

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

equipment under test 630 kVA - 20/0.4 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 impedance
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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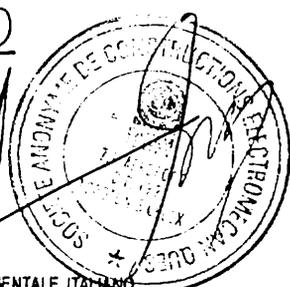
no of pages 8 **no of pages annexed** /

issue date 29 January, 1997

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CESI
CENTRO ELETTROTECNICO SPERIMENTALE ITALIANO
Il Direttore Area Laboratorio *28-01-97*

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.

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CHARACTERISTICS ASSIGNED BY THE CLIENT TO THE EQUIPMENT UNDER TEST

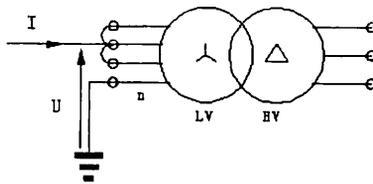
Manufacturer	:	SACEM	
Year of manufacture	:	1996	
Serial number	:	64236	
Rated power	:	630	kVA
Rated primary voltage	:	20.0 ± 2*2.5%	kV
Rated secondary voltage	:	400	V
Rated frequency	:	50	Hz
Rated primary current	:	18.18	A
Rated secondary current	:	909.4	A
Vector group symbol	:	Dyn11	
Rated impedance voltage	:	5.65	%
Rated insulation levels	:	LI 125 AC 50/AC 3	
Type of functioning	:	continuous	
Type of cooling	:	ONAN	
Total mass	:	2300	kg
Oil mass	:	400	kg
Type of windings	:	circular coils	
LV winding	:	metal foil	

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

Rated voltage $U_n = 20 \text{ kV}$

Test voltage	Frequency Hz	Harmonics	phase A		phase B		phase C	
			mV	%	mV	%	mV	%
U_n	50	fundamental	265.6	100	237.5	100	206.3	100
	150	3	9.38	4	21.8	9	28.1	14
	250	5	59.4	22	53.1	22	56.3	27
	350	7	15.6	6	9.38	4	12.5	6
$1.1 U_n$	50	fundamental	550	100	462.5	100	453.1	100
	150	3	12.5	2	62.5	14	62.5	14
	250	5	162.5	30	137.5	30	156.3	34
	350	7	62.5	11	37.5	8	46.9	10

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



Test current	Test voltage	Zero-sequence impedance $Z_0 = 3U/I$
[A]	[V]	[Ω] per phase
49.9	0.735	0.01472
70.2	1.035	0.01474
99.6	1.471	0.01477
151.1	2.236	0.01480
197.7	2.926	0.01480

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

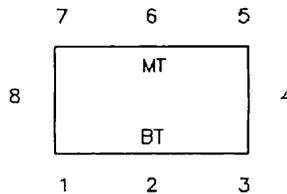
3241 pF	A	Measured capacitance: high voltage winding to earthed low voltage winding.
5587 pF	B	Measured capacitance: low voltage winding to earthed high voltage winding.
4211 pF	C	Measured capacitance: low and high voltage windings to earth.
2309 pF	$(A + B - C)/2$	Calculated capacitance: high voltage winding to low voltage winding.
933 pF	$(A - B + C)/2$	Calculated capacitance: high voltage winding to earth.
3279 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) 27.3 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
50.6	43.3	47.1	50.4	47.8	45.6	47.8	51.0

h (height of the tank) 1.05 m
 lm (length of the prescribed contour = $5.08 + 2\pi X$) 7.0 m
 S (area of the effective surface = $1,25hl_m$) 9.1 m²
 K (environmental correction) 0.6 dB

test result

LpA (surface sound pressure level = $10\log_{10}[1/\sum_{i=1}^N 10^{0.1LpAi}] - K$) 48.0 dB
 LwA (sound power level = $LpA + 10\log_{10}S$) 57.6 dB

PHOTOS OF TESTED EQUIPMENT

