

FUNDACIÓN PARA EL FOMENTO
DE LA INNOVACIÓN INDUSTRIAL

LCOE

LABORATORIO CENTRAL OFICIAL DE ELECTROTECNIA
FUNDACIÓN PARA EL FOMENTO DE LA INNOVACIÓN INDUSTRIAL
UPM Technological Center – Tecnogetafe
C/ Eric Kandel, 1 – 28906 Getafe (Madrid)
Telephone: +34 91 491 81 68
www.f2i2.net

TEST REPORT

2019 07 3F 0410

TESTED DEVICE	Lightning E.S.E. (Early Streamer Emission Lightning Conductor)
MODEL	SCHIRTEC-DA (S-DA)
SERIAL NUMBER	082932
REQUESTED BY	SCHIRTEC AG. Ignaz-Köck Strasse 10 A-1210 – Wien, Austria.
APPLIED STANDARDS	See page 3 of this report
Beginning of tests date	31/07/2019
End of tests date	31/07/2019

This test report consists of pages 7 and 2 appendixes

Authorized signatory

Date of issue: 10th September, 2019

Mr. Abderrahim Khamlichi
Technical Responsible of HV Testing

Tested by: Mr. Juan Pablo Vega
HV Test Technician

CONDITIONS OF VALIDITY FOR THIS DOCUMENT:

- The results of the tests refer exclusively to the sample which was tested.
- The above mentioned sample is described in this report. If any modification of the sample has been made after it has been received, the details will also be given in the report and further documented in LCOE files.
- Partial reproduction of this document is prohibited
- This report will be considered void if it is altered in any way without prior authorization.

A. GENERAL DESCRIPTION

1. TESTED MATERIAL
 - 1.1. Marking
 - 1.2. Specimen description
2. TYPE OF TESTS
 - 2.1 Lightning impulse current withstand test:
100 kA of 10/350 μ s waveform
3. APPLIED STANDARDS
4. GENERAL DETAILS
 - 4.1 Ambient conditions.
5. MEASUREMENT UNCERTAINTY

1. TESTED MATERIAL

One (1) E.S.E. (Early Streamer Emission Lightning Conductor) was supplied to LCOE by SCHIRTEC AG.

Test date: 31th July, 2019

1.1. Marking

Manufacturer: SCHIRTEC AG

Models: SCHIRTEC-DA (S-DA)

Serial Numbers: 080304

1.2. Specimen description

The specimen, according to the customer, consists of one Early Streamer Emission Lightning Conductor.

2. TYPE OF TESTS

2.1 Lightning impulse current withstand test:
100 kA of 10/350 μ s waveform

$I_{peak} = 100 \text{ kA} \pm 10 \%$
 $W/R = 2500 \cdot \text{kJ}/\Omega \pm 35\%$
 $Q = 50 \text{ C} \pm 20 \%$
Duration < 10 ms.

3. APPLIED STANDARDS.

The test referred in section 2 has been made with applied current impulses waveforms, 100 kA of 10/350 μ s, according to NFC 17-102 September 2011 Standard and UNE 21186:2011, Article C.3.4.

4. GENERAL DETAILS

Tests were carried out at the L.C.O.E. facilities in Getafe, located in Diesel Street No 13, Industrial park El Lomo, 28906 Getafe, Madrid on 31th July, 2019.

Tests were performed by:

Juan Pablo VEGA
Ángel Ramírez

FFII –LCOE
FFII –LCOE

4.1 Ambient Conditions

Ambient conditions during the tests were:

Temperature: 25°C ±3°C
Humidity: 40% ±20%.

5. GENERAL DETAILS

The uncertainty of the test is calculated and at the disposal of the applicant.

B. TESTS

I. TEST PROCEDURE

II. TEST RESULTS

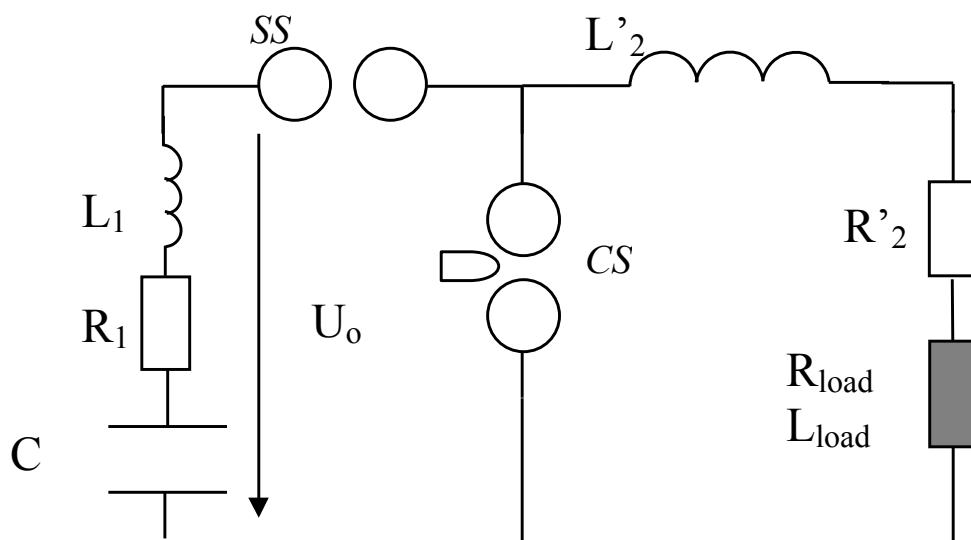
I. TEST PROCEDURE

I.1 INTRODUCTION

The purpose of the tests described in this report has been to test whether the tested sample has the ability to drain discharges of high current amplitude and high specific energy.

I.2 LIGHTNING TEST CURRENT GENERATION

It can be seen in figure 1 a schematic of the circuit generation for current impulses.



I.3 TEST PROCEDURE

The tested sample was subjected three times to a lightning impulse current of 100 kA of peak and 2500 kJ/ Ω of specific energy. Sufficient time was allowed between each applied impulse in order to enable the sample to cool down to ambient temperature.

II. TEST RESULTS

II.1. Tabulated results

Table 1. Tabulated results for the tests

SAMPLE	Serial Nº	Test	I_{peak} (kA)	W/R (kJ/Ω)	Q (C)	T₁ (μs)	T₂ (μs)	Visual inspection
S-DA	080304	RG31-01	94.2	2200	44.3	22.9	394.0	OK
		RG31-02	96.5	2240	43.8	22.9	388.1	OK
		RG10-06	97.5	2340	45.2	23.0	394.3	OK

II.2. Conclusions

The tested sample has successfully passed the test.

This test report was requested by SCHIRTEC AG and was issued in Madrid on 10th September, 2019.

Appendix I

To Test Report nº 2019 07 3F 0410

Photographs and current impulses waveforms

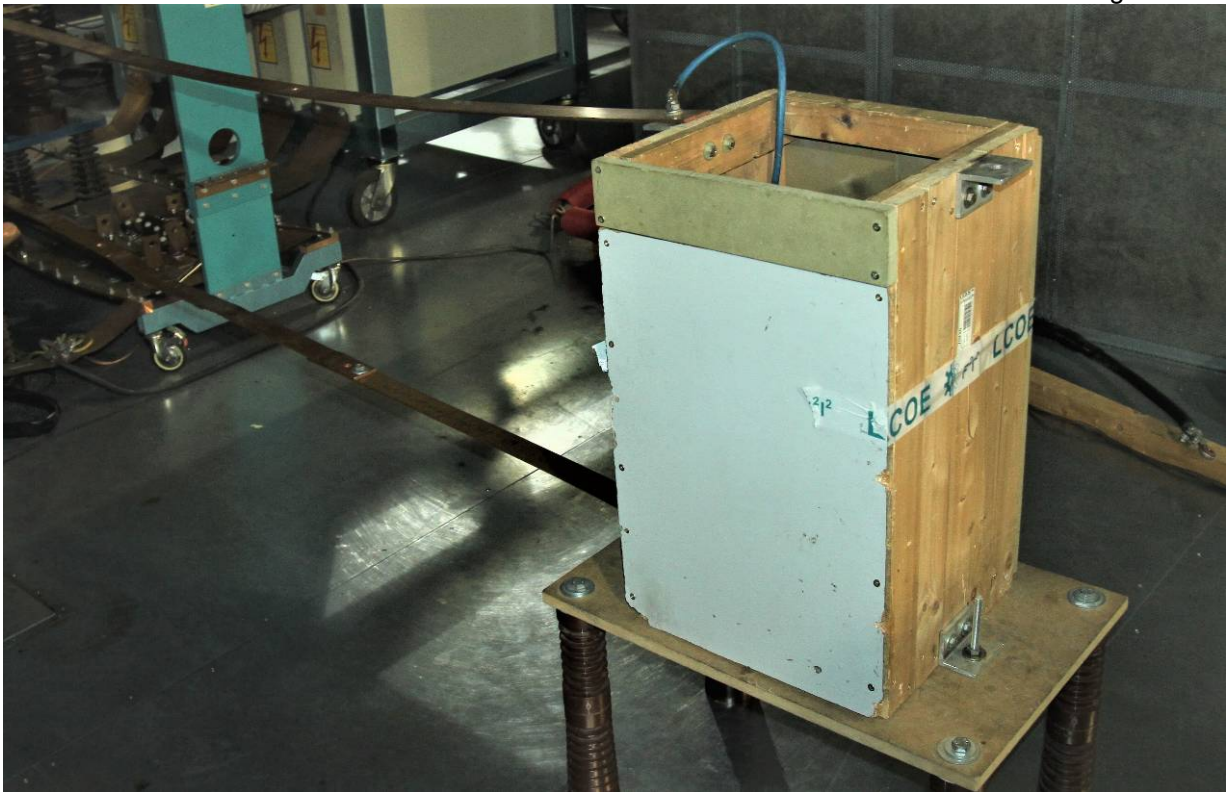


Figure 1. Test rig.



Figure 2. View of the specimen before the test



Figure 3. View of the specimen before the test.



Figure 4. View of the specimen after the test.

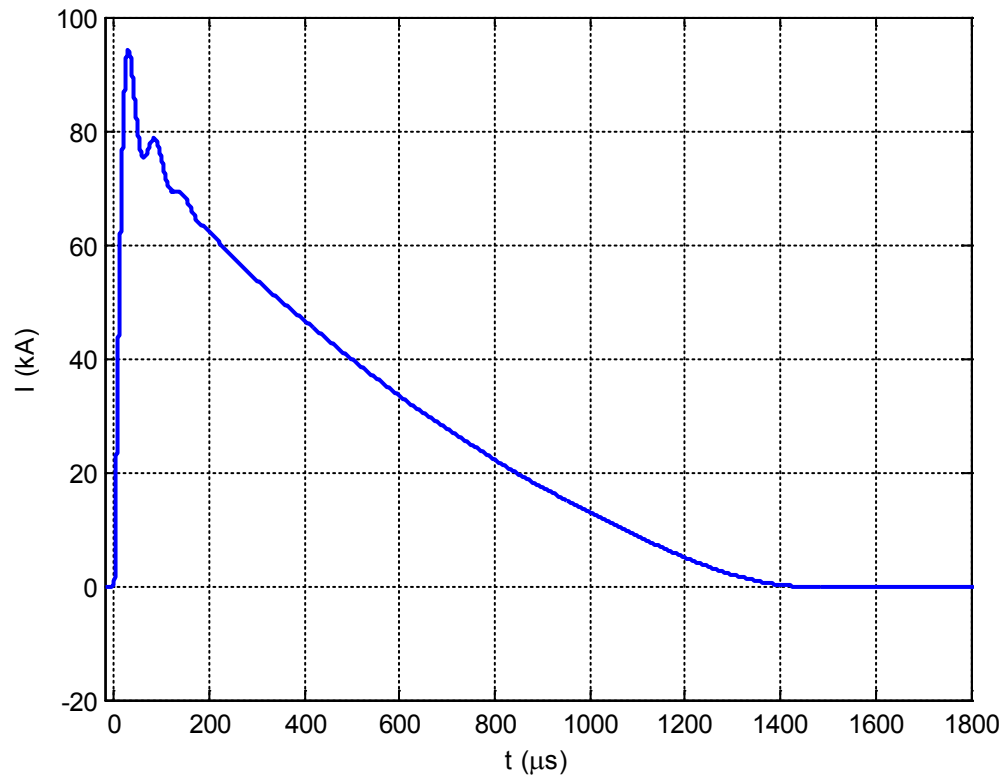


Figure 5. RG10-04. Total Current Injected.

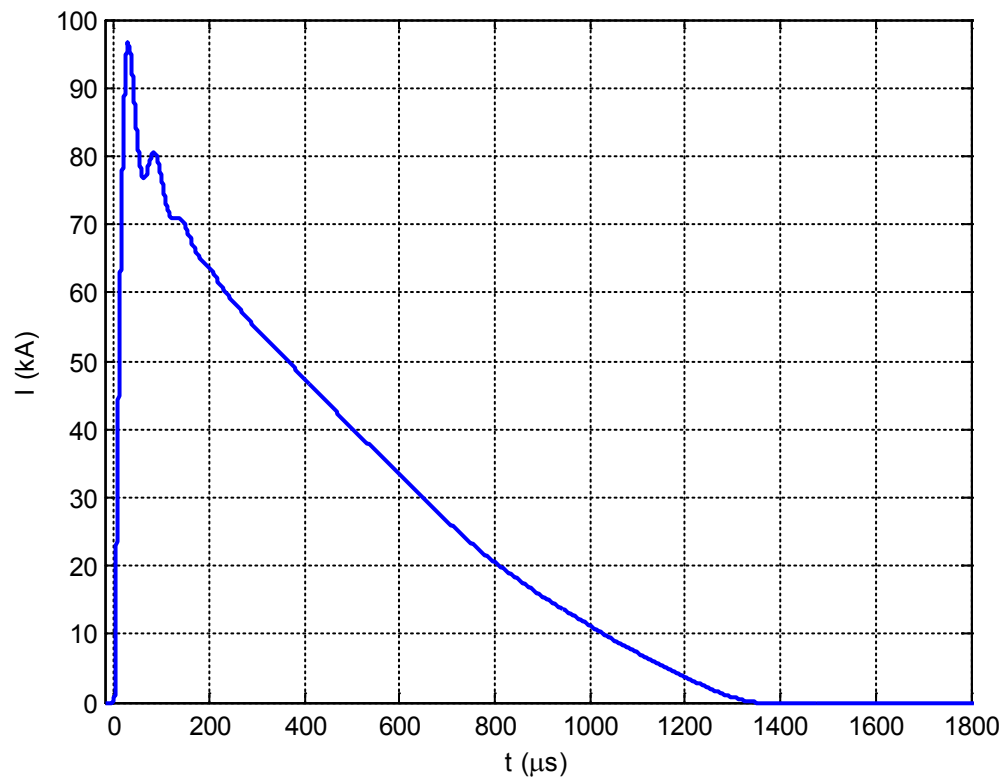


Figure 6. RG10-05. Total Current Injected.

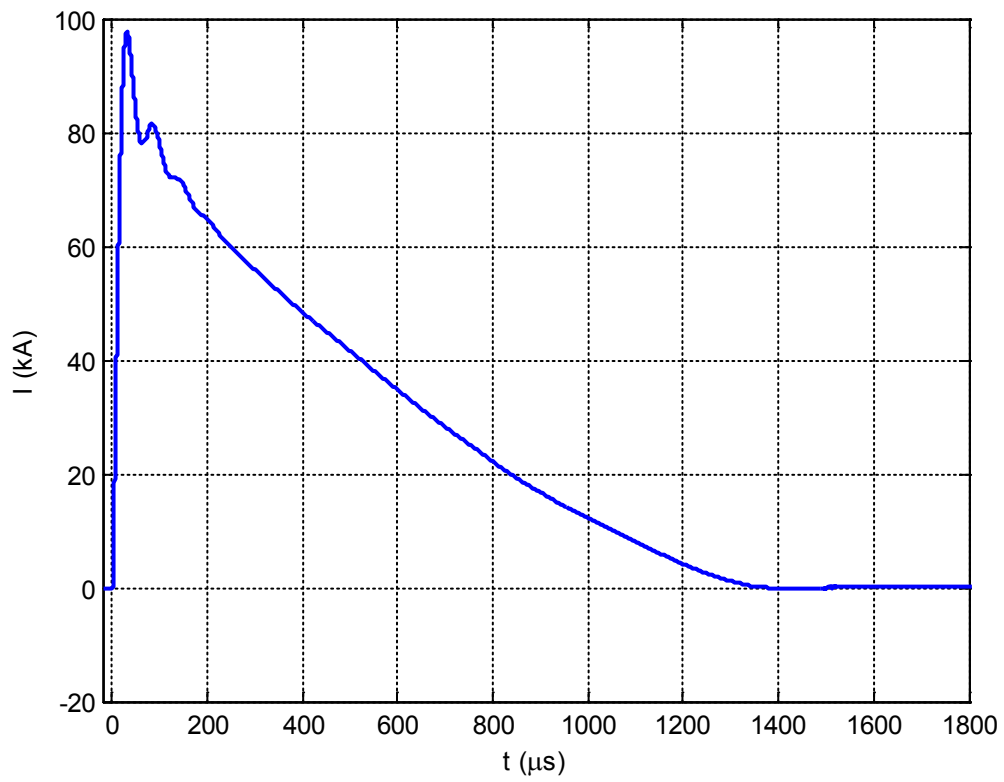


Figure 7. RG10-06. Total Current Injected.

Appendix II

To Test Report nº 2019 07 3F 0410

Test Facility and Measurement Systems.

1. Test Facility

The component A and D waveforms were generated using a 52 μ F capacitor bank charged up to 75 kV and a crowbar device. The output current waveform can be modified by varying the inductance and resistance in the generator and load circuit.

2. Measurement Systems and Calibration

Current Measuring System

Reference Number: III-4-IC-04

Acquisition:

Digital Storage Oscilloscope
Manufacturer: Yokogawa
Model: DL-750
Serial Number: 701210-F-J1-HE/C8
Reference number: III-1-OS-006

Measurement Software:

Reference number: III-1-SOFT-016
Ver. 1.0.3.

Last Calibration Date:

November 2018