

Document number | CG270_TR_02_0

Product test report


CG270 to IEC 62561-2: 2012



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1 Revision Record

Rev	Description	Prep.	Check'd	App'd	Date
0	Original issue.	A.P.M.	A.P.M.		30/07/2014

2 Introduction

This report details the testing of the Furse component CG270; Rod coupling (5/8") in accordance with IEC 62561-2:2012 Lightning Protection System Components (LPSC) – Part 2: Requirements for conductors and earth electrodes.

2.1 Declaration

The above product supplied by Furse has been successfully tested in accordance with IEC 62561-2:2012 Lightning Protection System Components (LPSC) – Part 2: Requirements for conductors and earth electrodes.


Therefore this component is declared appropriate for use in a lightning protection system (LPS) in line with the scope below.

2.2 Scope of Conformity

For use in a lightning protection system (LPS) as a coupling connector between two 5/8" Copperbond earth rods in accordance with Furse literature. For an impulse current withstand capability of 100kA (class H).

3 Variant Part Numbers

Valid for variant part numbers CG272.

	Document: Product Test Report Furse CG270 to IEC 62561-2:2012	Doc No: CG270_TR_02	
		Rev: 0	Date: 30/07/2014

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**RESEARCH CENTRE FOR TESTS AND DEVELOPMENT
SURGE CURRENT
AND HIGH VOLTAGE LABORATORY**

ELEMKO SA

TEST REPORT No. 31340

**OF THREADED COUPLING FOR 5/8" EARTH ROD, PART NUMBER : CG270
FOR USE IN EXTERNAL LIGHTNING PROTECTION SYSTEMS (LPS)
AS JOINT FOR EARTH RODS**

COMPANY :



APPLICABLE STANDARD:

IEC/BS EN 62561-2:2012



<http://www.a2la.org/scopepdf/3051-01.pdf>

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ABBREVIATIONS

IEC : International Electrotechnical Commission
ISO : International Standardization Organization
EN : European Norm
A2LA : American Association for Laboratory Accreditation

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1. (7.1) GENERAL

For the purpose of the easier assimilation of this report by the reader and for the better and the complete presentation of the test data, which is required by the standard IEC/BS EN 62561-2:2012, the format of the headings kept the same as it is mentioned in clause 7 of the above standard.

For the better comparison and completeness of this report with the standard's requirements, the corresponding numbering of the standard is also mentioned in each clause, in brackets.

2 (7.2) REPORT IDENTIFICATION

2.1 (7.2.a) Subject of the report

Description and results presentation of laboratory type testing according to IEC/BS EN 62561-2:2012 on coupling for earth rod, provided by FURSE (THOMAS & BETTS) with part number CG270.

2.2 (7.2.b) Name, address and telephone number of the test laboratory

Research Development and Testing Centre – High Voltage and High Current Testing laboratory
ELEMKO SA
2nd km Thiva-Chalkida Old National Road, GR 32200, THIVA
Tel: (+30) 2262024523 - 2262024574,
Fax : (+30) 2262023571
e-mail: elemko@elemko.gr

2.3 (7.2.c) Name, address and telephone number of the sub contracting test laboratory

There were no tests subcontracted by other laboratory.

2.4 (7.2.d) Number of test report **31340**

2.5 (7.2.e) Applicant's name and address

Request number:	177
Name:	W. J. FURSE Ltd (THOMAS & BETTS)
Address:	Wilford Road, Nottingham NG2 1EB, United Kingdom

2.6 (7.2.f) Total number of pages **17**

2.7 (7.1.g) Date of issue of report **2014/05/30**

2.8 (7.1.h) Dates of performance the tests

Initiation date: 2014/04/15	Closing date: 2014/05/23
------------------------------------	---------------------------------

2.9 (7.1.i) Authorized person to sign for the testing laboratory for the content of the report**Dr N. KOKKINOS**

Electrical Engineer Beng, MSc, PhD
Laboratory Technical Manager

2.10 (7.1.j) The tests were conducted by**L. KATSIKOIANNIS**

Electrical Engineer
Test engineer

S. MARKOU

Laboratory Technician

3. (7.3) SPECIMEN DESCRIPTION**3.1 (7.3.a) Specimen description**

Joint for earth rods, made out from copper alloy. For more details see drawing in clause 3.6.

3.2 (7.3.b) Description and identification of the test specimen and /or test assembly

Three specimens were assembled, each one, from two parts 500mm long of copper coated steel earth rod 14,2 mm nominal diameter. For traceability each arrangement was marked with the identification numbers 31340 A, 31340 B & 31340 C.

3.3 (7.3.c) Characterization and condition of the test specimen and/or test assembly

The received specimens were new and in good condition.

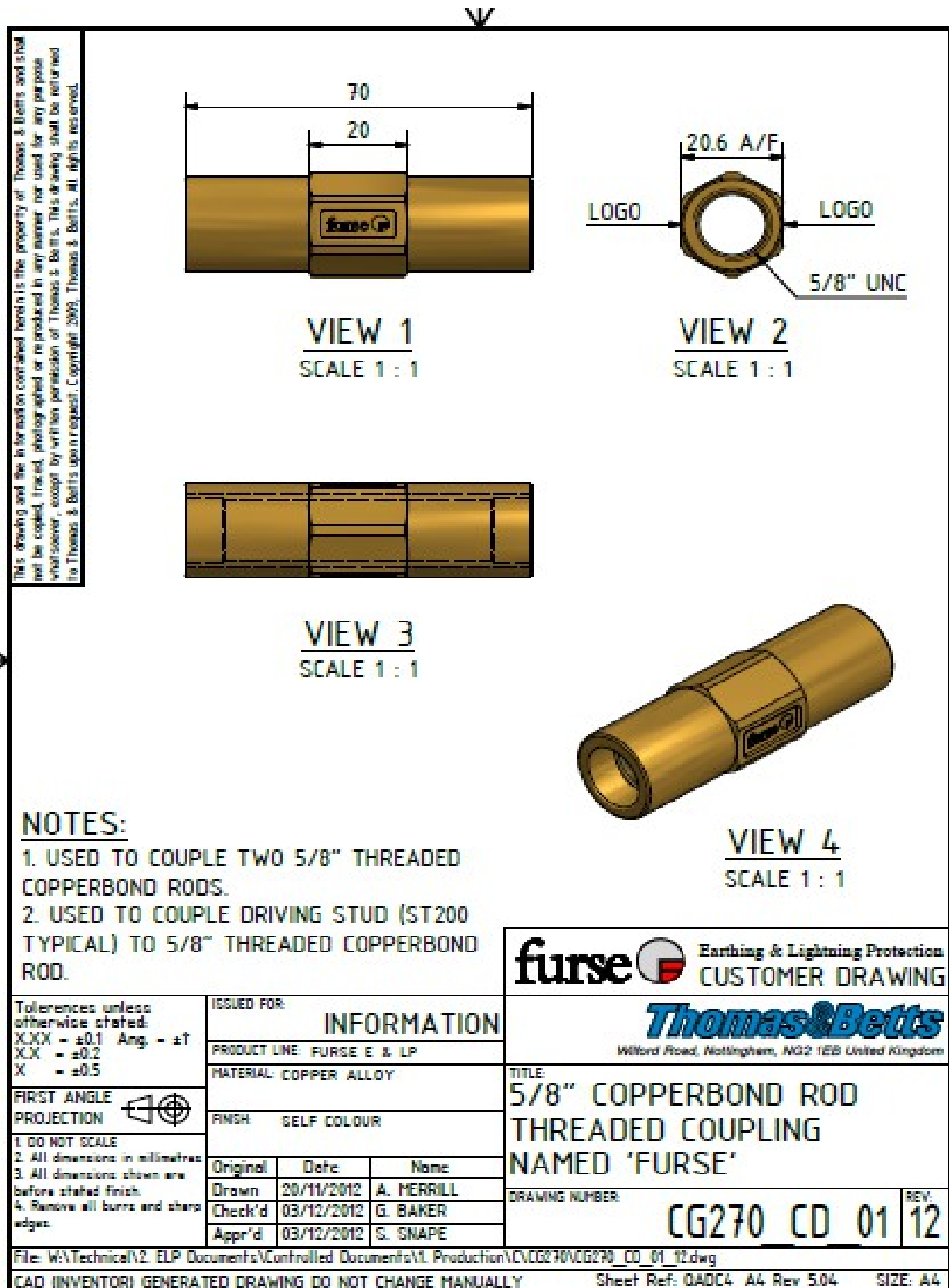
3.4 (7.3.d) Sampling procedure

Not relevant.

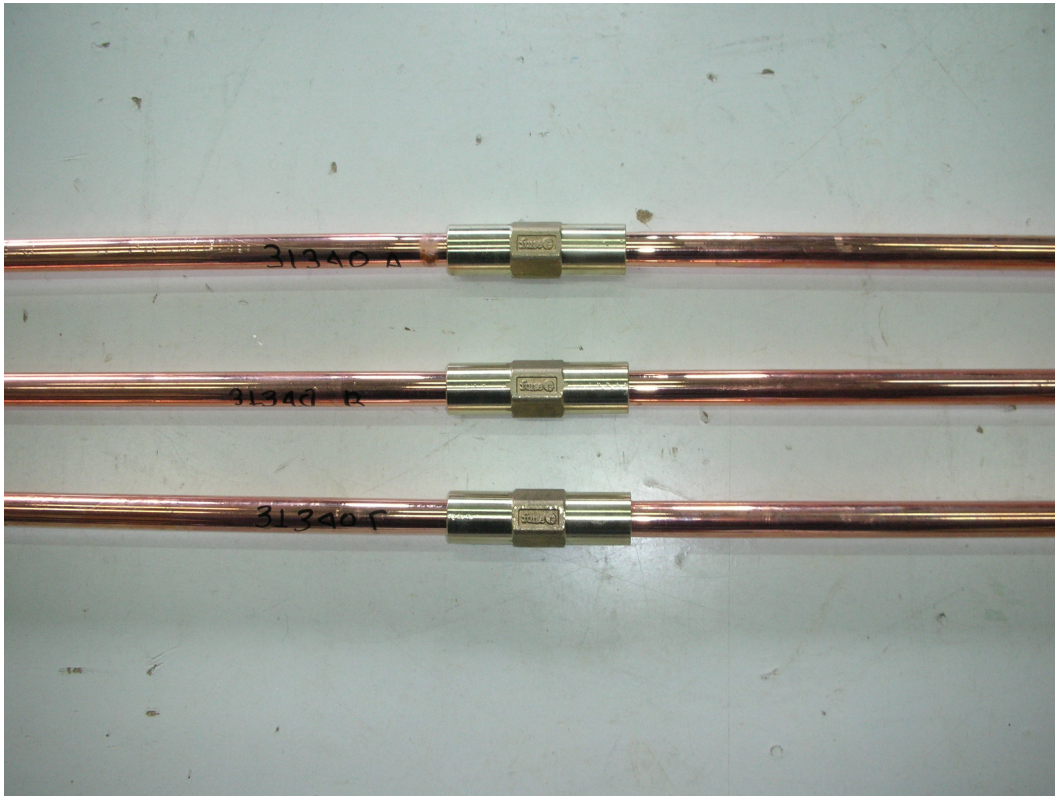
3.5 (7.3.e) Date of receipt of test items:

2014/03/27

3.6 (7.3.f) Photographs, drawings



Specimen's drawing



1. Photograph of the specimens before the test sequence



2. Photograph of the specimens after the salt mist and humid sulphurous atmosphere ageing test



3. Photograph of the specimens after the ammonia atmosphere treatment



4. The specimens following the termination of the electrical tests

4. (7.4) CONDUCTOR – ROD – PLATE

4.1 (7.4.a) Material

Copper coated steel.

4.2 (7.4.b) Nominal cross-section area, dimensions and shape

Declared by the applicant 158 mm², 14,2 mm diameter, solid round rod.

5. (7.5) STANDARDS AND REFERENCES

5.1 (7.5.a) Test standard used

IEC/BS EN 62561-2:2012

“Lightning protection system components (LPSC) – Part 2: Requirements for conductors and earth electrodes”.

5.2 (7.5.b) Other relevant documentation

- IEC EN 62561-1:2012 “Lightning protection system components (LPSC) – Part 1: Requirements for connection components”.
- IEC EN 62305-3 “Protection against lightning – Part 3: Physical damage to structures and life hazards”.
- IEC EN 62305-4 “Protection against lightning – Part 4: Electrical and electronic systems within structures” (IEC 62305-4).
- Furse, Thomas & Betts, Total Solutioin Product Catalogue, as downloaded from the website of Thomas & Betts, www.tnb.com in March 2014.

6. (7.6) TEST PROCEDURE

6.1 (7.6.a) Description of test procedure

According to IEC/BS EN 62561-2:2012 the following tests were performed:

- Inspection on installation instructions literature provided by applicant as per clause 4.2 of the standard.
- Compression test by mechanical means as per clause 5.4.2 of the standard.
- Environmental – electrical tests as per clause 5.4.3, of the standard.

For each test 3 specimens were used.

Before beginning of tests all specimens were cleaned by using a suitable degreasing agent and each one was marked for identification.

The tests were performed according the standard IEC/BS EN 62561-2:2012. Requirements and results are illustrated in detail in clause 9 “Table of results and parameters recorded” of the present report.

6.2 (7.6.b) Justification for any deviations from, additions to or exclusions from the referenced standard

There were no deviations from, additions to or exclusions from the referenced standard.

6.3 (7.6.c) Other information relevant to the tests

All information is tabled in clause 9 of this report.

6.4 (7.6.d) Configuration of the testing assembly

See photo 1 in clause 3.6 of this report.

6.5 (7.6.e) Location of the arrangement in the testing area and measuring techniques

Environmental tests were performed in our laboratory's "conditioning test room".

The electrical tests were performed in our laboratory's "high voltage area".

Measuring techniques used are illustrated in detail in clause 9 "Table of results and parameters recorded" of the present report.

7. (7.7) TESTING EQUIPMENT DESCRIPTION

1. Environmental chamber for salt mist ageing, serial nr. 4318.
2. Environmental chamber for humid sulphurous atmosphere ageing, serial nr. 4317.
3. 25.000kg press.
4. Impulse current generator 0-100kA, 0-65C, 0-187kJ.
5. 4-channel trigger / delay pulse generator serial nr. 09720.
6. Shunt 1 mΩ.
7. Vibration hammer, serial nr. 3 611 C35 100 2007.



Photograph of the environmental ageing chamber used for salt mist ageing.



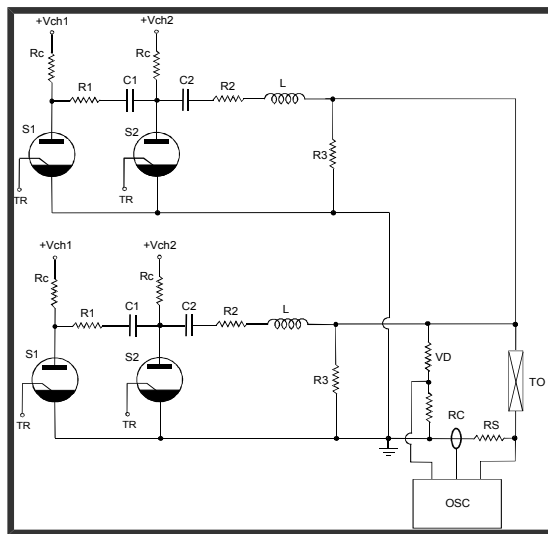
Photograph of the environmental ageing chamber used for humid sulphurous atmosphere ageing.



Photograph of the 100kA, 10/350µs impulse current generator.



Photograph of 25000kg press



Vch1 : Start bank charging voltage	S1 : Start switches
Vch2 : Sustain bank charging voltage	S2 : Sustain switches
Rc : Charging Resistors	TR : Triggering module
R1 : Start Resistor	VD : Voltage Divider
R2 : Sustain resistor	RC : Rogowski coil
R3 : Bleeding resistor	RS : Resistive shunt
L : Stray inductance	TO : Test object
C1 : Start Capacitor	OSC : Oscilloscope
C2 : Sustain Capacitor	

Figure a : A schematic diagram of the 100kA, 10/350 μ s impulse current generator.

8. (7.8) MEASURING INSTRUMENTS DESCRIPTION

Instrument	Calibration date	Calibration interval
1. Torque meter, 0-30Nm, serial nr. 0901610877	2013/08/19	1 year
2. Digital micro-ohmmeter, 5 $\mu\Omega$ -400 Ω , serial nr. 166423.	2013/05/30	1 year
3. 4-channel, digital oscilloscope, serial nr. LCRY3203N57222.	2013/09/10	1 year
4. Temperature, barometric pressure and humidity meter.	2013/07/24 (internal)	1 year
5. Balance, serial number 83017901.	2011/11/21	3 years

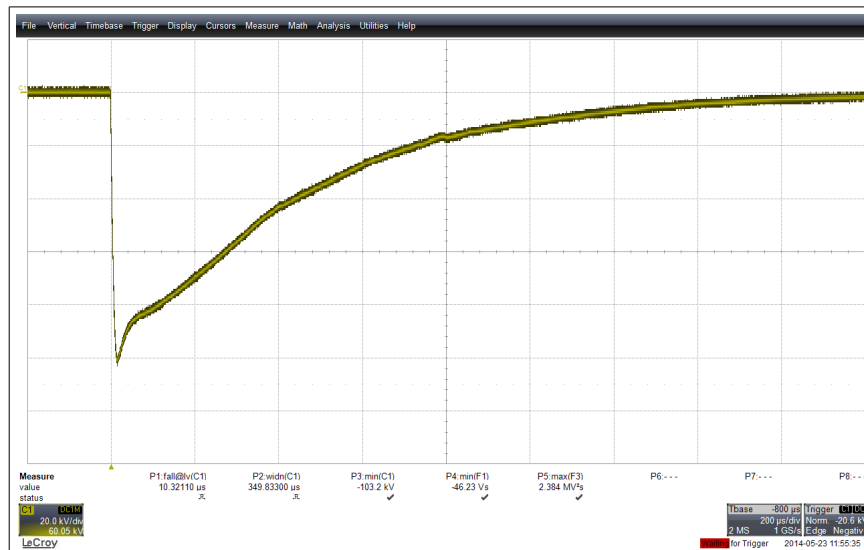
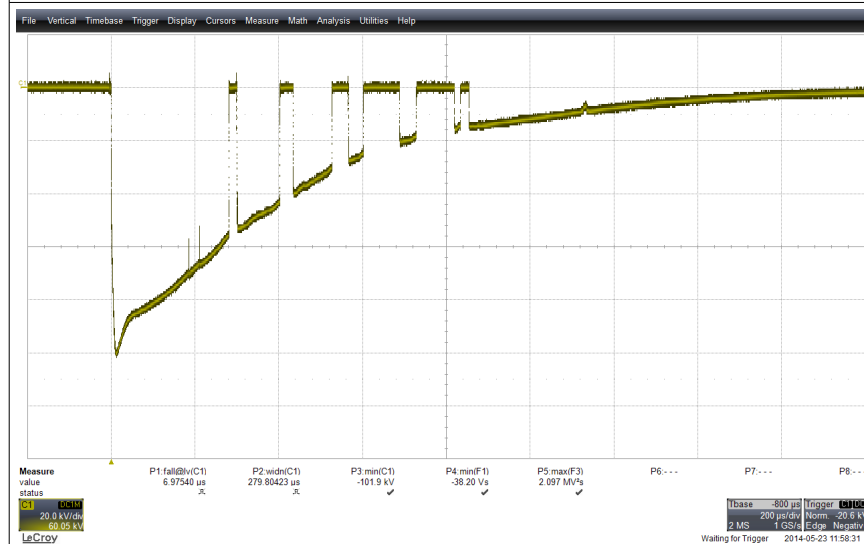
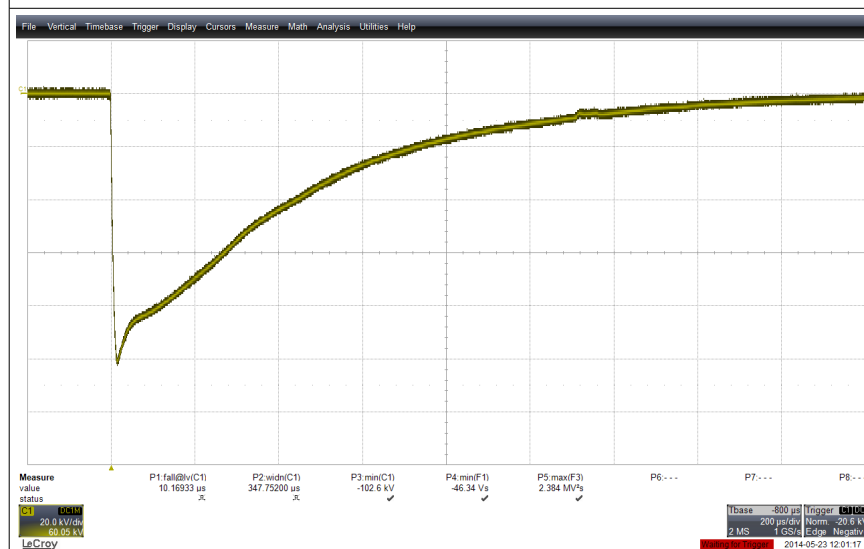
9. (7.9) RESULTS AND PARAMETERS RECORDED

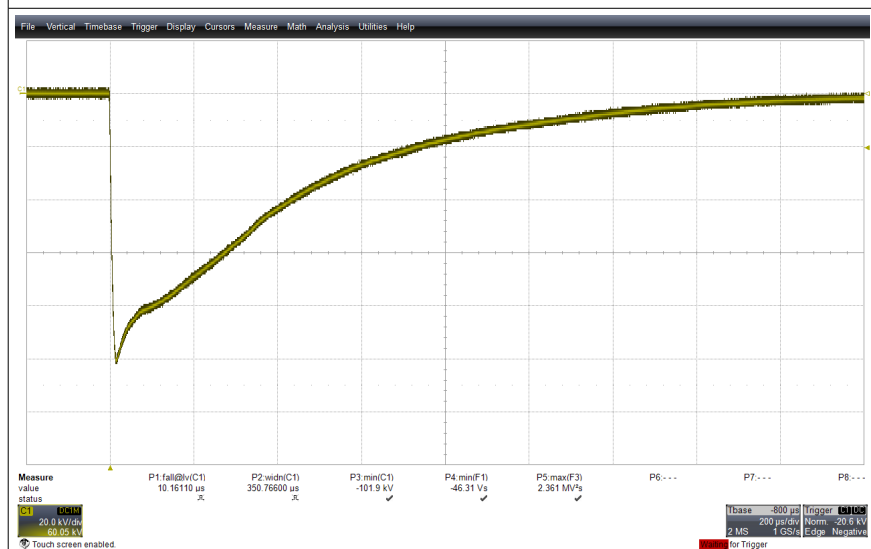
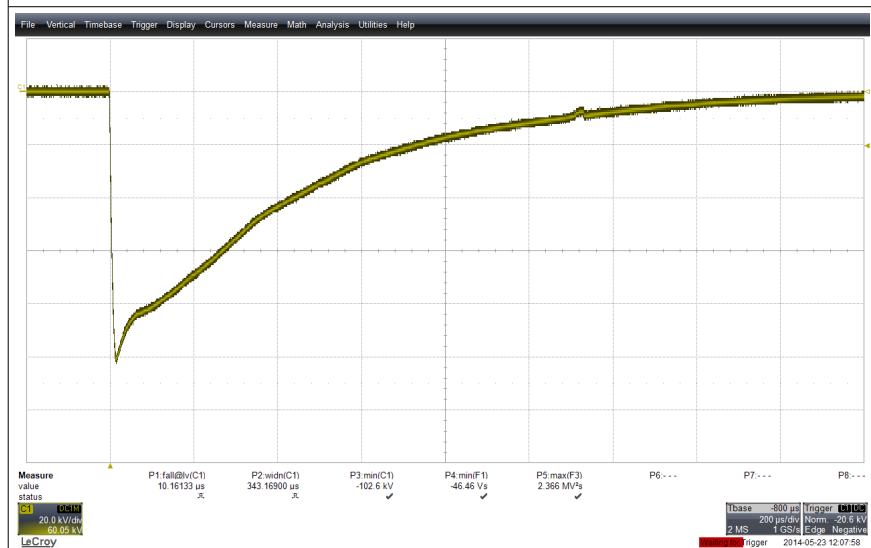
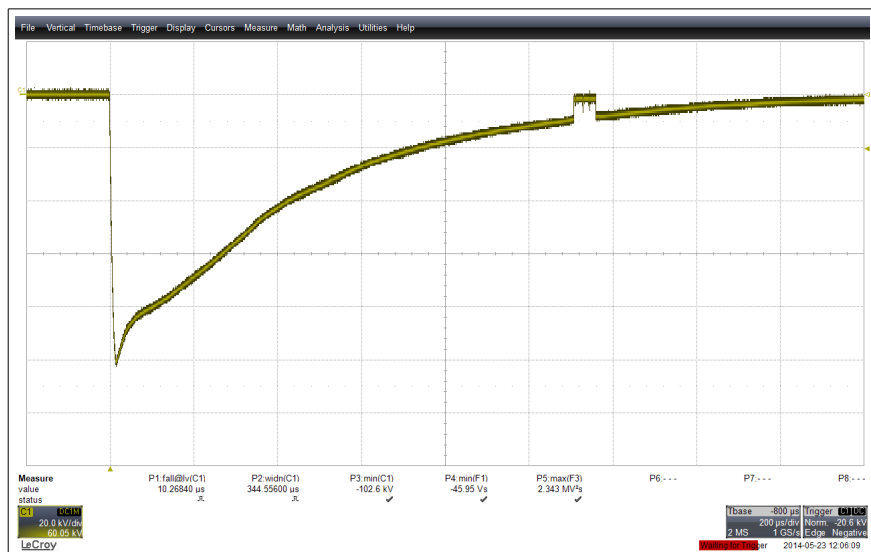
The performed tests, required for joints for earth rods and their results are shown in the below table

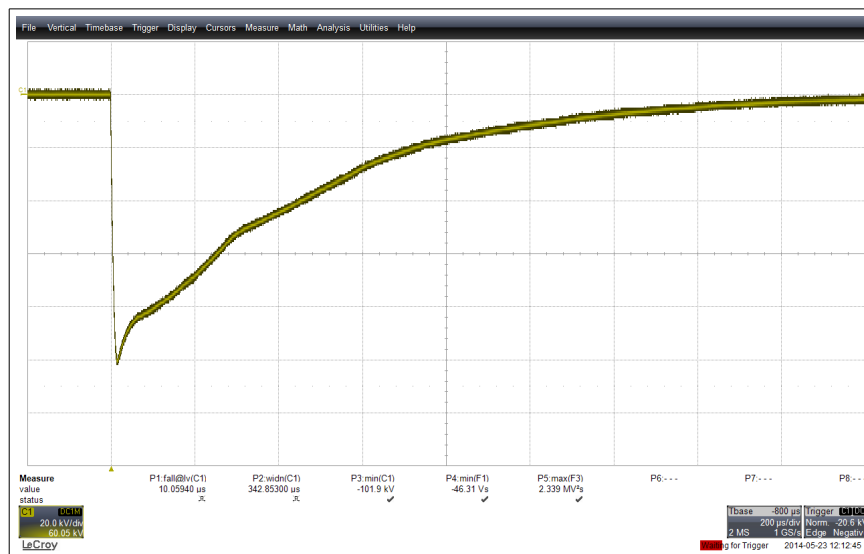
Table or clause	Requirements and passing criteria for joints for earth rods according to IEC/BS EN 62561-2:2012	Recorded results and parameters	PASS/FAIL
4.2	<u>Documentation:</u> Adequate information to ensure that the installer can select and install in suitable and safe manner in accordance to EN 62305-3.	<u>Documentation:</u> The information is ensuring that the selection of the tested specimens and its installation can be performed in a suitable and safe manner.	PASS
4.4.3	<u>Material compatibility:</u> The material shall be compatible with that of the earth rod being joined.	<u>Material compatibility:</u> The material (copper alloy) is compatible with that of the earth rod being joined(copper coated steel).	PASS

Table or clause	Requirements and passing criteria for joints for earth rods according to IEC/BS EN 62561-2:2012	Recorded results and parameters	PASS/FAIL																																																				
4.4.3	<p><u>Thread inspection:</u> Threaded external joints/couplers shall be of a sufficient length to ensure no threads on the earth rod are exposed when installed. Threaded internal joints/couplers shall ensure that the mating faces of the earth rods come in contact after assembly.</p>	<p><u>Thread inspection:</u> The joint is internal threaded and ensures that the mating faces of the earth rods come in contact after assembly.</p>	PASS																																																				
5.4.2	<p><u>Compression tests by mechanical means:</u> The top of each specimen shall be impacted with a vibration hammer defined with the following parameters for duration of 2 min :</p> <ul style="list-style-type: none"> • percussion rate $(2000 \pm 1000) \text{ min}^{-1}$; • single stroke impact energy $(50 \pm 10) \text{ Nm}$. <p>The specimens are deemed to have passed the test if their joints are not broken or do not show any crack to normal or corrected vision without magnification.</p>	<p><u>Compression tests by mechanical means:</u> After the test the specimens were not broken and did not show any crack to normal or corrected vision without magnification.</p>	PASS																																																				
5.4.3	<p><u>Environmental – Electrical tests:</u> The specimens must be subjected to a salt mist ageing test (3 days) followed by a humid sulphurous atmosphere test (7 days). Salt mist test is performed according to standard EN 60068-2-52:1996 (except clauses 7, 10 and 11 which are not applicable) Test is carried out using severity (2). Humid sulphurous atmosphere treatment is performed according to standard EN ISO 6988:1994 (except clauses 9 and 10 which are not applicable) with seven cycles with a concentration of sulphur dioxide of $(667 \pm 25) \text{ ppm}$ (in volume). Each cycle which has a duration of 24h is composed of a heating period of 8h at a temperature of $(40 \pm 3)^\circ\text{C}$ in the humid saturated atmosphere which is followed by a rest period of 16h. After that, the humid sulphurous atmosphere is replaced. Ammonia atmosphere treatment for 1 day, according to standard ISO 6957:1988 for a moderate atmosphere with the pH value 10 except for 8.4 and Clause 9 which are not applicable.</p> <p>After the conditioning test and without cleaning, the assembly shall be subjected to an electrical test as per clause 6.3 of EN 50164-1 (Each specimen – A, B & C, shall be stressed three times by a test current with the following characteristics $I_{imp} = 100 \text{ kA} \pm 10\%$, $W/R = 2.5 \text{ MJ}/\Omega \pm 35\%$, $T_1 \leq 50 \mu\text{s}$, $t_0 \leq 2 \text{ ms}$), and after that to a mechanical tensile force of $1000 \text{ N} \pm 10 \text{ N}$.</p>	<p><u>Environmental – Electrical tests:</u> The specimens were subjected to the tests as follows:</p> <ul style="list-style-type: none"> - Salt mist ageing test: 2014/05/06 – 2014/05/09 - Humid sulphurous atmosphere test: 2014/05/09 – 2014/05/16 - Ammonia atmosphere test: 2014/05/21 – 2014/05/22 <p>After the conditioning test and without cleaning, each assembly were stressed three times by an impulse current with the following characteristics:</p> <table> <tr> <th></th><th>I_{imp} (kA)</th><th>W/R MJ/Ω</th><th>Nr of shot</th></tr> <tr> <td colspan="4">Specimen 31340 A</td></tr> <tr> <td>A1</td><td>103,2</td><td>2,384</td><td>8455</td></tr> <tr> <td>A2</td><td>101,9</td><td>2,097</td><td>8456</td></tr> <tr> <td>A3</td><td>102,6</td><td>2,384</td><td>8457</td></tr> <tr> <td colspan="4">Specimen 31340 B</td></tr> <tr> <td>B1</td><td>102,6</td><td>2,343</td><td>8458</td></tr> <tr> <td>B2</td><td>102,6</td><td>2,366</td><td>8459</td></tr> <tr> <td>B3</td><td>101,9</td><td>2,361</td><td>8460</td></tr> <tr> <td colspan="4">Specimen 31340 C</td></tr> <tr> <td>C1</td><td>101,9</td><td>2,339</td><td>8461</td></tr> <tr> <td>C2</td><td>101,9</td><td>2,342</td><td>8462</td></tr> <tr> <td>C3</td><td>101,9</td><td>2,331</td><td>8463</td></tr> </table>		I_{imp} (kA)	W/R MJ/ Ω	Nr of shot	Specimen 31340 A				A1	103,2	2,384	8455	A2	101,9	2,097	8456	A3	102,6	2,384	8457	Specimen 31340 B				B1	102,6	2,343	8458	B2	102,6	2,366	8459	B3	101,9	2,361	8460	Specimen 31340 C				C1	101,9	2,339	8461	C2	101,9	2,342	8462	C3	101,9	2,331	8463	
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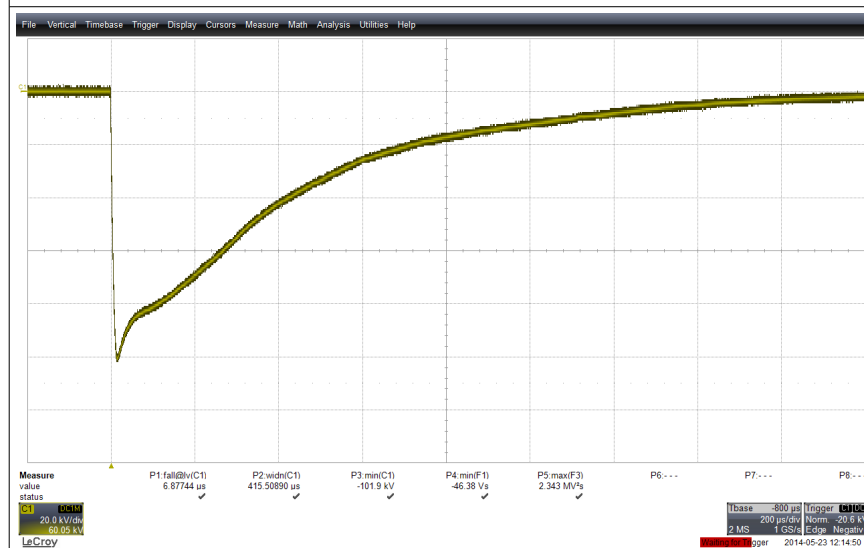
Table or clause	Requirements and passing criteria for joints for earth rods according to IEC/BS EN 62561-2:2012	Recorded results and parameters	PASS/FAIL
	<p>The specimens are deemed to have passed the tests if :</p> <ul style="list-style-type: none"> - the joints is not broken or do not show any crack to normal or corrected vision without magnification; - the contact resistance measured with a source of at least 10A, as close as possible to the joint, is equal or less than 1000$\mu\Omega$; - the specimen assembly still remain intact. 	<p>After the impulse current test each assembly subjected to a mechanical tensile force of 1000N</p> <p>Upon completion of the tests the following results observed or derived:</p> <ul style="list-style-type: none"> - The specimens were not broken and did not show any crack to normal or corrected vision without magnification. - Contact resistance : A : 100 $\mu\Omega$ B : 110 $\mu\Omega$ C : 101 $\mu\Omega$ - Each specimen assembly remained intact. <p>Environmental conditions during electrical tests : Humidity : 60 % Temperature : 23 °C Atm. Pres. : 995 mbar</p>	<p>PASS</p> <p>PASS</p> <p>PASS</p>
4.5 5.5	<p><u>Marking test</u></p> <p>The specimens shall be marked with:</p> <ul style="list-style-type: none"> - the manufacturer's or responsible vendor's name, logo or trademark; - identifying symbol. <p>The marking is checked by inspection and by rubbing it by hand for 15 sec, with a piece of cloth soaked in water and again for 15 sec with a piece of cloth soaked with white spirit/mineral spirit.</p> <p>The specimens are deemed to have passed the test if the marking remains legible.</p> <p>Note 1: Where marking proves to be impractical, it may be given on the smallest packing unit.</p> <p>Note 2: Marking made by moulding, pressing or engraving is not subjected to this test.</p>	<p><u>Marking test:</u></p> <p>The marking was made by engraving. Therefore only the visual inspection has been performed.</p> <p>Each specimen was marked with the manufacturer's name and trademark. The product identification is given on the smallest packing unit.</p>	<p>PASS</p>

OSCILLOSCOPE RECORDINGS OF THE IMPULSE CURRENT TESTS**31340_A1****31340_A2****31340_A3**

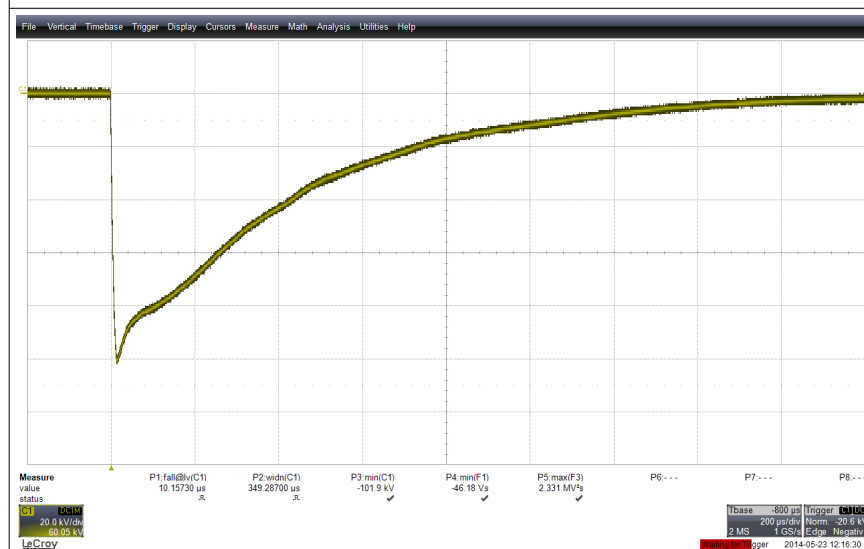




31340_C1



31340_C2




31340_C3

10. (7.10) SUMMARY STATEMENT

Three specimens of coupling for 5/8" earth rod, part number CG270, were submitted for testing by FURSE (THOMAS & BETTS) and have been subjected to all the applicable tests required by Standard IEC/BS EN 62561-2:2012, which are mentioned in the clauses 4.2, 4.4.3, 4.5, 5.4.2, 5.4.3, & 5.5 of the standard and found that :

The above three specimens have successfully passed the tests and therefore they satisfy the criteria according to IEC/BS EN 62561-2:2012 for use in external Lightning Protection Systems (LPS) as joints for earth rods.

	Laboratory Technical Director
NAME	Dr. N. Kokkinos Electrical Engineer BEng, MSc, PhD
SIGNATURE	 ELEMKO S.A. R. & D. Testing Lab. THIVA - GREECE TEL: +30 210 2845400 e-mail: elemko@elemko.gr

NOTE: This report only explains the specimens submitted for test and does not produce evidence for the quality for standard fabrication.

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