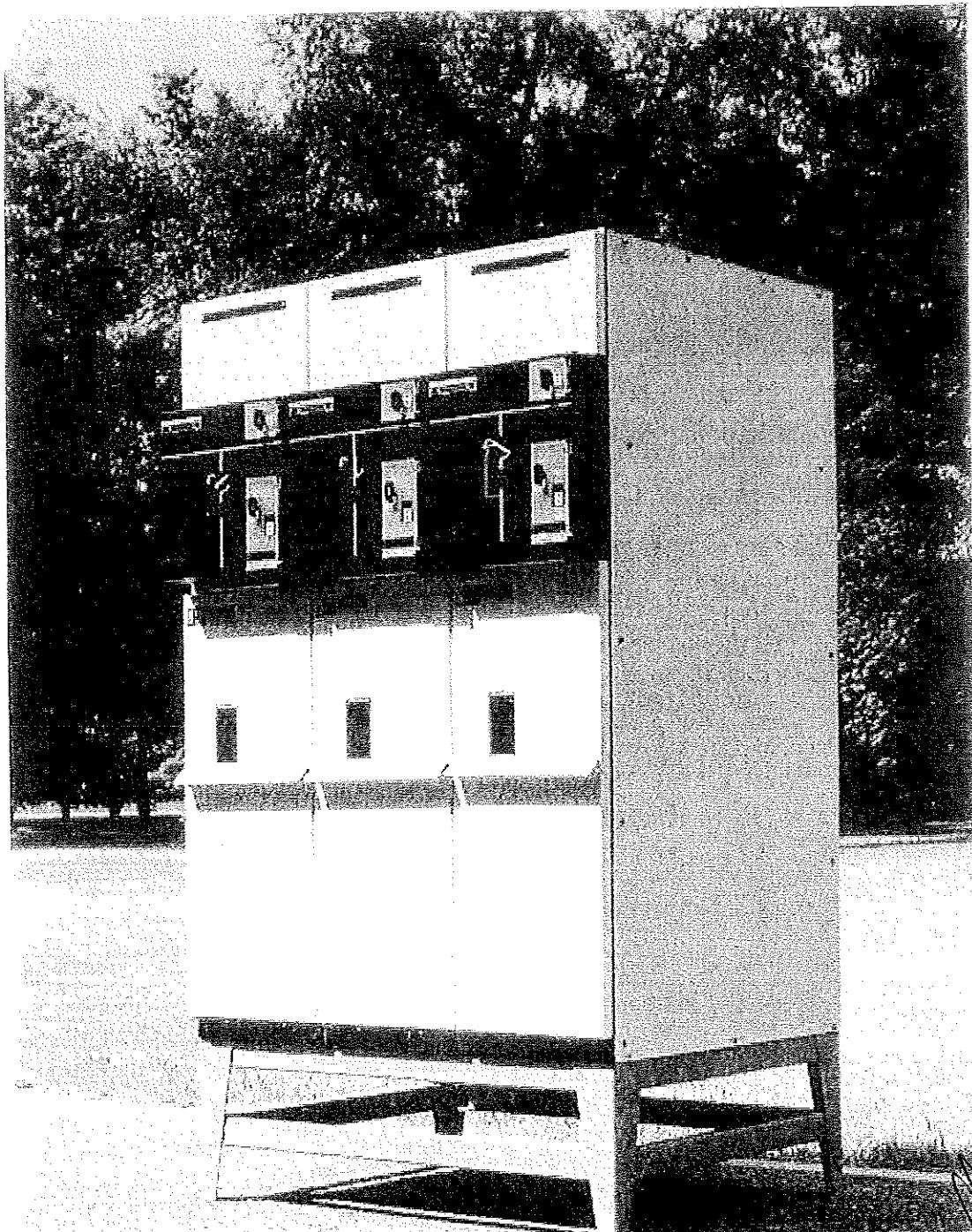
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*[Signature]*

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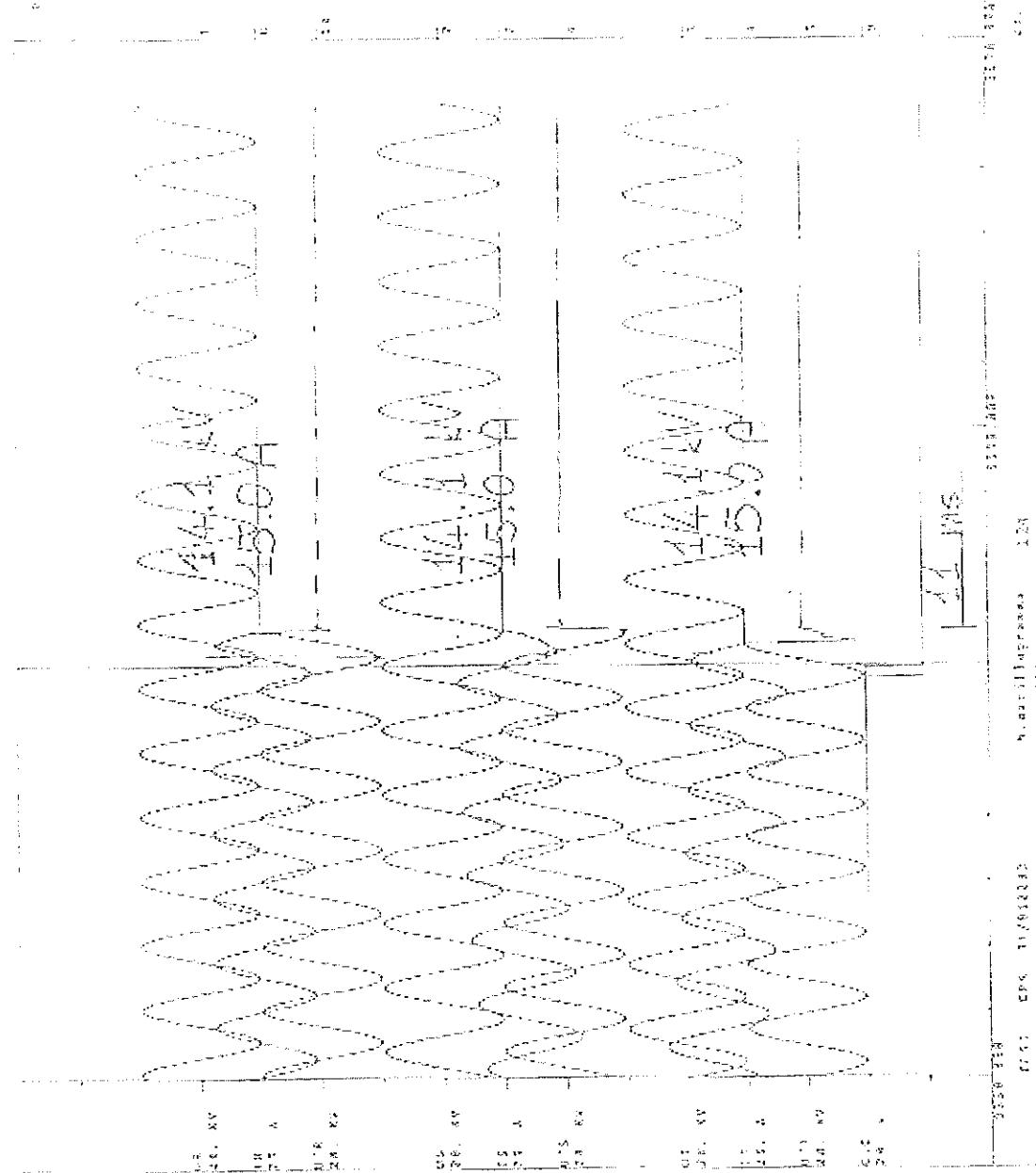
test report

OPS-91/015199 Page 10

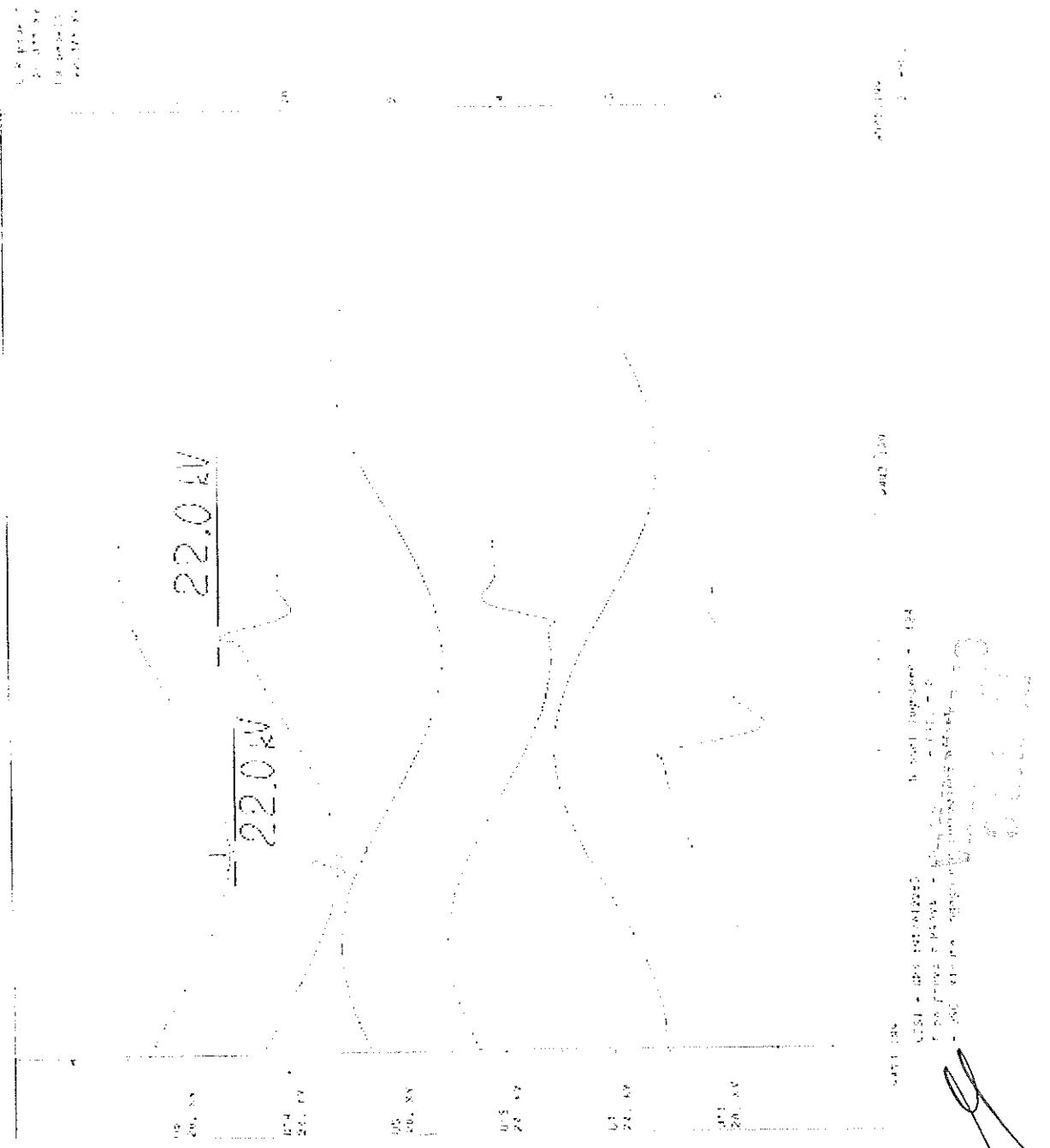


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*[Signature]*  
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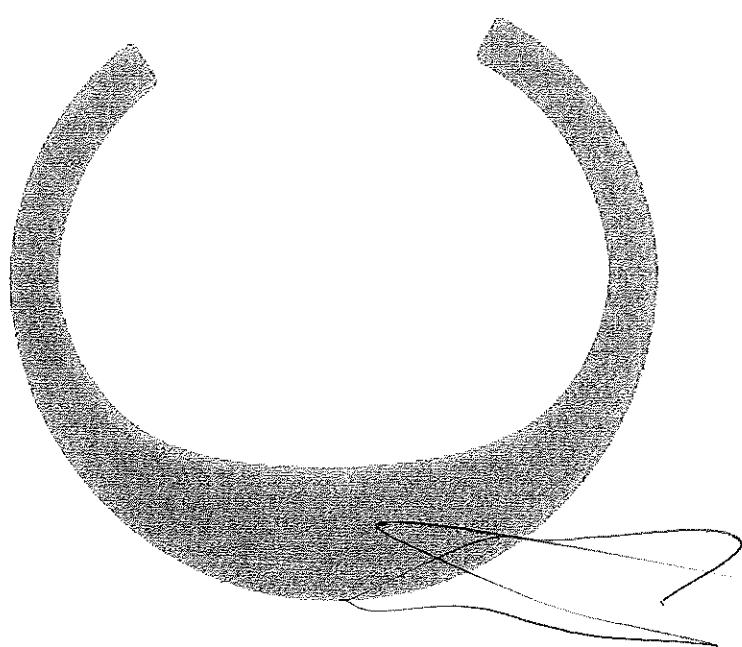
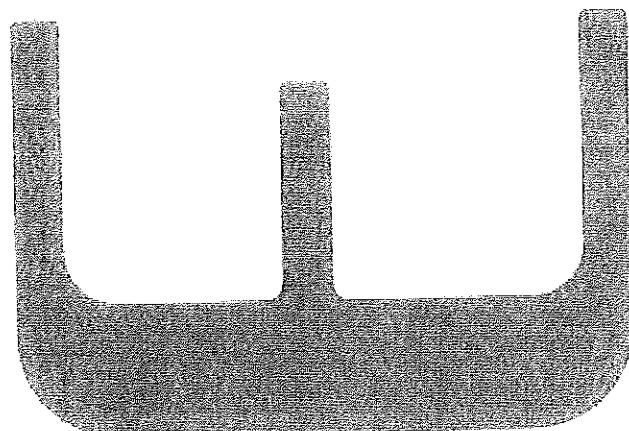
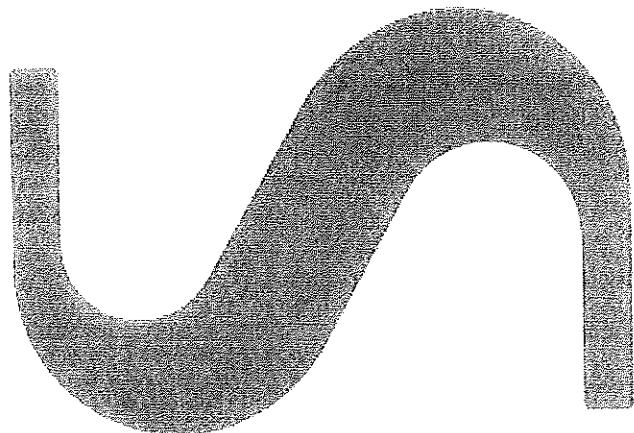
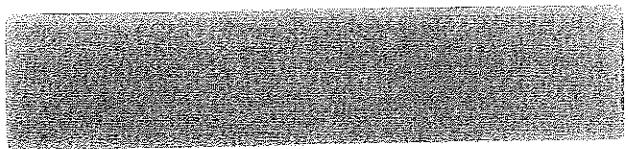


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GPS91/15213



51249040XA  
GPS91/15213

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**CEST**

**test report**

91/012285

client : MERLIN GERIN S.A.R.L - Gland (Pays de)

object : Three pole metal enclosed air insulated switchgear 3H6 system type 1000  
filled with an increased operating frequency SF6 gas insulated switch  
type T 3005.

characteristics of the tested object assigned by the Client

rated voltage 12 kV rated current 630 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 168 (1963)

test date June 26th, 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 13 pages, 119 oscillograms

client, August 22nd, 1991 test engineer

D.P.L. Roanec

Diephof

H. Ruyter

Keywords : 91/012285 120100 234303 150200 450400 630010

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1861

rated characteristics of the tested object assigned by the client

|                                      |              |
|--------------------------------------|--------------|
| voltage                              | 12 kV        |
| frequency                            | 50 Hz        |
| normal current                       | 630 A        |
| short-circuit making current         | 80 kA        |
| short-time withstand current         | 20 kA        |
| short-circuit duration               | 1 s          |
| mainly active load breaking current  | 630 A        |
| cable charging breaking current      | 25 A         |
| no-load transformer breaking current | 16 A         |
| gas pressure for interruption        | 1.4 bar abs. |

identification of the object effected.

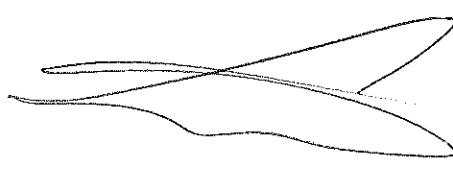
The tested object truly conforms to the drawings of its type supplied by the Client. These drawings identified by CESI with embossing press and numbered GPS- 91/015A61 1 to 12 are assembled in a folder.

## table of tests performed

| date              | type of test  | page |
|-------------------|---|------|
|                   | THREE-PHASE MAINLY ACTIVE LOAD CURRENT SWITCHING TESTS  |      |
| June 26th<br>1991 | No.100 tests with 630 A at 12 kV                        | 4    |
| June 26th<br>1991 | No.20 tests with 35 A at 12 kV                          | 5    |
|                   | THREE-PHASE NO-LOAD TRANSFORMER CURRENT SWITCHING TESTS |      |
| June 26th<br>1991 | No.10 tests with 15 A at 12 kV                          | 7    |
|                   | THREE-PHASE CABLE-CHARGING CURRENT SWITCHING TESTS      |      |
| June 26th<br>1991 | No.20 tests with 28 A at 12 kV                          | 8-9  |

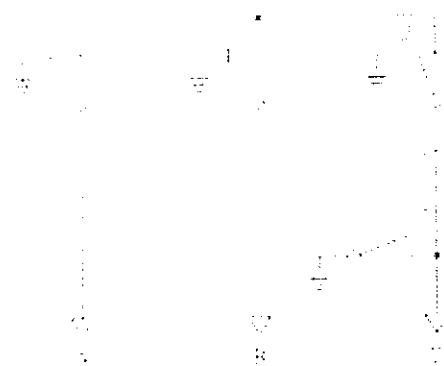
## tests witnessed by

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



**arrangement of the object for the tests**

The tested apparatus was assembled with two other apparatus of SMU system (see photo on page 12).  
The figure below shows the electric diagram of the complete setting (single phase diagram of a three phase circuit):



1 : switch and earthing switch under test

2-3 : auxiliary switches

A-B-C : cables

During the tests the cables 3 were connected to the supply, the switch 2 was in closed position and the cables A 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 3 m long to indicate any significant leakage current to earth.

## three-phase mainly active load current switching tests

Test duty with 630 A at 12.5 kV

## Test circuit conditions

Circuit diagram see page: 10

|                    |                   |  |       |
|--------------------|-------------------|--|-------|
| Supply circuit     | < 0.2             | Impedance                                    | 2.2 Ω |
| power factor:      |                   | (20 % of the total impedance of the circuit) |       |
| frequency:         | 50 Hz             |  |       |
| Neutral condition: | earthed           |  |       |
| TRV:               | at 21 kV ±3 62 μs |  |       |

|                    |           |                 |      |
|--------------------|-----------|-----------------|------|
| Load circuit       | 0.73      | frequency:      | — Hz |
| power factor:      |           | damping factor: |      |
| Neutral condition: | Insulated |                 |      |

|  |           |     |          |
|--|-----------|-----|----------|
| Control voltage of operating device for: | Closing   | =   | V        |
|  | opening   | =   | V        |
|  | motor     | =   | V        |
| QoS operating pressure for:              | operation | =   | bar abs. |
|  | breaking  | 1.4 | bar abs. |

## Conditions of the apparatus before the tests: new

|                     |   |
|---------------------|---|
| Tests performed     | no.100 tests with operating sequence CC |
| Test no.            | 1 to 100                                |
| Oscillograms no.    | 4 to 103                                |
| Test voltage        | 12 kV                                   |
| Test current        | 630 A                                   |
| Minimum arcing time | 7 ms                                    |
| Maximum arcing time | 13 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.

## three-phase mainly active load current switching tests

test duty with 35 A at 12.0 kV

## test circuit conditions

circuit diagram see page: 10

|                    |           |                      |       |
|--------------------|-----------|----------------------|-------|
| supply circuit     |           | Impedance            | 2.2 Ω |
| power factor:      | < 0.2     |                      |       |
| frequency:         | 50 Hz     |                      |       |
| neutral condition: | earthed   |                      |       |
| THV :              | ca. 21 kV | t <sub>3</sub> 52 μs |       |

|                    |           |                 |       |
|--------------------|-----------|-----------------|-------|
| load circuit       |           | frequency:      | 50 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. 102

|                     |   |
|---------------------|---|
| tests performed     | no. 20 tests with operating sequence CO |
| test no.            | 101 to 120                              |
| oscillogramm no.    | 104 to 120                              |
| test voltage        | 12 kV                                   |
| test current        | 35 A                                    |
| minimum arcing time | 7 ms                                    |
| maximum arcing time | 10 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.

## three-phase no-load transformer current switching tests

with 15.0 A at 12.0 kV

test, only

## test circuit conditions

circuit diagram see page 10

supply circuit power factor: 0.2  
 frequency: 50 Hz  
 neutral condition: earthed  
 TRV : no 21 kV t3 62 µs

load circuit power factor: 0.97 frequency: 500 Hz  
 neutral condition: insulated damping factor: 0.15

|   |               |
|---|---------------|
| control voltage of operating devices for: | closing = 9 V |
| opening = 9 V                             |               |
| motor = 9 V                               |               |
| operation = 1 bar abs.                    |               |
| breaking 1.4 bar abs.                     |               |

conditions of the apparatus before the tests: as after the test no. 120

| test no.  | 121  | 122  | 123  | 124  | 125  | 126  | 127  | 128  | 129  | 130  |
|---|------|------|------|------|------|------|------|------|------|------|
| oscillogram no.   | 127  | 128  | 129  | 130  | 131  | 132  | 133  | 134  | 135  | 136  |
| operating duty  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| voltage with open apparatus phase-to-neutral kV         | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 |
| phase-to-phase kV                                       | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| inrush making current kA                                | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| maximum closing overvoltage supply side kV load side kV | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| breaking current A                                      | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| average A   | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| maximum opening overvoltage supply side kV load side kV | -    | 12.0 | 15.0 | 13.0 | 13.0 | 14.0 | 11.0 | 12.0 | 13.0 | 14.0 |
| restrikes no. phase                                     | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| duration of prearc ms                                   | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| arc ms  | 10   | 9    | 7    | 9    | 9    | 9    | 8    | 10   | 10   | 9    |

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

## three-phase cable-charging current switching tests

test duty with 29.0 kV at 12.0 kV

## test circuit conditions

circuit diagram see page 11

supply circuit  
 power factor < 0.15  
 frequency: 50 Hz  
 CRY : ac 21 kV to 60 μs

short-circuit currents: 2 kA

load circuit  
 capacitance of capacitor banks: CVI = 10 μF (simulated)  
 voltage decay at 100 ms after final arc extinction < 10 %

voltage with open apparatus: 6.90 kV phase-to-neutral 12.0 kV phase-to-phase

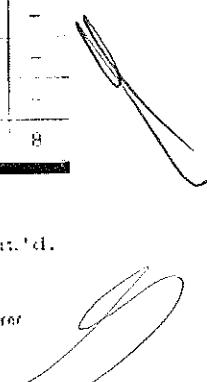
|   |           |   |          |
|---|-----------|---|----------|
| control voltage of operating devices for: | closing   | = | V        |
|   | opening   | = | V        |
|   | motor     | = | V        |
| gas operating pressure for:               | operation | = | bar abs. |
|   | breaking  | = | bar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

conditions of the apparatus before the tests : as after the test no. 130

| test  | no.                 | 131  | 132  | 133  | 134  | 135  | 136  | 137  | 138  | 139  | 140  |
|---|---------------------|------|------|------|------|------|------|------|------|------|------|
| oscillogram   | no.                 | 137  | 138  | 139  | 140  | 141  | 142  | 143  | 144  | 145  | 146  |
| operating duty  |                     | C-O  |
| voltage with closed apparatus                           | phase-to-neutral kV | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 |
| phase-to-phase kV                                       | 12.0                | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| inrush making current kA                                | -                   | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| maximum closing supply side kV overvoltage load side kV | 19.0                | 17.0 | 17.0 | 16.0 | 18.0 | 16.8 | 17.7 | 16.7 | 16.0 | 16.4 | 16.0 |
| breaking current A                                      | -                   | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| average   | A                   | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| maximum opening supply side kV overvoltage load side kV | -                   | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| restrikes   | no.                 | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| duration of   | phase               | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| closing   | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| opening   | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| preare  | ms                  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| arc   | ms                  | 8    | 7    | 6    | 9    | 7    | 9    | 9    | 7    | 7    | 8    |

conditions of the apparatus after the tests

cont'd.



NRG8

## three-phase cable-charging current switching tests

cont'd

| test                          | no.                 | 141                  | 142                  | 143                  | 144                  | 145                  | 146                  | 147                  | 148                  | 149                  | 150                  |
|-------------------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| oscillogram                   | no.                 | 147                  | 148                  | 149                  | 150                  | 151                  | 152                  | 153                  | 154                  | 155                  | 156                  |
| operating duty                |                     | C-O                  |
| voltage with closed apparatus | phase-to-neutral kV | 6.90<br>6.90<br>6.90 |
|                               | phase-to-phase kV   | 12.0<br>12.0<br>12.0 |
| inrush making current         | kA                  | -<br>-               |
| maximum closing overvoltage   | supply side kV      | 17.9<br>17.9         | 17.0<br>17.0         | 16.4<br>16.4         | 19.0<br>19.0         | 19.0<br>19.0         | 16.0<br>16.0         | 16.0<br>16.0         | 18.5<br>18.5         | 16.0<br>16.0         | 16.0<br>16.0         |
|                               | load side kV        | 17.9<br>17.9         | 17.0<br>17.0         | 16.4<br>16.4         | 19.0<br>19.0         | 19.0<br>19.0         | 16.0<br>16.0         | 16.0<br>16.0         | 18.5<br>18.5         | 16.0<br>16.0         | 16.0<br>16.0         |
| breaking current              | A                   | 28.0<br>28.0<br>28.0 |
|                               | average             | A                    | 28.0<br>28.0<br>28.0 |
| maximum opening overvoltage   | supply side kV      | -<br>13.0            | -<br>13.0            | -<br>14.0            | -<br>14.0            | -<br>13.5            | -<br>13.5            | -<br>13.5            | -<br>13.5            | -<br>14.0            | -<br>13.5            |
|                               | load side kV        | 13.0<br>13.0         | 13.0<br>14.0         | 14.0<br>14.0         | 14.0<br>14.0         | 13.5<br>13.5         | 13.5<br>13.5         | 13.5<br>13.5         | 13.5<br>14.0         | 14.0<br>13.5         | 13.5<br>13.5         |
| remarikas                     | no.                 | -<br>-               |
|                               | phase               | -<br>-               |
| duration of                   | closing             | ms                   | -<br>-               |
|                               | opening             | ms                   | -<br>-               |
|                               | pbreak              | ms                   | -<br>-               |
|                               | arc                 | ms                   | 9<br>8               | 9<br>8               | 9<br>8               | 7<br>6               | 6<br>6               | 6<br>6               | 9<br>9               | 9<br>9               | 9<br>9               |

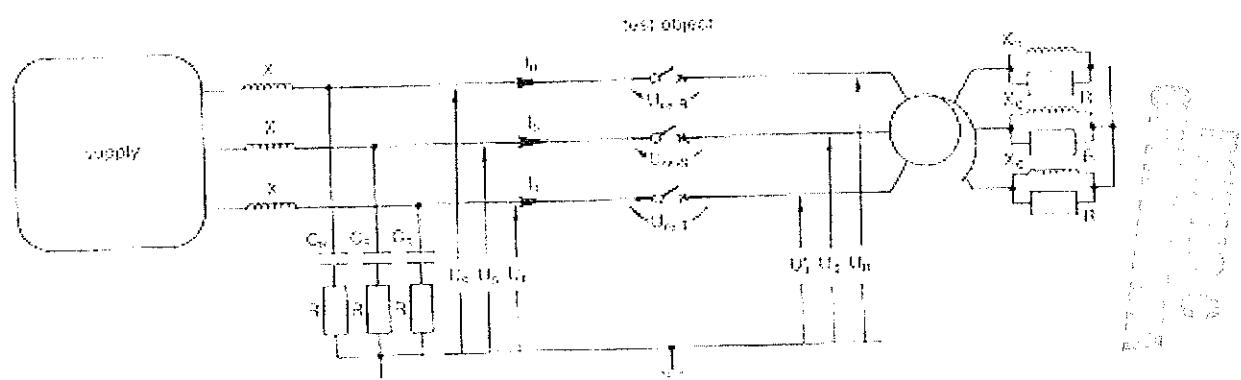
conditions of the apparatus after the tests: external parts as before the tests,  
internal parts not inspected

After all the tests the performance of the apparatus is considered  
satisfactory for the tests performed.

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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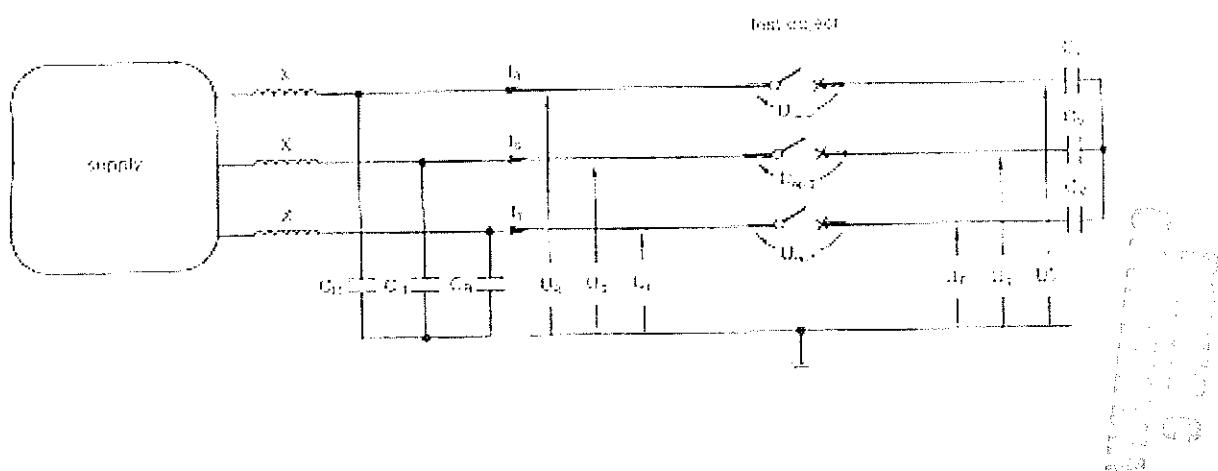
NRGG

## circuit-diagram



Component names in the diagram are the names as on the oscillograms

## circuit-diagram

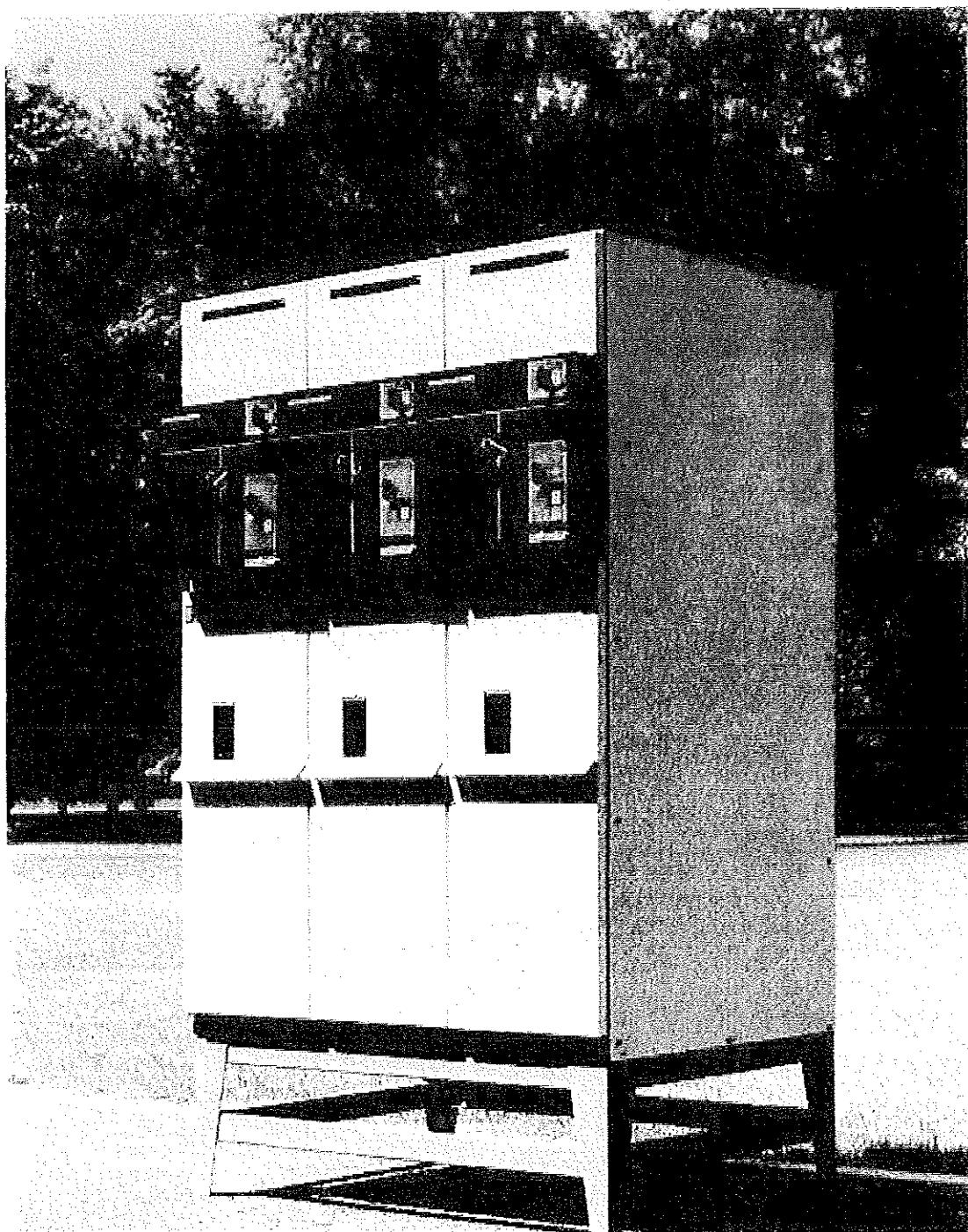


Approved by the engineer in charge on the date indicated:

**GESI**

**test report**

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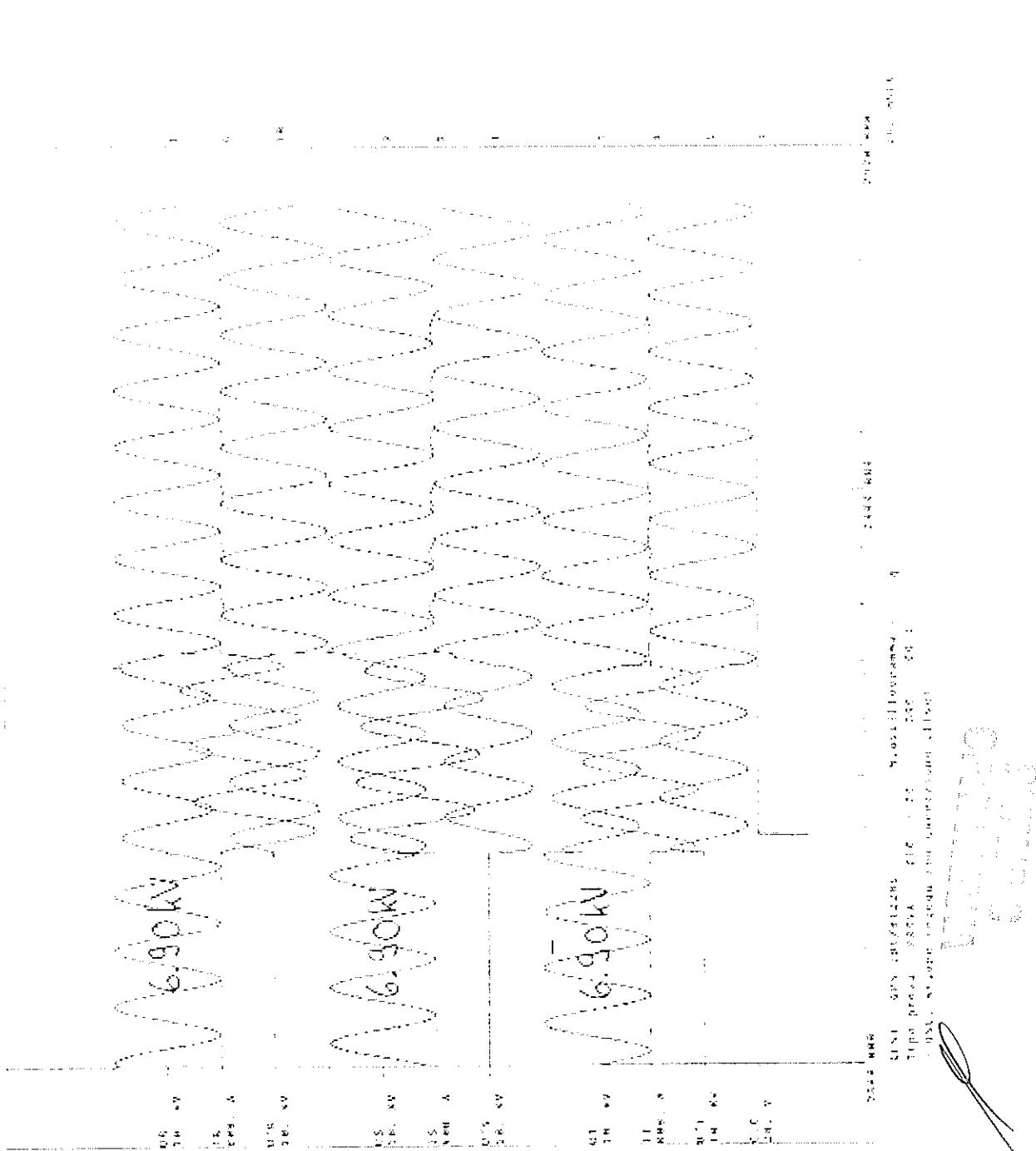


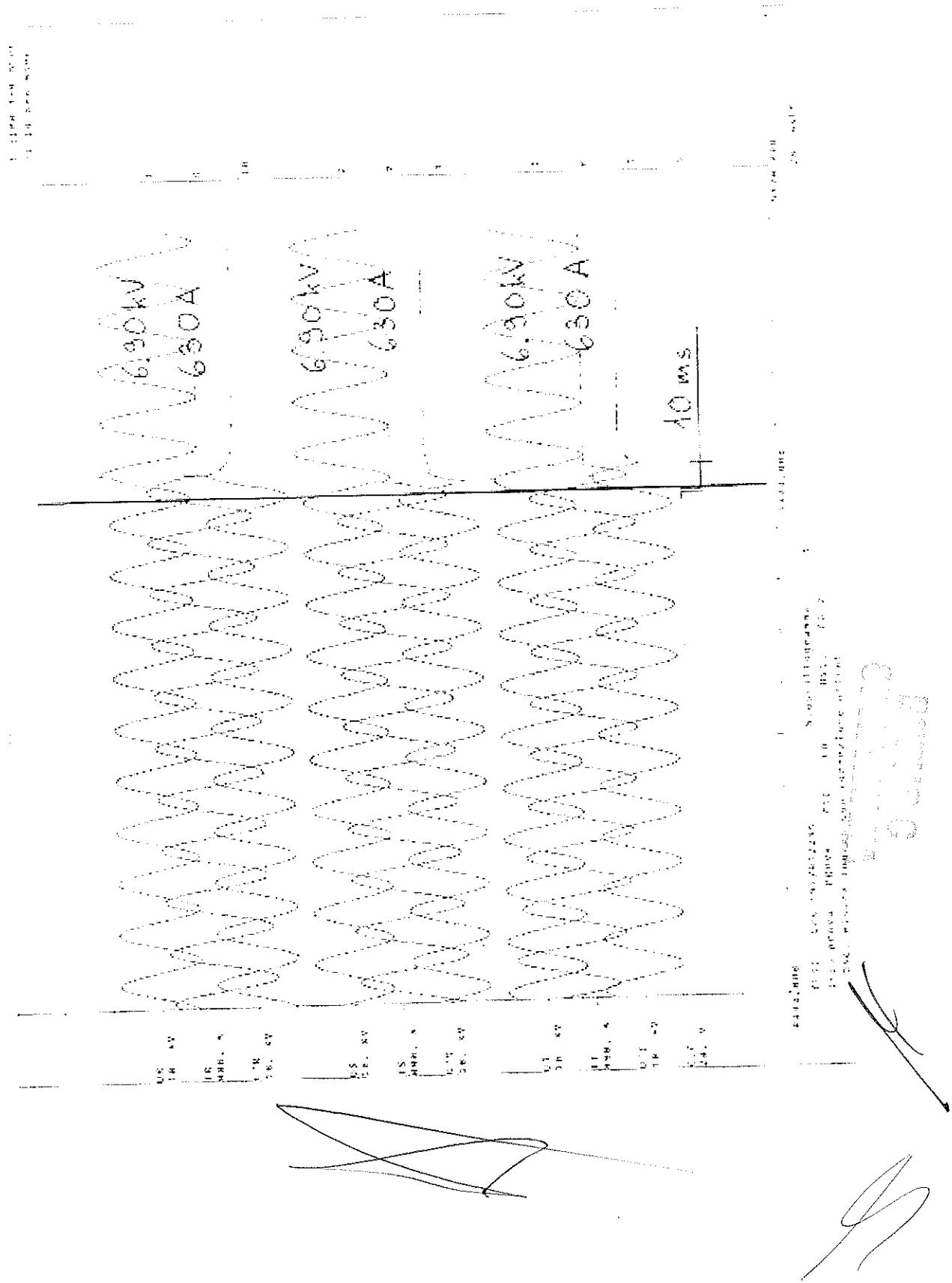
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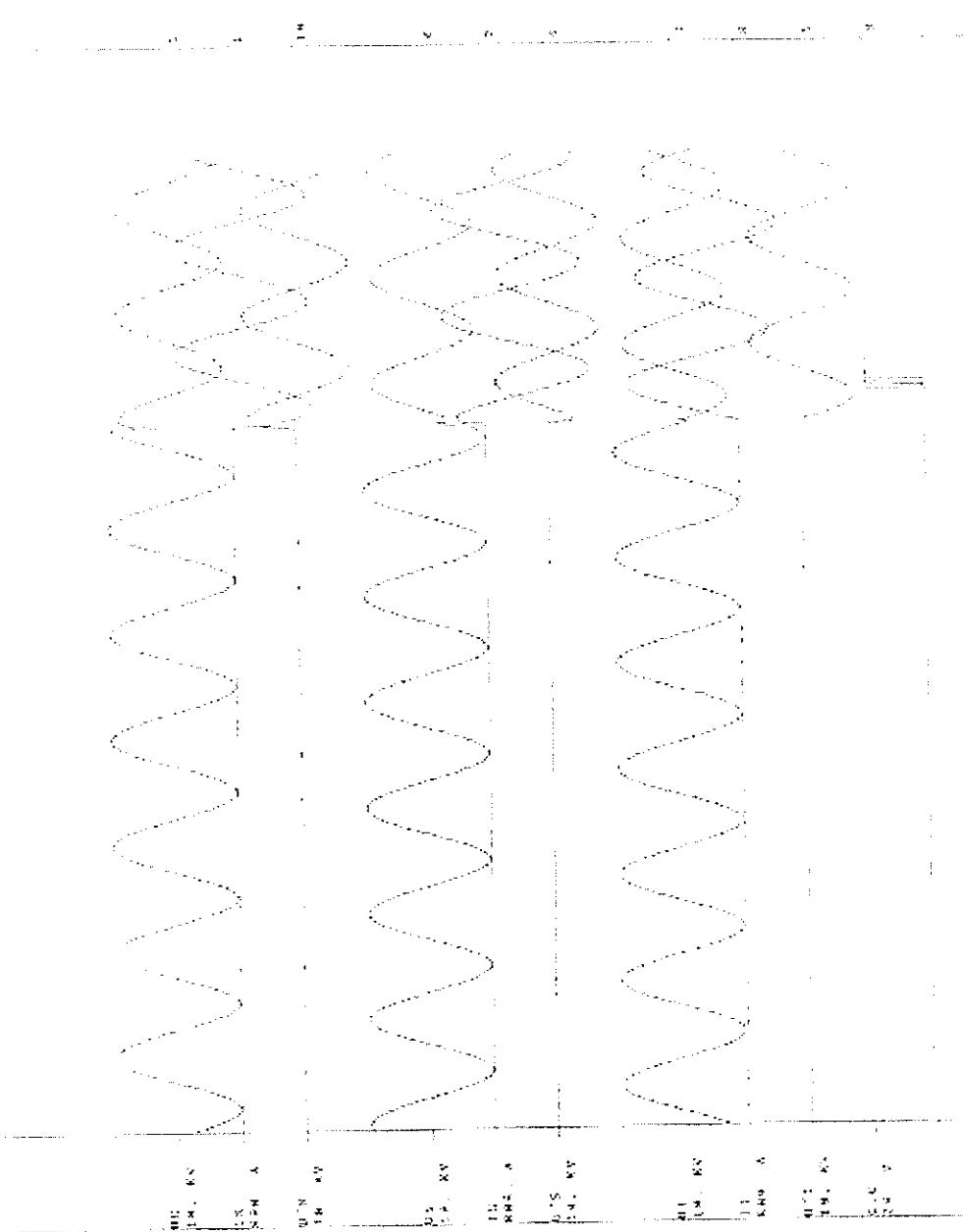
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MRM



Plot 1:  $\sin(2\pi f_1 t)$ ,  $f_1 = 1.0$   
 Plot 2:  $\sin(2\pi f_2 t)$ ,  $f_2 = 1.5$   
 Plot 3:  $\sin(2\pi f_3 t)$ ,  $f_3 = 2.0$   
 Plot 4:  $\sin(2\pi f_4 t)$ ,  $f_4 = 2.5$   
 Plot 5:  $\sin(2\pi f_5 t)$ ,  $f_5 = 3.0$

5d

1825