

**Client** FINE ART CERAMIC Co., Ltd

**Address of the Client** 104 Pattanakan 69, Pravet, 10250 Bangkok  
Thailand

**Tested samples/items** Pin-Post Type porcelain insulators type ANSI 56/57-4

**Tests carried out** Power Arc Tests

**Standards/Specifications** Client's request based on PEA specification

**Tests date** from November 24, 2008 to November 25, 2008

The results reported in this document relate only to the tested samples/items.  
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**No. of pages** 19 **No. of pages annexed** 5

**Issue date** December 12, 2008

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**CESI S.p.A.**  
Energy Division  
Technical Area Components  
"Testing Laboratories"  
Manager



**Tests witnessed by**

/

**Identification of the object**                      effected

The Manufacturer guarantees that the tested object is manufactured according to the submitted drawing.

CESI checked that this drawing adequately represents in shape and dimensions the essential details and the parts of the tested object.

This drawing, identified by CESI and numbered A8034829 No. 1, is annexed to this document.

Only for laboratory requirement, in order to reproduce the test conditions, all the laboratory data are contained in the document marked: ---

The measurement uncertainties of the test results reported in this document comply with the following limits:

**voltage :  $\pm 5$  % ; current :  $\pm 5$  % ; time :  $\pm 5$  %**

The measurement uncertainties are estimated at the level of twice the standard deviation (corresponding, in the case of normal distribution, to a confidence level of about 95 %) and have to be considered as maximum estimated values referred to that type of measurement.

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**Laboratory information**

**Receipt date of the sample**                      October 3, 2008

**Test location**    CESI – Via Rubattino 54 – Milan

**Test laboratory**    P102/MP1

**Activity code**    AE08LAP014

**Rated characteristics of the tested object assigned by the Client**

| <b>Pin-Post Type Porcelain insulator</b>  |                                  |
|---|----------------------------------|
| Manufacturer                              | <b>FINE ART CERAMIC Co., Ltd</b> |
| ANSI Type                                 | 56/57-4                          |
| Drawing No.                               | FAC-015                          |
| Leakage distance, minimum                 | 953 mm                           |
| Protected Leakage distance, minimum       | 483 mm                           |
| Cantilever strength                       | 12,5 kN                          |
| Cantilever proof load                     | 5 kN                             |
| Low – frequency dry flashover             | 140 kN                           |
| Low – frequency wet flashover             | 95 kN                            |
| Critical – impulse flashover, positive    | 225 kV                           |
| Critical – impulse flashover, negative    | 300 kV                           |
| Low-frequency test voltage, rms to ground | 44 kV                            |
| Maximum RIV at 1,000 kHz, radio freed     | 200 $\mu$ V                      |
| Colour of insulator glazed                | Brown                            |
| Puncture proof                            | Yes                              |

Name and signature of Client's witness / \_\_\_\_\_

**Power arc tests****Test arrangements and test procedure**

The test arrangement was as shown in the next page (Test arrangement D8001).

The power arc test was carried out in three-phase with three specimens simultaneously.

The line conductors were replaced by three covered iron tube 50 mm in diameter and 2,8 meter long.

The power supply calibrated before the test was applied to one terminals of the line conductors.

The supply frequency was 50 Hz.

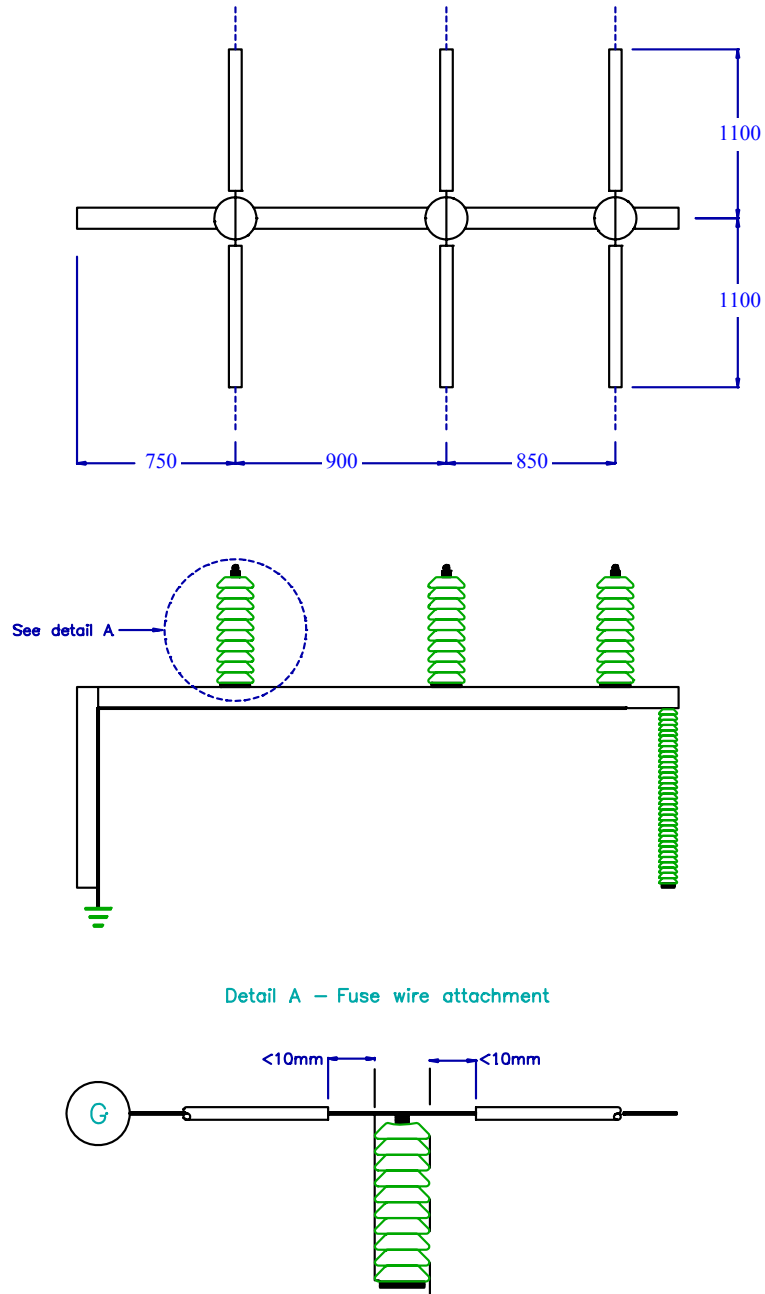
The arc were initiated by means of a copper wire 0,5 mm in diameter connected between the line conductors and the base of the insulators.

The concrete crossarm was replaced by a steel channel.

Two test were performed : the first with a current of  $3 \text{ kA} \pm 10\%$  for 0,79s and the second with  $10 \text{ kA} \pm 10\%$  for 0,40s.

The specimens were changed after the first test.

D8001 - Test arrangement



- The initiation of the power arc was obtained by means of a copper wire 0,5 mm in diameter.
- The line conductors were covered (See photos No.3 to 4).

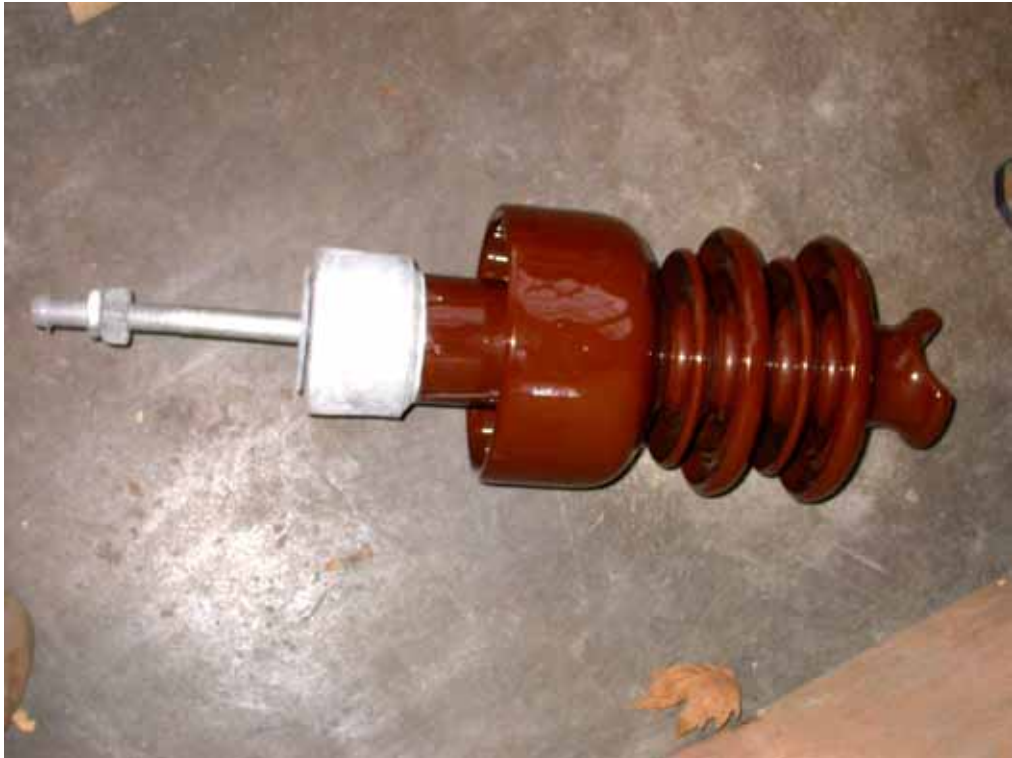


Photo no. 1



Photo no. 2



Photo no. 3



Photo no. 4

**Three-phase power arc tests with 3 kA at 15,6 kV****Test circuit :** See D0045      Power factor : 0,06      Frequency : 50 Hz**Test arrangement :** See D8001 and photo No.2 to 4

| Prospective test current |        |           |            |
|--------------------------|--------|-----------|------------|
| Oscillogram<br>A8034145  |        | rms value | Peak value |
| No.                      | Sheets | A         | A          |
| 1                        | 1      | 3077      | 7896       |

Condition of the apparatus before the tests: new as supplied by the Client

Date: November 24, 2008

| Test<br>No. | Oscillogram<br>A8034145 |        | Insulators<br>under test<br>No. | Duration<br>s | Phase-to-earth<br>no-load applied voltage<br>V | Test current         |             |                      | Notes<br>No. |              |
|-------------|-------------------------|--------|---------------------------------|---------------|--|----------------------|-------------|----------------------|--------------|--------------|
|             | No.                     | Sheets |                                 |               |  | Maximum peak<br>A    | Phase       | rms value<br>A       |              | Average<br>A |
| 1           | 2                       | 1      | 1<br>2<br>3                     | 0,79          | 9039   | 5879<br>7533<br>6187 | R<br>S<br>T | 2893<br>3045<br>2852 | 2930         | -            |
|             |                         |        |                                 |               |  |                      |             |                      |              |              |

Condition of the apparatus after the tests: no partial shed breakage on any insulators ( see photo from 5 to 10)

**Three-phase power arc tests with 10 kA at 4,3 kV****Test circuit :** See D0045      Power factor : 0,09      Frequency : 50 Hz**Test arrangement :** See D8001 and photo No.3 to 4

| Prospective test current |        |           |            |
|--------------------------|--------|-----------|------------|
| Oscillogram<br>A8034145  |        | rms value | Peak value |
| No.                      | Sheets | A         | A          |
| 3                        | 1      | 10640     | 28500      |

Condition of the apparatus before the tests: New

Date: November 25, 2008

| Test<br>No. | Oscillogram<br>A8034145 |        | Insulators<br>under test<br>No. | Duration<br>s | Phase-to-earth<br>no-load applied voltage<br>V | Test current            |             |                      | Notes<br>No. |              |
|-------------|-------------------------|--------|---------------------------------|---------------|--|-------------------------|-------------|----------------------|--------------|--------------|
|             | No.                     | Sheets |                                 |               |  | Maximum peak<br>A       | Phase       | rms value<br>A       |              | Average<br>A |
| 2           | 4                       | 1      | 4<br>5<br>6                     | 0,4           | 2447   | 18070<br>21010<br>16860 | R<br>S<br>T | 9732<br>9810<br>9433 | 9658         | -            |
|             |                         |        |                                 |               |  |                         |             |                      |              |              |

Condition of the apparatus after the tests: : no partial shed breakage on any insulators ( see photo from 11 to 16)



Photo no. 5



Photo no. 6



Photo no. 7



Photo no. 8



Photo no. 9



Photo no. 10



Photo no. 11



Photo no. 12



Photo no. 13



Photo no. 14

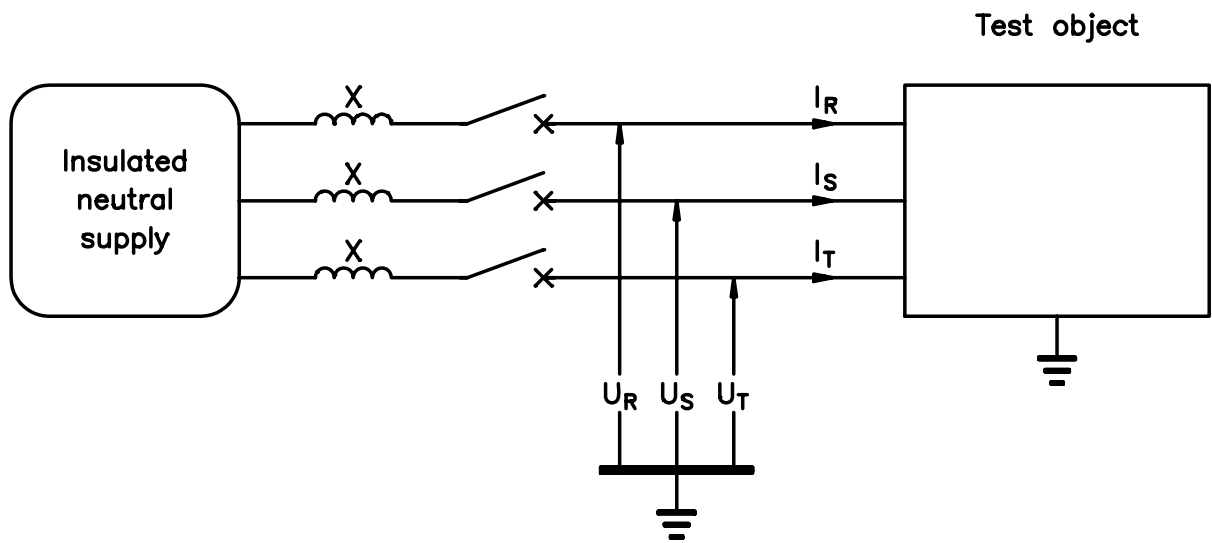


Photo no. 15



Photo no. 16

Test circuit D0045



Symbols used in this diagram are the same as those on the oscillograms.



## Laboratory information

Test laboratory: P102 / MP1  
 CESI testing team: A. Garanzini  
 G. Avona  
 P. Siracusa

Date: November 24 and 25, 2008

### Characteristics of supply circuit

| Tests |    | Supply         | OTE MV |          | OTE LV |          |
|-------|----|----------------|--------|----------|--------|----------|
| from  | to |                | K      | position | K      | position |
| T1    | 1  | 23 kV Lambrate | 1,467  | -        |        |          |
| T2    | 2  | “              | 5,4    | -        |        |          |
|       |    |                |        |          |        |          |

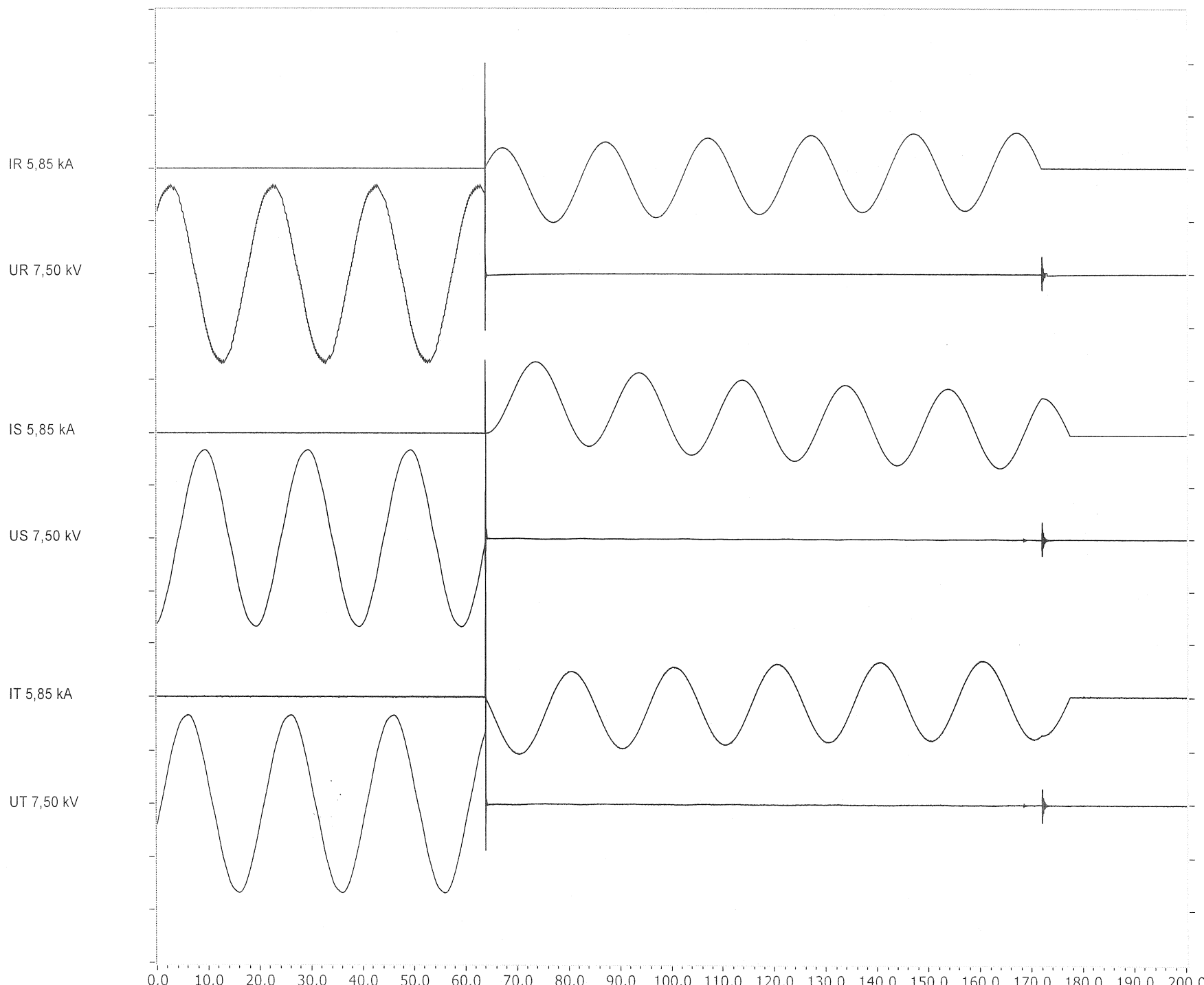
### Characteristics of measuring system

| Measure | Transducer |          | National Instrument |         | Krenz channel No. |
|---------|------------|----------|---------------------|---------|-------------------|
|         | ref.       | position | SCXI No.            | PXI No. |                   |
| Ir      | C1+C4      |          | 1                   | 1       |                   |
| Ur      | N1+N2      |          | 2                   | 2       |                   |
| Is      | C2+C4      |          | 3                   | 3       |                   |
| Us      | N3+N4      |          | 4                   | 4       |                   |
| It      | C3+C4      |          | 5                   | 5       |                   |
| Ut      | N5+N6      |          | 6                   | 6       |                   |
|         |            |          |                     |         |                   |
|         |            |          |                     |         |                   |
|         |            |          |                     |         |                   |
|         |            |          |                     |         |                   |

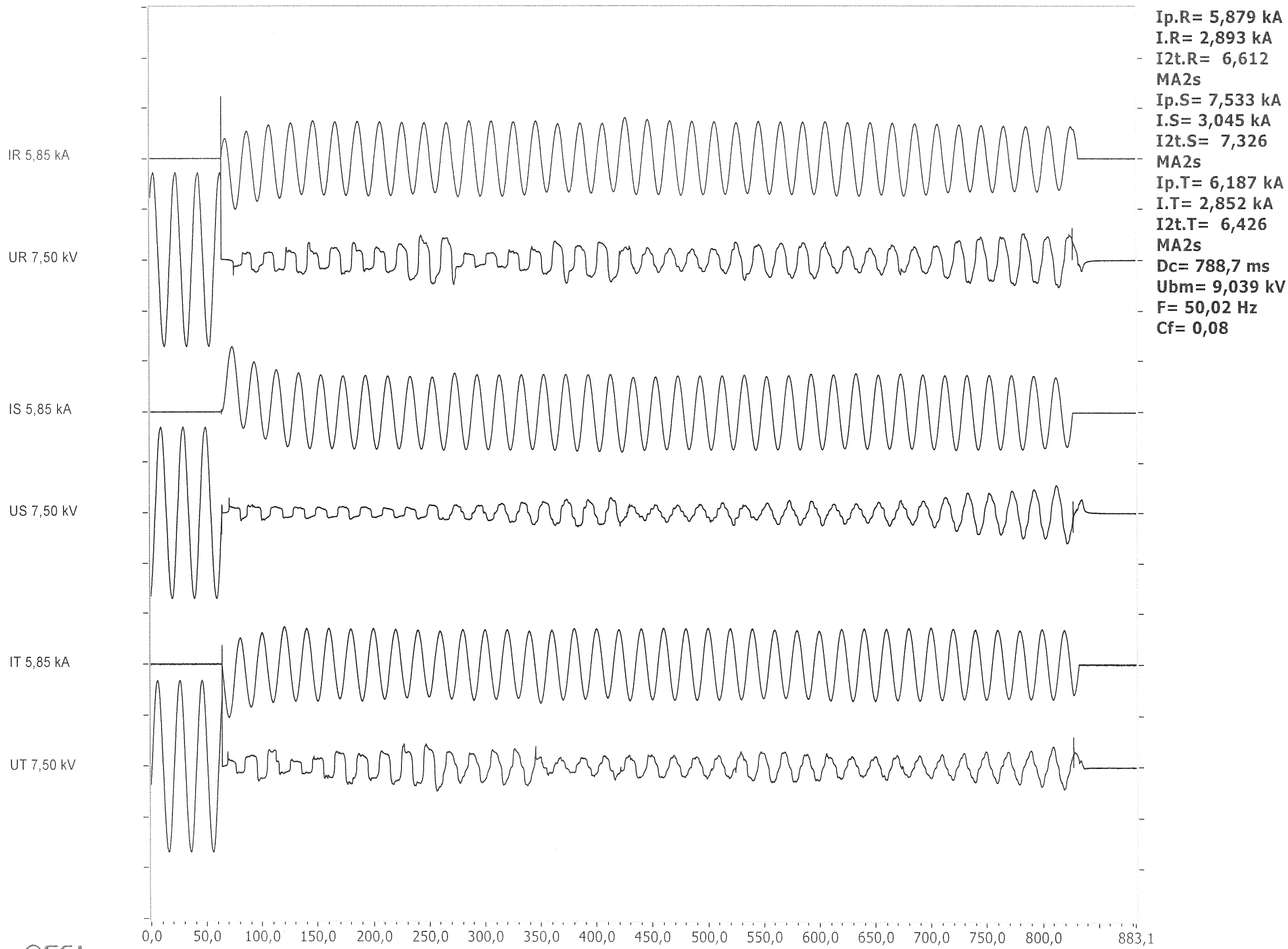
Symbols assigned in “ref.” column refer to the measuring equipment listed in page “Laboratory P102 – MP1. Measuring system characteristics.”

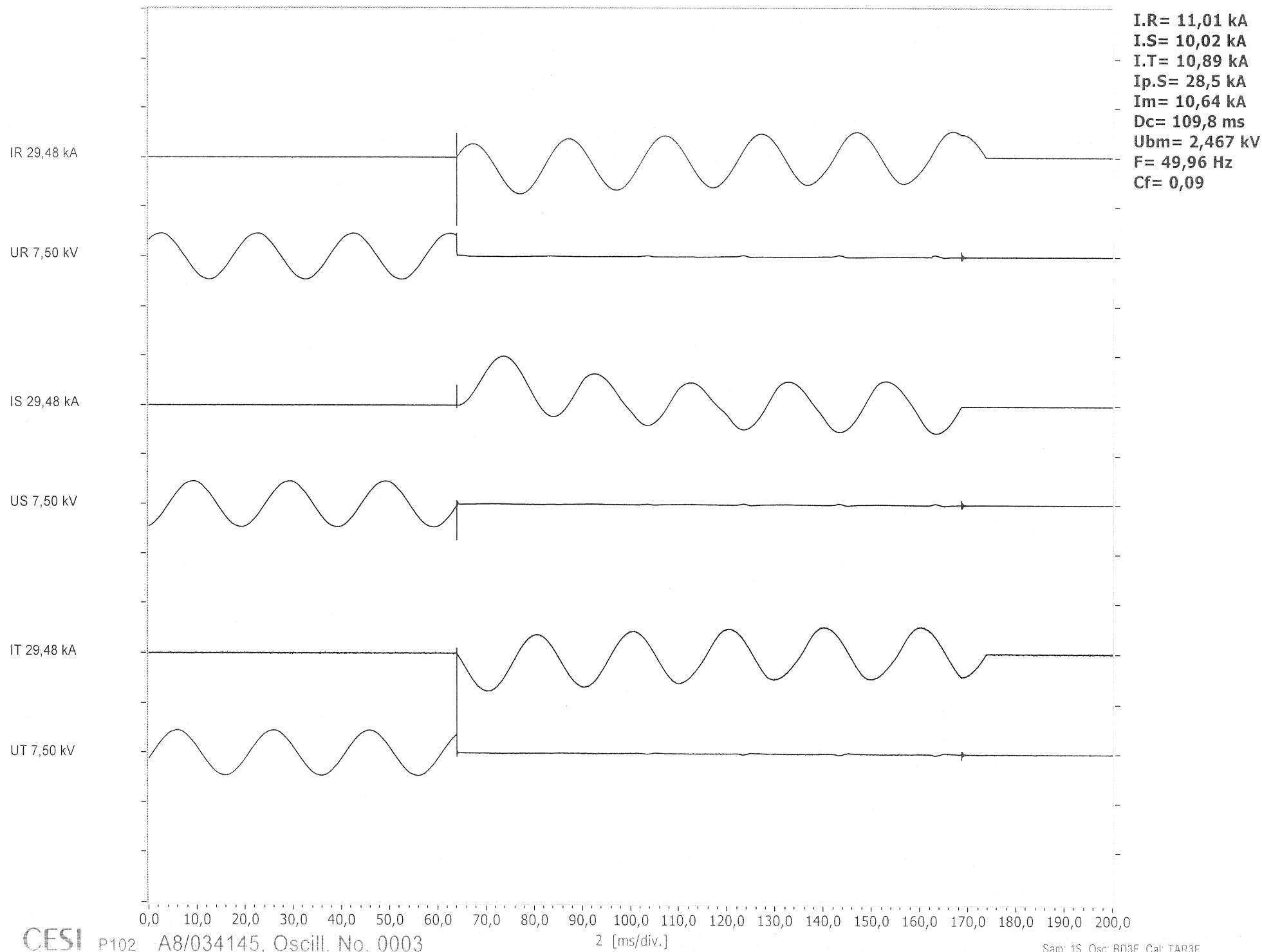
Other measuring equipment: /  
 Ohmmeter CESI number: /

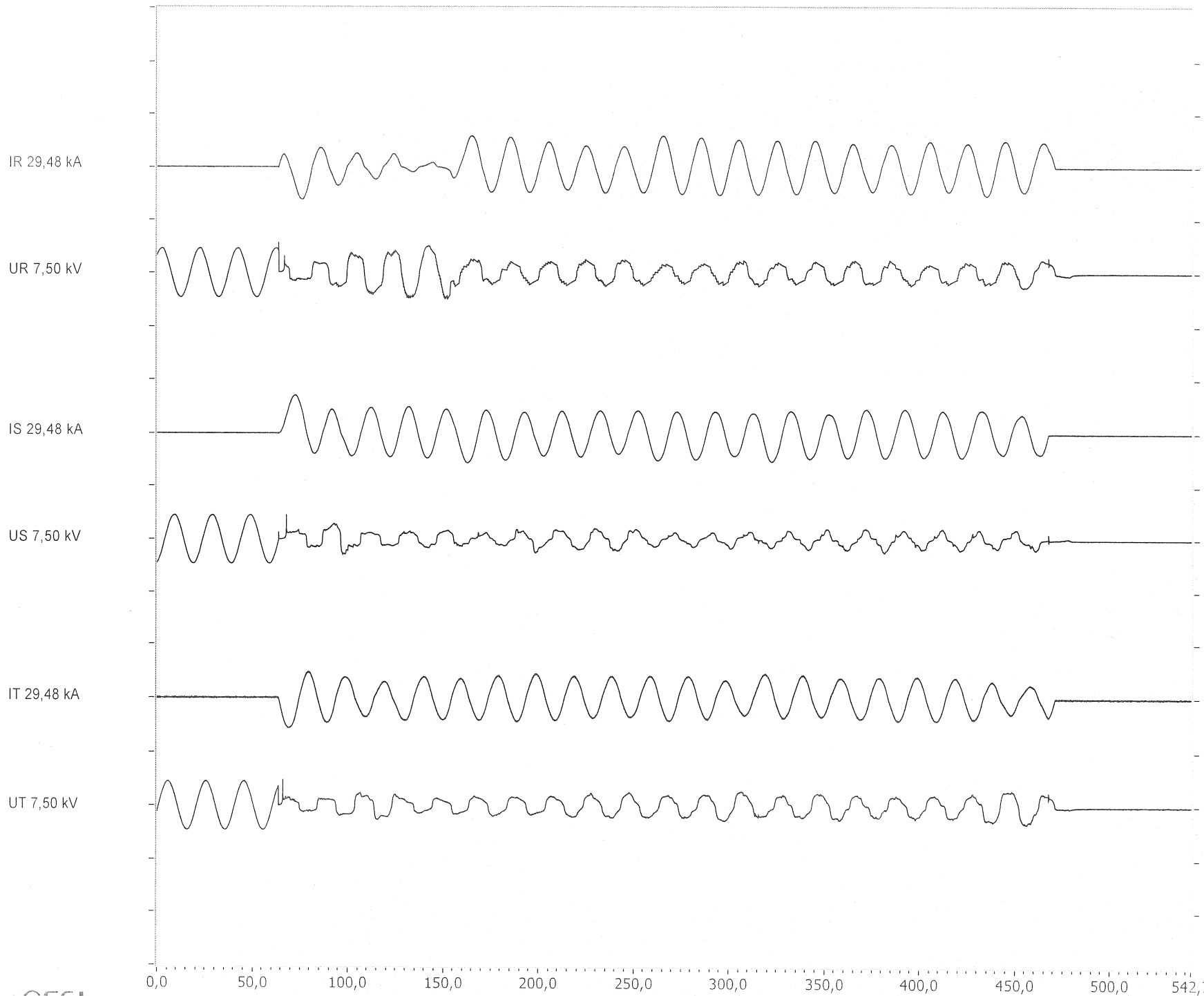




**I.R= 3,079 kA**  
**I.S= 3,051 kA**  
**I.T= 3,1 kA**  
**Ip.S= 7,869 kA**  
**Im= 3,077 kA**  
**Dc= 113,2 ms**  
**Ubm= 8,925 kV**  
**F= 49,95 Hz**  
**Cf= 0,06**



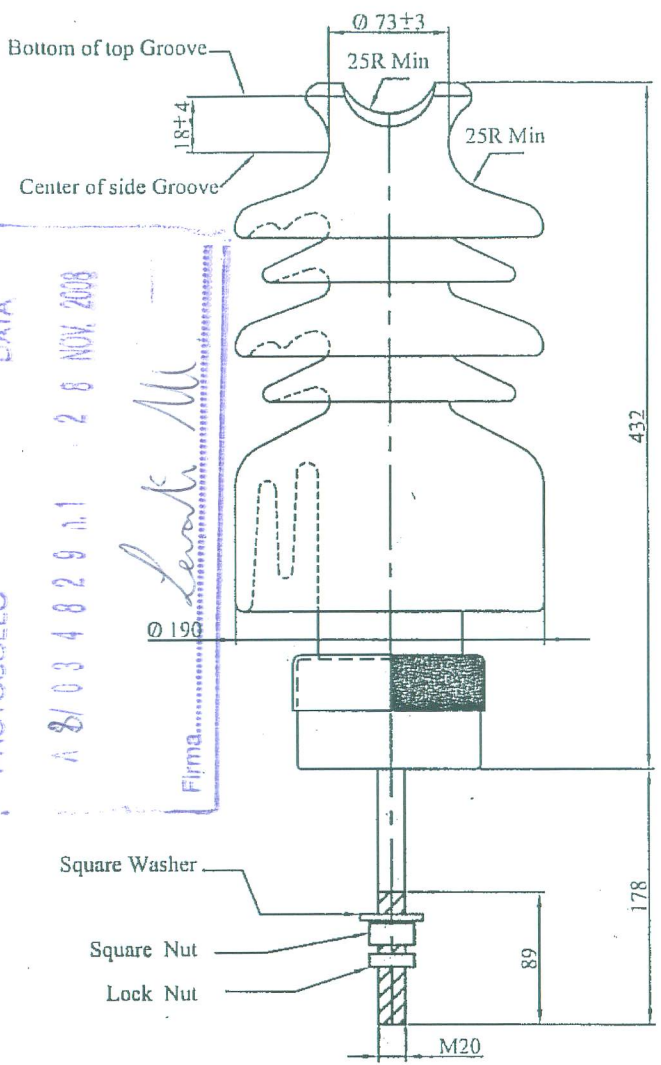




**Ip.R= 18,07 kA**  
**I.R= 9,732 kA**  
**I2t.R= 36,2 MA2s**  
**Ip.S= 21,01 kA**  
**I.S= 9,81 kA**  
**I2t.S= 32,03 MA2s**  
**Ip.T= 16,86 kA**  
**I.T= 9,433 kA**  
**I2t.T= 33,62 MA2s**  
**Dc= 407,2 ms**  
**Ubm= 2,447 kV**  
**F= 50,01 Hz**

COPY#8

CESI  
 PROTOCOLLO DATA  
 A 8/084829 n.1 28 NOV. 2008  
 Firma: *Levati M*



|  |         |
|--|---------|
| Leakage distance , mm                                    | 953     |
| Protected Leakage distance ( mm)                         | 483     |
| Cantilever strength , kN                                 | 12.5    |
| Cantilever proof load , kN                               | 5       |
| Low - frequency dry flashover , kilovolts                | 140     |
| Low - frequency wet flashover , kilovolts                | 95      |
| Critical - impulse flashover , positive , kilovolts      | 225     |
| Critical - impulse flashover , negative , kilovolts      | 300     |
| Low - frequency test voltage , rms to ground , kilovolts | 44      |
| Maximum RIV at 1,000 kHz , microvolts                    | 200     |
| Puncture proof   | Yes     |
| Colour of insulator glazed                               | - Brown |

|   |              |      |                           |                             |                               |
|---|--------------|------|---------------------------|-----------------------------|-------------------------------|
| INSULATOR , PIN - POST TYPE ACCORDING TO TIS. 1251 , TYPE 56 / 57 - 4 |              |      |                           | CATALOGUE NO. PP - 574      |                               |
| UNIT: mm.   | SCALE : NTS. | REV: | DRAWN: <i>[Signature]</i> | CHECKED: <i>[Signature]</i> | APPROVED : <i>[Signature]</i> |
| FINE ART CERAMIC CO.,LTD  |              |      |                           | DATE: 25 / 9 / 2007         | DRAWING NO. FAC - 015         |