

TYPE TESTS REPORTS INDEX

Сертификация CESI A3-009888

Вътрешна дъга ZQU 10-187

Температурни изпитания (IS 630A) MT983033

Температурни изпитания (CIS 63A) MT983034

Диелектрични изпитания SGS DI.03.3.14.041.F

Механични изпитания DI.03.3.14.043.F

Степен на защита SGS DI.03.3.14.044.F

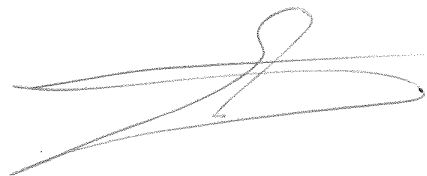
Якостни изпитания SGS DI.01.3.14.084.I

Изпитания за свръхналягане SGS DI.03.3.14.046.F

Изпитания за сигнализация на напрежение

SGS DI.03.3.14.047.F

Кинематични изпитания SGS DI.03.3.14.048.F



ВАРНО С
ОРИГИНАЛА

96


TYPE TESTS REPORTS INDEX

Certification CESI A3-009888

Internal Arc ZQU 10-187

Temperature Rise Tests (IS 630A) MT983033

Temperature Rise Tests (CIS 63A) MT983034

Dielectric Tests SGS DI.03.3.14.041.F

Mechanical Tests DI.03.3.14.043.F

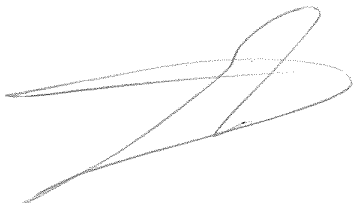
Protection degree SGS DI.03.3.14.044.F

Tightness Tests SGS DI.01.3.14.084.I

Overpressure Tests SGS DI.03.3.14.046.F

Voltage presence signalling Tests SGS DI.03.3.14.047.F

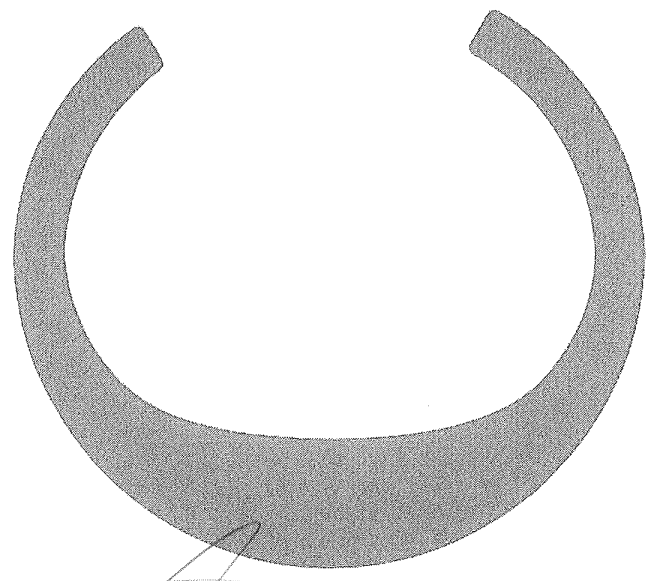
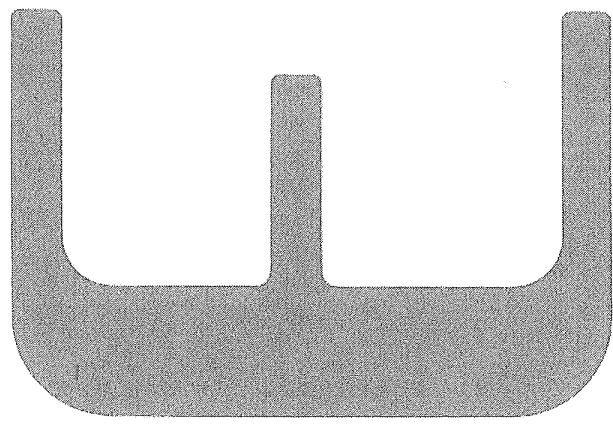
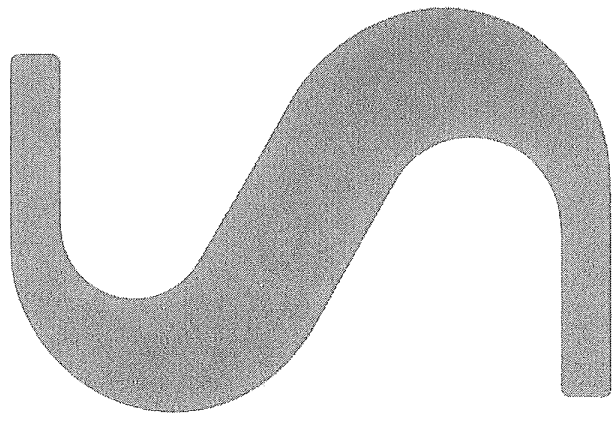
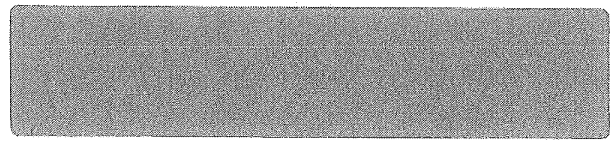
Cinematic Tests SGS DI.03.3.14.048.F



ВЯРНО С
ОРИГИНАЛА

98

GPS 03/0098388
TYPE TEST CERTIFICATE
NORMAFIX 26
(VER GPS 03/007015)



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A handwritten signature in black ink, located at the bottom center of the page.
ВЯРНО С
ОРИГИНАЛА



type test certificate of	Switching and short-circuit performance
apparatus	General purpose class E3 three-pole SF ₆ gas-filled switch, set in a metal-enclosed switchgear
designation	NORMAFIX rated voltage 24 kV; rated normal current 630 A; rated frequency 50 Hz
manufacturer	EFACEC AMT - S. Mamede Infesta - PORTUGAL
tested for	EFACEC AMT - S. Mamede Infesta - PORTUGAL
date(s) of tests	from January 28, 2003 to January 31, 2003
tested by	CESI S.p.A. - Milano - ITALY

the apparatus, constructed in accordance with the description, drawings and photographs incorporated in the reference documents, identified in this certificate, has been subjected to the series of proving tests in accordance with

IEC 60265-1 (1998)

Sub-clauses 6.6, 6.101.8.1, 6.101.8.2, 6.101.8.4, 6.101.8.5 and 6.101.8.6

this Type Test Certificate has been issued by CESI following exclusively the STL Guides.

the results are shown in the record of Proving Tests and the oscillograms attached in the Test Reports. The values obtained and the general performance are considered to comply with the above Standards and to justify the ratings assigned by the Manufacturer as listed on page no.2 .

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

only integral reproduction of this Certificate, or reproductions of this page accompanied by any pages on which are stated the endorsed ratings of the apparatus tested, are permitted without written permission from CESI.

no. of pages	3
issue date	March 19, 2003
prepared	PeC - P. BECCARINI
verified	PeC - A. GEROLI
approved	PeC - V. SCARIONI

на основании чл. 36а, ап. 3
от ЗОП

CESI
CENTRO ELETTROTECNICO SPERIMENTALE ITALIANO
Business Unit
Prove e Confronti
Il Responsabile del Laboratorio

CESI
Centro Elettrotecnico
Sperimentale Italiano
Giacinto Motta SpA

Via R. Rubattino 54
20134 Milano - Italia
Telefono +39 022125.1
Fax +39 0221255440
www.cesi.it

Capitale sociale 8 550 000 Euro
interamente versato
Codice fiscale e numero
iscrizione CCIAA 00793580150

Registro Imprese di Milano
Sezione Ordinaria
N. R.E.A. 429222
P.I. IT00793580150

ВЕРНО С
ОРИГИНАЛА



99

4 Record of proving tests

The table below lists all the tests performed and the references to the relevant Test Report containing the test results.

no. Standard and clause	description of tests	reference documents
<i>under test: switches no.1 and no.2</i>		
IEC 60265-1, 1998 - 6.6	Short-time withstand and peak withstand current test	GPS-A3/007015
<i>under test: switch no.2</i>		
IEC 60265-1, 1998 - 6.101.8.1	Test-duty 1 (I_1)	GPS-A3/007015
IEC 60265-1, 1998 - 6.101.8.2	Test-duty 2a	GPS-A3/007015
IEC 60265-1, 1998 - 6.101.8.1	Test-duty 1 (0,05 I_1)	GPS-A3/007015
IEC 60265-1, 1998 - 6.101.8.4	Test-duty 4a (I_{4a})	GPS-A3/007015
IEC 60265-1, 1998 - 6.101.8.4	Test-duty 4b	GPS-A3/007015
IEC 60265-1, 1998 - 6.101.8.4	Test-duty 4a (0,2 + 0,4 I_{4a})	GPS-A3/007015
IEC 60265-1, 1998 - 6.101.8.6	Test-duty 6a	GPS-A3/007015
IEC 60265-1, 1998 - 6.101.8.6	Test-duty 6b	GPS-A3/007015
IEC 60265-1, 1998 - 6.101.8.5	Test-duty 5	GPS-A3/007015

5 Identification of the sample

The Manufacturer guarantees that the tested object is manufactured according to the submitted drawings. CESI checked that these drawings adequately represent in shape and dimensions the essential details and the parts of the tested object.

These drawings identified by CESI and numbered A3/004024 no.1 to 11 have been returned to the Client.

Ultima pagina
Last page



ВЕРНО С
ОРИГИНАЛА



EFACEC ENERGY

MEDIUM VOLTAGE SWITCHGEAR DIRECTION

TEST REPORT No. DI.01.3.14.084.I

SF6 three position switch disconnecter type ISF

Gas tightness test

Test regulations applied:

IEC 298 (1990).

Tests results:

The Switch disconnecter passed the Tests.

Date of tests: 4th September, 2001

Tests performed by:

на основание чл. 36а, ал. 3
от ЗОП

Manuel Martins

на основание чл. 36а, ал. 3
от ЗОП

The laboratory chief

на основание чл. 36а, ал. 3
от ЗОП

Miguel Carvalho



Date: 2001.11.08	DI / RD	T. R. DI.01.3.14.084.I	Page 1 / 5
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ВЕРНО С
ОРИГИНАЛА

101



1 - TECHNICAL DATA OF SWITCH DISCONNECTOR

Type: ISF
 Serial no.: -
 Rated voltage: 24 kV
 Rated current: 630 A
 Rated power-frequency withstand voltage: 50 / 60 kV
 Rated lightning impulse withstand voltage: 125 / 145 kVp
 Breaking capacity:
 Active charge: 630 A
 No-load transformer: 1250 kVA
 No-load cables: 16 A
 Closing capacity: 40 kAp
 Rated short-time withstand current: 16 kA / 3 s
 Rated peak withstand current: 40 kAp
 Rated frequency: 50 Hz
 SF6 pressure (20°C): 0.3 bar rel.
 Drawing at page 5.

2 - MANUFACTURER

EFACEC, Medium Voltage Switchgear Direction

3 - TEST PERFORMED

Gas tightness test.
SF6 gas cumulative leakage measurement.

4 - TEST CONDITIONS

Service gas: sulphur hexafluoride (SF6)
 Test gas: SF6
 SF6 pressure: 0.3bar (rated)
 Meter type: electron capture detector with H type sinter capable of the following sensitivities:
 For SF6 gas sniffing test: $1 \times 10^{-8} \text{ cm}^3 / \text{s}$
 For SF6 gas cumulative leakage measurement: 0,01 ppm

According to IEC test regulation 298 annex GG, the following calculations were made:

Concerning formulae:

$$T = \frac{(Pr - Pm) \cdot Vol}{Fp \cdot 365 \cdot 24 \cdot 60 \cdot 60} \text{ years}$$

$$Fp = \frac{(Pr - Pm) \cdot Vol}{T} \text{ bar.cm}^3/\text{s}$$

$$Frel = \frac{Fp \cdot 365 \cdot 24 \cdot 60 \cdot 60 \cdot 100}{(Pr+1) \cdot Vol} \%/\text{year}$$

$$Frel = \frac{(Pr - Pm) \cdot 100}{(Pr+1) \cdot T} \%/\text{year}$$

Where Pr (rated filling pressure) = 0,3 bar
 Pm (minimum functional pressure) = 0,1 bar



Date: 2001.11.08	DI / RD	T. R. DI.01.3.14.084.I	Page 2 / 5
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EFACEC ENERGY

MEDIUM VOLTAGE SWITCHGEAR DIRECTION

Switch	ISF SF6 volume (cm ³)	Fp (bar*cm ³ /s)	Frel (%/year)
ISF	25.4 x 10 ³	5.4 x 10 ⁻⁶	0,51

The SF6 gas-sniffing test would use the values of Fp but for added security, the pass/fail level was lowered to 1,0 x 10⁻⁶ bar*cm³/s.

For the new value of Fp, the estimated lifespan and relative leakage rate were calculated:

$$Fp = 1,0 \times 10^{-6} \text{ bar} \cdot \text{cm}^3/\text{s}$$

Switch	ISF SF6 volume (cm ³)	Estimated lifespan (years)	Frel (%/year)
ISF	25.4 x 10 ³	161	0.096

For the SF6 gas cumulative leakage measurement over a determined test time, it was used a gas tight flexible housing (see drawing on page 5) and the formula:

$$C = \frac{Fp \cdot Tt \cdot Po}{V1 - V2} \text{ (ppm)}$$

Where
 Tt is the cumulative leakage measurement test time (s)
 Po is the atmospheric pressure value (bar)
 V1 is the gas tight housing volume (cm³)
 V2 is the ISF volume (cm³)

In order to obtain expected values within the measurable range, the test time was set to 2 hours (7200 s), thus obtaining the following acceptance criteria:

Switch	Housing volume V1 (cm ³)	ISF volume V2 (cm ³)	Maximum admissible concentration C (ppm)
ISF	81.5 x 10 ³	25.4 x 10 ³	0.13

As the maximum admissible concentration C has no great discrepancies, the mean value of C was calculated and used (C = 0.15 ppm).

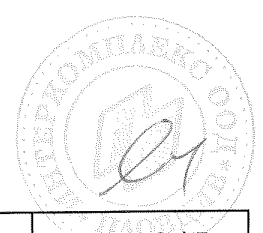
5 - TESTS RESULTS

Cumulative leakage test:

SF6 gas leakage measurement:

Switch	Test date	Test start time	Test finish time	C1 - start (ppm)	C2 - finish (ppm)
ISF	2001.09.04	08:00	10:00	0.00	0.06

Switch	ΔC = C2 - C1 (ppm)	Acceptance criteria	Test results
ISF	0.06	ΔC < 0.15	Passed



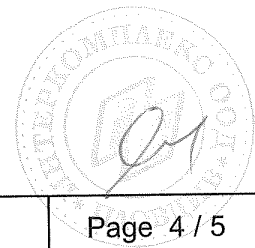
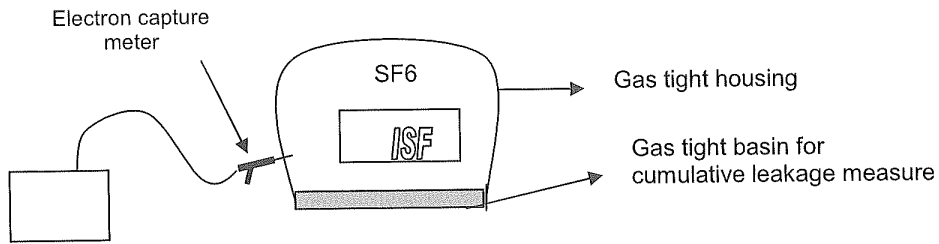
Date: 2001.11.08	DI / RD	T. R. DI.01.3.14.084.I	Page 3 / 5
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103



Test arrangements for cumulative leakage measurement



Date: 2001.11.08	DI / RD	T. R. DI.01.3.14.084.I	Page 4 / 5
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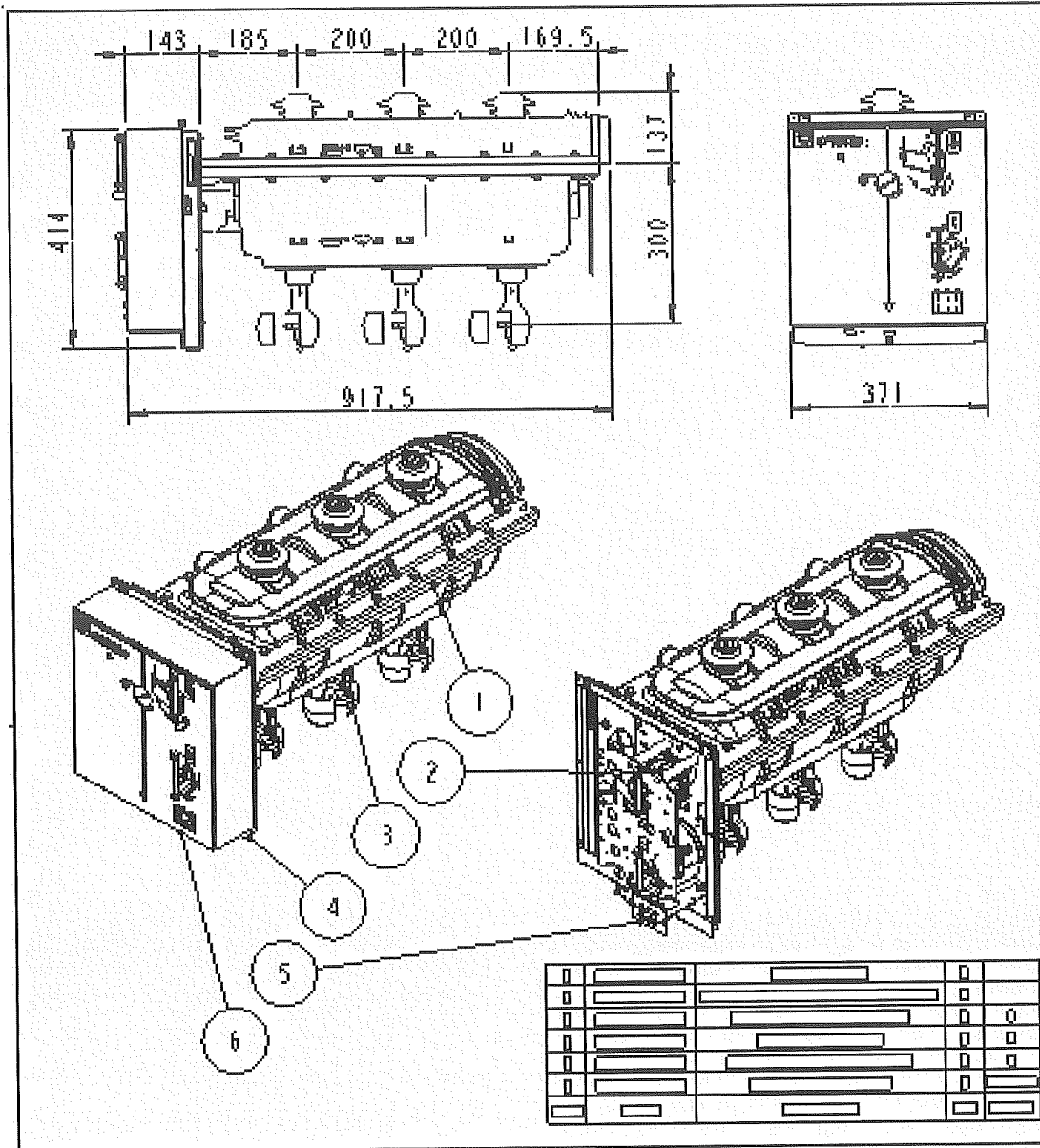
ΕΥΡΩΣ
ΣΟΡΗΤΗΡΙΑ

104



EFACEC ENERGY

MEDIUM VOLTAGE SWITCHGEAR DIRECTION



Escala	1:1	Proj. ...		P. d. o. ...		
Di. ludo	Project	Util. fecha:	ANT 495067-01	Fecha ludo:	ANT 695463-01	
	P. L. I. M.					
	Desarq	Artigo:		Dir. Dept.:	NSI	
	P. L. I. M.	INTERRUPTOR SECCIONADOR 15F 15F SWITCH DISCONNECTOR 24-11-2001-1946-1163 CELA 13 315			ANT 695463	
	95/11/04					
	Aprovada				Indica	0
	1.704AR				Numero	000700
	9170011				Nota	3108/01

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EFACEC ENERGY
MEDIUM VOLTAGE SWITCHGEAR DIVISION

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TEST REPORT
No. MT983033

Prefabricated panel Normafix type IS with SF6 three position switch disconnecter type ISF

Temperature rise tests at 630 A
Measurement of the resistance of the main circuit

Test regulations applied:

IEC 298 (1990).
 IEC 694 (1980).

Tests results:

The temperature rises did not exceed the permissible values in accordance with the above mentioned standards at an ambient air temperature not exceeding 40 °C.

Date of tests: 5 th of March, 1996.

Tests performed by:

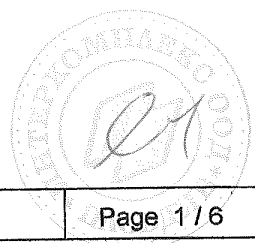
на основание чл. 36а, ал. 3
 от ЗОП

Manuel Martins

The laboratory chief

на основание чл. 36а, ал. 3
 от ЗОП

Rui Cardoso



Date: 98.06.18	MT / GQ	T. R. MT983033	Page 1 / 6
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 ВЪРХОВЕН
 АДМИНИСТРАЦИЯ



EFACEC ENERGY

MEDIUM VOLTAGE SWITCHGEAR DIVISION

1 - TECHNICAL DATA OF SWITCHGEAR

Prefabricated panel

Type: IS
Serial no.: Prototype
Rated voltage: 24 kV
Rated current: 630 A
Rated power-frequency withstand voltage: 50 / 60 kV
Rated lightning impulse withstand voltage: 125 / 145 kVp
Rated peak withstand current: 40 kAp
Rated short-time withstand current: 16 kA / 3 s
Rated frequency: 50 Hz
Drawing on page 6.

with SF6 rotary three position switch disconnecter

Type: ISF
Serial no.: Prototype
Rated voltage: 24 kV
Rated current: 630 A
Rated power-frequency withstand voltage: 50 / 60 kV
Rated lightning impulse withstand voltage: 125 / 145 kVp
Breaking capacity:
Active charge: 630 A
No-load transformer: 1250 kVA
No-load cables: 16 A
Closing capacity: 40 kAp
Rated short-time withstand current: 16 kA / 3 s
Rated peak withstand current: 40 kAp
Rated frequency: 50 Hz
SF6 pressure (20°C): 0.3 bar rel.

2 - MANUFACTURER

EFACEC, Medium Voltage Switchgear Division

3 - TESTS PERFORMED

Temperature rise test with 630 Aac - 50 Hz.
Measurement of the resistance of the main circuit with 100 Adc.



Date: 98.06.18	MT / GQ	T. R. MT983033	Page 2 / 6
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ВЕРНО С
ОРДЕРНАА

104

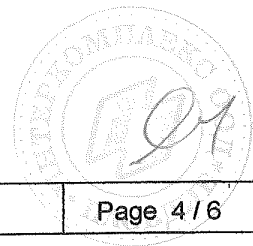


EFACEC ENERGY
MEDIUM VOLTAGE SWITCHGEAR DIVISION

6.2 - Measurement of the resistance of the main circuit

Measuring points	Resistance ($\mu\Omega$)					
	Before test			After test		
	L1	L2	L3	L1	L2	L3
A - B	31	38	38	31	39	38

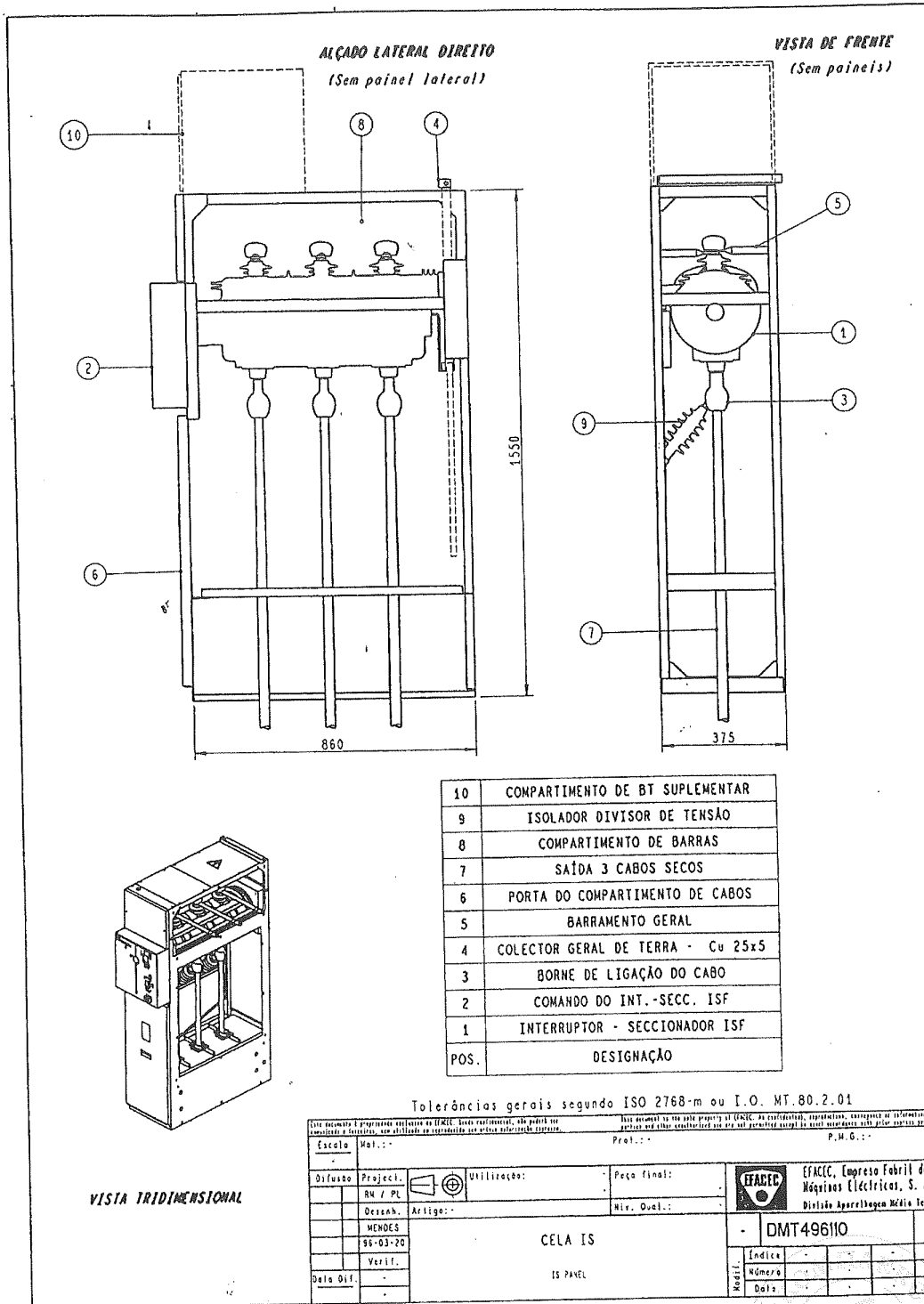
No remarkable change of measuring values after the test.



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ОРГАНИЗАЦИЯ

109



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EFACEC ENERGY
MEDIUM VOLTAGE SWITCHGEAR DIVISION

TEST REPORT
No. MT983034

Prefabricated panel Normafix type CIS with SF6 three position switch disconnector type ISF

Temperature rise tests with 80 A fuses
Measurement of the resistance of the main circuit

Test regulations applied:

- IEC 298 (1990).
- IEC 694 (1980).
- IEC 282-1 (1985).
- IEC 420 (1990).

Tests results:

The temperature rises did not exceed the permissible values in accordance with the above mentioned standards at an ambient air temperature not exceeding 40 °C.

Date of tests: 7 th of July, 1997.

Tests performed by:

на основании чл. 36а, ал. 3
от ЗОП

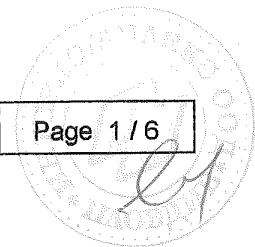
Manuél Martins

The laboratory chief

на основании чл. 36а, ал. 3
от ЗОП

Rui Cardoso

Date: 98.06.18	MT / GQ	T. R. MT983034	Page 1 / 6
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112



EFACEC ENERGY

MEDIUM VOLTAGE SWITCHGEAR DIVISION

1 - TECHNICAL DATA OF SWITCHGEAR

Prefabricated panel

Type: CIS
Serial no.: -
Rated voltage: 24 kV
Rated current: 63 A
Rated power-frequency withstand voltage: 50 / 60 kV
Rated lightning impulse withstand voltage: 125 / 145 kVp
Rated peak withstand current: 40 kAp
Rated short-time withstand current: 16 kA / 3 s
Rated frequency: 50 Hz
Drawing on page 6.

with SF6 rotary three position switch disconnecter

Type: ISF
Serial no.: -
Rated voltage: 24 kV
Rated current: 400 A
Rated power-frequency withstand voltage: 50 / 60 kV
Rated lightning impulse withstand voltage: 125 / 145 kVp
Breaking capacity:
 Active charge: 400 A
 No-load transformer: 1250 kVA
 No-load cables: 16 A
Closing capacity: 40 kAp
Rated short-time withstand current: 16 kA / 3 s
Rated peak withstand current: 40 kAp
Rated frequency: 50 Hz
SF6 pressure (20°C): 0.3 bar rel.

2 - MANUFACTURER

EFACEC, Medium Voltage Switchgear Division

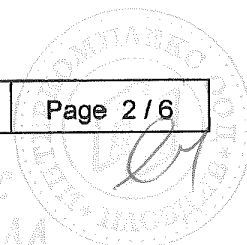
3 - TESTS REQUESTED BY:

1997 annual quality plan according MT.91.1.06 document.

4 - TESTS PERFORMED

Temperature rise test with 63 Aac - 50 Hz.
Measurement of the resistance of the main circuit with 100 Adc.

Date: 98.06.18	MT / GQ 	T. R. MT983034	Page 2 / 6
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113



EFACEC ENERGY

MEDIUM VOLTAGE SWITCHGEAR DIVISION

5 - TEST CONDITIONS

A switchgear consisting of two coupled panels provided with a SF6 switch disconnectors type ISF. The tests were performed under 63 A three - phase. Supply was ensured through the three phases of the cable compartment on the right panel, the short-circuit point was done in the busbar compartment of the left hand panel.

Main busbar in $\phi 22 \times 3.5$ copper tube.

Supply connections from current transformer to the switchgear: $1 \times 95 \text{ mm}^2$ copper.
The supply connections has been connected to the cables compartment.

Short circuit point in the busbar compartment with $1 \times 25 \times 5$ copper bar.

Fuses:

Type: BUSSMAN TFMSJ
Rated voltage: 17.5 / 24 kV
Rated current: 80 A
Resistance: 14 m Ω

6 - TESTS RESULTS

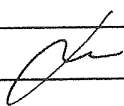
The maximum permissible temperature rises are:

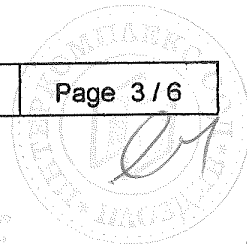
- At a silver coated connection: 75 °C
- At a silver coated contact: 65 °C

The temperature rises with a current of 63 Aac did not exceed the permissible values in accordance with above mentioned standards at an ambient air temperature not exceeding 40 °C.

7 - MEASURING VALUES

According drawing on page 5:

Date: 98.06.18	MT / GQ 	T. R. MT983034	Page 3 / 6
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114



EFACEC ENERGY

MEDIUM VOLTAGE SWITCHGEAR DIVISION

7.1 - Temperature rise test

Measuring points	Designation	Temperature rise in °C
1	Lower contact finger	23.6
2		23.0
3		22.7
4	Fuse	27.3
5		26.3
6		26.2
7	Fuse	58.2
8		62.2
9		59.4
10	Upper contact finger	55.2
11		55.1
12		55.5
13	Switch lower terminal	35.8
14		37.3
15		35.8
16	Lower fixed contact	29.9
17		31.2
18		29.8
19	Movable contact	27.1
20		28.1
21		25.3
22	Movable contact	20.9
23		22.6
24		20.8
25	Switch upper terminal	17.4
26		17.7
27		17.5
28	SF6 temperature	17.5
29	Busbar compartment temperature	12.4
30	Cables compartment temperature	18.0

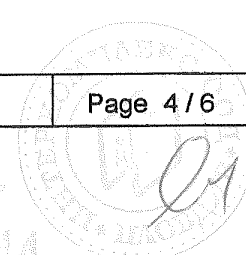
Ambient air temperature: 27.9 °C

7.2 - Measurement of the resistance of the main circuit

Measuring points	Resistance (μΩ)					
	Before test			After test		
	L1	L2	L3	L1	L2	L3
B - C	51	58	50	50	56	49

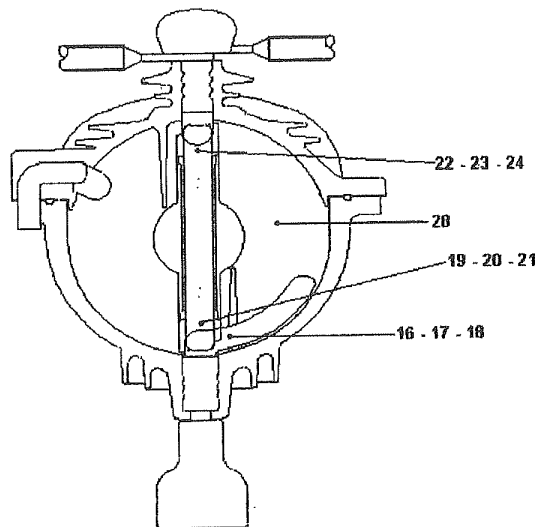
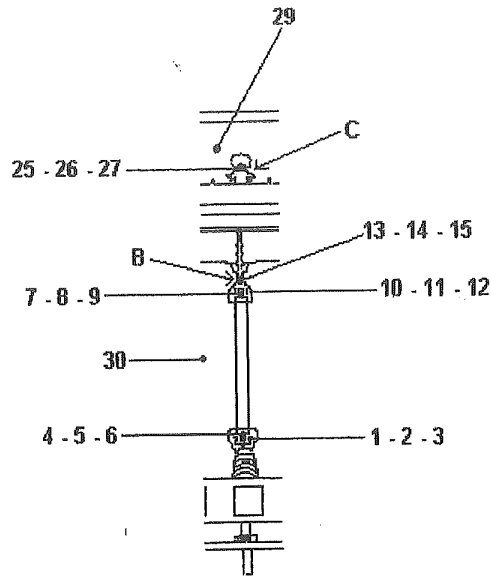
No remarkable change of measuring values after the test.

Date: 98.06.18 MT / GQ T. R. MT983034 Page 4 / 6





EFACEC ENERGY
MEDIUM VOLTAGE SWITCHGEAR DIVISION



Date: 98.06.18	MT / GQ	T. R. MT983034	Page 5 / 6
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116



TEST REPORT
No. MV.09.3.14.072.I

Prefabricated panel Normafix 24 type SBM with SF6 three position switch disconnecter type ISF24

Lightning impulse voltage test
Power frequency voltage test

Test regulations applied:

IEC 62271-200 (2003).
IEC 62271-1 (2007).

Tests results:

The prefabricated panel Normafix 24 passed the tests

Date of tests: November 17th, 2009.

Tests performed by:

на основании чл. 36а, ал. 3
от ЗОП

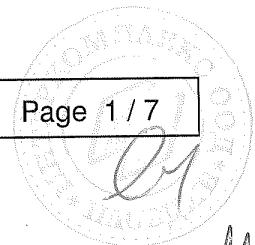
Manuel Martins

The laboratory Responsible

на основании чл. 36а, ал. 3
от ЗОП

Miguel Carvalho

Date: 2009.11.19	MV / RD 	T. R. MV.09.3.14.072.I	Page 1 / 7
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118



1 - TECHNICAL DATA OF SWITCHGEAR

Prefabricated panel

Type: SBM
Serial no.: -
Rated voltage: 24 kV
Rated current: 630 A
Rated power-frequency withstand voltage: 50 kV
Rated lightning impulse withstand voltage: 125 kVp
Rated peak withstand current: 40 kAp
Rated short-time withstand current: 16 kA / 3 s
Rated frequency: 50 Hz
See drawing on page 7.

With SF6 rotary three position switch disconnecter

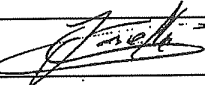
Type: ISF24
Serial no.: -
Rated voltage: 24 kV
Rated current: 630 A
Rated power-frequency withstand voltage: 50 / 60 kV
Rated lightning impulse withstand voltage: 125 / 145 kVp
Breaking capacity:
 Active charge: 630 A
 No-load transformer: 1250 kVA
 No-load cables: 16 A
Closing capacity: 40 kAp
Rated short-time withstand current: 16 kA / 3 s
Rated peak withstand current: 40 kAp
Rated frequency: 50 Hz
SF6 pressure (20°C): 0.3 bar rel.

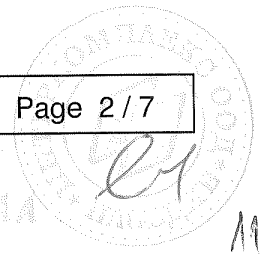
And current transformers:

Type: ACF24
Rated voltage: 24 kV
Rated primary current: 630 A
Rated secondary current: 5 A
Rated power: 15 VA

And voltage transformers:

Type: UCJ24
Rated voltage: 24 kV
Rated secondary voltage: $100/\sqrt{3}$ V

Date: 2009.11.19	MV / RD 	T. R. MV.09.3.14.072.I	Page 2 / 7
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2 - MANUFACTURER

Efacec Energia, Máquinas e Equipamentos Eléctricos, S.A.

3 - TESTS PERFORMED

Lightning impulse voltage test at 125 / 145 kVp, 1.2 / 50 μ s.
Power frequency voltage test at 50 / 60 kV, 1 minute.

4 - TEST CONDITIONS

Tests performed according to test circuits diagram on page 6.

Temperature: 12 °C
Atmospheric pressure: 1003 mb
Humidity: 58 %
d = 1.017
k = d

5 - TESTS RESULTS

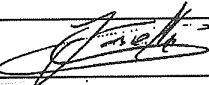
According circuit diagram on page 5:

5.1 – Switch disconnector closed on service position

(Test between phases and to earth)

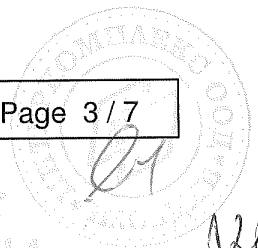
Voltage applied to	Connected to earth	Impulses / Flashovers +	Impulses / Flashovers -	Applied Voltage \pm kVp 1.2 / 50 μ s	Result	Power frequency Voltage kV - 1minute	Result
Aa	BCbc F	15 / 0	15 / 0	125	Passed	50	Passed
Bb	ACac F	15 / 0	15 / 0	125	Passed	50	Passed
Cc	ABab F	15 / 0	15 / 0	125	Passed	50	Passed

Date: 2009.11.19

MV / RD 

T. R. MV.09.3.14.072.I

Page 3 / 7



120



5.2 – Switch disconnector open

(Test between phases and to earth)

Voltage applied to	Connected to earth	Impulses / Flashovers +	Impulses / Flashovers -	Applied Voltage \pm kVp 1.2 / 50 μ s	Result	Power frequency Voltage kV – 1 minute	Result
A	BCabc F	15 / 0	15 / 0	125	Passed	50	passed
B	ACabc F	15 / 0	15 / 0	125	Passed	50	passed
C	ABabc F	15 / 0	15 / 0	125	Passed	50	passed
a	ABCbc F	15 / 0	15 / 0	125	Passed	50	passed
b	ABCac F	15 / 0	15 / 0	125	Passed	50	passed
c	ABCab F	15 / 0	15 / 0	125	Passed	50	passed

5.3 – Switch disconnector open

(Test across isolating distance)

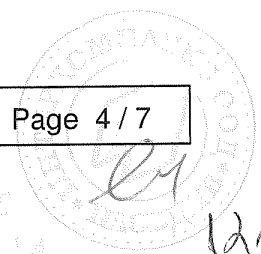
Voltage applied to	Connected to earth	Impulses / Flashovers +	Impulses / Flashovers -	Applied Voltage \pm kVp 1.2 / 50 μ s	Result	Power frequency Voltage kV – 1 minute	Result
A	a	15 / 0	15 / 0	145	Passed	60	passed
B	b	15 / 0	15 / 0	145	Passed	60	passed
C	c	15 / 0	15 / 0	145	Passed	60	passed
a	A	15 / 0	15 / 0	145	Passed	60	passed
b	B	15 / 0	15 / 0	145	Passed	60	passed
c	C	15 / 0	15 / 0	145	Passed	60	passed

Date: 2009.11.19

MV / RD

T. R. MV.09.3.14.072.I

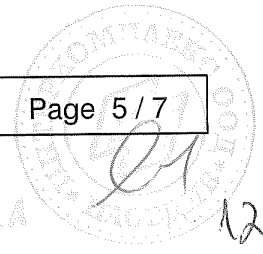
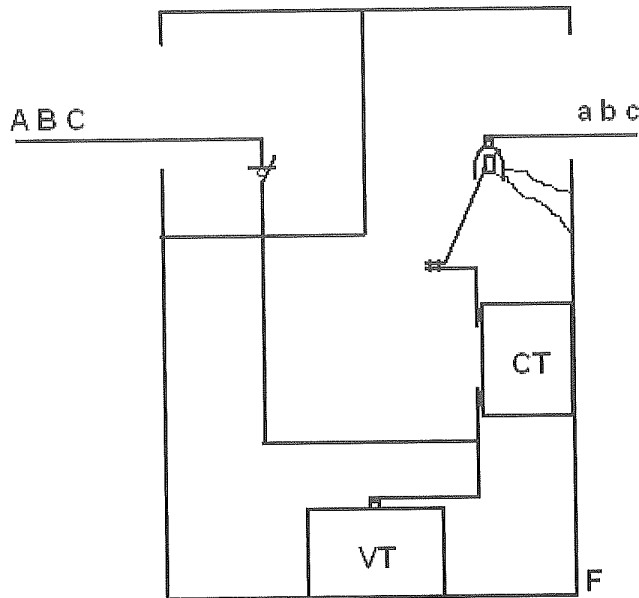
Page 4 / 7



1211



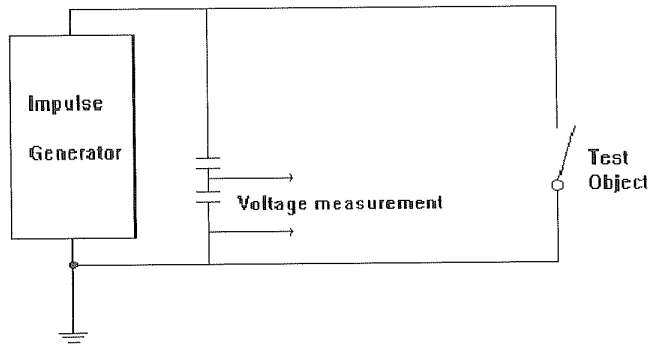
Voltage tests circuit arrangement



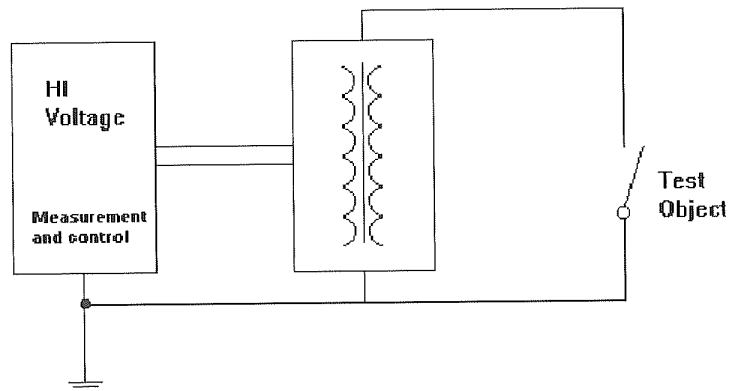
122

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Lightning impulse voltage test

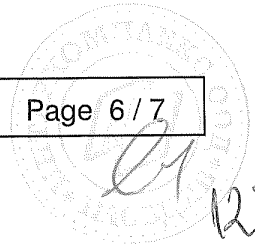


Power frequency voltage test



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ВЕРТІС С
ОРУТІКЛАА



123

1 - TECHNICAL DATA OF SWITCHGEAR

Prefabricated panel

Type: SBM
Serial no.: -
Rated voltage: 24 kV
Rated current: 630 A
Rated power-frequency withstand voltage: 50 kV
Rated lightning impulse withstand voltage: 125 kVp
Rated peak withstand current: 40 kAp
Rated short-time withstand current: 16 kA / 3 s
Rated frequency: 50 Hz
See drawing on page 5.

With SF6 rotary three position switch-disconnector

Type: ISF24
Serial no.: -
Rated voltage: 24 kV
Rated current: 630 A
Rated power-frequency withstand voltage: 50 / 60 kV
Rated lightning impulse withstand voltage: 125 / 145 kVp
Breaking capacity:
 Active charge: 630 A
 No-load transformer: 1250 kVA
 No-load cables: 16 A
Closing capacity: 40 kAp
Rated short-time withstand current: 16 kA / 3 s
Rated peak withstand current: 40 kAp
Rated frequency: 50 Hz
SF6 pressure (20°C): 0.3 bar rel.

And current transformers:

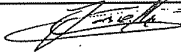
Type: ACF24
Rated voltage: 24 kV
Rated primary current: 630 A
Rated secondary current: 5 A
Rated power: 15 VA

And voltage transformers:

Type: UCJ24
Rated voltage: 24 kV
Rated secondary voltage: 100/√3 V

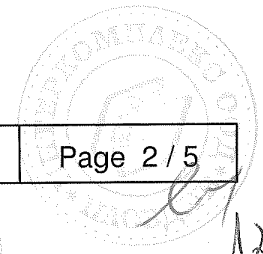
2 - MANUFACTURER

Efacec Energia, Máquinas e Equipamentos Eléctricos, S.A.

Date: 2009.11.25	MV / RD		T. R. MV.09.3.14.073.I	Page 2 / 5
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126

6.1 - Temperature rise test

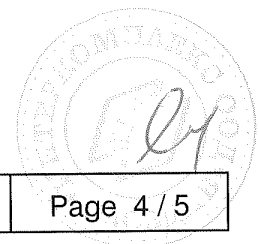
Measuring points	Designation	Temperature rise (K)
1	Main busbar (left hand side)	62.4
2		63.8
3		63.0
4	Switch-disconnector upper terminals	62.0
5		63.6
6		62.5
7	Switch-disconnector lower terminals	59.3
8		60.2
9		59.9
10	Busbar to CT and VT	59.5
11		60.2
12		60.3
13	Current transformer terminals	60.1
14		60.9
15		61.0
16	Current transformer terminals	60.6
17		61.3
18		61.7
19	Busbar	62.3
20		64.1
21		63.8
22	Main busbar (right hand side)	62.7
23		64.5
24		64.2
25	SBM compartment temperature	20.1

Ambient air temperature: 13.6 °C

6.2 - Measurement of resistance

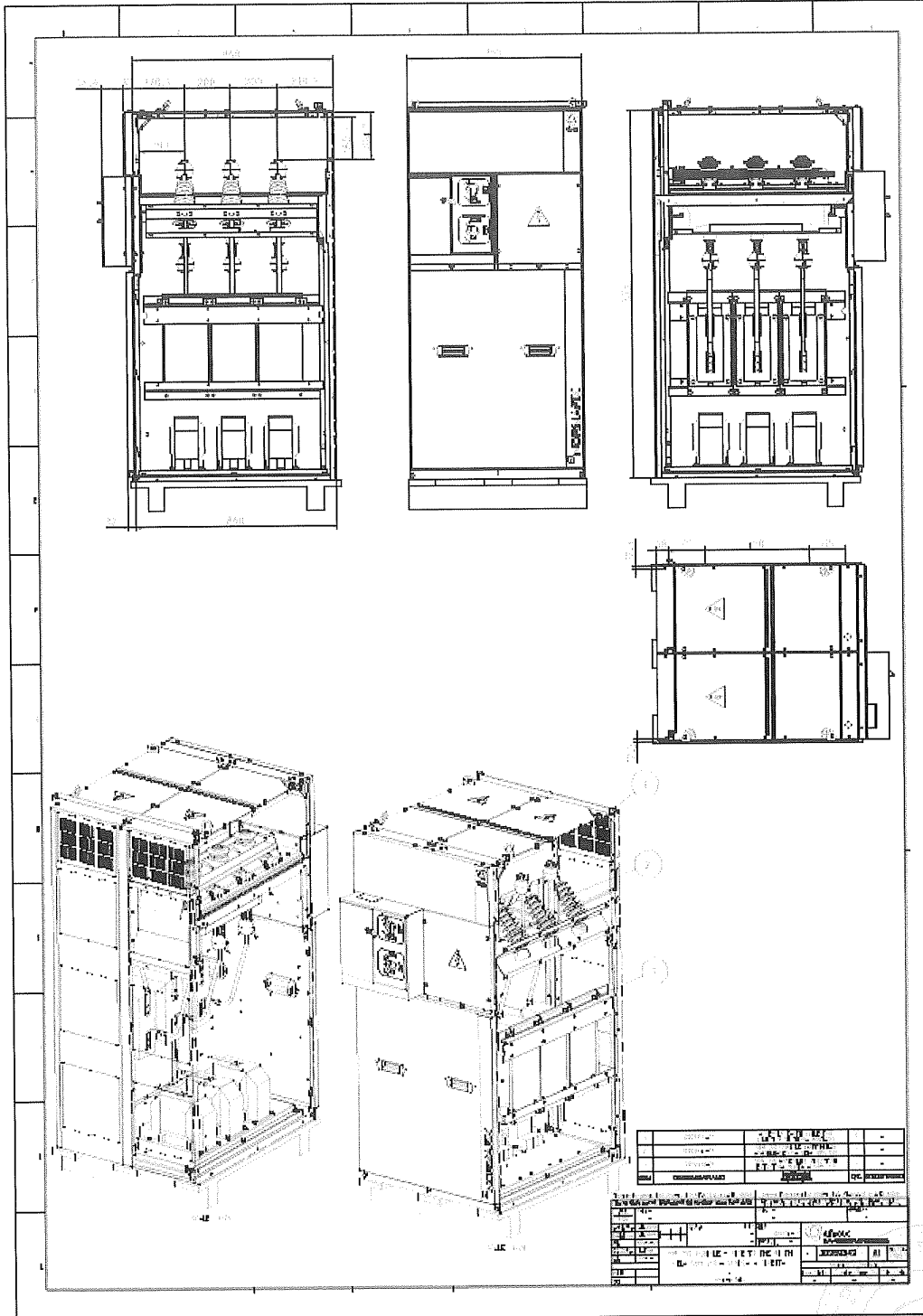
Measuring points	Resistance (μΩ)					
	Before test			After test		
	L1	L2	L3	L1	L2	L3
Main circuit (A-B)	176	182	178	174	179	175
Switch-disconnector (SD)	48	49	47	47	47	45

No remarkable change of measuring values after the test.



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128



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129



Стр.1

3- Тест на мълниев импулс и индустриална честота

Протокол No: DI.03.3.14.041.F

Модул Normafix с трипозиционен мощностен разединител тип ISF7

Диелектричен тест - тест върху основните вериги СрН

- тест с мълниев импулс
- тест на индустриална честота

Приложени стандарти:

CEI 60289 (1990)

CEI 60694 (1996)

Резултат от теста:

Модулът понесе успешно тестовете отговарящи на цитираните по-горе стандарти.

Дата на теста : 26-ти и 27-ми юни 2003г.

Тестовете са изпълнени от : Ръководител на лабораторията: Предствител на SGS

Мануел Мартинс

Мигиел Карвальо

Клаудио Бело



200306
0.3.14.041.F



130

Стр.2

1- Характеристики на използваният модул за тестване

Модул Normafix

Тип: IS

Ном. напрежение: 24кВ

Ном. ток: 630А

Напрежение по време на тест на индустриална честота (50Hz - 1 мин.): 50/60 кВ

Напрежение по време на тест на мълниев импулс (вълна 1.2/50мсек): 125/145 кВс

Максимален ток на к.с: 40 кАс

Ток на к.с.: 16 кА/3 сек.

Честота: 50 Hz

Чертеж на страница 6.

Трипозиционен разединител с елегазова изолация SF6

Тип: ISF

Ном. напрежение: 24кВ

Ном. ток: 630А

Напрежение по време на тест на индустриална честота (50Hz - 1 мин.): 50/60 кВ

Напрежение по време на тест на мълниев импулс (вълна 1.2/50мсек): 125/145 кВс

Изключвателна възможност:

- Активен товар: 630А

- Трансформатор на празен ход: 1250 кВА

- Кабелна линия на празен ход: 16 А

Включвателна възможност: 40 кАс

Ток на к.с: 16 кА/3 сек.

Честота: 50 Hz

Налягане на SF6 (20 C): 0.3 bar. rel.

2- Производител

ЕФАСЕК АМТ - Апаратура Средно Напрежение ООД

3- Изпълнени тестове

Тест на мълниев импулс 125/145 кВс, 1.2/50мсек

Тест на индустриална честота на 50/60 кВ за 1 мин.

4- Условия при изпълнение на тестовете

Тестовете са изпълнени според схемата на страница 5.

Температура на околната среда: 23 градуса по цЦелзий

Налягане: 1011 mb

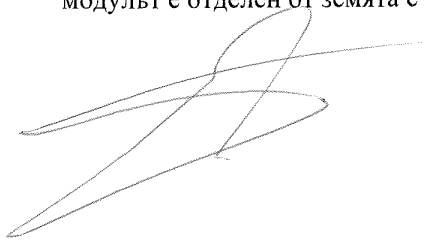
Влажност: 55%

Плътност на въздуха: 0.987

Фактор на корекция: $k=0.987$

Разединител- секционер ISF с SF6 на атмосферно налягане.

По време на диелектричните тестове, индикаторите за напрежение са монтирани и модулет е отделен от земята с изолатори.



ЕФАСЕК АМТ
О.О.Д.



Стр.3

5- Резултати от тестовете

Приложените напрежения са според схемата на стр.4

Забележка: Приложеният метод за разряд на материалите е следният: два импулса, един на 80-85%, другият на 100% от специфицираното напрежение като средство за позициониране и преди всяка серия от тестова за всяка от полярностите. Интервала между два последователни импулса е в порядъка на минута.

5.1 Разединителя е във включена позиция

Приложено Напрежение	Заземено	Импулси/ Пробивен заряд	Импулси/ Пробивен заряд	Приложено напрежение	Резултат	Напрежение при индуст. честота	Резултат
Tension appliqué e	Mise a la terre	Chocs / Décharge disruptive +	Chocs / Décharge disruptive -	Tension appliquée ± kVp 1.2/50µs	Résultat	Tension de fréquence industrielle kV – 1 minute	Résultat
Aa	BCbcF	15 / 0	15 / 0	125	conforme	50	conforme
Bb	ABacF	15 / 0	15 / 0	125	conforme	50	conforme
Cc	ABabF	15 / 0	15 / 0	125	conforme	50	conforme

5.2 Разединителят е в изключена позиция

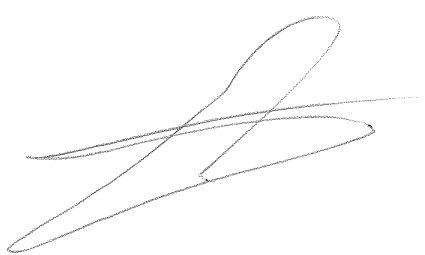
Приложено Напрежение	Заземено	Импулси/ Пробивен заряд	Импулси/ Пробивен заряд	Приложено напрежение	Резултат	Напрежение при индуст. честота	Резултат
Tension appliqué e	Mise a la terre	Chocs / Décharge disruptive +	Chocs / Décharge disruptive -	Tension appliquée ± kVp 1.2/50µs	Résultat	Tension de fréquence industrielle kV – 1 minute	Résultat
A	BCabcF	15 / 0	15 / 0	125	conforme	50	conforme
B	ACabcF	15 / 0	15 / 0	125	conforme	50	conforme
C	ABabcF	15 / 0	15 / 0	125	conforme	50	conforme
a	ABCbcF	15 / 0	15 / 0	125	conforme	50	conforme
b	ABCacF	15 / 0	15 / 0	125	conforme	50	conforme
c	ABCabF	15 / 0	15 / 0	125	conforme	50	conforme
A	a	15 / 0	15 / 0	145	conforme	60	conforme
B	b	15 / 0	15 / 0	145	conforme	60	conforme
C	c	15 / 0	15 / 0	145	conforme	60	conforme
a	A	15 / 0	15 / 0	145	conforme	60	conforme
b	B	15 / 0	15 / 0	145	conforme	60	conforme
c	C	15 / 0	15 / 0	145	conforme	60	conforme

5.3 Разединителят е в заземена позиция

Приложено Напрежение	Заземено	Импулси/ Пробивен заряд	Импулси/ Пробивен заряд	Приложено напрежение	Резултат	Напрежение при индуст. честота	Резултат
Tension appliqué e	Mise a la terre	Chocs / Décharge disruptive +	Chocs / Décharge disruptive -	Tension appliquée ± kVp 1.2/50µs	Résultat	Tension de fréquence industrielle kV – 1 minute	Résultat
A	BCabcF	15 / 0	15 / 0	125	conforme	50	conforme
B	ACabcF	15 / 0	15 / 0	125	conforme	50	conforme
C	ABabcF	15 / 0	15 / 0	125	conforme	50	conforme

Отговаря
Отговаря
Отговаря

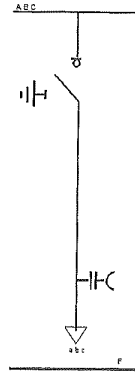
Отговаря
Отговаря
Отговаря




ПРОТЕСТ
О. ПИЧЕРИАН



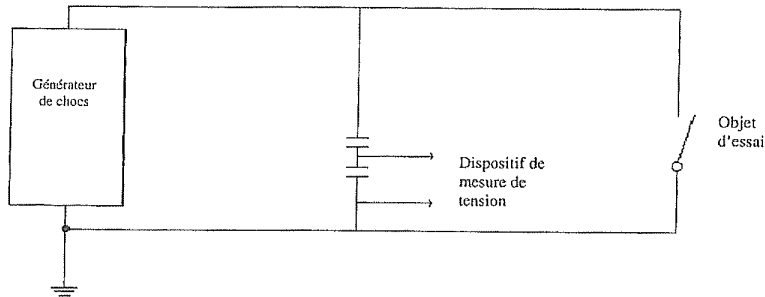
Модул Normafix IS, състояние по време на диелектрическите тестове



Разположение на апаратурата за теста на мълниев импулс

Генератор на импулси

Обект за тестване

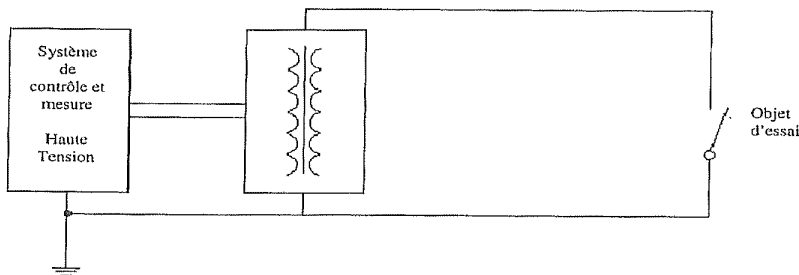


Диспозитиф за измерване на напрежението

Разположение на апаратурата за теста на индустриална честота

Система за контрол на измерването

Обект за тестване



Високо напрежение

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