

References

- [1] Luca Dalessandro, Fabiana da Silveira Cavalcante, and Johann W.Kolar, "Self-Capacitance of High-Voltage Transformers", IEEE Transactions on power electronics, vol.22, No.5, September 2007
- [2] J.Biela, and J.W.Kolar, "Using Transformer Parasitics for Resonant Converters-A Review of the Calculation of the Stray Capacitance of Transformers", Power Electronic Systems Laboratory (PES), ETH Zurich, Zurich, Switzerland
- [3] M.Heidarzadeh and M.R.Besmi, "Influence of Transformer Layer Winding Parameters on the Capacitive Characteristic Coefficient", International Journal on Technical and Physical problems of Engineering", Vol.5, June 2013
- [4] M.A.R.M.Fernando, and V.Coaray, "Lightning Surges at Distribution Transformer Secondary", ICIIS 2010, Jul 29-Aug 01, 2010, India
- [5] A.Miki, T.Hoseya, and K.Okuyama, "A Calculation Method for Impulse Voltage Distribution and Transferred Voltage in Transformer Windings", IEEE Transactions on Power Apparatus and Systems, Vol. PAS-97, no. 3, May/June 1978
- [6] M.Popov, R.P.P.Smeets, L.van der Sluis, H. de Herdt and J.Declercq, "Analysis of Voltage Distribution in Transformer Windings During Circuit Breaker Prestrike", International Conference on Power Systems Transients in Kyoto, Japan June 3-6, 2009
- [7] Bagheri, Mehdi and Vakilian, Mehdi and Hekmati, Arsalan, "Simulation and Comparison of Impulse Voltage Distribution in Continuous, Intershield and Interleaved Disc Winding in Power Transformer", International Conference on Electrical Engineering, 2008
- [8] Marjan Popov, Lou van der Sluis, Rene peter Paul Smeets, and Jose Lopez Roldan, "Analysis of Very Fast Transients in Layer-Type Transformer Windings", IEEE Transaction on Power Delivery, Vol.22, No.1, January 2007

- [9] Shigemitsu Okabe, and Jun Takami, “Evaluation of Breakdown Characteristics of Oil-immersed Transformers under Non-standard Lightning Impulse Waveforms – Method for Converting Non-standard Lightning Impulse Waveforms into Standard Lightning Impulse Waveforms”, IEEE, 2008
- [10] S. Okabe, “Evaluation of Breakdown Characteristics of Oil-immersed Transformers under Non-standard Lightning Impulse-Insulation Characteristics”, IEEE, Trans. Dielectr. Electr. Insu., Vol.14, pp. 679-688, 2007
- [11] S. Okabe, Masanori Koto, Genyo Ueta, Toshiyuki Saida, and S.Yamada, “Development of High Frequency Circuit Model for Oil-immersed Power Transformers and its Application for Lightning Surge Analysis”, IEEE, Trans. Dielectr. Electr. Insu., Vol. 18, No.2; 2011
- [12] T.Udea, S.Neo,T.Funabasi,T.Hagiwara,H.Watanabe, “Flashover Model for Arcing Horns and Transmission Line Arresters”, IPST’95,1995
- [13] AA Miki, T.Hosoya and K.Okuyama, “A calculation Method for Impulse Voltage Distribution and Transferred Voltage in Transformer Windings”, IEEE PES Summer Meeting, Mexico City, Mex, July 17-22,1977
- [14] V.B.Wijekoon, H.M.Wijekoon, “Measures to Minimize Distribution Transformer Failures in the MV Network of Ceylon electricity Board, Sri Lanka”, 2009
- [15] Eilert Bjerkan, “High Frequency Modelling of Power Transformers, Stresses & Diagnostics”, Trondheim, May 2005

Appendix A: Test Certificate of 160 kVA, 33/0.415 kV Distribution Transformer



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk



LTL Transformers (Pvt) Limited

(A Subsidiary of LTL Holdings (Pvt) Ltd)

154/11, Railway Station Road, Angulana , Moratuwa , Sri Lanka .

Telephone: (+94 11) 260 5101-3 Fax : (+94 11) 260 7312 E-mail : transformer@ltl.lk

TRANSFORMER TEST CERTIFICATE

Page 1 of 1

Customer	CEB						
Standards	IEC : 60076						
Application	DISTRIBUTION TRANSFORMER						
Serial No	T/13/U016030014	Cooling	ONAN	Phase	Three	Date	2/15/2013
Ratings							
HV Voltage (V)	33000	LV Voltage (V)	415	Capacity (kVA)	160	Dutv	Continuous
Vector Group	Dyn11	Frequency (Hz)	50	Type of Unit	Hermetically Sealed		
Tapping (HV)				Guaranteed temperature rise (° C)			
Step% 2.5	Range	+ 2.5 % to -7.5 %		Top Oil	55	Winding	60

TESTS CONDUCTED

1. RATIO AND VECTOR GROUP TEST

HV/LV (33/0.415 kV)

TAP NO.	VOLTAGES (kV)		CAL. RATIO	MEASURED RATIO		
	HV	LV		A - B	B - C	C - A
				a - n	b - n	c - n
1	33.825	0.4150	141.168	141.300	141.200	141.300
2(Nor)	33.000	0.4150	137.725	137.800	137.800	137.800
3	32.175	0.4150	134.282	134.400	134.400	134.400
4	31.350	0.4150	130.839	130.900	130.900	130.900
5	30.525	0.4150	127.396	127.400	127.500	127.500

Detected Vector Group : Dyn11

2. DC RESISTANCE TEST (at 26.00 ° C)

HV (33 kV) - WINDING RESISTANCE (in Ohms)				
TAP NO.	a - b	b - c	c - a	Avg. Resistance
2(Nor)	107.8500	107.8500	107.9800	107.8900

LV (0.415 kV) - WINDING RESISTANCE (in milli Ohms)				
TAP NO.	a - b	b - c	c - a	Avg. Resistance
-	9.310000	9.290000	9.390000	9.3300

3. NO LOAD TEST

Measured No Load Loss (W)	392	Measured No Load Current (%)	0.41
---------------------------	-----	------------------------------	------

4. LOAD TEST

Measured Tap position	Principal Tap		
Measured Load loss at 75 ° C (W)	2417	Impedance Voltage at 75 ° C (%)	4.27
Efficiency at 1.0 p.f. at full load (%)	98.27	Efficiency at 0.8 p.f. at full load (%)	97.85

5. SEPARATE - SOURCE VOLTAGE WITHSTAND TEST

HV to LV wdgs and Earth 70 kV for 60 Sec : Passed
 LV to HV wdgs and Earth 3 kV for 60 Sec : Passed

6. INDUCED OVER VOLTAGE WITHSTAND TEST

At 2 X Rated Voltage at 120 Hz for 50 Sec : Passed

7. INSULATION RESISTANCE TEST (at 26.00 ° C) in Giga Ohm

HV to LV	HV to Earth	LV to Earth
>2	>2	>2

8. OIL DIELECTRIC STRENGTH TEST (Mineral oil free of PCB)

Across 2.5 mm gap : 59kV

9. TANK PRESSURE TEST

Oil leaks : Not Detected

Manager Testing : For LTL Transformers (Pvt) Limited

2/15/2013

Registered Office : 67, Park Street , Colombo 02 , Sri Lanka

Telephone : (+94 11) 269 5007 , 267 9916

Fax : (+94 11) 268 4900

E -mail : info@ltl.lk

Internet : www.ltl.lk A licensee of ABB AS of Norway

