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ORTA DOĐU TEKNİK ÜNİVERSİTESİ ELEKTRİK VE ELEKTRONİK MÜHENDİSLİĐİ BÖL.  
MIDDLE EAST TECHNICAL UNIVERSITY ELECTRICAL AND ELECTRONICS ENG. DEPT.

No: 11-03-01-506-E

DAMEKS İ Dıř Ticaret ve San. A.ř.

Lightning Conductor Impulse Voltage Streamer Time Lag. Gain Measurements

## **TEST REPORT**

14.03.2013

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## **1. GENERAL**

**Firm Applied for the Test** : DAMEKS İç Dış Ticaret ve San. A.Ş.  
1201/4 Sokak No:1A Ege Ticaret Merkezi  
35170 Yenışehir İZMİR

**Tests Requested** : Lightning Conductor Impulse Voltage Streamer Time Lag.  
Gain Measurements

**Date of the Test** : 14.02.2013

**Test Laboratory** : Middle East Technical University  
High Voltage Laboratory , Ankara

**Environmental Conditions** : 18 °C , 687 mmHg , % 60 Relative Humidity  
(these values were observed not to change appreciably during the test.)

**Equipment Tested** : COSMOS Brand, ESE Lightning Conductor

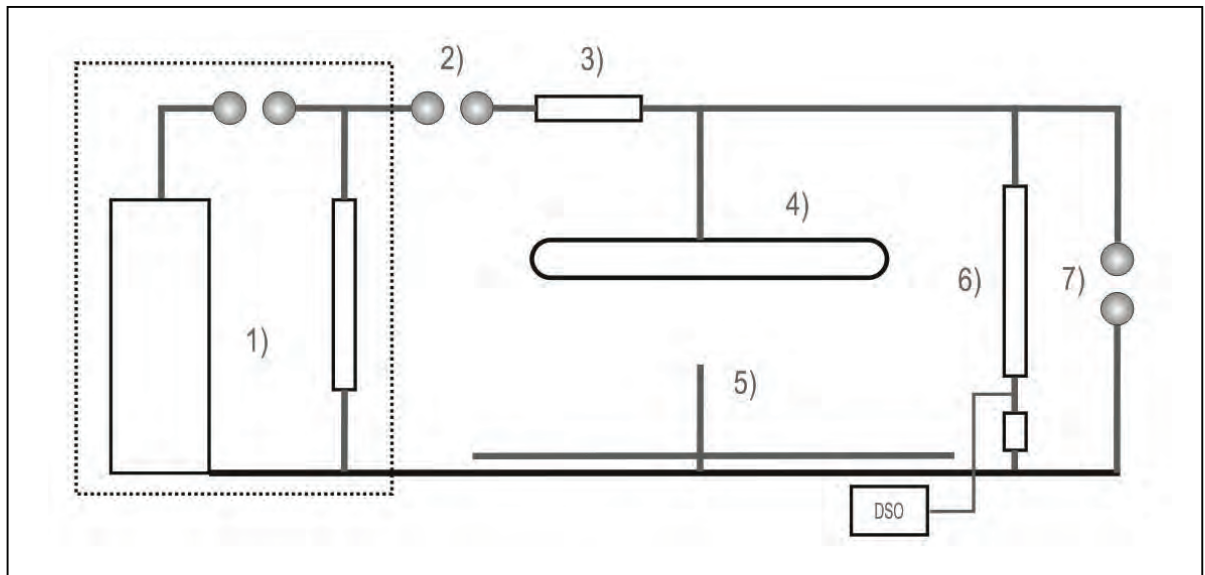
**Model** : C40                      **Year** : 2011                      **Serial Number** : 6EHP11601624  
**Dimensions** :                      **Length** : 510 mm                      **Maximum Dia.** : 140 mm

## **2. TEST STANDARDS**

NFC17-102 ( Appendix C ) French Standard

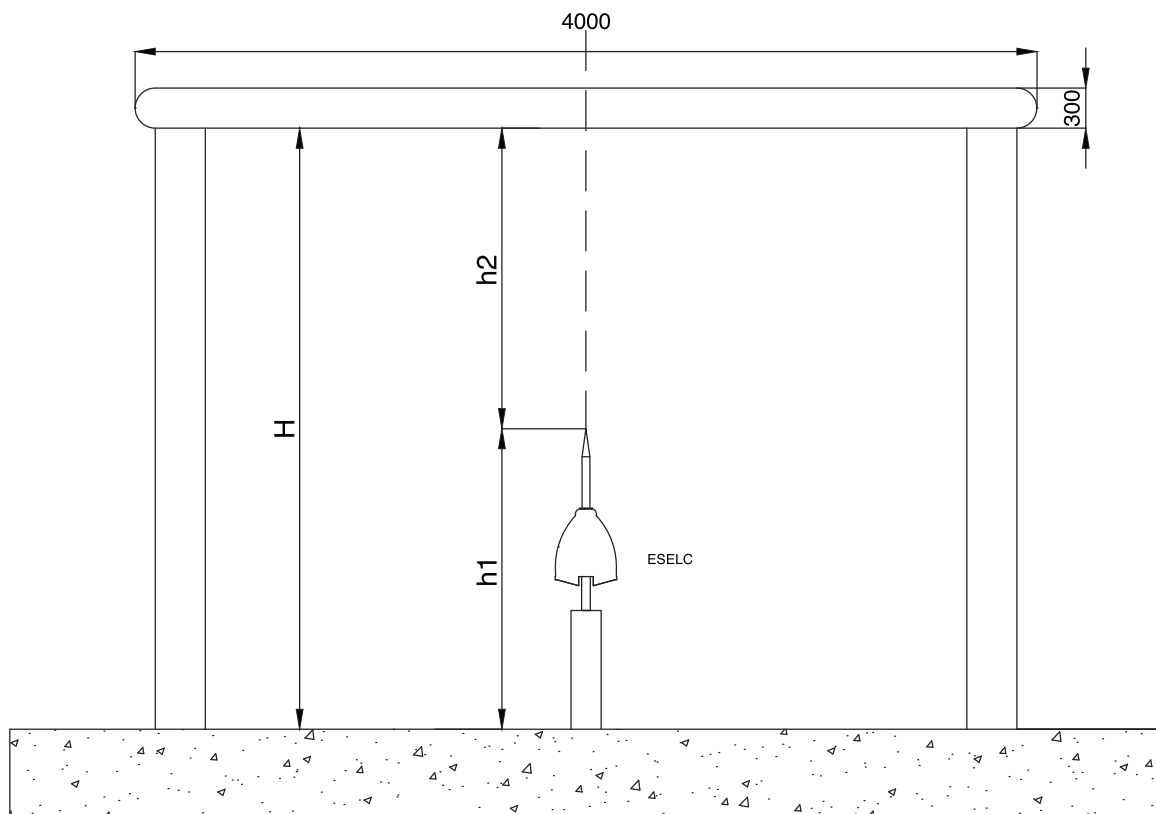
## **3. APPLICATIONS OF THE TESTS**

Tests were carried out using a high voltage electrode prepared according to the criteria mentioned in the related standart with dimensions ; edge radius  $R = 20$  cm , diameter  $\Phi = 300$  cm and as the ground electrode , in the first case a simple catching rod and in the second case the sample active catching device ( ESE ) head. In each case 100 negative impulses of approximately 200 / 2000  $\mu$ S (Rise time = 170  $\mu$ S ) waveform were applied and the streamer initiation time lags were recorded by DSO. The spacing between the cathing rod or device and the High Voltage plane electrode was set to 100 cm , the test impulse voltages were applied by means of a 1.2 MV , 20 kJoule impulse generator. The tests were applied using the ESE device under the test and a simple cathing rod of the same tip geometry and total length . Test set-up is shown in Figure.1 B. The magnitude of the impulse current observed during the tests was not less than 100 kA .The results are given in Table.1 .The test circuit diagram is shown in figure .1.A and the results are given in Figures 2-3 ..



- |  |                               |   |
|--|-------------------------------|---|
| 1) HV. Impulse Generator                         | 4) HV electrode               | 7) Parallel protective gap<br>( $\varnothing$ 500 mm) |
| 2) Series protective gap ( $\varnothing$ 250 mm) | 5) Sample ESE                 |   |
| 3) External front resistor                       | 6) Capacitive voltage divider |   |

**FIGURE.1A** Test System Circuit Diagram

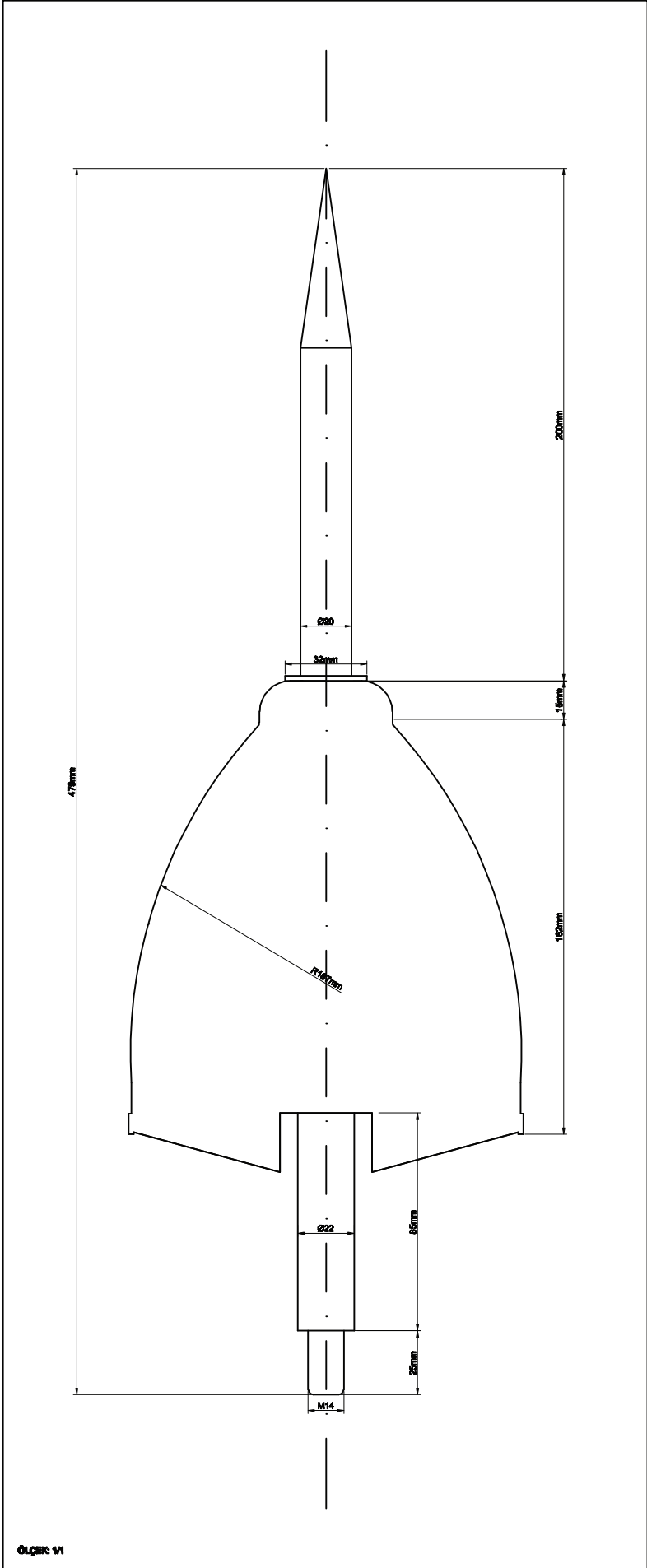


**FIGURE.1B** Test System Scheme



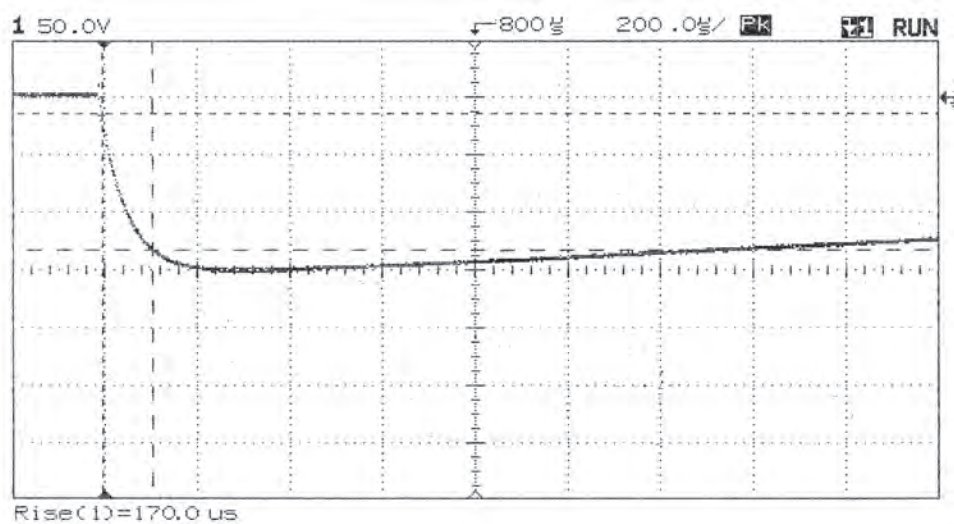
**FIGURE.1C** Test System

**4. TECHNICAL DRAWING OF THE TESTED ESE UNIT**

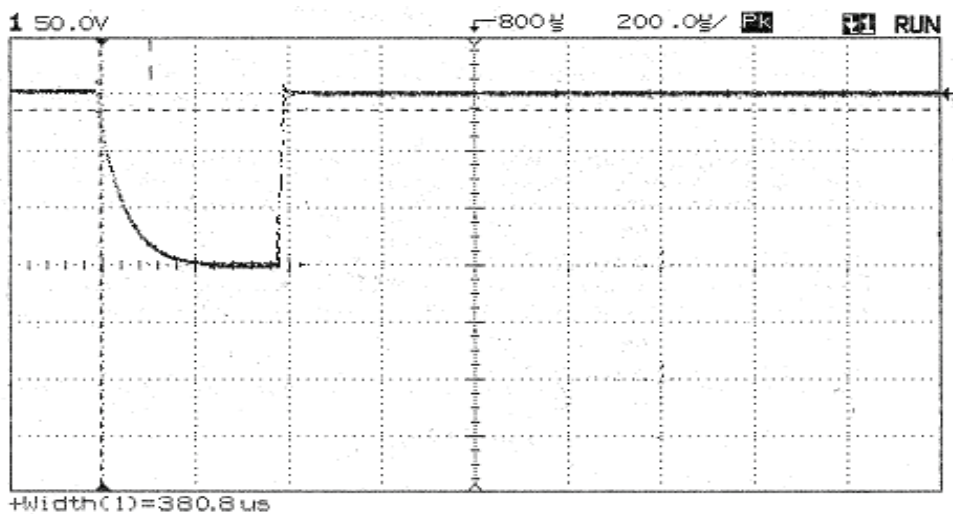


<b>TABLE.1</b>			
<u>Catching Device</u>	<u>Time lag ( <math>\mu</math>S )</u>		
	<u>Min.</u>	<u>Max.</u>	<u>Average</u>
<b>SR</b>	124	450	247
<b>ESE Numune</b>	134	278	191

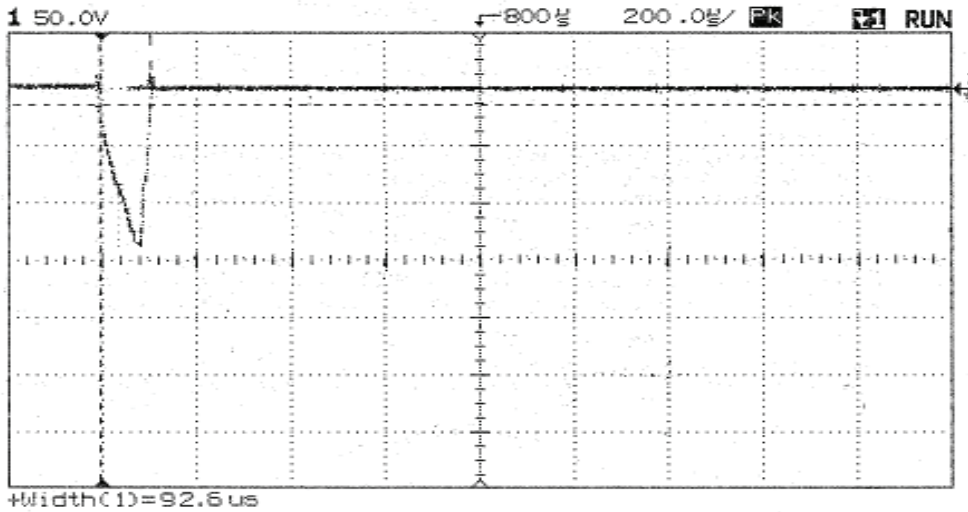
Test Voltage oscillograms are given in Figures .2 A,B,C



**Figure.2A** Impulse Test Voltage ,  $V_{min} = - 988$  kV



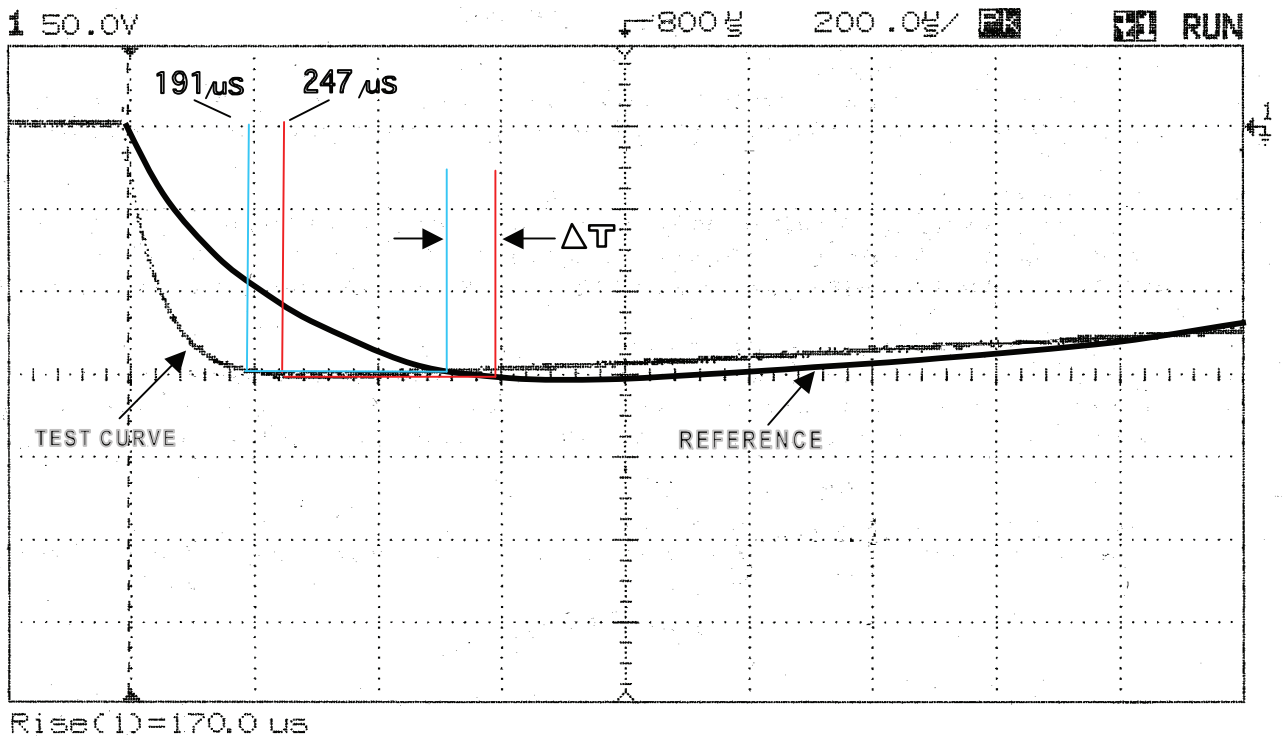
**Figure.2B** Impulse Test Voltage , SR Rod



**Figure.2C** Impulse Test Voltage , ESE Sample

### 5. EVALUATION OF THE TEST RESULTS

As described in NFC17-102 ( Appendix C ), the average time lags are applied to the reference curve and the test curve and the difference between the corresponding values are obtained as the time lag gain for the ESE sample  $\Delta T = 79.7 \mu S$  .



**Figure.3.** Streamer Time gain determination for the ESE Sample  
(  $\Delta t = 79.7 \mu S$  )



## **6. RESULT**

In context of the tests described above, it was determined that the ESE Sample has provided a certain time gain against the SR catching rod and therefore can be termed as ESE Lightning Conductor according to the criteria described in **NFC17-102 (Appendix C)**.

Prof. Dr. Mirzahan HIZAL

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