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TEST REPORT

Nr. 20093 / 23.03.2010

1. **CUSTOMER:** Fabrica Mernih Transformatora Zajecar A.D.
Paracinski put bb, 19000 Zajecar, SERBIA
2. **MANUFACTURER:** Fabrica Mernih Transformatora Zajecar A.D.
Paracinski put bb, 19000 Zajecar, SERBIA
ENERGO-GROUP D.O.O
Petra Milosevica 7, 71123 I. Sarajevo, B&H
3. **TESTED PRODUCT:** Power low voltage transformer,
type VROT 18, 400 V, 18 kVA, serial no. 2/10
4. **REFERENCE STANDARD:** IEC 60076-11:2004
5. **TEST PERFORMED:** I. Separate-source AC withstand voltage test
II. Induced AC withstand voltage test
III. Lightning impulse test
6. **TEST DATE:** 23.03.2010
7. **TEST RESULT:** The product PASSED the test.

This report contains 7 pages and it is edited in 4 copies from which 3 copies for customer and one copy for laboratory.

HEAD OF HV DIVISION,
Eng. Ion PĂTRU



HEAD OF LABORATORY,
Eng. Aurelia SCORNEA

AS

Issue date: 25.03.2010

WARNINGS:

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- d. All signatures from the present report are originals.
- e. The product was presented to be tested by the customer.



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IDENTIFICATION OF THE TESTED PRODUCT:

Tested product: Power low voltage transformer

Type: VROT 18

Serial number / year: 2 / 2010

Technical specification: Wiring diagram no.2202.1.09, presented in Annex 1

Photo of the product: presented in Fig. 1

Contract: 1543 / 05.03.2010

Product receiving date: 23.03.2010

Product condition at receiving: new



Fig.1 Tested product

TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:

Rated voltage for A1-A primary: 350 V

Rated voltage for A2-A primary: 380 V

Rated voltage for N-a secondary: 230 V

Rated voltage for n-c1 secondary: 20 V

Rated power: 18 kVA

Rated frequency: 50 Hz

TESTS PROGRAM:

I. Separate-source AC withstand voltage test

II. Induced AC withstand voltage test

III. Lightning impulse test

TESTS RESPONSIBLE: eng. Aurelia SCORNEA *AS*

**I. SEPARATE-SOURCE AC WITHSTAND VOLTAGE TEST**

1. **Product receiving date:** 23.03.2010
2. **Test date:** 23.03.2010
3. **Reference standard:** IEC 60076-11:2004
4. **Atmospheric conditions:** $t = 20.1^{\circ}\text{C}$, $\text{RH} = 36.6\%$
5. **Equipment used:**
 - Safety compact tester type KT 3301E, serial no. 04110402, manufactured by SPS Electronic Germany, calibration certificate no. 307/15.11.2005
 - Thermohygrometer type HD 100, serial no. 06102404, manufactured by KIMO, France, calibration certificate no. Dj 011-055 0482/ 2009
6. **Working procedure**

The separate-source AC withstand voltage test was performed according to IEC 60076-11:2004, clause 19.

The power frequency test voltage was increased from zero up to 3 kV during 5 s and then was maintained at this value for 60 s.

The testing voltage was applied in the following ways:

- between the short-circuited primary winding (terminals A1, A2 and A) and the short-circuited secondary windings (terminals a, n, zc1, c1), connected to the earth;
- between the short-circuited secondary windings (terminals a, n, zc1, c1) and the short-circuited primary windings (terminals A1, A2 and A), connected to the earth.

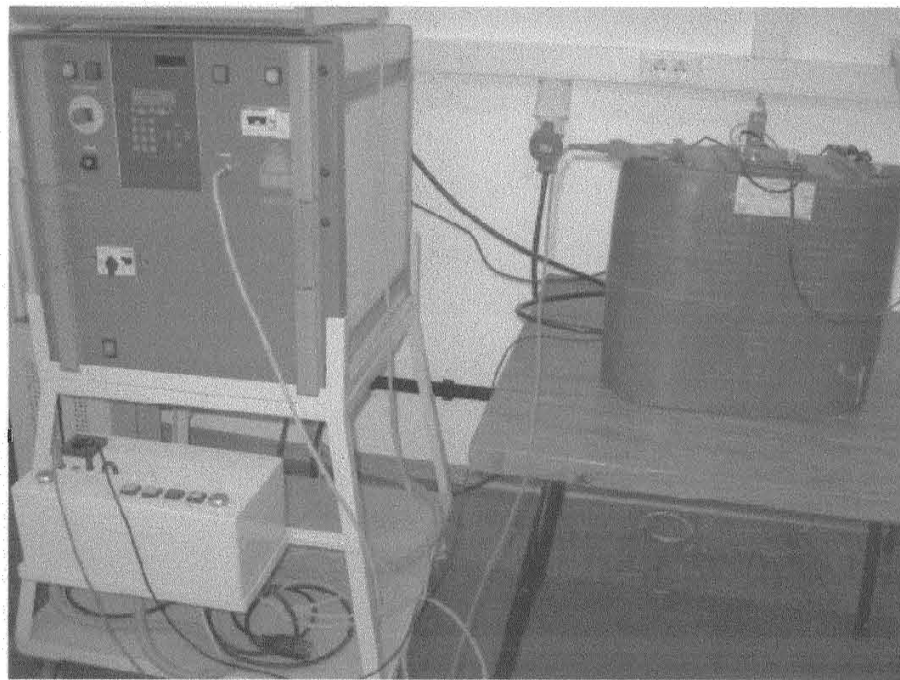


Fig.2 Power frequency withstand test

7. **Responsible for tests:** eng. Aurelia SCORNEA AS
8. **Test result:**

The product passed the tests.

During the tests did not occur any breakdown or flashover.

**II. INDUCED AC WITHSTAND VOLTAGE TEST**

1. **Product receiving date:** 23.03.2010
2. **Test date:** 23.03.2010
3. **Reference standard:** IEC 60076-11:2004
4. **Atmospheric conditions:** $t = 20.1^{\circ}\text{C}$, $\text{RH} = 36.6\%$
5. **Equipment used:**
 - Safety compact tester type KT 3301E, serial no. 04110402, manufactured by SPS Electronic Germany, calibration certificate no. 307/15.11.2005
 - AC power source, type SW 1750A, serial no. 0824A00049, manufactured by Elgar SmartWave USA
 - Thermohygrometer type HD 100, serial no. 06102404, manufactured by KIMO, France, calibration certificate no. Dj 011-055 0482/ 2009

6. Working procedure

The induced AC withstand voltage test was performed according to IEC 60076-11:2004, clause 20. An alternating voltage was applied to the secondary winding terminals c1-n of the transformer. The form of the voltage was sinusoidal and its frequency was adjusted at 150 Hz to avoid excessive magnetizing current during the test, the voltage measured at the primary winding terminals A1-A being twice of rated voltage, namely 700 V.

The test time of 40 s was determined using the following formula:

$$t = 120 \times \frac{\text{rated frequency}}{\text{test frequency}}$$



Fig.3 Induced AC withstand voltage test

7. **Responsible for tests:** eng. Aurelia SCORNEA *AS*
8. **Test result:**

The product passed the tests.

**III. LIGHTNING IMPULSE TEST**

1. **Product receiving date:** 23.03.2010
2. **Test date:** 23.03.2010
3. **Reference standard:** IEC 60076-11:2004
4. **Atmospheric conditions:** $t = 20.1^{\circ}\text{C}$, $\text{RH} = 36.6\%$
5. **Equipment used:**
 - High voltage pulse generator, type IPG 2025, serial no. 2009 3438, manufactured by HILO TEST Germany -
 - Thermohygrometer type HD 100, serial no. 06102404, manufactured by KIMO, France, calibration certificate no. Dj 011-055 0482/ 2009
6. **Working procedure**

The lightning impulse test was performed according to IEC 60076-11:2004, clause 21.

The test sequence consisted of one impulse of a voltage 2,5 kV, 1,2/50 μs , negative polarity and three subsequent impulses at full voltage 5 kV, 1,2/50 μs , negative polarity.

The testing voltage was applied in the following ways:

- between the short-circuited primary winding (terminals A1, A2 and A) and the short-circuited secondary windings (terminals a, n, zc1, c1), connected to the earth;
- between the short-circuited secondary windings (terminals a, n, zc1, c1) and the short-circuited primary windings (terminals A1, A2 and A), connected to the earth.

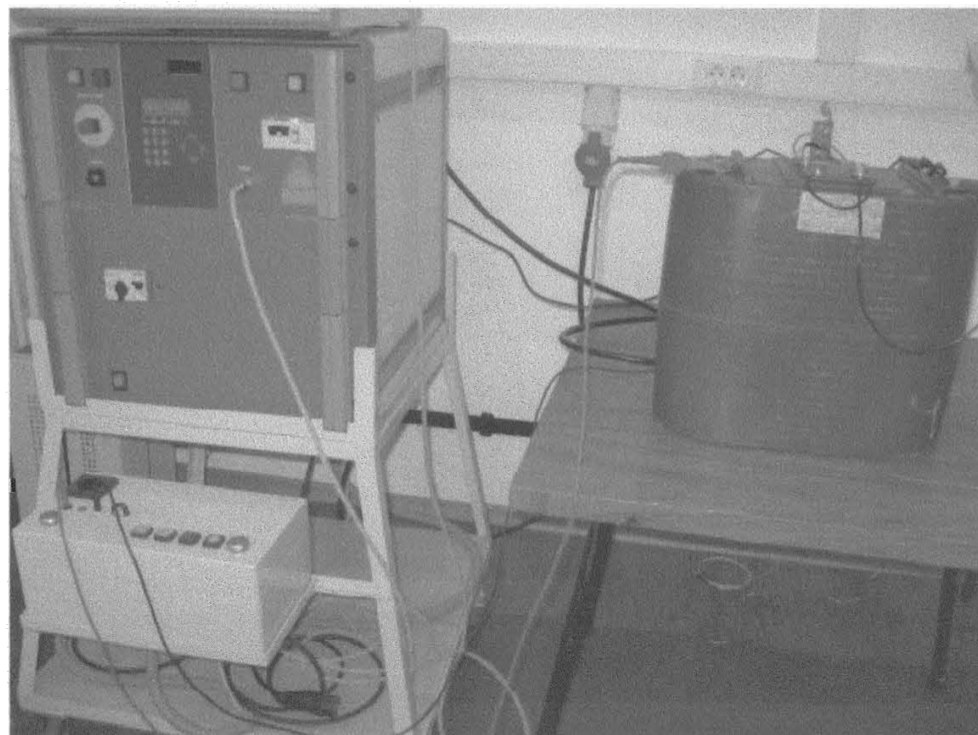


Fig.4 Lightning impulse withstand test

7. **Responsible for tests:** eng. Aurelia SCORNEA

AS

8. **Test result:**

The product passed the tests.

During the tests, in the circuit did not occur any external flashover.