TYPE TEST REPORT

Test Object:	High-voltage insulator
Designation:	Dielectric tests on 132 kV composite insulator
Manufacturer:	Insulator: **DOROOD Kelid Bargh Co.** Karaj Ghazvin Road after Nazer Abad Sq. IRAN
Tested for:	**DOROOD Kelid Bargh Co.** Karaj Ghazvin Road after Nazer Abad Sq. IRAN
Date of tests:	21st -23rd August 2012
Tested by:	VEIKI-VNL Ltd. – Budapest – HUNGARY
Project ID:	NFL-32/2012
Order/Contract:	NFL-32/2012, 26th April 2012
Test Specification:	**IEC 61109:2008, IEC 60383:1993.**
Tests Performed:	The test object, constructed in accordance with the description, drawings and photographs incorporated in this report has been subjected to dry lightning impulse voltage test, wet switching impulse voltage test and wet power-frequency voltage test.
Test Results:	**The test object passed the test.**

This Type Tests Report has been issued by VEIKI-VNL Ltd. in accordance with above mentioned Specifications.

The Report applies only to the test object tested. The responsibility for conformity of any test object having the same designations with that tested rests with the Manufacturer.

This Report comprises 12 sheets in total (7 numbered pages, 1 drawing and 4 oscillograms).
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VEIKI-VNL VILLAMOS NAGYLABORATÓRIUMOK Kft. * VEIKI-VNL ELECTRIC LARGE LABORATORIES Ltd.

(INTL.)
Witness:
Reviewed:
Signature:
Date:

Budapest,
30 August, 2012

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responsible for the test

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NAT

TEST CERTIFICATES OR REPORTS ISSUED BY VEIKI-VNL LTD.

Type Test Certificate of Complete Type Test
This certificate provides the verification of all the rated characteristics of the equipment as assigned by the manufacturer, by means of the performance of all type tests specified by the standards.

Type Test Certificate of Dielectric Performance
This certificate provides the verification of all dielectric ratings, by means of the performance of the appropriate type tests specified by the standards.

Type Test Certificate of Temperature-Rise Performance
This certificate provides the verification of temperature-rise limits together with measurement of the main circuit resistance, by means of the performance of the appropriate type tests specified by the standards.

Type Test Certificate of Short-Circuit / Making and Breaking Performance
This certificate provides the verification of rated characteristics with respect short-circuit and/or making and breaking performance, by means of the performance of the appropriate type tests specified by the standards.

Type Test Certificate of Switching Performance
This certificate provides the verification of the switching ratings (e.g. capacitive current), by means of the performance of the appropriate type tests specified by the standards.

Type Test Report
This report provides the verification of the rated characteristics of the equipment as assigned by the manufacturer, by means of the performance of the appropriate type tests specified by the standards, for type tests not indicated above.

Development Test Report
This report is issued when the test is intended only to provide the Client with information about the performance of the equipment. The tests are performed in accordance with relevant standards, but are not intended to verify compliance of the equipment.

Control Test Report
This report is issued for tests performed on equipment in service, or removed from service. Tests are performed, and compliance is evaluated in accordance with relevant standards.

Test Report
Test report is issued in all cases not listed above.

Ratings/characteristics assigned by the manufacturer:

Test Object:	High voltage insulator
Designation:	Dielectric tests on 132 kV composite insulator
Manufacturer:	**DOROOD Kelid Bargh Co.** Karaj Ghazvin Road after Nazer Abad Sq. IRAN
Rated voltage:	132 kV
Pos. dry lightning impulse withstand voltage:	850 kV
Wet power withstand frequency voltage test:	445 kV
Creepage distance:	5873 mm
Arcing distance	1805 mm
Specified Mechanical load (SML):	160 kN

The tests were carried out in accordance with the following standards:

IEC 61109:2008	Composite insulators for a.c. overhead lines with a nominal voltage greater than 1000 V- Definitions, test methods and acceptance criteria
IEC 60383:1993	Tests on insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1000 V

Requirements of manufacturer or purchaser:

List of manufacturer's drawings for identification of the test object:

DKHV-132-1 132 kV Insulator

Present at the test in charge of manufacturer or purchaser:

Mr. Ali Khordetchi	DOROOD Kelid Bargh Co.
Mr. Matz László	SAI International Inspection Co

TESTS PERFORMED ON THE TEST OBJECT

No.	Description	Relevant clauses of the standard
1	Dry lightning impulse withstand voltage test	Sub Clause 11.1 of IEC 61109:2008
2	Wet power-frequency withstand voltage test	Sub Clause 11.1 of IEC 61109:2008
3	Wet switching impulse withstand voltage test	Sub Clause 11.1 of IEC 61109:2008

DESCRIPTION OF THE TESTS

1. Dry lightning impulse voltage test

1.1 Test methods and parameters

The 50% flashover voltage values were determined with up and down test method. During the test impulses of 1.30-1.36/44.8-45.7 μs were applied (is shown in the attached oscillograms No. 3398, 3424). The test layout is shown on Photo 1.

The lightning impulse voltage test was carried out on suspension insulator set with corona rings at the test voltage of 856 kV_{peak} with application of the correction factor, 15 positive and 15 negative impulses.

Ambient parameters in outside laboratory:

- Dry/wet temperature: 35.8/21.9°C
- Air pressure: 100.4 kPa

During the tests the correction factor was K=0.9581

1.2. Test results

During the withstand lightning impulse voltage tests on the insulator set installed with corona rings neither flashover nor breakdown occurred at the test voltage of U=856 kV_{peak}, therefore the single suspension set met the requirements of lightning impulse test in dry condition.

The determined 50% flashover voltage values are:

50% flashover voltage:	+929/-1240 kV_{peak}
calculated withstand voltage	856 kV_{peak}

The typical oscillograms from each polarity are attached to the test report.

2. Wet power-frequency voltage test

2.1 Test methods and parameters

The average flashover voltages of the insulator set were determined in wet condition.The average value was calculated from five measured flashover voltages.

The specimen was pre-wetted for 15 minutes before the wet test. The form of the artificial rain was drop. During the test the set was continuously wetted.

Characterisation of the artificial rain:

- Vertical and horizontal component of the rain 1-1.2 mm/min
- Specific resistance of water 9800 Ωcm
- Direction of the rain to the insulator set 45°

During the tests the correction factor in wet condition was: K=0.9433

2.2. Test results

During the withstand power frequency voltage tests on suspension insulator set neither flashover nor breakdown occurred, therefore the insulator set met the requirements of power frequency test in wet condition.

In wet condition, 1 minute without flashover:	450.0 kV_{rms}
In wet condition, average flashover voltage:	551.0 kV_{rms}

3. Switching impulse voltage tests in wet condition

3.1 Test methods and parameters

The specimen was pre-wetted for 15 minutes before the wet test. The form of the artificial rain was drop. During the test the set was continuously wetted.

The switching impulse voltage test was carried out on suspension insulator set with corona rings of a test voltage of 770 kV_{peak} with application of the correction factor 15 positive and 15 negative impulses. During the test impulses of 240-261/3700-3760 μs were applied (is shown in the attached oscillograms No. 3469, 3485).

Characterisation of the artificial rain:

- Vertical and horizontal component of the rain 1-1.2 mm/min
- Specific resistance of water 9800 Ωcm
- Direction of the rain to the insulator set 45°

During the tests the correction factor was: K=0.9545

3.2 Test results

During the withstand switching impulse voltage tests on the insulator set installed with corona rings neither flashover nor breakdown occurred at test voltage of U=770 kV_{peak}, therefore the suspension insulator set met the requirements of switching impulse test in wet condition.

The determined 50% flashover voltage values are:

50% flashover voltage:	+867/-1057 kV_{peak}
calculated withstand voltage	770 kV_{peak}

The typical oscillograms from each polarity are attached to the test report.

Uncertainty of measurements

During the tests the uncertainties of the measurements were the following:

- power frequency voltage: ± 1%
- lightning impulse voltage measurement: ± 0.64 %

The uncertainty values given in this report are the standard deviation values multiplied by k=2. Measurement uncertainty was estimated according to the method described in the EA-4/02 document.

Measuring devices used for the tests:

Designation	Manufacturer	Type	S/N
Impulse generator	Haefely	SGV4000/320	-
Divider	Haefely	WO 553633	138127 ÷ 138133
Termination	Haefely	WO 553633 Ca/2	117147
Impulse voltage measuring system	DR STRAUSS	TR-AS 100-10	350
Transformer (1500 kV)	TUR	PEO 500/500 AB I	860115
		PEO 1000/500 AB II	861876
Divider	ISO-FARAD	-	3109-04 3111-04 3107-04 3113-04 3112-04
Termination	TUR	H91	852509
Meter	SIEMENS	MU-15	880019

PHOTO

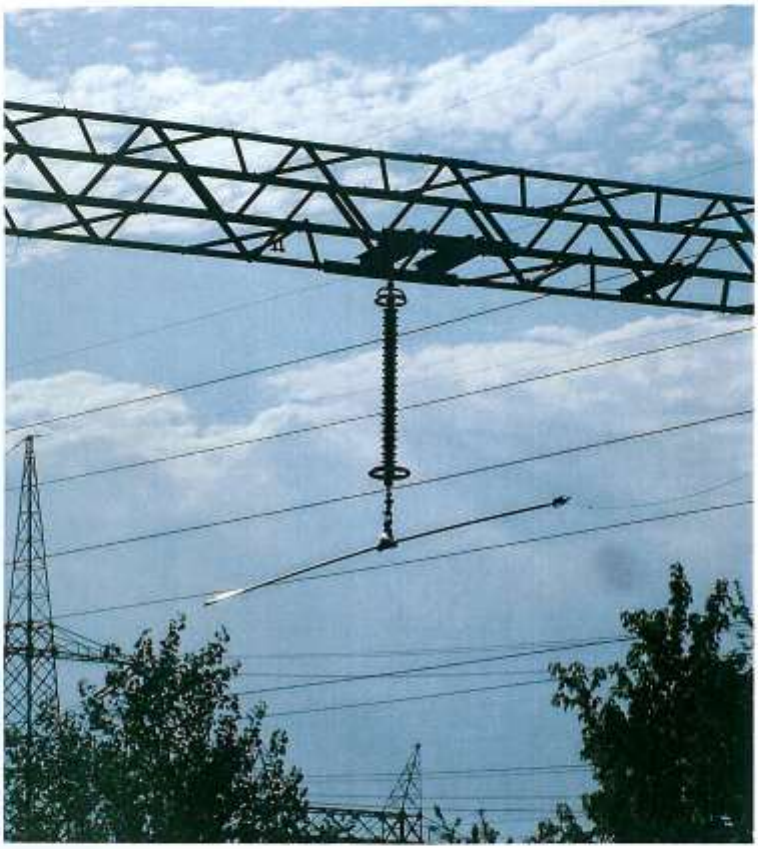
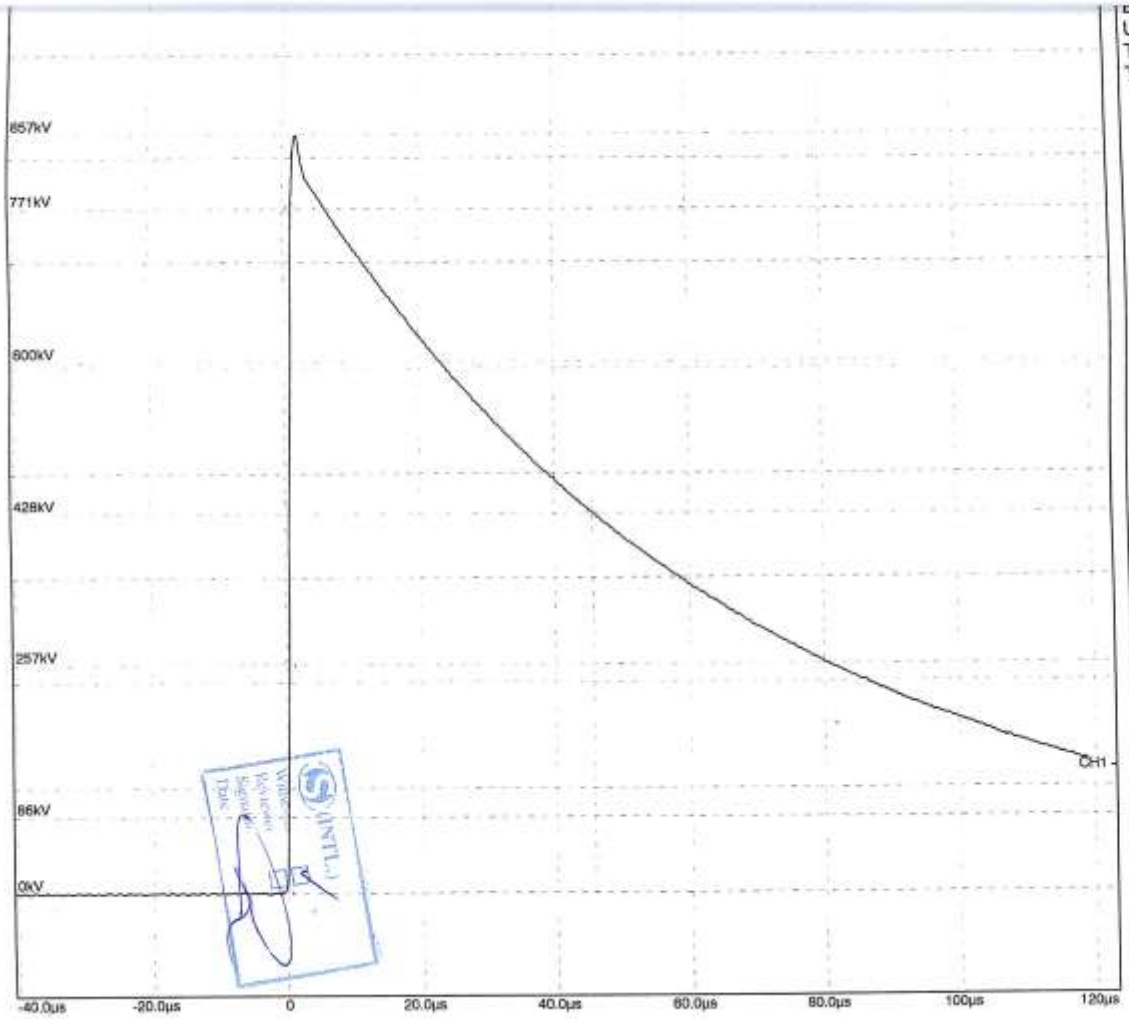


Photo 1

Dielectric tests on 132 kV suspension insulator set



Eval.: C
Up= 856.6kV
T1= 1.36µs
T2= 45.7µs

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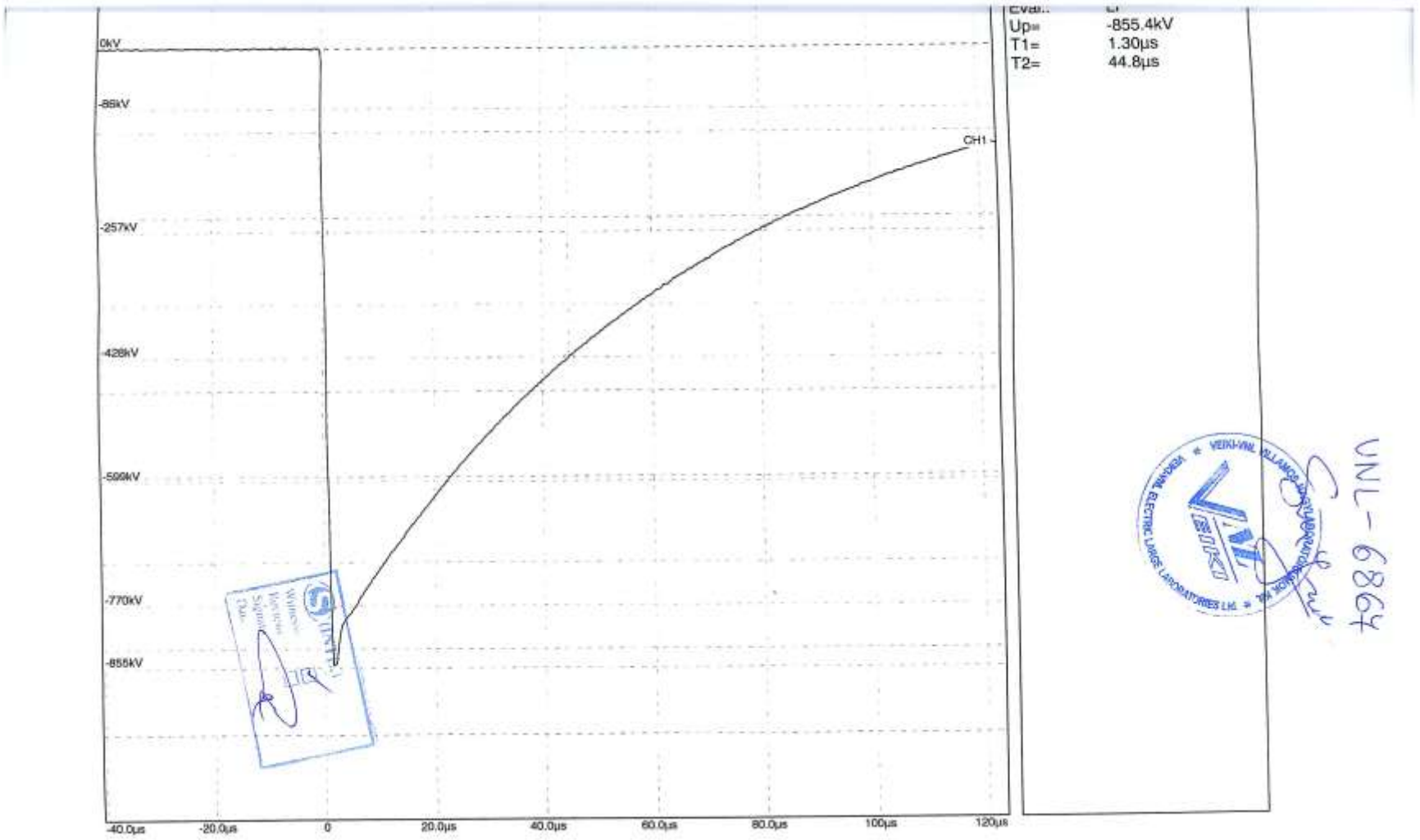
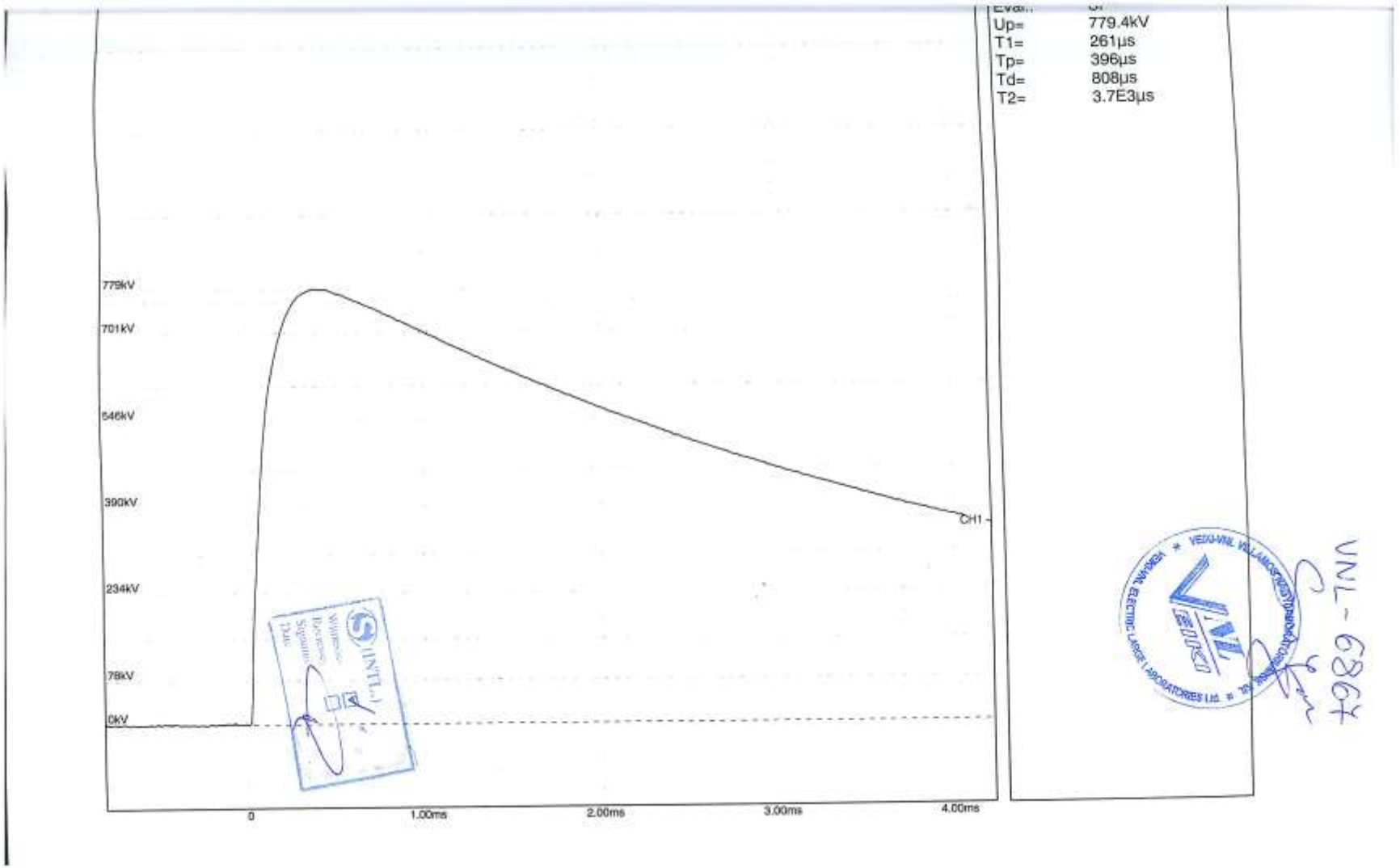

0kV
-86kV
-257kV
-428kV
-599kV
-770kV
-855kV
CH1
-40.0µs
-20.0µs
0
20.0µs
40.0µs
60.0µs
80.0µs
100µs
120µs
Up=
-855.4kV
T1=
1.30µs
T2=
44.8µs

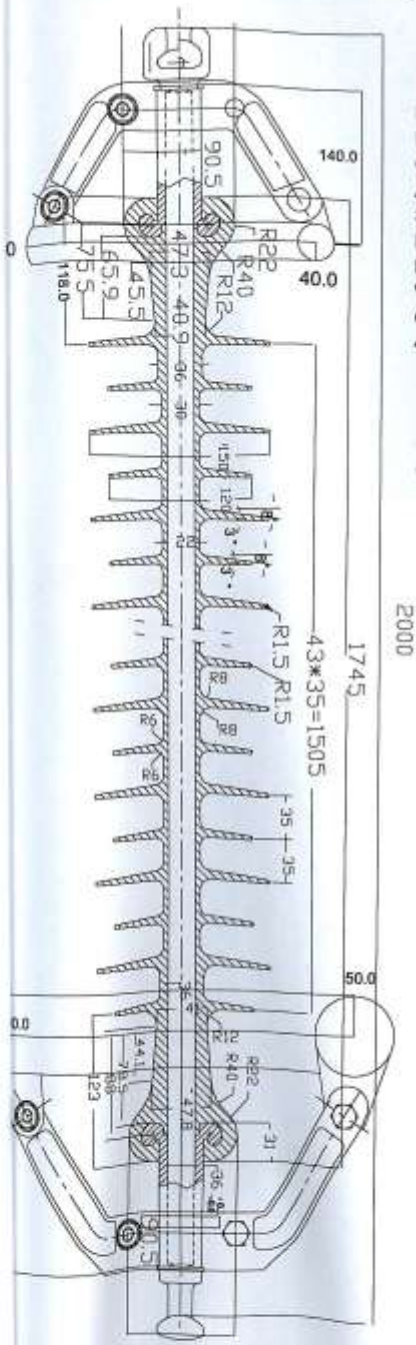
UNL-6867


Up= 779.4kV
T1= 261µs
Tp= 396µs
Td= 808µs
T2= 3.7E3µs
779kV
701kV
546kV
390kV
234kV
78kV
0kV
CH1
0
1.00ms
2.00ms
3.00ms
4.00ms

UNL - 6867

UNL-6864

-774.7kV
240µs
380µs
828µs
3.76E3µs
Up=
T1=
Tp=
Td=
T2=
CH1
4.00ms
3.00ms
2.00ms
1.00ms
0
0%
10%
30%
50%
70%
90%
100%
(INTL.)
(INTL.)



Technical data:

U_m=145 Kv
U_n=132 Kv
Power Frequency Withstand Voltage,50 Hz,Wet=445 Kv
Lightning Impulse Withstand Voltage,Pos=850 Kv
Creepage distance=5873 mm
Arcing distance=1805 mm
Specified Mechanical Load tension=160 KN
Routine test Load tension=80 KN
Number of Sheds=44
Weight= 10.7 Kg
Coupling= 2000 mm
40.5 mm/kv

Material:
Insulator = ECR Fiberglass Rod With HTV Silicone rubber Housing
End Fittings = Drop Forged Steel-hot
Split Pins = Stainless Steel

Tolerances Of insulator acc. To IEC6 1109

VNL-6867

Doroud Kelid Bargh Co		
132 Kv Insulator		
Unit: mm	DWG No: DKHV-132-1	Number of pages :1