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TEST LABORATORY / DENEY LABORATUVARI

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TÜRKAK
AB-0665-T

AB-0665-T
1707095
07.2017

TEST REPORT
DENEY RAPORU

Customer Name *Müşterinin Adı*	:	Nikdim LTD.
Customer Address *Müşterinin Adresi*	:	80, 23-rd Pehoten Shipchenski polk blvd. 6100 Kananlak, Bulgaria
Description of Sample *Numunenin Tanımı*	:	12 kV Indoor Type Post Insulator
Trade Mark / Type *Marka / Tip*	:	Nikdim / PAK-10
Test(s) Performed *Yapılan Deney(ler)*	:	Dry Lightning-Impulse Withstand Voltage Test Dry Power-Frequency Withstand Voltage Test
Test Standart(s) *Deney Standart(lar)ı*	:	IEC 60168: 1994 + A1: 1997 + A2: 2000
Serial Number(s) *Seri No(lar)*	:	9511101 / T2
Reception Date of Sample *Numune Kabul Tarihi*	:	15.07.2017
Test Date(s) *Deney Tarih(ler)i*	:	15.07.2017
Number of Pages of the Report *Raporun Sayfa Sayısı*	:	14
Test(s) Result(s) *Deney Sonuçları*	:	☒ **Passed** / *Geçti* ☐ **Failed** / *Geçmedi* ☐ **Other** / *Diğer*

HİLKAR is accredited by TÜRKAK under registration number AB-0665-T for TS EN ISO IEC 17025:2012 as test laboratory.

Deney Laboratuvarı olarak faaliyet gösteren HİLKAR, TÜRKAK'tan AB-0665-T ile TS EN ISO IEC 17025:2012 standardına göre akredite edilmiştir.

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The test and/or measurements results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları, bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

Seal
Mühür / Kaşe

Date
Tarih
10.08.2017

Person in Charge of Test
Deney Sorumlusu
Laboratory Technician

На основание чл.2 от ЗЗЛД

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1. IDENTIFICATION OF THE TEST SAMPLE:

Description of the Sample	: 12 kV Indoor Type Post Insulator
Trade Mark / Type	: Nikdim / PAK-10
Serial Number	: 9511101 / T2
Technical Specification / Drawing	: See the Clause 5
Contract No	: FT.DNY-07.003.2017
Product Condition at Arrival	: New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:

Manufacturer	: Nikdim
Type	: PAK-10
Rated Voltage	: 12 kV
Power Frequency Withstand Voltage	: 38 kV
Lightning Impulse Withstand Voltage	: 75 kV
Creepage Distance	: 11,3 mm / kV
Material	: Porcelain C110
Color of Glaze	: White
Dimensions	: See the Clause 5

3. TEST(S) PROGRAM:

Witnessed By	:	Mr. Dechko Dechev
Dry Lightning-Impulse Withstand Voltage Test	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5
Dry Power-Frequency Withstand Voltage Test	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7

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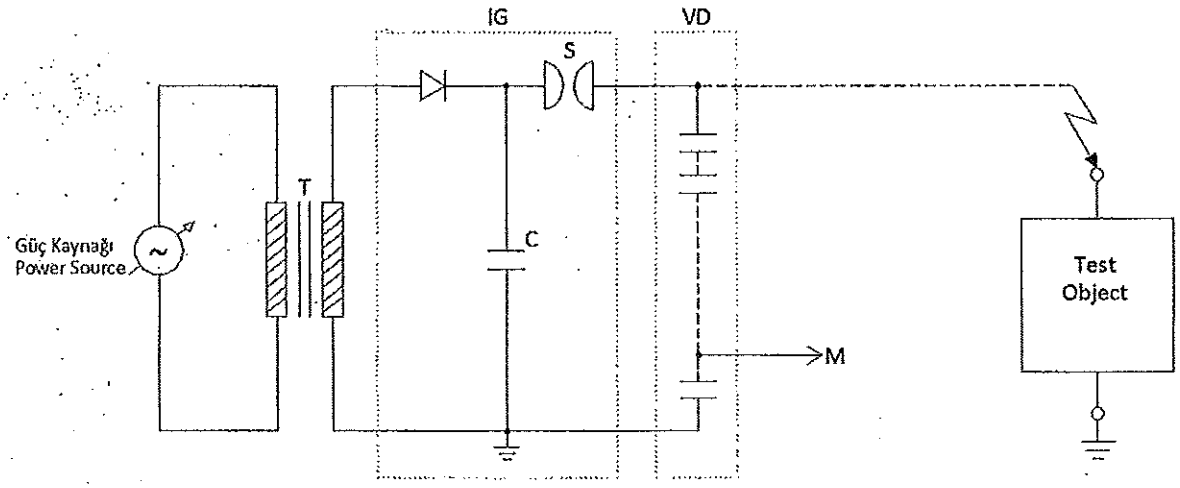
4. APPLIED TEST(S):

- Test results are only belong to the tested sample.
- The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2 which for a normal distribution corresponds to a coverage probability of approximately 95 %.

4.1 Dry Lightning-Impulse Withstand Voltage Test:

4.1.1	Sample Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5
4.1.2	Test Standard	:	IEC 60060-1: 2010 Clause 7 IEC 60273: 1990
4.1.3	Equipment Used	:	BHT / Lightning Impulse Test System (K003) Madgetech / Environmental Conditions Recorder (K274)
4.1.4	Environmental Conditions	:	Ambient Temperature : 26,6 °C Ambient Humidity : 64,3 %RH Air Pressure : 1007,9 mbar
4.1.5	Test Circuit Diagram	:	



IG : Darbe Jeneratörü / Impulse Generator
VD : Hibrit Gerilim Bölücü / Hybrid Voltage Divider
T : Yükseltici Trafo / Step-up Transformer
F : Metal Gövde / Frame

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4.1.6 Test Criteria and Measurement Results:

S. No		Voltage Ut Applied to	Earth Connected to	Insulated from Earth	Test Voltage (%)	Test Voltage (kVpeak) (75 kVpeak ±%3)	Peak Time t_1 (µs) (1,2 µs ± 30 %)	Tail Time t_2 (µs) (50 µs ± 20 %)	Result(s)	
1	40976	Top of Insulator	Mounting Face of Insulator	-	50-80	52,45	1,315	48,46		
1	**40977**				100	**67,27[1)]**	**1,183**	**51,11**	**Affirmative ☐**	**Negative ☒**
2	**40978**					**71,78[1)]**	**1,171**	**52,04**	**Affirmative ☐**	**Negative ☒**
3	**40979**					**72,21[1)]**	**1,116**	**51,71**	**Affirmative ☐**	**Negative ☒**
4	40980					74,95	1,140	51,72	Affirmative ☒	Negative ☐
5	40981					74,52	1,097	51,96	Affirmative ☒	Negative ☐
6	40982					74,82	1,193	51,68	Affirmative ☒	Negative ☐
7	40983					76,48	1,178	52,09	Affirmative ☒	Negative ☐
8	40984					75,97	1,196	51,88	Affirmative ☒	Negative ☐
9	40985					76,61	1,262	51,67	Affirmative ☒	Negative ☐
10	40986					76,10	1,176	51,99	Affirmative ☒	Negative ☐
11	40987					75,47	1,171	52,06	Affirmative ☒	Negative ☐
12	40988					74,90	1,203	51,99	Affirmative ☒	Negative ☐
13	40989					75,35	1,205	51,91	Affirmative ☒	Negative ☐
14	40990					75,76	1,164	52,14	Affirmative ☒	Negative ☐
15	40991					75,46	1,148	52,32	Affirmative ☒	Negative ☐
16	40992					74,65	1,149	51,66	Affirmative ☒	Negative ☐
17	40993					74,68	1,125	52,08	Affirmative ☒	Negative ☐
18	40994					75,81	1,200	51,51	Affirmative ☒	Negative ☐
2	40996				50-80	-51,21	1,297	48,82		
1	40997				100	-75,12	1,155	51,04	Affirmative ☒	Negative ☐
2	40998					-75,67	1,183	51,00	Affirmative ☒	Negative ☐
3	40999					-75,69	1,194	50,33	Affirmative ☒	Negative ☐
4	41000					-75,63	1,207	51,53	Affirmative ☒	Negative ☐
5	41001					-75,44	1,209	51,80	Affirmative ☒	Negative ☐
6	41002					-75,84	1,190	51,69	Affirmative ☒	Negative ☐
7	41003					-76,03	1,184	51,03	Affirmative ☒	Negative ☐
8	41004					-76,22	1,256	51,02	Affirmative ☒	Negative ☐
9	41005					-75,94	1,210	51,67	Affirmative ☒	Negative ☐
10	41006					-74,22	1,149	51,51	Affirmative ☒	Negative ☐
11	41007					-76,52	1,281	51,17	Affirmative ☒	Negative ☐
12	41008					-74,38	1,117	51,70	Affirmative ☒	Negative ☐
13	41009					-75,84	1,176	52,21	Affirmative ☒	Negative ☐
14	41010					-74,86	1,208	51,85	Affirmative ☒	Negative ☐
15	41011					-75,97	1,214	51,71	Affirmative ☒	Negative ☐

Remarks:

1) Out of voltage tolerance, additional impulses were applied instead.

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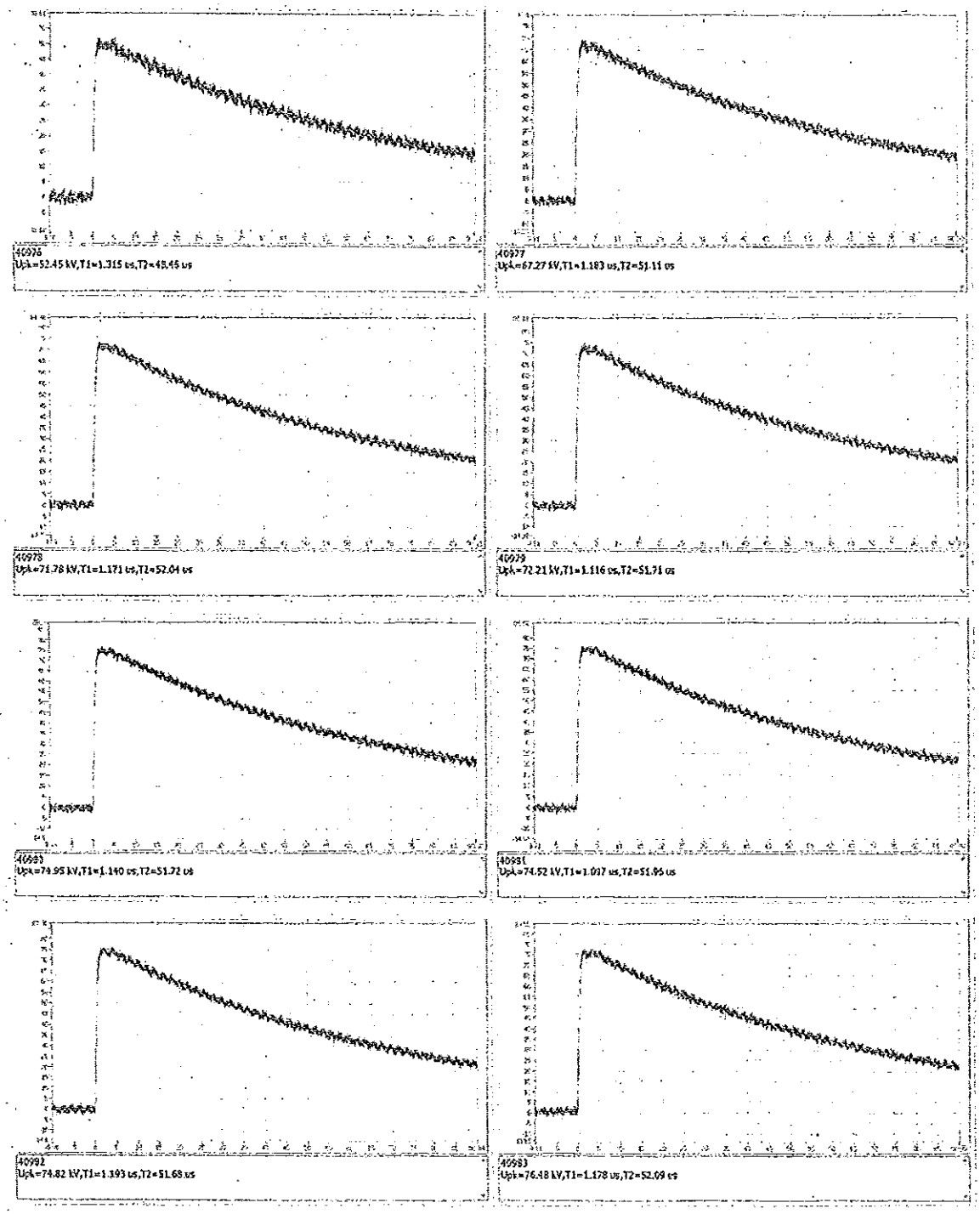
4.1.7 Oscillograms:

4.1.7.1 S. No:1 / Positive Impulses



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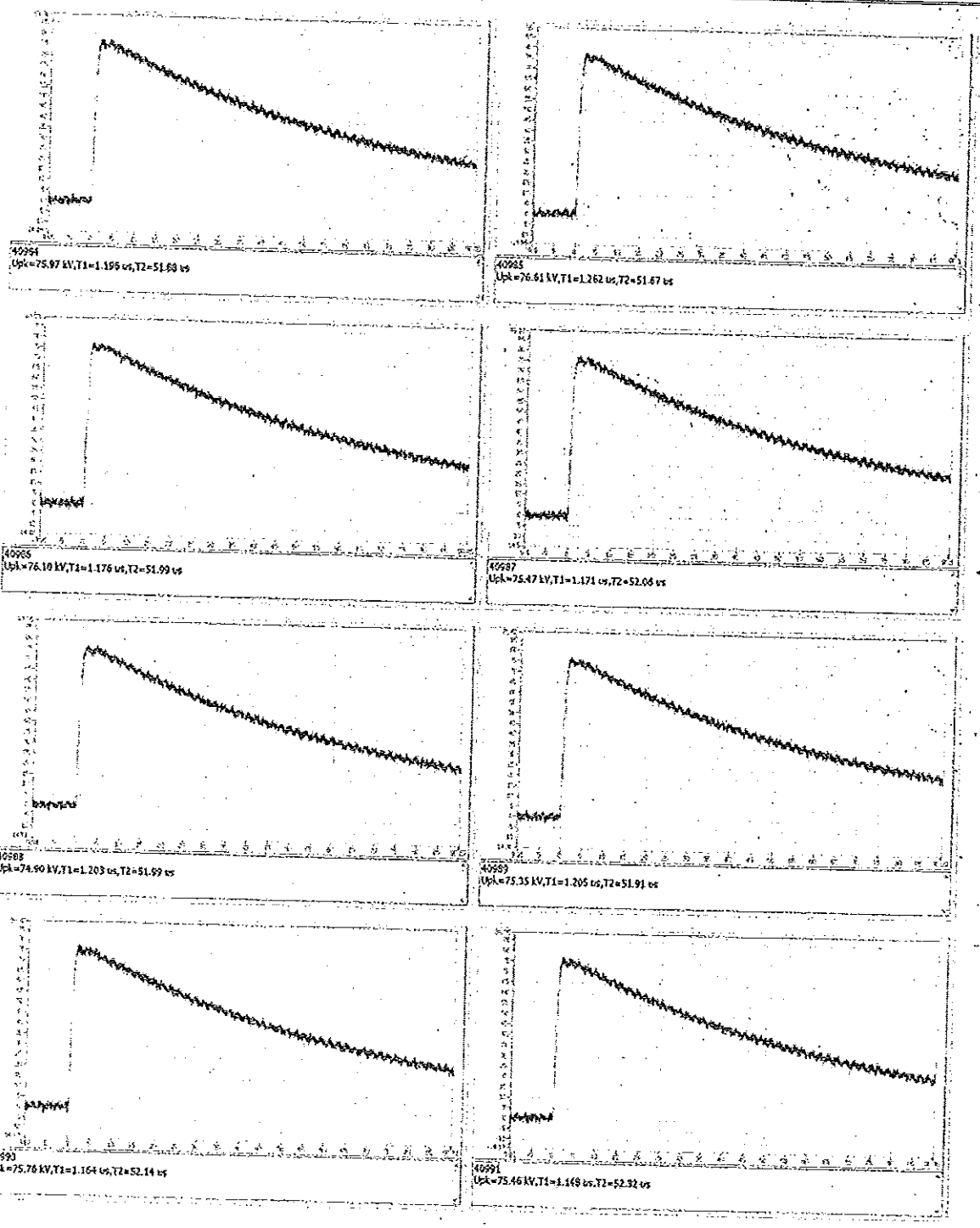

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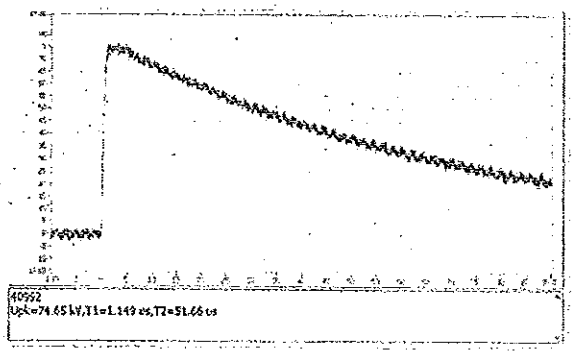
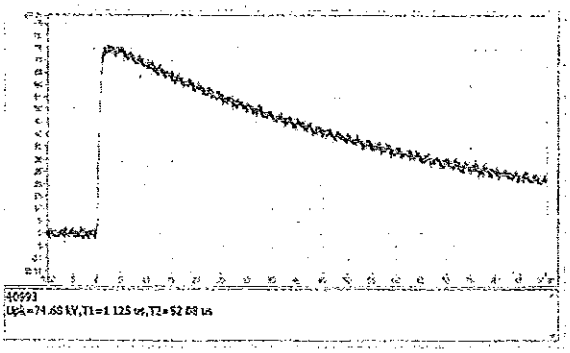
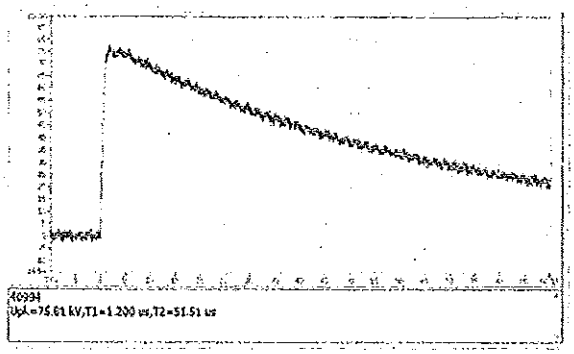
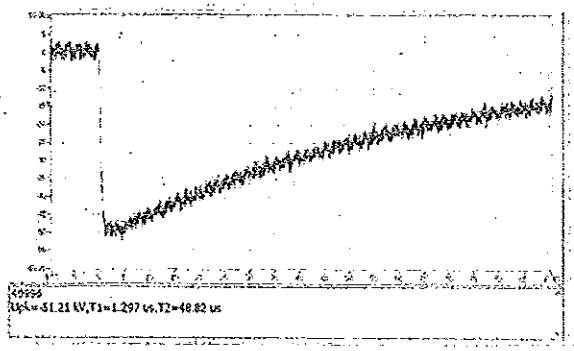
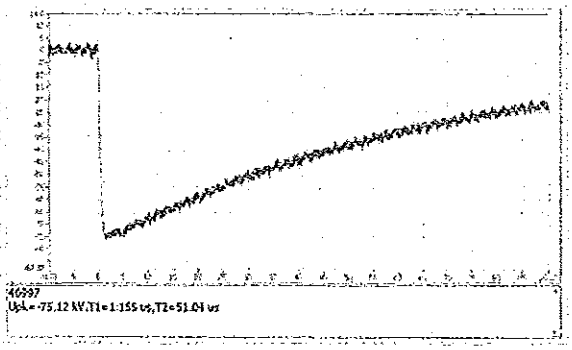


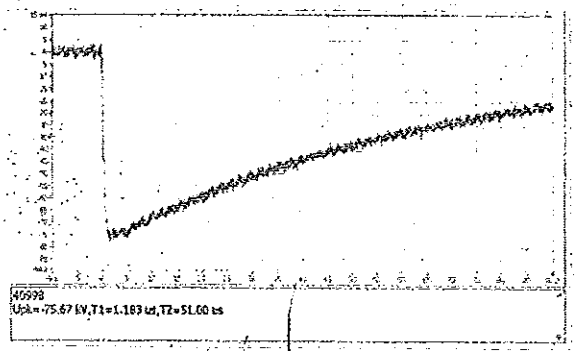


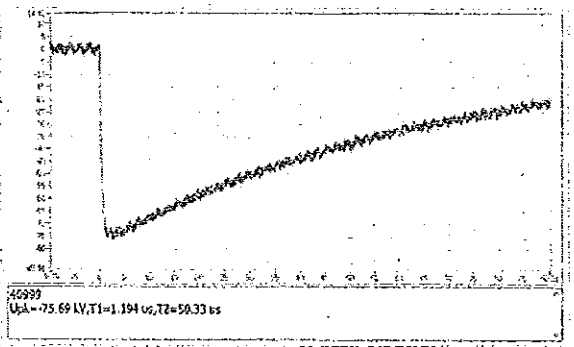


4.1.7.2 S. No:2 / Negative Impulses









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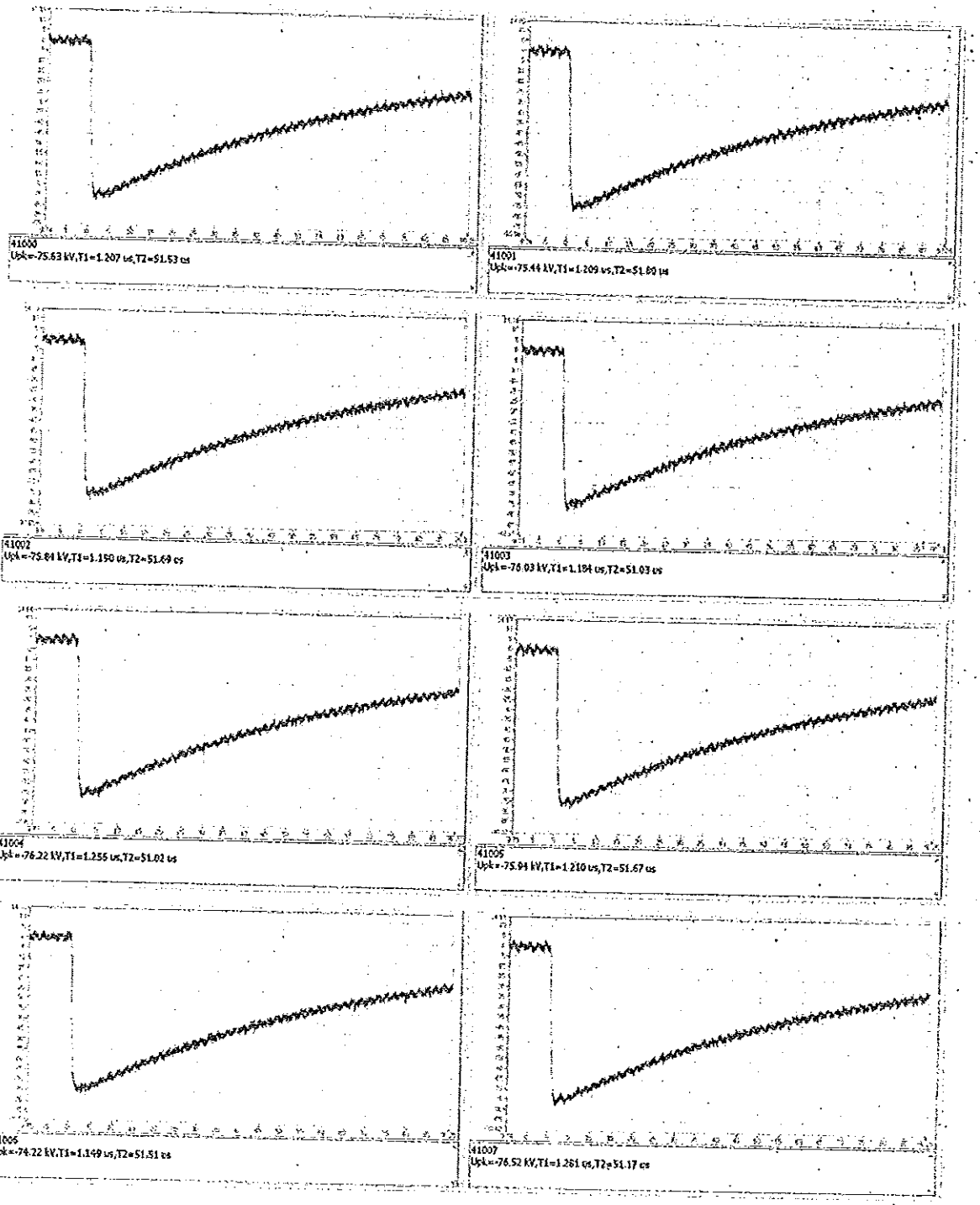

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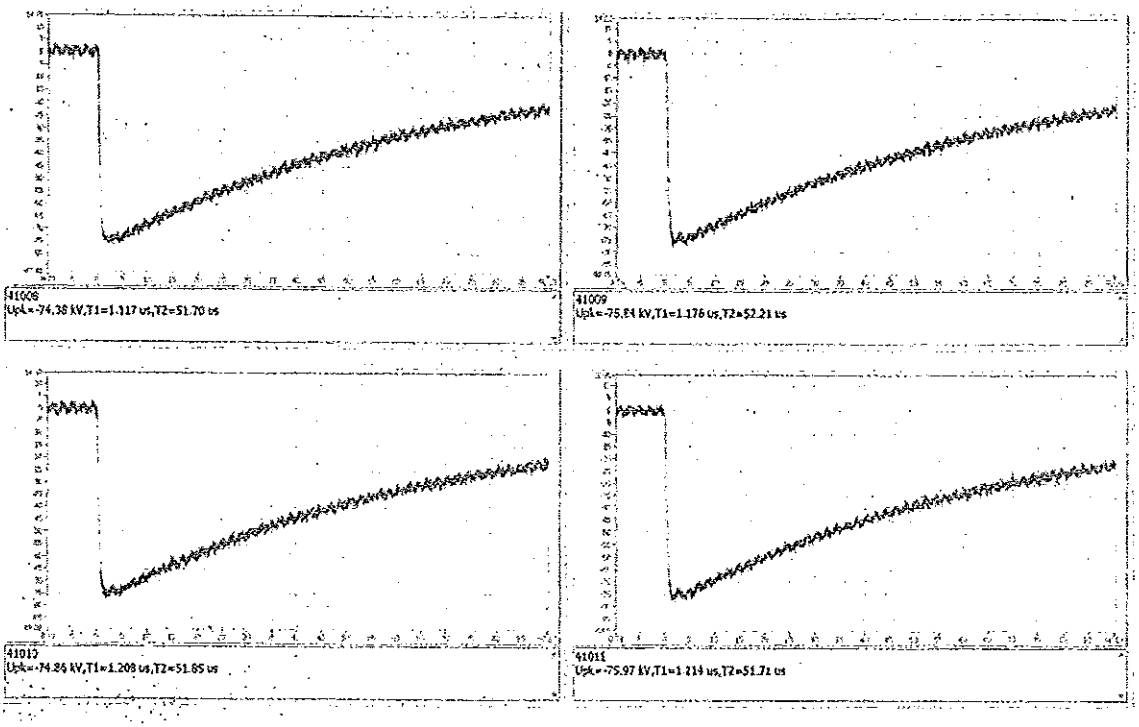

4.1.8 Remarks, Comments and Statements of Compliance:

- Test voltage were applied as per IEC 60273:1990 Table-1
- Tests were applied without considering atmospheric correction.
- Measurement Uncertainty of K003: U_t: 2,206% t_1: 4,791 % t_2: 2,620%
- The insulator was mounted vertically upright on a horizontal earthed metal support consisting of a U-channel section with the flanges pointing downwards which has a width about equal to the diameter of the mounting face of the insulator and a length longer than twice the height of the insulator, and was placed 1,1 m above ground.
- A cylindrical conductor, maintained in the horizontal plane and perpendicular to the earthed support, was attached to the top of the insulator. The length of the conductor was longer than 1,5 times the height of the insulator and it was extended 1 m on each side of the insulator axis. The diameter of the conductor was 30 mm.
- 12 kV indoor type post insulator with Nikdim brand, PAK-10 type and 9511101 / T2 serial number, has been tested and passed successfully to the Dry Lightning-Impulse Withstand Voltage Test as per IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5 the withstand voltage procedure.

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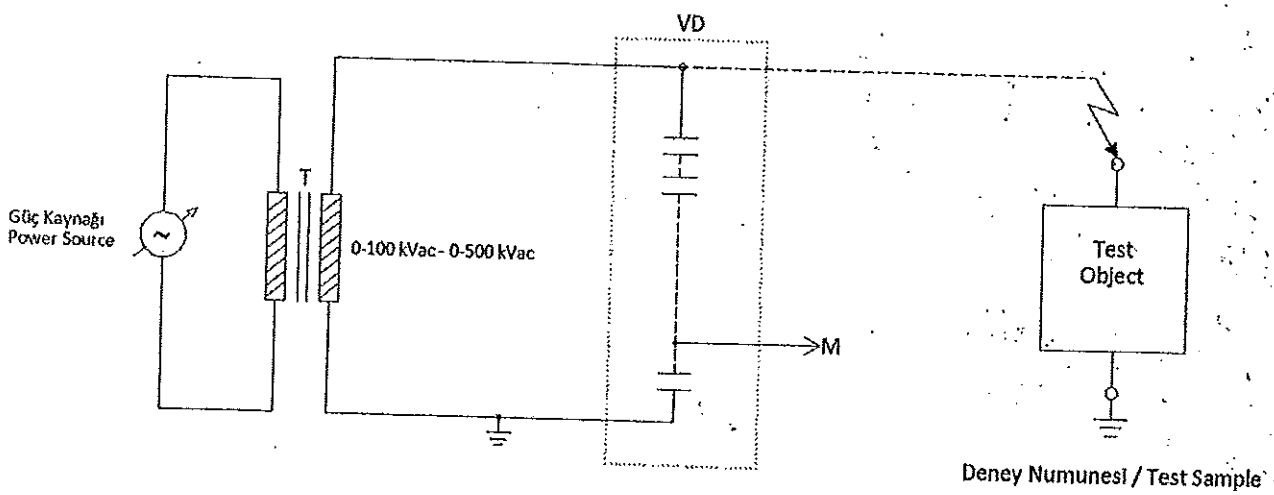
4.2 Dry Power-Frequency Withstand Voltage Test:

4.1.1	Sample Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000
4.1.2	Test Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7 IEC 60060-1: 2010 Clause 6 IEC 60273: 1990
4.1.3	Equipment Used	:	Baur / 100 kVac High Voltage Test System (K001) Madgetech / Environmental Conditions of the Recorder (K274)
4.1.4	Environmental Conditions	:	Ambient Temperature : 26,6 °C Ambient Humidity : 64,3 %RH Air Pressure : 1007,9 mbar
4.1.5	Test Circuit Diagram	:	



VD : Kapasitif Gerilim Bölücü / Capacitive Voltage Divider
T : 0 - 100 kVac - 0 - 500 kVac Test Trafosu / 0 - 100 kVac - 0-500 kVac Test Transformer
F : Metal Gövde / Frame

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4.2.5 Test Criteria and Measurement Results:

S. No	Voltage Ut Applied to	Earth Connected to	Insulated from Earth	Test Voltage (kVrms) (28 kVrms ±%1)	Frequency (Hz)	Time (sec.)	Result(s)	
1	Top of Insulator	Mounting Face of Insulator	-	38,12	50	60	Affirmative ☒	Negative ☐

4.2.6 Remarks, Comments and Statements of Compliance:

- Test voltage were applied as per IEC 60273:1990 Table-1
- Tests were applied without considering atmospheric correction.
- Measurement Uncertainty of K001: U_t: 1,409%
- The post insulator was mounted vertically upright on a horizontal earthed metal support consisting of a U-channel section with the flanges pointing downwards which has a width about equal to the diameter of the mounting face of the insulator and a length longer than twice the height of the insulator, and was placed 1,1 m above ground.
- A cylindrical conductor, maintained in the horizontal plane and perpendicular to the earthed support, was attached to the top of the insulator. The length of the conductor was longer than 1,5 times the height of the insulator and it was extended 1 m on each side of the insulator axis. The diameter of the conductor was 30 mm.
- 12 kV indoor type post insulator with Nikdim brand, PAK-10 type and 9511101 / T2 serial number, has been tested and passed successfully to the Dry Power-Frequency Withstand Voltage Test as per IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7.

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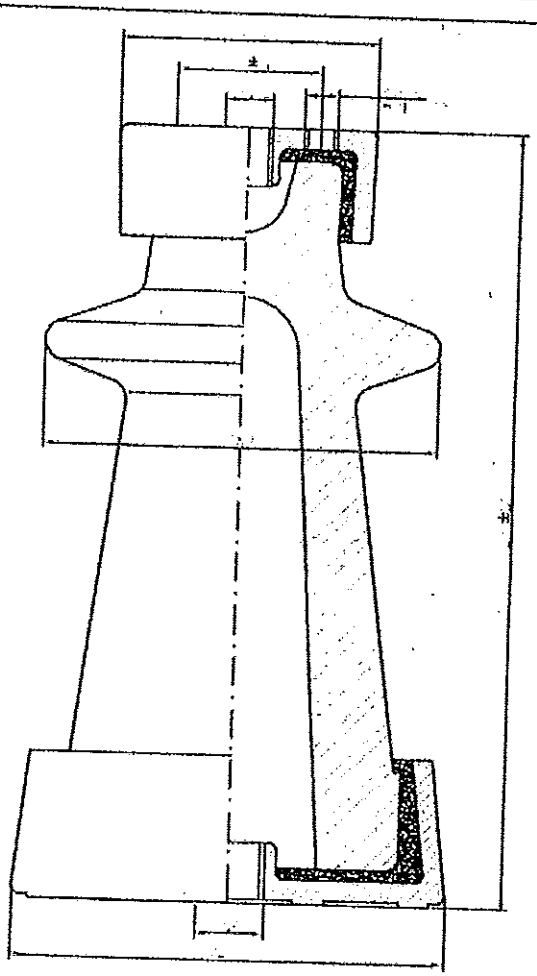
5. TECHNICAL DRAWING(S) of the TEST SAMPLE:



1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white,
3. Maximum working voltage - 12 kV,
4. The general tolerances are according to DIN 40680,
5. Electrical parameters according to IEC 60168.

Alter	Numbe	№ of elocum	Signature	Date	ND 92.12.00.00	Stage	Mass	Масшаб
					Support insulators for indoor mounting type PAK 10			1:1
Developed		Iliev				Sheet 1	A4 sheet 1	
Controled		Donov						
Controled		Donov				"NIKDIM" OOD		

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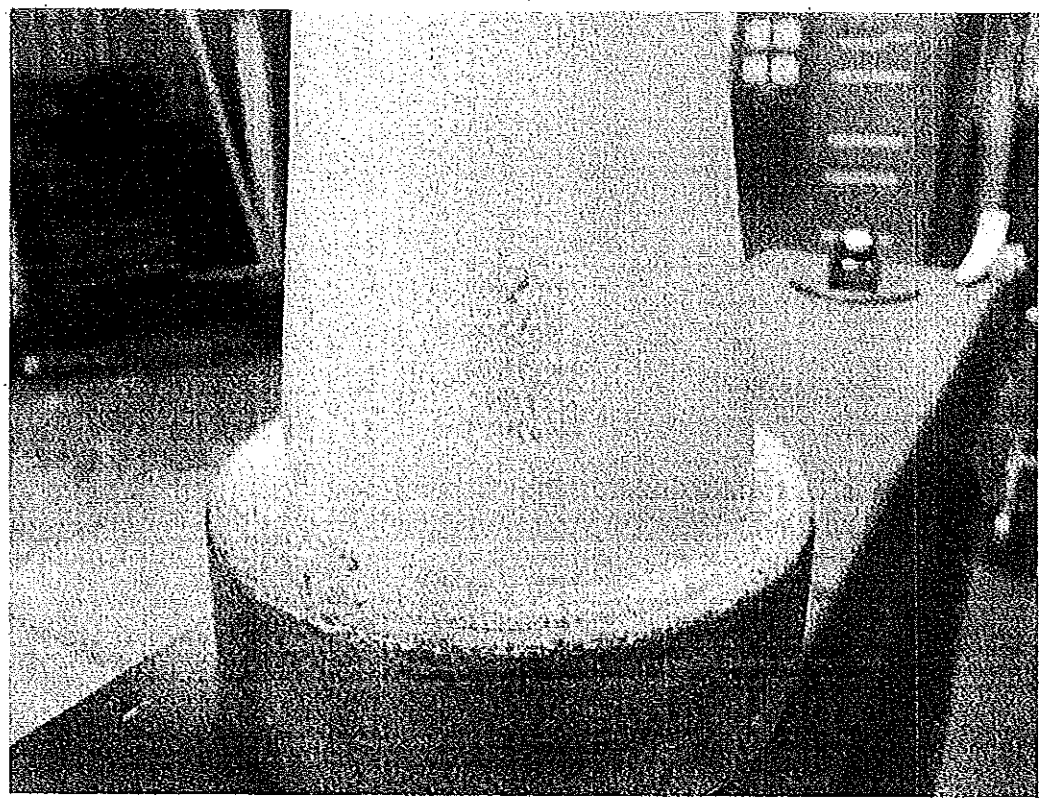
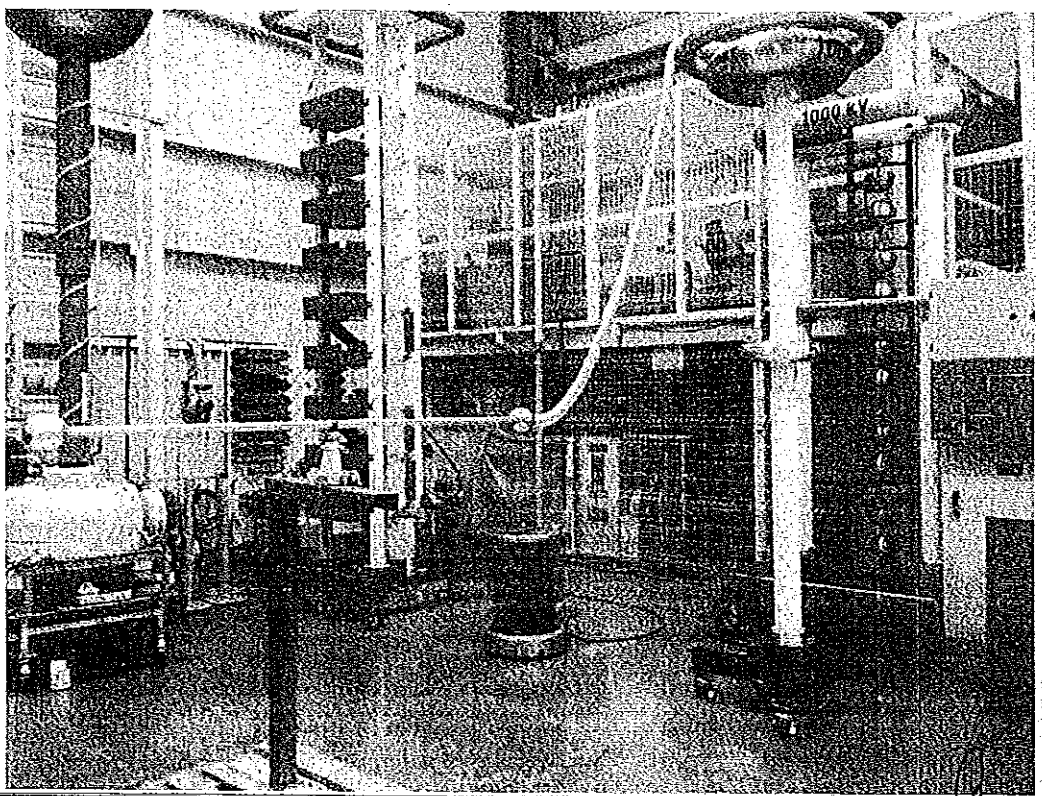
6. PHOTO(S) of the TEST SAMPLE:





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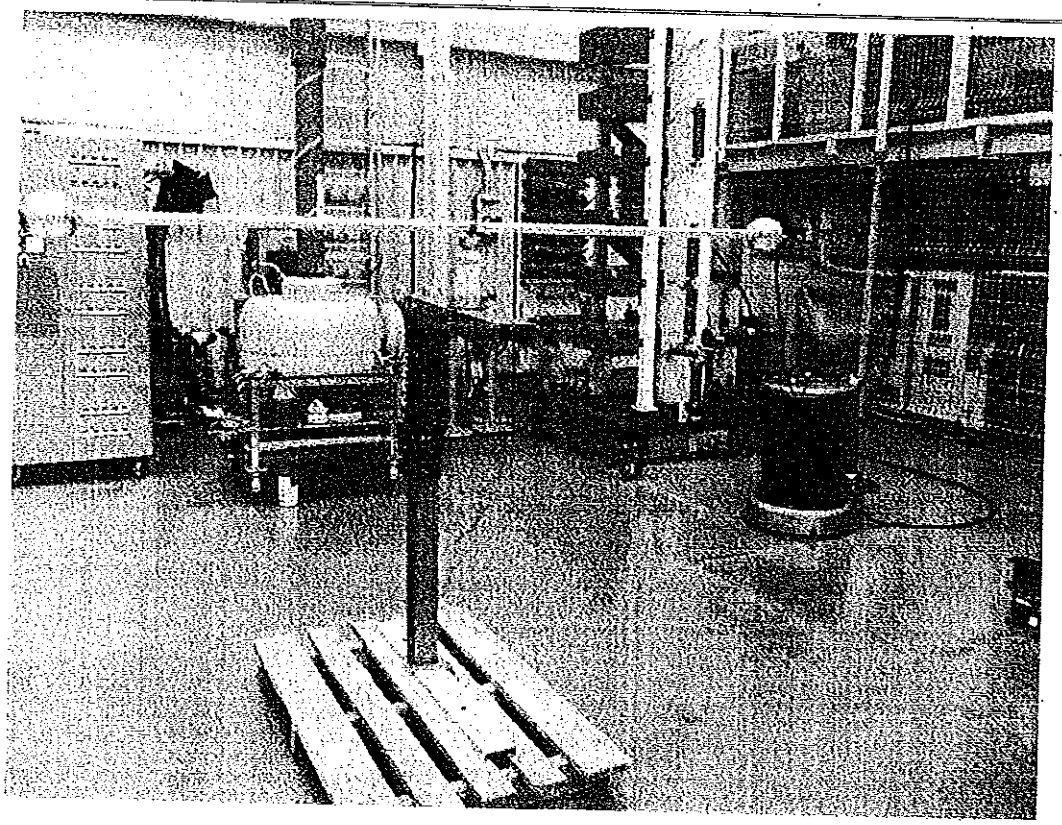

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Low and High Voltage Testing Laboratory
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Matriculation certificate: J16/312/1999, VAT number: RO3871599
Phone: + 40 0351 402425, 404888; Fax: + 40 0351 404890
www.icmet.ro ; E-mail: market@icmet.ro

accredited for TESTING
SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICATE LI 1626

TEST REPORT
No. 45966 / 11.08.2017

1. CUSTOMER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
2. MANUFACTURER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
3. TESTED PRODUCT:	Indoor Post Insulator type PAK 10
4. REFERENCE STANDARD:	Customer requirements (IEC 60168:2001, clause 5.2.4)
5. PERFORMED TESTS:	Mechanical failing load test. Bending test
6. TEST DATE:	10.08.2017
7. TEST RESULTS:	The product passed the test.

The test report contains 5 pages and is edited in 4 copies, copy no.1 remain in laboratory and copies 2, 3, 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER, **HEAD OF TESTING TEAM,**

Dipl. E

На основание чл.2 от ЗЗЛД

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c. *All signatures of the present report are original ones.*

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CONTENT

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1. IDENTIFICATION OF THE TEST PRODUCT

Type:	PAK 10
Serial / year:	2011
Technical Specification / Drawing:	Drawing no. ND 92.12.00.00 - Support insulators for indoor mounting type PAK 10
Contract / Test order:	705.2/876/03.08.2017
Internal test order:	23362/07.08.2017
Product receiving date:	08.08.2017
Product condition at receiving:	New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER

Maximum working voltage	12 kV
Mechanical failing load	4000 N (indicated by the customer)

3. TESTS PROGRAM

Mechanical failing load test. Bending test — Customer requirements (IEC 60168:2001, clause 5.2.4)

4. RESPONSIBLE FOR TEST

Dipl. Eng. Luminita Tascau

5. PRESENT AT THE TEST

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6. MECHANICAL FAILING LOAD TEST. BENDING TEST

Test date:	10.08.2017
Test standard:	Customer requirements (IEC 60168:2001, clause 5.2.4)
Atmospheric conditions:	t = 28 ^{0}C; RH = 53%
Equipment used:	• Manual lever hoist SAFETEX 3000 kg, manufacturer SC Delta Flex SRL Bucuresti • Tension load cell, model CTL 1000 kg, serial no. 201106182, manufacturer LAUMAS ELECTRONICA Italy, CC no. F - 03/329/2017, SC GELUTECH Laboratory of Forces SRL
Test procedure:	The post insulator was subjected to a bending load to verify the mechanical failing load of 4000 N as specified in Annex 1 to the contract. The load was applied perpendicular to the axis of the post insulator, to the free end (see Photo 1). The specified bending load was reached.
Test results:	The product passed the test.

Photo 1

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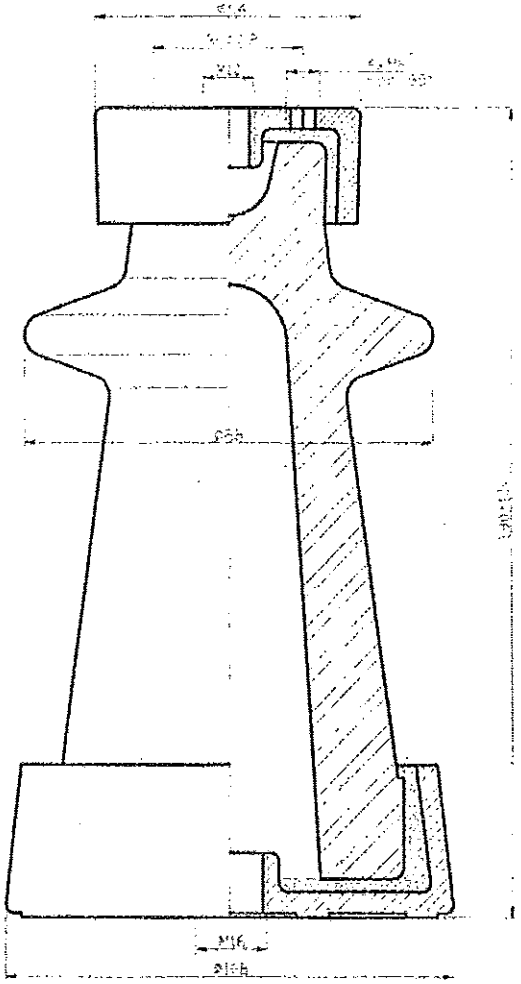
Annex 1



1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 12 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

					ND 92.12.00.00	
Alter	Numbe	№ of clocum.	Signature	Date	Support insulators for indoor mounting type PAK 10	Stage / Mass / Мащаб: 1:1
Developed		Iliev				Sheet 1 / All sheet 1
Controled		Donev				
Controled		Donev				"NIKDIM" OOD

-- End of test report --

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TEST LABORATORY / DENEY LABORATUVARI

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Tel : +90 264 275 55 40 Fax : +90 264 275 12 76

www.hilkar.com

AB-0665-T

AB-0665-T
1707097
07.2017

TEST REPORT
DENEY RAPORU

Customer Name *Müşterinin Adı*	:	Nikdim LTD.
Customer Address *Müşterinin Adresi*	:	80, 23-rd Pehoten Shipchenski polk blvd. 6100 Kananlak, Bulgaria
Description of Sample *Numunenin Tanımı*	:	12 kV Indoor Type Post Insulator
Trade Mark / Type *Marka / Tip*	:	Nikdim / PAM-10
Test(s) Performed *Yapılan Deney(ler)*	:	Dry Lightning-Impulse Withstand Voltage Test Dry Power-Frequency Withstand Voltage Test
Test Standart(s) *Deney Standart(lar)ı*	:	IEC 60168: 1994 + A1: 1997 + A2: 2000
Serial Number(s) *Seri No(lar)*	:	9511106 / T4
Reception Date of Sample *Numune Kabul Tarihi*	:	15.07.2017
Test Date(s) *Deney Tarih(ler)i*	:	15.07.2017
Number of Pages of the Report *Raporun Sayfa Sayısı*	:	14
Test(s) Result(s) *Deney Sonuçları*	:	☒ **Passed** / *Geçti* ☐ **Failed** / *Geçmedi* ☐ **Other** / *Diğer*

HİLKAR is accredited by TÜRKAK under registration number AB-0665-T for TS EN ISO IEC 17025:2012 as test laboratory.

Deney Laboratuvarı olarak faaliyet gösteren HİLKAR, TÜRKAK'tan AB-0665-T ile TS EN ISO IEC 17025:2012 standardına göre akredite edilmiştir.

The Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for the Accreditation (EA) Multilateral Agreement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of test reports.

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The test and/or measurements results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları, bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

Seal *Mühür / Kaşe*

Date *Tarih*
10.08.2017

Person in Charge of Test *Deney Sorumlusu*
Mustafa KURKMAZ
Laboratory Technician

На основание чл.2 от ЗЗЛД

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1. IDENTIFICATION OF THE TEST SAMPLE:

Description of the Sample	: 12 kV Indoor Type Post Insulator
Trade Mark / Type	: Nikdim / PAM-10
Serial Number	: 9511106 / T4
Technical Specification / Drawing	: See the Clause 5
Contract No	: FT.DNY-07.003.2017
Product Condition at Arrival	: New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:

Manufacturer	: Nikdim
Type	: PAM-10
Rated Voltage	: 12 kV
Power Frequency Withstand Voltage	: 38 kV
Lightning Impulse Withstand Voltage	: 75 kV
Creepage Distance	: 16,3 mm / kV
Material	: Porcelain C110
Color of Glaze	: White
Dimensions	: See the Clause 5

3. TEST(S) PROGRAM:

Witnessed By	:	Mr. Dechko Dechev
Dry Lightning-Impulse Withstand Voltage Test	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5
Dry Power-Frequency Withstand Voltage Test	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7

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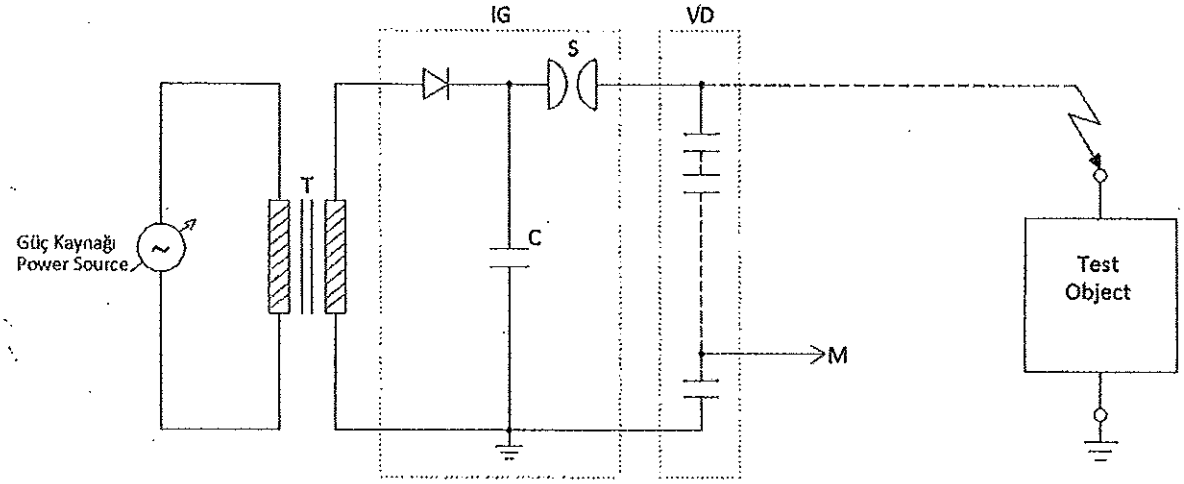
4. APPLIED TEST(S):

- Test results are only belong to the tested sample.
- The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2 which for a normal distribution corresponds to a coverage probability of approximately 95 %.

4.1 Dry Lightning-Impulse Withstand Voltage Test:

4.1.1	Sample Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5
4.1.2	Test Standard	:	IEC 60060-1: 2010 Clause 7 IEC 60273: 1990
4.1.3	Equipment Used	:	BHT / Lightning Impulse Test System (K003) Madgetech / Environmental Conditions Recorder (K274)
4.1.4	Environmental Conditions	:	Ambient Temperature : 29,2 °C Ambient Humidity : 56,1 %RH Air Pressure : 1009,2 mbar
4.1.5	Test Circuit Diagram	:	



IG : Darbe Jeneratörü / Impulse Generator
VD : Hibrit Gerilim Bölücü / Hybrid Voltage Divider
T : Yükseltici Trafo / Step-up Transformer
F : Metal Gövde / Frame

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4.1.6 Test Criteria and Measurement Results:

S. No			Voltage Ut Applied to	Earth Connected to	Insulated from Earth	Test Voltage (%)	Test Voltage (kVpeak) (75 kVpeak ±%3)	Peak Time t_1 (µs) (1,2 µs ± 30 %)	Tail Time t_2 (µs) (50 µs ± 20 %)	Result(s)	
1	1	41086	Top of Insulator	Mounting Face of Insulator	-	50-80	54,19	1,543	46,30		
	1	**41087**				100	**70,32[1)]**	**1,304**	**50,98**	**Affirmative ☐**	**Negative ☒**
	2	41088					72,94	1,163	51,49	Affirmative ☒	Negative ☐
	3	41089					74,66	1,117	51,66	Affirmative ☒	Negative ☐
	4	41090					73,72	1,183	51,07	Affirmative ☒	Negative ☐
	5	41091					74,14	1,085	52,06	Affirmative ☒	Negative ☐
	6	41092					74,38	1,237	51,27	Affirmative ☒	Negative ☐
	7	41093					73,83	1,205	51,27	Affirmative ☒	Negative ☐
	8	41094					74,07	1,169	51,38	Affirmative ☒	Negative ☐
	9	41095					74,67	1,207	51,17	Affirmative ☒	Negative ☐
	10	41096					75,90	1,232	51,08	Affirmative ☒	Negative ☐
	11	41097					76,15	1,191	51,34	Affirmative ☒	Negative ☐
	12	41098					74,59	1,084	51,99	Affirmative ☒	Negative ☐
	13	41099					74,31	1,081	51,86	Affirmative ☒	Negative ☐
	14	41100					74,83	1,198	51,34	Affirmative ☒	Negative ☐
	15	41101					74,76	1,190	51,75	Affirmative ☒	Negative ☐
	16	41102					75,46	1,175	51,82	Affirmative ☒	Negative ☐
2	1	41105				50-80	-50,63	1,247	49,41		
	1	41106				100	-76,82	1,327	50,54	Affirmative ☒	Negative ☐
	2	41107					-76,24	1,316	50,79	Affirmative ☒	Negative ☐
	3	41108					-74,66	1,203	50,16	Affirmative ☒	Negative ☐
	4	41109					-75,62	1,252	51,13	Affirmative ☒	Negative ☐
	5	41110					-73,68	1,100	51,16	Affirmative ☒	Negative ☐
	6	41111					-75,00	1,253	50,71	Affirmative ☒	Negative ☐
	7	41112					-76,03	1,296	50,84	Affirmative ☒	Negative ☐
	8	41113					-75,57	1,331	50,66	Affirmative ☒	Negative ☐
	9	41114					-76,17	1,313	50,44	Affirmative ☒	Negative ☐
	10	41115					-75,23	1,287	51,35	Affirmative ☒	Negative ☐
	11	41116					-73,90	1,136	51,56	Affirmative ☒	Negative ☐
	12	41117					-74,23	1,153	50,94	Affirmative ☒	Negative ☐
	13	41118					-75,90	1,258	51,68	Affirmative ☒	Negative ☐
	14	41119					-76,19	1,332	50,95	Affirmative ☒	Negative ☐
	15	41120					-75,72	1,293	50,26	Affirmative ☒	Negative ☐

Remarks:

1) Out of voltage tolerance, additional impulses were applied instead.

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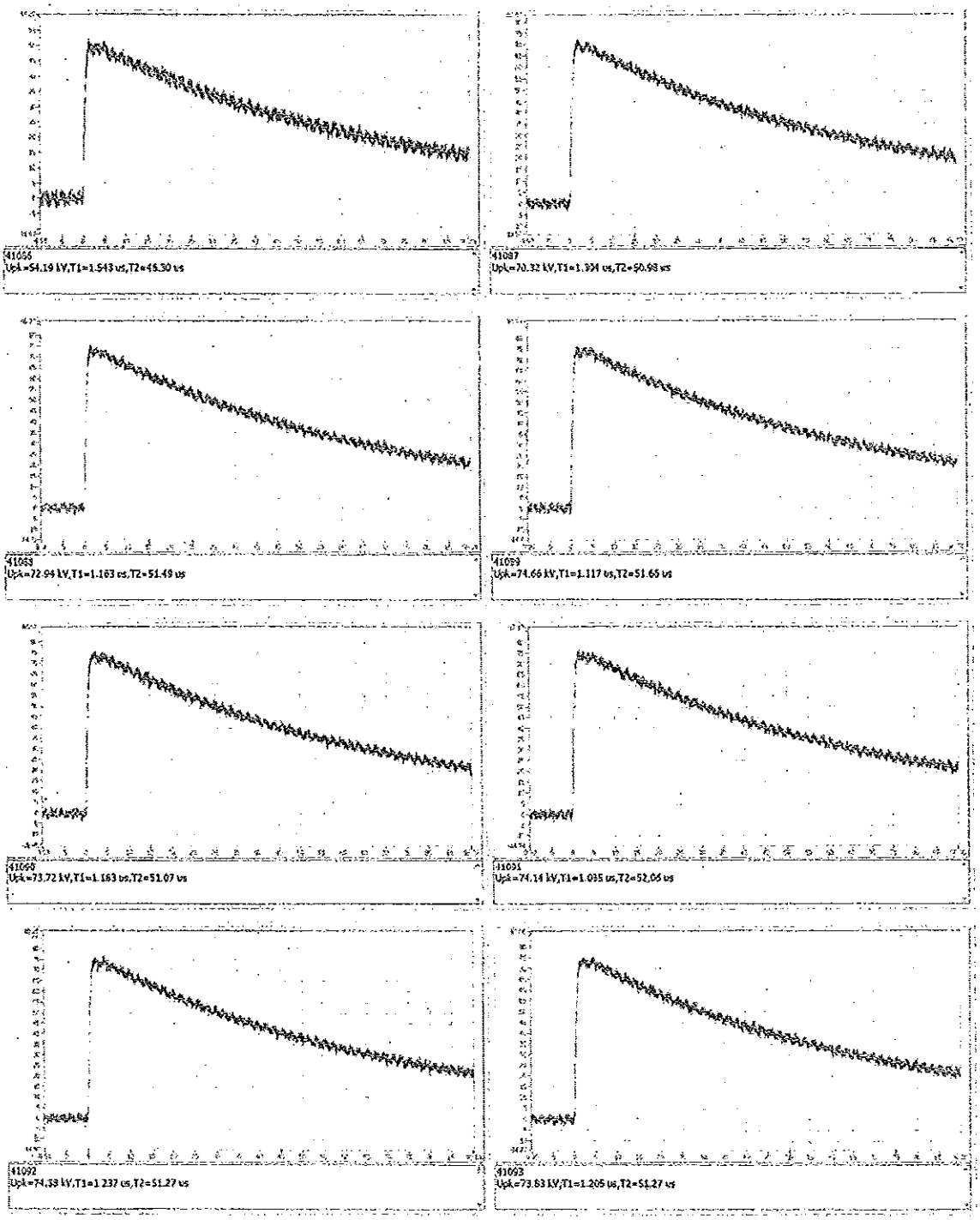
4.1.7 Oscillograms:

4.1.7.1 S. No:1 / Positive Impulses



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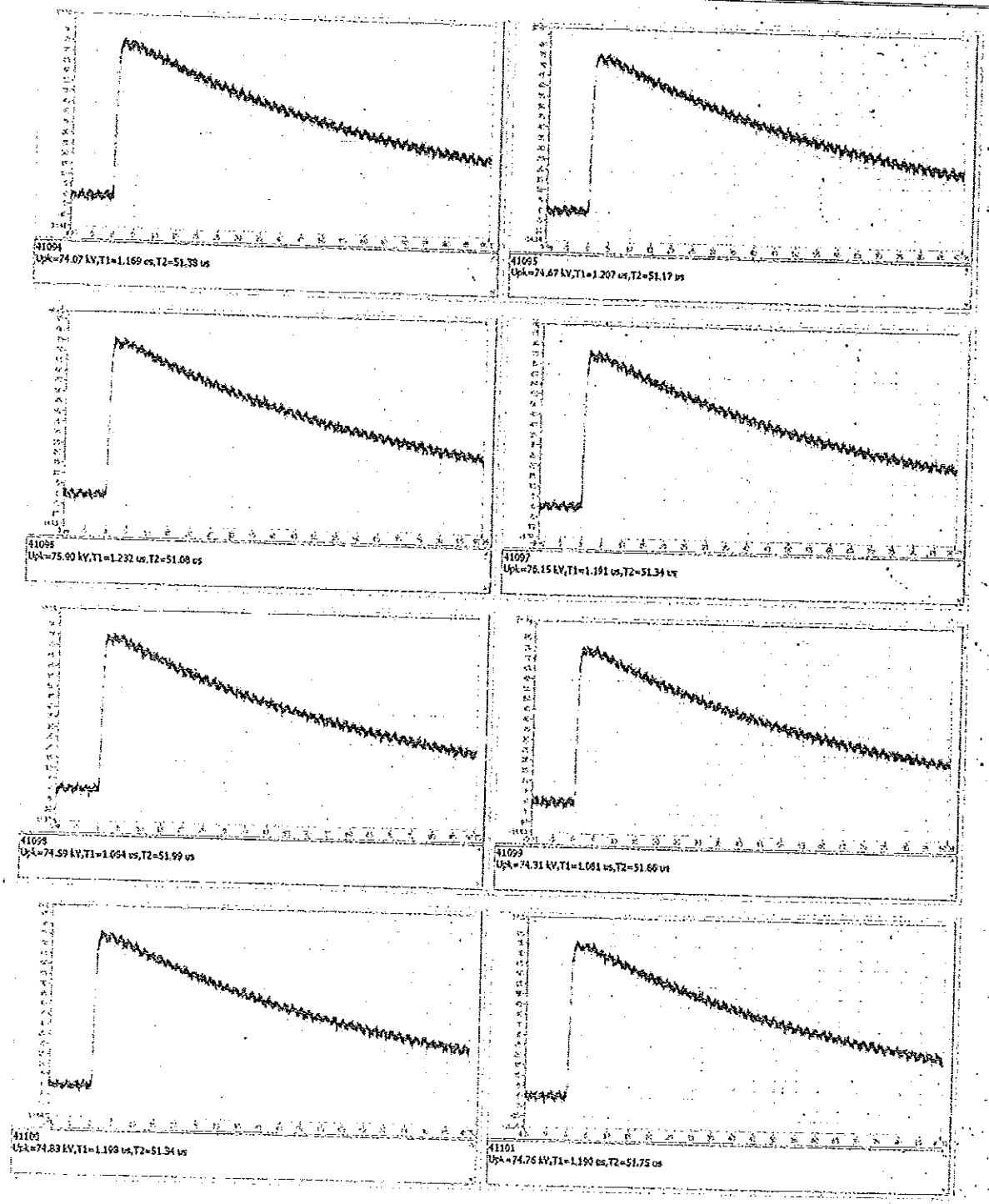

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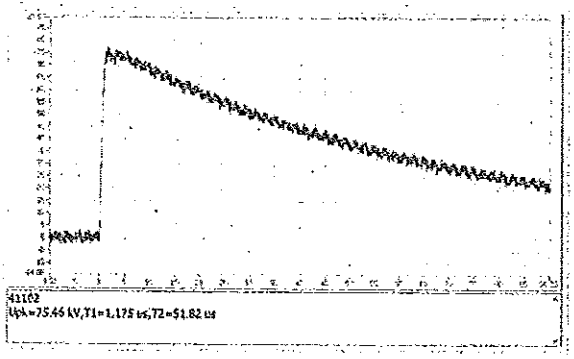
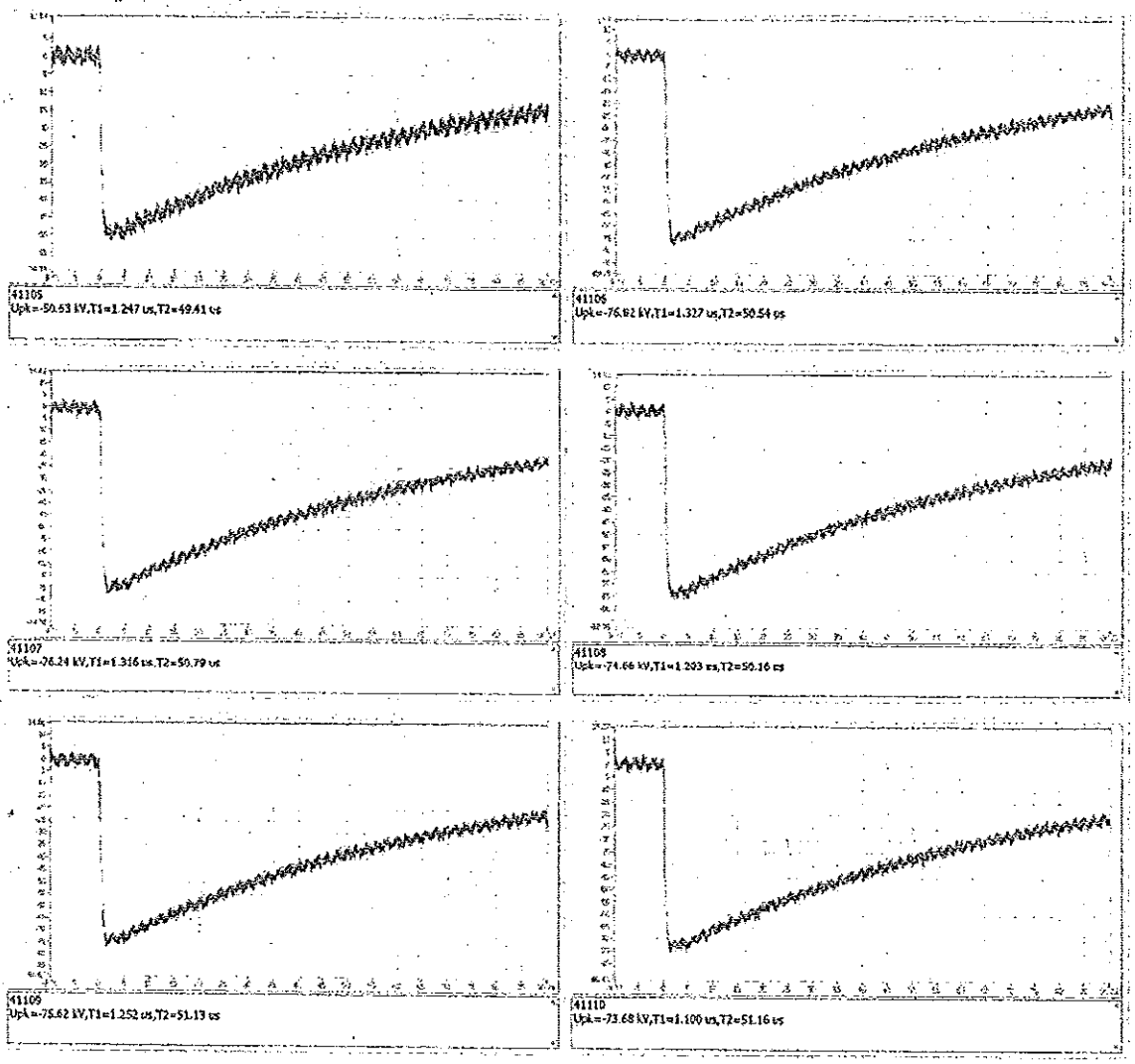


4.1.7.2 S. No:2 / Negative Impulses



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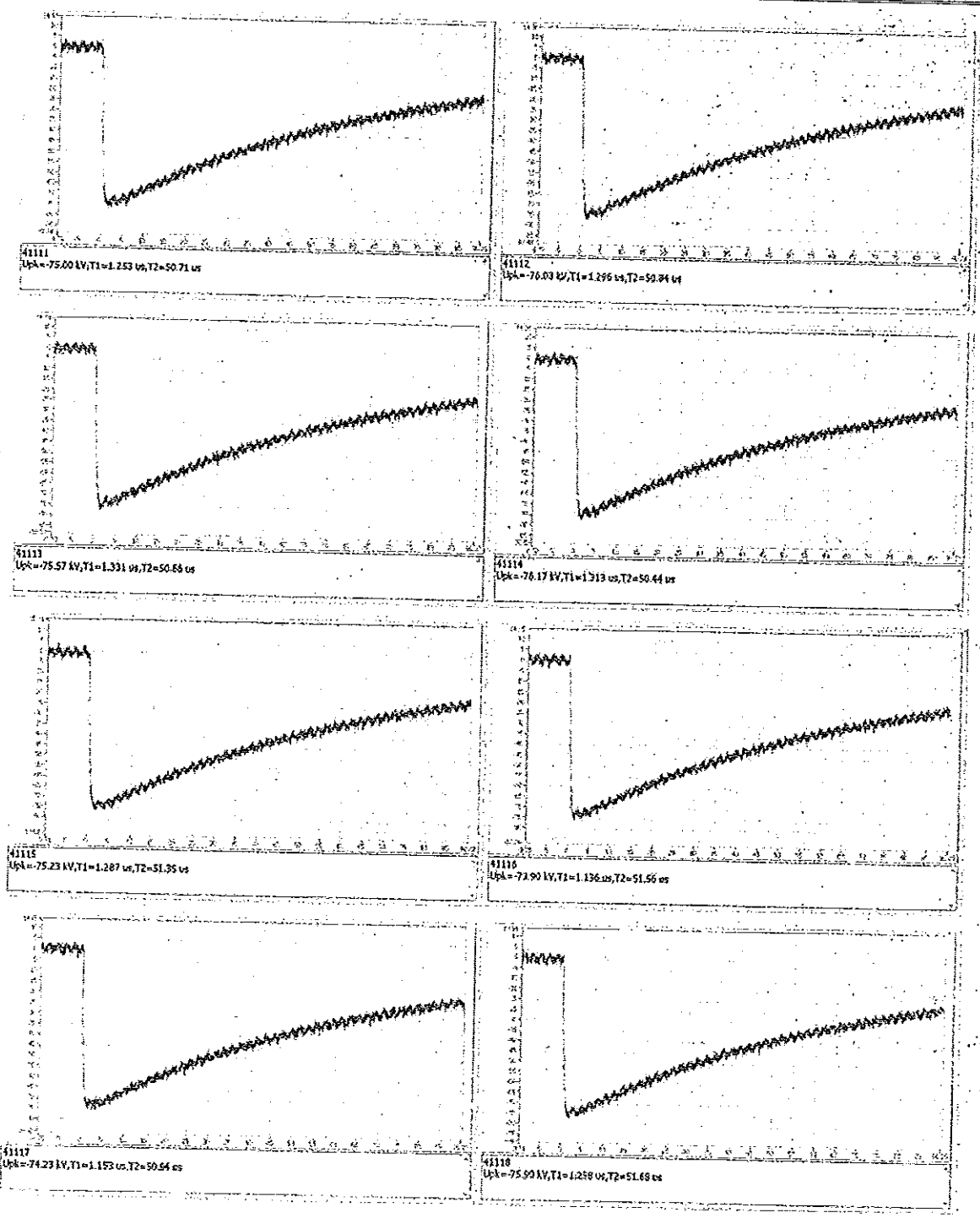

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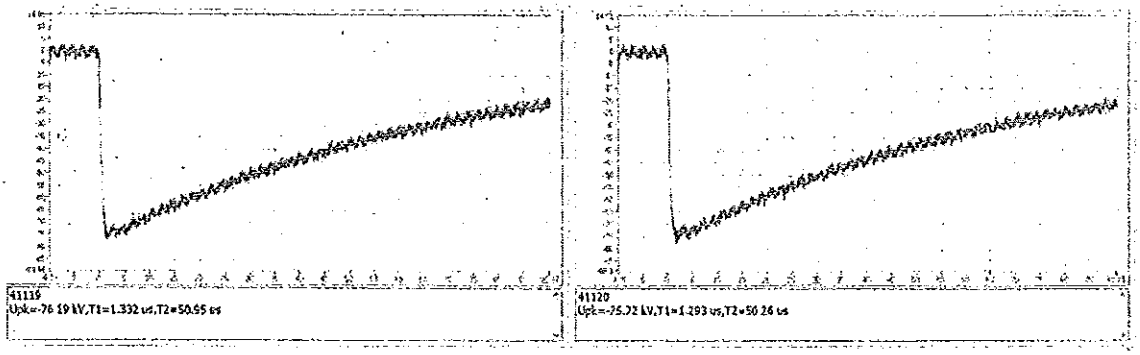

4.1.8 Remarks, Comments and Statements of Compliance:

- Test voltage were applied as per IEC 60273:1990 Table-1
- Tests were applied without considering atmospheric correction.
- Measurement Uncertainty of K003: U_i: 2,206% t_1: 4,791 % t_2: 2,620%
- The insulator was mounted vertically upright on a horizontal earthed metal support consisting of a U-channel section with the flanges pointing downwards which has a width about equal to the diameter of the mounting face of the insulator and a length longer than twice the height of the insulator, and was placed 1,1 m above ground.
- A cylindrical conductor, maintained in the horizontal plane and perpendicular to the earthed support, was attached to the top of the insulator. The length of the conductor was longer than 1,5 times the height of the insulator and it was extended 1 m on each side of the insulator axis. The diameter of the conductor was 30 mm.
- 12 kV indoor type post insulator with Nikdim brand, PAM-10 type and 9511106 / T4 serial number, has been tested and passed successfully to the Dry Lightning-Impulse Withstand Voltage Test as per IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5 the withstand voltage procedure.

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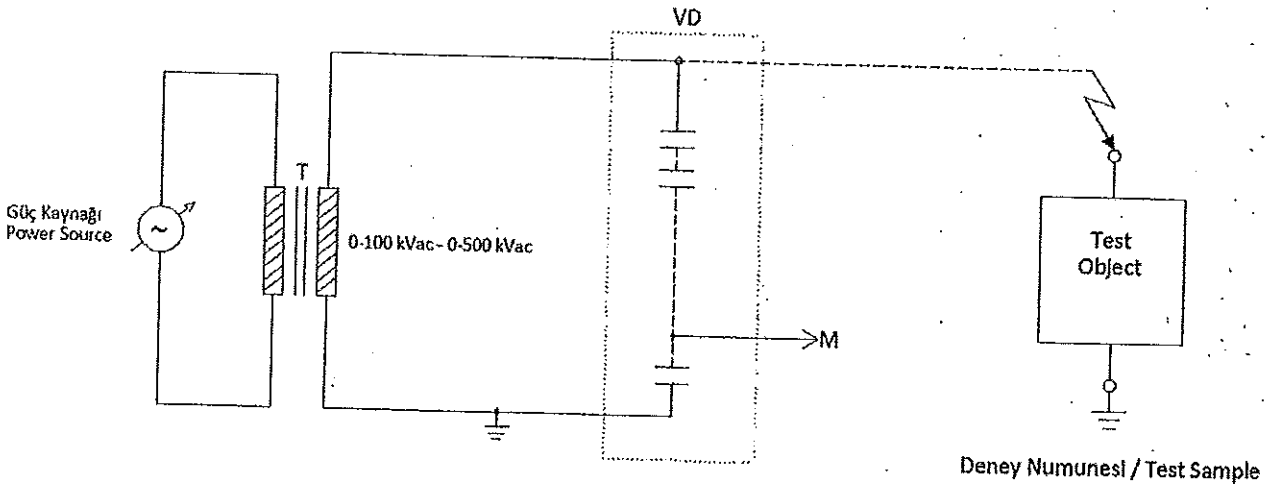
4.2 Dry Power-Frequency Withstand Voltage Test:

4.1.1	Sample Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000	
4.1.2	Test Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7 IEC 60060-1: 2010 Clause 6 IEC 60273: 1990	
4.1.3	Equipment Used	:	Baur / 100 kVac High Voltage Test System (K001) Madgetech / Environmental Conditions of the Recorder (K274)	
4.1.4	Environmental Conditions	:	Ambient Temperature	: 29,2 °C
			Ambient Humidity	: 56,1 %RH
			Air Pressure	: 1009,2 mbar
4.1.5	Test Circuit Diagram	:		



VD : Kapasitif Gerilim Bölücü / Capacitive Voltage Divider
T : 0 - 100 kVac - 0 - 500 kVac Test Trafosu / 0 - 100 kVac - 0-500 kVac Test Transformer
F : Metal Gövde / Frame

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4.2.5 Test Criteria and Measurement Results:

S. No	Voltage Ut Applied to	Earth Connected to	Insulated from Earth	Test Voltage (kVrms) (28 kVrms ±%1)	Frequency (Hz)	Time (sec.)	Result(s)	
1	Top of Insulator	Mounting Face of Insulator	-	38,05	50	60	Affirmative ☒	Negative ☐

4.2.6 Remarks, Comments and Statements of Compliance:

- Test voltage were applied as per IEC 60273:1990 Table-1
- Tests were applied without considering atmospheric correction.
- Measurement Uncertainty of K001: U_t: 1,409%
- The post insulator was mounted vertically upright on a horizontal earthed metal support consisting of a U-channel section with the flanges pointing downwards which has a width about equal to the diameter of the mounting face of the insulator and a length longer than twice the height of the insulator, and was placed 1,1 m above ground.
- A cylindrical conductor, maintained in the horizontal plane and perpendicular to the earthed support, was attached to the top of the insulator. The length of the conductor was longer than 1,5 times the height of the insulator and it was extended 1 m on each side of the insulator axis. The diameter of the conductor was 30 mm.
- 12 kV indoor type post insulator with Nikdim brand, PAM-10 type and 9511106 / T4 serial number, has been tested and passed successfully to the Dry Power-Frequency Withstand Voltage Test as per IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7.

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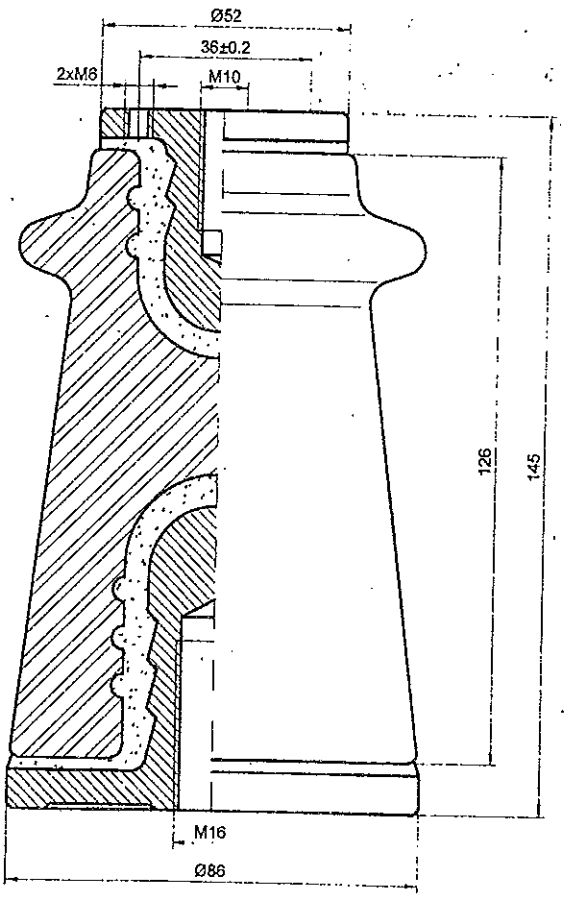
5. TECHNICAL DRAWING(S) of the TEST SAMPLE:



1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 12 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

					ND 92.01.00.00		
Alter	Numbe	№ of docum.	Signature	Date	Support insulators for indoor mounting type PAM 10	Stage	Mass / Масаб
Developed		Donev					1:1
Controled		Donev				Sheet 1	A1 sheet 1
Controled		Donev				"NIKDIM" OOD	

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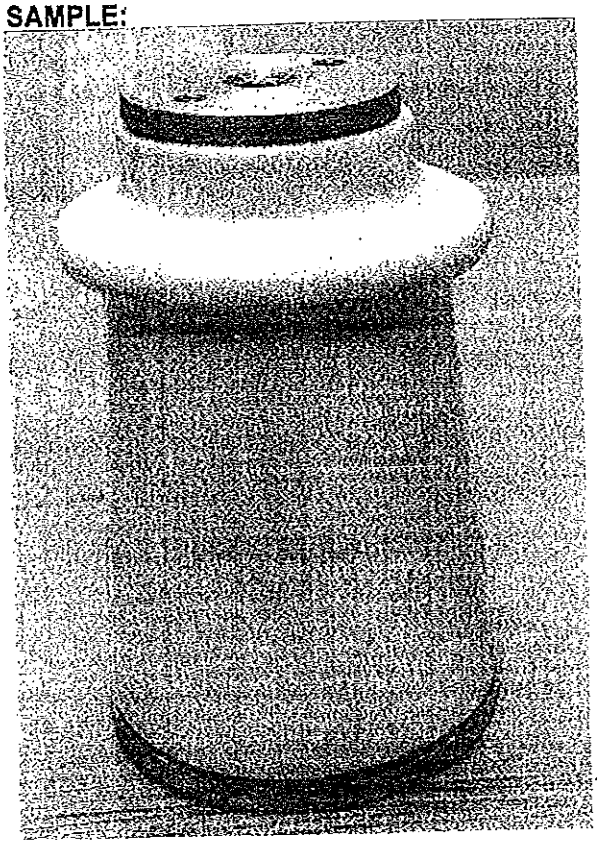
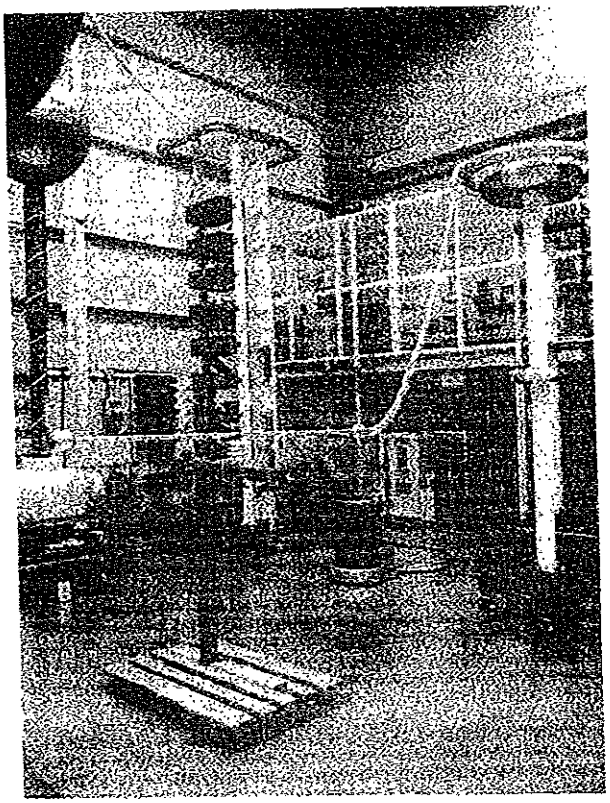
6. PHOTO(S) of the TEST SAMPLE:





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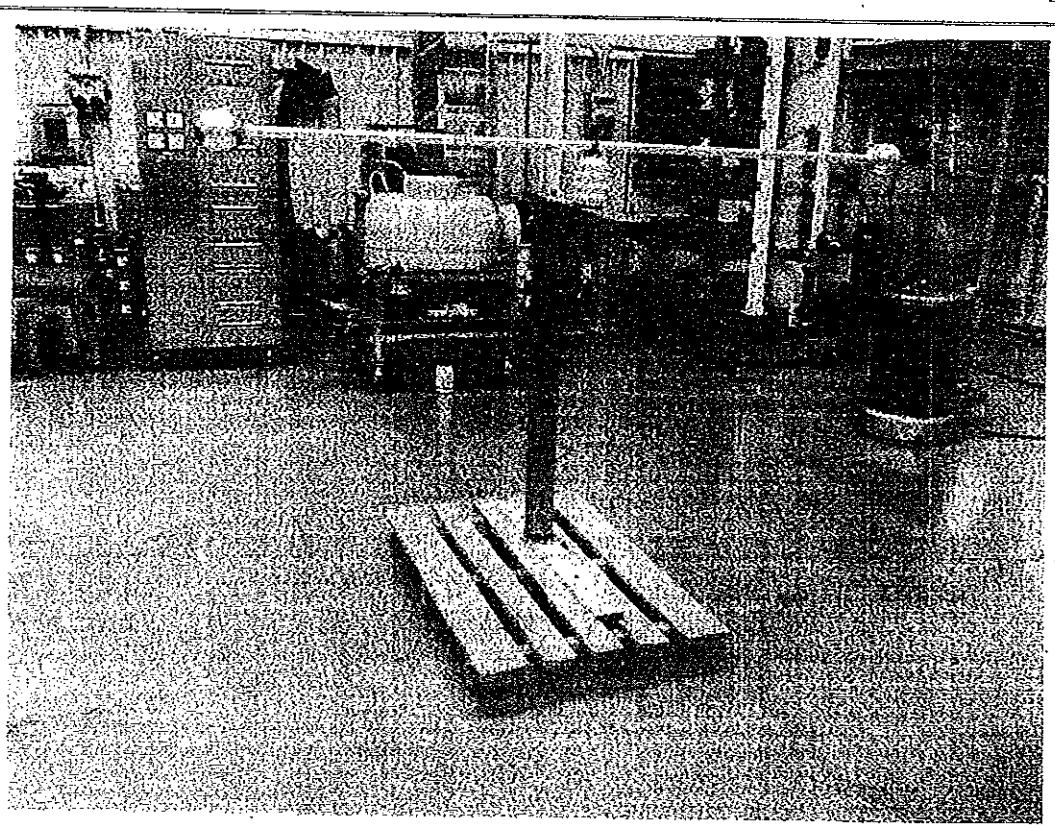

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ACCREDITATION CERTIFICATE
LI 1036

TEST REPORT
No. 45963 / 11.08.2017

1. CUSTOMER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
2. MANUFACTURER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
3. TESTED PRODUCT:	Indoor Post Insulator type PAM 10
4. REFERENCE STANDARD:	Customer requirements (IEC 60168:2001, clause 5.2.4)
5. PERFORMED TESTS:	Mechanical failing load test. Bending test
6. TEST DATE:	10.08.2017
7. TEST RESULTS:	The product passed the test.

The test report contains 5 pages and is edited in 4 copies, copy no.1 remain in laboratory and copies 2, 3, 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER, **HEAD OF TESTING TEAM,**

Dipl. Eng. Ion Bursiu **Dipl. Eng. Ion Dinu**

На основание чл.2 от ЗЗЛД

Warnings:

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b. *Publication and reproduction of the contents of this report in any other form unless its complete photocopying is not allowed without writing approval of Division to which laboratory belongs.*
c. *All signatures of the present report are original ones.*

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CONTENT

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1. IDENTIFICATION OF THE TEST PRODUCT

Type:	PAM 10
Serial / year:	2014
Technical Specification / Drawing:	Drawing no. ND 92.01.00.00 - Support insulators for indoor mounting type PAM 10
Contract / Test order:	705.2/876/03.08.2017
Internal test order:	23362/07.08.2017
Product receiving date:	08.08.2017
Product condition at receiving:	New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER

Maximum working voltage	12 kV
Mechanical failing load	4000 N (indicated by the customer)

3. TESTS PROGRAM

Mechanical failing load test. Bending test — Customer requirements (IEC 60168:2001, clause 5.2.4)

4. RESPONSIBLE FOR TEST

Dipl. Eng. Luminita Tascau

5. PRESENT AT THE TEST

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6. MECHANICAL FAILING LOAD TEST. BENDING TEST

Test date:	10.08.2017
Test standard:	Customer requirements (IEC 60168:2001, clause 5.2.4)
Atmospheric conditions:	t = 28 ^{0}C; RH = 53%
Equipment used:	• Manual lever hoist SAFETEX 3000 kg, manufacturer SC Delta Flex SRL Bucuresti • Tension load cell, model CTL 1000 kg, serial no. 201106182, manufacturer LAUMAS ELECTRONICA Italy, CC. no. F - 03/329/2017, SC GELUTECH Laboratory of Forces SRL
Test procedure:	The post insulator was subjected to a bending load to verify the mechanical failing load of 4000 N as specified in Annex 1 to the contract. The load was applied perpendicular to the axis of the post insulator, to the free end (see Photo 1). The specified bending load was reached.
Test results:	The product passed the test.

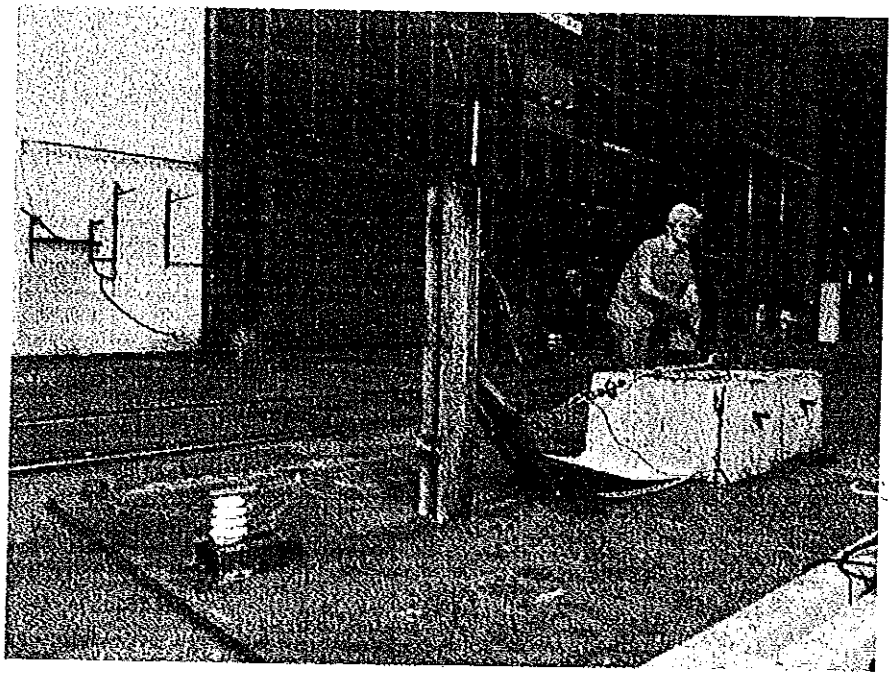

Photo 1

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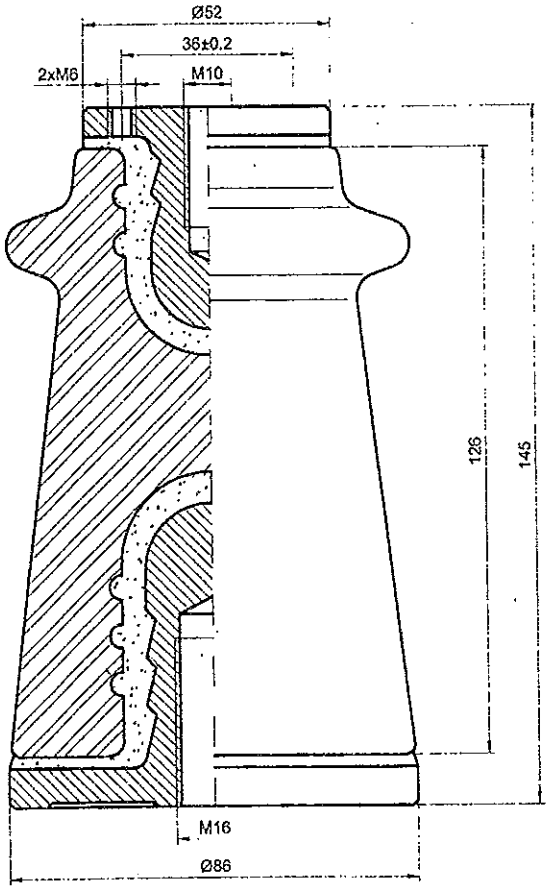
Annex 1



1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 12 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

					ND 92.01.00.00	
Alter	Numbe	Na of docum.	Signature	Date	Support insulators for indoor mounting type PAM 10	Stage / Mass Мащаб: 1:1
Developed		Donev				Sheet 1 / All sheet 1
Controled		Donev				
Controled		Donev				"NIKDIM" OOD

– End of test report –

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www.hilkar.com

TÜRKAK
AB-0665-T

AB-0665-T
1707096
07.2017

TEST REPORT
DENEY RAPORU

Customer Name *Müşterinin Adı*	:	Nikdim LTD.
Customer Address *Müşterinin Adresi*	:	80, 23-rd Pehoten Shipchenski polk blvd. 6100 Kananlak, Bulgaria
Description of Sample *Numunenin Tanımı*	:	24 kV Indoor Type Post Insulator
Trade Mark / Type *Marka / Tip*	:	Nikdim / PAK-20
Test(s) Performed *Yapılan Deney(ler)*	:	Dry Lightning-Impulse Withstand Voltage Test Dry Power-Frequency Withstand Voltage Test
Test Standart(s) *Deney Standart(lar)ı*	:	IEC 60168: 1994 + A1: 1997 + A2: 2000
Serial Number(s) *Seri No(lar)*	:	9512101 / T3
Reception Date of Sample *Numune Kabul Tarihi*	:	15.07.2017
Test Date(s) *Deney Tarih(ler)i*	:	15.07.2017
Number of Pages of the Report *Raporun Sayfa Sayısı*	:	14
Test(s) Result(s) *Deney Sonuçları*	:	☒ **Passed** / *Geçti* ☐ **Failed** / *Geçmedi* ☐ **Other** / *Diğer*

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Deney Laboratuvarı olarak faaliyet gösteren HİLKAR, TÜRKAK'tan AB-0665-T ile TS EN ISO IEC 17025:2012 standardına göre akredite edilmiştir.

The Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for the Accreditation (EA) Multilateral Agreement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of test reports.

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The test and/or measurements results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları, bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

Seal *Mühür / Kaşe*	**Date** *Tarih*	**Person in Charge of Test** *Deney Sorumlusu*	**Approval** *Onaylayan*
HİLKAR DENEY LABORATUVARI	10.08.2017	На основание чл.2 от ЗЗЛД	

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ВЯРНО С ОРИГИНАЛА

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1. IDENTIFICATION OF THE TEST SAMPLE:

Description of the Sample	: 24 kV Indoor Type Post Insulator
Trade Mark / Type	: Nikdim / PAK-20
Serial Number	: 9512101 / T3
Technical Specification / Drawing	: See the Clause 5
Contract No	: FT.DNY-07.003.2017
Product Condition at Arrival	: New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:

Manufacturer	: Nikdim
Type	: PAK-20
Rated Voltage	: 24 kV
Power Frequency Withstand Voltage	: 50 kV
Lightning Impulse Withstand Voltage	: 125 kV
Creepage Distance	: 8,5 mm / kV
Material	: Porcelain C110
Color of Glaze	: White
Dimensions	: See the Clause 5

3. TEST(S) PROGRAM:

Witnessed By	:	Mr. Dechko Dechev
Dry Lightning-Impulse Withstand Voltage Test	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5
Dry Power-Frequency Withstand Voltage Test	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7

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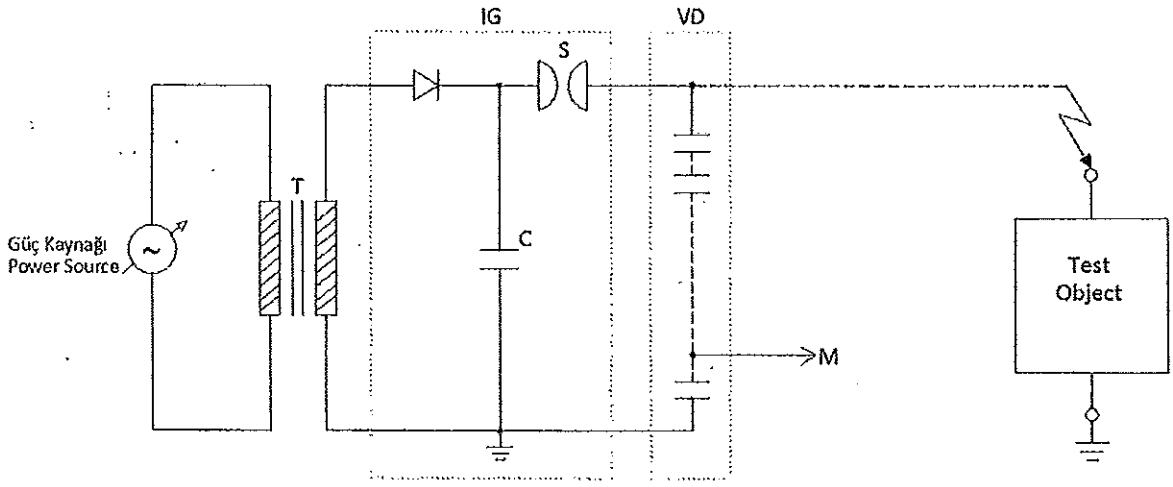
4. APPLIED TEST(S):

- Test results are only belong to the tested sample.
- The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2 which for a normal distribution corresponds to a coverage probability of approximately 95 %.

4.1 Dry Lightning-Impulse Withstand Voltage Test:

4.1.1	Sample Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5
4.1.2	Test Standard	:	IEC 60060-1: 2010 Clause 7 IEC 60273: 1990
4.1.3	Equipment Used	:	BHT / Lightning Impulse Test System (K003) Madgetech / Environmental Conditions Recorder (K274)
4.1.4	Environmental Conditions	:	Ambient Temperature : 27,9 °C Ambient Humidity : 60,4 %RH Air Pressure : 1007,1 mbar
4.1.5	Test Circuit Diagram	:	



Deney Numunesi / Test Sample

IG : Darbe Jeneratörü / Impulse Generator
VD : Hibrit Gerilim Bölücü / Hybrid Voltage Divider
T : Yükseltici Trafo / Step-up Transformer
F : Metal Gövde / Frame

ВЯРНО С ОРИГИНАЛА

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4.1.6 Test Criteria and Measurement Results:

S. No		Voltage Ut Applied to	Earth Connected to	Insulated from Earth	Test Voltage (%)	Test Voltage (kVpeak) (121,0 kVpeak ±%3)	Peak Time t_1 (µs) (1,2 µs ± 30 %)	Tail Time t_2 (µs) (50 µs ± 20 %)	Result(s)	
1	41050	Top of Insulator	Mounting Face of Insulator	-	50-80	84,34	1,178	50,90		
1	41051				100	119,09	1,226	50,60	Affirmative ☒	Negative ☐
2	41052					118,74	1,117	51,26	Affirmative ☒	Negative ☐
3	41053					119,14	1,198	50,77	Affirmative ☒	Negative ☐
4	41054					118,88	1,213	50,76	Affirmative ☒	Negative ☐
5	41055					118,89	1,125	51,50	Affirmative ☒	Negative ☐
6	41056					120,25	1,173	51,48	Affirmative ☒	Negative ☐
7	41057					119,57	1,196	51,15	Affirmative ☒	Negative ☐
8	41058					118,84	1,131	51,17	Affirmative ☒	Negative ☐
9	41059					119,78	1,177	51,45	Affirmative ☒	Negative ☐
10	41060					118,81	1,140	51,88	Affirmative ☒	Negative ☐
11	41061					118,92	1,195	50,86	Affirmative ☒	Negative ☐
12	41062					118,41	1,119	51,50	Affirmative ☒	Negative ☐
13	41063					119,81	1,233	50,95	Affirmative ☒	Negative ☐
14	41064					119,29	1,191	50,76	Affirmative ☒	Negative ☐
15	41065					119,94	1,246	50,67	Affirmative ☒	Negative ☐
2	41067				50-80	-84,52	1,307	50,19		
1	41068				100	-119,86	1,240	51,35	Affirmative ☒	Negative ☐
2	41069					-119,99	1,213	50,84	Affirmative ☒	Negative ☐
3	41070					-119,45	1,218	50,54	Affirmative ☒	Negative ☐
4	41071					-119,00	1,130	51,15	Affirmative ☒	Negative ☐
5	41072					-118,87	1,128	51,17	Affirmative ☒	Negative ☐
6	41073					-119,28	1,194	50,70	Affirmative ☒	Negative ☐
7	41074					-119,84	1,171	51,23	Affirmative ☒	Negative ☐
8	41075					-119,16	1,170	50,70	Affirmative ☒	Negative ☐
9	41076					-118,66	1,162	50,77	Affirmative ☒	Negative ☐
10	41077					-120,94	1,220	50,85	Affirmative ☒	Negative ☐
11	41078					-120,11	1,228	50,84	Affirmative ☒	Negative ☐
12	41079					-120,72	1,209	50,99	Affirmative ☒	Negative ☐
13	41080					-118,94	1,121	51,25	Affirmative ☒	Negative ☐
14	41081					-119,72	1,139	51,23	Affirmative ☒	Negative ☐
15	41082					-120,00	1,225	50,72	Affirmative ☒	Negative ☐

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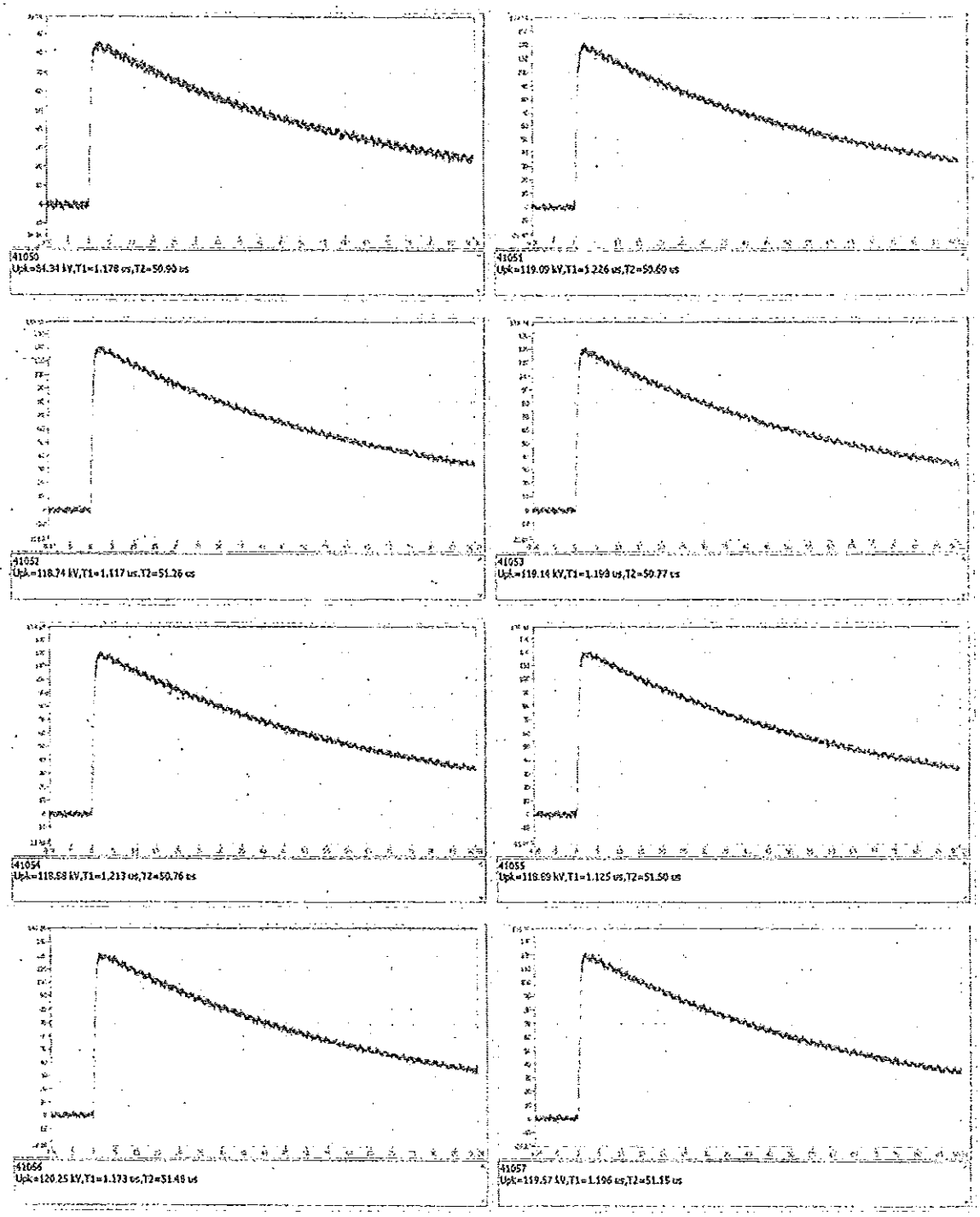
4.1.7 Oscillograms:

4.1.7.1 S. No:1 / Positive Impulses



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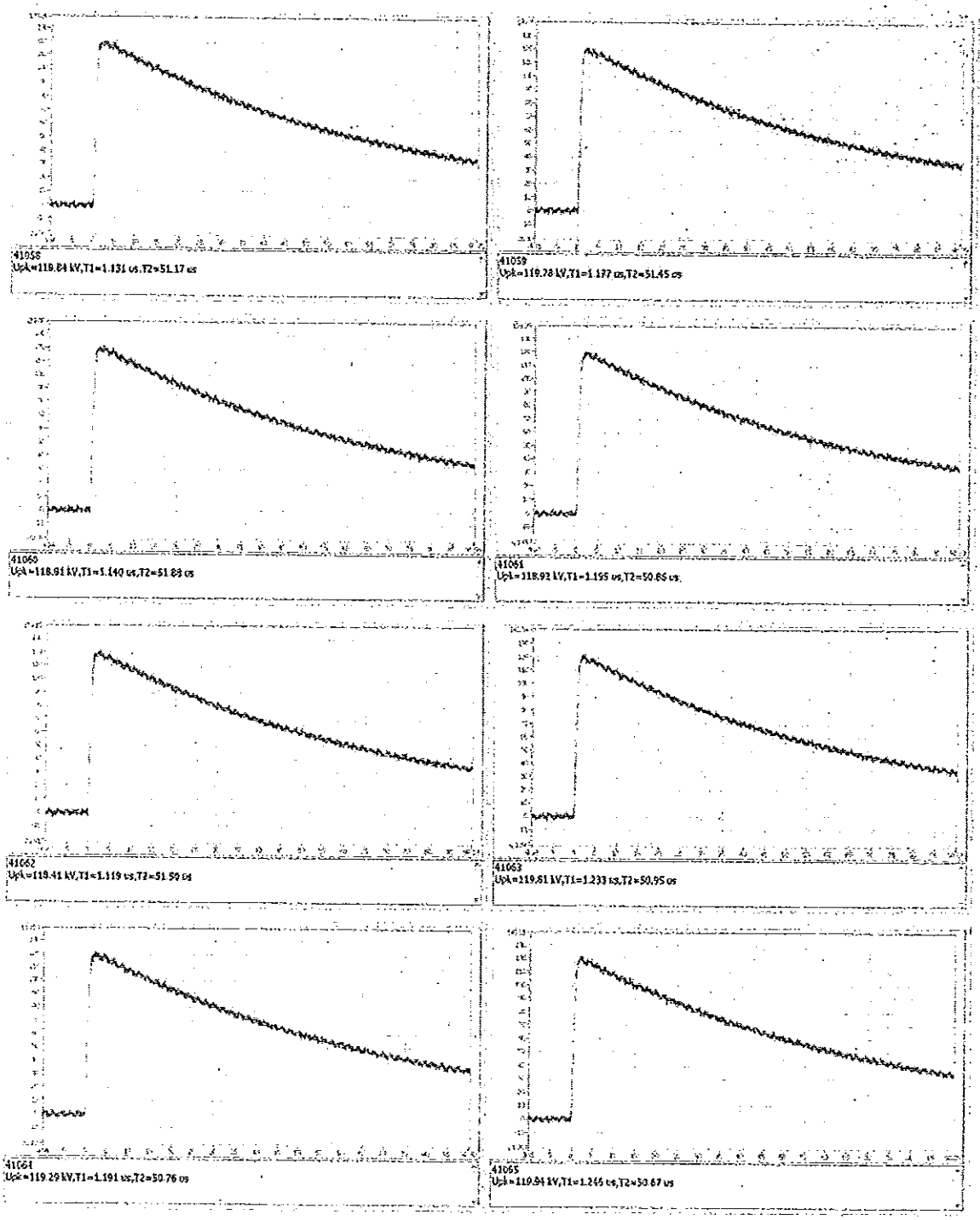

4.1.7.2 S. No:2 / Negative Impulses

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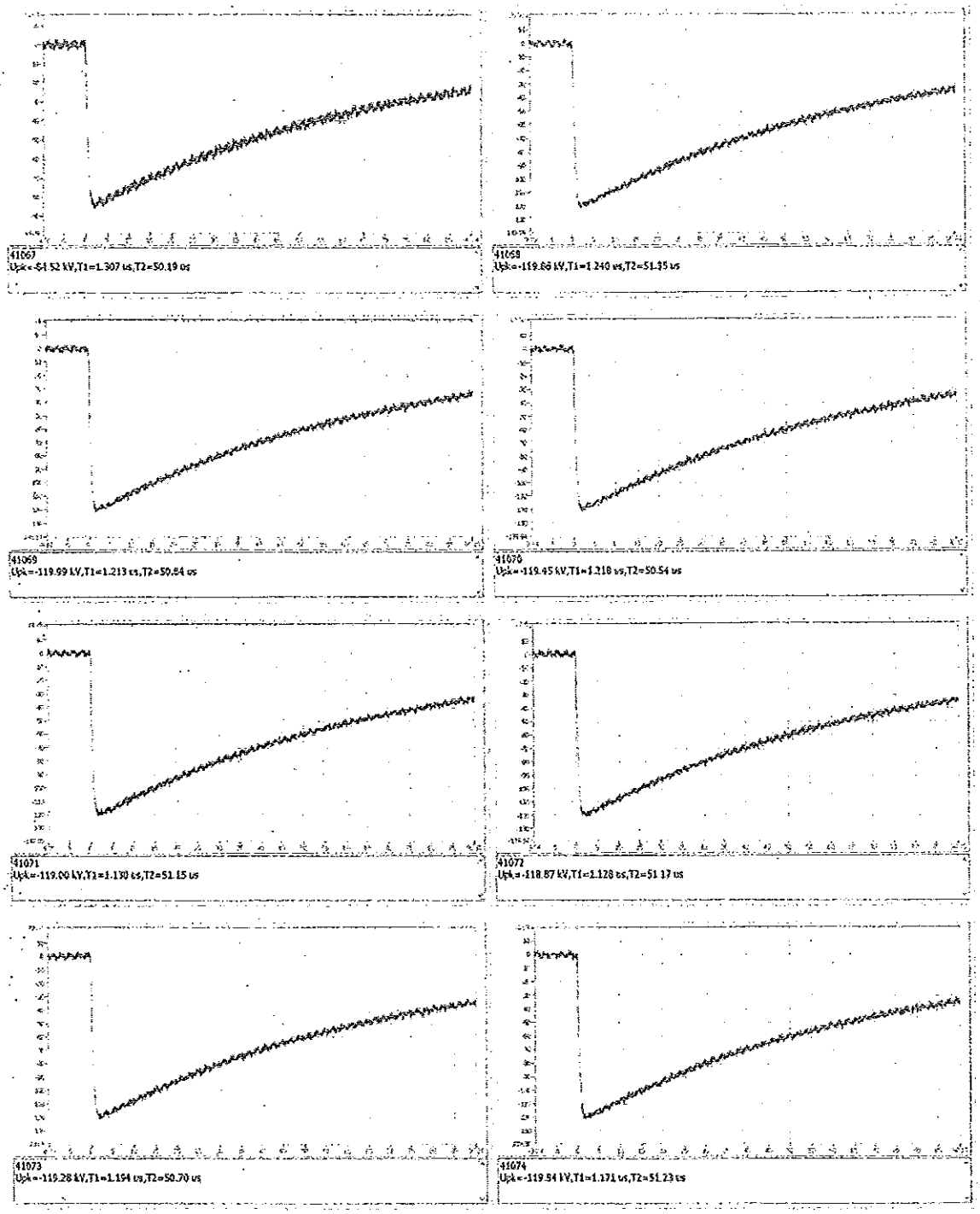

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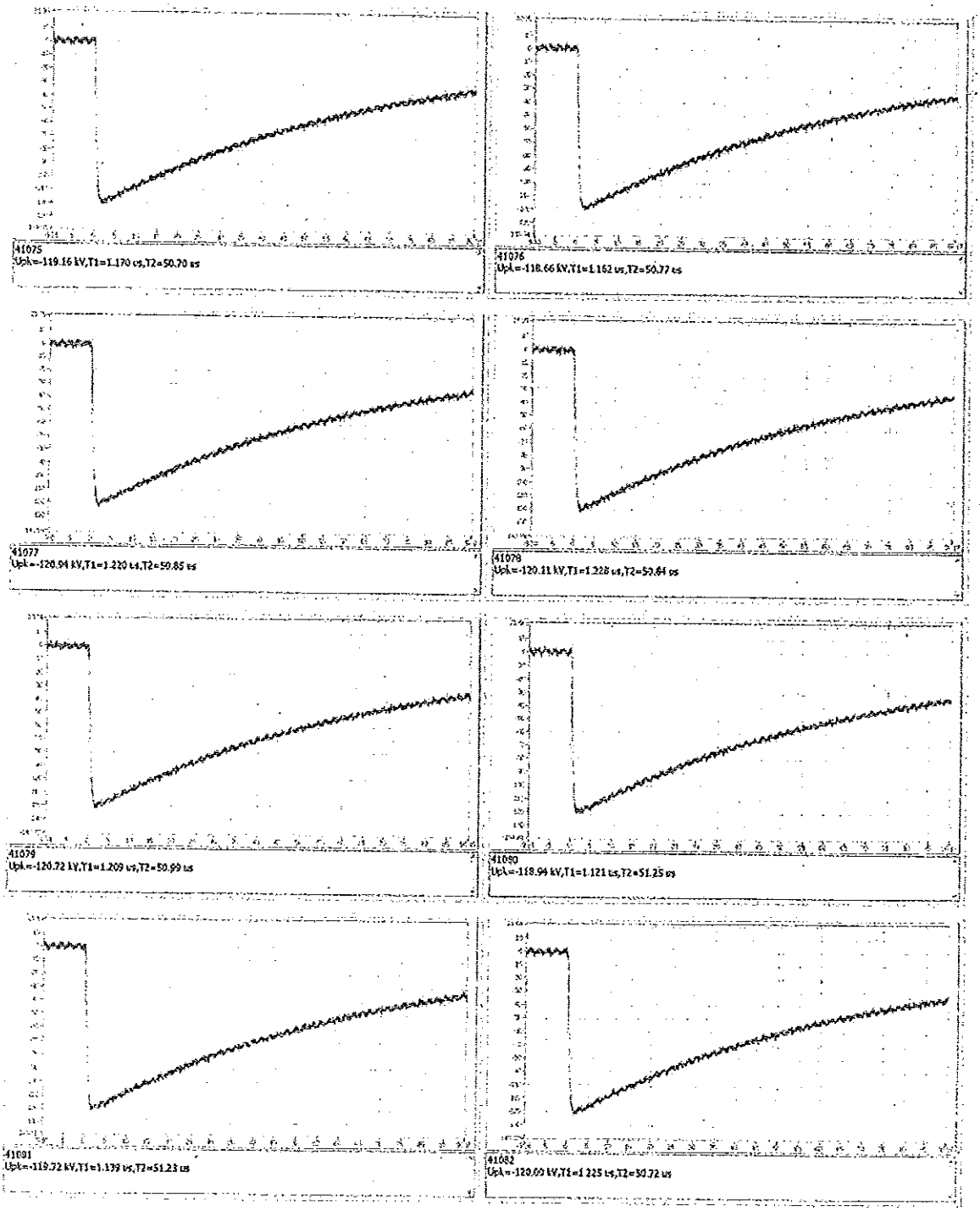

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4.1.8 Remarks, Comments and Statements of Compliance:

- Test voltage were applied as per IEC 60273:1990 Table-1
- Tests were applied with atmospheric correction.
  K1 = 0,968 K2 = 1,000 Kt = 0,968
- Measurement Uncertainty of K003: U_t: 2,206% t_1: 4,791 % t_2: 2,620%
- The insulator was mounted vertically upright on a horizontal earthed metal support consisting of a U-channel section with the flanges pointing downwards which has a width about equal to the diameter of the mounting face of the insulator and a length longer than twice the height of the insulator, and was placed 1,1 m above ground.
- A cylindrical conductor, maintained in the horizontal plane and perpendicular to the earthed support, was attached to the top of the insulator. The length of the conductor was longer than 1,5 times the height of the insulator and it was extended 1 m on each side of the insulator axis. The diameter of the conductor was 30 mm.
- 24 kV indoor type post insulator with Nikdim brand, PAK-20 type and 9512101 / T3 serial number, has been tested and passed successfully to the Dry Lightning-Impulse Withstand Voltage Test as per IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5 the withstand voltage procedure.

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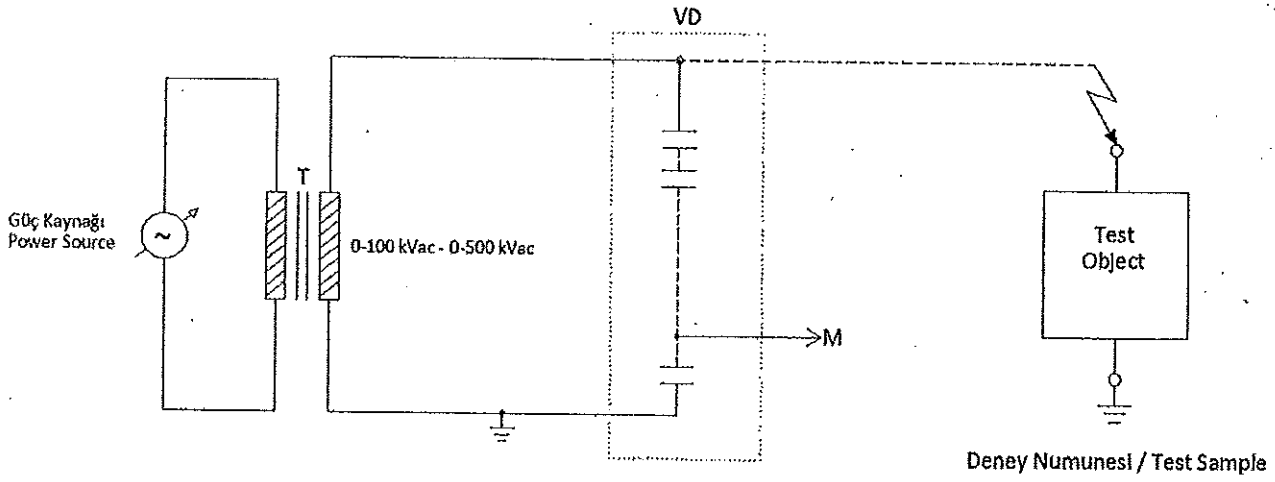
4.2 Dry Power-Frequency Withstand Voltage Test:

4.1.1	Sample Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000
4.1.2	Test Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7 IEC 60060-1: 2010 Clause 6 IEC 60273: 1990
4.1.3	Equipment Used	:	Baur / 100 kVac High Voltage Test System (K001) Madgetech / Environmental Conditions of the Recorder (K274)
4.1.4	Environmental Conditions	:	Ambient Temperature : 27,9 °C Ambient Humidity : 60,4 %RH Air Pressure : 1007,1 mbar
4.1.5	Test Circuit Diagram	:	



VD : Kapasitif Gerilim Bölücü / Capacitive Voltage Divider
T : 0 - 100 kVac - 0 - 500 kVac Test Trafosu / 0 - 100 kVac - 0-500 kVac Test Transformer
F : Metal Gövde / Frame

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4.2.5 Test Criteria and Measurement Results:

S. No	Voltage Ut Applied to	Earth Connected to	Insulated from Earth	Test Voltage (kVrms) (50 kVrms ±%1)	Frequency (Hz)	Time (sec.)	Result(s)	
1	Top of Insulator	Mounting Face of Insulator	-	50,08	50	60	Affirmative ☒	Negative ☐

4.2.6 Remarks, Comments and Statements of Compliance:

- Test voltage were applied as per IEC 60273:1990 Table-1
- Tests were applied without considering atmospheric correction.
- Measurement Uncertainty of K001: U_t: 1,409%
- The post insulator was mounted vertically upright on a horizontal earthed metal support consisting of a U-channel section with the flanges pointing downwards which has a width about equal to the diameter of the mounting face of the insulator and a length longer than twice the height of the insulator, and was placed 1,1 m above ground.
- A cylindrical conductor, maintained in the horizontal plane and perpendicular to the earthed support, was attached to the top of the insulator. The length of the conductor was longer than 1,5 times the height of the insulator and it was extended 1 m on each side of the insulator axis. The diameter of the conductor was 30 mm.
- 24 kV indoor type post insulator with Nikdim brand, PAK-20 type and 9512101 / T3 serial number, has been tested and passed successfully to the Dry Power-Frequency Withstand Voltage Test as per IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7.

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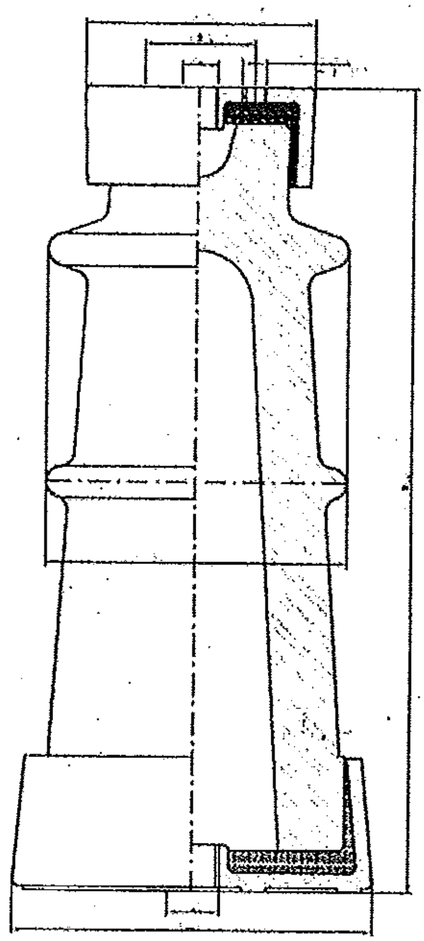
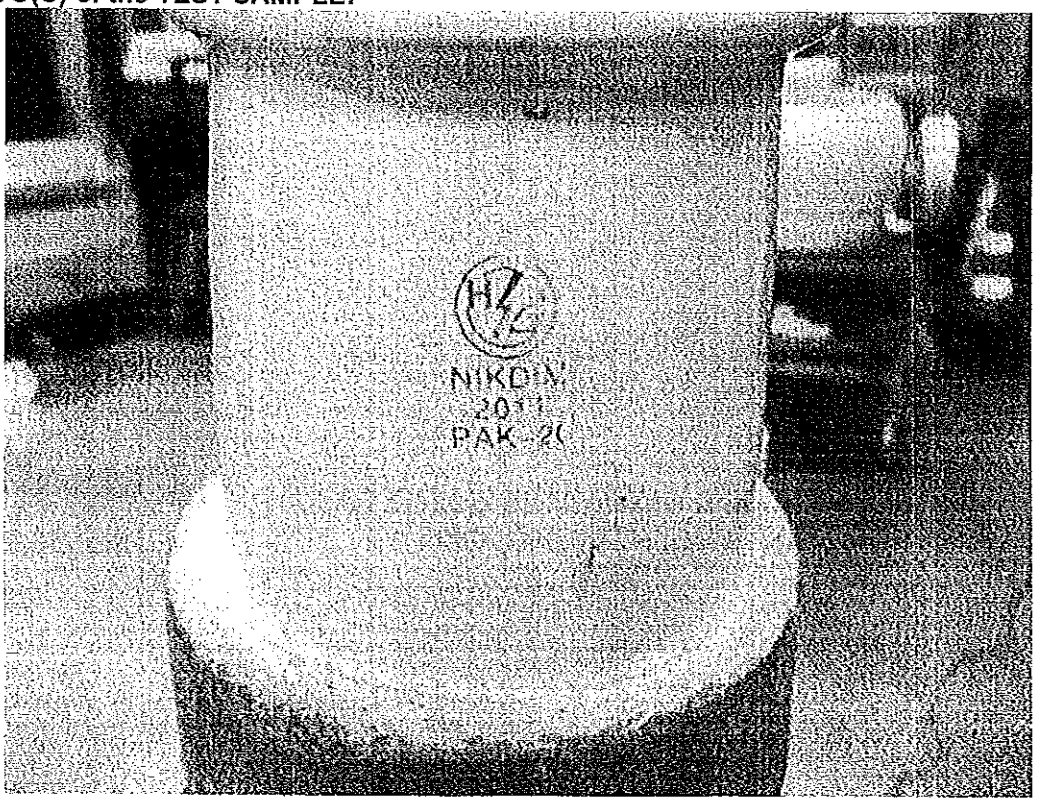
5. TECHNICAL DRAWING(S) of the TEST SAMPLE:

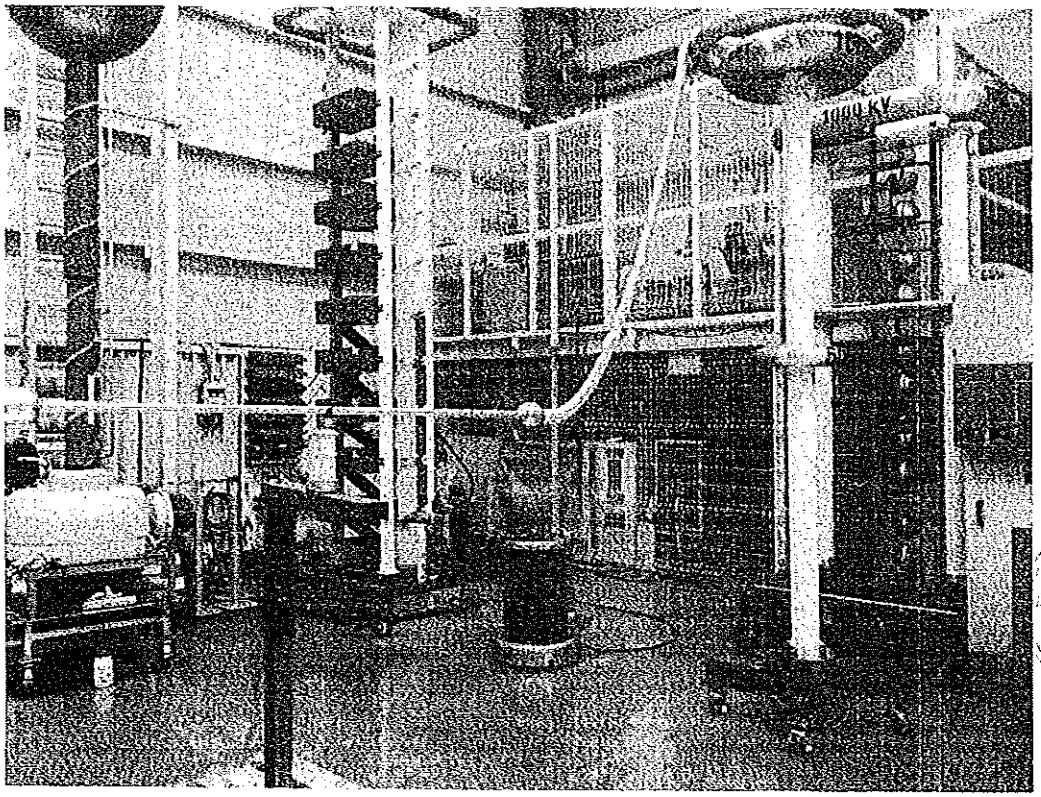


1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 24 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

Alter	Number	№ of docum.	Signature	Date	ND 92.13.00.00			
Developed	Iliev				Support insulators for indoor mounting type PAK 20	Stage	Mass	Мащаб
Controled	Donov							1:1
						Sheet 1	All sheet 1	
Controled	Donov					"NIKDIM" OOD		

6. **PHOTO(S) of the TEST SAMPLE:**





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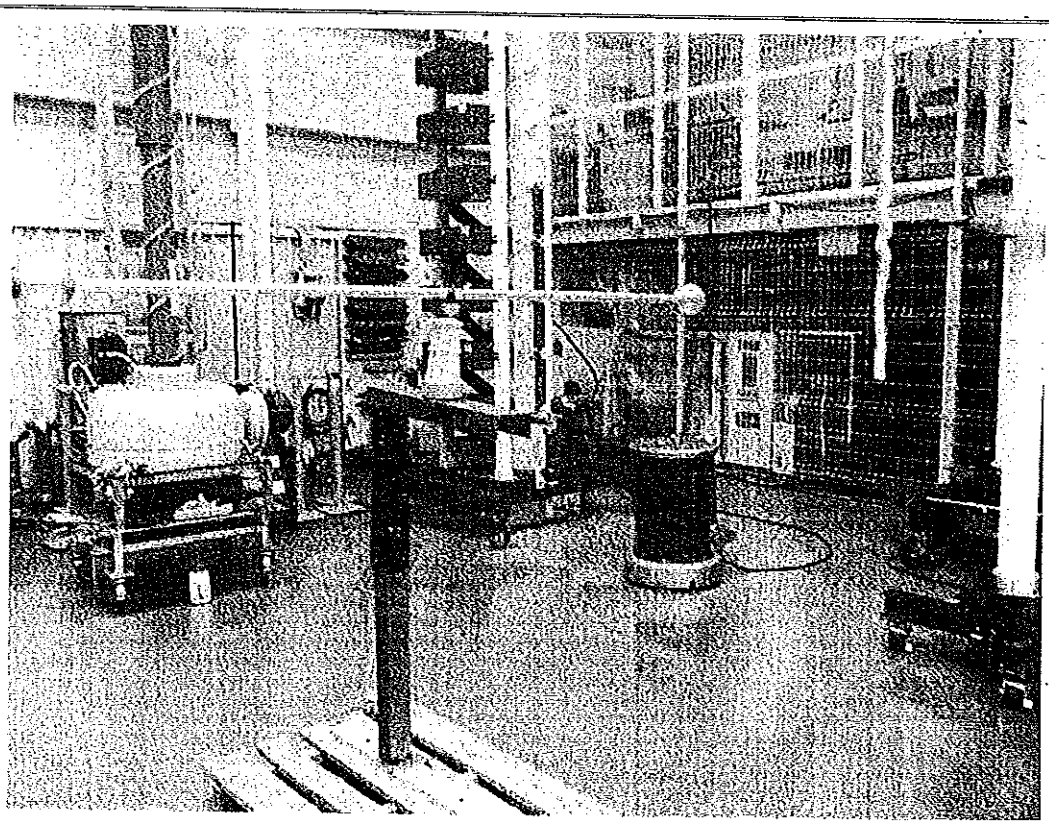

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Phone: + 40 0351 402425, 404888; Fax: + 40 0351 404890
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SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICATE
LI 1036

TEST REPORT
No. 45967 / 11.08.2017

1. CUSTOMER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
2. MANUFACTURER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
3. TESTED PRODUCT:	Indoor Post Insulator type PAK 20
4. REFERENCE STANDARD:	Customer requirements (IEC 60168:2001, clause 5.2.4)
5. PERFORMED TESTS:	Mechanical failing load test. Bending test
6. TEST DATE:	10.08.2017
7. TEST RESULTS:	The product passed the test.

The test report contains 5 pages and is edited in 4 copies, copy no.1 remain in laboratory and copies 2, 3, 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER,

Dipl. Eng. Ion Burciu

HEAD OF TESTING TEAM,

Dipl. Eng. Ion Dinu

На основание чл.2 от ЗЗЛД

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ВЯРНО С ОРИГИНАЛА

CONTENT

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1. IDENTIFICATION OF THE TEST PRODUCT

Type:	PAK 20
Serial / year:	2011
Technical Specification / Drawing:	Drawing no. ND 92.13.00.00 - Support insulators for indoor mounting type PAK 20
Contract / Test order:	705.2/876/03.08.2017
Internal test order:	23362/07.08.2017
Product receiving date:	08.08.2017
Product condition at receiving:	New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER

Maximum working voltage	24 kV
Mechanical failing load	4000 N (Indicated by the customer)

3. TESTS PROGRAM

Mechanical failing load test. Bending test — Customer requirements (IEC 60168:2001, clause 5.2.4)

4. RESPONSIBLE FOR TEST

Dipl. Eng. Luminita Tascau

5. PRESENT AT THE TEST

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6. MECHANICAL FAILING LOAD TEST. BENDING TEST

Test date:	10.08.2017
Test standard:	Customer requirements (IEC 60168:2001, clause 5.2.4)
Atmospheric conditions:	t = 28 ^{0}C; RH = 53%
Equipment used:	• Manual lever hoist SAFETEX 3000 kg, manufacturer SC Delta Flex SRL Bucuresti • Tension load cell, model CTL 1000 kg, serial no. 201106182, manufacturer LAUMAS ELECTRONICA Italy, CC no. F - 03/329/2017, SC GELUTECH Laboratory of Forces SRL
Test procedure:	The post insulator was subjected to a bending load to verify the mechanical failing load of 4000 N as specified in Annex 1 to the contract. The load was applied perpendicular to the axis of the post insulator, to the free end (see Photo 1). The specified bending load was reached.
Test results:	The product passed the test.

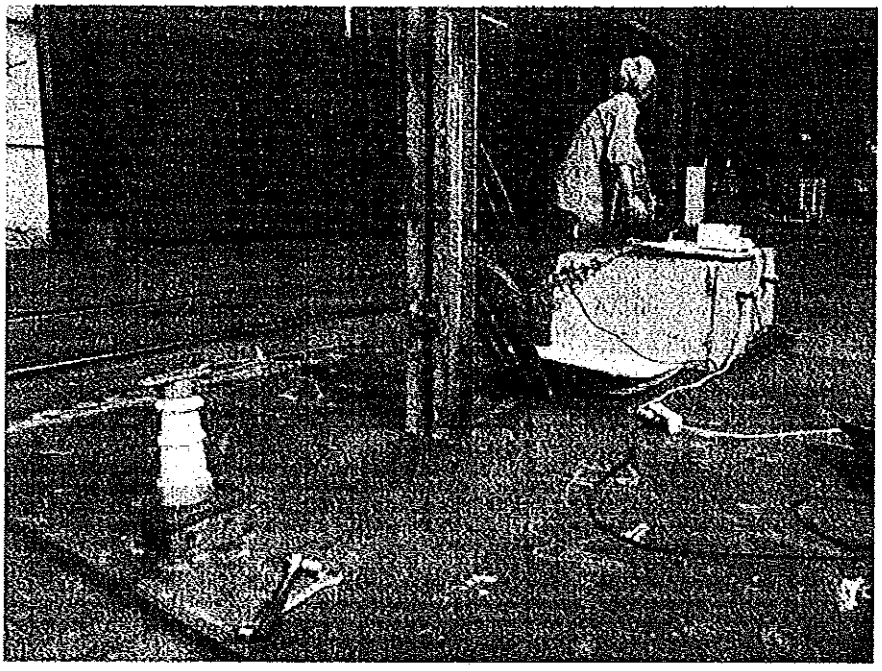

Photo 1

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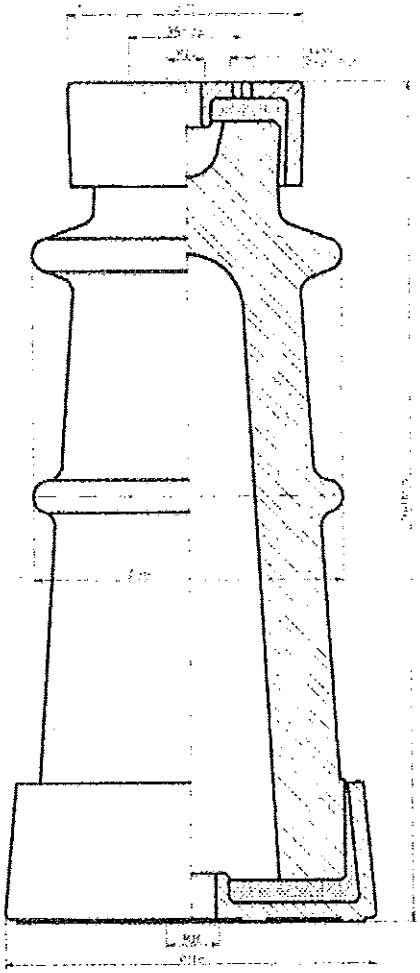
Annex 1



1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 24 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

Alter	Numbe	№ of clocum.	Signature	Date	ND 92.13.00.00		
					Support insulators for Indoor mounting type PAK 20	Stage	Mass / Мащаб
Developed		Iliev					1:1
Controled		Donev				Sheet 1	All sheet 1
Controled		Donev				"NIKDIM" OOD	

– *End of test report* –

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TEST LABORATORY / DENEY LABORATUVARI

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Tel : +90 264 275 55 40 Fax : +90 264 275 12 76

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AB-0665-T
1707098
07.2017

TEST REPORT
DENEY RAPORU

Customer Name *Müşterinin Adı*	:	Nikdim LTD.
Customer Address *Müşterinin Adresi*	:	80, 23-rd Pehoten Shipchenski polk blvd. 6100 Kananlak, Bulgaria
Description of Sample *Numunenin Tanımı*	:	24 kV Indoor Type Post Insulator
Trade Mark / Type *Marka / Tip*	:	Nikdim / PAM-20
Test(s) Performed *Yapılan Deney(ler)*	:	Dry Lightning-Impulse Withstand Voltage Test Dry Power-Frequency Withstand Voltage Test
Test Standart(s) *Deney Standart(lar)ı*	:	IEC 60168: 1994 + A1: 1997 + A2: 2000
Serial Number(s) *Seri No(lar)*	:	9511107 / T5
Reception Date of Sample *Numune Kabul Tarihi*	:	15.07.2017
Test Date(s) *Deney Tarih(ler)i*	:	15.07.2017
Number of Pages of the Report *Raporun Sayfa Sayısı*	:	14
Test(s) Result(s) *Deney Sonuçları*	:	☒ **Passed** / *Geçti* ☐ **Failed** / *Geçmedi* ☐ **Other** / *Diğer*

HİLKAR is accredited by TÜRKAK under registration number AB-0665-T for TS EN ISO IEC 17025:2012 as test laboratory.

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The test and/or measurements results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları, bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

Seal	**Date** *Tarih*	**Person in Charge of Test**	**Approval**
Mühür / Kaşe	10.08.2017	На основание чл.2 от ЗЗЛД	

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1. IDENTIFICATION OF THE TEST SAMPLE:

Description of the Sample	: 24 kV Indoor Type Post Insulator
Trade Mark / Type	: Nikdim / PAM-20
Serial Number	: 9511107 / T5
Technical Specification / Drawing	: See the Clause 5
Contract No	: FT.DNY-07.003.2017
Product Condition at Arrival	: New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:

Manufacturer	: Nikdim
Type	: PAM-20
Rated Voltage	: 24 kV
Power Frequency Withstand Voltage	: 50 kV
Lightning Impulse Withstand Voltage	: 125 kV
Creepage Distance	: 8,5 mm / kV
Material	: Porcelain C110
Color of Glaze	: White
Dimensions	: See the Clause 5

3. TEST(S) PROGRAM:

Witnessed By	:	Mr. Dechko Dechev
Dry Lightning-Impulse Withstand Voltage Test	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5
Dry Power-Frequency Withstand Voltage Test	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7

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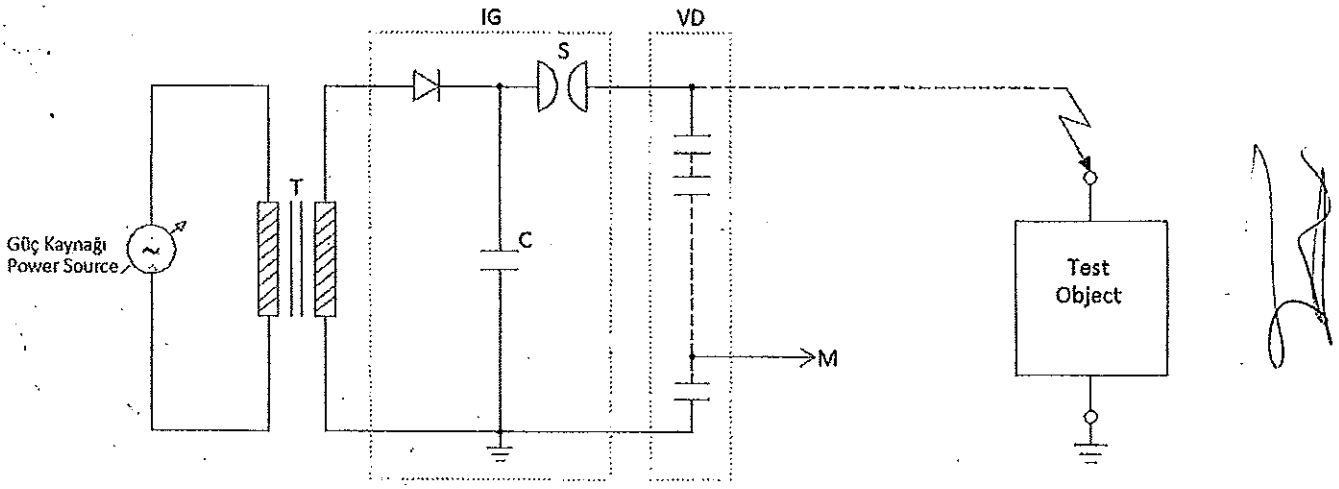
4. APPLIED TEST(S):

- Test results are only belong to the tested sample.
- The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2 which for a normal distribution corresponds to a coverage probability of approximately 95 %.

4.1 Dry Lightning-Impulse Withstand Voltage Test:

4.1.1	Sample Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5
4.1.2	Test Standard	:	IEC 60060-1: 2010 Clause 7 IEC 60273: 1990
4.1.3	Equipment Used	:	BHT / Lightning Impulse Test System (K003) Madgetech / Environmental Conditions Recorder (K274)
4.1.4	Environmental Conditions	:	Ambient Temperature : 29,3 °C Ambient Humidity : 56,0 %RH Air Pressure : 1009,2 mbar
4.1.5	Test Circuit Diagram	:	



Deney Numunesi / Test Sample

IG : Darbe Jeneratörü / Impulse Generator
VD : Hibrit Gerilim Bölücü / Hybrid Voltage Divider
T : Yükseltici Trafo / Step-up Transformer
F : Metal Gövde / Frame

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4.1.6. Test Criteria and Measurement Results:

S. No		Voltage Ut Applied to	Earth Connected to	Insulated from Earth	Test Voltage (%)	Test Voltage (kVpeak) (125 kVpeak ±%3)	Peak Time t_1 (µs) (1,2 µs ± 30 %)	Tail Time t_2 (µs) (50 µs ± 20 %)	Result(s)	
1	41122	Top of Insulator	Mounting Face of Insulator	-	50-80	85,29	1,276	50,65		
1	41123					124,47	1,160	51,13	Affirmative ☒	Negative ☐
2	41124					125,20	1,207	50,89	Affirmative ☒	Negative ☐
3	41125					123,17	1,170	50,47	Affirmative ☒	Negative ☐
4	41126					124,18	1,236	50,48	Affirmative ☒	Negative ☐
5	41127					124,08	1,168	51,53	Affirmative ☒	Negative ☐
6	41128					124,38	1,228	50,49	Affirmative ☒	Negative ☐
7	41129					124,32	1,146	50,83	Affirmative ☒	Negative ☐
8	41130					122,74	1,126	51,34	Affirmative ☒	Negative ☐
9	41131					123,76	1,219	50,46	Affirmative ☒	Negative ☐
10	41132					123,95	1,143	51,29	Affirmative ☒	Negative ☐
11	41133					124,16	1,202	50,50	Affirmative ☒	Negative ☐
12	41134					123,27	1,129	51,27	Affirmative ☒	Negative ☐
13	41135					124,89	1,205	50,92	Affirmative ☒	Negative ☐
14	41136					124,20	1,245	50,40	Affirmative ☒	Negative ☐
15	41137					124,81	1,223	50,61	Affirmative ☒	Negative ☐
2	41139				50-80	-84,68	1,298	50,87		
1	41140				100	-125,22	1,239	50,57	Affirmative ☒	Negative ☐
2	41141					-124,87	1,180	50,88	Affirmative ☒	Negative ☐
3	41142					-124,91	1,209	50,33	Affirmative ☒	Negative ☐
4	41143					-125,87	1,236	50,62	Affirmative ☒	Negative ☐
5	41144					-123,91	1,184	50,44	Affirmative ☒	Negative ☐
6	41145					-125,22	1,140	50,89	Affirmative ☒	Negative ☐
7	41146					-125,51	1,198	51,04	Affirmative ☒	Negative ☐
8	41147					-124,40	1,136	50,70	Affirmative ☒	Negative ☐
9	41148					-124,96	1,235	50,63	Affirmative ☒	Negative ☐
10	41149					-124,33	1,139	50,95	Affirmative ☒	Negative ☐
11	41150					-124,08	1,127	51,09	Affirmative ☒	Negative ☐
12	41151					-125,23	1,222	50,88	Affirmative ☒	Negative ☐
13	41152					-125,57	1,172	51,04	Affirmative ☒	Negative ☐
14	41153					-124,29	1,157	50,75	Affirmative ☒	Negative ☐
15	41154					-124,05	1,193	50,52	Affirmative ☒	Negative ☐

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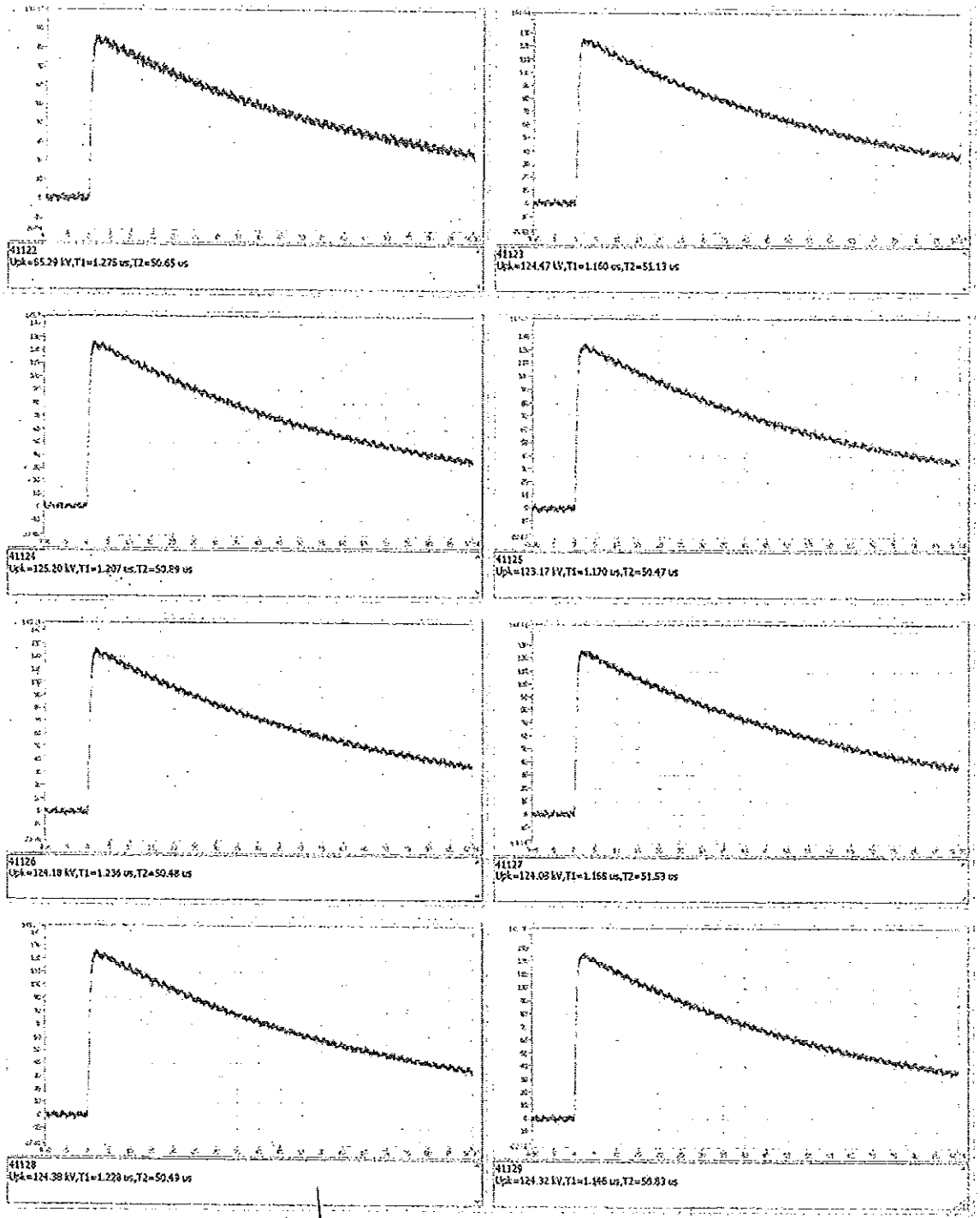
4.1.7 Oscillograms:

4.1.7.1 S. No:1 / Positive Impulses



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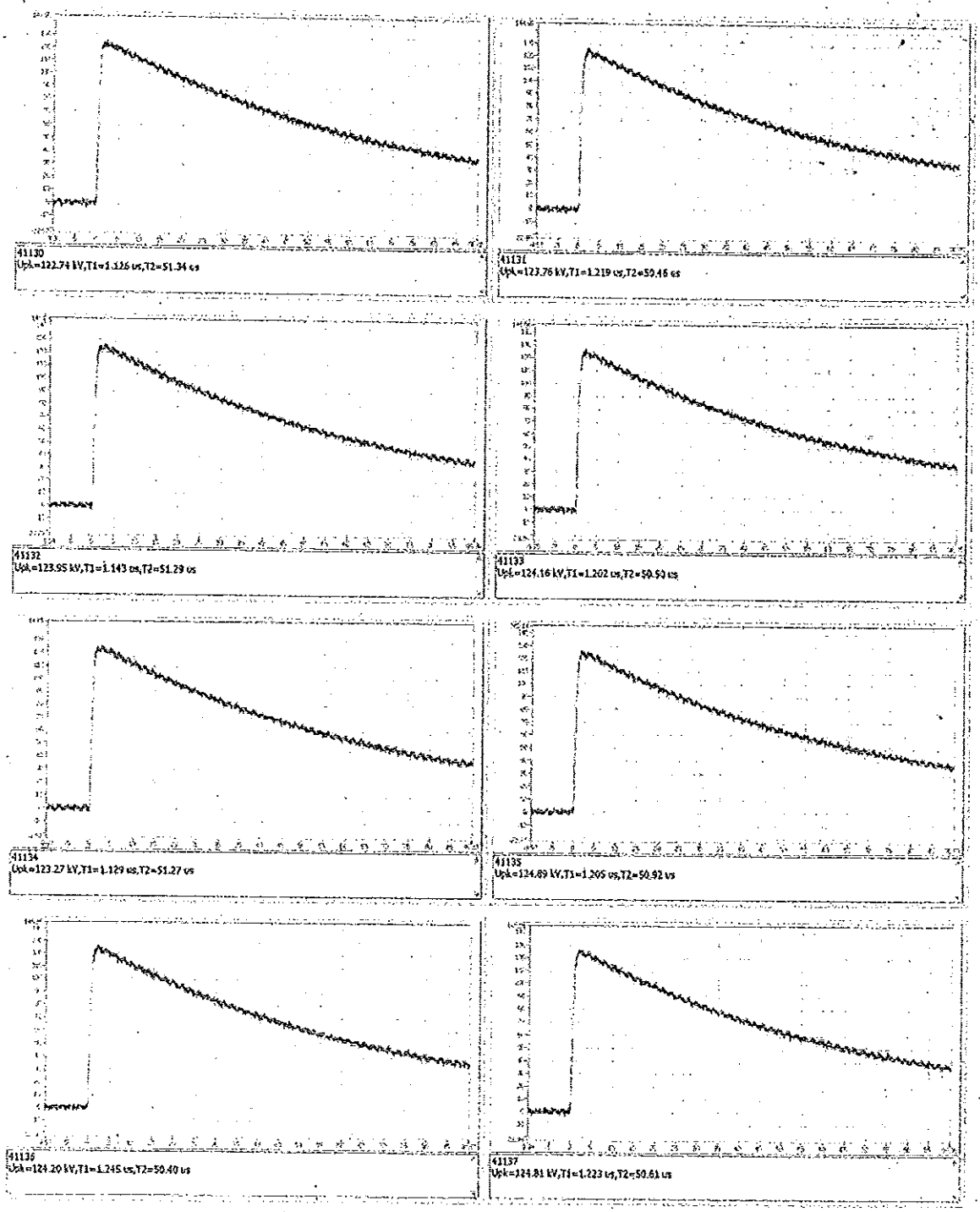

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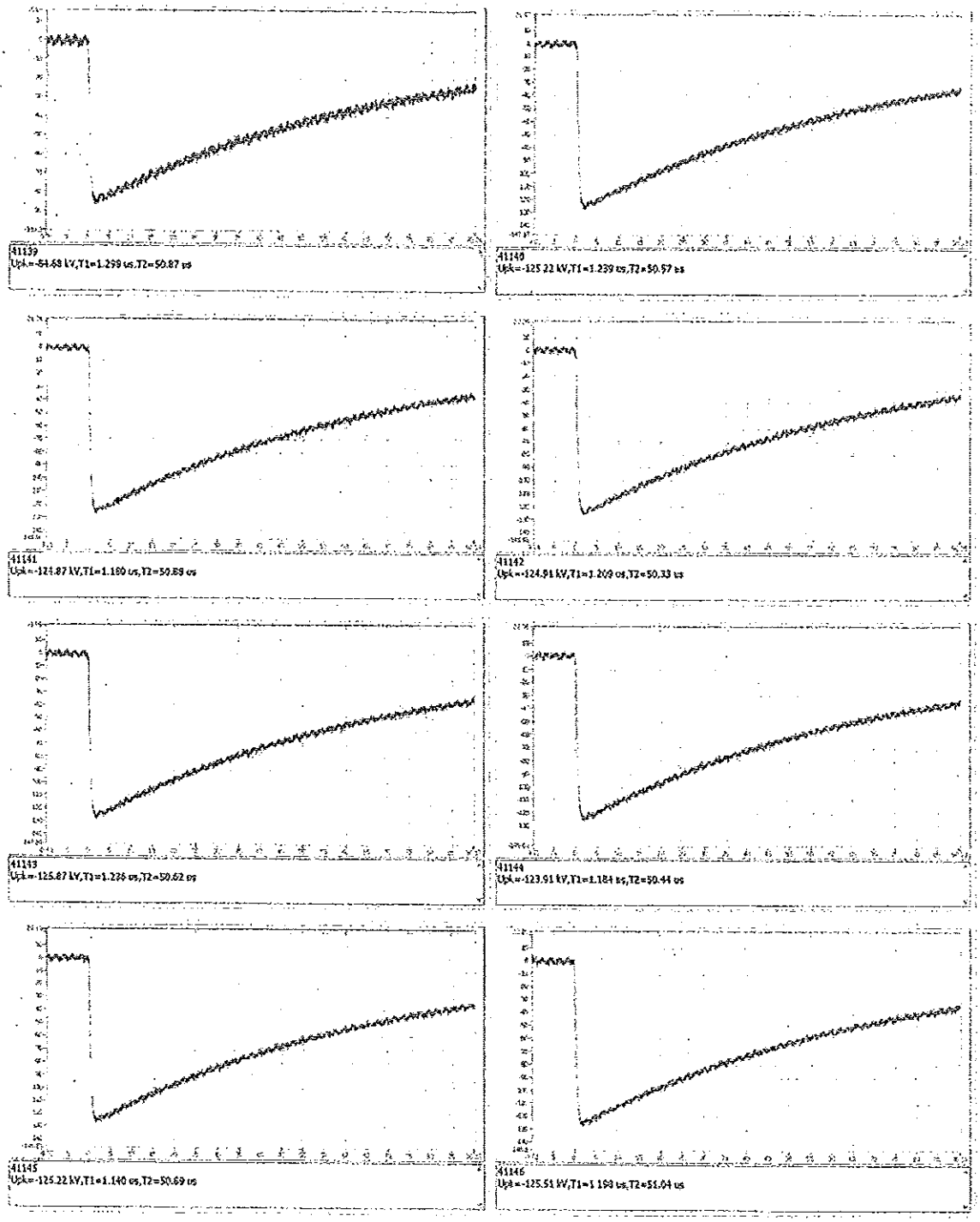
4.1.7.2 S. No:2 / Negative Impulses



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ВЯРНО С ОРИГИНАЛА

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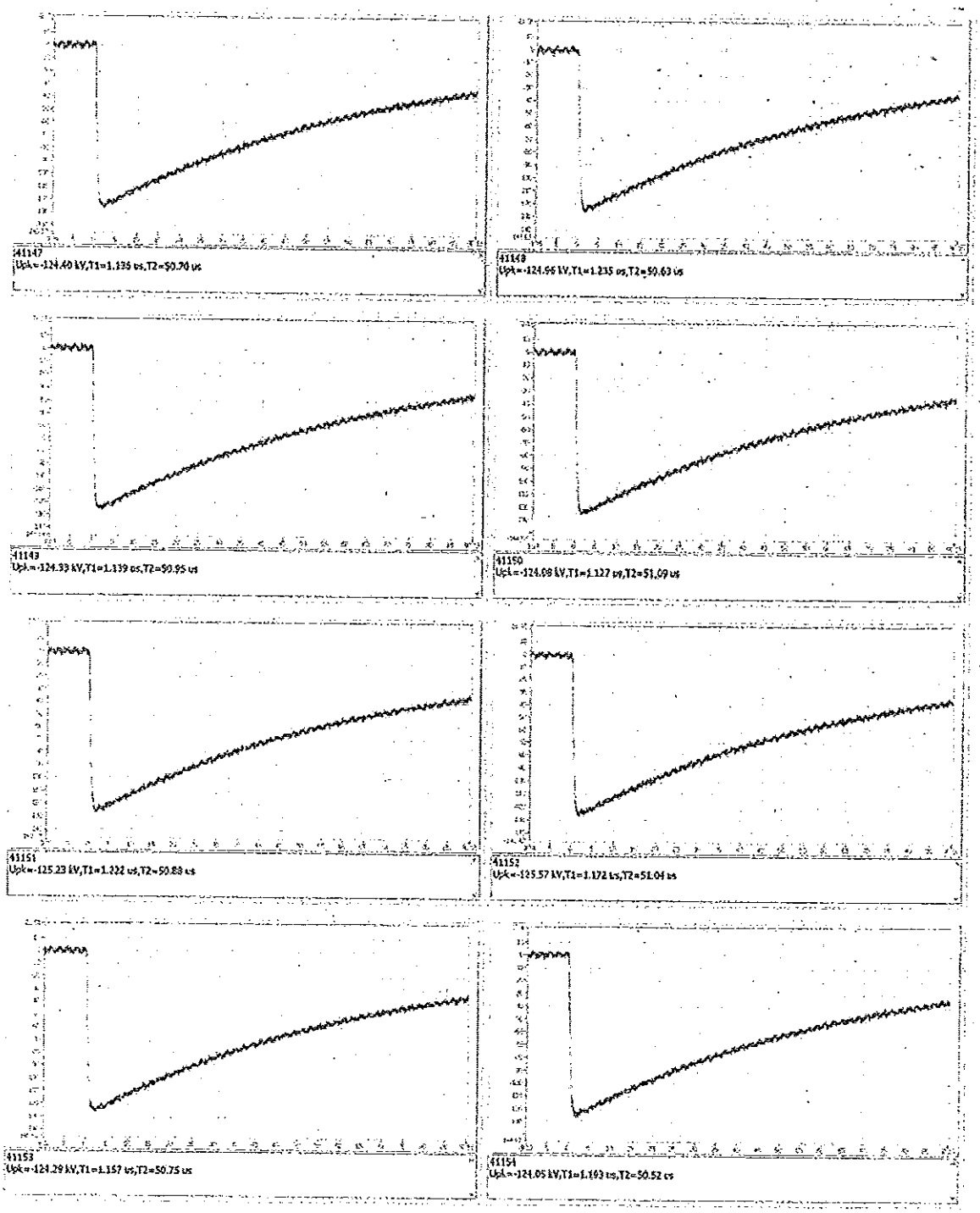

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4.1.8 Remarks, Comments and Statements of Compliance:

- Test voltage were applied as per IEC 60273:1990 Table-1
- Tests were applied without considering atmospheric correction.
- Measurement Uncertainty of K003: U_t: 2,206% t_1: 4,791 % t_2: 2,620%
- The insulator was mounted vertically upright on a horizontal earthed metal support consisting of a U-channel section with the flanges pointing downwards which has a width about equal to the diameter of the mounting face of the insulator and a length longer than twice the height of the insulator, and was placed 1,1 m above ground.
- A cylindrical conductor, maintained in the horizontal plane and perpendicular to the earthed support, was attached to the top of the insulator. The length of the conductor was longer than 1,5 times the height of the insulator and it was extended 1 m on each side of the insulator axis. The diameter of the conductor was 30 mm.
- 24 kV indoor type post insulator with Nikdim brand, PAM-20 type and 9511108 / T5 serial number, has been tested and passed successfully to the Dry Lightning-Impulse Withstand Voltage Test as per IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.5 the withstand voltage procedure.

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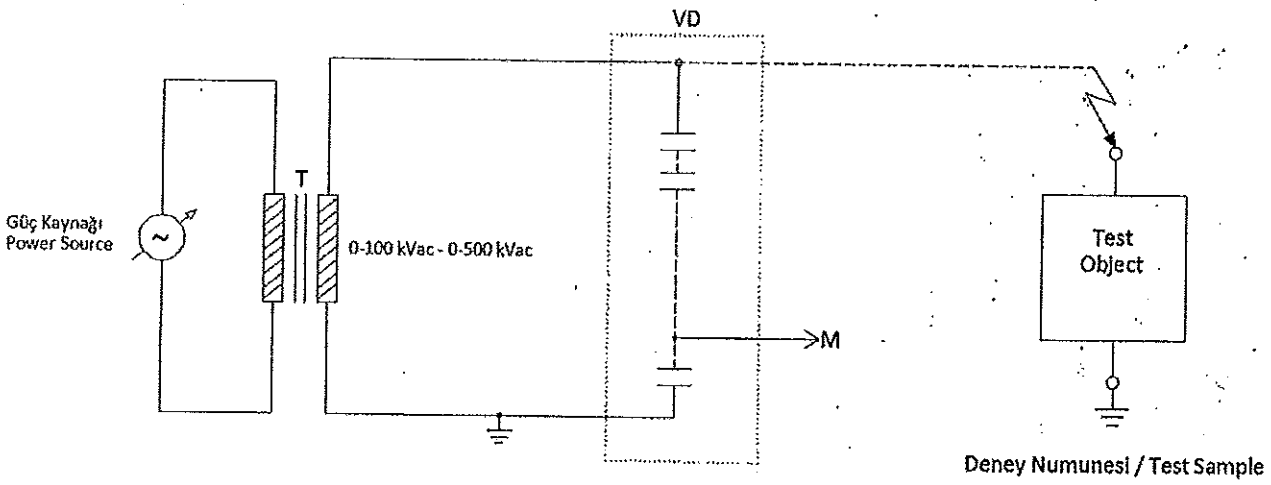
ВЯРНО С ОРИГИНАЛА

4.2 Dry Power-Frequency Withstand Voltage Test:

4.1.1	Sample Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000
4.1.2	Test Standard	:	IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7 IEC 60060-1: 2010 Clause 6 IEC 60273: 1990
4.1.3	Equipment Used	:	Baur / 100 kVac High Voltage Test System (K001) Madgetech / Environmental Conditions of the Recorder (K274)
4.1.4	Environmental Conditions	:	Ambient Temperature : 29,3 °C Ambient Humidity : 56,0 %RH Air Pressure : 1009,2 mbar
4.1.5	Test Circuit Diagram	:	



VD : Kapasitif Gerilim Bölücü / Capacitive Voltage Divider
T : 0 - 100 kVac - 0 - 500 kVac Test Trafosu / 0 - 100 kVac - 0-500 kVac Test Transformer
F : Metal Gövde / Frame

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4.2.5 Test Criteria and Measurement Results:

S. No	Voltage Ut Applied to	Earth Connected to	Insulated from Earth	Test Voltage (kVrms) (50 kVrms ±%1)	Frequency (Hz)	Time (sec.)	Result(s)	
1	Top of Insulator	Mounting Face of Insulator	-	50,09	50	60	Affirmative ☒	Negative ☐

4.2.6 Remarks, Comments and Statements of Compliance:

- Test voltage was applied as per IEC 60273:1990 Table-1.
- Tests were applied without considering atmospheric correction.
- Measurement Uncertainty of K001: U_t: 1,409%
- The post insulator was mounted vertically upright on a horizontal earthed metal support consisting of a U-channel section with the flanges pointing downwards which has a width about equal to the diameter of the mounting face of the insulator and a length longer than twice the height of the insulator, and was placed 1,1 m above ground.
- A cylindrical conductor, maintained in the horizontal plane and perpendicular to the earthed support, was attached to the top of the insulator. The length of the conductor was longer than 1,5 times the height of the insulator and it was extended 1 m on each side of the insulator axis. The diameter of the conductor was 30 mm.
- 24 kV indoor type post insulator with Nikdim brand, PAM-20 type and 9511108 / T5 serial number, has been tested and passed successfully to the Dry Power-Frequency Withstand Voltage Test as per IEC 60168: 1994 + A1: 1997 + A2: 2000 Clause 4.7.

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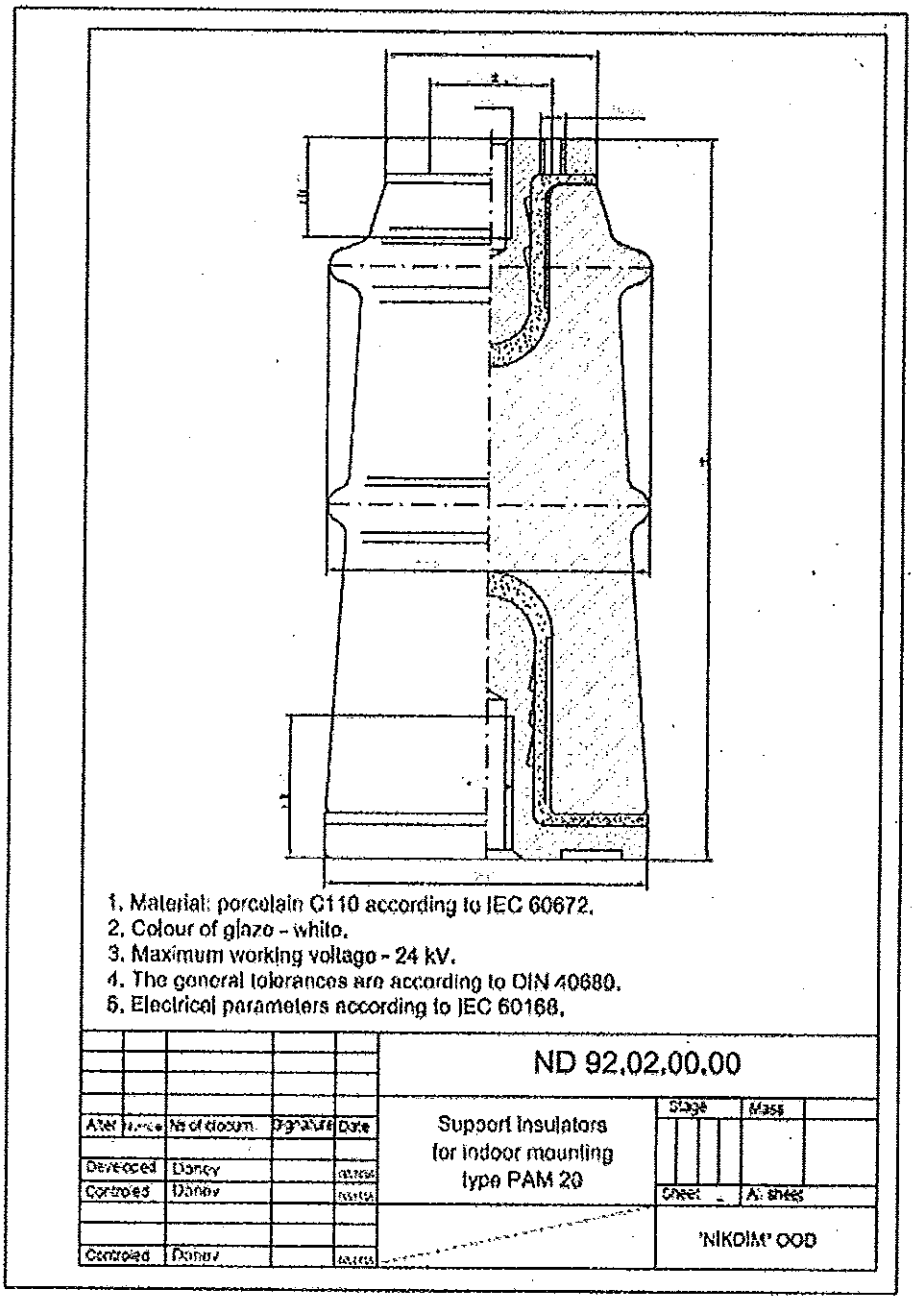
5. TECHNICAL DRAWING(S) of the TEST SAMPLE:



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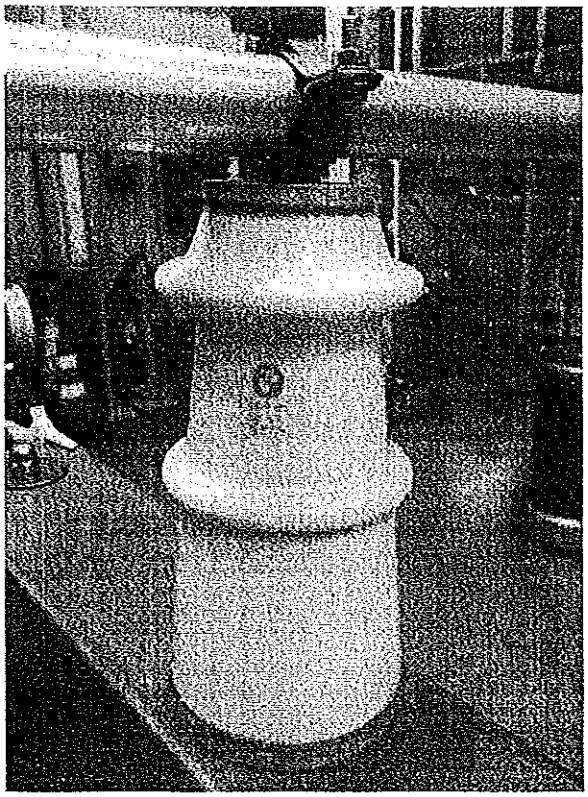
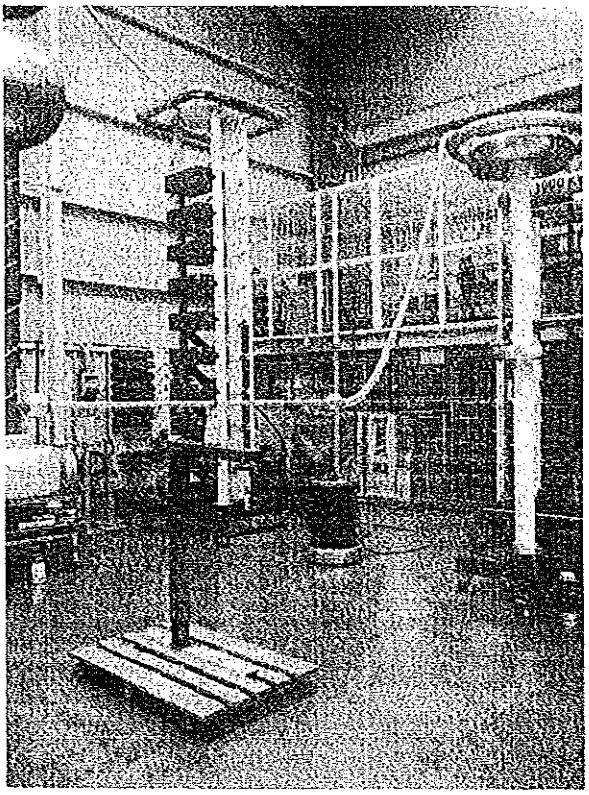
6. PHOTO(S) of the TEST SAMPLE:





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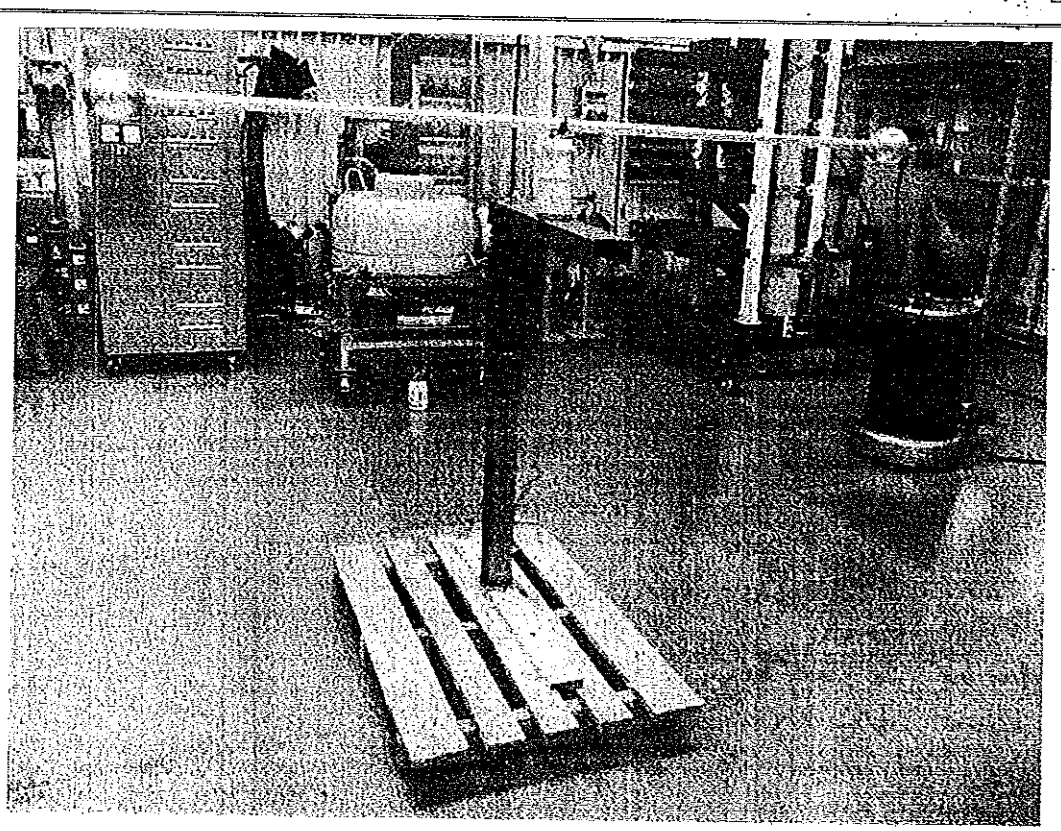

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accredited for TESTING
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SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICATE
LI 1036

TEST REPORT
No. 45964 / 11.08.2017

1. CUSTOMER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
2. MANUFACTURER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
3. TESTED PRODUCT:	Indoor Post Insulator type PAM 20
4. REFERENCE STANDARD:	Customer requirements (IEC 60168:2001, clause 5.2.4)
5. PERFORMED TESTS:	Mechanical failing load test. Bending test
6. TEST DATE:	10.08.2017
7. TEST RESULTS:	The product passed the test.

The test report contains 5 pages and is edited in 4 copies, copy no.1 remain in laboratory and copies 2, 3, 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER, **HEAD OF TESTING TEAM,**

Dipl. Eng. Ion Burciu **Dipl. Eng. Ion Dinu**

На основание чл.2 от ЗЗЛД

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ВЯРНО С ОРИГИНАЛА

CONTENT

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1. IDENTIFICATION OF THE TEST PRODUCT

Type:	PAM 20
Serial / year:	2017
Technical Specification / Drawing:	Drawing no. ND 92.02.00.00 - Support insulators for indoor mounting type PAM 20
Contract / Test order:	705.2/876/03.08.2017
Internal test order:	23362/07.08.2017
Product receiving date:	08.08.2017
Product condition at receiving:	New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER

Maximum working voltage	24 kV
Mechanical failing load	4000 N (indicated by the customer)

3. TESTS PROGRAM

Mechanical failing load test. Bending test — Customer requirements (IEC 60168:2001, clause 5.2.4)

4. RESPONSIBLE FOR TEST

Dipl. Eng. Luminita Tascau

5. PRESENT AT THE TEST

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ВЯРНО С ОРИГИНАЛА

6. MECHANICAL FAILING LOAD TEST. BENDING TEST

Test date:	10.08.2017
Test standard:	Customer requirements (IEC 60168:2001, clause 5.2.4)
Atmospheric conditions:	t = 28 ^{0}C; RH = 53%
Equipment used:	• Manual lever hoist SAFETEX 3000 kg, manufacturer SC Delta Flex SRL Bucuresti • Tension load cell, model CTL 1000 kg, serial no. 201106182, manufacturer LAUMAS ELECTRONICA Italy, CC no. F - 03/329/2017, SC GELUTECH Laboratory of Forces SRL
Test procedure:	The post insulator was subjected to a bending load to verify the mechanical failing load of 4000 N as specified in Annex 1 to the contract. The load was applied perpendicular to the axis of the post insulator, to the free end (see Photo 1). The specified bending load was reached.
Test results:	The product passed the test.

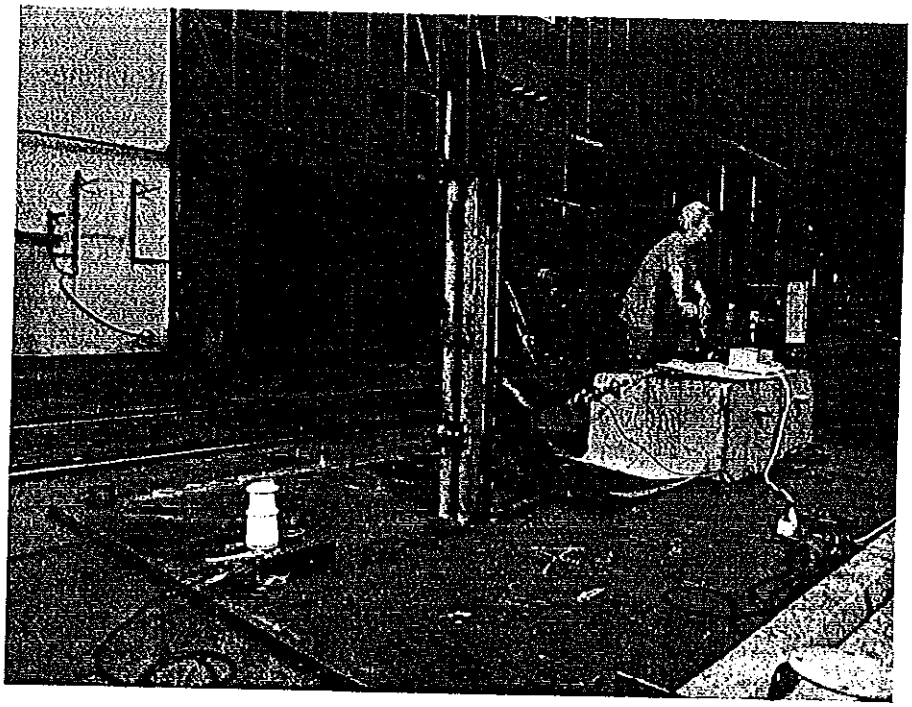

Photo 1

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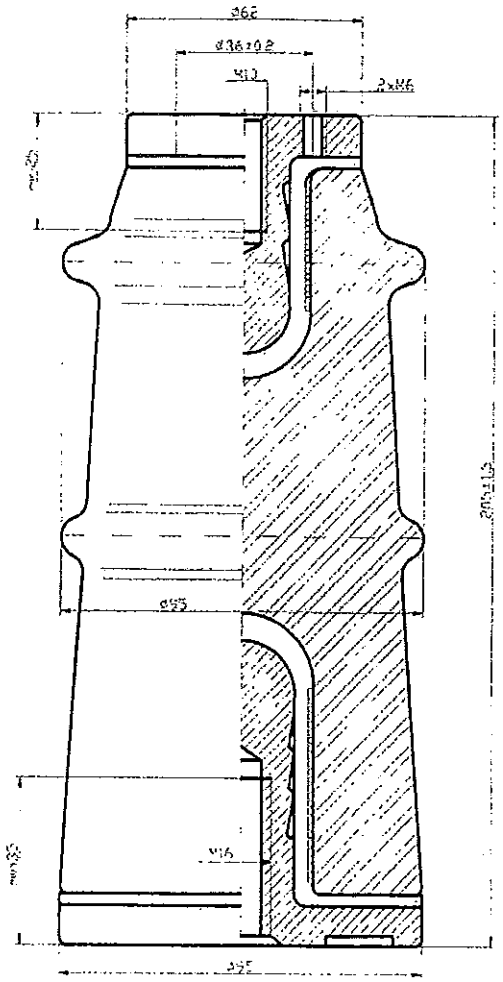
Annex 1



1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 24 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

Alter	Number	Na of docum.	Signature	Date	ND 92.02.00.00		
					Support insulators for indoor mounting type PAM 20	Stage	Mass
Developed		Donev		02.2016		Sheet 1	All sheet
Controled		Donev		02.2016		"NIKDIM" OOD	
Controled		Donev		02.2016			

– End of test report –

ВЯРНО С ОРИГИНАЛА

NATIONAL INSTITUTE FOR RESEARCH, DEVELOPMENT
AND TESTING IN ELECTRICAL ENGINEERING
ICMET CRAIOVA
HIGH VOLTAGE DIVISION
Low and High Voltage Testing Laboratory
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Phone: + 40 0351 402425, 404888; Fax: + 40 0351 404890
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accredited for TESTING
SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICAT
LI 1036

TEST REPORT
No. 45958 / 08.08.2017

1. CUSTOMER: **NIKDIM Ltd.**
Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

2. MANUFACTURER: **NIKDIM Ltd.**
Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

3. TESTED PRODUCT: **Indoor post insulator 35kV type PAK 35**

4. REFERENCE STANDARD: IEC 60168 : 2001

5. PERFORMED TEST:

I – Dry lightning impulse voltage withstand test
II – Dry power frequency voltage withstand test

6. TESTS DATE: 08.08.2017

7. TESTS RESULT: The product passed the test.

The test report contains 12 pages and is edited in 4 copies, copy no.1 remain in laboratory and copies 2÷ 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER,
Dipl. eng. Ion BURCIU

HEAD OF TESTING TEAM,
Dipl. eng. Ion BADEA

На основание чл.2 от ЗЗЛД

Warnings:

a. *The results refer only to the tested product.*
b. *Publication and reproduction of the contents of this report in any other form unless its complete photocopying is not allowed without writing approval of Division to which laboratory belongs.*
c. *All signatures of the present report are original ones.*

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ВЯРНО С ОРИГИНАЛА

Content **Page**

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1. IDENTIFICATION OF THE TEST PRODUCT: Indoor post insulator 35kV

Type: PAK 35

Serial / year: - / 2017

Technical Specification / Drawing: – / see page 12

Client test order: Contract no. 876 / 03.08.2017

Internal test order: 23362 / 07.08.2017

Product receiving date: 07.08.2017

Product condition at receiving: New

2. MAIN TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:

Maximum working voltage.....36 kV

Dry lightning impulse withstand voltage 1.2 / 50 µs: .....190 kV_{peak}

Dry power frequency withstand voltage :.....80 kV_{rms}

Material : porcelain C110

Colour of glaze: white

Note : The level of test voltages were specified by the customer .

3. TESTS PROGRAM:

I – Dry lightning impulse voltage withstand test
II – Dry power frequency voltage withstand test

4. RESPONSIBLE FOR TEST: Dipl. eng. Laurenţiu Vlădoi (I)
/Dipl. eng. Dan Ştefan (II)

5. PRESENT AT TESTS: General Manager eng.Maria Georgieva – NIKDIM Bulgaria

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ВЯРНО С ОРИГИНАЛА

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I. DRY LIGHTNING IMPULSE VOLTAGE WITHSTAND TEST

1. Test date: 08.08.2017

2. Test standard: IEC 60168 : 2001, subclause 4.5

3. Equipment used:

- Impulse generator 4.2 MV, no. 5 – 1197; connection I_2 (2 x 1);
- C_s = 0.288 [μF]; R_s = 94 [Ω]; R_p = 230 [Ω].

Addenda: C_s – equivalent capacity of impulse generator;
R_s – equivalent serial resistance of impulse generator;
R_p – equivalent parallel resistance of impulse generator.

Measuring system used:

- High voltage measuring system of impulse generator 4.2 MV consists of:
  - Capacitive divider of the impulse generator 4.2 MV with k_{div} = 699.3;
  - Digital measuring system type TR – AS 100 – 10 / 4, no.228; channel 2. (Calibration Certificate no. 91 / 12.2016)

Measuring uncertainty for: peak value of lightning impulse is: ± 1.56 %

- for front time T_1 is ± 7.41 %,
- for tail time T_2 is ± 3.28 %.

The uncertainty stated is expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k = 2. The value of measurand lies within the assigned range of values with probability of 95%.

4. Test procedure / Test set-up: according to IEC 60168 : 2001, subclause 4.4.1

5. Atmospheric conditions; correction factors; U_{test}

Atmospheric conditions:	p [mbar]	1005
	t [°C]	26
	h_r [%]	53
Arcing distance measured [mm]:		310
Correction factors:	k_1	0.9722
	k_2	1.0151
	$k_t = k_1 \cdot k_2$	0.9868
$U_{test}(p_0,t_0,h_0)$ (-) and (+) [kV_{peak}]:		**190**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**187.5**

Symbols used:

- $U_{test}(p_0, t_0, h_0)$ – rated withstand voltage value;
- $U_{test}(p, t, h)$ – test voltage corrected to atmospheric conditions;

6.Test circuit diagram:

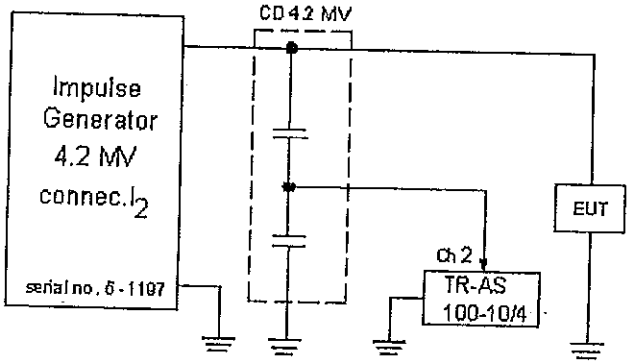

Fig. 1

Legend: EUT – Equipment under test

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Legend: EUT – Equipment under test

Notes:

1. The test was performed by the withstand voltage procedure with 15 impulses.
2. The standard 1.2 / 50 μs lightning impulse was used. For wave parameters see oscillograms from pages 6 ÷ 10.

Photo 1

7. Test result: The product passed the test.

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ВЯРНО С ОРИГИНАЛА

LI lightning-Impulse						
no.	Up [kV]	T1[µs]	T2[µs]	Tc[µs]	Ip[A]	remark
316978	96.1	1.44	45.1			RFW / PAK 35
316994	191	1.44	45.5			FW / PAK 35
316995	190	1.42	45.6			FW / PAK 35
316997	188	1.43	45.6			FW / PAK 35
316998	189	1.43	45.6			FW / PAK 35
316999	187	1.43	45.7			FW / PAK 35
317000	189	1.43	45.6			FW / PAK 35
317001	191	1.43	45.7			FW / PAK 35
317002	188	1.43	45.7			FW / PAK 35
317003	190	1.43	45.6			FW / PAK 35
317004	190	1.43	45.6			FW / PAK 35
317005	190	1.43	45.7			FW / PAK 35
317006	189	1.43	45.7			FW / PAK 35
317007	189	1.43	45.6			FW / PAK 35
317008	189	1.43	45.7			FW / PAK 35
317009	189	1.43	45.6			FW / PAK 35
317010	-98.3	1.43	45.8			RFW / PAK 35
317011	-188	1.43	45.6			FW / PAK 35
317012	-188	1.43	45.7			FW / PAK 35
317013	-189	1.43	45.3			FW / PAK 35
317014	-188	1.43	45.5			FW / PAK 35
317015	-189	1.43	45.6			FW / PAK 35
317016	-189	1.43	45.5			FW / PAK 35
317017	-189	1.43	45.5			FW / PAK 35
317018	-189	1.43	45.5			FW / PAK 35
317019	-189	1.43	45.6			FW / PAK 35
317020	-190	1.43	45.6			FW / PAK 35
317021	-189	1.43	45.5			FW / PAK 35
317022	-189	1.43	45.6			FW / PAK 35
317023	-190	1.43	45.6			FW / PAK 35
317024	-190	1.43	45.4			FW / PAK 35
317025	-189	1.43	45.3			FW / PAK 35

Notes: 1.UP-peak value of testing voltage; T1, T2, T_c – front, tail and chopping time – parameters of testing impulse wave;

2. RFW – reduced wave 50 – 75%; FW – full wave 100%

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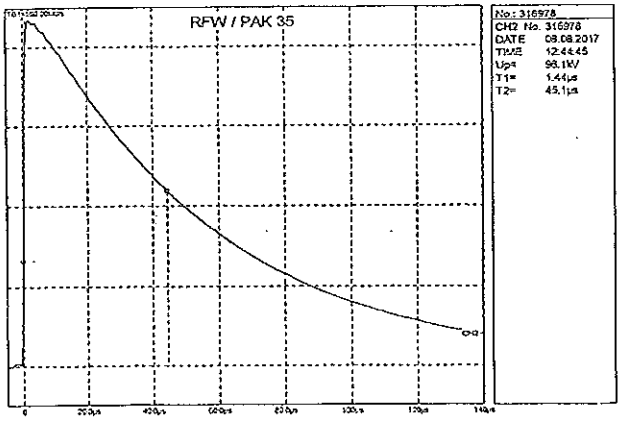

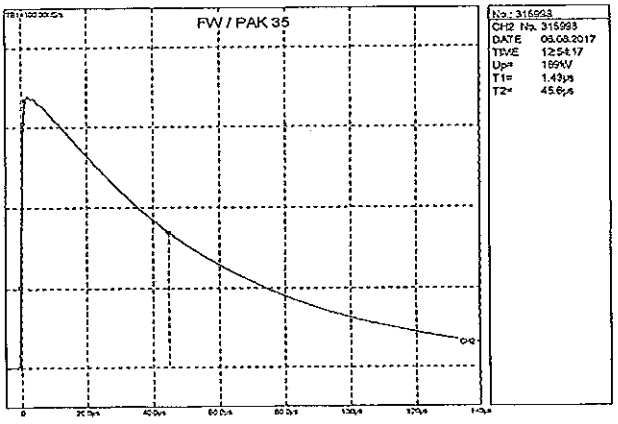

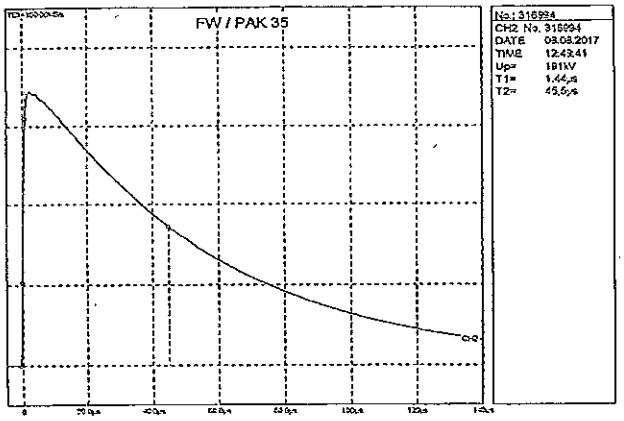

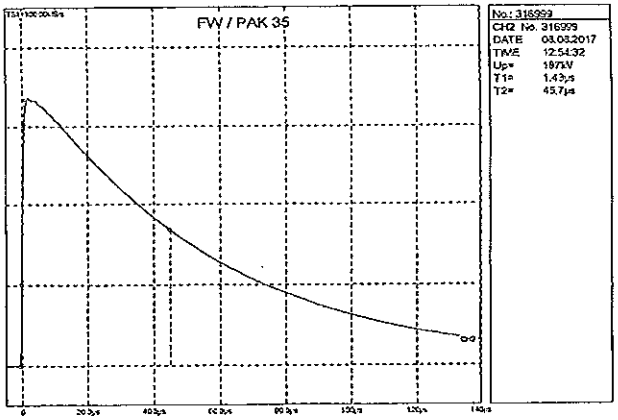

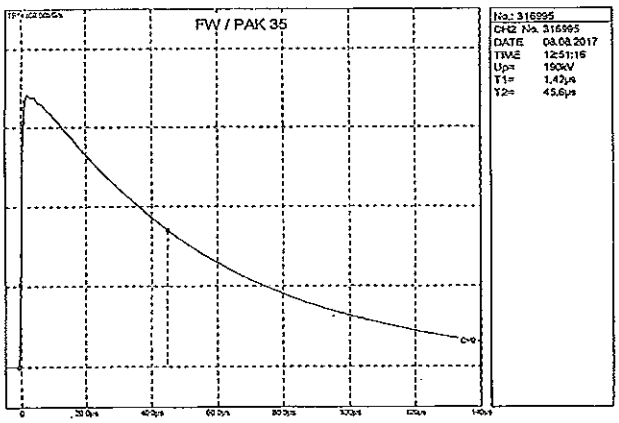

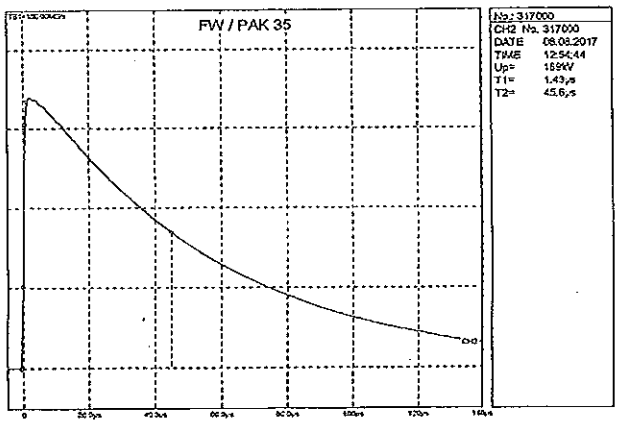

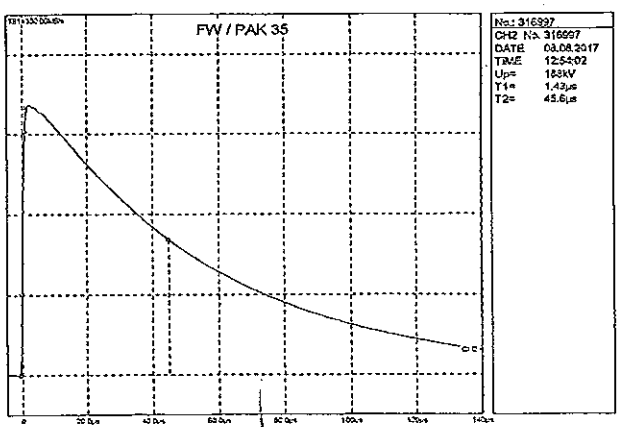

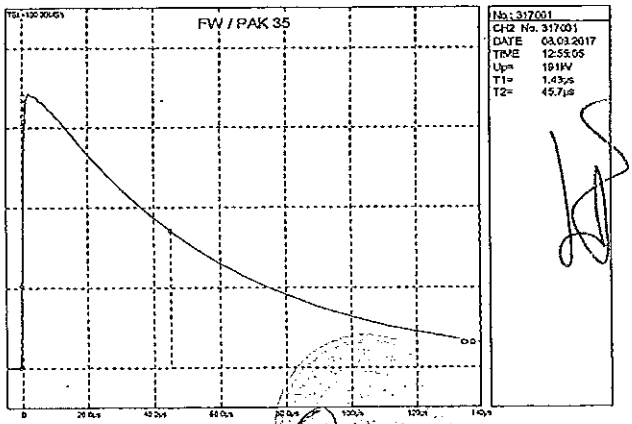

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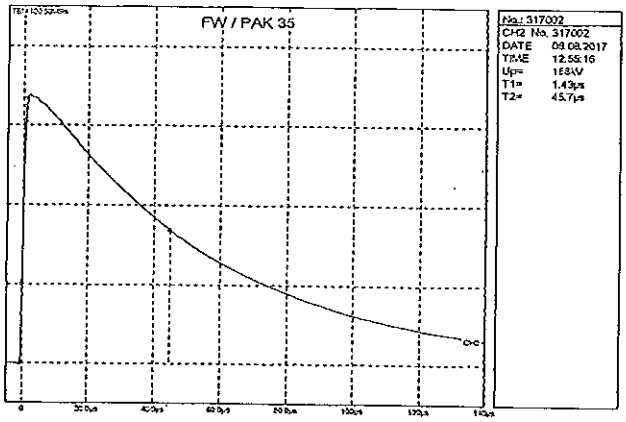

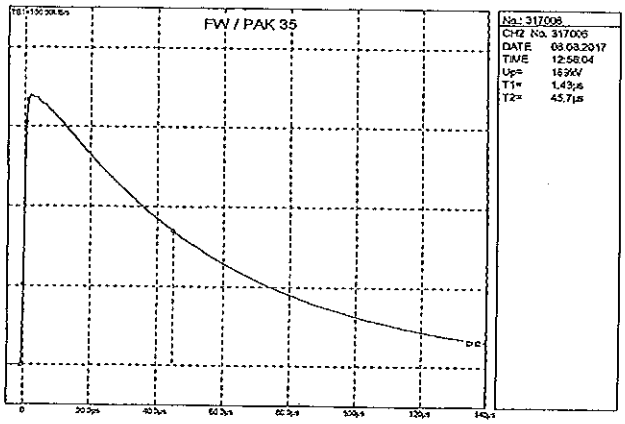

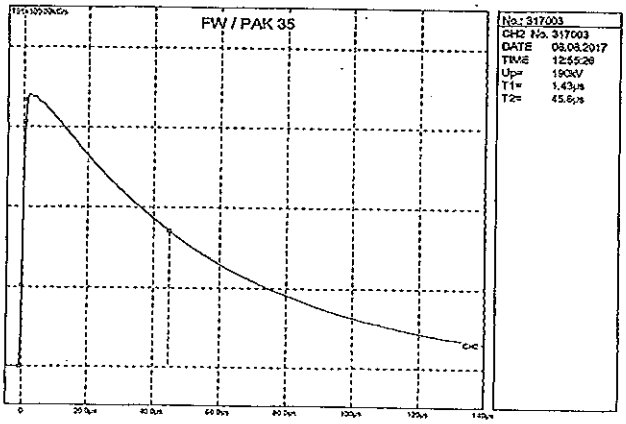

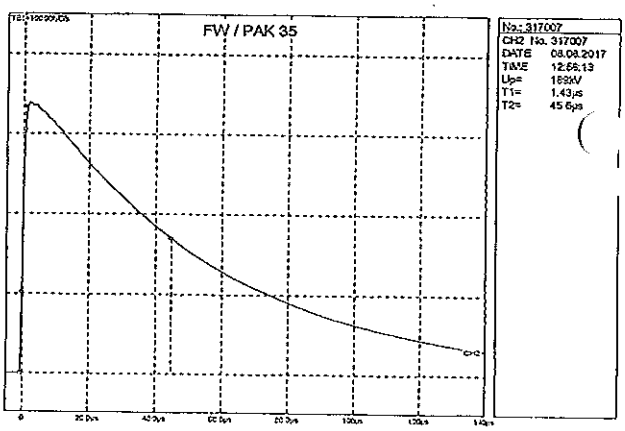

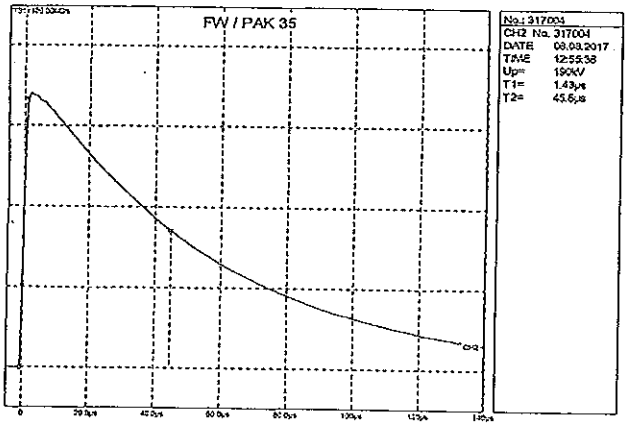

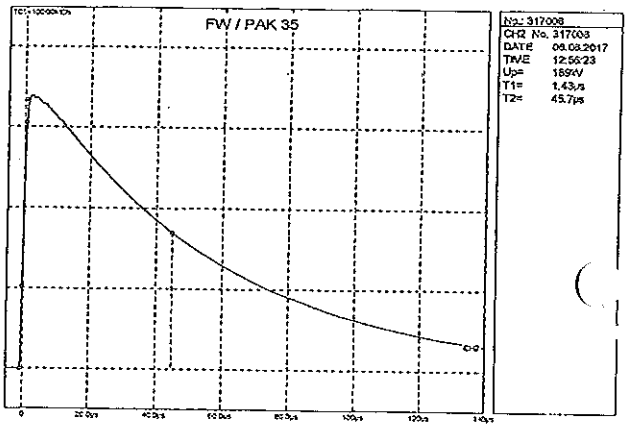

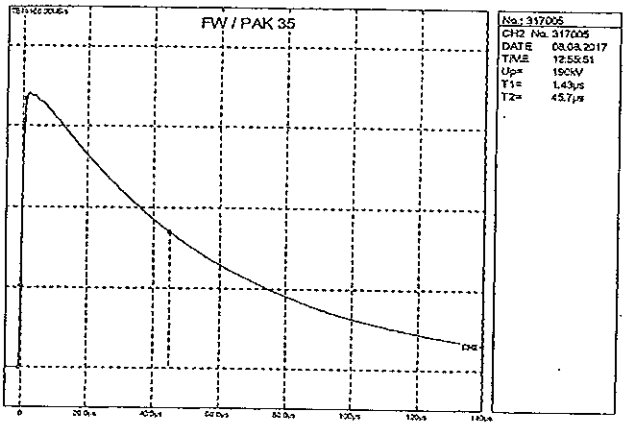

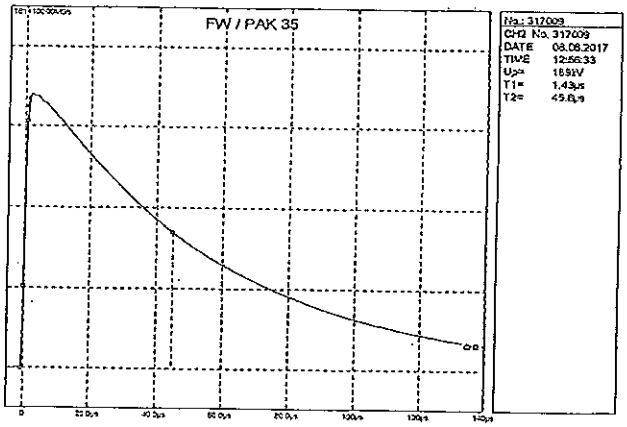

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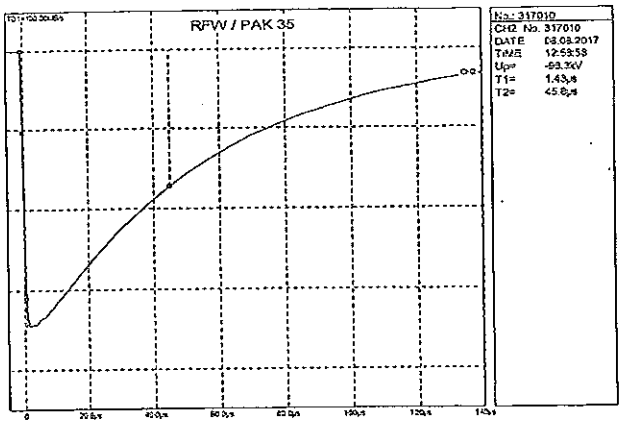

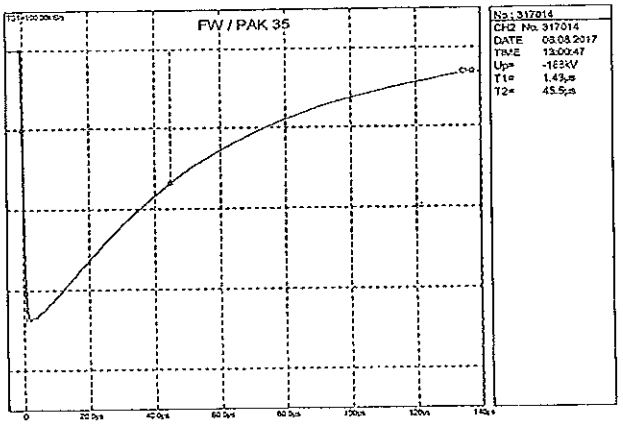

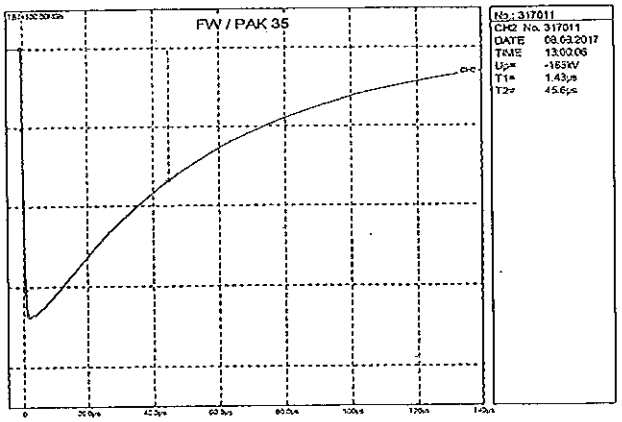

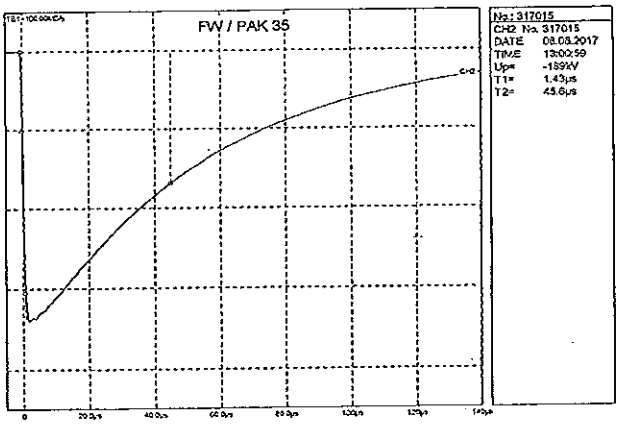

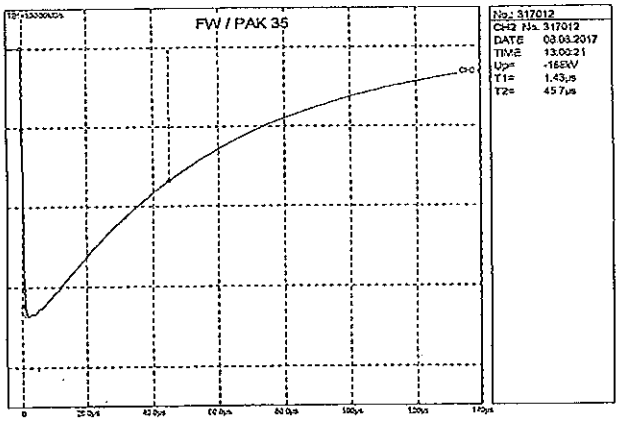

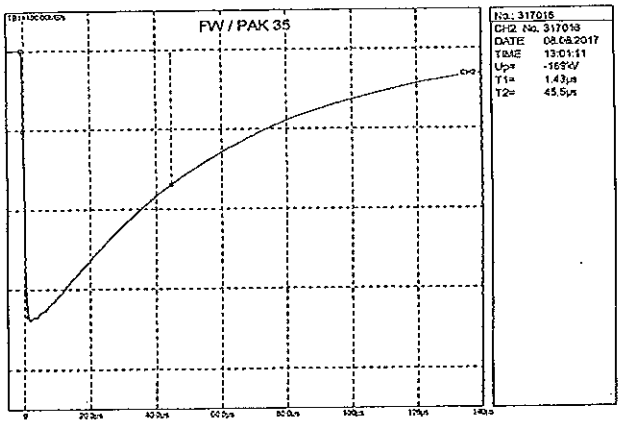

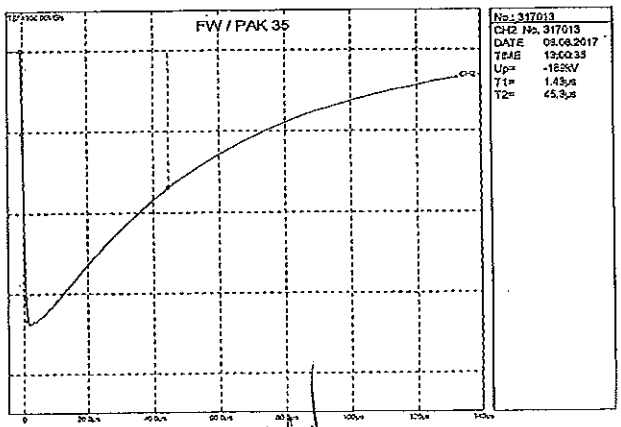

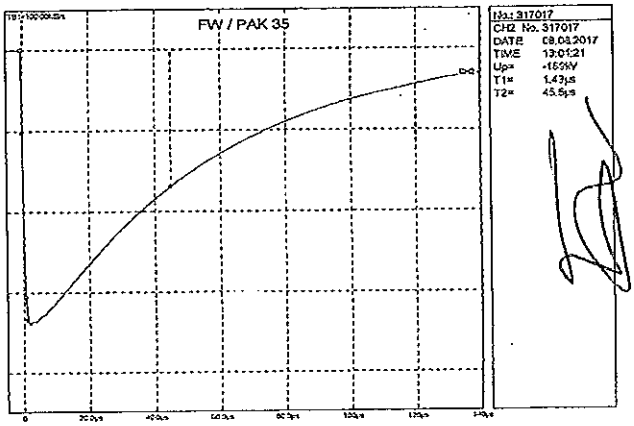

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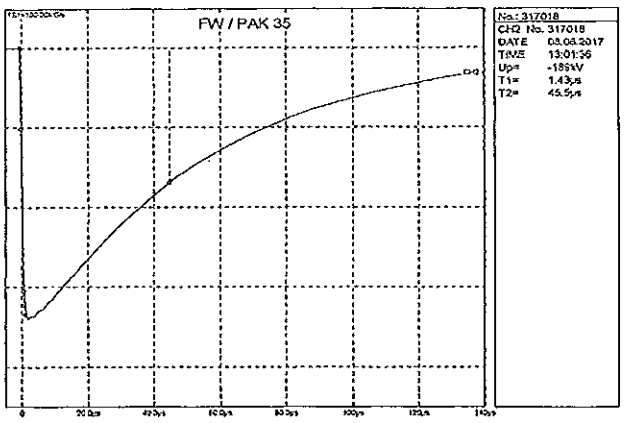

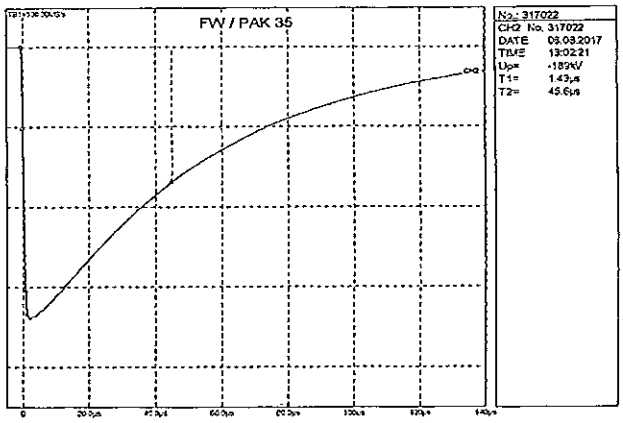

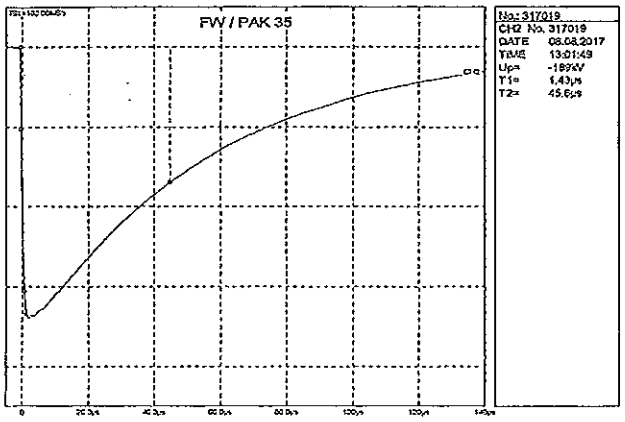

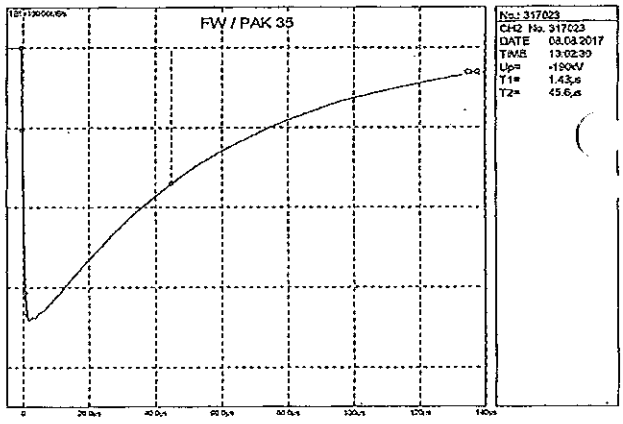

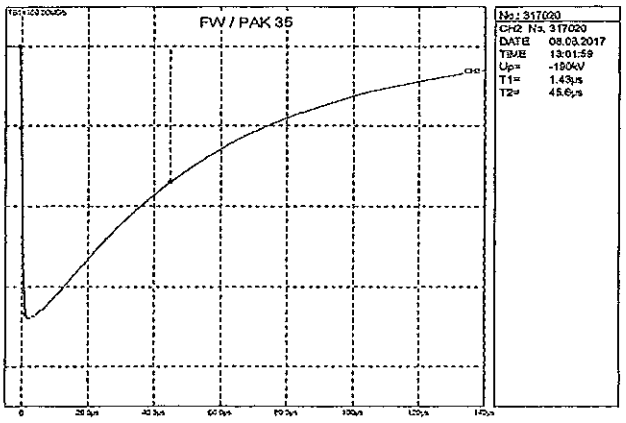

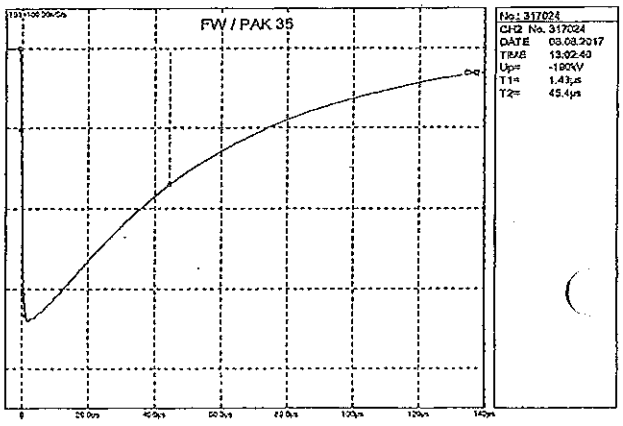

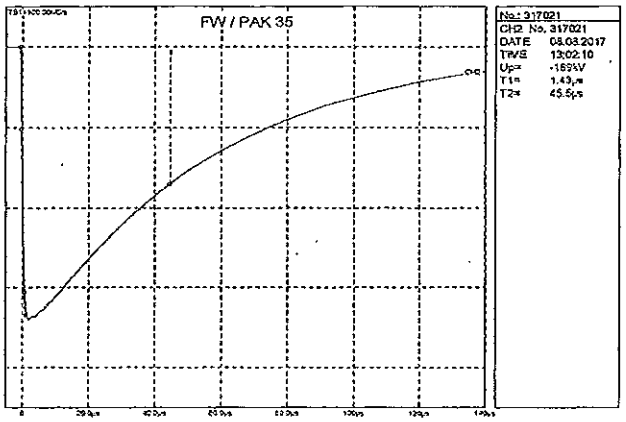

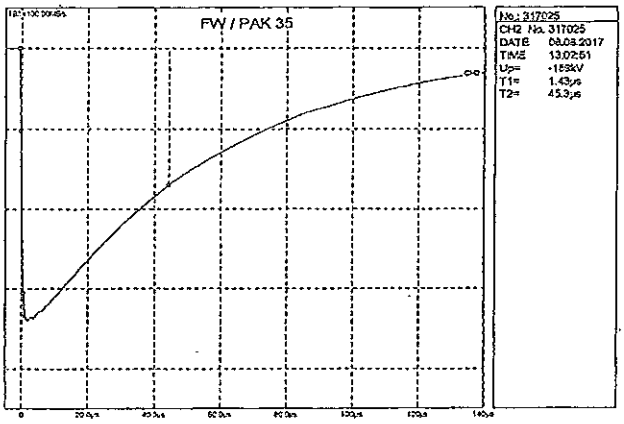

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II. DRY POWER FREQUENCY VOLTAGE WITHSTAND TEST

1. **Test date:** 08.08.2017
2. **Test standard:** IEC 60168:2001, subclause 4.7
3. **Equipment used:**
   – Test transformer 350 kVA / 350 kV, no.3 – 1963

   Measuring system:
   – AC measuring system 350 kV consists of:
   - high voltage compressed gas capacitor type MCF 75 / 350P, no.853889 and low voltage arm type H90, no.898939;
   - digital peak voltmeter type MU-17, no. 910396;
   - coaxial measuring cable, 75Ω.

   (Calibration Certificate no.41 / 04.2015).

Measuring uncertainty is ± 1.6 %..
The reported uncertainty is an expanded uncertainty, based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %.

4. **Test procedure / Test set-up:** according to IEC 60168 : 2001, subclause 4.4.1
5. **Atmospheric condition, correction factors, U_{test}**

Atmospheric conditions:	p [mbar]	1005
	t [°C]	26
	h_r [%]	53
Arcing distance measured [mm]:		310
Correction factors:	k_1	0.983
	k_2	1.0162
	$k_t = k_1 \cdot k_2$	0.9989
Frequency: [Hz]		50
Time: [sec]		60
$U_{test}(p_0,t_0,h_0)$: [kV_{rms}]		**80**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**79.9**

Symbols used:
– U_{test} (p_0, t_0, h_0) – rated withstand voltage value;
– U_{test} (p, t, h) – test voltage corrected to atmospheric conditions.

6. **Test circuit diagram:**

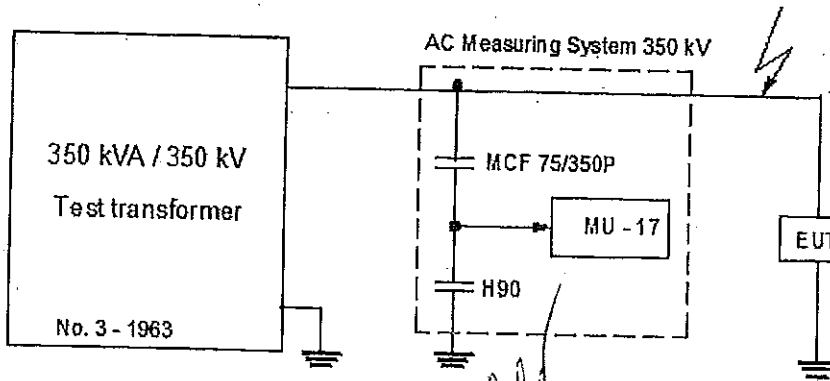

Fig. 2

7. **Test result:** The product passed the test.

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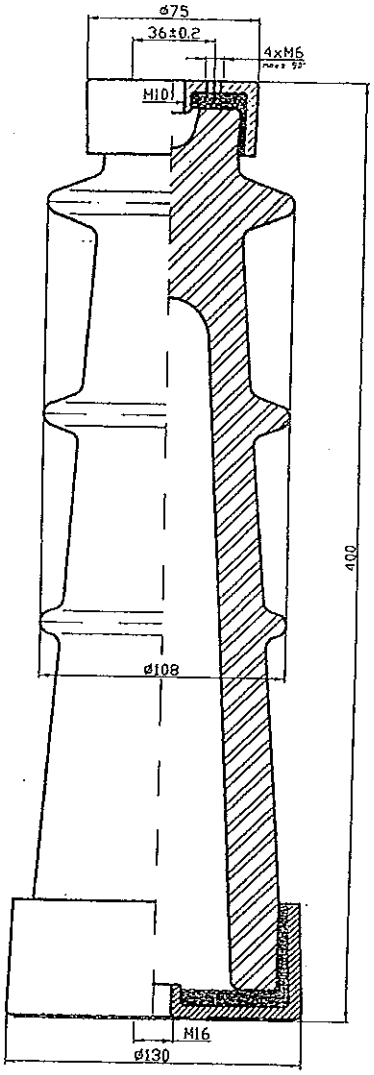

1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 36 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

					ND 92.14.00.00			
Alter	Numbe	№ of clocum.	Signature	Date	Support insulators for indoor mounting type PAK 35	Stage	Mass	Мащаб
Developed		Petrov						
Controled		Donev				Sheet 1	All sheet 1	
Controled		Iliev				"NIKDIM" OOD		

– end of test report –

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Phone: + 40 0351 402425, 404888; Fax: + 40 0351 404890
www.icmet.ro ; E-mail: market@icmet.ro

accredited for TESTING
SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICATE
LI 1036

TEST REPORT
No. 45983 / 24.08.2017

1. CUSTOMER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
2. MANUFACTURER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
3. TESTED PRODUCT:	Indoor Post Insulator type PAK 35
4. REFERENCE STANDARD:	Customer requirements (IEC 60168:2001, clause 5.2.4)
5. PERFORMED TESTS:	Mechanical failing load test. Bending test
6. TEST DATE:	23.08.2017
7. TEST RESULTS:	The product passed the test

The test report contains 5 pages and is edited in 4 copies, copy no.1 remains in laboratory and copies 2, 3, 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER,
Dipl. Eng. Ion Burciu

HEAD OF TESTING TEAM,
Dipl. Eng. Ion Dinu

На основание чл.2 от ЗЗЛД

Warnings:

a. *The results refer only to the tested product.*
b. *Publication and reproduction of the contents of this report in any other form unless its complete photocopying is not allowed without writing approval of Division to which laboratory belongs.*
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CONTENT

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1. IDENTIFICATION OF THE TEST PRODUCT

Type:	PAK 35
Serial / year:	–
Technical Specification / Drawing:	Drawing no. ND 92.14.00.00 - Support insulators for indoor mounting type PAK 35
Contract / Test order:	Add. Act No.1 to the Contract No. 705.2/876/03.08.2017
Internal test order:	23377/23.08.2017
Product receiving date:	23.08.2017
Product condition at receiving:	New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER

Maximum working voltage	36 kV
Mechanical failing load	4000 N (indicated by the customer)

3. TESTS PROGRAM

Mechanical failing load test. Bending test — Customer requirements (IEC 60168:2001, clause 5.2.4)

4. RESPONSIBLE FOR TEST

Dipl. Eng. Radu Serban Georgescu

5. PRESENT AT THE TEST

Maria Georgieva-NIKDIM Ltd.

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6. MECHANICAL FAILING LOAD TEST. BENDING TEST

Test date:	23.08.2017
Test standard:	Customer requirements – 4000 N (IEC 60168:2001, clause 5.2.4)
Atmospheric conditions:	t = 28 ^{0}C; RH = 53%
Equipment used:	• Manual lever hoist SAFETEX 3000 kg, manufacturer SC Delta Flex SRL Bucharest • Tension load cell, model CTL 1000 kg, serial no. 201106182, manufacturer LAUMAS ELECTRONICA Italy, CC no. F - 03/329/2017, SC GELUTECH Laboratory of Forces SRL
Test procedure:	The post insulator was subjected to a bending load, to verify the mechanical failing load of 4000 N, as specified in Annex 1 of the contract. The load was applied perpendicular to the axis of the post insulator, to the free end (see Photo 1). The specified bending load was reached.
Test results:	The product passed the test.

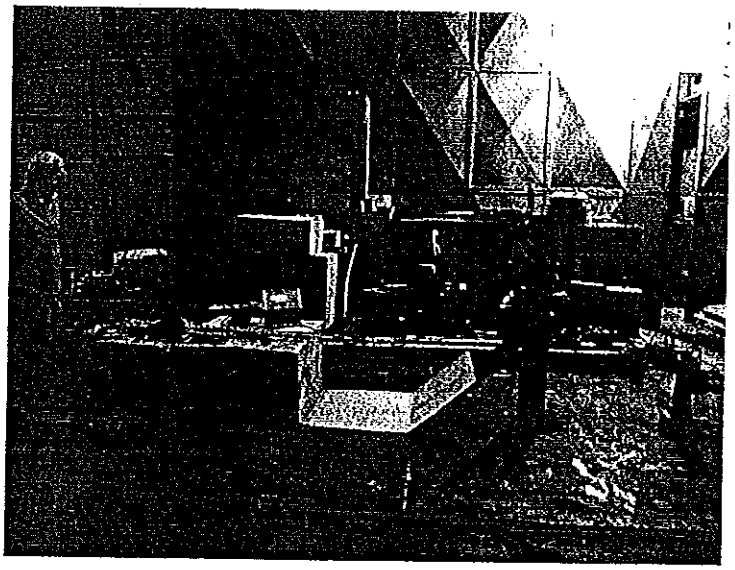

Photo 1

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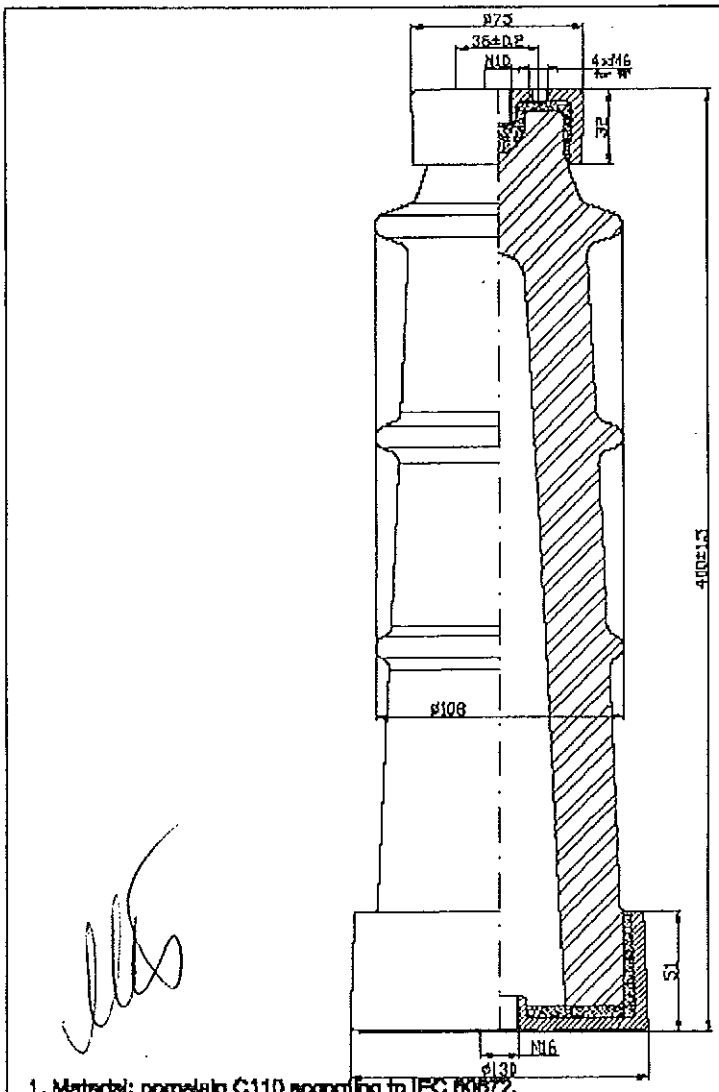
Annex 1



1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 38 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

					ND 92.14.00.00		
Alter	Number	№ of docum.	Signature	Date	Support insulators for indoor mounting type PAK 35	Stage	Mass / Мащаб
Developed		Petrov				Sheet 1	All sheet 1
Controled		Donev					
Controled		Iliev				"NIKDIM" OOD	

– End of test report –

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ROMANIA RENAR
SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICATE
LI 1036

TEST REPORT
No. 45959 / 08.08.2017

1. CUSTOMER: **NIKDIM Ltd.**
Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

2. MANUFACTURER: **NIKDIM Ltd.**
Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

3. TESTED PRODUCT: **Indoor post insulator 35kV type PAM 35**

4. REFERENCE STANDARD: IEC 60168 : 2001

5. PERFORMED TEST:

I – Dry lightning impulse voltage withstand test
II – Dry power frequency voltage withstand test

6. TESTS DATE: 08.08.2017

7. TESTS RESULT: The product passed the test.

The test report contains 12 pages and is edited in 4 copies, copy no.1 remain in laboratory and copies 2÷ 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER,
Dipl. eng. [redacted]

На основание чл.2 от ЗЗЛД

HEAD OF TESTING TEAM,

Warnings:

a. *The results refer only to the tested product.*
b. *Publication and reproduction of the contents of this report in any other form unless its complete photocopying is not allowed without writing approval of Division to which laboratory belongs.*
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Content

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TEST REPORT No. 45959

1. IDENTIFICATION OF THE TEST PRODUCT: Indoor post insulator

Type: PAM 35

Serial / year: - / 2017

Technical Specification / Drawing: – / see page 12

Client test order: Contract no. 876 / 03.08.2017

Internal test order: 23362 / 07.08.2017

Product receiving date: 07.08.2017

Product condition at receiving: New

2. MAIN TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:

Maximum working voltage.....36 kV

Dry lightning impulse withstand voltage 1.2 / 50 µs:.....190 kV_{peak}

Dry power frequency withstand voltage : .....80 kV_{rms}

Material : porcelain C110

Colour of glaze: white

Note : The level of test voltages were specified by the customer .

3. TESTS PROGRAM:

I – Dry lightning impulse voltage withstand test
II – Dry power frequency voltage withstand test

4. RESPONSIBLE FOR TEST: Dipl. eng. Laurenţiu Vlădoi (I)
/Dipl. eng. Dan Ştefan (II)

5. PRESENT AT TESTS: General Manager eng.Maria Georgieva – NIKDIM Bulgaria

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I. DRY LIGHTNING IMPULSE VOLTAGE WITHSTAND TEST

1. **Test date:** 08.08.2017
2. **Test standard:** IEC 60168 : 2001, subclause 4.5
3. **Equipment used:**
   - Impulse generator 4.2 MV, no. 5 – 1197; connection I_2 (2 x 1);
   - C_s = 0.288 [μF]; R_s = 94 [Ω]; R_p = 230 [Ω].

   Addenda: C_s – equivalent capacity of impulse generator;
   R_s – equivalent serial resistance of impulse generator;
   R_p – equivalent parallel resistance of impulse generator.

   Measuring system used:
   - High voltage measuring system of impulse generator 4.2 MV consists of:
     - Capacitive divider of the impulse generator 4.2 MV with k_{div} = 699.3;
     - Digital measuring system type TR – AS 100 – 10 / 4, no.228; channel 2. (Calibration Certificate no. 91 / 12.2016)

Measuring uncertainty for: peak value of lightning impulse is: ± 1.56 %
- for front time T_1 is ± 7.41 %,
- for tail time T_2 is ± 3.28 %.

The uncertainty stated is expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k = 2. The value of measurand lies within the assigned range of values with probability of 95%.

4. **Test procedure / Test set-up:** according to IEC 60168 : 2001, subclause 4.4.1.
5. **Atmospheric conditions; correction factors; U_{test}**

Atmospheric conditions:	p [mbar]	1005
	t [°C]	27
	h_r [%]	51
Arcing distance measured [mm]:		335
Correction factors:	k_1	0.969
	k_2	1.0219
	$k_t = k_1 \cdot k_2$	0.9902
$U_{test}(p_0,t_0,h_0)$ (-) and (+) [kV_{peak}]:		**190**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**188.1**

Symbols used:
- U_{test} (p_0, t_0, h_0) – rated withstand voltage value;
- U_{test} (p, t, h) – test voltage corrected to atmospheric conditions;

6. **Test circuit diagram:**

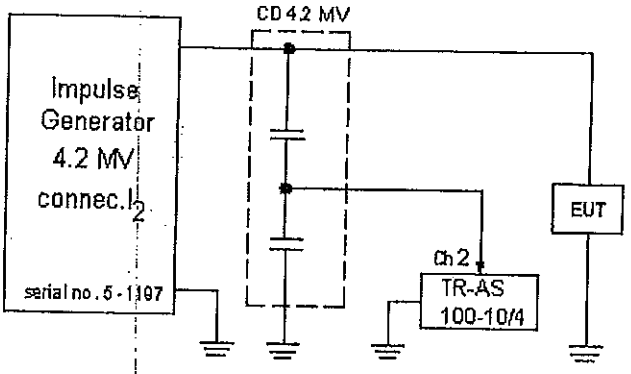

Fig. 1

Legend: EUT – Equipment under test

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Notes:

1. The test was performed by the withstand voltage procedure with 15 impulses.
2. The standard 1.2 / 50 μs lightning impulse was used. For wave parameters see oscillograms from pages 6 ÷ 10.

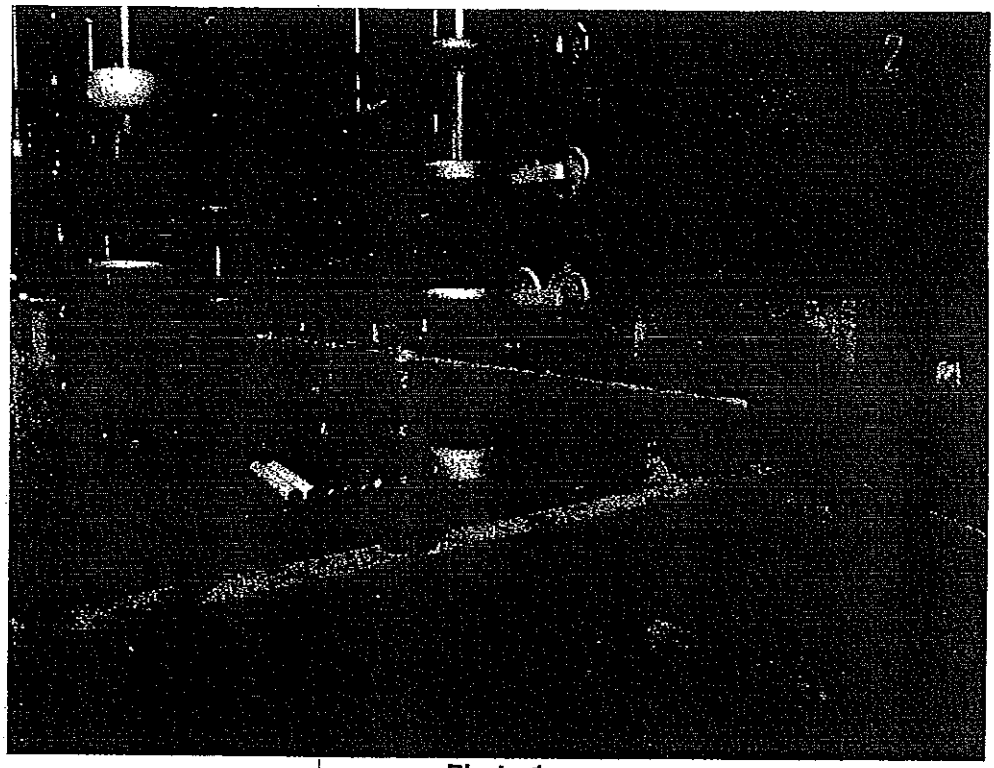

Photo 1

7. Test result: The product passed the test.

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LI lightning-impulse						
no.	Up [kV]	T1[µs]	T2[µs]	Tc[µs]	Ip[A]	remark
317027	-98.8	1.42	45.7			RFW / PAM 35
317028	-189	1.43	45.4			FW / PAM 35
317029	-188	1.43	45.5			FW / PAM 35
317030	-187	1.42	45.6			FW / PAM 35
317031	-189	1.43	45.5			FW / PAM 35
317032	-189	1.43	45.6			FW / PAM 35
317033	-190	1.43	45.6			FW / PAM 35
317034	-190	1.43	45.6			FW / PAM 35
317035	-190	1.43	45.4			FW / PAM 35
317036	-190	1.42	45.6			FW / PAM 35
317037	-190	1.43	45.5			FW / PAM 35
317038	-190	1.43	45.6			FW / PAM 35
317039	-190	1.43	45.5			FW / PAM 35
317040	-189	1.43	45.7			FW / PAM 35
317041	-189	1.43	45.6			FW / PAM 35
317042	-190	1.43	45.6			FW / PAM 35
317043	95.8	1.42	45.4			RFW / PAM 35
317045	189	1.44	45.6			FW / PAM 35
317046	188	1.43	45.8			FW / PAM 35
317047	190	1.43	45.7			FW / PAM 35
317048	190	1.43	45.6			FW / PAM 35
317049	189	1.43	45.6			FW / PAM 35
317050	189	1.43	45.7			FW / PAM 35
317051	188	1.43	45.6			FW / PAM 35
317052	188	1.44	45.6			FW / PAM 35
317053	189	1.43	45.6			FW / PAM 35
317054	189	1.44	45.8			FW / PAM 35
317055	189	1.43	45.7			FW / PAM 35
317056	189	1.43	45.6			FW / PAM 35
317057	189	1.43	45.6			FW / PAM 35
317058	189	1.43	45.6			FW / PAM 35
317059	189	1.42	45.6			FW / PAM 35

Notes: 1.UP-peak value of testing voltage; T1, T2, T_c – front, tail and chopping time – parameters of testing impulse wave;

2. RFW – reduced wave 50 – 75%; FW – full wave 100%

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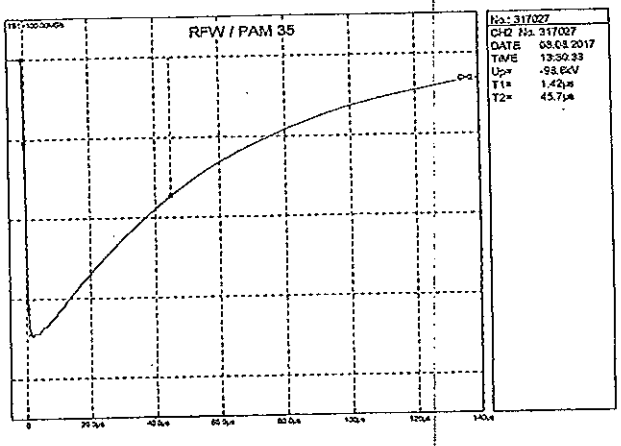

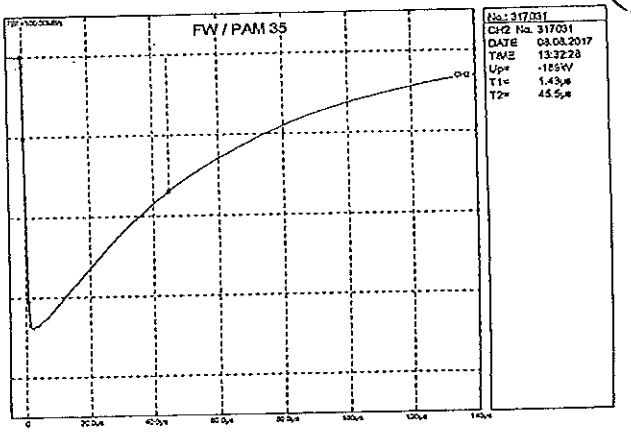

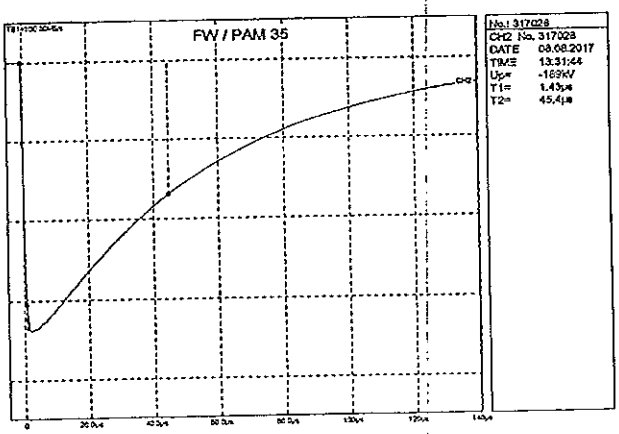

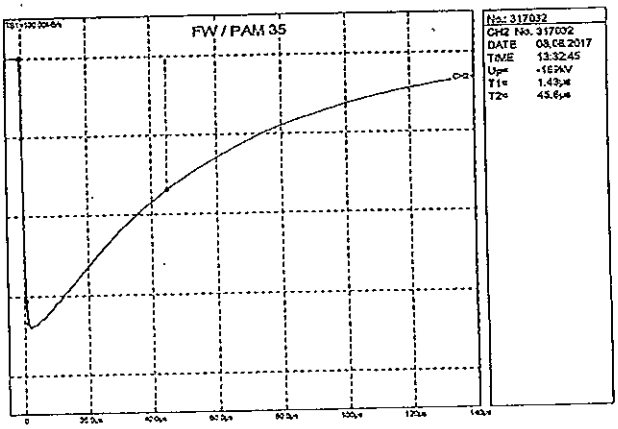

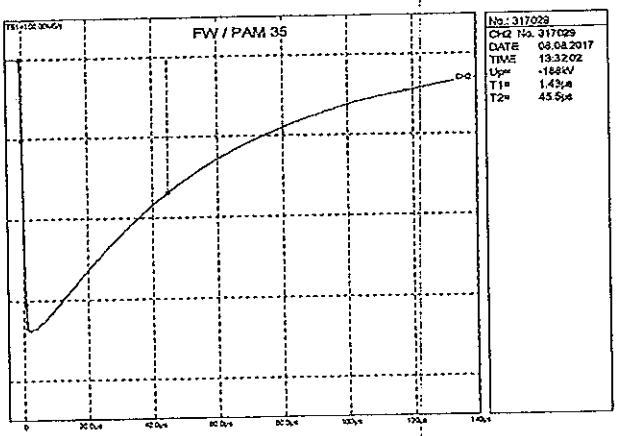

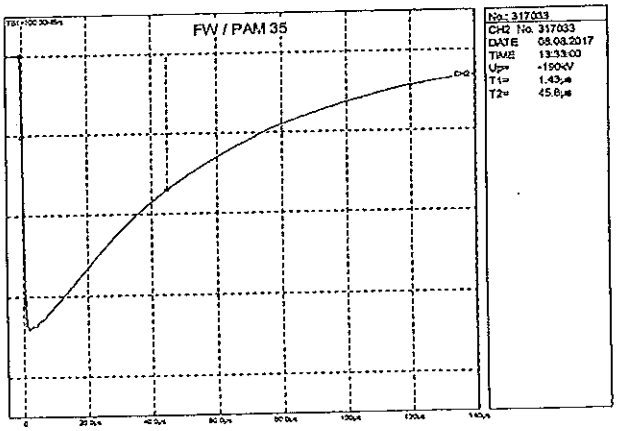

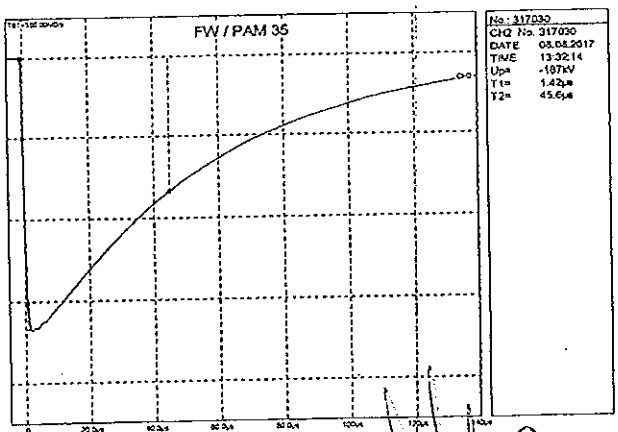

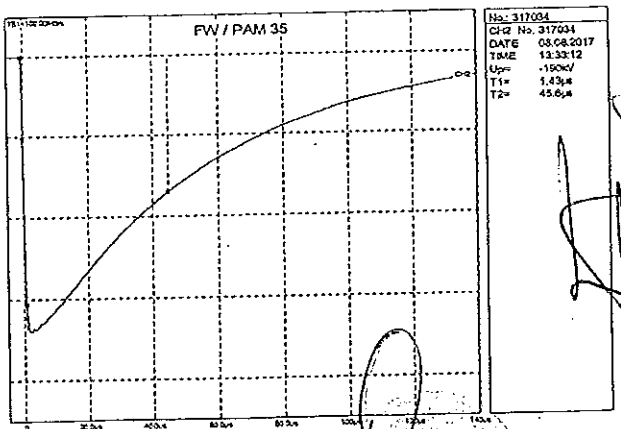

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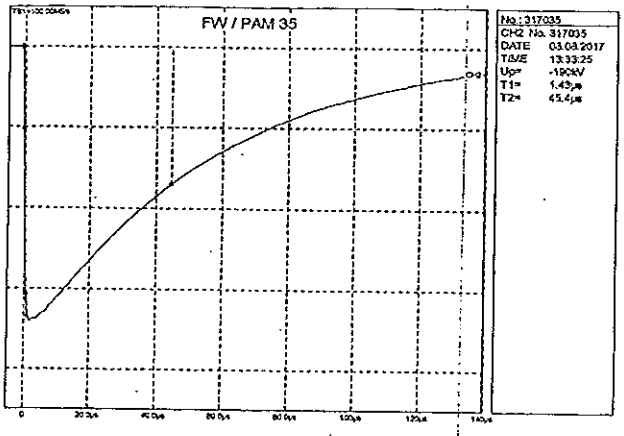

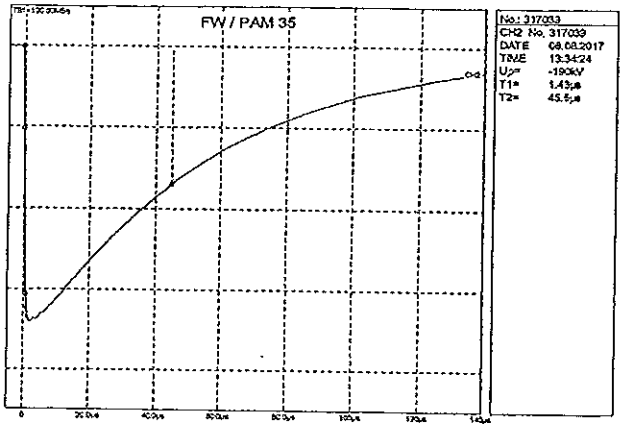

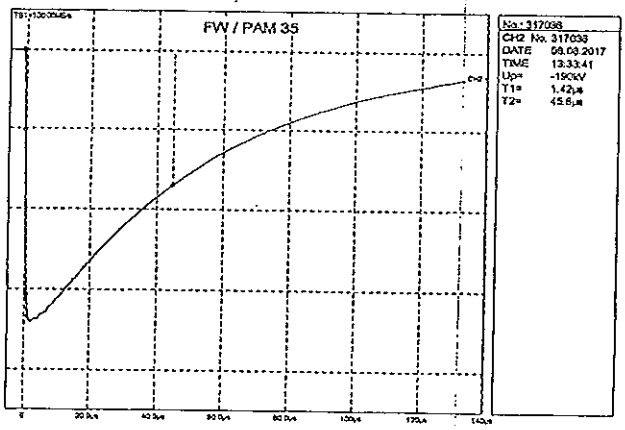

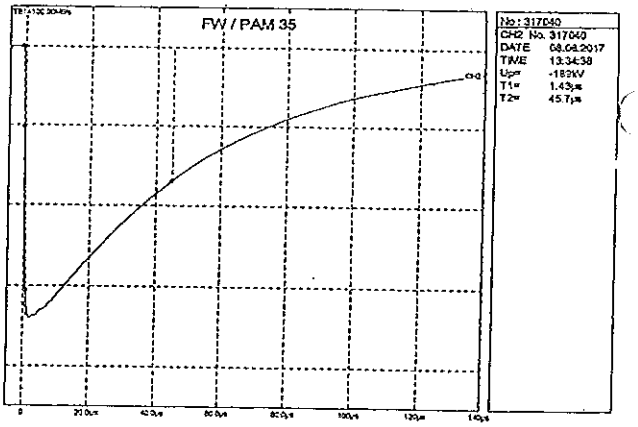

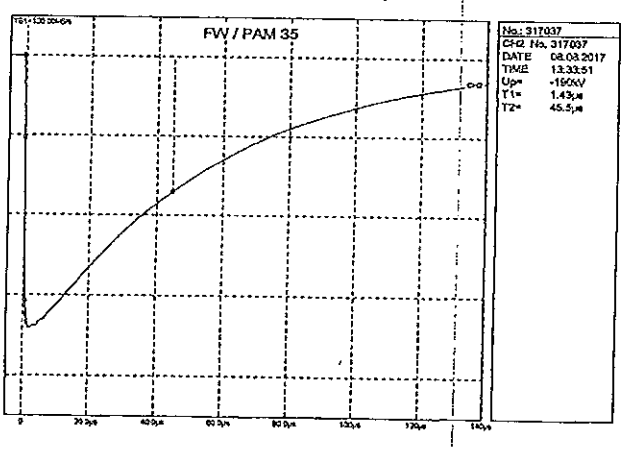

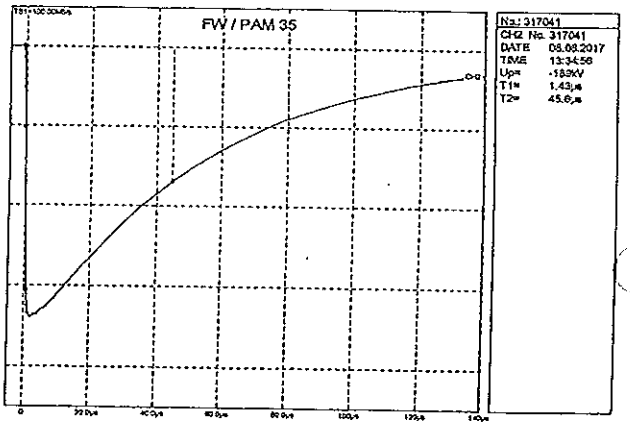

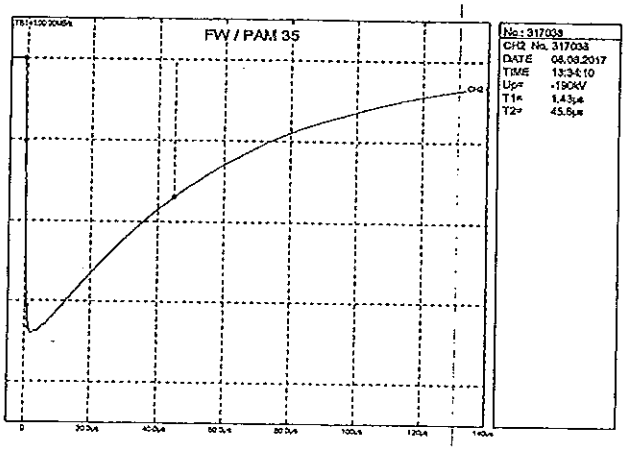

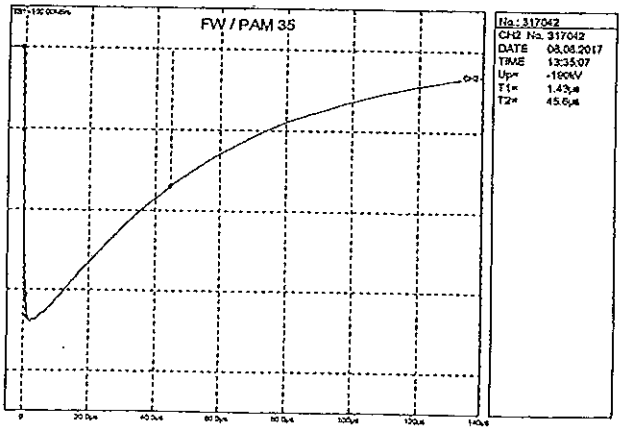

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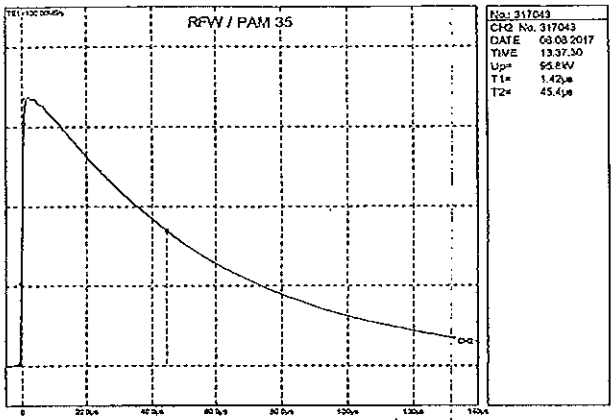

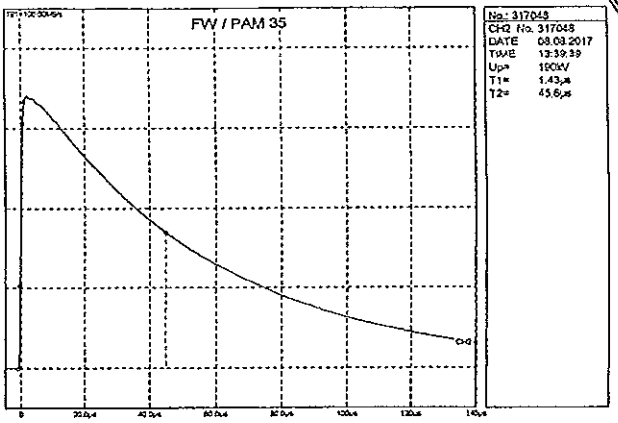

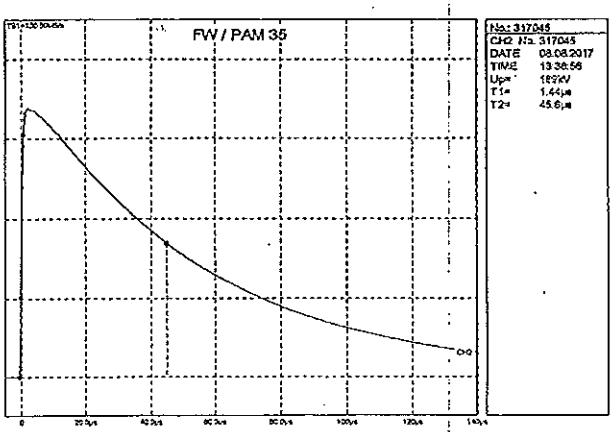

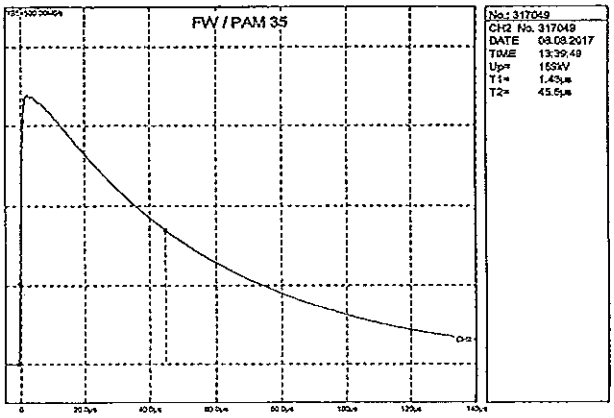

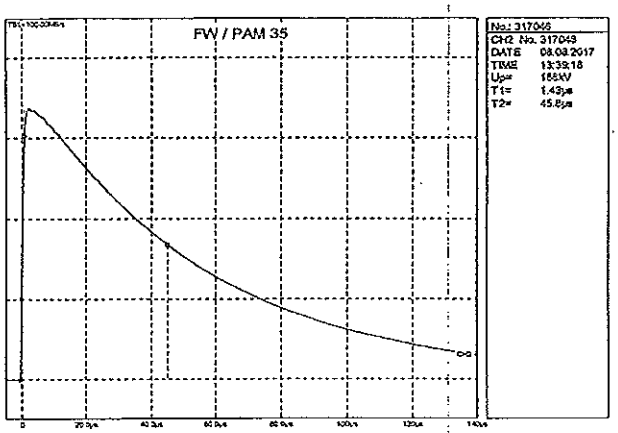

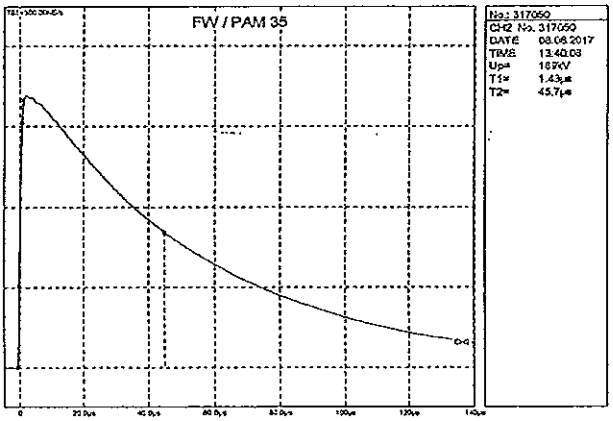

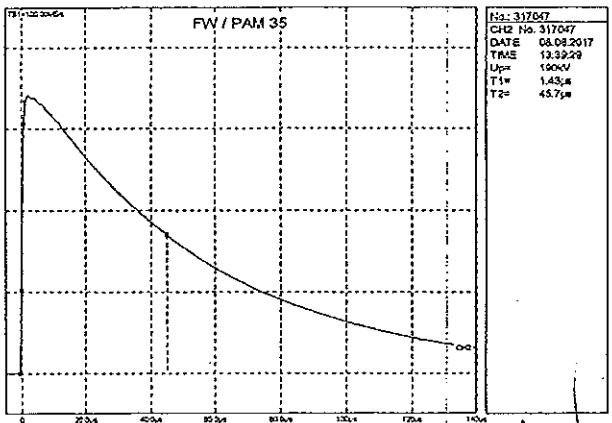

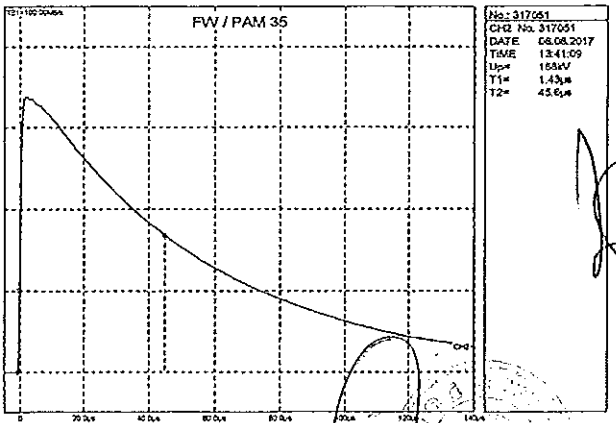

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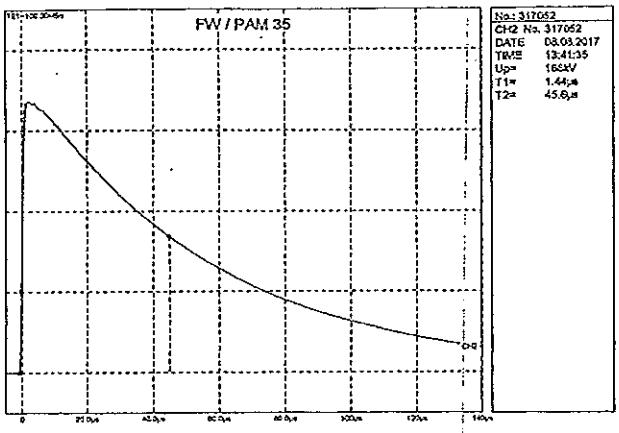

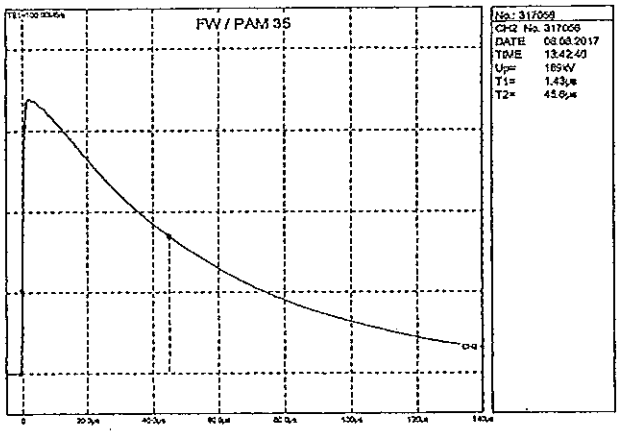

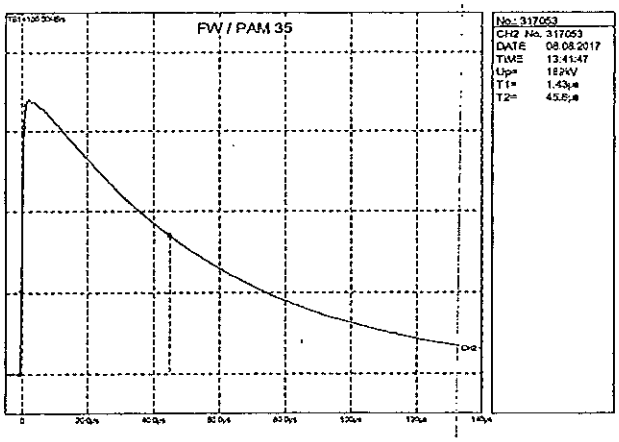

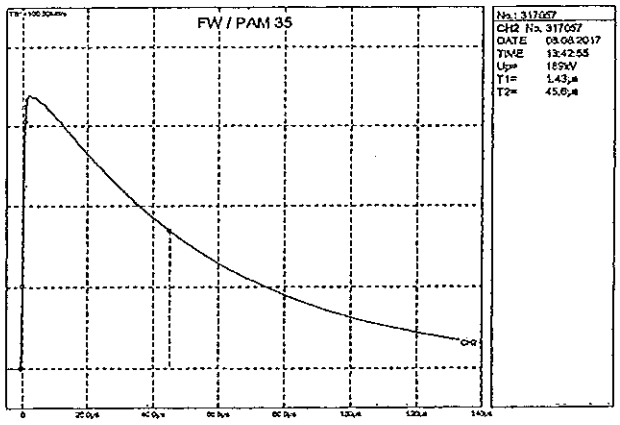

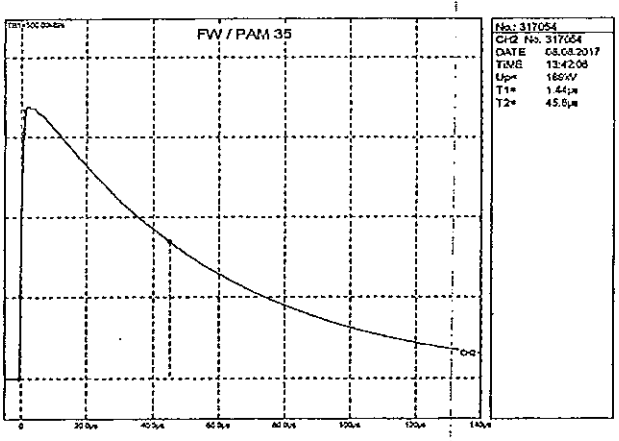

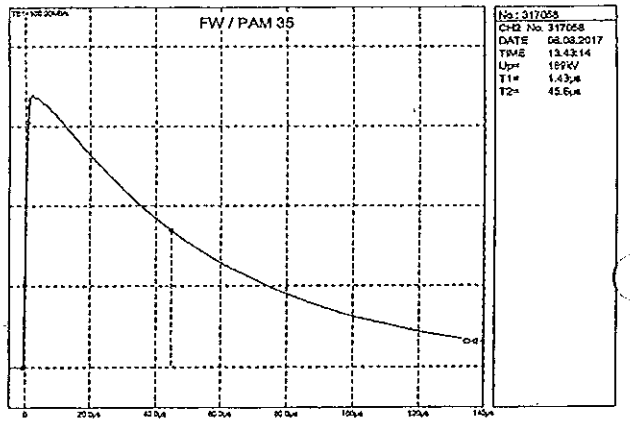

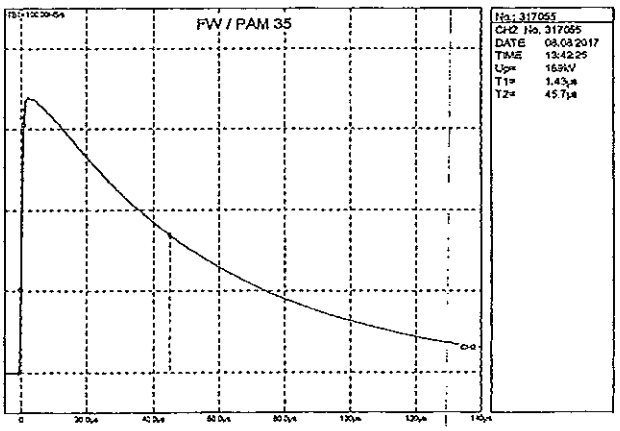

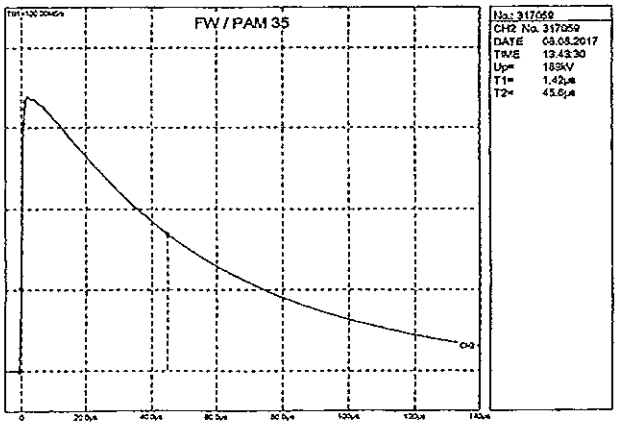

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II. DRY POWER FREQUENCY VOLTAGE WITHSTAND TEST

1. **Test date:** 08.08.2017
2. **Test standard:** IEC 60168:2001, subclause 4.7
3. **Equipment used:**
   – Test transformer 350 kVA / 350 kV, no.3 – 1963

Measuring system:

– AC measuring system 350 kV consists of:
- high voltage compressed gas capacitor type MCF 75 / 350P, no.853889 and low voltage arm type H90, no.898939;
- digital peak voltmeter type MU-17, no. 910396;
- coaxial measuring cable, 75Ω.

(Calibration Certificate no.41 / 04.2015).

Measuring uncertainty is ± 1.6 %..
The reported uncertainty is an expanded uncertainty, based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %.

4.Test procedure / Test set-up: according to IEC 60168 : 2001, subclause 4.4.1

5. Atmospheric condition, correction factors, U_{test}

Atmospheric conditions:	p [mbar]	1005
	t [°C]	27
	h_r [%]	51
Arcing distance measured [mm]:		335
Correction factors:	k_1	0.9841
	k_2	1.0151
	$k_t = k_1 \cdot k_2$	0.999
Frequency: [Hz]		50
Time: [sec]		60
$U_{test}(p_0,t_0,h_0)$: [kV_{rms}]		**80**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**79.92**

Symbols used:
– U_{test} (p_0, t_0, h_0) – rated withstand voltage value;
– U_{test} (p, t, h) – test voltage corrected to atmospheric conditions.

6. Test circuit diagram:

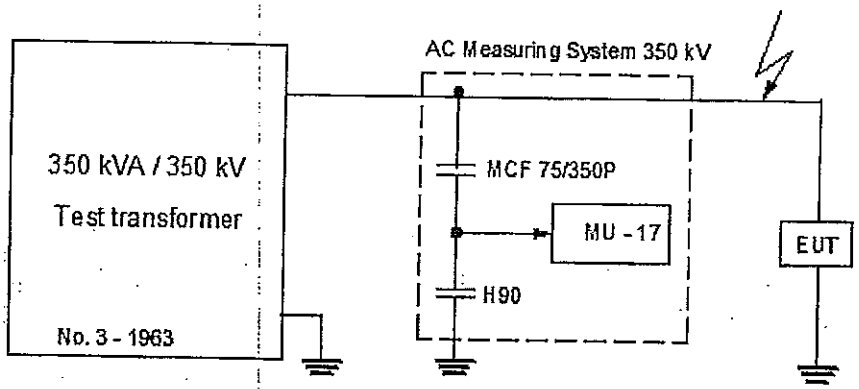

Fig. 2

7.Test result: The product passed the test.

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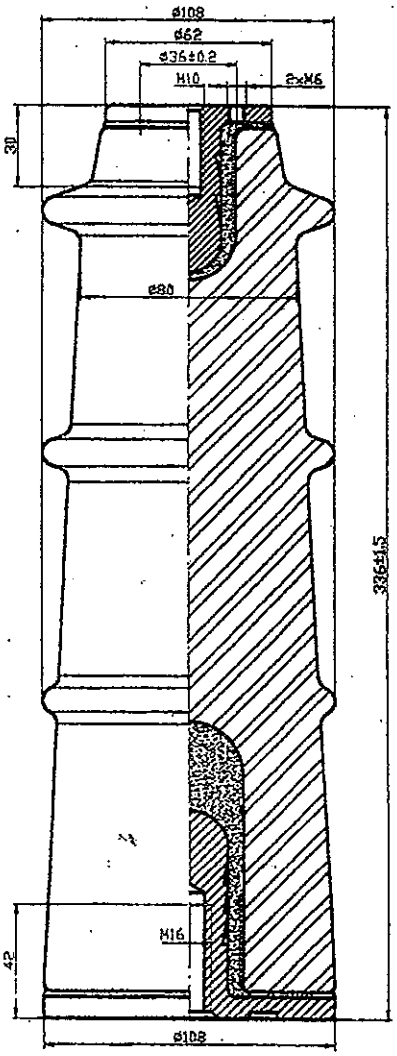

1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 36 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

Alter	Numbs	№ of docum.	Signature	Date		
					ND 92.03.00.00	
Developed		Iliev			Support insulators for indoor mounting type PAM 35	Stage: — / Mass: — / Мащаб: 1:1
Controled		Donev				Sheet 1 / All sheet 1
Controled		Donev				"NIKDIM" OOD

– end of test report –

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Phone: + 40 0351 402425, 404888; Fax: + 40 0351 404890
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SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICATE
LI 1036

TEST REPORT
No. 45984 / 24.08.2017

1. CUSTOMER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
2. MANUFACTURER:	NIKDIM Ltd. 23rd Shipchensky Polk No 80, 6100 Kazanlak, Bulgaria
3. TESTED PRODUCT:	Indoor Post Insulator type PAM 35
4. REFERENCE STANDARD:	Customer requirements (IEC 60168:2001, clause 5.2.4)
5. PERFORMED TESTS:	Mechanical failing load test. Bending test
6. TEST DATE:	23.08.2017
7. TEST RESULTS:	The product passed the test

The test report contains 5 pages and is edited in 4 copies, copy no.1 remains in laboratory and copies 2, 3, 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER,
Dipl. Eng. Ion Burciu

HEAD OF TESTING TEAM,
Dipl. Eng. Ion Dinu

ICMET

На основание чл.2 от ЗЗЛД

Warnings:

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CONTENT

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1. IDENTIFICATION OF THE TEST PRODUCT

Type:	PAM 35
Serial / year:	–
Technical Specification / Drawing:	Drawing no. ND 92.03.00.00 - Support insulators for indoor mounting type PAM 35
Contract / Test order:	Add. Act No.1 to the Contract No.705.2/876/03.08.2017
Internal test order:	23377/23.08.2017
Product receiving date:	23.08.2017
Product condition at receiving:	New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER

Maximum working voltage	36 kV
Mechanical failing load	4000 N (indicated by the customer)

3. TESTS PROGRAM

Mechanical failing load test. Bending test — Customer requirements (IEC 60168:2001, clause 5.2.4)

4. RESPONSIBLE FOR TEST

Dipl. Eng. Radu Serban Georgescu

5. PRESENT AT THE TEST

Maria Georgieva- NIKDIM Ltd.

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6. MECHANICAL FAILING LOAD TEST. BENDING TEST

Test date:	23.08.2017
Test standard:	Customer requirements – 4000 N (IEC 60168:2001, clause 5.2.4)
Atmospheric conditions:	t = 26 ^{0}C; RH = 50%
Equipment used:	• Manual lever hoist SAFETEX 3000 kg, manufacturer SC Delta Flex SRL Bucharest • Tension load cell, model CTL 1000 kg, serial no. 201106182, manufacturer LAUMAS ELECTRONICA Italy, CC no. F - 03/329/2017, SC GELUTECH Laboratory of Forces SRL
Test procedure:	The post insulator was subjected to a bending load, to verify the mechanical failing load of 4000 N, as specified in Annex 1 of the contract. The load was applied perpendicular to the axis of the post insulator, to the free end (see Photo 1). The specified bending load was reached.
Test results:	The product passed the test.

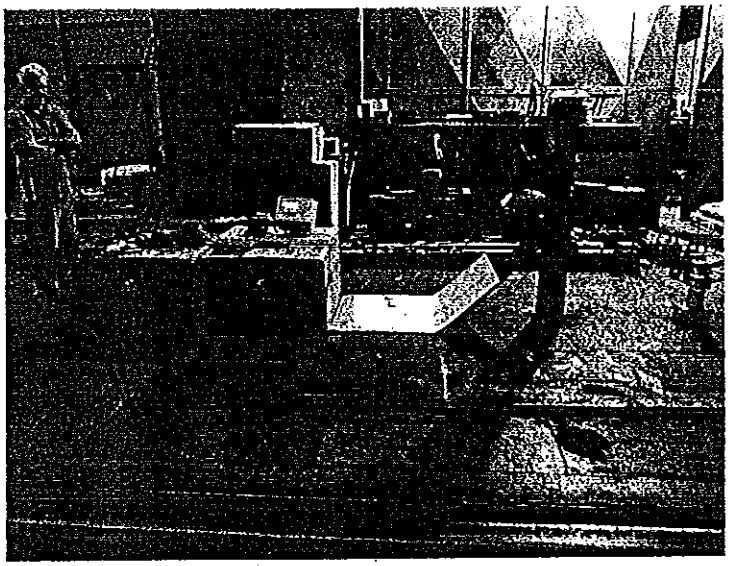

Photo 1

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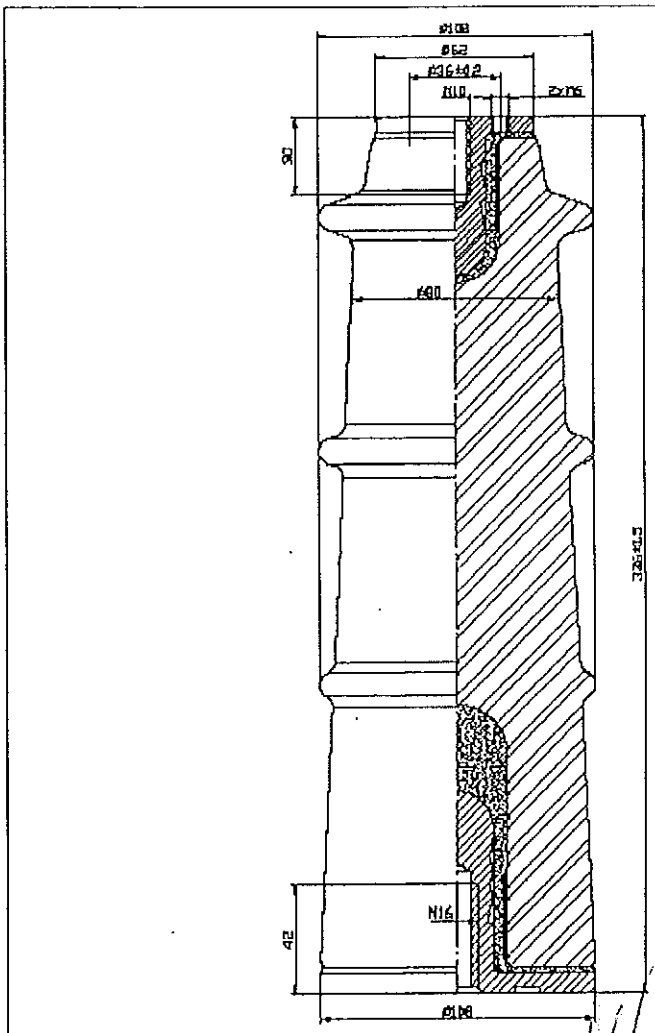
Annex 1



1. Material: porcelain C110 according to IEC 60672.
2. Colour of glaze - white.
3. Maximum working voltage - 35 kV.
4. The general tolerances are according to DIN 40680.
5. Electrical parameters according to IEC 60168.

					ND 92.03.00.00		
Alter	Number	№ of docum.	Signature	Date	Support insulators for indoor mounting type PAM 35	Stage	Mass	Мащаб
								1:1
Developed	Ilev					Sheet 1	All sheet 1
Controled	Donev						
						"NIKDIM" OOD	
Controled	Donev						

–End of test report –

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accredited for TESTING
SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICATE
LI 1036

TEST REPORT
No. 45970 / 09.08.2017

1. CUSTOMER: **NIKDIM Ltd.**
Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

2. MANUFACTURER: **NIKDIM Ltd.**
Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

3. TESTED PRODUCT: **Indoor to Indoor Bushing type PrB 10**

4. REFERENCE STANDARD: IEC 60137 : 2017

5. PERFORMED TEST:
I – Dry lightning impulse voltage withstand test
II – Dry power frequency voltage withstand test

6. TESTS DATE: 10.08.2017

7. TESTS RESULT: The product passed the test.

The test report contains 12 pages and is edited in 4 copies, copy no.1 remain in laboratory and copies 2÷ 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER,
Dipl. eng. Ion BURCIU

HEAD OF TESTING TEAM,
Dipl. eng. Ion BADEA

На основание чл.2 от ЗЗЛД

Warnings:
a. *The results refer only to the tested product.*
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Content

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1. **IDENTIFICATION OF THE TEST PRODUCT:** Indoor to Indoor Bushing 10kV/400A

Type: PrB 10

Serial / year: - / 2017

Technical Specification / Drawing: – / see page 7

Client test order: Contract no. 876 / 03.08.2017

Internal test order: 23362 / 07.08.2017

Product receiving date: 10.08.2017

Product condition at receiving: New

2. **MAIN TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:**

Maximum working voltage (Um).....12 kV

Rated current (Ir)..... 200A, 400A, 630A, 1000A

Dry lightning impulse withstand voltage 1.2 / 50 µs:.....75 kV_{peak}

Dry power frequency withstand voltage.....42 kV_{rms}

Material : porcelain C110

Colour of glaze: brown

.....

Note : Level of voltage test (42kV) for the dry power frequency withstand voltage test was specified by the customer.

3. **TEST PROGRAM:**

I – Dry lightning impulse voltage withstand test
II – Dry power frequency voltage withstand test

4. **RESPONSIBLE FOR TEST:** Dipl. eng. Laurenţiu Vlădoi (I)
Dipl. eng. Dan Ştefan (II)

5. **PRESENTS AT TESTS:** General Manager eng. Maria Georgieva – NIKDIM Bulgaria

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DRY LIGHTNING IMPULSE VOLTAGE WITHSTAND TEST

1. Test date: 10.08.2017

2. Test standard: IEC 60137 : 2017 subclause 8.4

3. Equipment used:

- Impulse generator 4.2 MV, no. 5 – 1197; connection I_1 (1 x 1);
- C_s = 0.576 [μF]; R_s = 47 [Ω]; R_p = 115 [Ω].

Addenda: C_s – equivalent capacity of impulse generator;
R_s – equivalent serial resistance of impulse generator;
R_p – equivalent parallel resistance of impulse generator.

Measuring system used:

- High voltage measuring system of impulse generator 4.2 MV consists of:
  - Capacitive divider of the impulse generator 4.2 MV with k_{div} = 345.1;
  - Digital measuring system type TR – AS 100 – 10 / 4, no.228; channel 2. (Calibration Certificate no. 91 / 12.2016)

Measuring uncertainty for: peak value of lightning impulse is: ± 1.38 %

- for front time T_1 is ± 8.44 %,
- for tail time T_2 is ± 3.39 %.

The uncertainty stated is expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k = 2. The value of measurand lies within the assigned range of values with probability of 95%.

4. Test procedure / Test set-up: according to IEC 60137 : 2017, subclause 8.4.

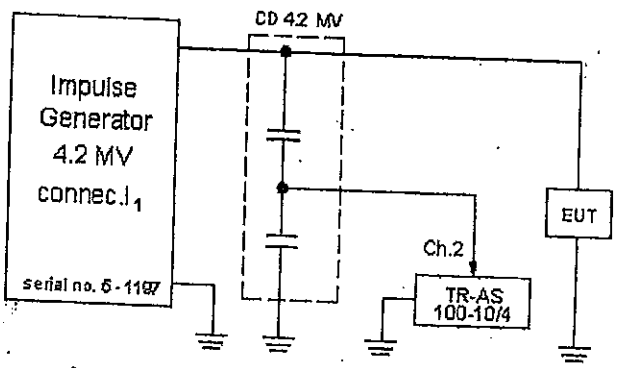
5. Atmospheric conditions; correction factors; U_{test}

Atmospheric conditions:	p [mbar]	1005
	t [°C]	27
	h_r [%]	51
Arcing distance measured [mm]:		220
Correction factors:	k_1	0.9831
	k_2	1.0131
	$k_t = k_1 \cdot k_2$	0.9960
$U_{test}(p_0,t_0,h_0)$ (-) and (+) [kV_{peak}]:		**75**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**74.7**

Symbols used:

- U_{test} (p_0, t_0, h_0) – rated withstand voltage value;
- U_{test} (p, t, h) – test voltage corrected to atmospheric conditions;

6.Test circuit diagram:



Legend: EUT – Equipment under test

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Notes:

1. The test was performed applying 15 voltage impulses of positive polarity and 15 voltage impulses of negative polarity on the test voltage to 75kV peak (see foto).
2. The standard 1.2 / 50 µs lightning impulse was used. For wave parameters see oscillograms from pages 6 ÷ 10.

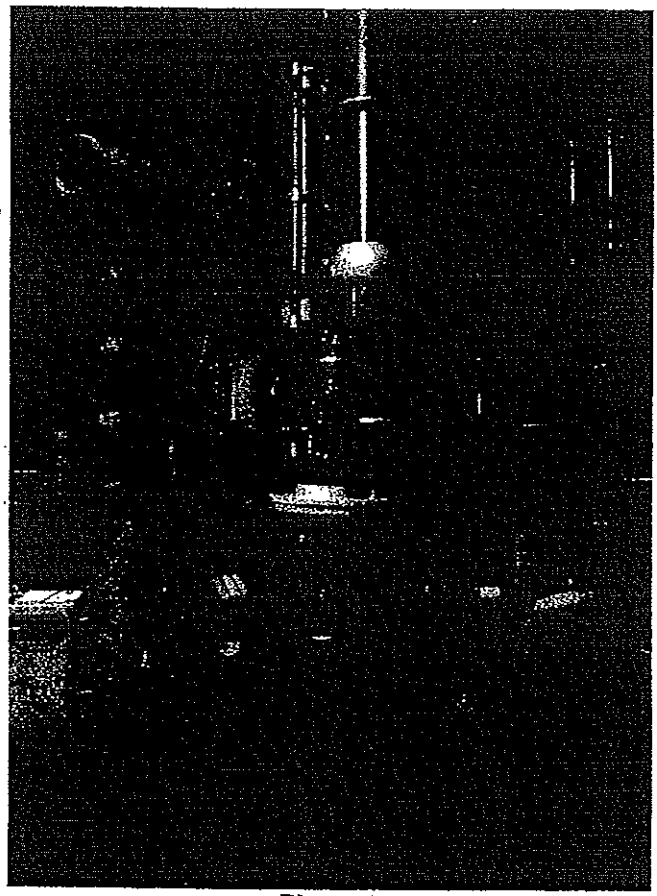

Photo 1

7. Test result: The product passed the test.

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project : 45970

LI lightning-impulse

no.	Up [kV]	T1[µs]	T2[µs]	Tc[µs]	Ip[A]	remark
317241	-39.3	1.28	45			RFW / PRB 10
317242	-73.5	1.28	44.8			FW / PRB 10
317243	-74	1.28	44.7			FW / PRB 10
317244	-73.8	1.27	44.8			FW / PRB 10
317245	-73.8	1.27	44.8			FW / PRB 10
317246	-73.8	1.28	44.8			FW / PRB 10
317247	-73.9	1.27	44.7			FW / PRB 10
317248	-73.6	1.28	44.8			FW / PRB 10
317249	-73.5	1.28	44.8			FW / PRB 10
317250	-73.9	1.28	44.9			FW / PRB 10
317251	-74	1.28	44.8			FW / PRB 10
317252	-73.9	1.28	44.7			FW / PRB 10
317253	-73.8	1.27	44.7			FW / PRB 10
317254	-73.8	1.28	44.9			FW / PRB 10
317255	-73.5	1.28	44.7			FW / PRB 10
317256	-74.1	1.28	44.8			FW / PRB 10
317258	43.5	1.29	44.9			RFW / PRB 10
317259	73.8	1.29	44.7			FW / PRB 10
317260	74	1.29	44.7			FW / PRB 10
317261	73.9	1.28	44.7			FW / PRB 10
317262	74.7	1.28	44.7			FW / PRB 10
317263	73.5	1.28	44.7			FW / PRB 10
317264	74.1	1.28	44.7			FW / PRB 10
317265	73.7	1.28	44.7			FW / PRB 10
317266	73.9	1.28	44.8			FW / PRB 10
317267	74.1	1.28	44.7			FW / PRB 10
317268	74.2	1.29	44.8			FW / PRB 10
317269	74.2	1.28	44.8			FW / PRB 10
317270	73.8	1.28	44.7			FW / PRB 10
317271	73.8	1.28	44.7			FW / PRB 10
317272	74.2	1.28	44.8			FW / PRB 10
317273	73.9	1.28	44.7			FW / PRB 10

Notes: 1.UP-peak value of testing voltage; T1, T2, T_c – front, tail and chopping time – parameters of testing impulse wave;

2. RFW – reduced wave 50 – 75%; FW – full wave 100%

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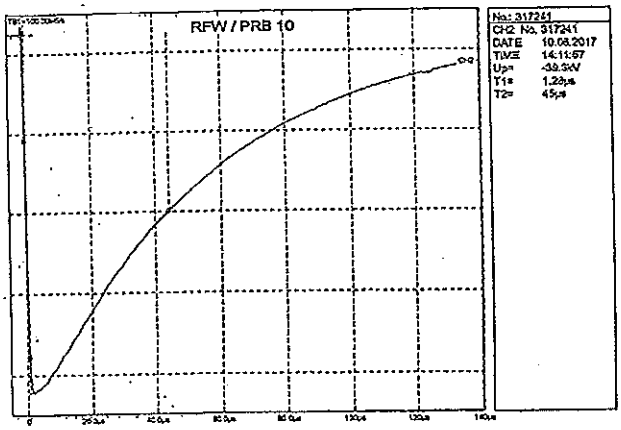

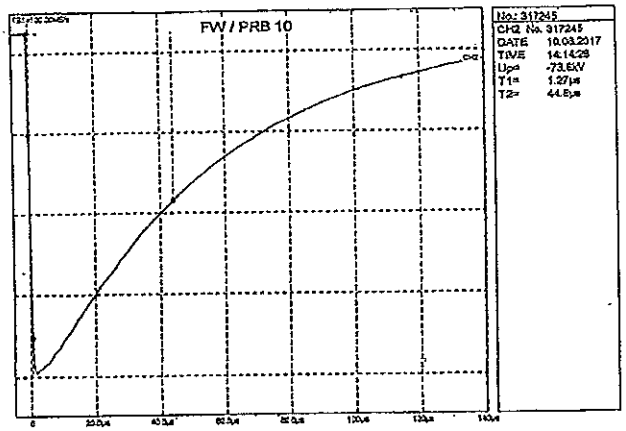

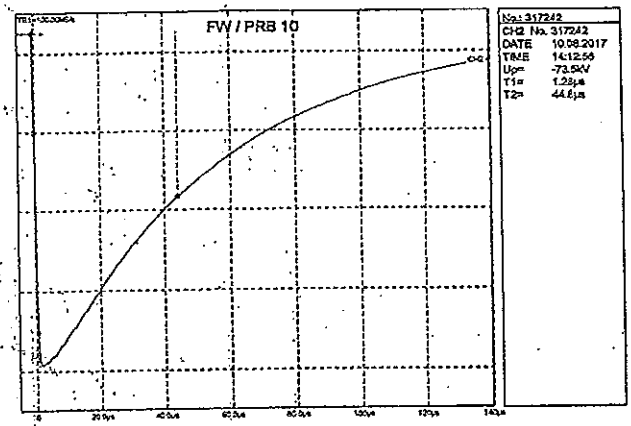

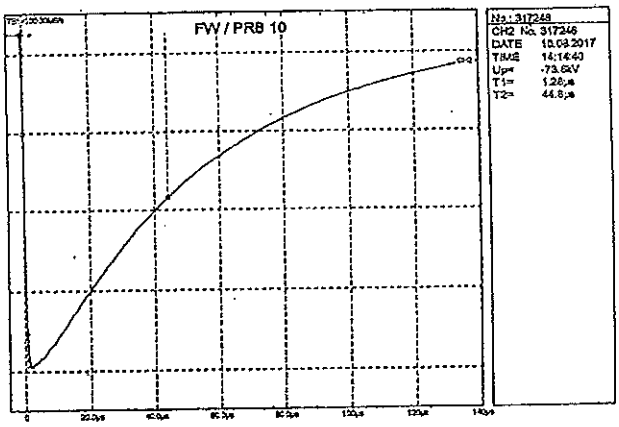

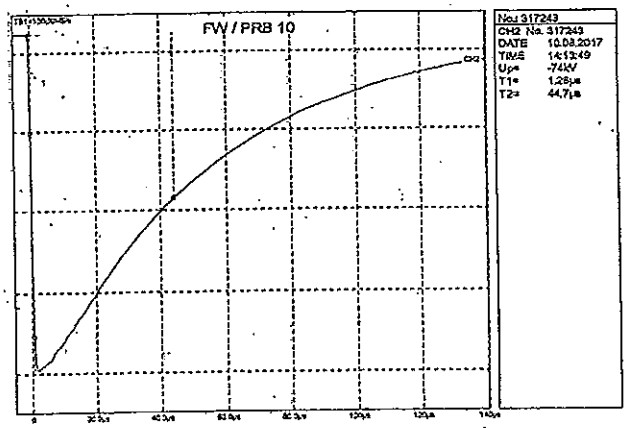

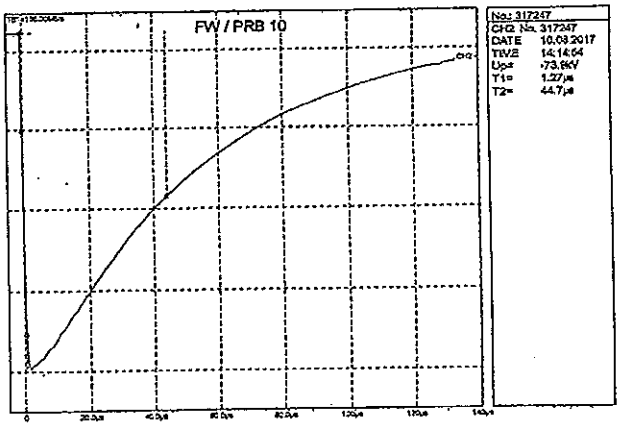

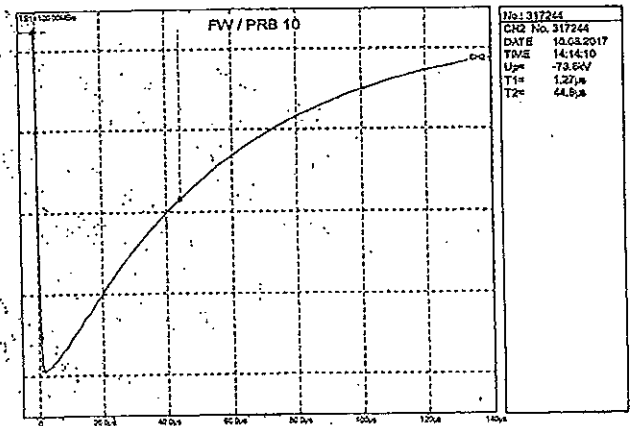

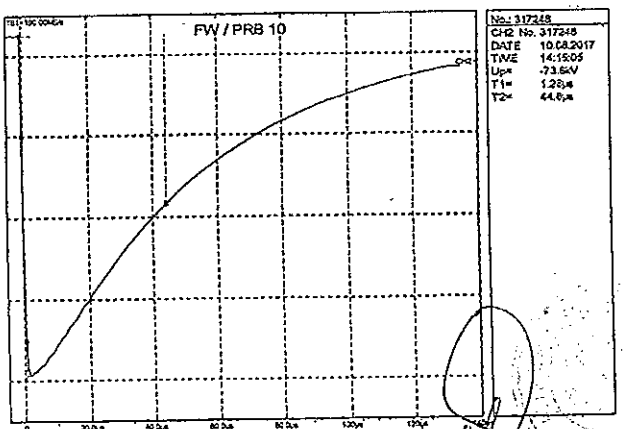

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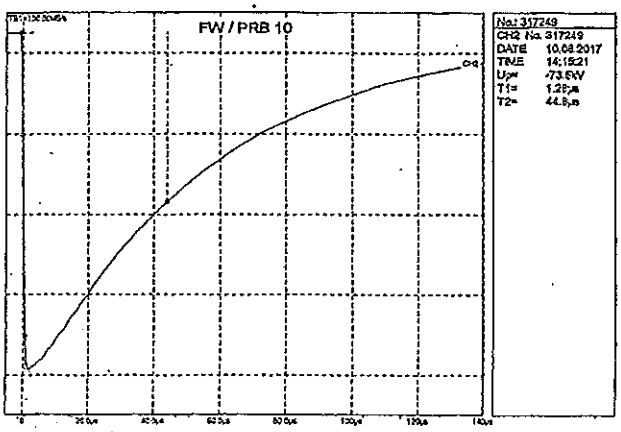

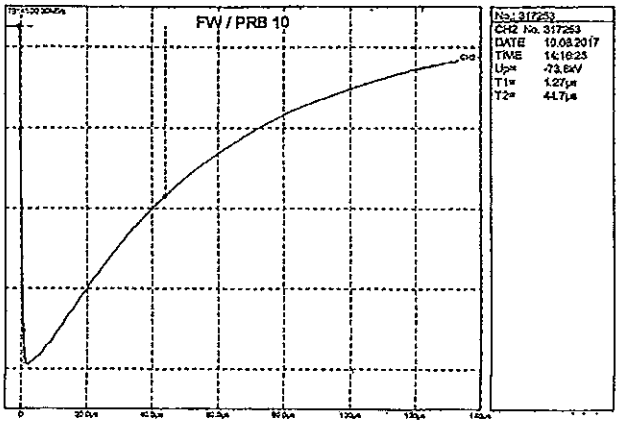

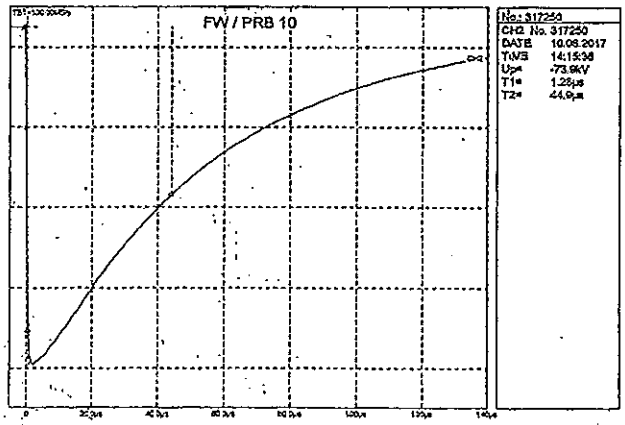

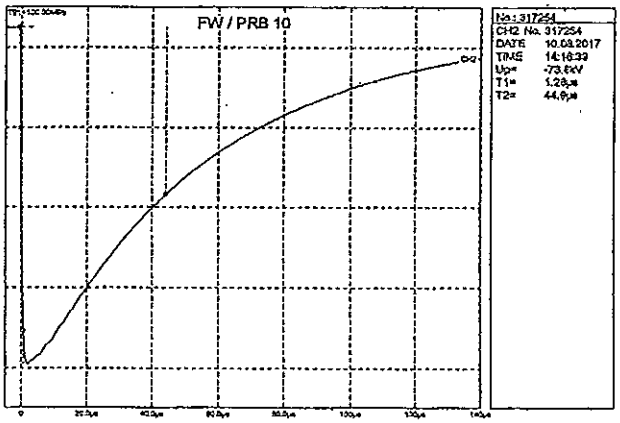

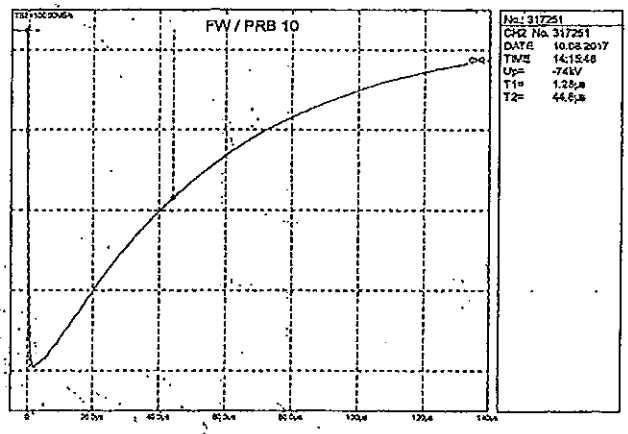

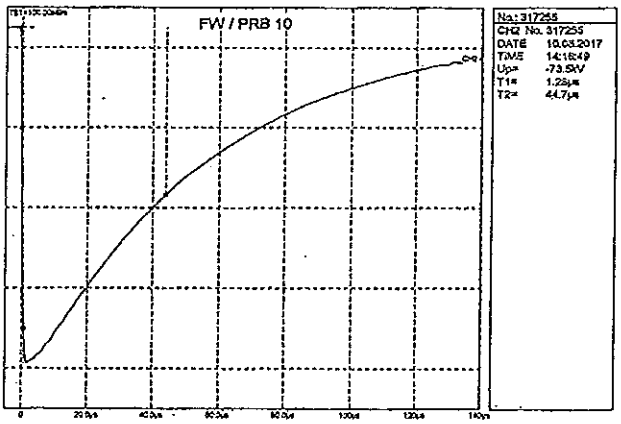

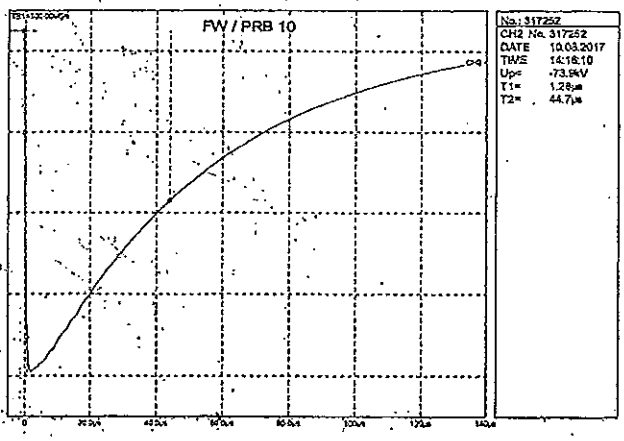

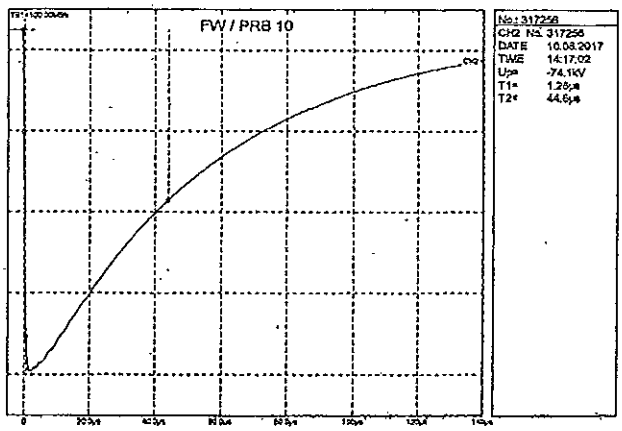

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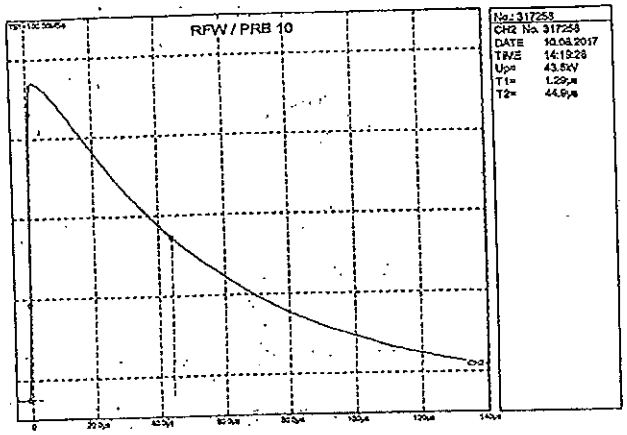

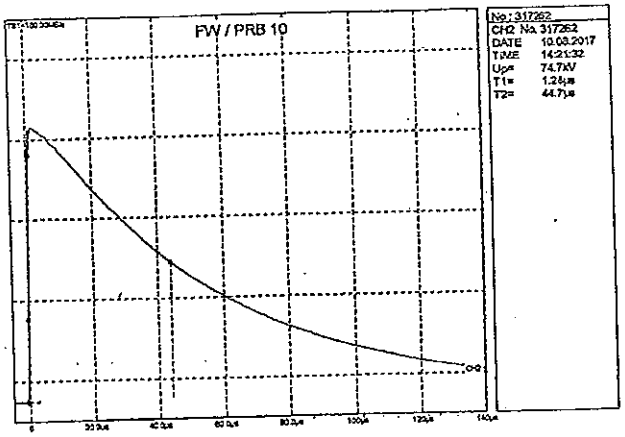

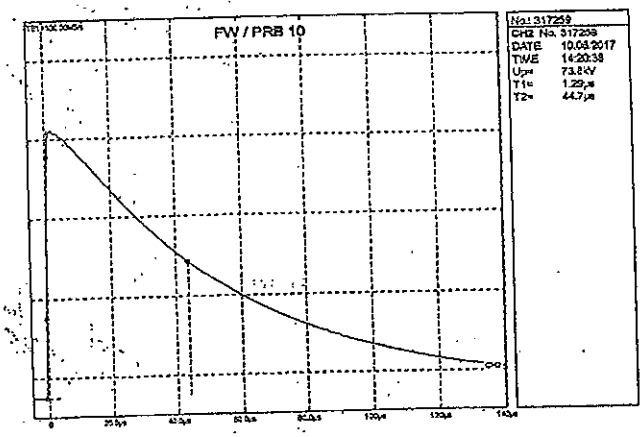

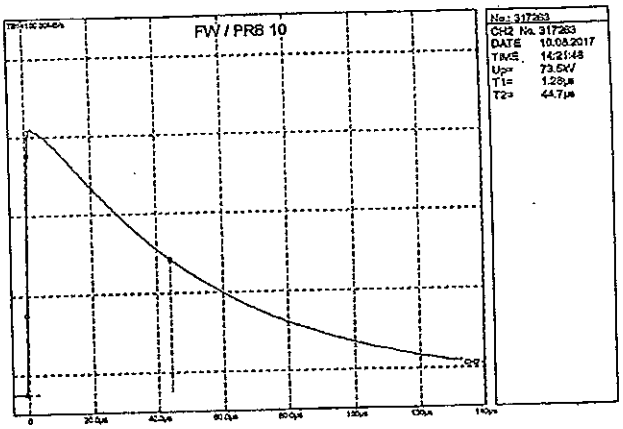

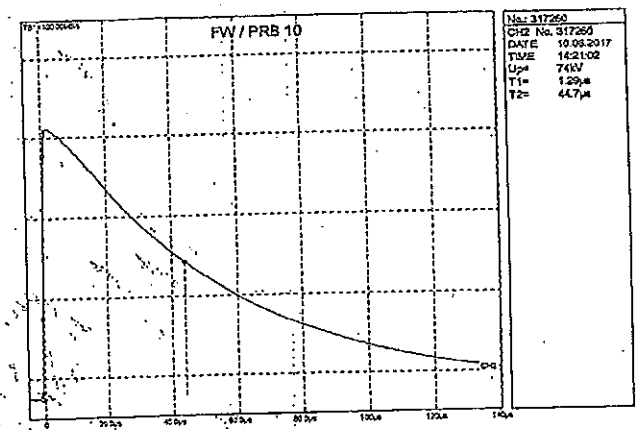

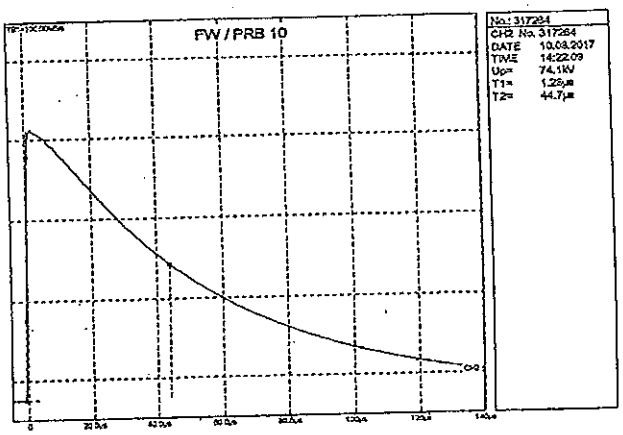

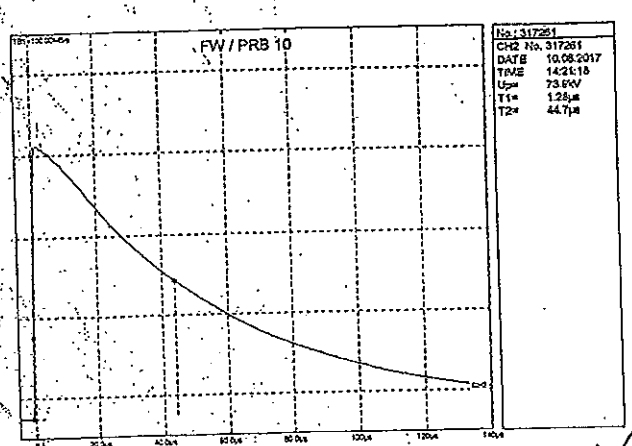

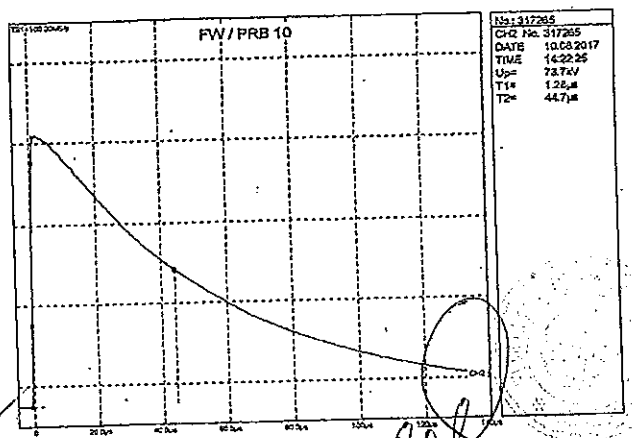

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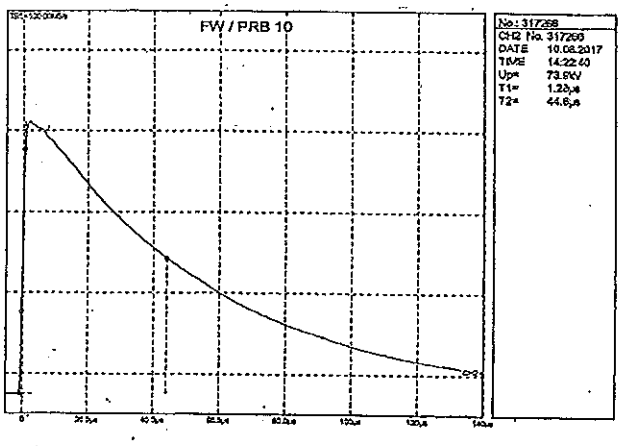

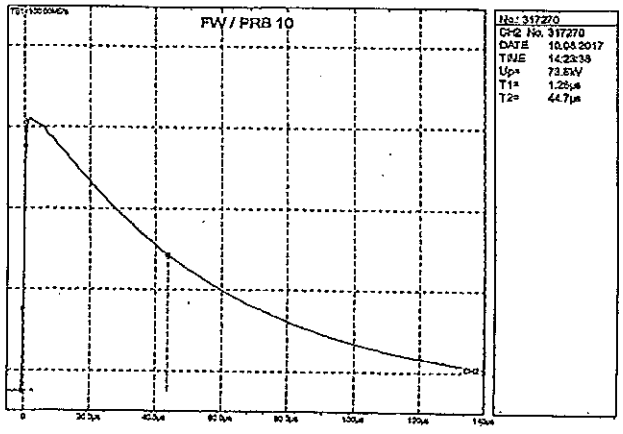

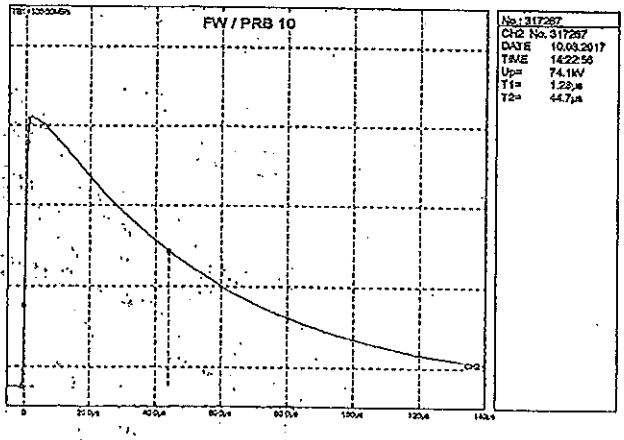

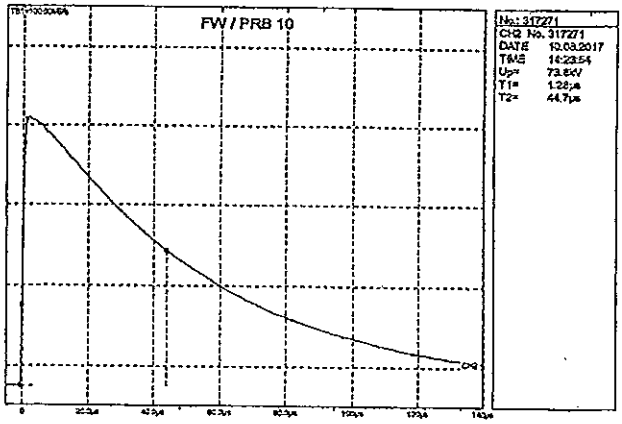

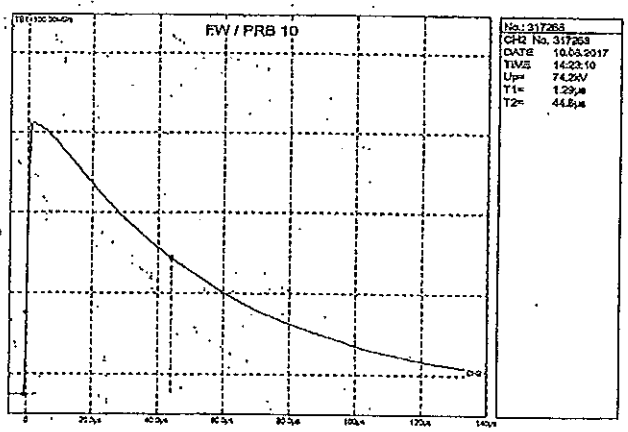

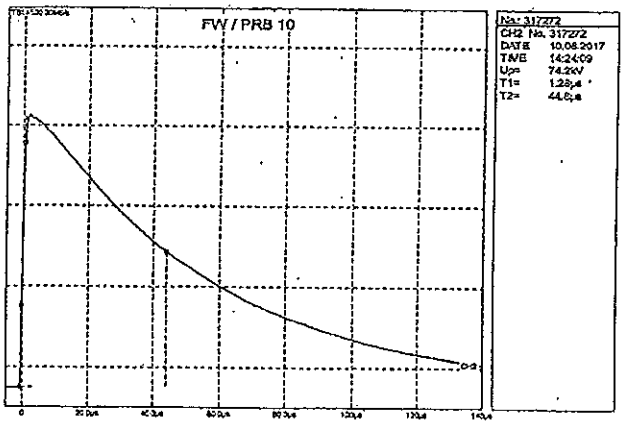

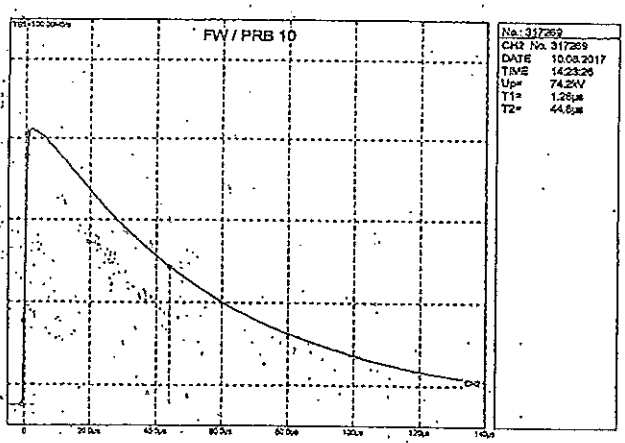

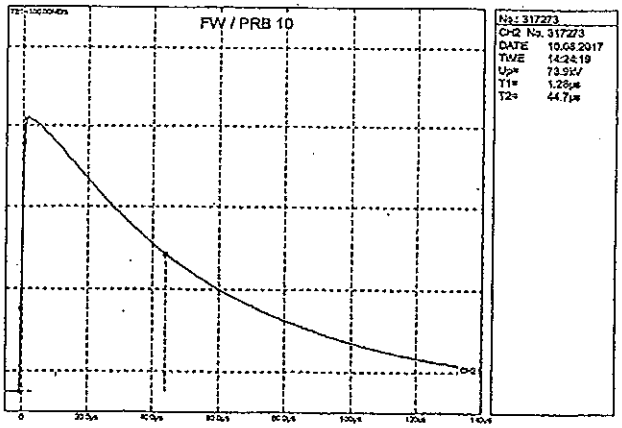

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II. DRY POWER FREQUENCY VOLTAGE WITHSTAND TEST

1. **Test date:** 11.08.2017
2. **Test standard:** IEC 60137 : 2017, subclause 8.2.
3. **Equipment used:**
   – Test transformer 350 kVA / 350 kV, no.3 – 1963
   Measuring system:
   – AC measuring system 350 kV consists of:
   - high voltage compressed gas capacitor type MCF 75 / 350P, no.853889 and low voltage arm type H90, no.898939;
   - digital peak voltmeter type MU-17, no. 910396;
   - coaxial measuring cable, 75Ω.

   (Calibration Certificate no.41 / 04.2015).

Measuring uncertainty is ± 1.6 %..
The reported uncertainty is an expanded uncertainty, based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %.

4. **Test procedure / Test set-up:** according to IEC 60137 : 2017, subclause 8.2
5. **Atmospheric condition, correction factors, U_{test}**

Atmospheric conditions:	p [mbar]	1004
	t [°C]	27
	h_r [%]	51
Arcing distance measured [mm]:		220
Correction factors:	k_1	0.9905
	k_2	1.0028
	$k_t = k_1 \cdot k_2$	0.9992
Frequency:	[Hz]	50
Time:	[sec]	60
$U_{test}(p_0,t_0,h_0)$:	[kV_{rms}]	**42**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**41.97**

Symbols used:
– U_{test} (p_0, t_0, h_0) – rated withstand voltage value;
– U_{test} (p, t, h) – test voltage corrected to atmospheric conditions.

6. **Test circuit diagram:**

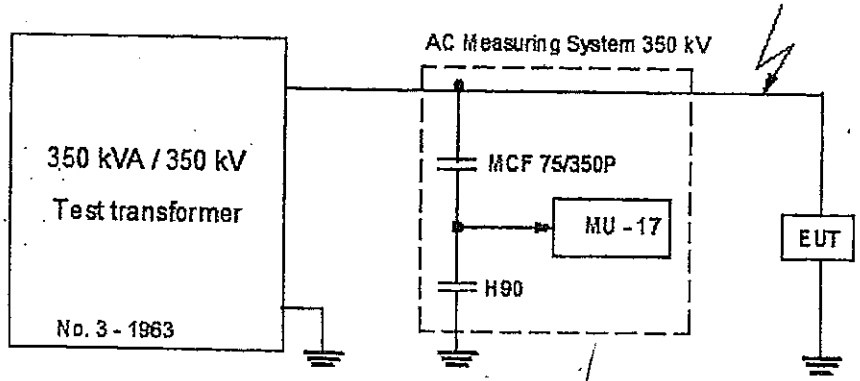

Fig. 2

7. **Test result:** The product passed the test.

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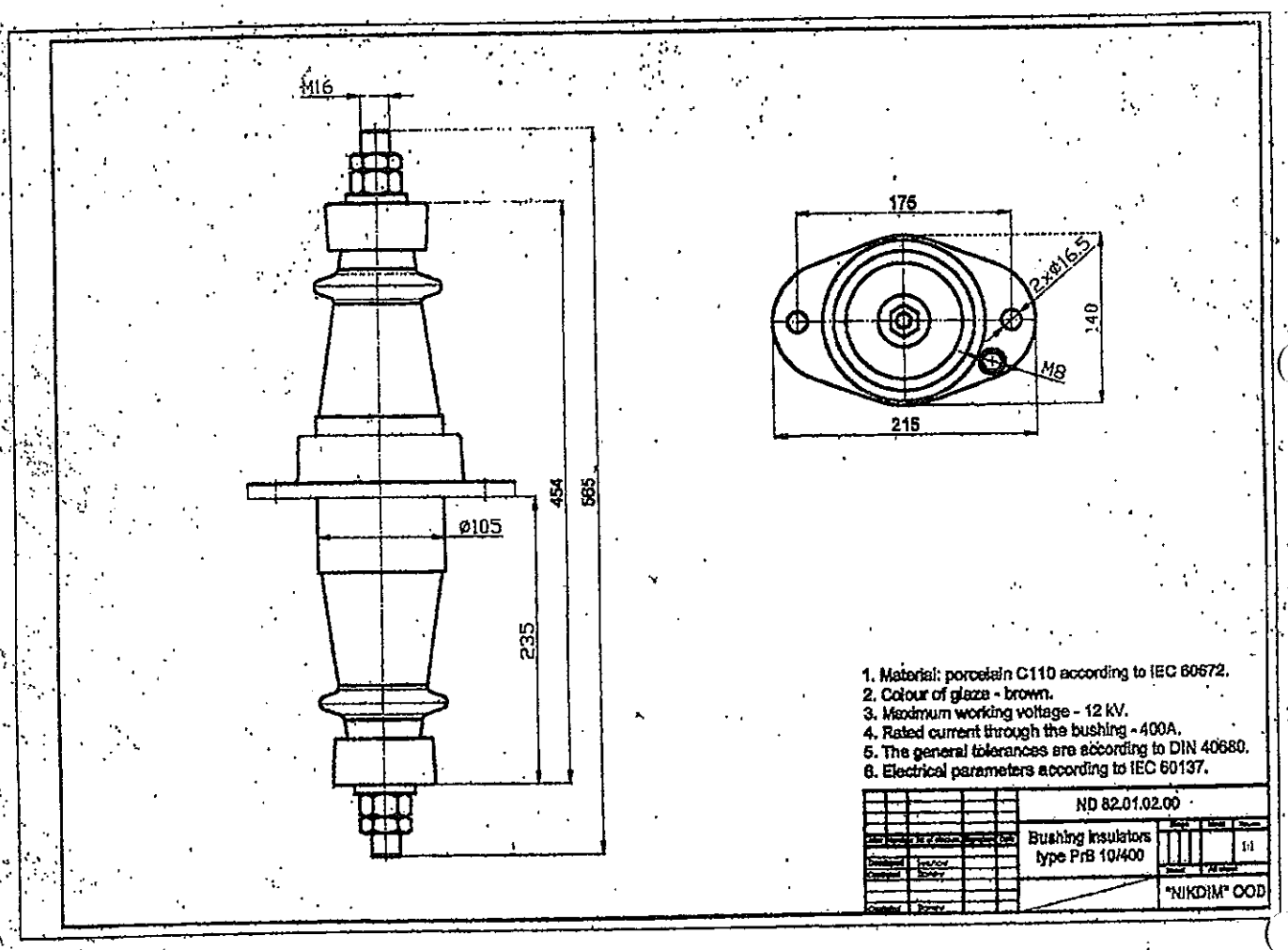

– end of test report –

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accredited for TESTING
SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICATE
LI 1036

TEST REPORT
No. 45962 / 09.08.2017

1. CUSTOMER: **NIKDIM Ltd.**
   Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

2. MANUFACTURER: **NIKDIM Ltd.**
   Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

3. TESTED PRODUCT: **Indoor to Indoor Bushing type PrB 20kV**

4. REFERENCE STANDARD: IEC 60137 : 2017

5. PERFORMED TEST:
   I – Dry lightning impulse voltage withstand test
   II – Dry power frequency voltage withstand test

6. TESTS DATE: 10÷11.08.2017

7. TESTS RESULT: The product passed the test.

The test report contains 12 pages and is edited in 4 copies, copy no.1 remain in laboratory and copies 2÷ 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER,
Dipl

HEAD OF TESTING TEAM,
EA

На основание чл.2 от ЗЗЛД

Warnings:
a. *The results refer only to the tested product.*
b. *Publication and reproduction of the contents of this report in any other form unless its complete photocopying is not allowed without writing approval of Division to which laboratory belongs.*
c. *All signatures of the present report are original ones.*

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Content

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1. **IDENTIFICATION OF THE TEST PRODUCT:** Indoor to Indoor Bushing 20kV; 400A

Type: PrB 20

Serial / year: - / 2017

Technical Specification / Drawing: – / see page 12

Client test order: Contract no. 876 / 03.08.2017

Internal test order: 23362 / 07.08.2017

Product receiving date: 10.08.2017

Product condition at receiving: New

2. **MAIN TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:**

Maximum working voltage (Um): ..... 24 kV

Rated current (Ir): 200A, 400A, 630A, 1000A

Dry lightning impulse withstand voltage 1.2 / 50 µs: ..... 125 kV_{peak}

Dry power frequency withstand voltage: ..... 65 kV_{rms}

Material : porcelain C110

Colour of glaze: brown

Note : The level of dry power frequency withstand voltage was specified by the customer.

3. **TEST PROGRAM:**

I – Dry lightning impulse voltage withstand test
II – Dry power frequency voltage withstand test

4. **RESPONSIBLE FOR TEST:** Dipl. eng. Laurenţiu Vlădoi (I)
Dipl. eng. Dan Ştefan (II)

5. **PRESENTS AT TESTS:** General Manager eng. Maria Georgieva – NIKDIM Bulgaria

ВЯРНО С ОРИГИНАЛА

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DRY LIGHTNING IMPULSE VOLTAGE WITHSTAND TEST

1. Test date: 10.08.2017

2. Test standard: IEC 60137 : 2017 subclause 8.4

3. Equipment used:

- Impulse generator 4.2 MV, no. 5 – 1197; connection I_1 (1 x 1);
- C_s = 0.576 [μF]; R_s = 47 [Ω]; R_p = 115 [Ω].

Addenda: C_s – equivalent capacity of impulse generator;
R_s – equivalent serial resistance of impulse generator;
R_p – equivalent parallel resistance of impulse generator.

Measuring system used:

- High voltage measuring system of impulse generator 4.2 MV consists of:
  - Capacitive divider of the impulse generator 4.2 MV with k_{div} = 345.1;
  - Digital measuring system type TR – AS 100 – 10 / 4, no.228; channel 2. (Calibration Certificate no. 91 / 12.2016)

Measuring uncertainty for: peak value of lightning impulse is: ± 1.38 %

- for front time T_1 is ± 8.44 %,
- for tail time T_2 is ± 3.39 %.

The uncertainty stated is expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k = 2. The value of measurand lies within the assigned range of values with probability of 95%.

4. Test procedure / Test set-up: according to IEC 60137 : 2017, subclause 8.4.

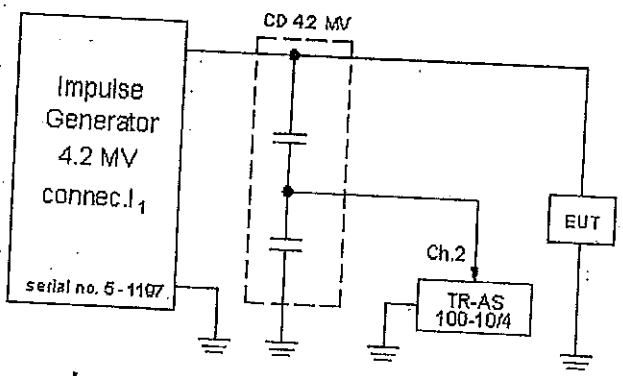
5. Atmospheric conditions; correction factors; U_{test}

Atmospheric conditions:	p [mbar]	1005
	t [°C]	27
	h_r [%]	52
Arcing distance measured [mm]:		275
Correction factors:	k_1	0.969
	k_2	1.0277
	$k_t = k_1 \cdot k_2$	0.9958
$U_{test}(p_0,t_0,h_0)$ (-) and (+) [kV_{peak}]:		**125**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**124.5**

Symbols used:

- U_{test} (p_0, t_0, h_0) – rated withstand voltage value;
- U_{test} (p, t, h) – test voltage corrected to atmospheric conditions;

6.Test circuit diagram:



Legend: EUT – Equipment under test

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Notes:

1. The test was performed applying successively 15 voltage impulses of positive polarity and 15 voltage impulses of negative polarity. (see photo from page 5).
2. The standard 1.2 / 50 µs lightning impulse was used. For wave parameters see oscillograms from pages 6 ÷ 10.
3. Only one external flashover occurred (see oscillogram 317214) from page 6.

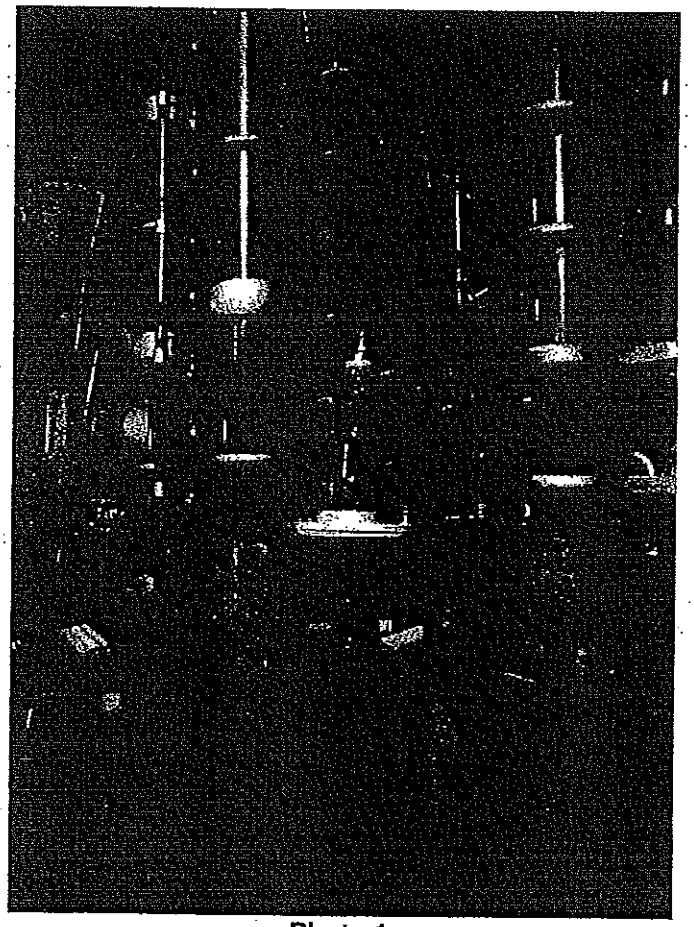

Photo 1

7. Test result: The product passed the test.

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LI lightning-impulse

no.	Up [kV]	T1[µs]	T2[µs]	Tc[µs]	Ip[A]	remark
317208	-65.6	1.27	44.7			RFW / PRB 20
317209	-124	1.29	44.7			FW / PRB 20
317210	-124	1.28	44.7			FW / PRB 20
317211	-124	1.29	44.8			FW / PRB 20
317212	-123	1.28	44.8			FW / PRB 20
317213	-123	1.28	44.8			FW / PRB 20
317214	-125	1.3		17.7		FW / PRB 20
317215	-124	1.29	44.8			FW / PRB 20
317216	-124	1.29	44.8			FW / PRB 20
317217	-123	1.28	44.7			FW / PRB 20
317218	-124	1.28	44.7			FW / PRB 20
317219	-124	1.28	44.8			FW / PRB 20
317220	-124	1.29	44.6			FW / PRB 20
317221	-124	1.28	44.8			FW / PRB 20
317222	-124	1.28	44.6			FW / PRB 20
317223	-124	1.28	44.7			FW / PRB 20
317224	65.5	1.28	44.9			RFW / PRB 20
317225	124	1.27	44.7			FW / PRB 20
317226	124	1.28	44.8			FW / PRB 20
317227	124	1.27	44.7			FW / PRB 20
317228	124	1.28	44.8			FW / PRB 20
317229	123	1.27	44.7			FW / PRB 20
317230	123	1.28	44.8			FW / PRB 20
317231	123	1.27	44.7			FW / PRB 20
317232	124	1.27	44.7			FW / PRB 20
317233	123	1.28	44.7			FW / PRB 20
317234	124	1.28	44.7			FW / PRB 20
317235	124	1.27	44.7			FW / PRB 20
317236	124	1.28	44.7			FW / PRB 20
317237	124	1.27	44.8			FW / PRB 20
317238	123	1.28	44.8			FW / PRB 20
317239	124	1.28	44.7			FW / PRB 20

Notes: 1.UP-peak value of testing voltage; T1, T2, T_c – front, tail and chopping time – parameters of testing impulse wave;

2. RFW – reduced wave 50 – 75%; FW – full wave 100%

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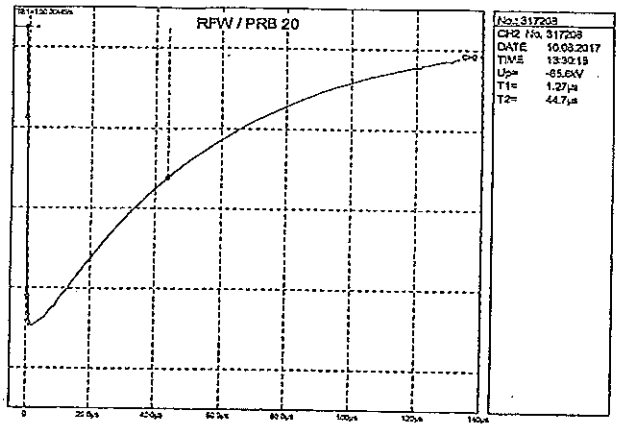

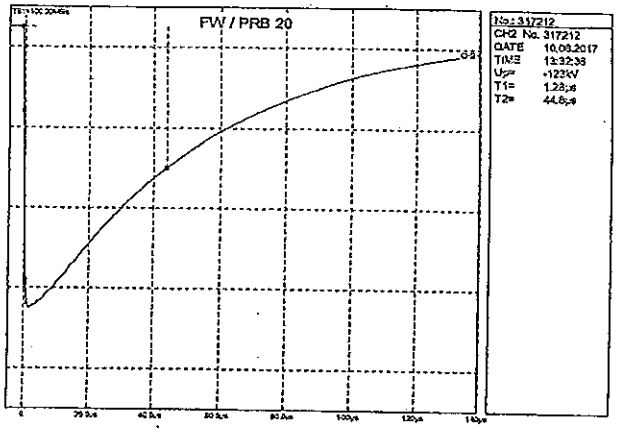

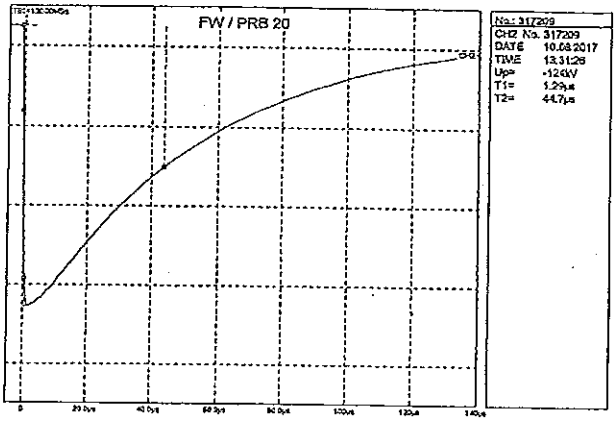

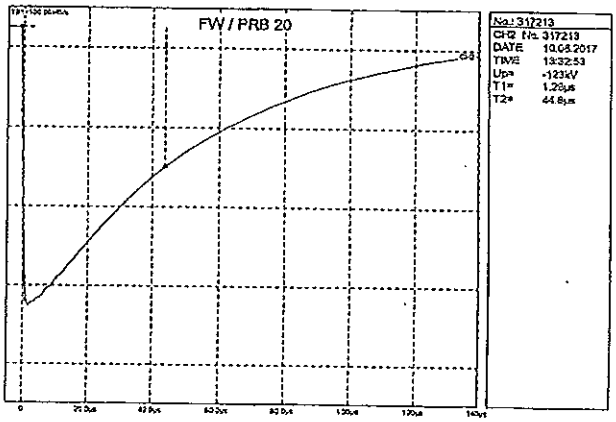

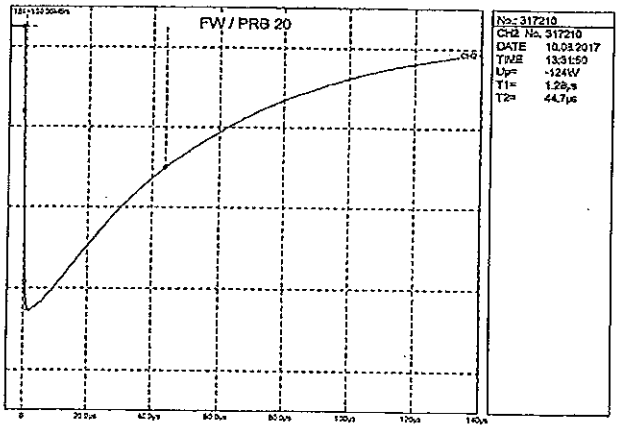

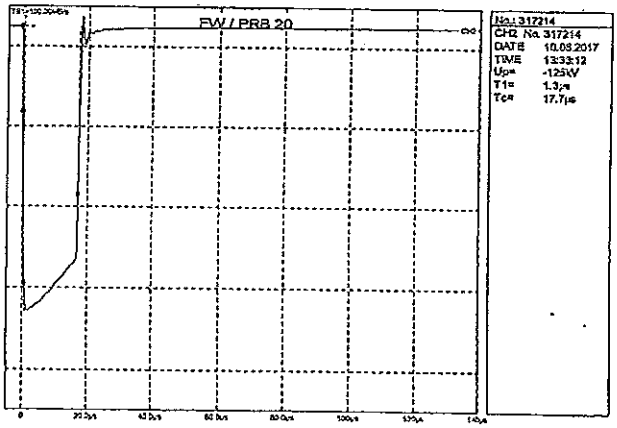

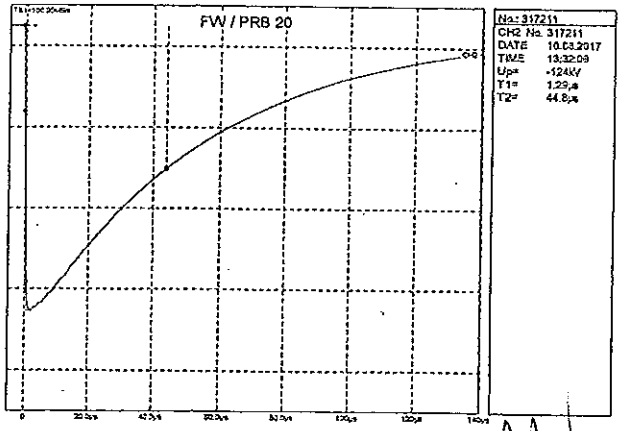

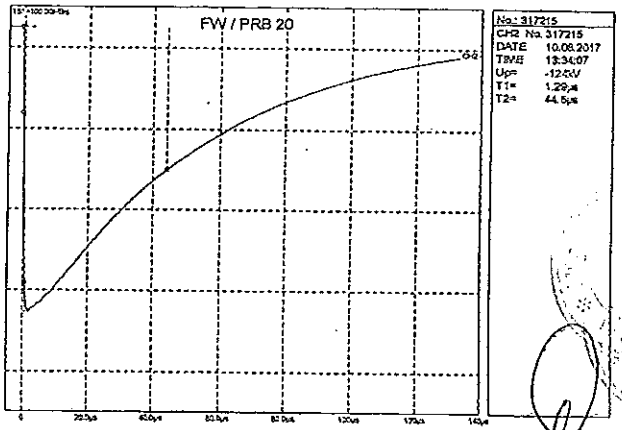

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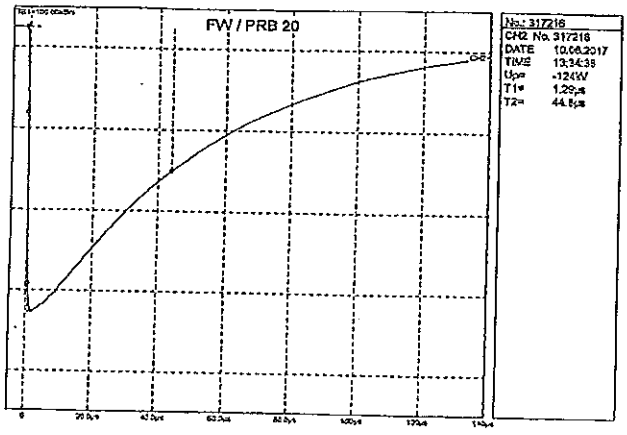

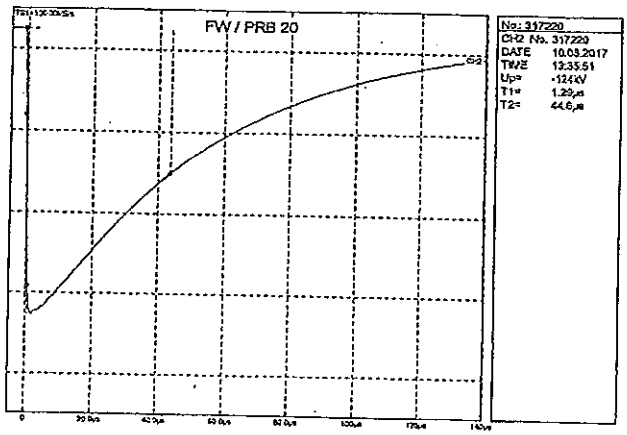

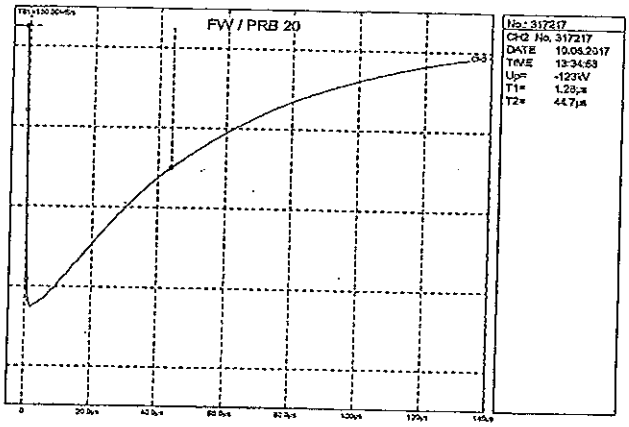

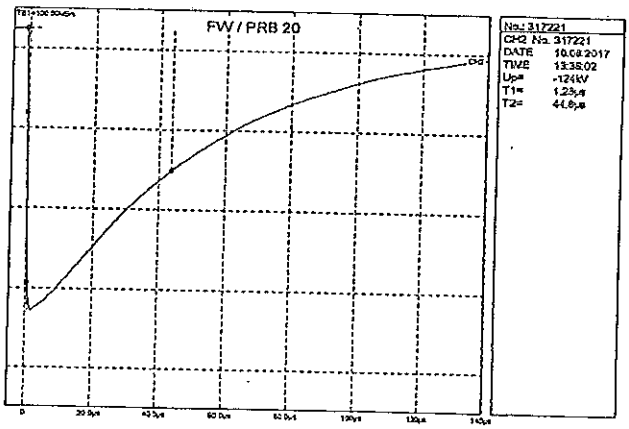

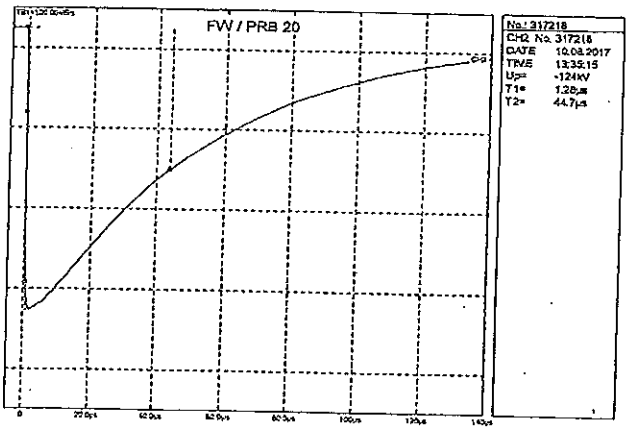

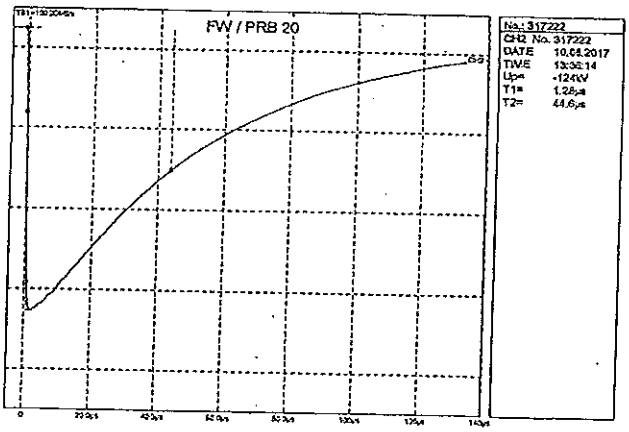

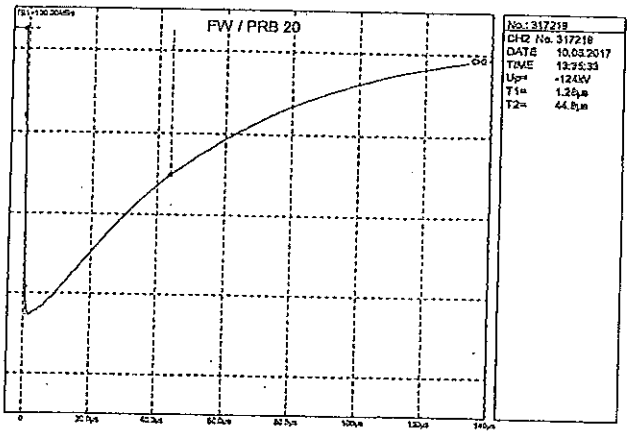

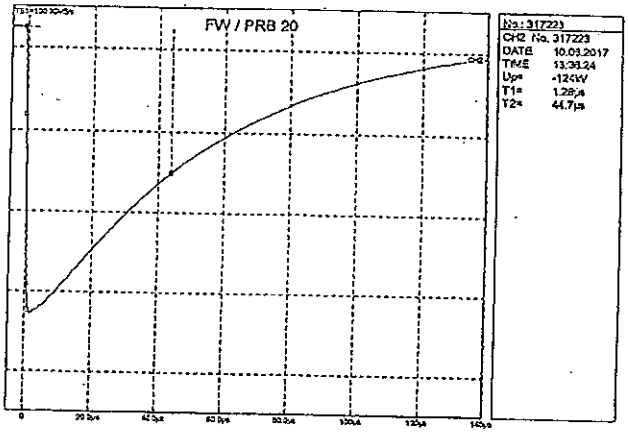

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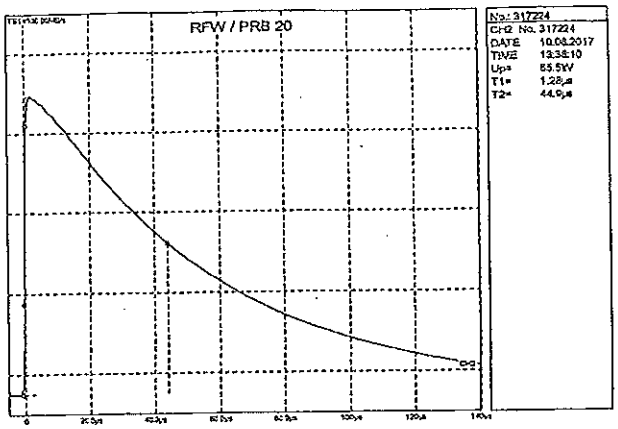

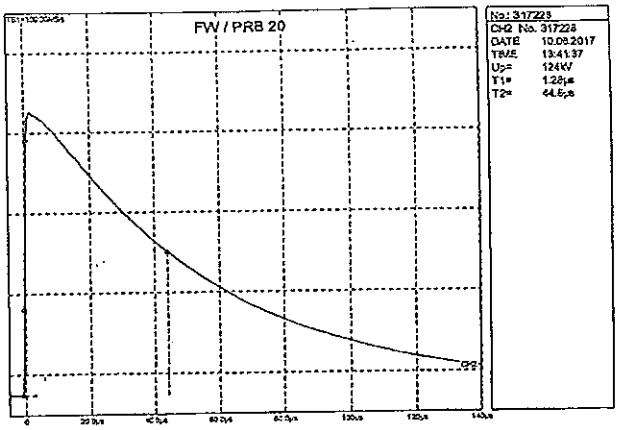

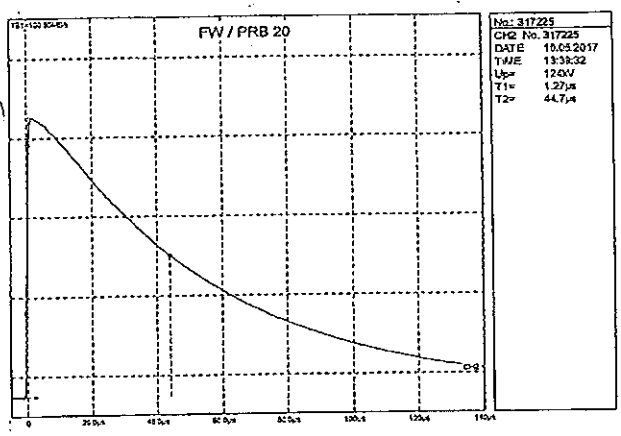

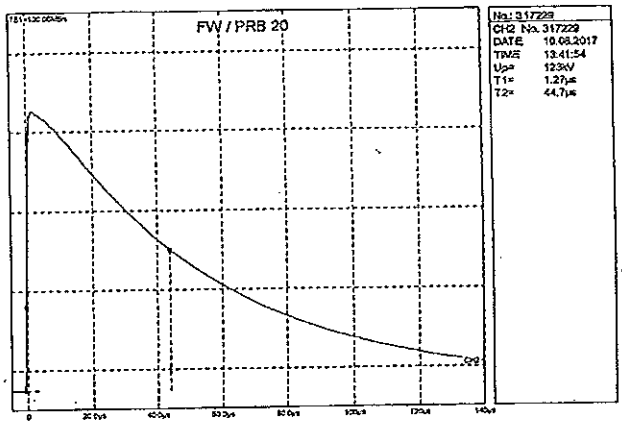

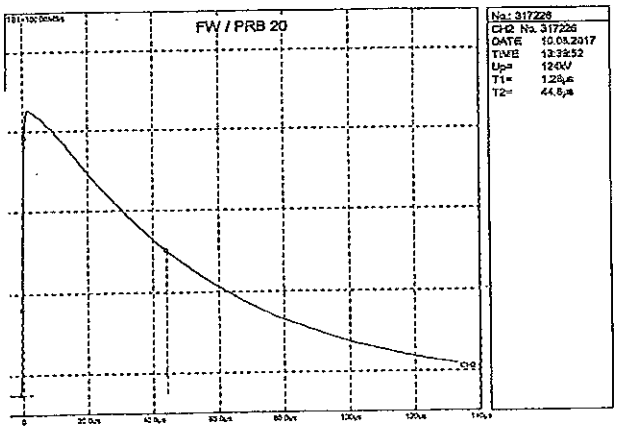

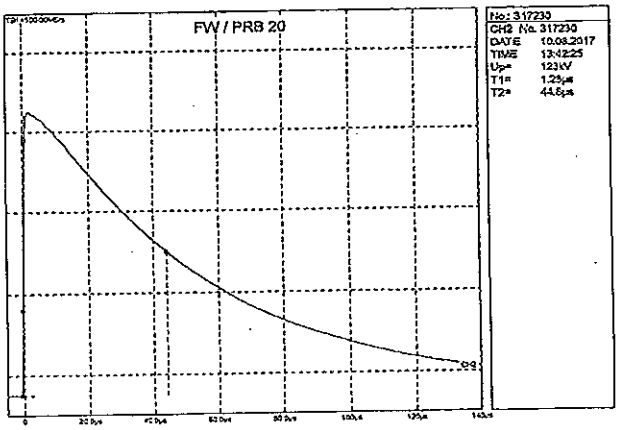

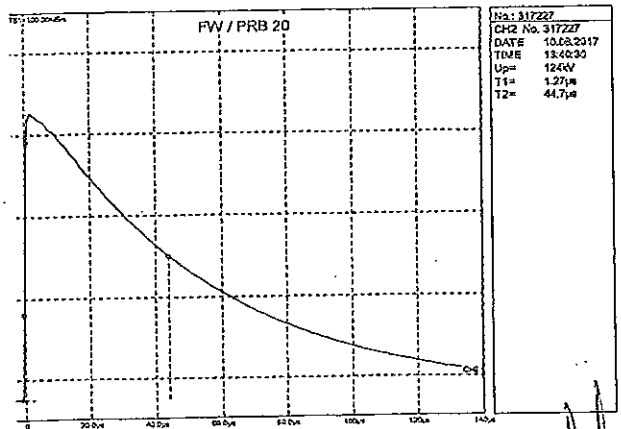

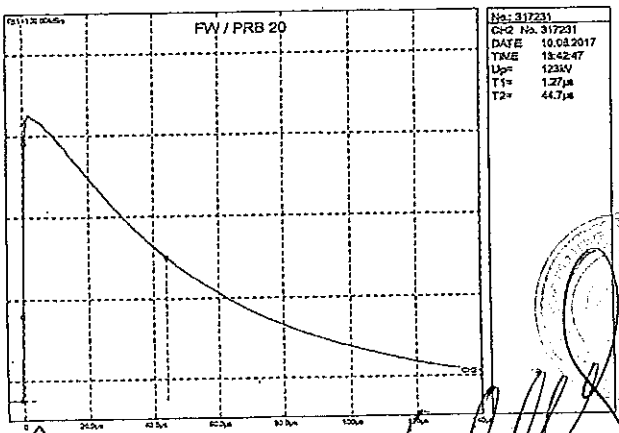

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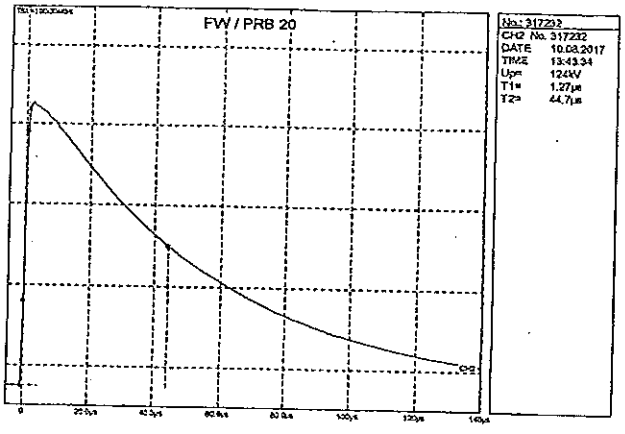

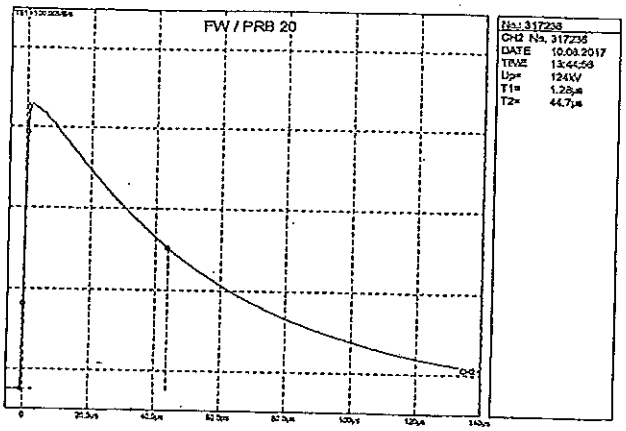

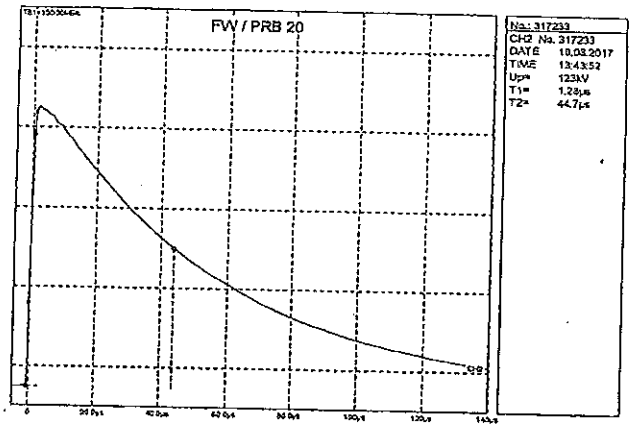

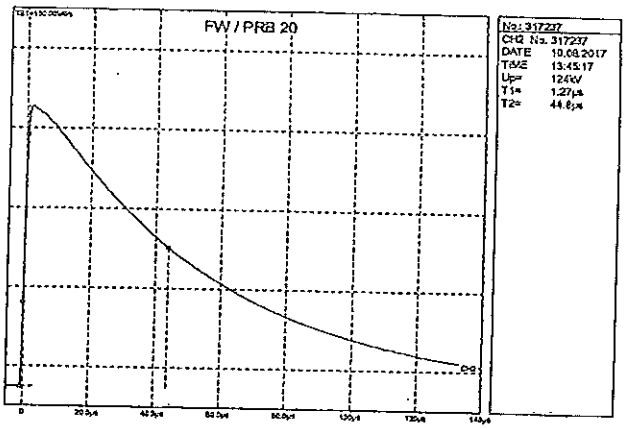

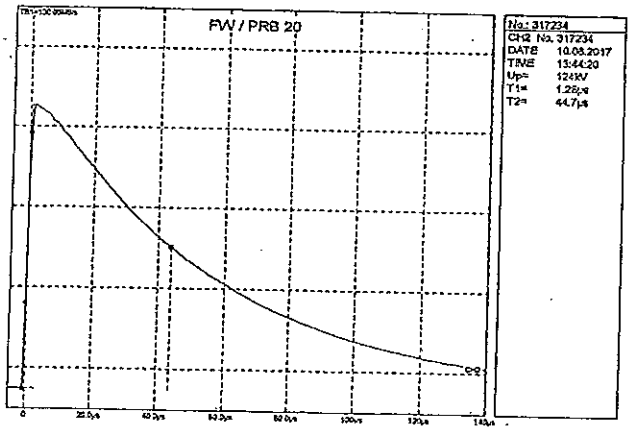

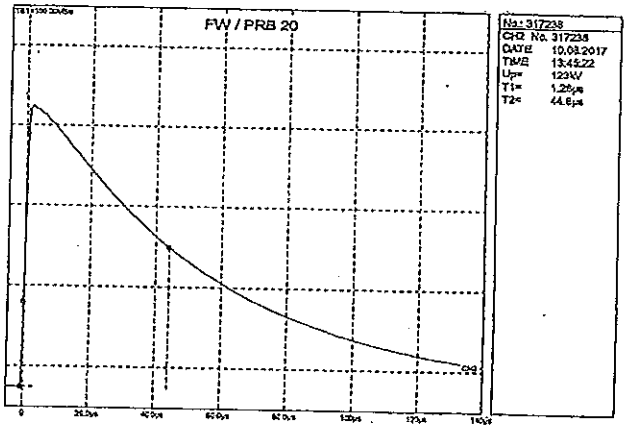

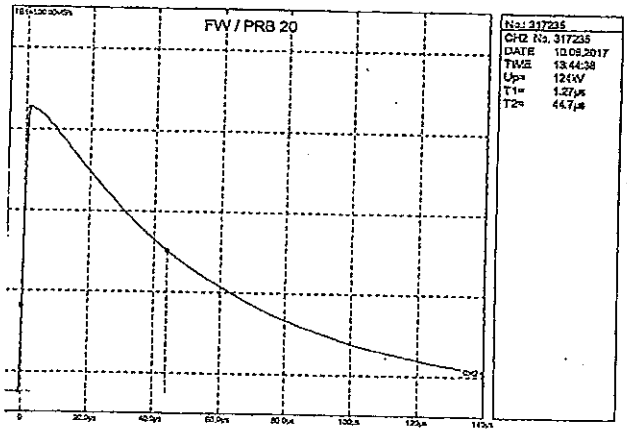

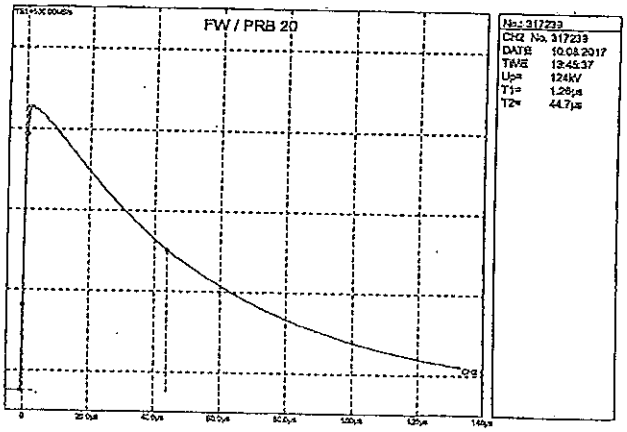

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II. DRY POWER FREQUENCY VOLTAGE WITHSTAND TEST

1. **Test date:** 11.08.2017
2. **Test standard:** IEC 60137 : 2017, subclause 8.2.
3. **Equipment used:**
   – Test transformer 350 kVA / 350 kV, no.3 – 1963

   Measuring system:
   – AC measuring system 350 kV consists of:
   - high voltage compressed gas capacitor type MCF 75 / 350P, no.853889 and low voltage arm type H90, no.898939;
   - digital peak voltmeter type MU-17, no. 910396;
   - coaxial measuring cable, 75Ω.

   (Calibration Certificate no.41 / 04.2015).

Measuring uncertainty is ± 1.6 %..
The reported uncertainty is an expanded uncertainty, based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %.

4.Test procedure / Test set-up: according to IEC 60137 : 2017, subclause 8.2

5. Atmospheric condition, correction factors, U_{test}

Atmospheric conditions:	p [mbar]	1005
	t [°C]	25
	h_r [%]	58
Arcing distance measured [mm]:		275
Correction factors:	k_1	0.9840
	k_2	1.0148
	$k_t = k_1 \cdot k_2$	0.9986
Frequency:	[Hz]	50
Time:	[sec]	60
$U_{test}(p_0,t_0,h_0)$:	[kV_{rms}]	**65**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**64.9**

Symbols used:
– U_{test} (p_0, t_0, h_0) – rated withstand voltage value;
– U_{test} (p, t, h) – test voltage corrected to atmospheric conditions.

6. Test circuit diagram:

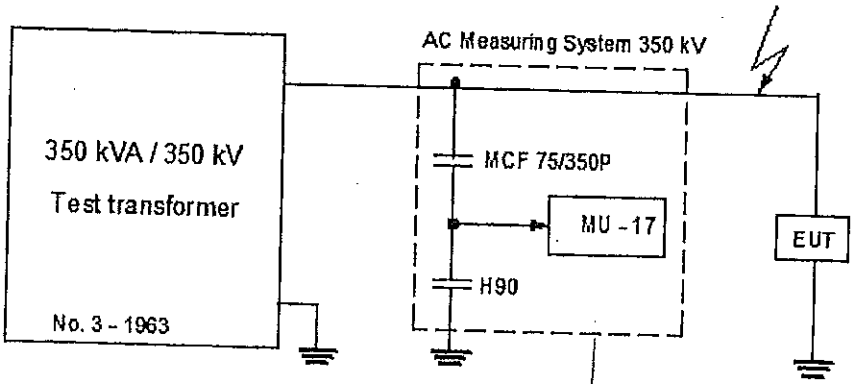

Fig. 2

7.Test result: The product passed the test.

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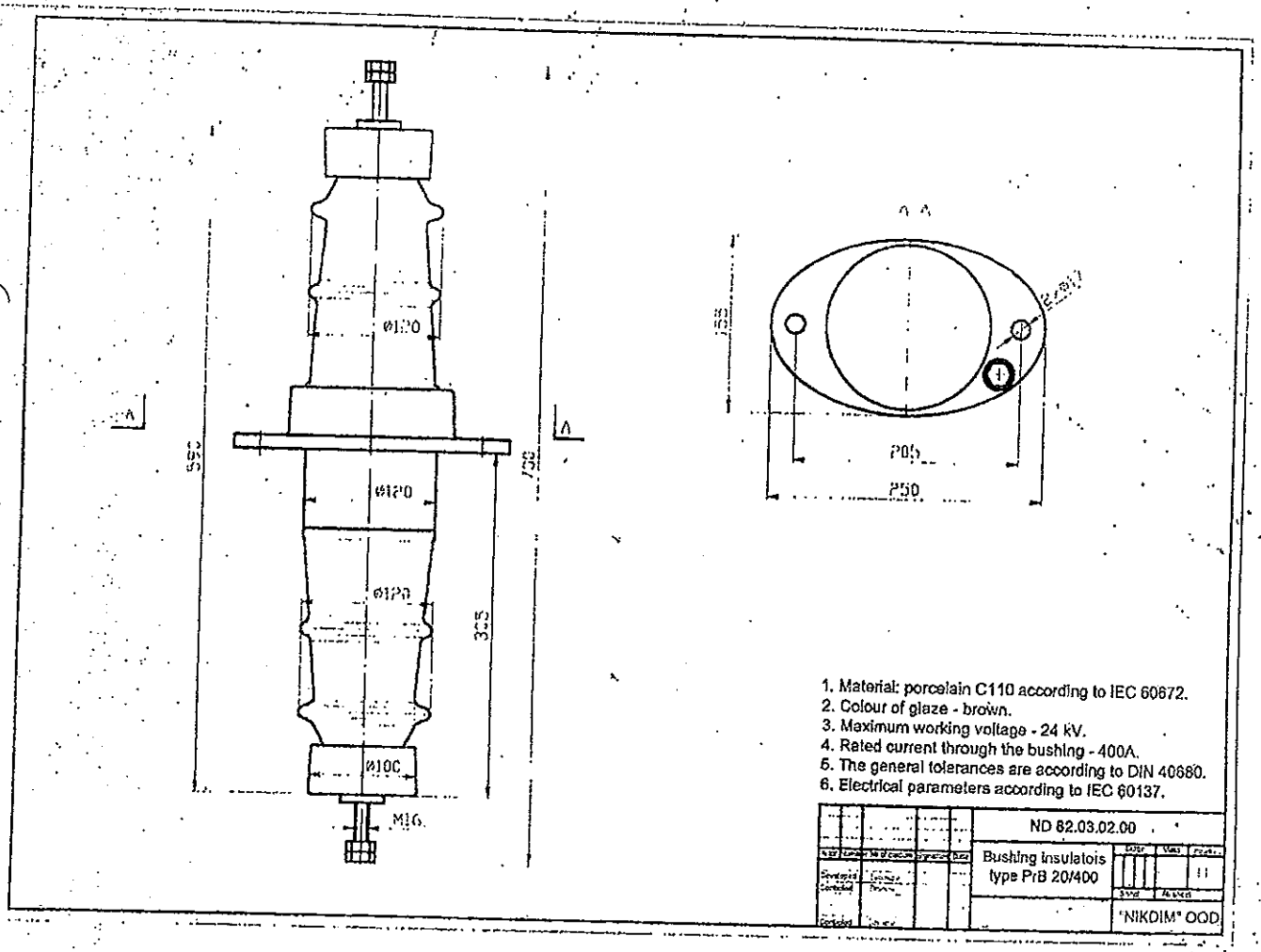

– end of test report –

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SR EN ISO/CEI 17025:2005
ACCREDITATION CERTIFICATE
LI 1036

TEST REPORT
No. 45957 / 08.08.2017

1. CUSTOMER: NIKDIM Ltd.
Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

2. MANUFACTURER: NIKDIM Ltd.
Address: 23rd Shipchensky Polk No. 80, 6100 Kazanlak, Bulgaria

3. TESTED PRODUCT: Outdoor to Indoor Bushing type PrBO 10

4. REFERENCE STANDARD: IEC 60137 : 2017

5. PERFORMED TEST:

I – Dry lightning impulse voltage withstand test
II – Dry power frequency voltage withstand test
III – Wet power frequency voltage withstand test

6. TESTS DATE: 08.08.2017

7. TESTS RESULT: The product passed the test.

The test report contains 14 pages and is edited in 4 copies, copy no.1 remain in laboratory and copies 2÷ 4 are sent to the customer.

HEAD OF HVD – TECHNICAL MANAGER,
Dipl. eng. Ion BURCIU

HEAD OF TESTING TEAM,
Dipl. eng. Ion RADEA

На основание чл.2 от ЗЗЛД

Warnings:

a. *The results refer only to the tested product.*
b. *Publication and reproduction of the contents of this report in any other form unless its complete photocopying is not allowed without writing approval of Division to which laboratory belongs.*
c. *All signatures of the present report are original ones.*

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ВЯРНО С ОРИГИНАЛА

Content

Page

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1. **IDENTIFICATION OF THE TEST PRODUCT:** Outdoor to Indoor Bushing 10kV/400A

Type: PrBO 10

Serial / year: - / 2017

Technical Specification / Drawing: – / see page 14

Client test order: Contract no. 876 / 03.08.2017

Internal test order: 23362 / 07.08.2017

Product receiving date: 07.08.2017

Product condition at receiving: New

2. **MAIN TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER:**

Maximum working voltage(Um): ..... 12 kV

Rated current (Ir): 200A, 400A, 630A, 1000A

Dry lightning impulse withstand voltage 1.2 / 50 µs: ..... 75 kV_{peak}

Dry power frequency withstand voltage test: .....42 kV_{rms}

Wet power frequency withstand voltage test: .....28 kV_{rms}

Material : porcelain C110

Colour of glaze: brown

Note :

1. **The dry power frequency withstand voltage test was performed at the customer request.**
2. **The level of dry and wet power frequency withstand voltages was specified by customer.**

3. **TESTS PROGRAM:**

I – Dry lightning impulse voltage withstand test
II – Dry power frequency voltage withstand test
III – Wet power frequency voltage withstand test

4. **RESPONSIBLE FOR TEST:** Dipl. eng. Laurenţiu Vlădoi (I)
Dipl. eng. Dan Ştefan (II, III)

5. **PRESENT AT TESTS:** General Manager eng. Maria Georgieva – NIKDIM Bulgaria

ВЯРНО С ОРИГИНАЛА

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I. DRY LIGHTNING IMPULSE VOLTAGE WITHSTAND TEST

1. Test date: 08.08.2017
2. Test standard: IEC 60137 : 2017 subclause 8.4
3. Equipment used:
- Impulse generator 4.2 MV, no. 5 – 1197; connection I_1 (1 x 1);
- C_s = 0.576 [μF]; R_s = 47 [Ω]; R_p = 115 [Ω].

Addenda: C_s – equivalent capacity of impulse generator;
R_s – equivalent serial resistance of impulse generator;
R_p – equivalent parallel resistance of impulse generator.

Measuring system used:
- High voltage measuring system of impulse generator 4.2 MV consists of:
  - Capacitive divider of the impulse generator 4.2 MV with k_{div} = 345.1;
  - Digital measuring system type TR – AS 100 – 10 / 4, no.228; channel 2. (Calibration Certificate no. 91 / 12.2016)

Measuring uncertainty for: peak value of lightning impulse is: ± 1.38 %
- for front time T_1 is ± 8.44 %,
- for tail time T_2 is ± 3.39 %.

The uncertainty stated is expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k = 2. The value of measurand lies within the assigned range of values with probability of 95%.

4. Test procedure / Test set-up: according to IEC 60137 : 2017, subclause 8.4.

5. Atmospheric conditions; correction factors; U_{test}

Atmospheric conditions:	p [mbar]	1005
	t [°C]	26
	h_r [%]	53
Arcing distance measured [mm]:		185
Correction factors:	k_1	0.9782
	k_2	1.0174
	$k_t = k_1 \cdot k_2$	0.9952
$U_{test}(p_0,t_0,h_0)$ (-) and (+) [kV_{peak}]:		**75**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**74.6**

Symbols used:
- $U_{test}(p_0, t_0, h_0)$ – rated withstand voltage value;
- $U_{test}(p, t, h)$ – test voltage corrected to atmospheric conditions;

6.Test circuit diagram:

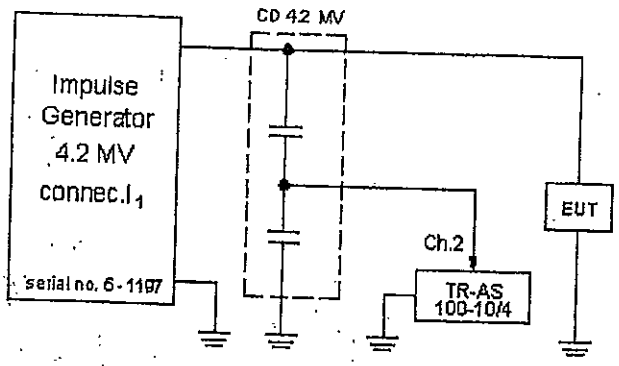

Fig. 1
Legend: EUT – Equipment under test

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Notes:

1. The test was performed applying successively 15 voltage impulses of positive polarity and 15 voltage impulses of negative polarity (see photos from page 5).
2. The standard 1.2 / 50 μs lightning impulse was used. For wave parameters see oscillograms from pages 6 ÷ 10.

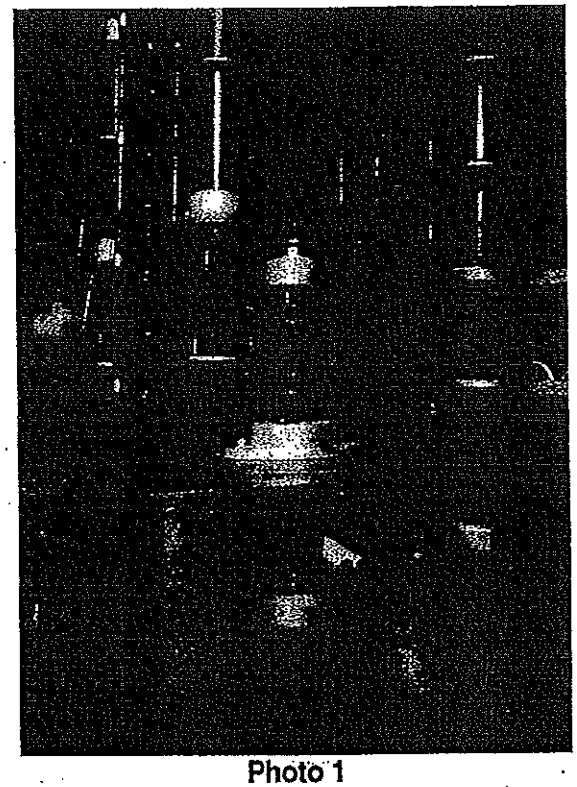

Photo 1

7.Test result: The product passed the test.

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ВЯРНО С ОРИГИНАЛА

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II. DRY POWER FREQUENCY VOLTAGE WITHSTAND TEST

1. **Test date:** 08.08.2017
2. **Test standard:** IEC 60137 : 2017, subclause 8.2.
3. **Equipment used:**
   – Test transformer 350 kVA / 350 kV, no.3 – 1963

   Measuring system:
   – AC measuring system 350 kV consists of:
   - high voltage compressed gas capacitor type MCF 75 / 350P, no.853889 and low voltage arm type H90, no.898939;
   - digital peak voltmeter type MU-17, no. 910396;
   - coaxial measuring cable, 75Ω.

   (Calibration Certificate no.41 / 04.2015).

Measuring uncertainty is ± 1.6 %..
The reported uncertainty is an expanded uncertainty, based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %.

4.Test procedure / Test set-up: according to IEC 60137 : 2017, subclause 8.2

5. Atmospheric condition, correction factors, U_{test}

Atmospheric conditions:	p [mbar]	1005
	t [°C]	26
	h_r [%]	53
Arcing distance measured [mm]:		185
Correction factors:	k_1	0.9955
	k_2	1.0042
	$k_t = k_1 \cdot k_2$	0.9997
Frequency: [Hz]		50
Time: [sec]		60
$U_{test}(p_0,t_0,h_0)$: [kV_{rms}]		**42**
$U_{test}(p, t, h) = k_t \cdot U_{test}(p_0,t_0,h_0)$:		**41.98**

Symbols used:
– U_{test} (p_0, t_0, h_0) – rated withstand voltage value;
– U_{test} (p, t, h) – test voltage corrected to atmospheric conditions.

6. Test circuit diagram:

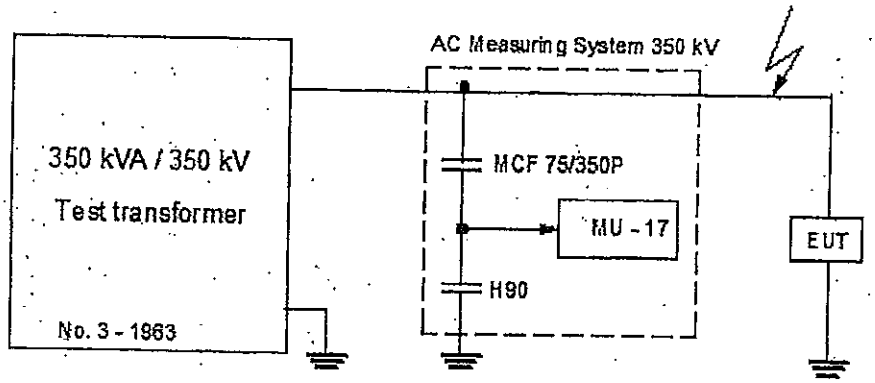

Fig. 2

7.Test result: The product passed the test.

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