CESI

TEST REPORT

APPROVED B4007356

Client	**MF TRASFORMATORI S.r.l.**
Address of the client	via S. Anna, 25011 Calcinato (BS) - Italia
Manufacturer	**MF TRASFORMATORI S.r.l.**
Tested samples/items	Non-enclosed three-phase dry-type power transformer, with encapsulated windings, for continuous duty, with cooling by air natural convection (AN): Type - - 1600 kVA - 15 kV / 0,4 kV
Tests carried out	*Environmental Test E3 Class Condensation test*
Standards/Specifications	IEC 60076-16 {Ed.1.0} (2011-16)

Tests date **from** March 18, 2014 **to** March 18, 2014

The results reported in this document relate only to the tested samples/items.

No. of pages 10 **No. of pages annexed** /

Issue date March 18, 2014

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P.I. IT00793580150
N. R.E.A. 429222

Tests witnessed by
Mr. Daniele Lorandi **MF TRASFORMATORI S.r.l.**

Identification of the object not requested

The measurement uncertainties stated in this Test Report have been determined in accordance with the current Publication EA-4/02.
They are expressed as expanded uncertainty obtained multiplying the standard uncertainty by a coverage factor k = 2, normally corresponding to a confidence level of about 95 %.(CESI procedure B3008625)

Voltage a.c.	*≤ ± 3,0 %*
Current a.c.	*≤ ± 3,0 %*
Resistance d.c.	*≤ ± 0,50 %*
Temperature (with TC type T)	*≤ ± 2,0 °C*
Transformer voltage ratio	*≤ ± 0,25 %*
Time	*≤ ± 2,0 s*

Laboratory information

Receipt date of the sample

Test location CESI – Via Rubattino 54 – Milan

CESI testing team Mr.Garanzini

Test laboratory P443

Activity code

Rated characteristics of the tested object assigned by the Client

Dry-type power transformer	
Manufacturer	**MF TRASFORMATORI S.r.l.**
Type	-
Manufacturer's serial number	111213/14
Year of manufacturing	2012
Number of phases	3
Rated voltage of the high-voltage winding (primary winding)	15 kV ± 2 x 2,5 % kV
Rated voltage of the low-voltage winding (secondary winding)	400 V
Rated voltage ratio	15 kV / 0,4 kV
Rated frequency	50 Hz
Rated power	1600 kVA
Rated current of the high-voltage winding (primary winding)	61,6 A
Rated current of the low-voltage winding (secondary winding)	2309 A
Short-circuit impedance	6,0 %
Connection symbol	Dyn11
Cooling method	AN
Total mass	5090 kg

Characteristics of the windings	
Rated insulation levels	LI 95 AC 38 / AC 3
Insulation class	F / F
Type of construction	with circular concentric coils
Maximum temperature rise for 40°C ambiente temperature	100 K / 100 K

Name and signature of Client's witness:

Environmental Test E3 Class condensation test

Date: March 18, 2014
The non-energized transformer was placed in a climatic chamber (400 m^3) with controlled humidity and temperature, for 6,0hours of conditioning.
In particular the humidity was maintained above 95%.

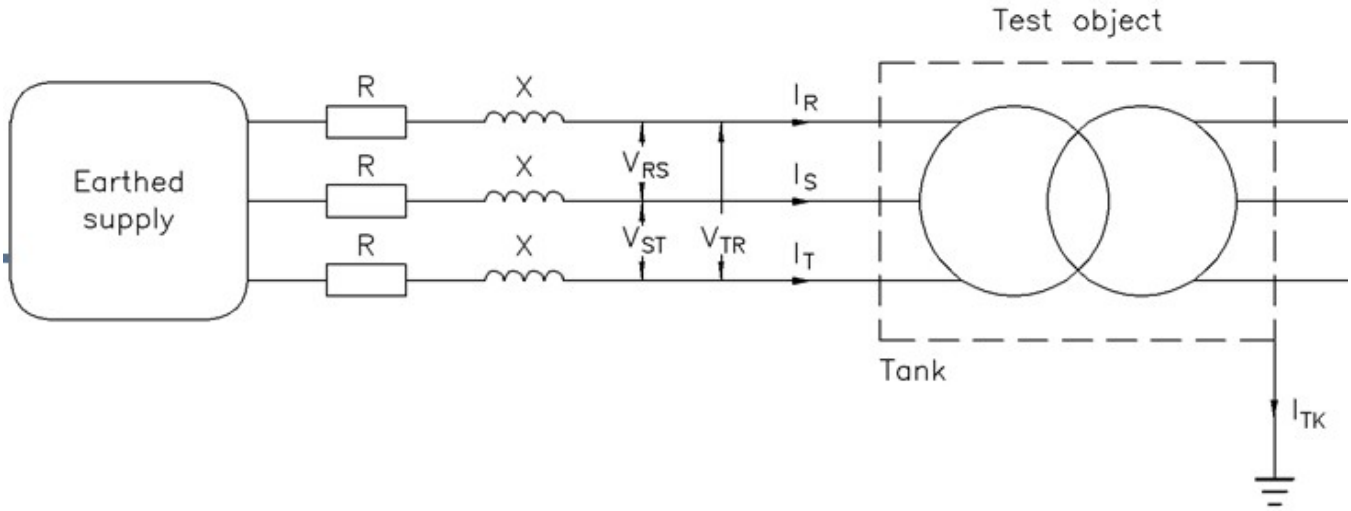
Said conditions was obtained by atomizing water with conductivity at about **3,9 S/m (28 g/l at 18 °C)**

Within 5 minutes from the end of the conditioning period the low voltage winding was energized (three application of 5 minutes) by a three-phase voltage of 440 V [equal to 1.1 times the rated value], with the high-voltage winding open.

Test parameters applied:

Specified conductivity	**3,9 S/m (28 g/l at 18 °C)**
Number of the nozzles	**4**
Air pressure at the nozzles	**3,0** bar
Temperature of the test chamber	**18,0** °C
Humidity	**95** %
Duration	**6,0** hours

Test circuit M0040



Correspondence between laboratory circuit phase and test object terminal

Laboratory circuit phase	Test object terminal
R	U
S	V
T	W

Verification of the energizing at 1,1 rated voltage after condensation

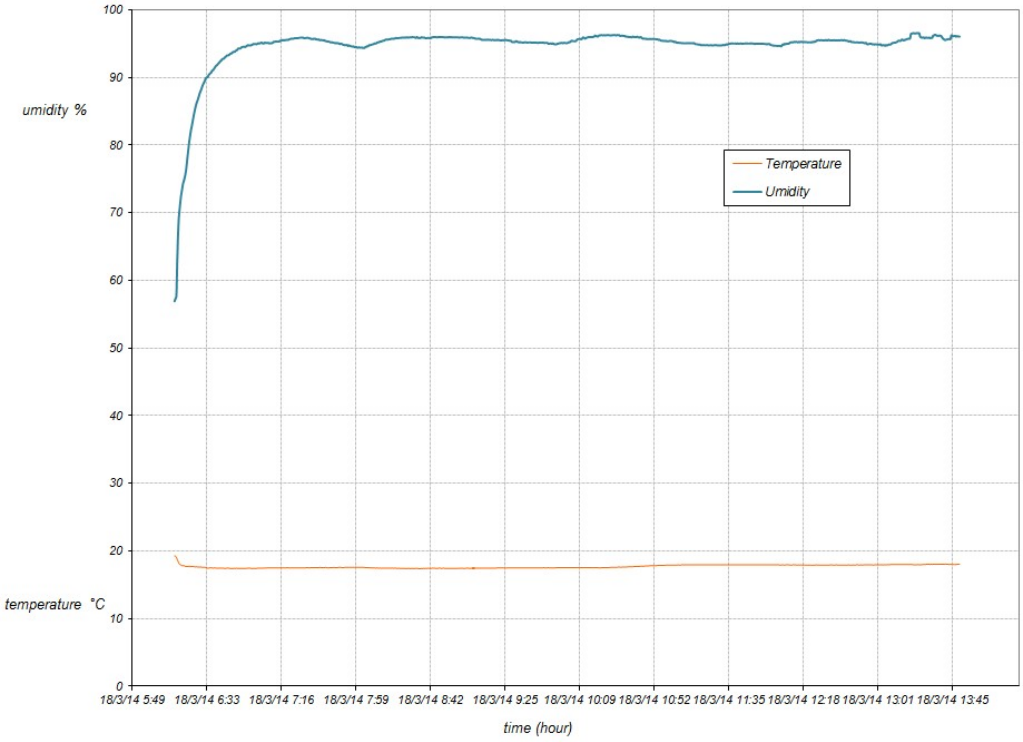
The tests were performed supplying the low-voltage winding at 1,1 rated voltage with the high-voltage winding open.

Test circuit: M0040
Test frequency: 50 Hz
Reference number of the oscillograms: -
Transformer prearranged on the voltage ratio: 15 kV / 0,4 kV

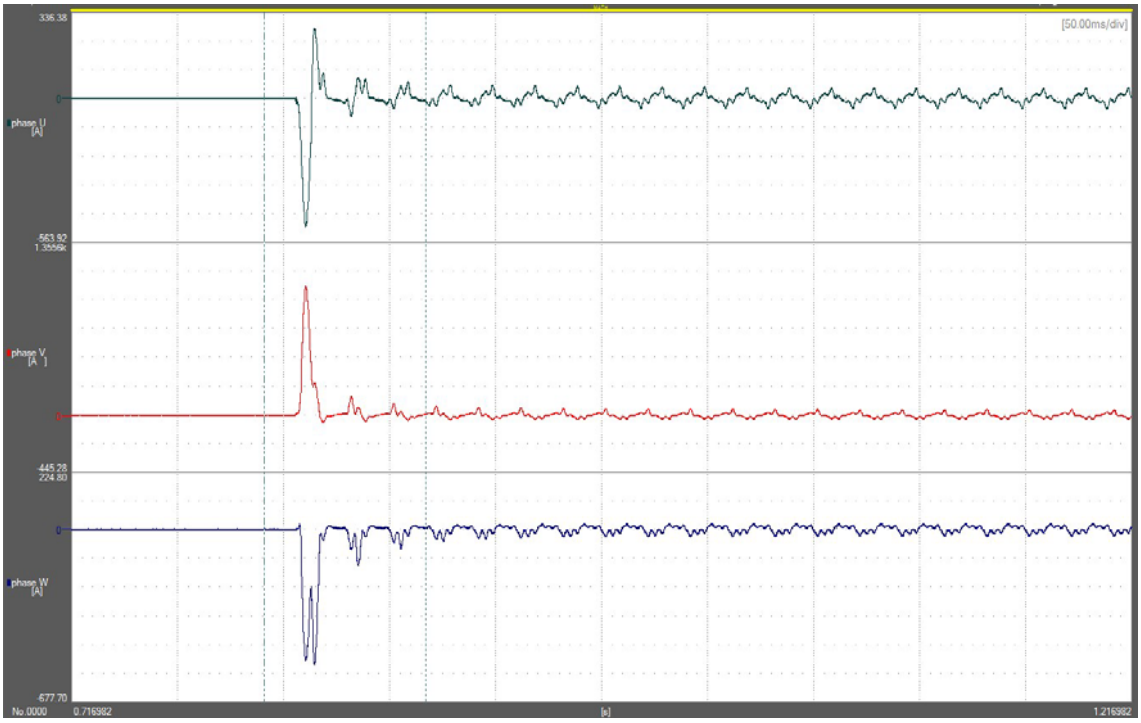
Date: March 18, 2014

Test	Oscillogram	Making angle referred to voltage RS	No-load supply voltage	phase earthed	Test current peak value	Test duration		Notes
No.	No./sheets	°	V	-	A	min		No.
1	1	-	440	U	**503** **1011** **532**	5		-
2	2	-	440	V	**303** **474** **246**	5		-
3	3	-	440	W	**540** **866** **1071**	5		-

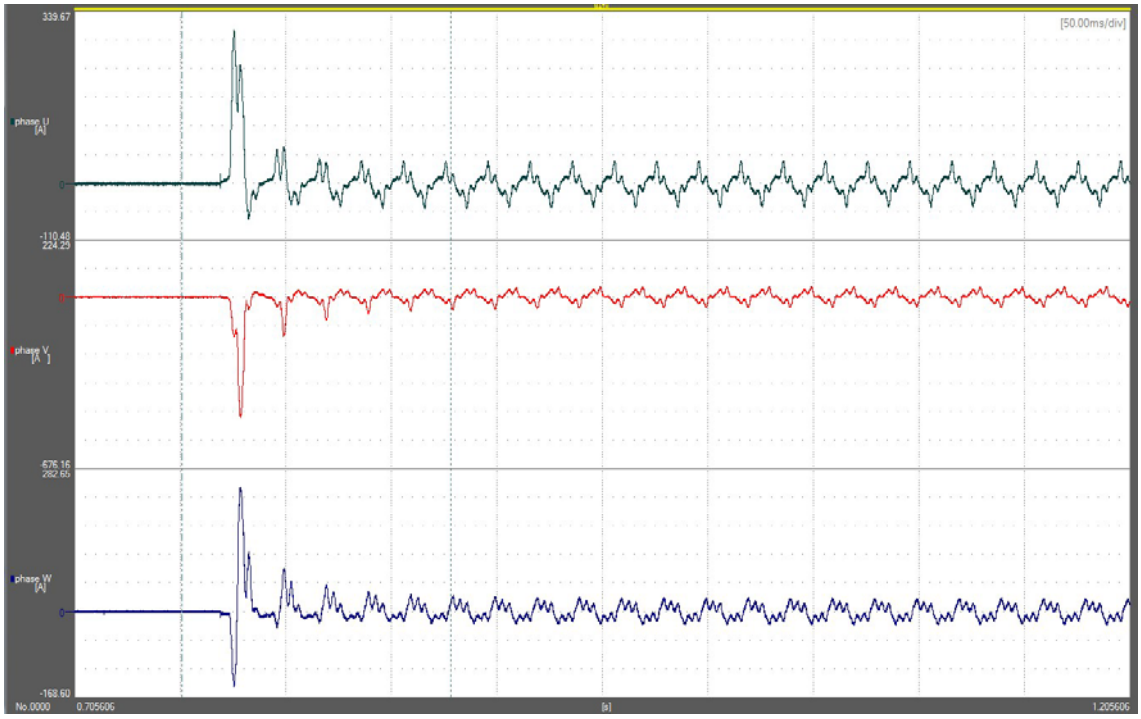
Notes: ***During the voltage application, no flashover occurred, visual inspection did not show any serious tracking.***



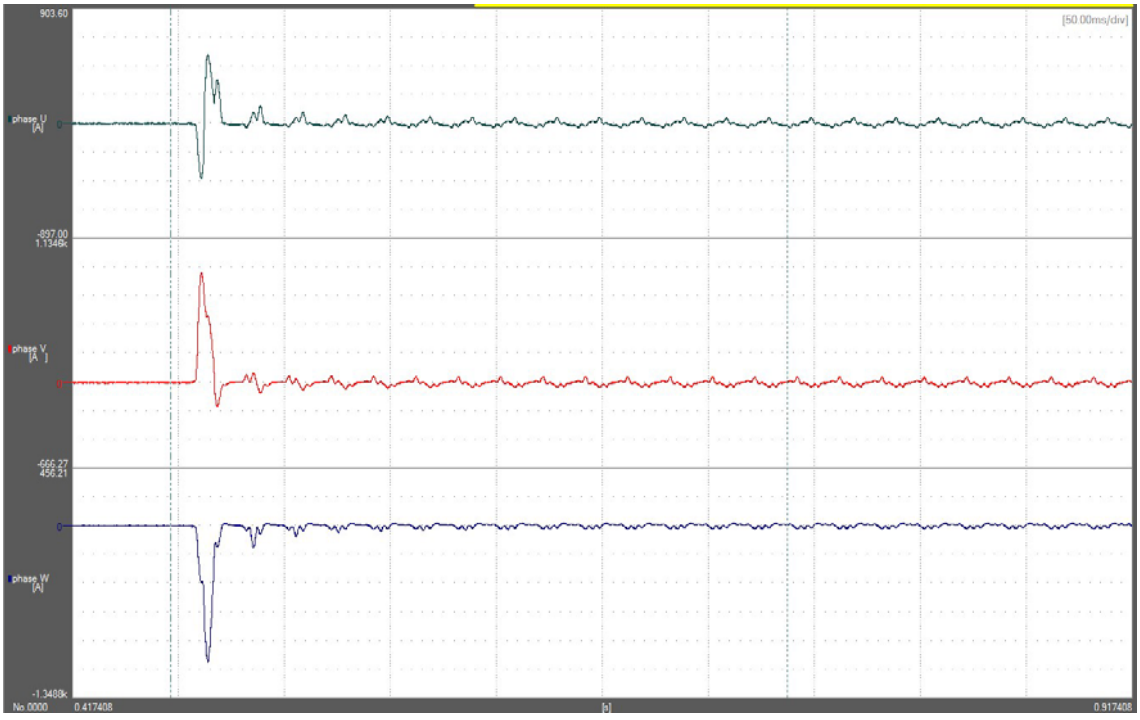
Condensation test



Oscillogram n°1
Condensation test



Oscillogram n°2
Condensation test



Oscillogram n°3
Condensation test

Photo no. 1
Condensation test

Photo no. 2
Condensation test

Laboratory information

Test laboratory: P443
CESI testing team:
Date:

Characteristics of supply circuit

Test	Regulator		Alternator		Transformer	
	type	diagram	type	diagram	type	ratio
			-	-	-	-
			-	-	-	-
			-	-	-	-
Condensation test	AME	68 kVA	-	-	-	-

characteristics of measuring instrumentation

measure	*instrument*	*CESI n°*	*Calibration Report*	*Data Acq. Syst*
Data Acq. Syst	NORMA D5255 T	011579	B2010051	-
Data Acq. Syst	HP3497A (1)	006462	B2037785	-
Data Acq. Syst	Yokogawa DL850	057031	B2015750	-
Data Acq. Syst	HP3497A (2)	004902	B2038641	
AC current (temperature-rise)	CT	013003 013001 013002	B0026352 B0026355 B0026353	NORMA D5255 T
AC voltage (temperature-rise)	VT	009440 009441 009442	B0030011 B0030010 B0030008	NORMA D5255 T
Idc /routine (resistance)	shunt	006412 011209		HP3497A (1)
Vdc /routine (resistance)	-	-	-	HP3497A (1)
temperature	-	-	-	HP3497A (1)
umidity	Elektronik	57702	-	HP3497A (2)
Dielectric test	VT	000262 000263 013155	B0030007 B0030006 B1010409	-

Measurement of temperatures:
The copper-constantan thermocouples used for measuring the temperatures were previously checked in accordance with CESI procedure NOA A5022464.