

client S.A.C.E.M. SOCIETE ANONYME DE CONSTRUCTIONS
ELECTRO-MECANIKUES - Usine de Menzel Bourguiba - Tunis

equipment under test 630 kVA - 30/0.4 kV three-phase oil-immersed power
transformer for continuous duty, natural air cooled.

tests performed Measurement of the harmonics of the no-load current
Measurement of zero-sequence impedances
Determination of capacitances windings-to-earth
Measurement of sound pressure level

normative documents IEC Standards 76-1 (1993) and 551 (1987)

test date from 21 to 22 January, 1997

the test results relate only to the sample tested
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no of pages 9 no of pages annexed /

issue date 29 January, 1997

prepared TEST - V. Mantegazza

verified TEST - U. Di Marco

approved TEST - G. Magistris

The image shows several handwritten signatures and stamps. A large circular stamp is partially visible. Below the signatures, the text 'CESI' is printed in a bold, sans-serif font. Underneath 'CESI', the full name of the laboratory is written: 'CENTRO ELETTROTECNICO SPERIMENTALE ITALIANO'. Below that, the title 'Direttore Area Laboratori' is printed. A date '28.01.97' is handwritten next to the title. There are also some illegible handwritten initials or marks.

tests witnessed by: El Gouader Abderrazzak SACEM
Chtioui Mohamed SACEM

identification of the object: /

laboratory informations

CESI testing team: Mantegazza - Garanzini

test laboratory: MP3

keywords: 12015R - 22601Y - 33020C - 44040V - 53001D - 62420Z

The present transformer has been submitted to the test sequence listed in the following table.

CONTENTS	PAGE
Characteristics of the equipment under test	4
Short-circuit test (see test report GPS-97/001876)	-
Measurement of the harmonics of the no-load current	5
Measurement of zero-sequence impedances	6
Determination of capacitances windings-to-earth	7
Measurement of sound pressure level	8
Lightning impulse test (see test report AT-97/002105)	-
Lightning impulse test on LV winding (see test report AT-97/002105)	-
Measurement of insulation resistance to earth (see test report AT-97/002105)	-
Measurement of Radio Influence Voltage (see test report AT-97/002105)	-
Partial Discharges measurement (see test report AT-97/002105)	-

CHARACTERISTICS ASSIGNED BY THE CLIENT TO THE EQUIPMENT UNDER TEST

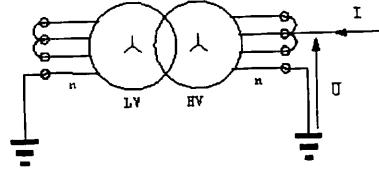
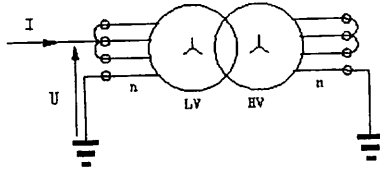
Manufacturer	:	SACEM	
Year of manufacture	:	1996	
Serial number	:	64237	
Rated power	:	630	kVA
Rated primary voltage	:	30.0 ± 5%	kV
Rated secondary voltage	:	400	V
Rated frequency	:	50	Hz
Rated primary current	:	12.12	A
Rated secondary current	:	909.4	A
Vector group symbol	:	YNyn0	
Rated impedance voltage	:	4.33	%
Rated insulation levels	:	LI 170 AC 70/AC 3	
Type of functioning	:	continuous	
Type of cooling	:	ONAN	
Total mass	:	2500	kg
Oil mass	:	480	kg
Type of windings	:	circular coils	
LV winding	:	metal foil	
Magnetic circuit	:	4-legs type	

Measurement of the harmonics of the no-load current (IEC 76-1 Std)

Rated voltage $U_n = 30 \text{ kV}$

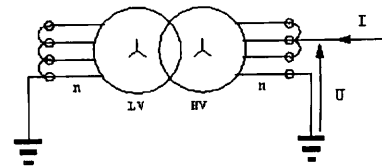
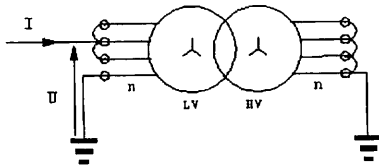
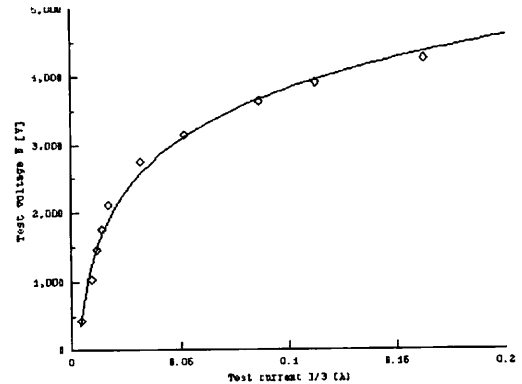
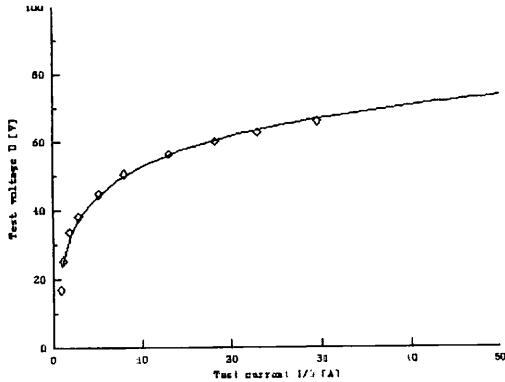
Test voltage	Frequency Hz	Harmonics	phase A		phase B		phase C	
			mV	%	mV	%	mV	%
Un	50	fundamental	306.3	100	196.9	100	256.3	100
	150	3	68.8	22	59.4	30	28.1	11
	250	5	18.8	6	25.0	13	9.38	4
	350	7	12.5	4	18.8	10	9.38	4
1.1 Un	50	fundamental	500	100	331.3	100	425	100
	150	3	125	25	106.3	32	50.0	12
	250	5	37.5	8	43.8	13	6.25	1
	350	7	31.3	6	31.3	9	18.8	4

Measurement of zero-sequence impedances (IEC 76-1 Std)



Test current $I/3$ [A]	Test voltage U [V]	Zero-sequence impedance $Z_0 = 3U/I$ [Ω] per phase
0.801	16.9	21.14
1.132	25.3	22.35
1.829	33.7	18.41
2.799	38.1	13.60
5.130	44.7	8.71
8.058	50.6	6.28
13.007	56.3	4.33
18.227	60.1	3.30
22.960	62.7	2.73
29.553	65.8	2.23

Test current $I/3$ [A]	Test voltage U [V]	Zero-sequence impedance $Z_0 = 3U/I$ [Ω] per phase
0.0048	439	92012
0.0090	1033	114660
0.0118	1462	123503
0.0139	1755	126438
0.0169	2112	125217
0.0315	2746	87143
0.0518	3142	60652
0.0864	3631	42049
0.1122	3895	34728
0.1624	4243	26124



Test current $I/3$ [A]	Test voltage U [V]	Zero-sequence impedance $Z_0 = 3U/I$ [Ω] per phase
3.75	0.0437	0.0116
56.70	0.6500	0.0115
91.50	1.0660	0.0117

Test current $I/3$ [A]	Test voltage U [V]	Zero-sequence impedance $Z_0 = 3U/I$ [Ω] per phase
0.122	8.71	71.54
0.209	14.90	71.15
0.335	23.86	71.22

Determination of capacitances windings-to-earth (IEC 76-1 Std)

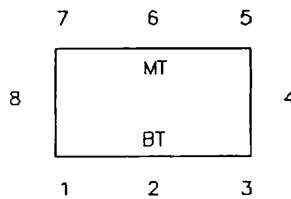
4695 pF	A	Measured capacitance: high voltage winding to earthed low voltage winding.
7227 pF	B	Measured capacitance: low voltage winding to earthed high voltage winding.
4358 pF	C	Measured capacitance: low and high voltage windings to earth.
3782 pF	$(A + B - C)/2$	Calculated capacitance: high voltage winding to low voltage winding.
913 pF	$(A - B + C)/2$	Calculated capacitance: high voltage winding to earth.
3445 pF	$(C + B - A)/2$	Calculated capacitance: low voltage winding to earth.

Measurement of sound pressure level (IEC 551 Std)

date: 22 Jan 1997

The test was performed supplying the secondary windings with the rated voltage

measurement point



calculation of the surface sound pressure level (LpA)

Rf (background noise - main value) 27.7 dB
 X (distance of microphone from the principal radiating surface) 0.3 m
 H (height of microphone) half of the tank height

sound power level (LpAi)

measurement point							
1	2	3	4	5	6	7	8
dB	dB	dB	dB	dB	dB	dB	dB
54.7	51.9	55.0	56.9	56.2	55.3	51.8	58.0

h (height of the tank) 1.11 m
 lm (length of the prescribed contour = $5.15 + 2\pi X$) 7.0 m
 S (area of the effective surface = $1,25hlm$) 9.8 m²
 K (environmental correction) 0.7 dB

test result

LpA (surface sound pressure level = $10\log_{10}[1/N\sum_{i=1}^N 10^{0.1LpAi}] - K$) 54.8 dB
 LwA (sound power level = $LpA + 10\log_{10}S$) 64.7 dB

PHOTOS OF THE EQUIPMENT

