INFOWARE LTD.
HIGH-POWER LABORATORY
22. HATÁR STR. H-2310 SZIGETSZENTMIKLÓS

TEL.: (06)24-465-171
FAX: (06)24-442-139
E-MAIL: labor@infoware.hu

ACCREDITATION CERTIFICATE NO.:
NAT – 1 – 1732/2014

TEST REPORT

NO.: ZP 348 / 2014

SUBJECT:	**TESTS ON 22000:√3 // 100:√3 / 100:√3 / 100:3 V VOLTAGE TRANSFORMER**
NAME AND ADDRESS OF THE CLIENT:	**TRANSZVILL MÉRŐVÁLTÓ GYÁRTÓ ÉS FORGALMAZÓ ZRT,** HUNGARY, BUDAPEST, TÜZÉR STR. 43.
KIND OF THE TEST:	Type tests certificate
PLACE OF THE TEST:	**High-Power Laboratory of INFOWARE Ltd.** (Hungary, 2310 Szigetszentmiklós, Határ u. 22.)
DATE OF THE TEST:	11.05…06.07.2014
PRESENT AT THE TEST IN CHARGE OF THE CLIENT:	
TEST REPORT SENT TO:	Mr. István Tálos (Transzvill Zrt.)
DATE OF ISSUE OF THE ORIGINAL TEST REPORT:	04-09-2015
DATE OF ISSUE OF A DUPLICATE COPY:	--. --. ----
THE TEST WAS CARRIED OUT BY:	G. Somogyi, test engineer
THE TEST WAS SUPERVISED AND APPROVED:	Dr. T. Mihálkovics, head of the Laboratory

Infoware ZRt. Adó: 10900516-2-13 L.S. 10402166-21614536 No.: 7. 2310 Szigetszentmiklós, Határ út 22.

DETAILS OF THE TEST OBJECTS:

Voltage transformer

Type / Serial No. / Year:	DFM-24 / 423003/14 / 2014
Manufacturer:	Transzvill Mérőváltó Gyártó és Forgalmazó Zrt.
Rated primary voltage (U_{pr}):	A – N: 22000:√3 V
Secondary windings:	1a – 1n / 2a – 2n / da - dn
Rated secondary voltages (U_{sr}): :	100:√3 V / 100:√3 V / 100:3 V
Rated outputs (S_r):	10VA / 10VA / 25VA
Rated thermal limiting outputs:	200VA / 200VA / 25VA
Rated accuracy class:	0,2 / 3P / 6P
Rated voltage factor (F_V):	1,9 – 8 h
Rated frequency:	50 Hz
Highest voltage for equipment (U_m):	24kV
Rated insulation level:	$125kV_{peak}$ / $50kV_{RMS}$
Mass:	30kg
Dimensions:	see on the enclosed drawing
Insulation class:	B

1. SUMMARY OF THE TEST RESULTS

The voltage transformer type DFM-24, 22000:√3 V / 100:√3 V / 100:√3 V / 100:3 V has been tested in accordance with IEC 61869-1 and 61869-3 (hereafter [1] and [2]).
The VT has met the prescribed requirements because:

- data on rating plate and the terminal markings were in accordance with the prescription in [2],
- measured errors were less, than the prescribed values in [2],
- the differences of the error values measured before and after the short-circuit withstand capability test were less, than the limit given in Clause 7.2.301 b) of [2],
- primary winding has passed the test with 15x(+125kV) and 15x(-125kV) lightning impulses,
- primary winding has passed the power frequency voltage test with $50kV_{RMS}$ - 30s – 200Hz before and with $45kV_{RMS}$ - 30s – 200Hz values after short-circuit test,
- secondary windings have passed the power frequency voltage test with $3kV_{RMS}$ – 60s before and with $2.7kV_{RMS}$ – 60s values after short-circuit test,
- PD values measured before and after the short-circuit test were less, than the limits given in Table 3 of [1],
- During the short-circuit withstand capability test the (1a-1n) and (2a-2n) windings were short circuited. The test with 12.9kV primary voltage and 1.03s parameters was successful, because the VT satisfied the requirements prescribed in points a)...d) of Clause 7.2.301 of [2]:
  a) it was not visibly damaged;
  b) its errors did not differ from those recorded before the tests by more than half the limits of error in its accuracy class,
  c) it withstands the dielectric tests specified in 7.3.1, 7.3.2, 7.3.3 and 7.3.4, but with the test voltage reduced to 90% of those given,
  d) the examination of the winding insulations were not required, because the current densities in the windings were less, than $180A/mm^2$
- The temperature-rise test was conducted in three steps. The highest temperature-rise measured at 200VA + 200VA rated thermal limiting outputs was $\Delta\theta$ = 20.8K << 85K.

The drawing enclosed for identification of the test object: 29560-100

NUMBERED SHEETS: 19	OSCILLOGRAMS: 1	PHOTOS: 5
FIGURES: 12	DRAWINGS: 1	TABLES: 11

Standards in accordance with which the tests were carried out:
[1] IEC 61869-1: Instrument transformers. Part1: General requirements.
[2] IEC 61869-3: Instrument transformers. Part 2: Additional requirements for inductive voltage transformers.

2. Course of the test , Specifications and the Applied test procedure

The aim of the tests was to perform all the type- and routine tests prescribed in Publication **IEC 61869-1** and **IEC 61869-3.**

3. Identification of the test object

3.1 Technical information and specifications

Type / Serial No. / Year:	DFM-24 / 423003/14 / 2014
Manufacturer:	Transzvill Mérőváltó Gyártó és Forgalmazó Zrt.
Rated primary voltage (U_{pr}):	A – N: 22000:√3 V
Secondary windings:	1a – 1n / 2a – 2n / da - dn
Rated secondary voltages (U_{sr}): :	100:√3 V / 100:√3 V / 100:3 V
Rated outputs (S_r):	10VA / 10VA / 25VA
Rated thermal limiting outputs:	200VA / 200VA / 25VA
Rated accuracy class:	0.2 / 3P / 6P
Rated voltage factor (F_V):	1.9 – 8 h
Rated frequency:	50 Hz
Highest voltage for equipment (U_m):	24kV
Rated insulation level:	$125kV_{peak}$ / $50kV_{RMS}$
Mass:	30kg
Dimensions:	see on the enclosed drawing
Insulation class:	B

Information supplied by manufacturer:

- Primary winding – 26256 turns	Ø 0.18mm / Cu
- 1a - 1n winding – 120 turns	Ø 1.5mm / Cu
- 2a – 2n winding – 120 turns	Ø 1.5mm / Cu
- da – dn residual voltage winding – 69 turns	Ø 1.0mm / Cu

3.2 Verification of the voltage transformer (VT), terminal markings and rating plate

The client (the manufacturer) declared that the test object complies with the attached 29560-100 number drawing, the Infoware HPL has not verified this in detail. It was verified that the data on rating plate and the terminals directly below the rating plate are correct and are in accordance with Clauses 6.13 of IEC 61869-1 and 61869-3 (hereinafter [1] and [2]). The rating plate is shown on Photo 5.

The relative polarities of the windings were correct.

4. The performed tests

The power-frequency voltage withstand tests, the tests for accuracy and the prescribed routine tests were performed on the same VT before and after the short-circuit withstand capability test.

4.1 Tests for accuracy

Table 1 and 2 show the limits of ratio error and phase displacement given in Clauses 5.6.301.3 and 5.6.302.3 of [2].

Table 1: Limits of voltage error and phase displacement for measuring winding

Class	Voltage (ratio) error at voltages between 80% and 120% of rated voltage, at 0...100% cosφ=1 rated burden and at 25...100% cosφ=0.8 rated burden [± %]	Phase displacement at voltages between 80% and 120% of rated voltage, at 0...100% cosφ=1 rated burden and at 25...100% cosφ=0.8 rated burden [± minutes
0.2	0.2	10

Table 2: Limits of voltage error and phase displacement for protective winding

Class	Voltage (ratio) error at voltages between 5% and 190% of rated voltage, at 0...100% cosφ=1 rated burden and at 25...100% cosφ=0.8 rated burden [± %]	Phase displacement at voltages between 5% and 190% of rated voltage, at 0...100% cosφ=1 rated burden and at 25...100% cosφ=0.8 rated burden [± minutes]
3P	3,0 *	120 *
6P	6,0 *	240 *

* at 2% rated voltage the limits can be twice

The measured values are summarized in Tables 3 and 4:

Table 3: Accuracy values measured before the voltage withstand and short-circuit tests [1)]

Percentage voltage of the rated voltage [%]	1. (1a-1n) secondary winding				2. (2a-2n) secondary winding			
	S_1 =10VA S_2 = 10VA		S_1 =2.5VA S_2 = 0VA		S_1 =10VA S_2 = 10VA		S_1 = 0VA S_2 = 2.5VA	
	ε_U (%)	Δφ (minutes)	ε_U (%)	Δφ (minutes)	ε_U (%)	Δφ (minutes)	ε_U (%)	Δφ (minutes)
190					-0.07	+2.87	+0.12	+2.15
120	-0.05	+3.41	+0.14	+2.44	-0.08	+2.74	+0.12	+2.14
100	-0.05	+3.36	+0.13	+2.59	-0.09	+2.88	+0.11	+2.14
80	-0.05	+3.31	+0.13	+2.74	-0.09	+2.94	+0.11	+2.24
5					-0.22	+3.99	-0.01	+2.97
2					-0.45	+4.86	-0.20	+3.88

Percentage voltage of the rated voltage [%]	3. (da-dn) secondary winding			
	S_3 =25VA		S_3 =0VA	
	ε_U (%)	Δφ (minutes)	ε_U (%)	Δφ (minutes)
190	-1.23	+17.75		
100			-0.27	+1.49

Table 4: Accuracy values measured after the voltage withstand and short-circuit tests [1)]

Percentage voltage of the rated voltage [%]	1. (1a-1n) secondary winding				2. (2a-2n) secondary winding			
	S_1 =10VA S_2 = 10VA		S_1 =2.5VA S_2 = 0VA		S_1 =10VA S_2 = 10VA		S_1 = 0VA S_2 = 2.5VA	
	ε_U (%)	Δφ (minutes)	ε_U (%)	Δφ (minutes)	ε_U (%)	Δφ (minutes)	ε_U (%)	Δφ (minutes)
190					-0.07	+2.89	+0.13	+2.06
120	-0.05	+3.55	+0.14	+2.33				
100	-0.06	+3.58	+0.13	+2.38	-0.08	+2.79	+0.12	+1.99
80	-0.07	+3.63	+0.13	+2.43				
5					-0.18	+3.44	+0.05	+2.64

Percentage voltage of the rated voltage [%]	3. (da-dn) secondary winding			
	S_3 =25VA		S_3 =0VA	
	ε_U (%)	Δφ (minutes)	ε_U (%)	Δφ (minutes)
190	-1,23	+17,7		
100			-0.26	+1.41
80			-0.24	+1.22
5			-0.29	+1.25
2			-0.34	+1.25

1) The accuracy tests were performed in the laboratory of Transzvill Zrt. in the presence of Infoware test engineer. The number of calibration document of Transzvill measuring equipment is MKEH - EÁT – 0006/2012.

The accuracy tests were successful, because
- the measured errors were less, than the prescribed limit values,
- the measured values do not differ from those recorded before the s.c. test by more than the half the limits of error appropriate to its accuracy class (see Clause 7.2.301 b) of [2]).

4.2 *LIGHTNING IMPULSE VOLTAGE WITHSTAND TEST ON PRIMARY WINDING*

The frame and the secondary windings were connected to earth. The test voltage was applied on terminal "A" of the primary winding, terminal "N" was earthed. The test arrangement is shown on Photo 1.

The test was performed according to Clause 7.2.3 of [2]. The test results are summarised in Table 5, the 2 x 15 impulses are shown on Figures 1 and 2.

Table 5: Impulse voltage test

Peak value [kV]	Impulse form [μs / μs]	Impulses / flashover	Result
+ 124...125.5	1.15 / 55	15 / 0	has passed
- 125...126.2	1.1 / 55	15 / 0	has passed

Result: the VT has passed.

4.3 *POWER FREQUENCY WITHSTAND TESTS*

4.3.1 *Tests on primary winding*

4.3.1.1 Test before the short-circuit test

According to 7.3.1 of [2] the 50kV$_{RMS}$ – 200Hz test voltage was applied between primary terminal and earth, the duration was 30s. The secondary terminals and the frame were connected to earth.
This test was performed in the laboratory of Transzvill Zrt. in the presence of Infoware test engineer.

Result: the VT has passed.

4.3.1.2 Test after the short-circuit test

The voltage test performed in point 4.3.1.1 was repeated with
0.9 x 50 = 45kV$_{RMS}$ – 200Hz – 30s test parameters (see Clause 7.2.301 of [2])

Result: the VT has passed.

4.3.2 *Tests on secondary windings*

4.3.2.1 Test before the short-circuit test

According to 7.3.4 of [1] the 3kV$_{RMS}$ – 50Hz test voltage was applied in turn between terminals of each secondary winding and earth, the duration was 60s. The frame and the terminals of all the other windings were connected to earth.

Result: the VT has passed

4.3.2.2 Test after the short-circuit test

The voltage test performed in point 4.3.2.1 was repeated with
0.9 x 3 = 2.7kV$_{RMS}$ – 60s test parameters (see Clause 7.2.301 of [2])

Result: the VT has passed.

4.4 *PARTIAL DISCHARGE MEASUREMENTS*

The tests were performed according to procedure B of Clause 7.3.2 of [1] in test circuit shown on Figure 6 of [1]. Photo 2 shows the VT in the test circuit.
The PD values measured before and after are short-circuit test are summarised in Table 6.

Table 6: Partial discharge measurement (1) see Table 3 in Clause 5.3.3.1 of [1])

Measurement	Test voltage [kV]	Measured PD values [pC]	Background noise [pC]	Permissible PD level 1) [pC]	Remark
before s.c. test	0.8 x 50 = 40kV – 60s	-	~ 0.5	-	successful
	1.2 x 24 = 28.8	10		50	
	1.2 x 24 / $\sqrt{3}$ = 16.6	5		20	
after s.c. test	40kV – 60s	-	~ 0.5	-	successful
	28.8	6		50	
	. 16.6	~ 1		20	

Result: the VT has passed.

4.5 *SHORT-CIRCUIT WITHSTAND CAPABILITY TEST*

The test was performed according to Clause 7.2.301 of [2]. According to the client's request the measuring and protective secondary windings were short-circuited, the residual voltage winding was opened. The test circuit are shown on Fig. 3 and Photo 3. The switch-on and switch-off of the test circuit happened by circuit-breaker ABB20 (see Fig. 3).

Osc. 140520 – 04 shows the s.c. test, the parameters are summarised in Table 7.
The channels on the oscillogram show in succession:

- $U_{TÁP}$ - the voltage on the primary winding
- Ipr - the short-circuit current in the primary winding
- I_1 - the short-circuit current in secondary winding 1a-1n
- I_2 - the short-circuit current in secondary winding 2a-2n

Table 7: VT short-circuit withstand capability test

Osc. No.	Voltage on primary winding (kV)	Current in primary winding (A)	Current in 1a – 1n winding (A)	Current in 2a – 2n winding (A)	Duration (s)	Remark
140520-04	12.9	0.729	76.8	83.3	1.03	successful

Result: the VT has passed the s.c. test because it satisfied the following requirements of Clause 7.2.301 of [2]:

a) it was not visibly damaged;
b) its errors did not differ from those recorded before the tests by more than half the limits of error in its accuracy class,
c) it withstands the dielectric tests specified in 7.3.1, 7.3.2, 7.3.3 and 7.3.4, but with the test voltage reduced to 90% of those given,
d) the examination of the winding insulations were not required, because the current densities in the windings were less, than $180 A/mm^2$

- on primary winding: $0.729A/0.0254mm^2 = 28.7A/mm^2 < 180A/mm^2$,
- on secondary winding 1a-1n: $76.8A/1.767mm^2 = 43.5A/mm^2 < 180A/mm^2$,
- on secondary winding 2a-2n: $83.3A/1.767mm^2 = 47.1A/mm^2 < 180A/mm^2$.

4.6 TEMPERATURE-RISE TEST

The tests were performed on VT Serial No.: 423001/14, it had the same parameters as is shown on page 1.
The test was supplied by a 150kV / 300V – 35kVA transformer, the test arrangement is shown on Photo 4. The ambient air temperature was measured by 4 oil immersed thermocouples distributed around the test object.

The measured "cold" resistances of the windings at t_{K1} = 19.7°C temperature:

- primary winding: R_{PRh} = 6858 ohm
- 1a-1n winding: R_{1h} = 0.3408 ohm
- 2a-2n winding: R_{2h} = 0.3117 ohm
- da-dn winding: R_{3h} = 0.3762 ohm

The temperature-rise tests were performed in three steps according to Clause 7.2.2 of [2].

4.6.1 Test at rated primary voltage and at burdens corresponding to the thermal limiting outputs

According to the 2nd paragraph of Clause 7.2.2 a) of [2] the loads were:
1a-1n: 200VA, 2a-2n: 200VA, da-dn: 0

The burden resistances are: $R_{b1} = R_{b2} = (100/\sqrt{3})^2 / 200 = 16.67$ ohm

The primary voltage $U_{PR} = 22 / \sqrt{3} = 12.7$kV was measured by the Infoware VT.

The voltages of the windings during the 7.7hours temperature-rise test are shown on Fig.4.

The resistance of the primary winding was measured with HP multimeter, the resistances of the secondary windings happened by METEX multimeters with voltage/current measuring method.
After 7.7 hours test the ambient air temperature was t_{K2} = 21.7°C .

The winding θ_m temperature can be calculated knowing the "warm" resistance R_m at t = 0.

$$\theta_m = \frac{Rm}{Rh}(235 + t_{k1}) - 235$$

The temperature-rise of the winding is $\Delta\theta = \theta_m - t_{k2}$.

Fig. 5 and 6 show the cooling curves of the winding resistances, the measured and the calculated values are summarised in Table 8.

Table 8: Temperature-rises at 12.7kV and 200VA + 200VA

Winding	R_m (ohm)	R_h (ohm)	θ_m (°C)	t_{K2} (°C)	**Δθ (K)**	Limit (K)
primary	7382	6858	39.2	21.7	**17.5**	85
1a – 1n	0.3713	0.3408	42.5		**20.8**	
2a – 2n	0.3385	0.3117	41.6		**19.9**	
da - dn	0.4073	0.3762	40.8		**19.1**	

4.6.2 Test at 1.2 x 12.7kV voltage and at rated outputs of the windings

At the second test according to Clause 7.2.2 a) of [2]
the primary voltage was 1.2 x 12.7 = 15.24kV
the loads were: 1a-1n: 10VA, 2a-2n: 10VA, da-dn: 25VA .
The burden resistances were: $R_{b1} = R_{b2} = (100/\sqrt{3})^2 / 10 = 333.3$ ohm
$R_{b3} = (100/3)^2 / 25 = 44.4$ ohm

The voltages of the windings during the test are shown on Fig. 7.
After 15.2 hours test the ambient air temperature was $t_{K2} = 20.5$°C .

Fig. 8 and 9 show the cooling curves of the winding resistances, the measured and the calculated values are summarised in Table 9.

Table 9: Temperature-rises at 1.2 x 12.7kV and 10VA + 10VA + 25VA

Winding	R_m (ohm)	R_h (ohm)	θ_m (°C)	t_{K2} (°C)	**Δθ (K)**	Limit (K)
primary	7019	6858	25.7	20.5	**5.2**	85
1a – 1n	0.3509	0.3408	27.3		**6.8**	
2a – 2n	0.3209	0.3117	27.2		**6.7**	
da - dn	0.3876	0.3762	27.4		**6.9**	

4.6.3 Test at 1.9 x 12.7kV – 8 hours voltage and at rated outputs of the windings

After 13 minutes recording of the cooling curves at the second test (see above) the primary voltage was increased to 1.9 x 12.7 = 24.1kV according to Clause 7.2.2 c) of [2].

The loads remained: 1a-1n: 10VA, 2a-2n: 10VA, da-dn: 25VA .
The burden resistances were: $R_{b1} = R_{b2} = 333.3$ ohm $R_{b3} = 44.4$ ohm

The voltages of the windings during the 8 hours test are shown on Fig. 10.
After 8 hours test the ambient air temperature was $t_{K2} = 22.7$°C .
Fig. 11 and 12 show the cooling curves of the winding resistances, the measured and the calculated values are summarised in Table 10.

Table 10: Temperature-rises at 1.9 x 12.7kV – 8 hours and 10VA + 10VA + 25VA

Windings	R_m (ohm)	R_h (ohm)	θ_m (°C)	t_{K2} (°C)	**Δθ (K)**	Limit (K)
primary	7187	6858	31.9	22.7	**9.2**	85
1a – 1n	0.3610	0.3408	34.8		**12.1**	
2a – 2n	0.3304	0.3117	35.0		**12.3**	
da - dn	0.3994	0.3762	35.4		**12.7**	

Result: the VT has passed.

5. Equipment, measuring devices during the tests

Table 11

Designation	Manufacturer	Type	Serial No.	Class	Calibration doc.	Sign
Current transformer	GANZ	MAK 86/60 400/5A	822497	0.5	MKJ08L063	CT
			822498	0.5	MKJ08L064	CT
Voltage transformer	TRANSZVILL	FFM20 20000/100V	200/40/73	0.5	MKJ13L022	VT
			200/48/73	0.5	MKJ13L023	VT
Voltage transformer	TRANSZVILL	FM24 3000/100V	432001	0.5	MKJ10L022	VT
Data acquisition equipment	Ahlborn	THERM5500	A2719105	1 °C	MKJ13L052	THERM
Impulse generator	Impulsphysik Gmbh	ISOLEX 125-250kV	415.221.010.01	2	MKJ13L051	LI
Multimeter	METEX	M4650CR	GE510858	0.05	K/45698	200mV
			GE510868	0.05	K/45697	200mV
			GE510750	0.5	K/45695	200mA
			GE510736	0.05	K/45696	200mV
Multimeter	NORMA	MP12	CN18661XB	0.1	K/45700	200mV
			CG08477XB	0.1	K/45700	200mV
Multimeter	HP	34401A	3146A32584	0.1	0907/2012	Rpr
PD measuring system	TETTEX	9124	134541	5	MKJ13L004	PD
Insulation tester	RFT	WIP-6	33126	2	MKJ13L049	ISOL
Transient recorder	HS	ITR-7068	001	0.5	MKJ12L029	TR

The results of the measurements with the use of the given equipment and measuring devices are traceable to the national standards on the base of the above mentioned calibration/inspection documents.

Error of the voltage measurement:	< ± 1%
Error of the current measurement:	< ± 1%
Error of the temperature measurement:	< ± 1°C
Error of the resistance measurement:	< ± 0.85%

Photo 1

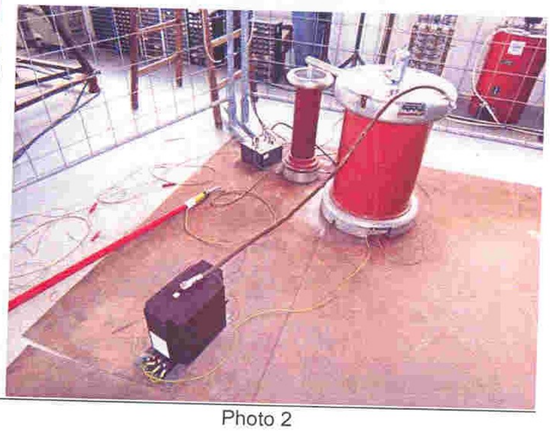


Photo 2

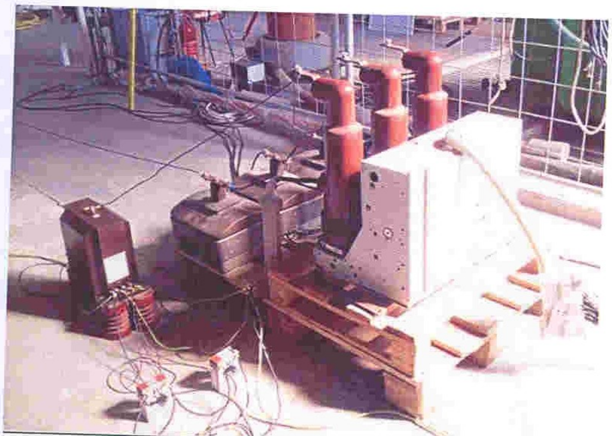


Photo 3

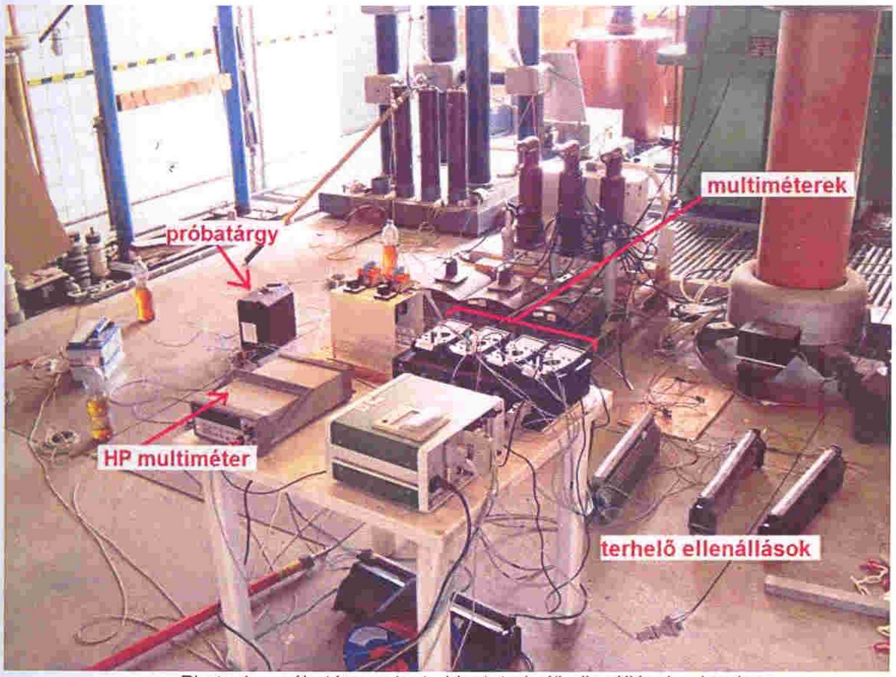


Photo 4: próbatárgy = test object, terhelő ellenállások = burdens

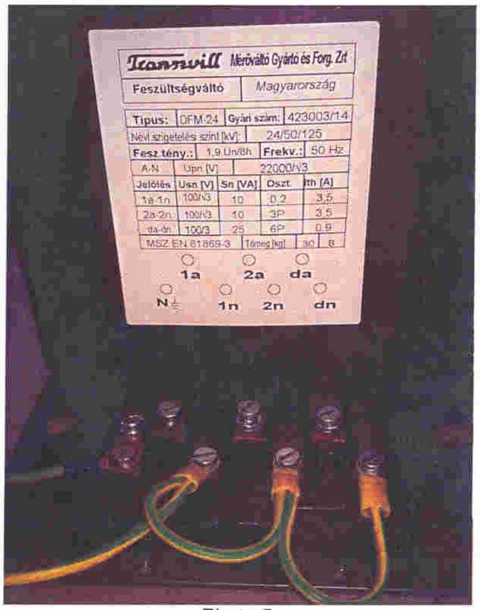


Photo 5

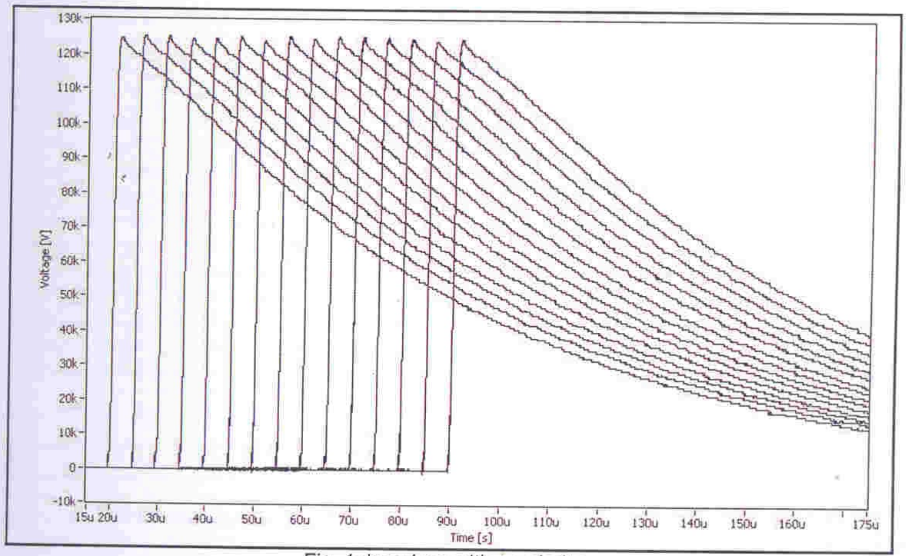


Fig. 1: impulses with + polarity

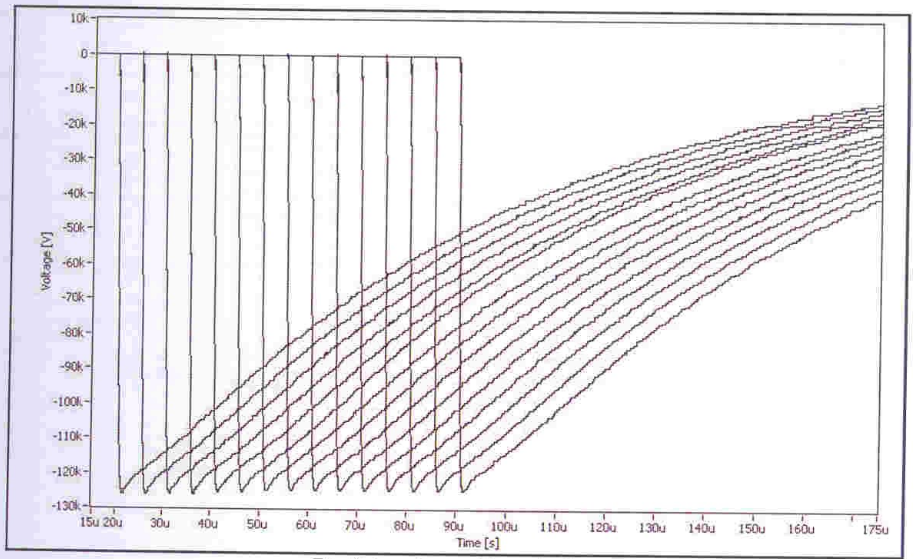


Fig. 2: impulses with - polarity

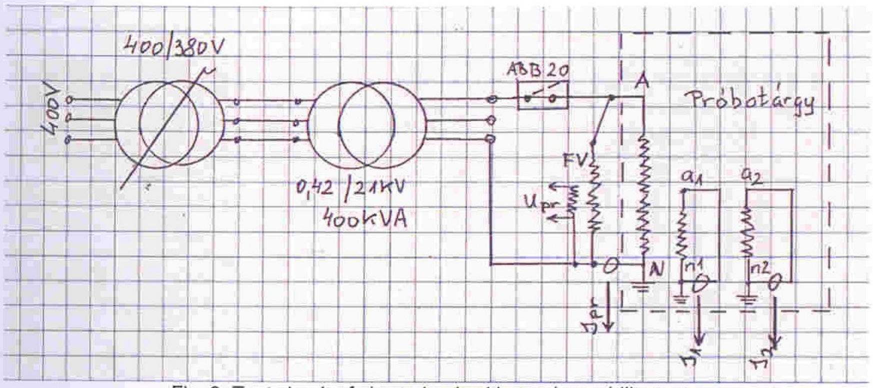


Fig. 3: Test circuit of short-circuit withstand capability test

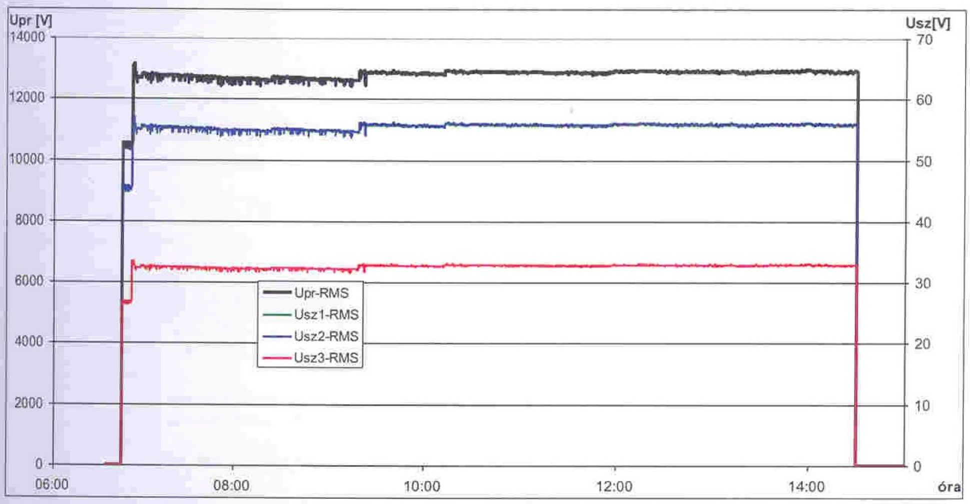


Fig. 4: Primary voltage and voltages of the secondary windings (V) during the 7.7 hours test at 1x12.7kV – 200VA + 200VA

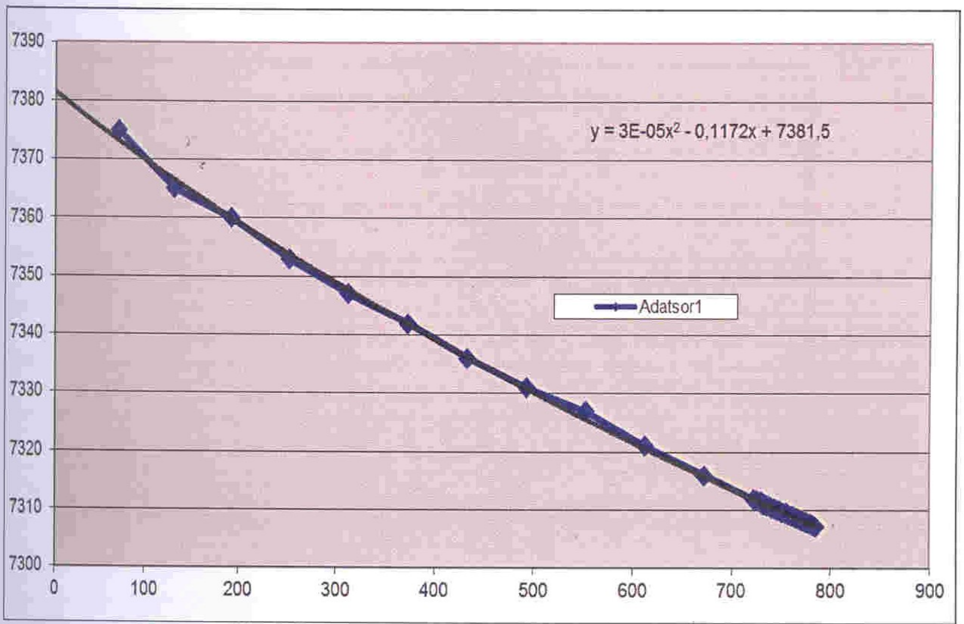


Fig. 5: R_{PR} primary winding resistance (ohm) versus time (s)

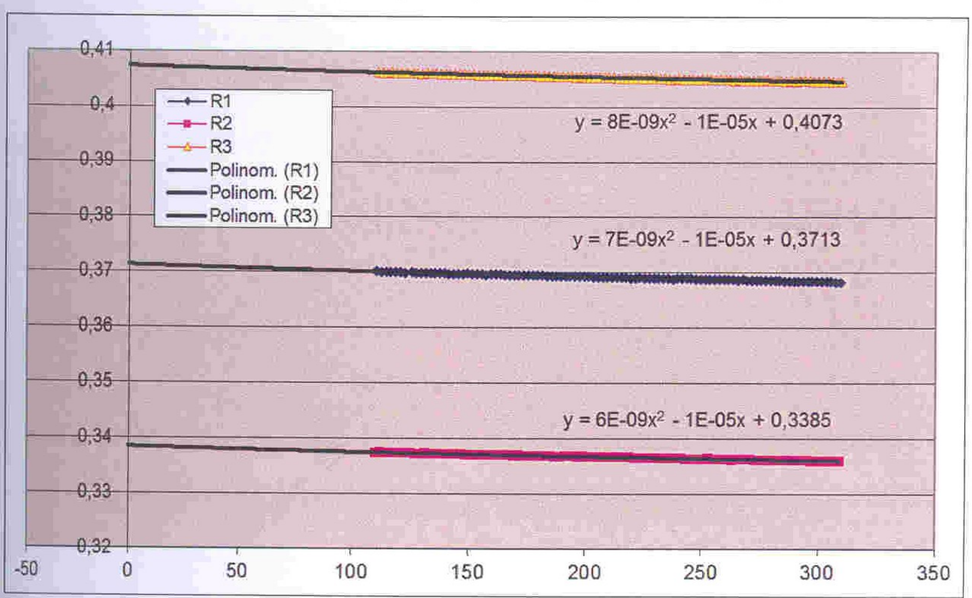


Fig. 6: R_1, R_2 and R_3 winding resistances (ohm) versus time (s)

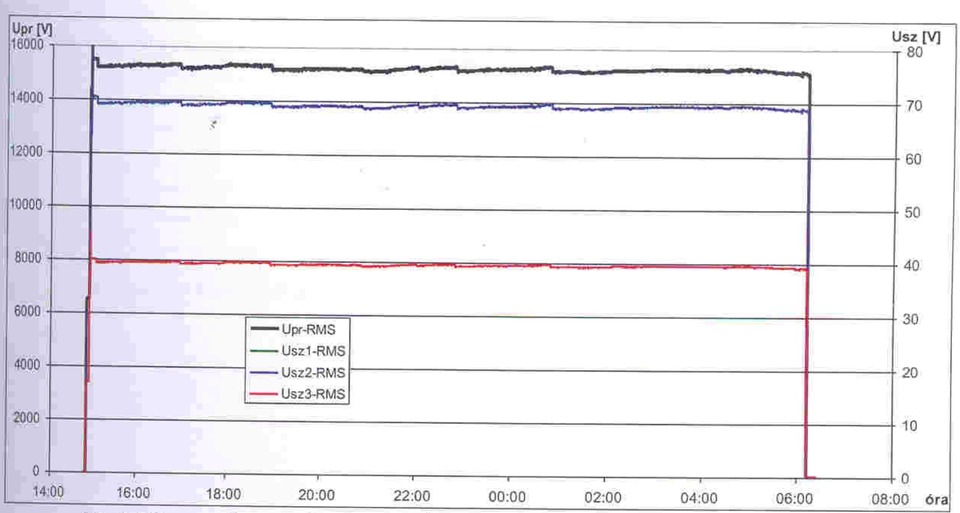


Fig. 7: Primary voltage and voltages of the secondary windings (V) during the 15.2 hours test at 1.2 x12.7kV

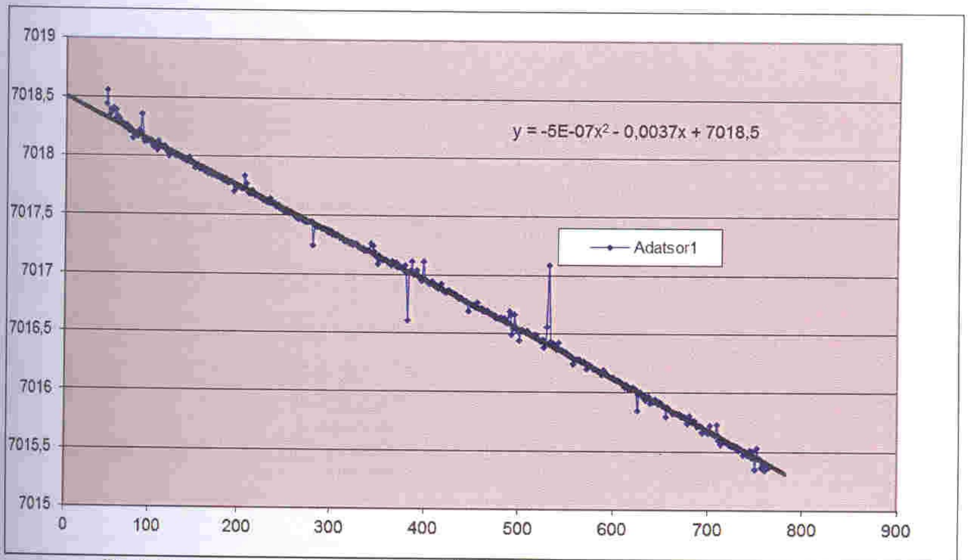


Fig. 8: R_{PR} primary winding resistance (ohm) versus time (s) after 1.2 x 12.7kV test

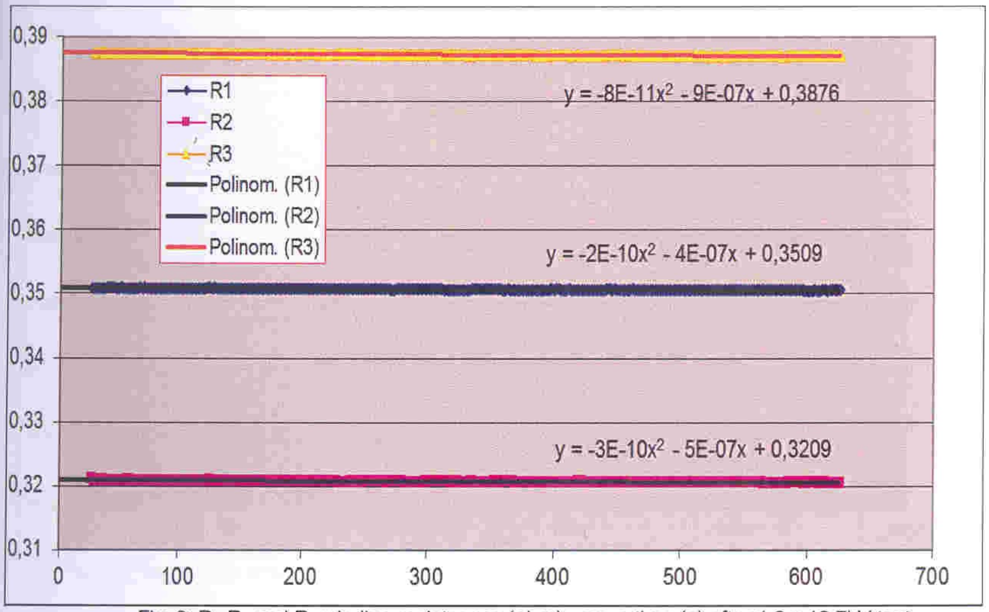


Fig. 9: R_1, R_2 and R_3 winding resistances (ohm) versus time (s) after 1.2 x 12.7kV test

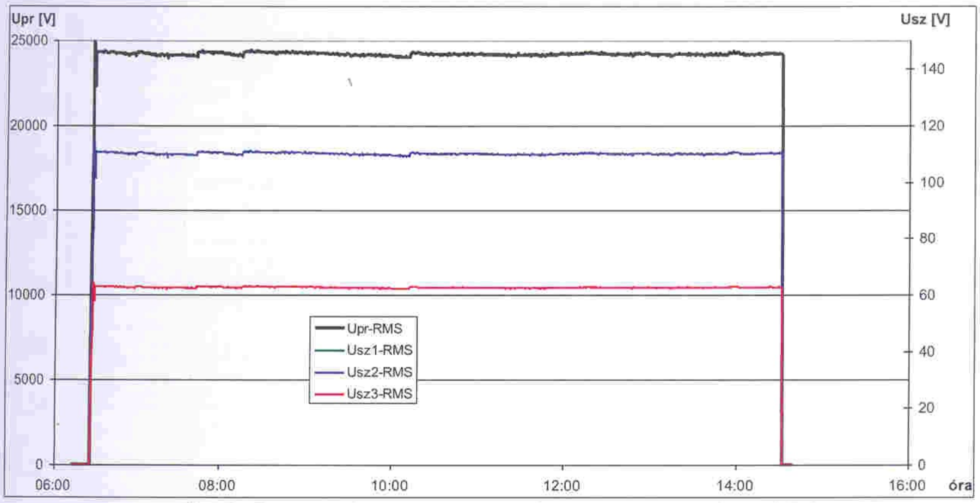


Fig. 10: Primary voltage and voltages of the secondary windings (V) during 1.9 x12.7kV – 8 hours test

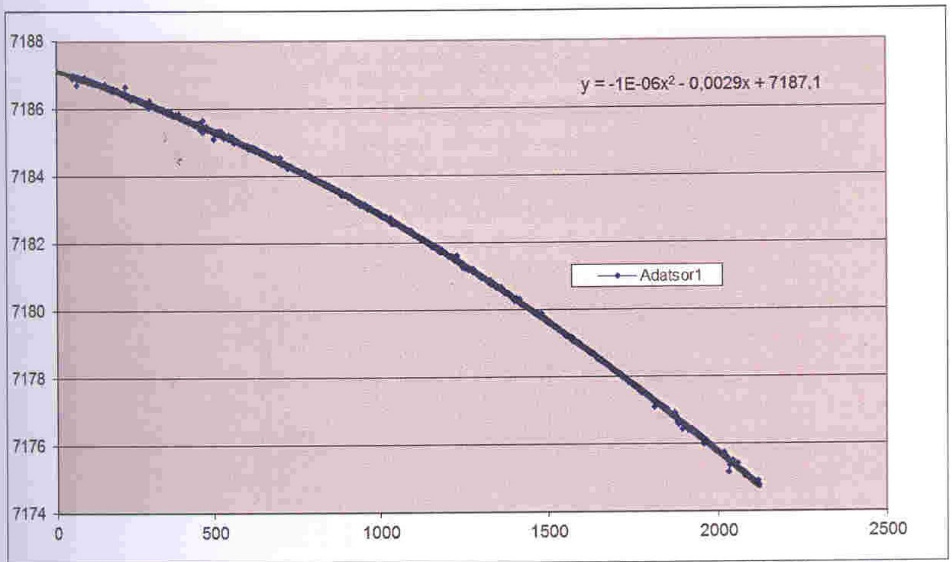


Fig. 11: R_{PR} primary winding resistance (ohm) versus time (s) after 1.9 x 12.7kV – 8 hours test

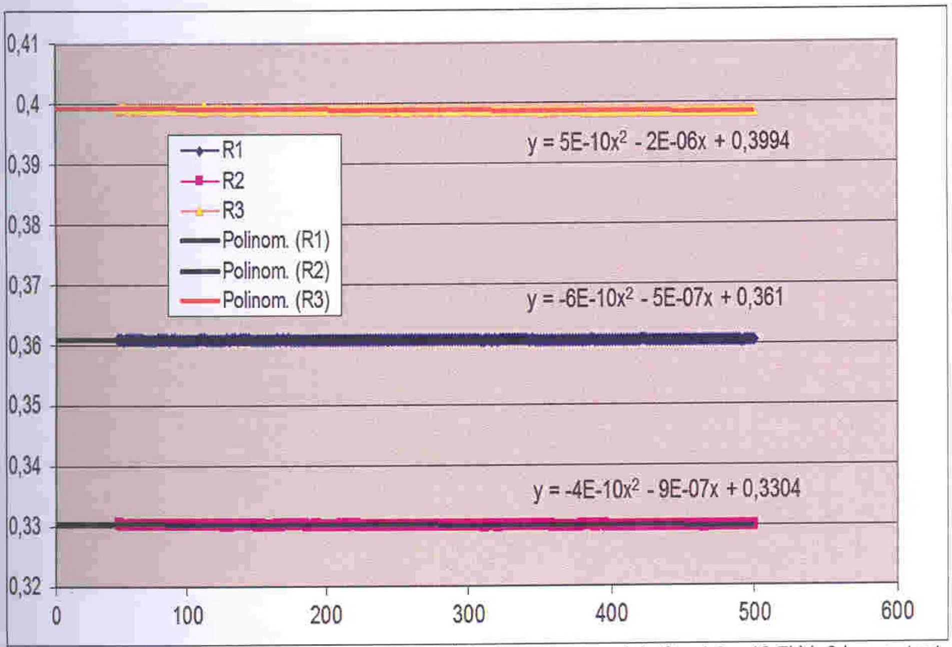
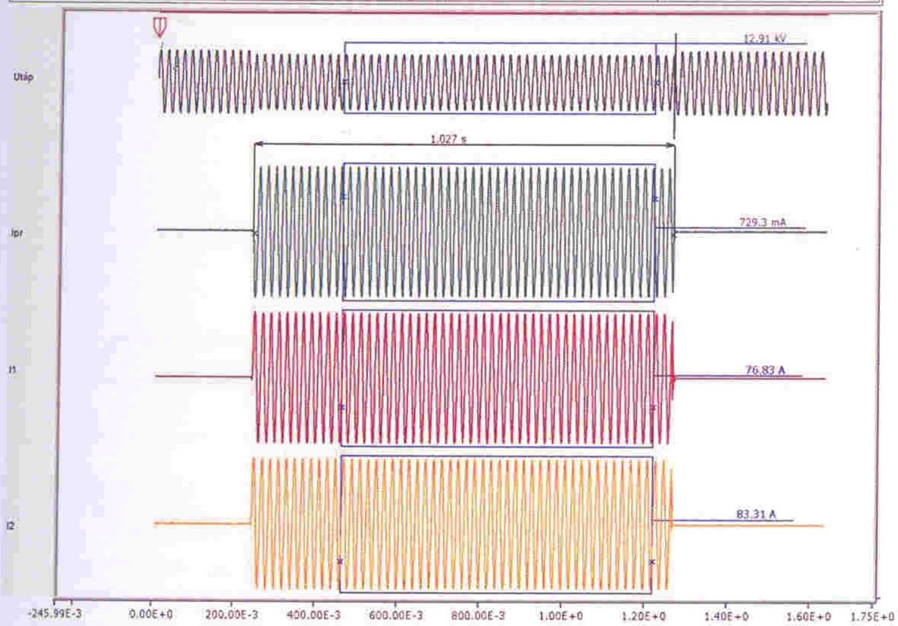
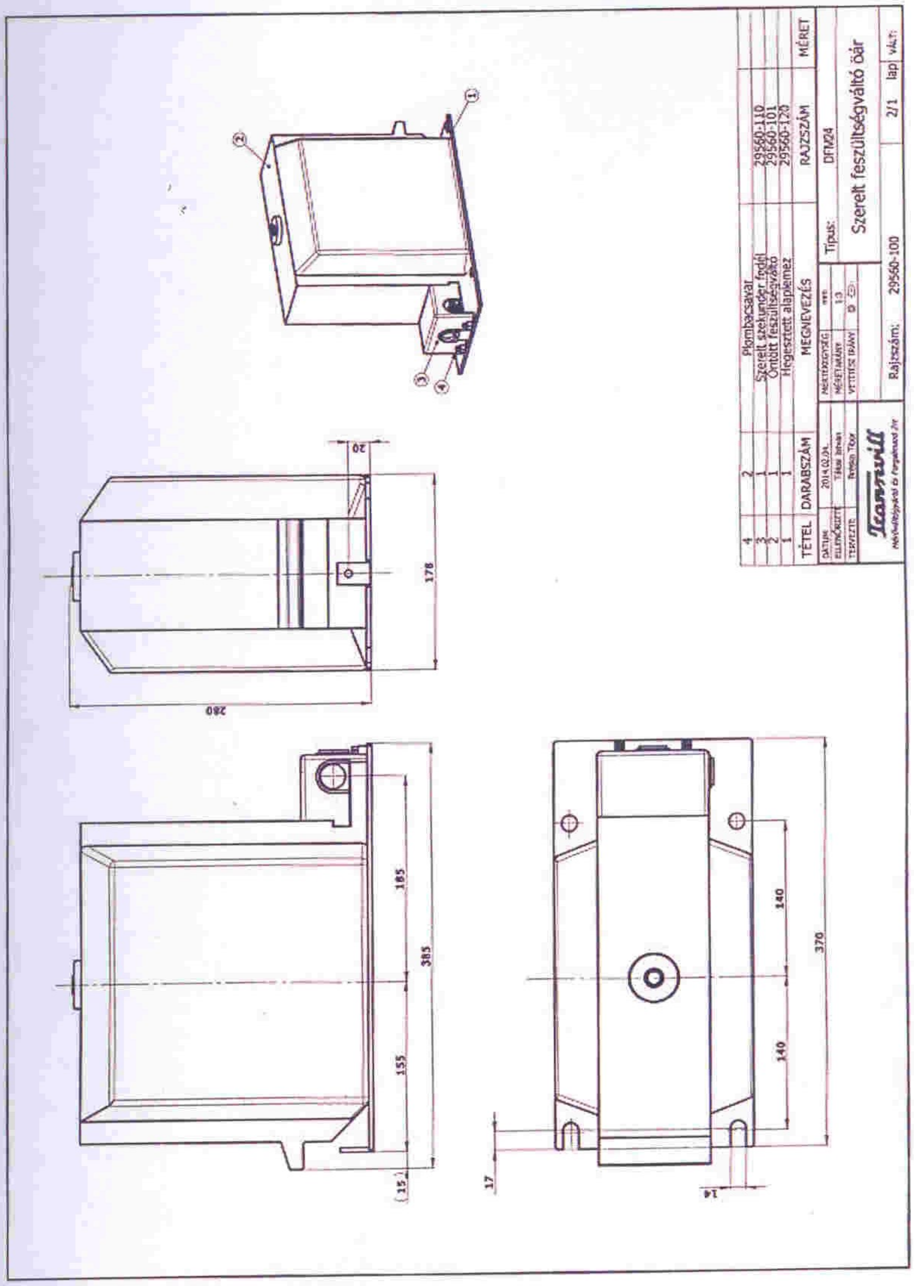


Fig. 12: R_1, R_2 and R_3 winding resistances (ohm) versus time (s) after 1.9 x 12.7kV- 8 hours test

FILE NEVE	FELVÉTEL IDEJE	Infoware ZRt. Zárlati Próbaállomás	NYOMTATÁS IDEJE
73,5V.MER	2014.05.20. 11:09	Infoware, High Power Lab.	2014.05.20. 14:22



Oszc. 140520 – 04


Plombacsavar
Szerelt szekunder fedél
Öntött feszültségváltó
Hegesztett alaplemez
29560-110
29560-101
29560-120
TÉTEL
DARABSZÁM
MEGNEVEZÉS
RAJZSZÁM
MÉRET
Típus:
DFM24
Szerelt feszültségváltó öár
Rajzszám:
29560-100
2/1
lap
20
178
280
185
385
155
15
17
140
140
370
14