KEMA Labs

TYPE TEST CERTIFICATE OF COMPLETE TYPE TEST

Certificate No.
C4015507
Revision 0

Test Object Polymer-housed metal-oxide surge arresters

Designation YH10W **Serial No.**

Rated voltage 3 kV to 51 kV; Arrester class Distribution DH; Rated frequency 50/60 Hz

Manufacturer Nanyang Jinniu Electric Co., Ltd Industry park of Tongbay, Nanyang city, Henan province, China 474750

Production Location See manufacturer address above

Client Nanyang Jinniu Electric Co., Ltd Industry park of Tongbay, Nanyang city, Henan province, China 474750

Date(s) of tests From November 14, 2022 to November 29 2024

Tested by CESI S.p.A. ("KEMA Labs"),
Via Rubattino, 54
20134 Milano – Italy

The test object, constructed in accordance with the description, drawings and photographs incorporated in the documents forming part of this Certificate, has been subjected to the series of proving tests in accordance with:

IEC 60099-4 (2014-06), subclause 10.8
This Certificate has been issued following exclusively the STL Guides and Procedures.

The results are shown in the record of proving tests reported in detail in chapter 2 of this document and the oscillograms (if any) attached hereto.
The values obtained and the general performance are considered to comply with the above standard(s) and to justify the ratings assigned by the manufacturer as listed in chapter 1.
This Certificate applies only to the individual object tested. KEMA Labs makes no representations or warranties with respect to any device other than the object tested. It is the responsibility of the applicable device manufacturer to ensure that any other devices or units having the same name and descriptions as the test object are identical.

This certificate comprises 07 Pages in total

Issued by **CESI S.p.A.**

Bertani Alessandro
C4015507 5000 APP
Director,
High Voltage Labs

Milan, January 17, 2025

Digitally signed by Nguyen Huu thuy
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INFORMATION SHEET

The type of documents presented below can be issued by test laboratories which are part of KEMA Labs.
Details of these and all other types of certificates and reports issued by KEMA Labs are given on the website, which can be accessed through the QR code on the front sheet. The title on the front sheet of the document indicates which type of document is under review. All documents comprise a record of the (type) tests carried out. Mandatory requirements for items 1, 2, 3, 4 and 5 are that the object tested is clearly identified and verified by technical description, drawings and/or additional specifications. The condition of the object after testing is assessed and recorded, if applicable.

1 Certificate

A Certificate is issued when the object tested has fulfilled the requirements of (the named (sub)clauses of) a recognized standard. The relevant ratings assigned by the manufacturer are endorsed by KEMA Labs. All relevant test results and observations are given in the records of proving tests (items 3, 4, 5 and 6) which form the basis of a Certificate and are referred to in this Certificate.

2 Calibration Certificate

A Calibration Certificate is issued when a calibration program has been successfully executed. The calibration program refers to an accredited calibration procedure that is according to recognized standards, manufacturer's specifications or validated internal methods.

3 Type Test Report

A Type Test Report is issued for products in the segments of low voltage, railway applications, automotive, metering and protection & substation automation when the object tested has successfully passed the requested type tests (of the named (sub)clauses) in accordance with a recognized standard. The tests required in these (sub)clauses could cover a complete or partial set of type tests.
The sentence on the front sheet of a Type Test Report will state that the tests have been carried out in accordance with ..... The object has complied with the relevant requirements of the standard and justify the relevant ratings assigned by the manufacturer as listed in chapter 1.

4 Design Verification Report

A Design Verification Report is issued when the object tested has successfully passed the requested design verification tests of the named (sub)clauses in accordance with IEC 61439. The tests series required in these (sub)clauses could cover a complete or selected set of design verification tests.
The sentence on the front sheet of a Design Verification Report will state that the tests have been carried out in accordance with IEC 61439. The object has complied with the relevant requirements of the standard and justify the relevant ratings assigned by the manufacturer as listed in chapter 1.

5 Report of Performance or Type Test Report

A Report of Performance or Type Test Report is issued for products in the segments of MV and HV transmission and distribution when the object tested has successfully passed the requested (type) tests of the named (sub)clauses in accordance with a recognized standard. The tests required in these (sub)clauses could cover a complete or partial set of (type) tests.
The sentence on the front sheet of a Report of Performance or Type Test Report will state that the tests have been carried out in accordance with ..... The object has complied with the relevant requirements of the standard.
However, a Report of Performance or Type Test Report does not confirm any assigned rating.

6 Test Report

A Test Report is issued in all other cases.

7 Identification of official test documents

The official test documents of KEMA Labs are issued in digital form through .pdf files. Only integral reproduction of this document is permitted without written permission from KEMA Labs. A sealed and bound version of the test document may be available for the convenience of the client and has the status 'for information only'. The copyright must be respected.
Items 1 and 2 are identified by a gold watermark and a gold seal with red ribbon on its front sheet. Items 3, 4 and 5 are identified by a silver watermark and a silver seal with green ribbon on its front sheet. Item 6 is identified by a blue watermark on its front sheet.

8 Disclaimers

No certificate or other report issued by KEMA Labs for the purpose of confirming the performance of a test object in relation to the testing requirements of a national or international standard, or in relation to any other testing specification, shall constitute a warranty as to the adequacy or quality of the design or construction of the test object. No other document issued by KEMA Labs for the purpose of reporting, explaining or describing any engineering or consulting services performed by KEMA Labs shall constitute a warranty as to the adequacy or quality of the design or construction of any apparatus or system that is the subject of the document. Information provided by the client or manufacturer can affect the validity of results. KEMA Labs is not responsible for the consequences in such cases.

REVISION OVERVIEW

The edition with the highest revision number always replaces the earlier issued editions.

Rev.No	Date of issue	Page no. and changes
0	January 17, 2025	First issue

1 IDENTIFICATION OF THE OBJECT

1.1 Ratings/characteristics proven by tests

Polymer-housed metal-oxide surge arresters	
Type / Designation	YH10W
Rated voltage - U_r	3 kV to 51 kV (see details in table at page 5)
Continuous operating voltage - U_c	2,4 kV to 40,8 kV (see details in table at page 5)
Rated frequency	50/60 Hz
Arrester classification	Distribution DH
Nominal discharge current – I_n	10 kA
Repetitive charge transfer rating – Q_{rs}	0,4 C
Thermal CHARGE rating - Q_{th}	1,1 C
Rated short current - Is	31,5 kA
- Design	B
Specified short –term load- SSL	220 Nm
Specified long-term load - SLL	100 Nm
Terminal torque	20 Nm
Power frequency voltage versus time curve with prior duty	
- for 0,1 s	1,200 U_r
- for 1,1 s	1,050 U_r
- for 10,1 s	1,000 U_r
- for 1000 s	0,950 U_r
Power frequency voltage versus time curve without prior duty	
- for 0,1 s	1,220 U_r
- for 1000 s	0,980 U_r
Min. reference voltage at the reference current of 1 mA	3,0 kV to 51,0 kV (see details in table at page
Maximum residual voltage at I_n = 10 kA	8,8 kV to 149,6 kV (see details in table at page 5)

1.2 Description of the object tested

Polymer-housed metal-oxide surge arresters. Here below a list of the size of the tested objects:

Surge arrester type	Rated voltage [kV]	Continuous operating voltage [kV]	Minimum reference voltage at the reference current of 1,0 mA [kV]	Maximum residual voltage at In = 10 kA [kV]	N. of MO resistors fitted: type D36,5x20	Outline drawing (see document C4015547)
YH10W-3	3	2,4	3	8,8	1	C4015547- 1
YH10W-6	6	4,8	6	17,6	2	C4015547- 2
YH10W-9	9	7,2	9	26,4	3	C4015547- 3
YH10W-10	10	8	10	29,3	3	C4015547- 4
YH10W-11	11	8,8	11	32,3	4	C4015547- 5
YH10W-12	12	9,6	12	35,2	4	C4015547- 6
YH10W-15	15	12	15	44	5	C4015547- 7
YH10W-17.5	17,5	14	17,5	51,3	6	C4015547- 8
YH10W-18	18	14,4	18	52,8	6	C4015547- 9
YH10W-21	21	16,8	21	61,6	7	C4015547- 10
YH10W-24	24	19,2	24	70,4	8	C4015547- 11
YH10W-27	27	21,6	27	79,2	9	C4015547- 12
YH10W-30	30	24	30	88	10	C4015547- 13
YH10W-33	33	26,4	33	96,8	11	C4015547- 14
YH10W-36	36	28,8	36	105,6	12	C4015547- 15
YH10W-39	39	31,2	39	114,4	13	C4015547- 16
YH10W-42	42	33,6	42	123,2	14	C4015547- 17
YH10W-45	45	36	45	132	15	C4015547- 18

YH10W-48	48	38,4	48	140,8	16	C4015547- 19
YH10W-51	51	40,8	51	149,6	17	C4015547- 20

1.3 List of drawings

The manufacturer has guaranteed that the object submitted for tests has been manufactured in accordance with the following drawings and/or documents, supplied by them. KEMA Labs has verified that these drawings and/or documents adequately represent the object tested. The manufacturer is responsible for the correctness of these drawings and/or documents and the technical data presented. KEMA Labs makes no representations or warranties regarding the accuracy of the drawings or that the drawings meet any applicable industry standards or legal or regulatory requirements.

The table here below specifies details of the ratings of the surge arresters belonging to the homogeneous series arresters type YH10W as proved by the type tests

The following drawings have been annexed to the relevant reports:

Drawing JNDQ.MO3620 (MO resistor drawing)	C3008047
Drawing JN-DH3.RMX (Long term stability test) section	C3008329
Drawing JN-DH6.49187 (Sections in thermal model) for TOV test	C3008323-2
Drawing JN- DHBL.49187 (Sections in thermal model) for Operating duty test	C3008109-2
Drawing JN- DH51.49427.RMX (Sections in thermal model) 51kV Arrester with thermal sensor	C3008356
Drawing JN-DH51.49427 (Cross sectional) 51 kV Surge arrester drawing	C3008071

2 RECORDS OF PROVING TESTS

This Certificate is issued based on the following records of proving tests, demonstrating the conformity of the apparatus to the standard(s) mentioned on the front sheet. These following documents form an integral part of this Certificate.

Description	**Revision**
FGH TTR H24026	00
CESI TTR C4017166	00
CESI TTR C2016889	00
CESI TTR C2016356	00
CESI TTR C2016357	00
CESI TTR C2017219	00
CESI TTR C2017220	00
CESI TTR C2016984	00
CESI TTR C2017565	00
CESI TTR C2016265	00
CESI TTR C3008043	00
CESI TTR C2016352	00

3 TESTS CARRIED OUT

A brief description of all the tests carried out is given in the tables below.

No. Standard and clause	Description of tests	Reference documents
IEC 60099-4 Sub-clause 10.8.2	Insulation withstand test	C4017166
IEC 60099-4 Sub-clause 10.8.3	Residual voltage tests	C2016889
IEC 60099-4 Sub-clause 10.8.4	Test to verify long term stability under continuous operating voltage	C2016356
IEC 60099-4 Sub-clause 10.8.5	Test to verify the repetitive charge transfer rating, Qrs	C2016357
IEC 60099-4 Sub-clause 10.8.6	Heat dissipation behaviour of test sample	C2017219 C2017220
IEC 60099-4 Sub-clause 10.8.7	Operating duty test	C2016984
IEC 60099-4 Sub-clause 10.8.8	Power frequency voltage-versus-time test	C2017565
IEC 60099-4 Sub-clause 10.8.10	Short circuit test	C2016265
IEC 60099-4 Sub-clause 10.8.11	Test of the bending moment	C2016352
IEC 60099-4 Sub-clause 10.8.17.2	Salt fog test	H24026
IEC 60099-4 Sub-clause 10.8.17.3	UV light test	C3008043

4 ADDITIONAL TYPE TESTS

Not applicable.

5 ADDITIONAL REFERENCES

CESI Report C4015515

The Report C4015515 specifies the criteria, adopted for the selection of the test samples and for the calculation of the test parameters, in such a way that a type test carried out on one test specimen can cover at the same time all the surge arresters of the homogeneous.

END OF DOCUMENT

The laboratories of KEMA Labs are:

- CESI S.p.A., Milan, Italy.
- FGH Engineering & Test GmbH, Mannheim, Germany.
- IPH Institut "Prüffeld für elektrische Hochleistungstechnik" GmbH, Berlin, Germany.
- KEMA B.V., Arnhem, The Netherlands.
- KEMA Labs, Zkušebnictví, a.s., Prague, the Czech Republic.
- KEMA-Powertest, LLC, Chalfont, United States.

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TESTING
CNAS L1020

实验室名称：国家电器产品质量监督检验中心
Lab Name: China National Center for Quality Supervision and Test of Electrical Apparatus Products

№ 21P0528-S

检验（试验）报告
Test Report

委托单位：NanYang JinNiu Electric Co., Ltd.
Client:

产品名称：Disconnector
Name of Product:

产品型号：TBL-II
Product Type:

检验类别：Commission test
Test Category:

本实验室对出具的检验（试验）结果负责，未经实验室书面同意，不得部分地复制本报告。

The laboratory is responsible for the inspection (Test) results. The report shall not be reproduced except in full, written approval of the laboratory.

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL-II Disconnector

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	Blank below	

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL-II Disconnector

General

Test category	Commission test
Type and name of specimens	TBL-II Disconnector
Client	NanYang JinNiu Electric Co., Ltd.
Address	South of Zhongyuan Road, Industrial Cluster Zone, Tongbai County, Nanyang, Henan, China
Manufacturer	NanYang JinNiu Electric Co., Ltd.
Address	South of Zhongyuan Road, Industrial Cluster Zone, Tongbai County, Nanyang, Henan, China
Manufacturing date and serial number	/

Main technical parameters of the specimens	
Repetitive charge Q_{rs} C	0.6
Thermal charge transfer rating Q_{th} C	1.1
Bending breaking load N	≥150
Tensile breaking load N	≥500
Torsional breaking load N·m	≥30
4/10μs high current impulse kA	100

Technical data from client	TBL-II Disconnector Test commission form
Description	

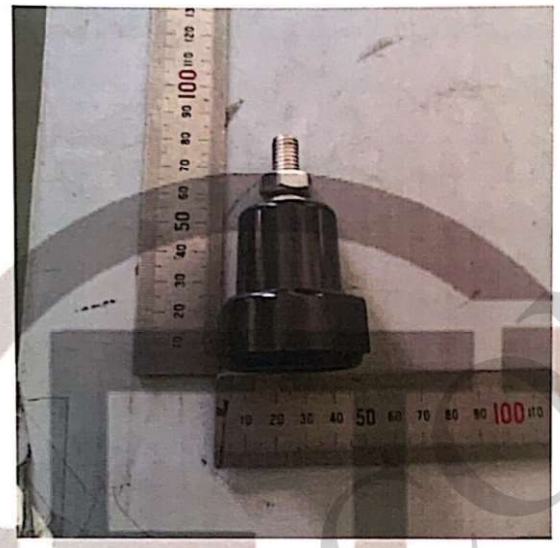
Representative of client: Zhang Yu

Date of specimens receiving: Jul. 29th, 2021

Test period: from Aug. 6th, 2021 to Aug. 11th, 2021

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL- II Disconnector

Photos of the specimens



China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL-II Disconnector

Test conclusion

Client	NanYang JinNiu Electric Co., Ltd.	
Type of specimens	TBL-II	
Name of specimens	Disconnector	
Manufacturer	NanYang JinNiu Electric Co., Ltd.	
Test items and results	Disconnector tests	
	Test to verify the repetitive charge transfer rating [Q_{rs}=0.6C, 20times]	PASS
	Operating duty test [Q_{th}=1.1C]	PASS
	Time versus current test	PASS
	Mechanical tests [Bending load≥150N; Tensile load≥500N; Torsional load≥30N·m]	PASS
	Temperature cycling test and seal pumping test	PASS
Test standard	IEC 60099-4:2014 Surge arresters –Part 4: Metal-oxide surge arresters without gaps for a.c. systems Clause 10.8.9	
Test conclusion	The tests are carried out on TBL-II Disconnector by NanYang JinNiu Electric Co., Ltd., and the test items meet the relevant clauses of above test standard and technical specifications, and the specimens have passed the tests. Note: the conclusion is valid only for the inspected and tested specimens.	

Compiled by: Proofread by: Checked by: Approved by:

Date: 2021-8-24 Date: 2021-8-26 Date: 2021-8-26 Date: 2021-8-26

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL-II Disconnector

Disconnector test Test to verify the repetitive charge transfer rating

Test date: 2021-08-06/2021-08-10

1. Test requirements

No. of the specimens		21P0528-S-C01	21P0528-S-C02	21P0528-S-C03	Standard value
Resistance before test (MΩ)		25.61	38.96	19.78	/
Repetitive charge value (C)	1	0.67	0.66	0.66	0.66
	2	0.66	0.66	0.67	
	3	0.66	0.67	0.66	
	4	0.67	0.67	0.66	
	5	0.67	0.66	0.67	
	6	0.66	0.66	0.66	
	7	0.66	0.66	0.66	
	8	0.66	0.66	0.66	
	9	0.66	0.67	0.66	
	10	0.66	0.66	0.67	
	11	0.66	0.66	0.66	
	12	0.67	0.66	0.66	
	13	0.66	0.66	0.66	
	14	0.66	0.67	0.66	
	15	0.66	0.66	0.66	
	16	0.67	0.66	0.67	
	17	0.66	0.67	0.66	
	18	0.66	0.66	0.66	
	19	0.66	0.66	0.67	
	20	0.66	0.66	0.66	
Resistance after test (MΩ)		25.69	39.25	19.95	/
Variation ratio (%)		0.31	0.74	0.86	≤20
Test results		No flashover or operation	No flashover or operation	No flashover or operation	No flashover or operation

The disconnectors can work at current of 20 A after the test, and meet the standard specified and the test is passed.
Note: Specimens 21P0528-S-C01~C03 are disconnectors.

Atmosphere condition of test zone	P= 100.3kPa/101.4kPa; Environmental temperature t=27.1℃/27.5℃; Relative humidity: 50%/59% Atmosphere correction factor Kt=/ Height correction factor Ka= /

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL-II Disconnector

Disconnector test Operating duty test

Test date: 2021-08-06

No. of the specimens			21P0528-S-C04	21P0528-S-C05	21P0528-S-C06
Test resistance value before the test (MΩ)			23.78	28.98	17.89
U_r^* (kV)			3.0	3.0	3.0
U_c^* (kV)			2.4	2.4	2.4
4/10μs high current impulse withstand	The first current(kA)		95.42	94.62	95.47
Preheat to 60℃, twice 8/20μs Lightning impulse					
Thermal charge transfer rating within 1min Q_{th}	Rating (1.1C)	1	0.58	0.58	0.58
		2	0.58	0.58	0.58
Close the power-frequency source within 100ms (Actual time is 59ms)					
Application of U_r^* (kV)			3.02	3.02	3.03
Duration (s)			10	10	10
Application of U_c^* (kV)			2.40	2.41	2.41
Duration (min)			30	30	30
Power dissipation value at U_{c^*} (W)	The first minute		0.52	0.48	0.45
	The fifteenth minute		0.32	0.30	0.28
	The thirtieth minute		0.29	0.26	0.26
Visual examination of test specimens			Intact	Intact	Intact
Test resistance value after the test (MΩ)			23.56	29.23	18.11
Variation ratio (%): ≤5			0.93	0.86	1.23
The specimens should be no evidence of puncture, flashover or cracking			No evidence of puncture, flashover or cracking	No evidence of puncture, flashover or cracking	No evidence of puncture, flashover or cracking

The disconnectors can work at current of 20 A after the test, and meet the standard specified and the test is passed.

Note: Specimens 21P0528-S-C04~C06 are disconnectors.

Atmosphere condition of test zone	P= 100.3kPa; Environmental temperature t=27.1℃; Relative humidity: 50% Atmosphere correction factor Kt=/ Height correction factor Ka= /

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL-II Disconnector

Disconnector test Time versus current test

Test date: 2021-08-09

No. of the specimens	Applied current (A)	Maximum disconnection duration of each five specimens (s)	Test results
21P0528-S-C07~C11	0.1±10%	29.6	Operation of disconnector occurs, and there shall be clear evidence and permanent disconnection.
21P0528-S-C12~C16	19.5±10%	5.27	
21P0528-S-C17~C21	26.5±10%	3.89	
21P0528-S-C22~C26	224±10%	0.094	
21P0528-S-C27~C31	800±10%	0.026	

Note: Time versus current characteristic curve refers to annex. Specimens 21P0528-S-C07~C31 are disconnectors.

Atmosphere condition of test zone	P= 101.3kPa; Environmental temperature t=28℃; Relative humidity: 54% Atmosphere correction factor Kt=/ Height correction factor Ka= /

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL-II Disconnector

Disconnector test Mechanical tests

Test date: 2021-08-05~2021-08-06

1. Test requirements

Bending moment test:

The test shall be made on five new specimens. On each specimen, the bending load shall be increased smoothly until breaking occurs within 30s to 90s. Bending breaking load≥150N.

Tensile load test:

The test shall be made on five new specimens. On each specimen, the tensile load shall be increased smoothly until breaking occurs within 30s to 90s. Tensile breaking load≥500N.

Torsional load test:

The test shall be made on five new specimens. On each specimen, the torsion load shall be increased smoothly until breaking occurs within 30s to 90s. Torsional breaking load≥30N·m.

2. Test results

Bending moment test

No. of the specimens	Time to specimens occur breakage(s)	Bending breaking load (≥150N)
21P0528-S-C32	63	2470
21P0528-S-C33	48	1543
21P0528-S-C34	35	1279
21P0528-S-C35	38	954
21P0528-S-C36	44	1279

Tensile load test

No. of the specimens	Time to specimens occur breakage(s)	Tensile breaking load (≥500N)
21P0528-S-C37	33	3443
21P0528-S-C38	47	3468
21P0528-S-C39	41	3191
21P0528-S-C40	50	3291
21P0528-S-C41	51	3493

Torsional load test

No. of the specimens	Time to specimens occur breakage(s)	Torsional breaking load (≥30N•m)
21P0528-S-C42	65	31.25
21P0528-S-C43	71	32.28
21P0528-S-C44	64	30.86
21P0528-S-C45	70	33.74
21P0528-S-C46	62	32.80

Note: Specimens 21P0528-S-C32~C46 are disconnectors.

Atmosphere condition of test zone	P= 100.5kPa/100.1kPa; Environmental temperature t=25.8℃/24.6℃; Relative humidity: 83%/66% Atmosphere correction factor Kt=/ Height correction factor Ka= /

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL- II Disconnector

Disconnector test Temperature cycling and seal pumping test

Test date: 2021-08-05~2021-08-10

1. Test requirements

Within 24 h after having reached ambient temperature the resistance or capacitance of the grading element of each specimen shall be measured and the specimens shall be opened for visual inspection. The disconnectors shall have passed the tests if no moisture is found within the test specimens upon visual examination of the internal parts and surfaces and if the resistance or capacitance of the grading element has not changed by more than 20 %.

2. Test results

	Required value		Result
Temperature cycling test	High temperature	40~70℃	50℃
	Duration	3h	3h
	Low temperature	-35~-50℃	-40℃
	Duration	3h	3h
	Temperature gradient change	1K/min	1K/min
	Cycles	10	10
Seal pumping test	High temperature	60±3℃	60℃
	Duration	≥60min	60min
	Temperature transfer time	≤5min	4
	Low temperature	4±3℃	4℃
	Duration	≥120min	120min
	Cycles	10	10

Note: Specimens 21P0528-S-C47~C56 are disconnectors.

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL-II Disconnector

Disconnector test Temperature cycling and seal pumping test (Continued)

Test date: 2021-08-05~2021-08-11

1. Test requirements

Within 24 h after having reached ambient temperature the resistance or capacitance of the grading element of each specimen shall be measured and the specimens shall be opened for visual inspection. The disconnectors shall have passed the tests if no moisture is found within the test specimens upon visual examination of the internal parts and surfaces and if the resistance or capacitance of the grading element has not changed by more than 20 %.

2. Test results

The verification after temperature cycling and seal pumping test

No. of the specimens	Resistance measurement of grading components			Whether moisture existed inside or not
	Before test (MΩ)	After test (MΩ)	Variation≤20%	
21P0528-S-C47	27.78	27.85	0.25	No
21P0528-S-C48	38.42	38.59	0.44	No
21P0528-S-C49	33.45	33.65	0.60	No
21P0528-S-C50	28.60	28.42	0.63	No
21P0528-S-C51	27.82	27.95	0.47	No
21P0528-S-C52	33.91	33.82	0.27	No
21P0528-S-C53	27.68	27.78	0.36	No
21P0528-S-C54	25.50	25.32	0.71	No
21P0528-S-C55	35.68	35.85	0.48	No
21P0528-S-C56	32.84	32.97	0.40	No

Meet the standard specified and the test is passed.

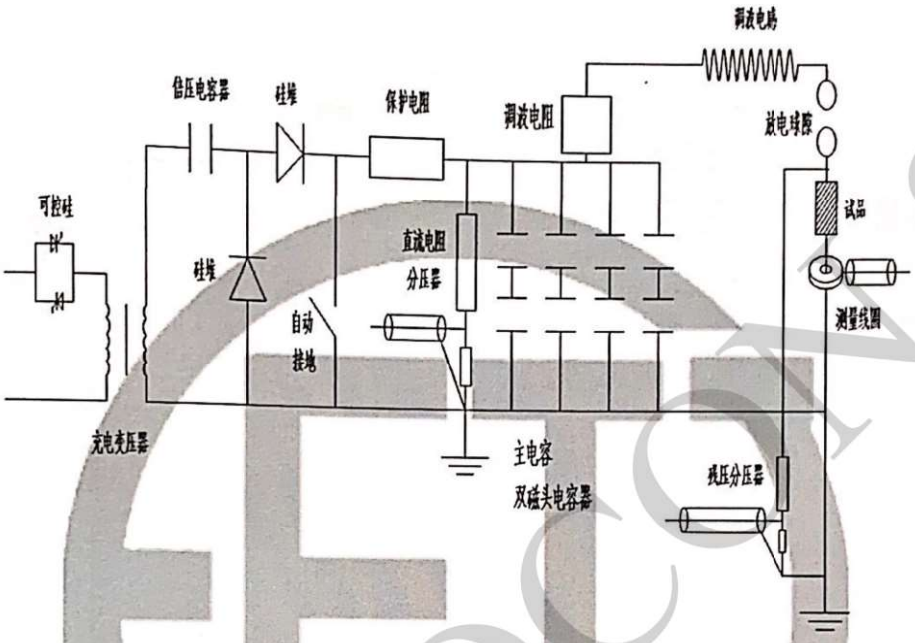
Note: Specimens 21P0528-S-C47~C56 are disconnectors.

China National Center for Quality Supervision and Test of Electrical Apparatus Products	Test Report	TBL-II Disconnector

Annex

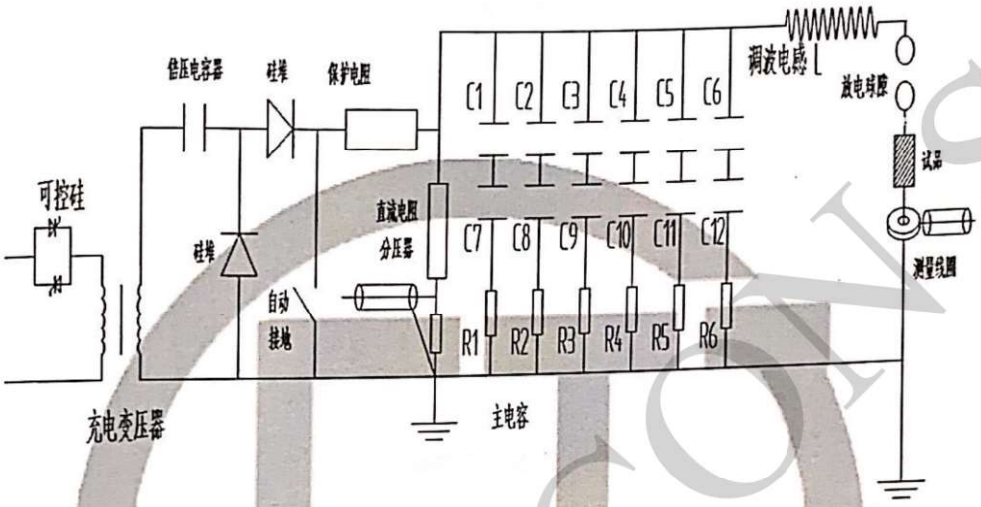
Serial number	Contents	No.
1	Schematic diagram of disconnector test (Test to verify the repetitive charge transfer rating)	21P0528-S-1
2	Schematic diagram of disconnector test (Operating duty test)	21P0528-S-2
3	Oscillograms of disconnector test (Test to verify the repetitive charge transfer rating)	/
4	Oscillograms of disconnector test (Operating duty test)	/
5	Oscillograms of disconnector test (Time versus current test)	/
6	Oscillogram of disconnector test (Mechanical tests)	/

Schematic diagram of disconnector test (Test to verify the repetitive charge transfer rating)	TBL-II Disconnector
	No.: 21P0528-S-1



可控硅(Silicon controlled rectifier)
充电变压器(Charging transformer)
倍压电容器(Double voltage capacitor)
硅堆(Silicon stack)
自动接地(Automatic grounding)
保护电阻(Protected resistance)
直流电阻分压器(DC resistance voltage divider)
调波电感(Modulated wave inductance)
调波电阻(Modulated wave resistance)
主电容 双磁头电容器(Main capacitor Double magnetic head capacitor)
放电球隙(Discharge ball-gap)
试品(Tested object)
测量线圈(Measuring coil)
残压分压器(Residual voltage divider)

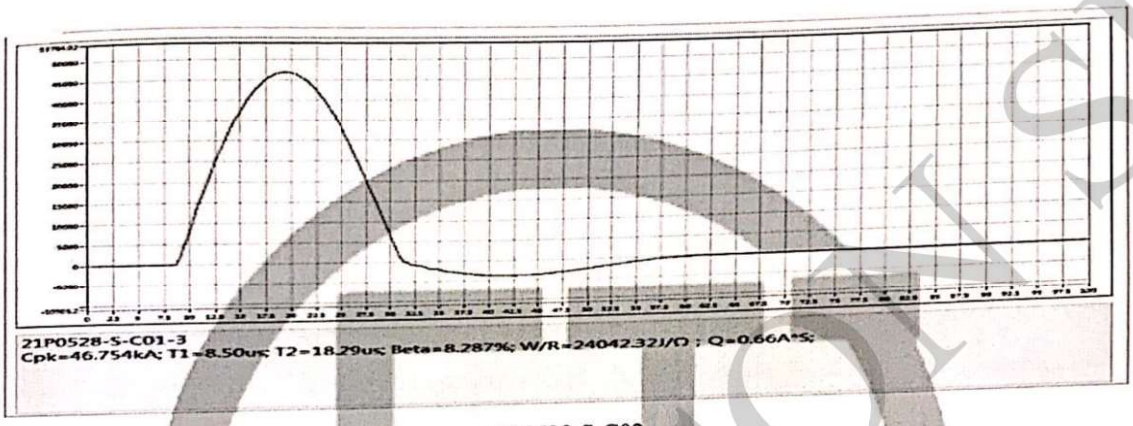
Schematic diagram of disconnector test (Operating duty test)	TBL- II Disconnector
	No: 21P0528-S-2



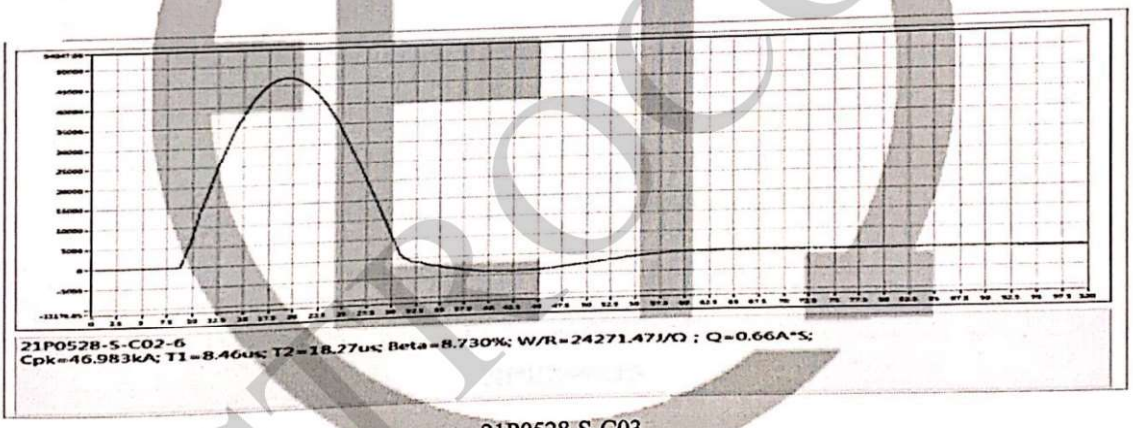
可控硅(Silicon controlled rectifier)
充电变压器(Charging transformer)
倍压电容器(Double voltage capacitor)
硅堆(Silicon stack)
自动接地(Automatic grounding)
保护电阻(Protected resistance)
直流电阻分压器(DC resistance voltage divider)
调波电感(Modulated wave inductance)
主电容及磁头电容器(Main capacitor and magnetic head capacitor)
电源(Power supply)
去耦电路(Decoupling circuit)
真空开关(Vacuum switch)
放电球隙(Discharge ball-gap)
试品(Tested object)
测量线圈(Measuring coil)
工频电容分压器(Power-frequency capacitive voltage divider)
工频移相触发控制器(Power-frequency phase-shifted trigger controller)

Oscillograms of disconnector test (Test to verify the repetitive charge transfer rating)	TBL- II Disconnector
	No: /

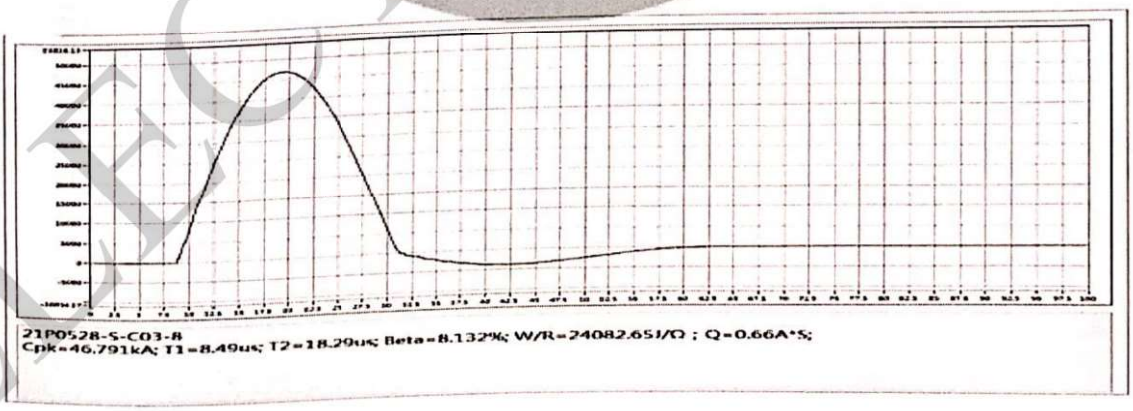
21P0528-S-C01



21P0528-S-C02

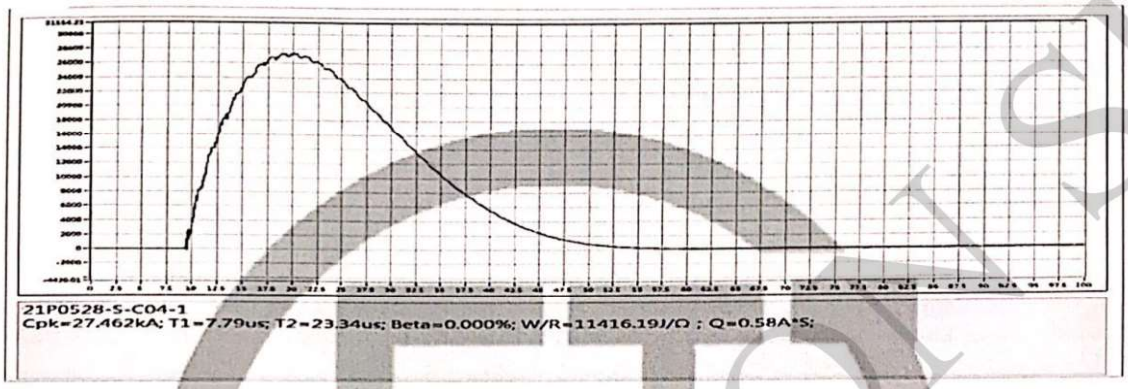


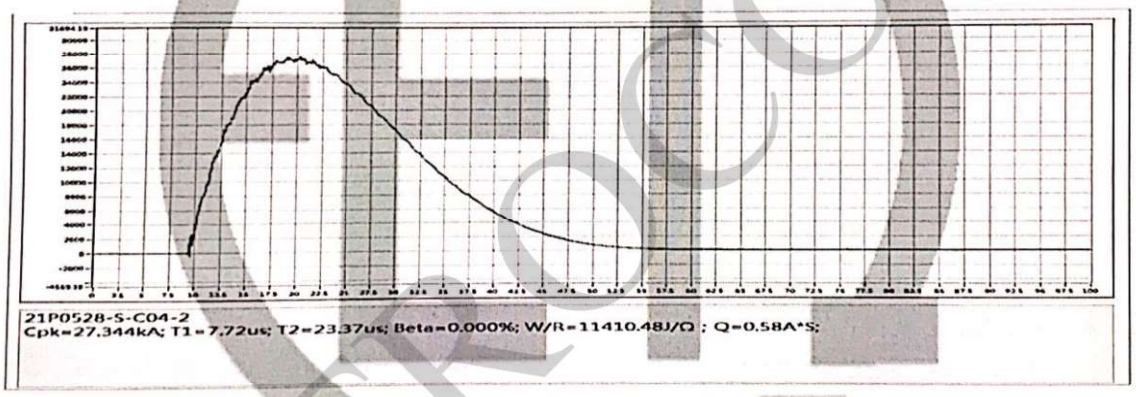
21P0528-S-C03



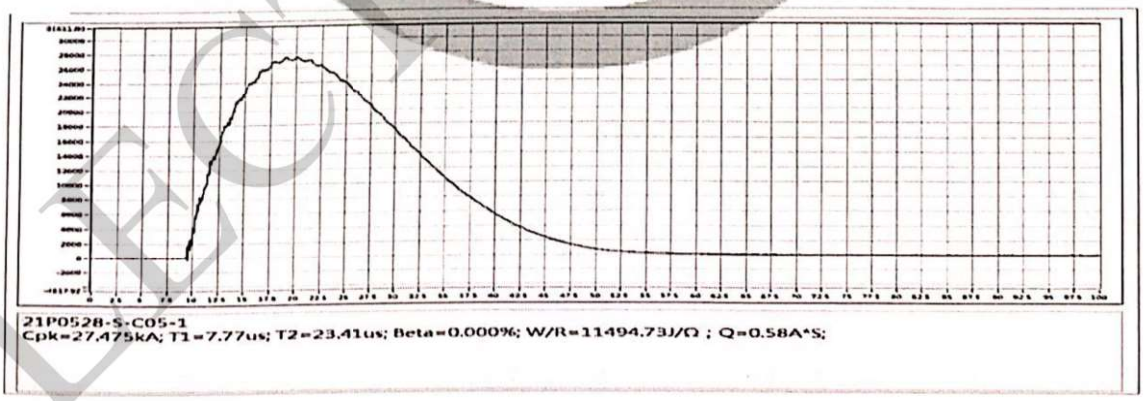
Oscillograms of disconnector test (Operating duty test)	TBL- II Disconnector
	No: /

21P0528-S-C04



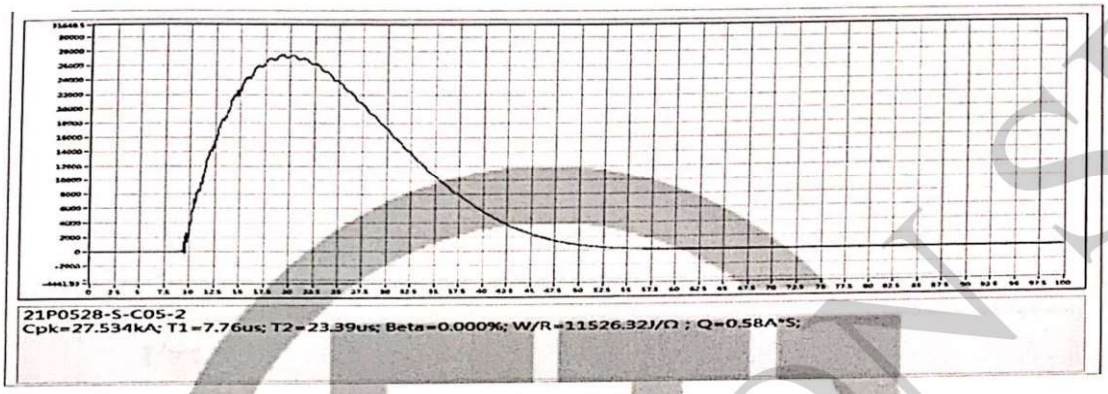


21P0528-S-C05



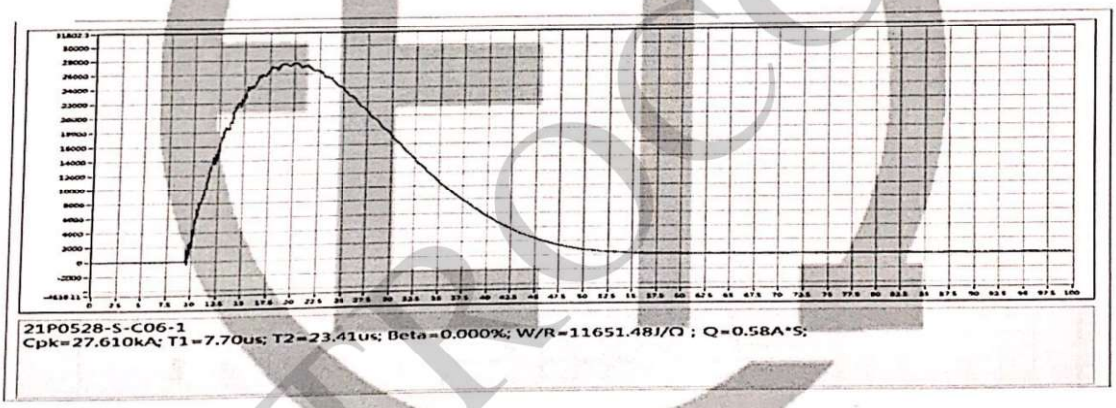
Oscillograms of disconnector test (Operating duty test)	TBL- II Disconnector
	No: /

21P0528-S-C05

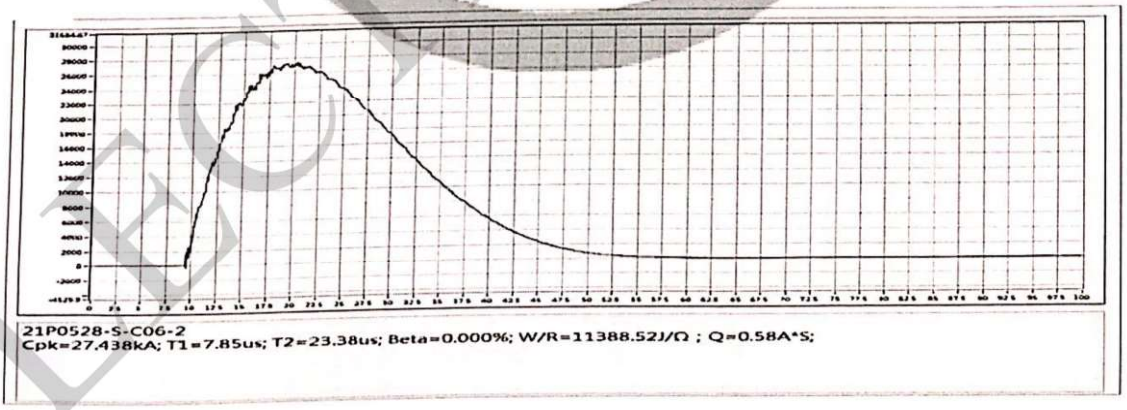


21P0528-S-C05-2
Cpk=27.534kA; T1=7.76us; T2=23.39us; Beta=0.000%; W/R=11526.32J/Ω ; Q=0.58A*S;

21P0528-S-C06

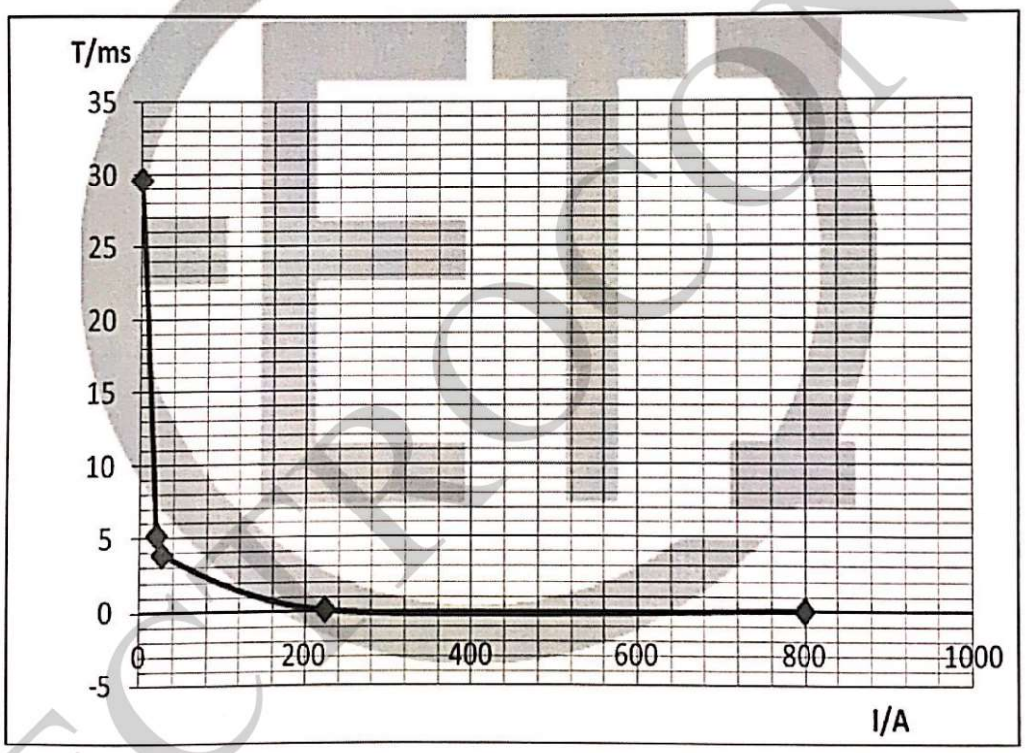


21P0528-S-C06-1
Cpk=27.610kA; T1=7.70us; T2=23.41us; Beta=0.000%; W/R=11651.48J/Ω ; Q=0.58A*S;



21P0528-S-C06-2
Cpk=27.438kA; T1=7.85us; T2=23.38us; Beta=0.000%; W/R=11388.52J/Ω ; Q=0.58A*S;

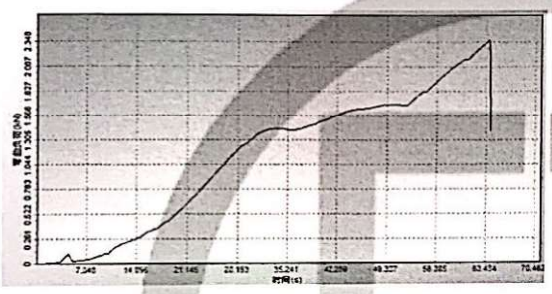
Oscillogram of disconnector test (Time versus current test)	TBL- II Disconnector
	No: /



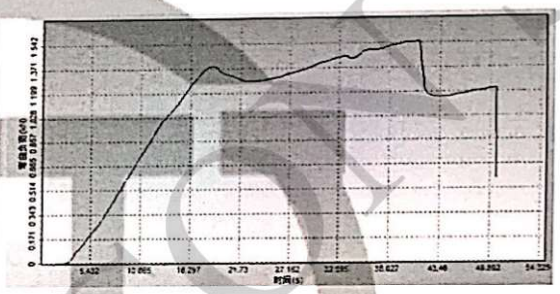
Oscillograms of disconnector test (Mechanical tests)	TBL- II Disconnector
	No.: /

Bending moment test

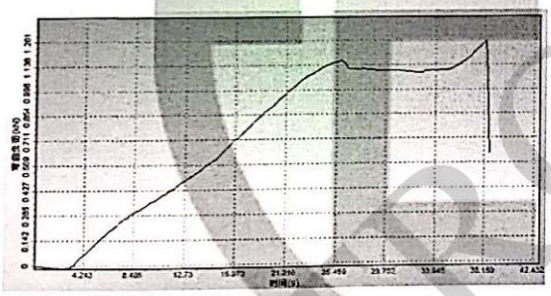
21P0528-S-C32



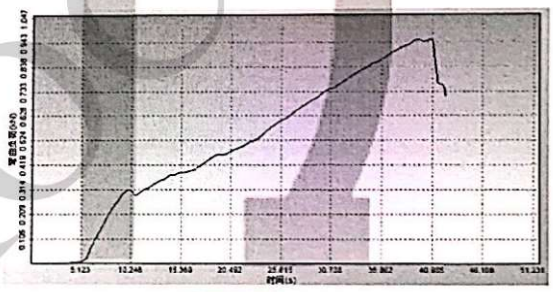
21P0528-S-C33



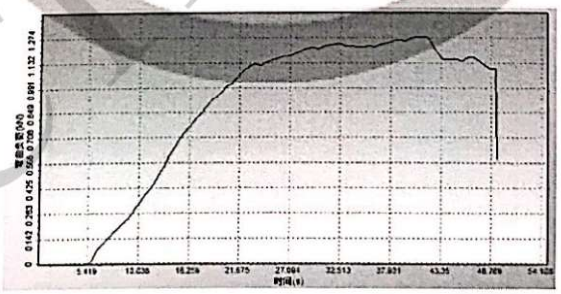
21P0528-S-C34



21P0528-S-C35



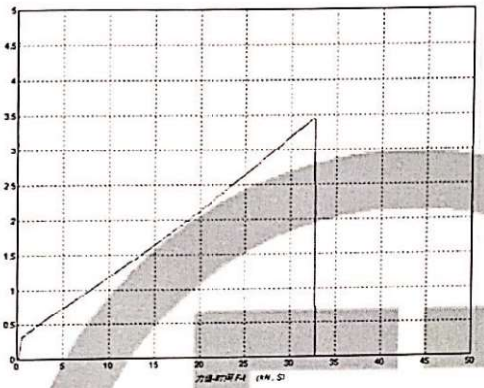
21P0528-S-C36



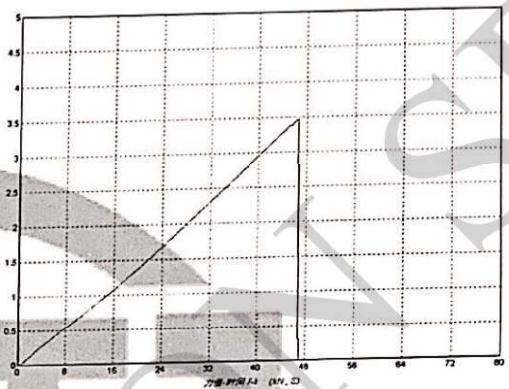
Oscillograms of disconnector test (Mechanical tests)	TBL- II Disconnector
	No.: /

Tensile test

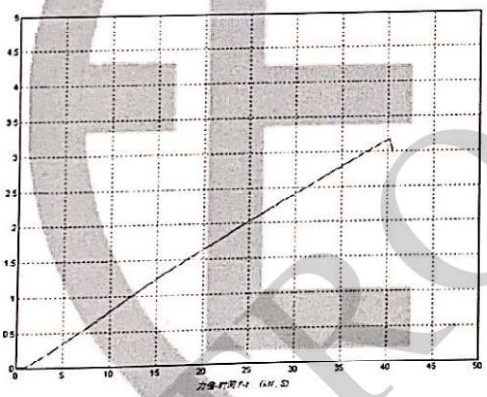
21P0528-S-C37



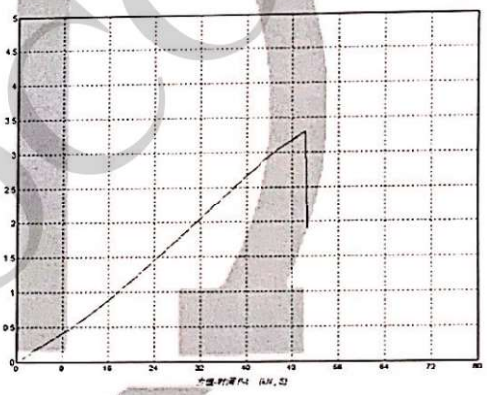
21P0528-S-C38



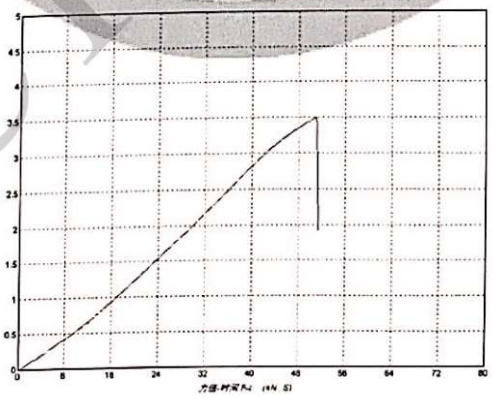
21P0528-S-C39



21P0528-S-C40



21P0528-S-C41



No text below

DECLARATION

1.The report is invalid without seal or page combining seal on the report;

2. The report is invalid if altered;

3. The report is invalid without signatures of persons for drawing up, proof-reading,reviewing and approval;

4. The report is valid only for the inspected and tested samples.

NOTICE

1. In case there is any objection to this report, please raise it to the laboratory within fifteen days starting from the date of receiving the report. Thank you for your cooperation.
2. In case there is no objection, please take back the samples within one month starting from the date of receiving the report, when the manufacturer is going to take back the samples, certificate for sample taking and along with the written approval for the report should be brought in presence, only then the samples could be taken back. On time due, the samples will be in the laboratory's own disposal.

The test report is in total 19 pages including 8 figures and 1 photo

Typewriter Danli Han Proofreader Qing Ding Binder Danli Han

Address: No.5 Qianzhu Rd.,Yuexi,Wuzhong District,Suzhou

Tel: (0512) 66556600 (switchboards) 68252753 68081201 Fax: (0512) 68081686

Post code: 215104 http: //www.eeti.cn E-mail: eservice@eeti.cn

Type Test Report

Document No.	C2016984	Copy No.	1	Number of pages	65
Apparatus	Metal-Oxide resistors type D36,5x20 assembled in thermally prorated section representing the polymer-housed surge arrester series type YH10W				
Designation	---				
Serial Number	---				
Manufacturer	Nanyang Jinniu Electric Co., Ltd Industry park of Tongbai, Nanyang city, Henan province, China 474750				
Client	Nanyang Jinniu Electric Co., Ltd Industry park of Tongbai, Nanyang city, Henan province, China 474750				
Tested for	---				
Date(s) of tests	November 24÷30, 2022				
Tested by	CESI S.p.A. Via Rubattino, 54 20134 Milano – Italy				
Test performed	Operating duty test				

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this document has been subjected to the series of proving tests in accordance with:

IEC 60099-4 – Edition 3.0 (2014-06)

The results are shown in the record of proving tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standard(s). The ratings assigned by the Manufacturer are listed on the ratings page.
The document applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designations with that tested rests with the Manufacturer.

June 14, 2023

Date	Gregori Marco C2016984 3059 AUT Test Engineer in charge	The Manager - Verhoeven Bas C2016984 3482248 APP Approved by

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
LAB N° 0030 L

The laboratory meets the requirements of the Standard ISO/IEC 17025: 2017 "General requirements for the competence of testing and calibration laboratories". The in force status of the accreditation and the list of accredited tests may be checked in the WEB site: www.cesi.it

测思 Centro Elettrotecnico Sperimentale Italiano

CESI

Shaping a Better Energy Future

Notes

STL-Member

CESI Group members are founder members of the SHORT-CIRCUIT TESTING LIAISON (STL) which has been established in 1969. STL is a forum for voluntary international cooperation of testing organizations.

CESI Group Test Documents description

STL Type Test Certificate of .....

Issued for type tests of high voltage products (> 1 kV_{ac}; > 1,5 kV_{dc}), which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. The STL Type Test Certificate consists of documents unequivocally identifying the test object and describes all conditions under which the tests were conducted. It gives evidence of the unobjectionable behavior of the test object during the tests in line with the normative documents applied as well as of the results of successful testing.

Type Test Certificate of .....

Issued for type tests of high voltage products (> 1 kV_{ac}; > 1,5 kV_{dc}), which have successfully been carried out in full compliance with the relevant specifications or standards valid at the time of the test. The Type Test Certificate consists of documents unequivocally identifying the test object and describes all conditions under which the tests were conducted. It gives evidence of the unobjectionable behavior of the test object during the tests in line with the normative documents applied as well as of the results of successful testing.

Test Certificate of (complete / selected) Type Tests

Issued if type tests of low voltage products (< 1 kV_{ac}; < 1,5 kV_{dc}) requested by the relevant product standard were passed. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Certificate of Design Verification

Issued for passed design verification tests according to IEC 61439. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Type Test Report

Issued for high and low voltage products if parts of selected type tests have been passed; those shall be carried out in full compliance with the relevant standards but (for high voltage products) do not fulfill all STL requirements for issuing a Type Test Certificate. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Test Report

Issued for all other tests on high and low voltage products which have been carried out according to specifications, standards and/or client instructions

On-Site Test Record

Issued as a record of results acquired during the on-site tests / measurements

Test Award

Can be additionally issued for all named types of test documents above if the tests to be referenced were passed

Tests witnessed by:

--- ---

Identification of the object: Requested

The Manufacturer guarantees that the tested object is manufactured according to the submitted drawings.
CESI checked that these drawings adequately represent in shape and dimensions the essential details and the parts of the tested object.
These drawings, identified by CESI and numbered C3008109 No. 2 & C3008047 , are annexed to this document.

Test evaluation

Subclause	Test	Test result
IEC 60099-4 (2014-06) – clause 10.8.7	Operating duty test	Passed
The decision rule in conformity assessment is based on the simple acceptance method without considering the measuring uncertainties.		

The reported expanded uncertainties are determined in accordance with the Publication JCGM 100 "Evaluation of measurement data – Guide to the expression of uncertainty in measurement" and are based on a standard uncertainty multiplied by a coverage factor K=2, which for a normal distribution provides a level of confidence of approximately 95%

- Voltage a.c. : **± 3,0%**
- Residual peak voltage (impulse tests) : **± 3,0%**
- Current a.c. : **± 3,0%**
- Peak current (impulse tests) : **± 3,0%**
- Time (impulse tests) : **± 10,0%**
- Time (a.c. tests) : **± 1,5%**

Laboratory information

Receipt date of the sample November 2022

Test location CESI – Via Rubattino 54 – Milan

CESI testing team Mr. L. Podavitte

Test laboratory P177 (Surge Arrester laboratory)

7000005391

The sampling of the apparatuses to be tested has been carried out by CESI according to the product Standard

content	page	test date
Test object characteristics	5	---
Photographs of the test object	6	---
Reference standard	7	---
Test carried out	7	---
Test object identification	7	---
Test procedure	8	---
Visual inspection and summary of test result	9	---
Operating duty test	from page 10 to 18	November 24÷30 2022
Technical data	from page 19 to 24	

Pages annexed:

Oscillograms n. 39 pages

Client's drawing (Thermal model) CESI no. C3008109/2 – n.1 page

Client's drawing (MO resistor) - CESI no. C3008047 – n.1 page

Test object characteristics

electrical characteristics (assigned by the client)

Manufacturer's name	Nanyang Jinniu Electric Co., Ltd
Arrester section type	YH10W-15
Block's supplier	Nanyang Jinniu Electric Co., Ltd
Drawing code	JN-DHBL.49187
Metal-oxide resistor type	D36,5x20
Arrester class	Distribution
Designation	DH
Nominal discharge current - [kA]	10
Rated voltage – U_r [kV]	1,000 x $U_{ref.}$
Continuous operating voltage - U_c [kV]	0,800 x $U_{ref.}$
Repetitive charge transfer rating – Q_{rs} [C]	0,4
Thermal charge transfer rating - Q_{th} [C]	1,1
Reference current - $I_{ref.}$ [mA]	1,0
Rated frequency - [Hz]	50/60
Year of manufacture	2022

geometrical characteristics measured only on the metal-oxide resistor block

Total height [mm]	20±0,5
Diameter [mm]	36,5±1,0

Photograph of the test samples

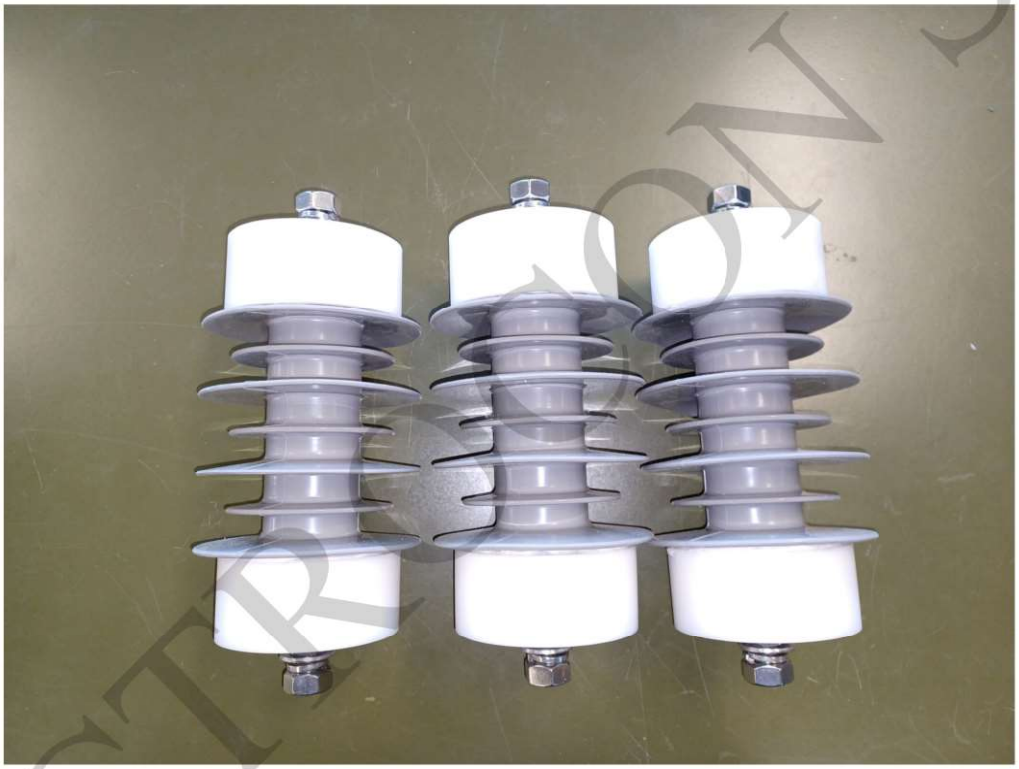


Photo no. 1

Reference Standard

IEC 60099-4 (2014/06) – Edition 3.0 - Clause 10.8.7
"Metal-oxide surge arresters without gaps for a.c. system"

Test carried out	Number of sample tested
Operating duty test	3

Test object identification

Test object name	Identification of the test sample (given by CESI)
Metal-Oxide resistors type D36,5x20 assembled in thermally prorated section representing the polymer-housed surge arrester series type YH10W	OD1
	OD2
	OD3

Test procedure

1. Test performed on Polymer-housed metal-oxide surge arrester section

The test procedure consisted of the following sequence:

Initial test

a) Measurement of the lightning impulse residual voltage at the nominal discharge current
b) Measurement of the power frequency reference voltage at the reference current

Conditioning

c) Application of one high current impulse 4/10 µs at 100 kA

2. Test performed on Polymer-housed metal-oxide surge arrester section

Thermal recovery test

d) Calculation of the voltage correction factors
e) The surge arrester sections were kept in an oven at the temperature of 62 °C till thermal equilibrium (not more than twenty hours)
f) Injection of two 8/20 lightning current impulses at rated thermal charge transfer Q_{th} and at a time shorter than 100 ms after the application of the second 8/20 current impulse the sample was energized at U_{r}' for 10s and then at U_{c}' for 30 min. to verify the thermal stability.
   - intervals between 8/20 lightning current impulse: 55 seconds
   - nominal test frequency : 50 Hz

3. Test performed on Polymer-housed metal-oxide surge arrester section

g) Measurement of the lightning impulse residual voltage at nominal discharge current for comparison with initial value
h) After that the sample has cooled to ambient temperature, two current impulses 8/20 at In have been applied for to check the integrity of the internal parts. The interval between impulses was 50-60 seconds.

Test result

The visual inspection of the sample after the test has revealed no sign of physical damage.
The variation of lightning impulse residual voltage before and after the test was less than 5% (maximum allowed variation according to reference standard is 5%).
The thermal recovery was achieved.

.

The acceptance criteria are fulfilled. The test result is positive.

Summary of test results

Variation of lightning impulse residual voltage at I_n

sample	before test		after test		Variation
	discharge current	residual voltage	discharge current	residual voltage	
	kA	kV	kA	kV	%
OD1	10,16	42,13	10,16	43,06	2,2
OD2	10,13	42,23	10,18	43,20	2,3
OD3	10,07	42,21	10,21	43,15	2,2

Variation of lightning impulse residual voltage between residual voltage measurement at In during initial test and residual voltage measurement at In during last impulse

sample	before test		after test (last impulse)		Variation
	discharge current	residual voltage	discharge current	residual voltage	
	kA	kV	kA	kV	%
OD1	10,16	42,13	10,18	43,24	2,6
OD2	10,13	42,23	10,15	43,33	2,6
OD3	10,07	42,21	10,18	43,31	2,6

Visual inspection after the test

The visual external inspection of polymer-housed metal-oxide surge arrester section after the test has revealed no sign of physical damage

Operating duty test.

Lightning impulse residual voltage measurement before the test

Test circuit: A0120

Date: November 24, 2022

Sample	Requested current	Charging voltage	Oscillogram	Current waveshape	Discharge current	Residual Voltage
No.		kV	No.	µs	kA	kV
OD1	I_n	32,6x2	1	8,2/18,2	10,16	42,13
OD2		32,6x2	2		10,13	42,23
OD3		32,6x2	3		10,07	42,21

Notes:

Operating duty test.

Reference voltage test

Test circuit: A0019

Date: November 24, 2022

Sample No. OD1						
oscillogram	voltage	current	current	current	power	3rd harmonic amplitude
No.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
4	16,56	0,90	1,00	0,48	4,36	--

Sample No. OD2						
oscillogram	voltage	current	current	current	power	3rd harmonic amplitude
No.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
5	16,57	0,91	1,00	0,48	4,48	--

Sample No. OD3						
oscillogram	voltage	current	current	current	power	3rd harmonic amplitude
No.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
6	16,63	0,94	1,00	0,49	4,59	--

Operating duty test.

Conditioning: Application of 100 kA 4/10 µs high current impulse

Test circuit: A0121

Date: November 24, 2022

Sample	Impulse	Charging voltage	Oscillogram	Discharge current	Current waveshape	Opposite polarity
No.	No.	kV	No.	kA	µs	%
OD1	1	85,0 x 2	7	93,59	4,3/8,9	3,0
OD2	1	85,0 x 2	8	93,91		
OD3	1	85,0 x 2	9	94,20		

Notes:

Operating duty test.

Voltage correction factor and thermal energy calculations

Date: November 26, 2022

Sample	U_{ref} [1]	KU_r [2]	KU_C [3]	U_r' [4]	U_c' [5]
No.	kV			kV	kV
OD1	16,56	1,000	0,800	16,56	13,25
OD2	16,57			16,57	13,26
OD3	16,63			16,63	13,30

[1] U_{ref} : measured reference voltage
[2] KU_r : maximum guaranteed factor for calculation of Ur' – $U_r/U_{ref.min.}$ (declared by the Manufacturer)
[3] KU_C : maximum guaranteed factor for calculation of Uc'– $U_c/U_{ref.min.}$ (declared by the Manufacturer)
[4] U_r' : corrected rated voltage [4] = [1] × [2]
[5] U_c' : corrected continuous operating voltage [5] = [1] × [3]

Sample	U_r'	Requested thermal charge transfer, Q_{th}	Requested Q_{th} per impulse
No.	kV	C	C
OD1	16,56	1,1	0,55 (±10%)
OD2	16,57		0,55 (±10%)
OD3	16,63		0,55 (±10%)

Operating duty test.

Application of the lightning current impulses 8/20 µs, corrected rated voltage U_r' and corrected continuous operating U_c' for evaluation of the thermal stability.

Test circuit: A0123-A0020-A0131

Sample No.: OD1

Ambient temperature: 17 °C
Preheating temperature: 62 °C

Date: November 29, 2022

Lightning current impulses 8/20 µs application

Oscillogram	Impulse	Charging voltage	Residual voltage	Discharge current	Q_{th}	Applicable range for Q_{th}
No.	No.	kV	kV	kA	C	C
10	1	65,0 x 2	---	36,09	0,55	0,495÷0,605
11	2	65,0 x 2	---	35,23	0,55	0,495÷0,605

Current impulse waveshape
(µs)
8,9/19,0

Corrected rated voltage U_r' application

Oscillogram	Time	U_r'	Current	Current
No.	s	kV	+ mA_{cr}	- mA_{cr}
12	0	16,56	55,55	118,5
13	10		31,98	54,24

Corrected continuous operating voltage U_c' application to evaluate the thermal stability

Oscillogram	Time	U_c'	Current	Current	Power	Temperature
No.	min	kV	+ mA_{cr}	- mA_{cr}	W	°C
14	1	13,25	3,42	3,33	6,78	---
	5		3,21	3,20	5,02	---
	10		3,17	3,15	4,49	---
15	15		3,12	3,11	3,99	---
	20		3,08	3,08	3,82	---
	25		3,02	3,01	3,70	---
16	31		3,00	3,00	3,60	---

continued

Note : Before the injection of the charge the temperature of the test sample has been checked with instrument type FLUKE 52II thermometer CESI no.30889

Continued

Sample No.: OD2

Ambient temperature: 17 °C
Preheating temperature: 62 °C

Date: November 29, 2022

Lightning current impulses 8/20 µs application

Oscillogram	Impulse	Charging voltage	Residual voltage	Discharge current	Q_{th}	Applicable range for Q_{th}
No.	No.	kV	kV	kA	C	C
17	1	65,0 x 2	---	35,84	0,55	0,495÷0,605
18	2	65,0 x 2	---	36,19	0,55	0,495÷0,605

Current impulse waveshape
µs
8,9/19,0

Corrected rated voltage U_r' application

Oscillogram	Time	U_r'	Current	Current
No.	s	kV	+ mA_{cr}	- mA_{cr}
19	0	16,57	69,19	146,1
20	10		33,29	61,94

Corrected continuous operating voltage U_c' application to evaluate the thermal stability

Oscillogram	Time	U_c'	Current	Current	Power	Temperature
No.	min	kV	+ mA_{cr}	- mA_{cr}	W	°C
21	1	13,26	3,40	3,28	6,73	---
	5		3,25	3,23	5,30	---
	10		3,18	3,17	4,45	---
22	15		3,14	3,12	4,09	---
	20		3,08	3,06	3,86	---
	25		3,05	3,03	3,69	---
23	31		3,02	3,02	3,50	---

Note : Before the injection of the charge, the temperature of the test sample has been checked with instrument type FLUKE 52II thermometer CESI no.30889

continued

Continued

Sample No.: OD3

Ambient temperature: 17 °C
Preheating temperature: 62 °C

Date: November 29, 2022

Lightning current impulses 8/20 µs application

Oscillogram	Impulse	Charging voltage	Residual voltage	Discharge current	Q_{th}	Applicable range for Q_{th}
No.	No.	kV	kV	kA	C	C
24	1	65,0 x 2	---	36,84	0,56	0,495÷0,605
25	2	65,0 x 2	---	36,36	0,56	0,495÷0,605

Current impulse waveshape
µs
8,9/19,0

Corrected rated voltage U_r' application

Oscillogram	Time	U_r'	Current	Current
No.	s	kV	+ mA_{cr}	- mA_{cr}
26	0	16,63	64,30	131,6
27	10		35,61	58,28

Corrected continuous operating voltage U_c' application to evaluate the thermal stability

Oscillogram	Time	U_c'	Current	Current	Power	Temperature
No.	min	kV	+ mA_{cr}	- mA_{cr}	W	°C
28	1	13,30	3,33	3,32	8,57	---
	5		3,24	3,24	5,15	---
	10		3,20	3,20	4,46	---
29	15		3,14	3,12	4,05	---
	20		3,10	3,10	3,90	---
	25		3,05	3,07	3,83	---
30	31		3,00	3,00	3,72	---

Note :

-Before the injection of the charge, the temperature of the test sample has been checked with instrument type FLUKE 52II thermometer CESI no.30889

Operating duty test.

Lightning impulse residual voltage measurement after the test

Test circuit: A0120

Date: November 30, 2022

Sample	Requested current	Charging voltage	Oscillogram	Current waveshape	Discharge current	Residual voltage
No.		kV	No.	µs	kA	kV
OD1	I_n	32,0	31	8,7/19,3	10,16	43,06
OD2		32,0	32		10,18	43,20
OD3		32,0	33		10,21	43,15

Notes:

Operating duty test.

Additional two lightning impulses residual voltage measurement for check no damage occurred during the test

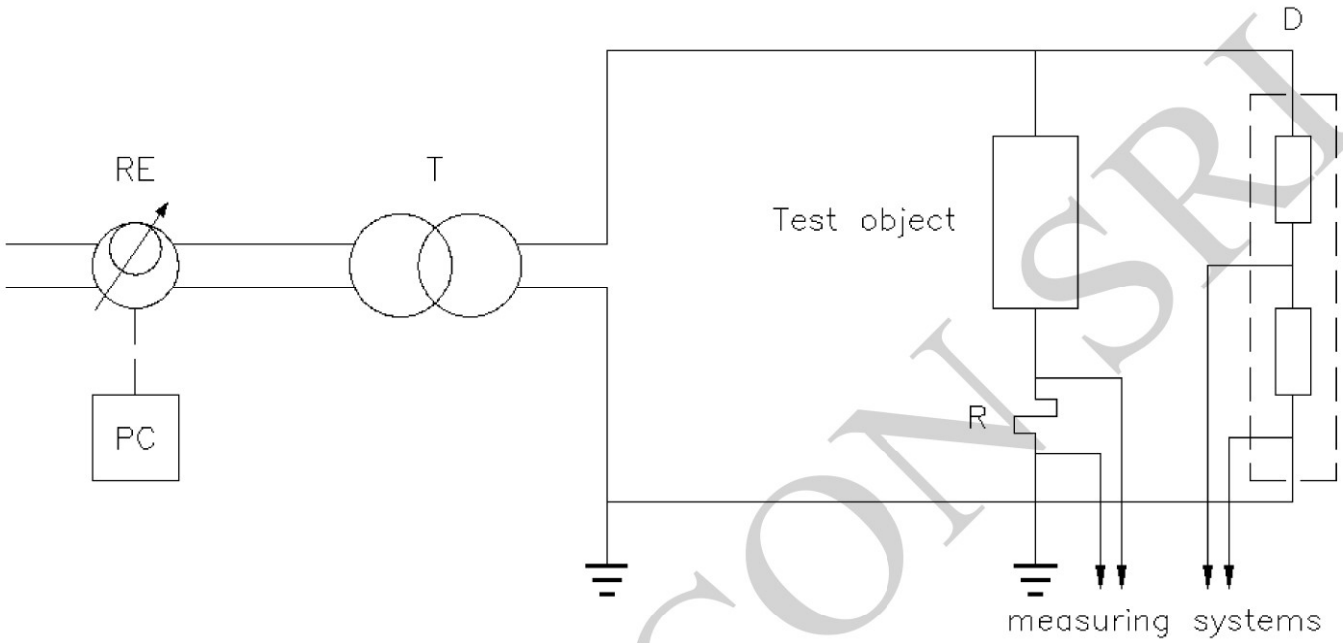
Test circuit: A0120

Date: November 30, 2022

Sample	Requested current	Charging voltage	Oscillogram	Current waveshape	Discharge current	Residual voltage
No.		kV	No.	µs	kA	kV
OD1	I_n	29,8	34	8,7/19,4	10,20	43,27
		29,8	35		10,18	43,24
OD2		29,8	36		10,22	43,13
		29,8	37		10,15	43,33
OD3		29,8	38		10,20	43,10
		29,8	39		10,18	43,31

Notes:

Circuit A0019



Power frequency supply

RE - programmable supply type PACIFIC A.C. Power Source 140 ASX.; CESI no. 0560408
PC - personal computer
T - voltage transformer type SPECIALTRASFO; power 30 kVA; voltage 200 V/15-30 kV

Current measuring system

R - Current shunt CESI No.31120; R= 941,4 Ω
- Electro optical system HBM No.57987/57986

OSC
- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122;
- CESI No 056227- 056226 (on channel No.1)

Voltage measuring system

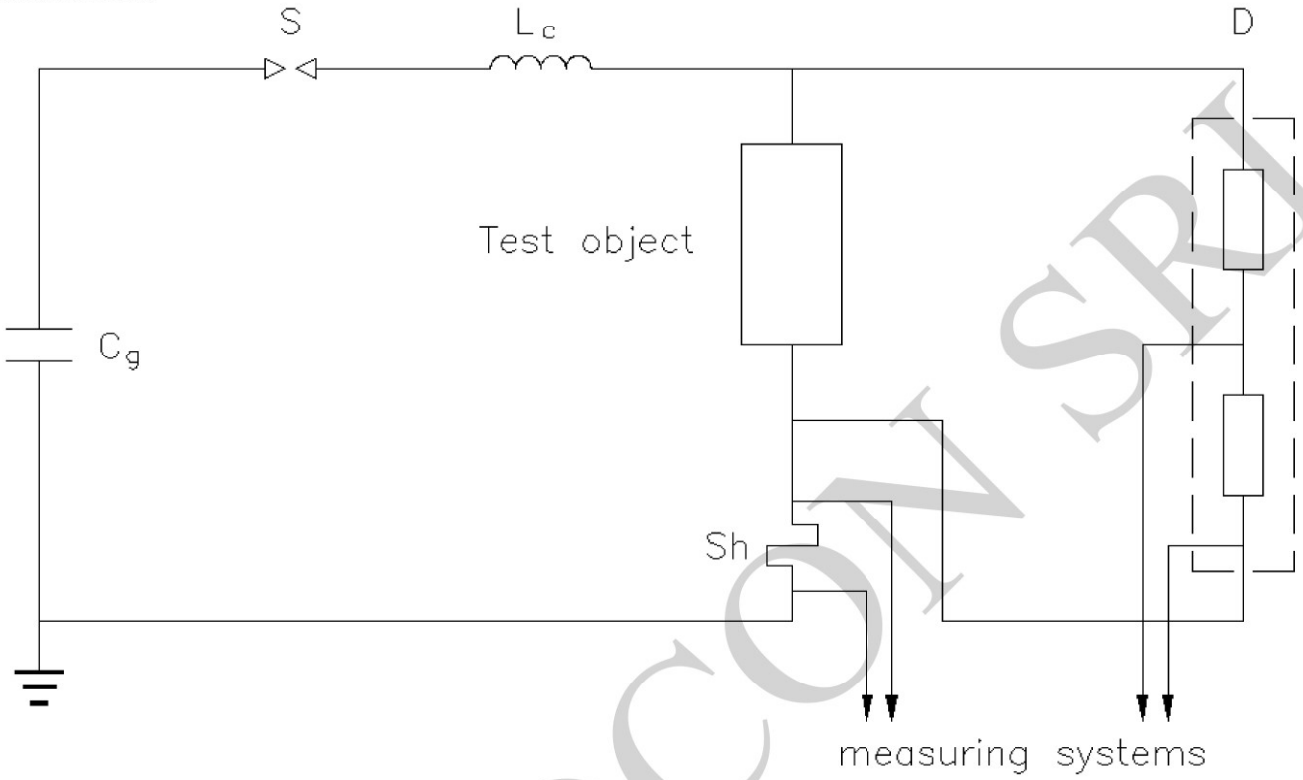
D - Voltage divider SAGI; CESI No.13027
- Electro optical system HBM No.57991/57986

OSC
- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122;
- CESI No 056227- 0562226 (on channel No.2)

SOFTWARE SYSTEM:

SW - S.A.D. Surge arrester version 2.0

Circuit A0120



Impulse generator

No. of stages	2
Cg	3,32 µF
Lc	16 µH
S	- Spark-gap

Voltage measuring system.

D	- Voltage divider SAGI; CESI No.13027
	- Electro optical system HBM No.57991/57986
OSC	- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122 - CESI No 056227- 056226 (on channel No.2)

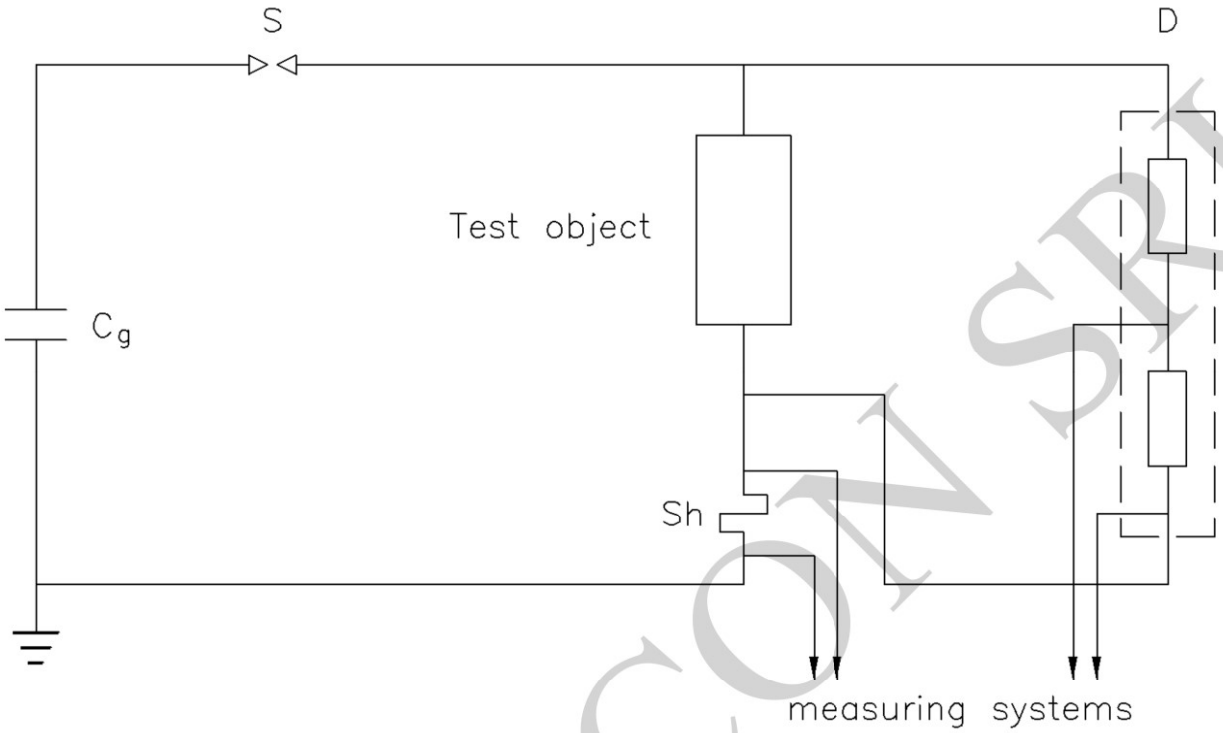
Current measuring system

Sh	- Current shunt CESI No.6042; R= 1,98 mΩ; peak current= 250 kA
	- Electro optical system HBM No.57987/57986
OSC	- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5152; - CESI No 056227- 0562226 (on channel No.1)

SOFTWARE SYSTEM:

SW - S.A.D. Surge arrester version 2.0

Circuit A0121



Impulse generator

No. of stages 2
Cg 2,91 µF

S - Spark-gap

Two blocks in series have been added

Voltage measuring system.(not used)

D - Voltage divider SAGI; CESI No.13027
- Electro optical system HBM No.57991/57986

OSC
- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122;
- CESI No 056227- 056226 (on channel No.2)

Current measuring system

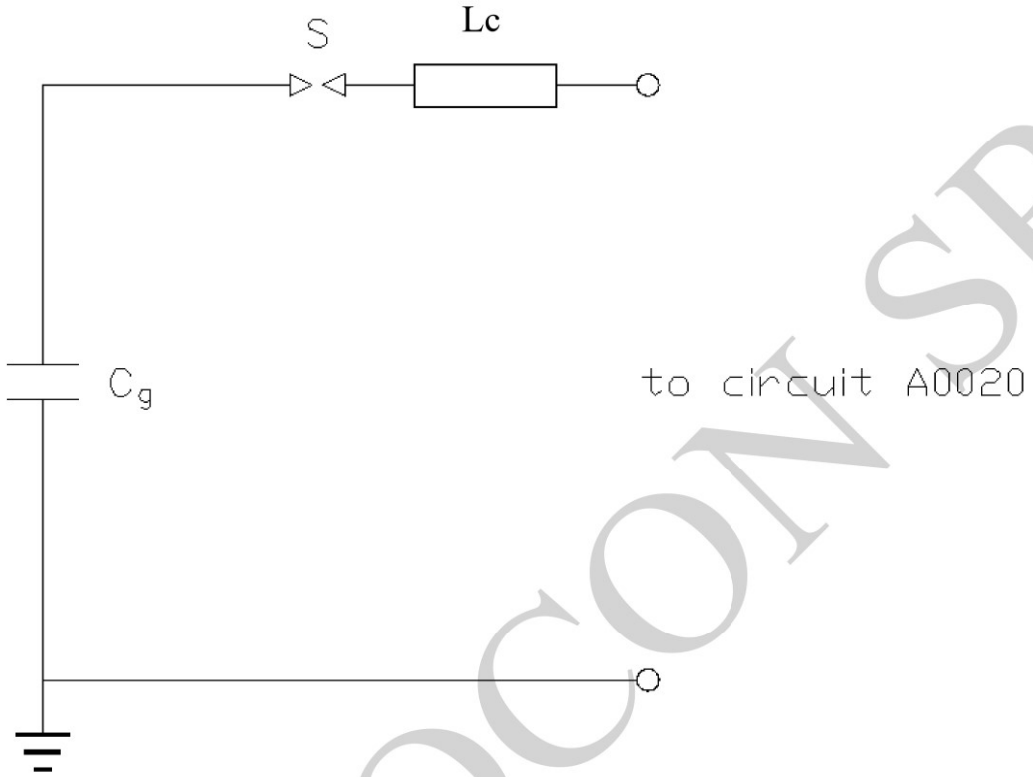
Sh - Current shunt CESI No.6042; R= 1,99 mΩ; peak current= 250 kA
- Electro optical system HBM No.57987/57986

OSC
- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122;
- CESI No 056227- 0562226 (on channel No.1)

SOFTWARE SYSTEM:

SW - S.A.D. Surge arrester version 2.0

Circuit A0123

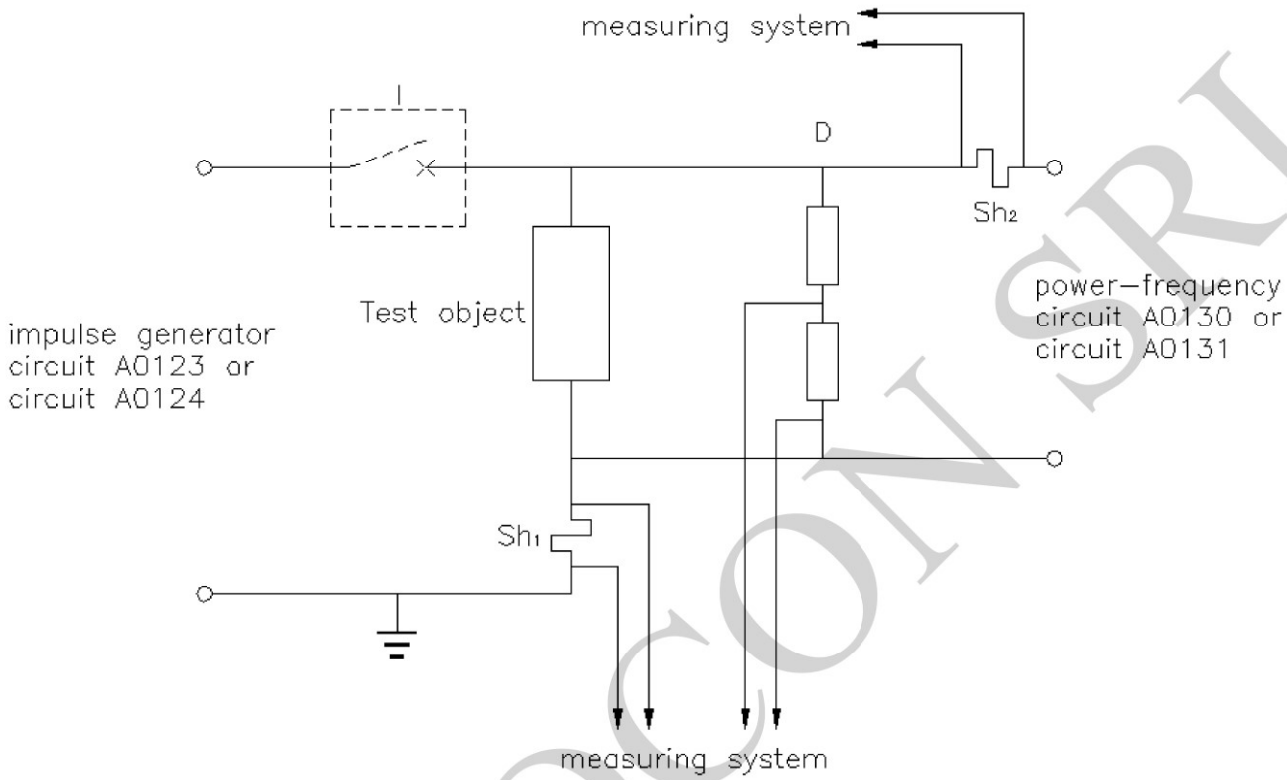


Impulse generator circuit

No. of stages	2
Cg	3,32 µF
Lc	16 µH
S	- Spark-gap

Note : additional MO resistors have been added

Circuit A0020



Impulse generator circuit A0124

I - Circuit-breaker

Power frequency circuit A0130

Voltage measuring system.

D - Voltage divider SAGI; CESI No.13027
- Electro optical system HBM No.57991/57986

$OSC_{2,3}$ - Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122
- CESI No 056227- 0562226 (on channel No.2)

Current measuring system

Sh_2 (TOV) - Current shunt CESI No 058315/15; R= 200 Ω - Electro optical system HBM No.58295/57986

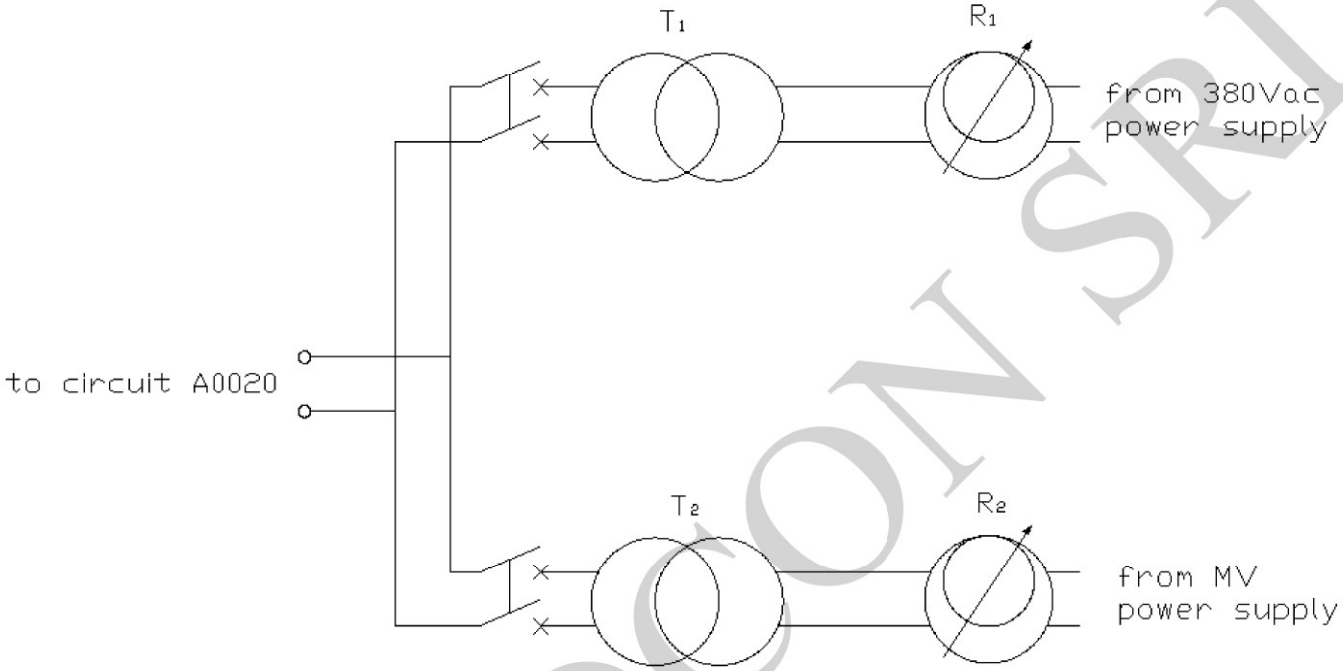
Sh_2 (MCOV) - Current shunt type CESI No. 05831/17; R= 1000 Ω - Electro optical system HBM No.58294/57986

$OSC_{2,3}$ - Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122;
- CESI No 056227- 056226 (on channel No.1)

SOFTWARE SYSTEM:

SW - S.A.D. Surge arrester version 2.0

Circuit A0130



Power-frequency circuit

from 380Vac power supply

R_1 - programmable supply type PACIFIC A.C. Power Source 140 ASX.; CESI no. 0560408

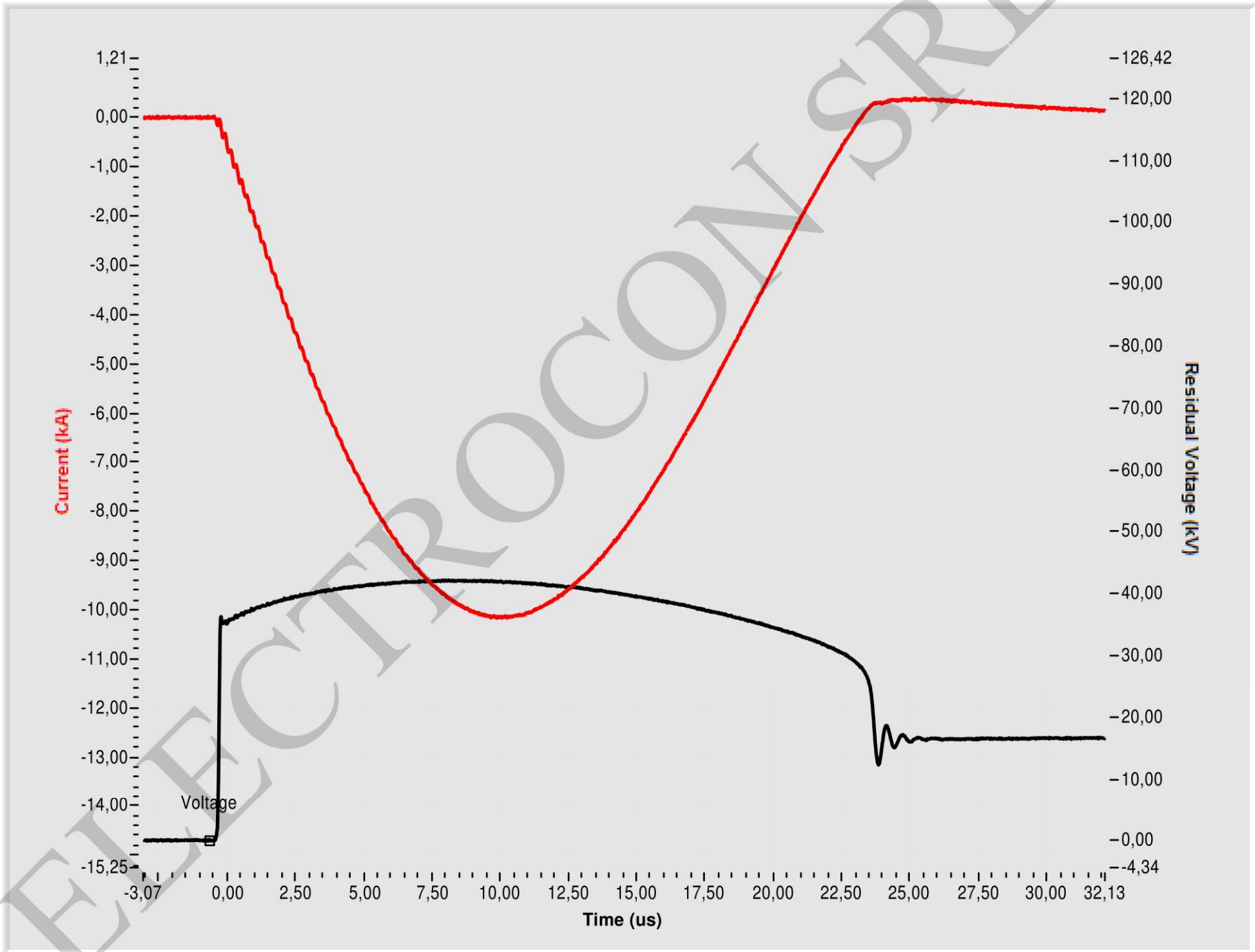
T_1 - voltage transformer type PIVI; power 20 kVA; voltage 220 V/50 kV

from Medium Voltage (MV) power supply

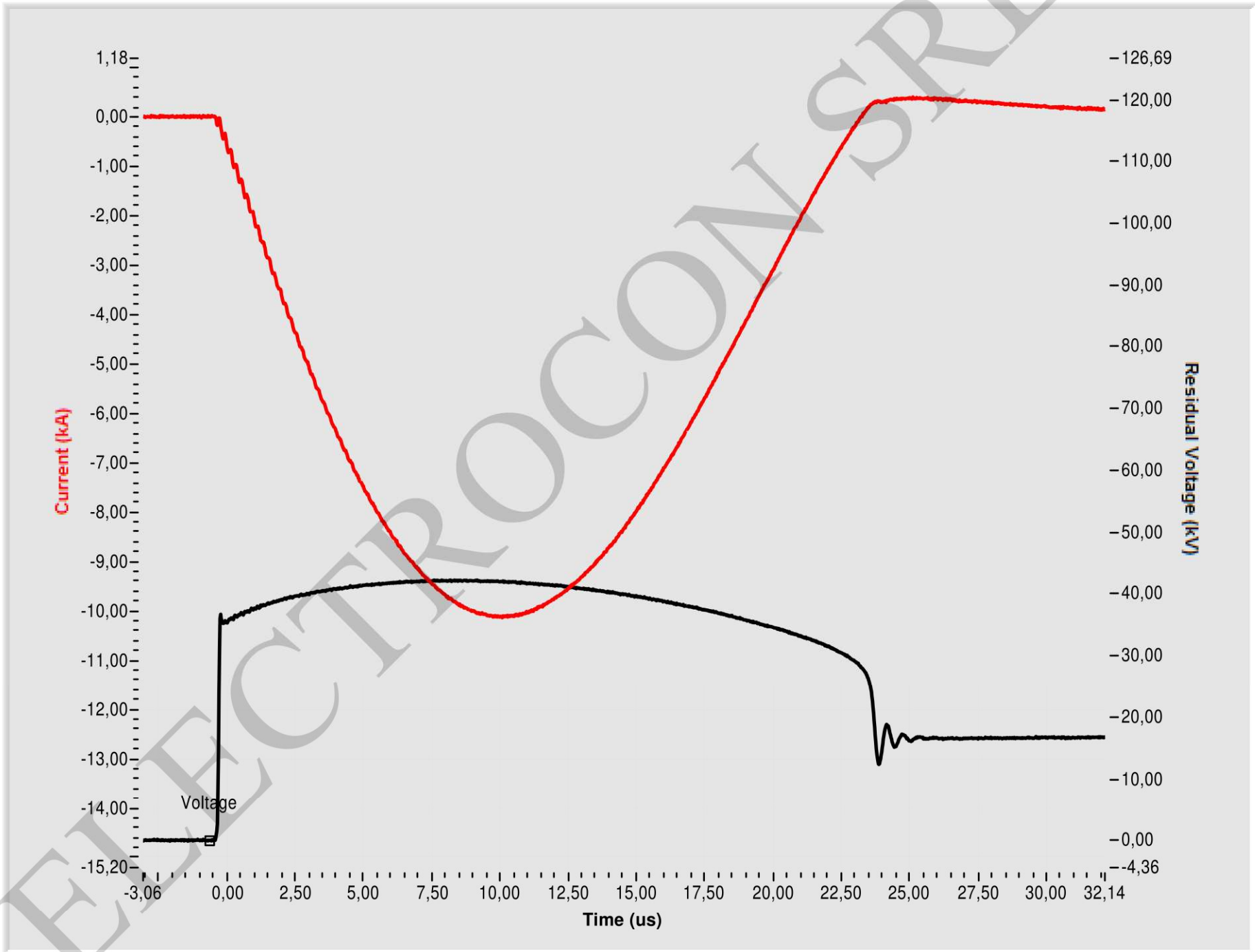
R_2-T_2 - voltage regulator group BONNEFOND; power 3x350 kVA; voltage 23 kV/0 ÷ 6*√3 kV

END OF THE DOCUMENT

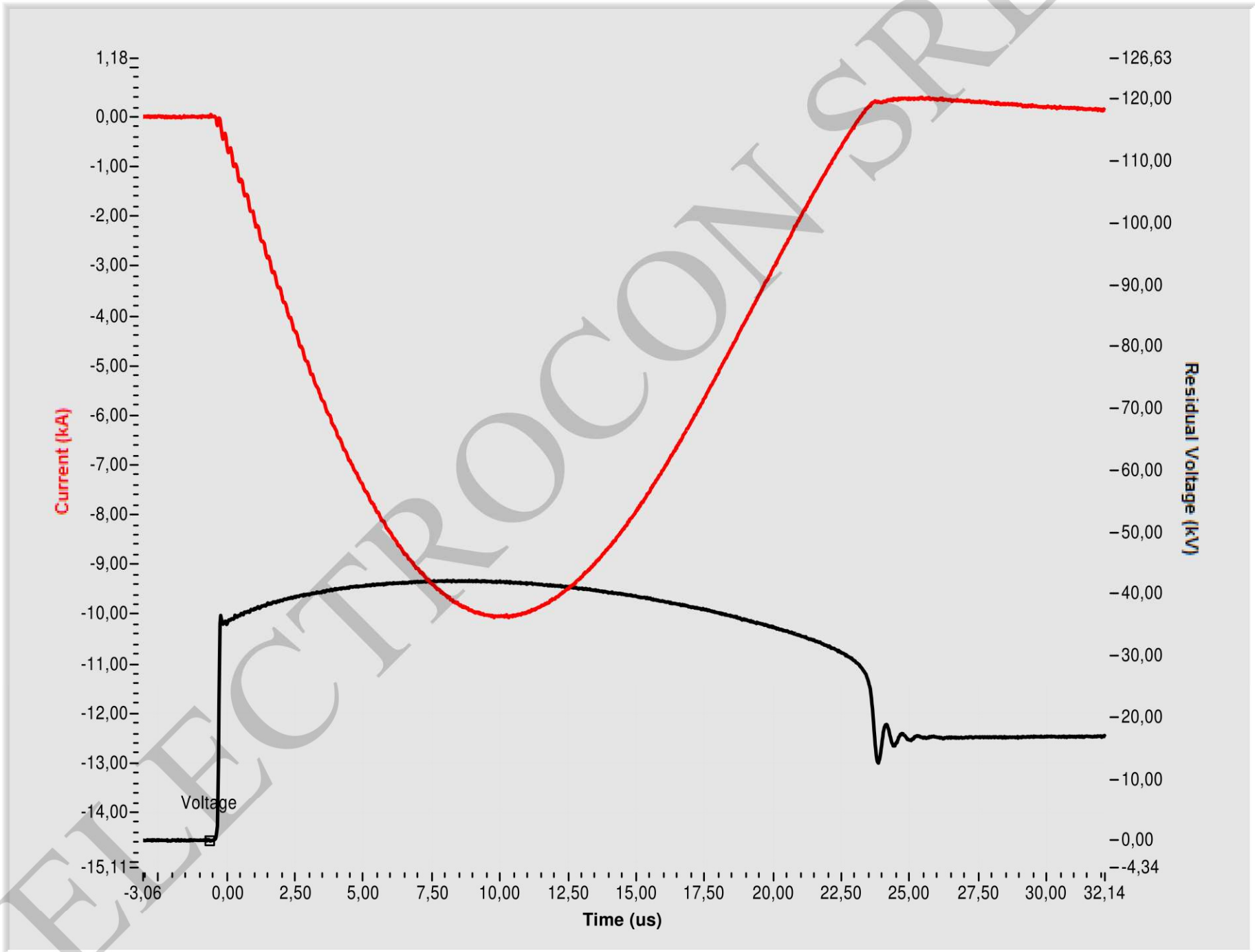
CESI C2016984 Oscillogram n. 1



CESI C2016984 Oscillogram n. 2



CESI C2016984 Oscillogram n. 3



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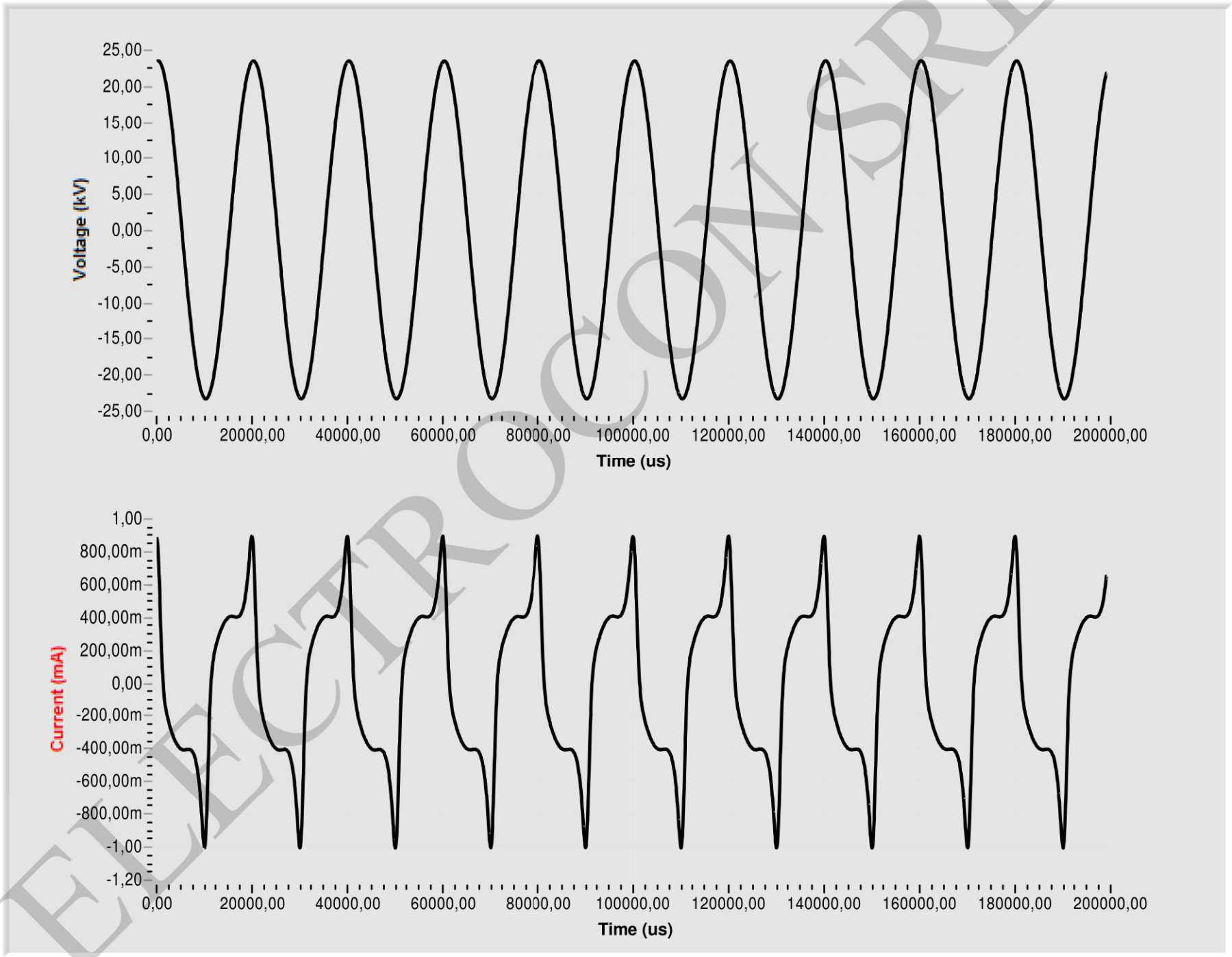

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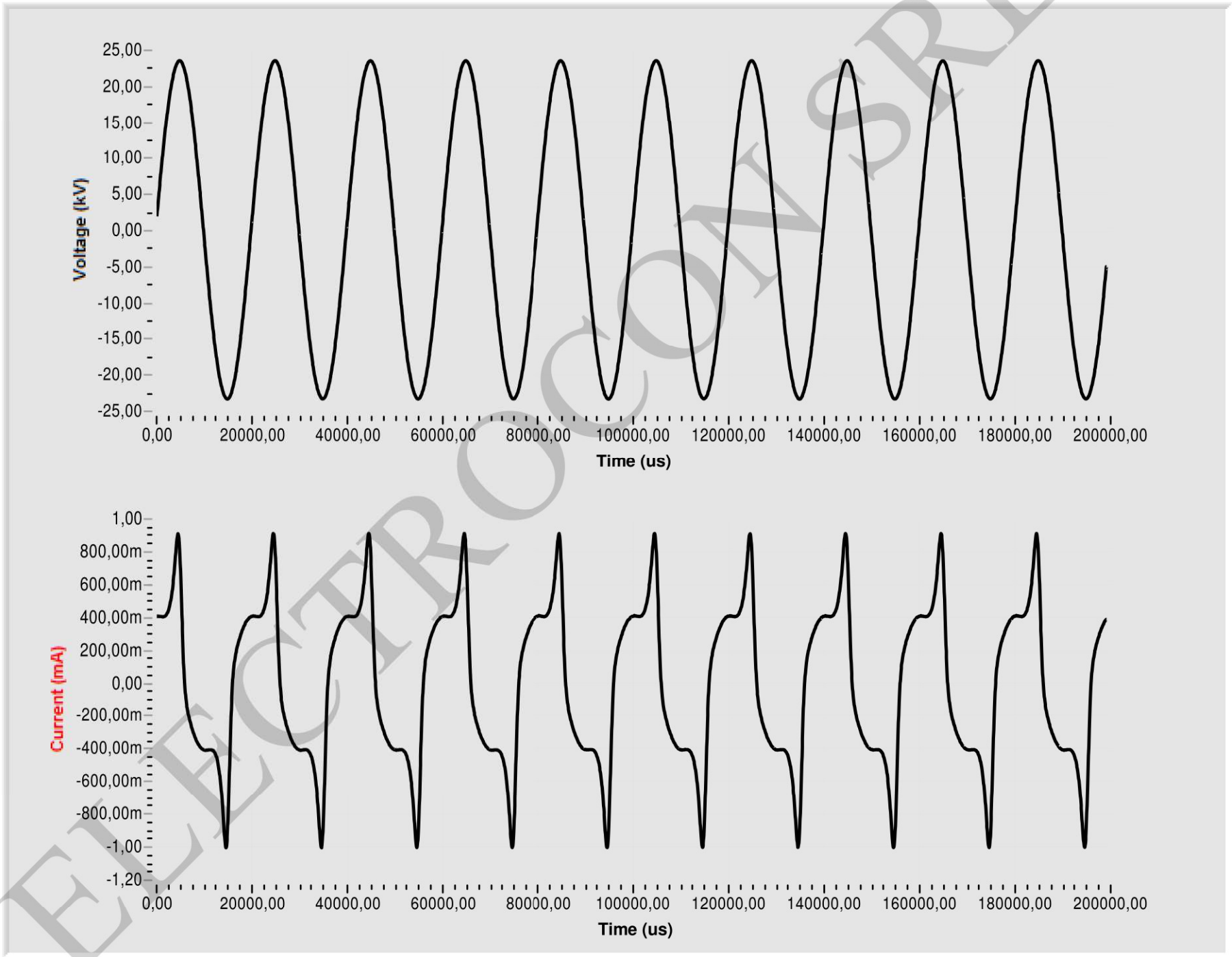

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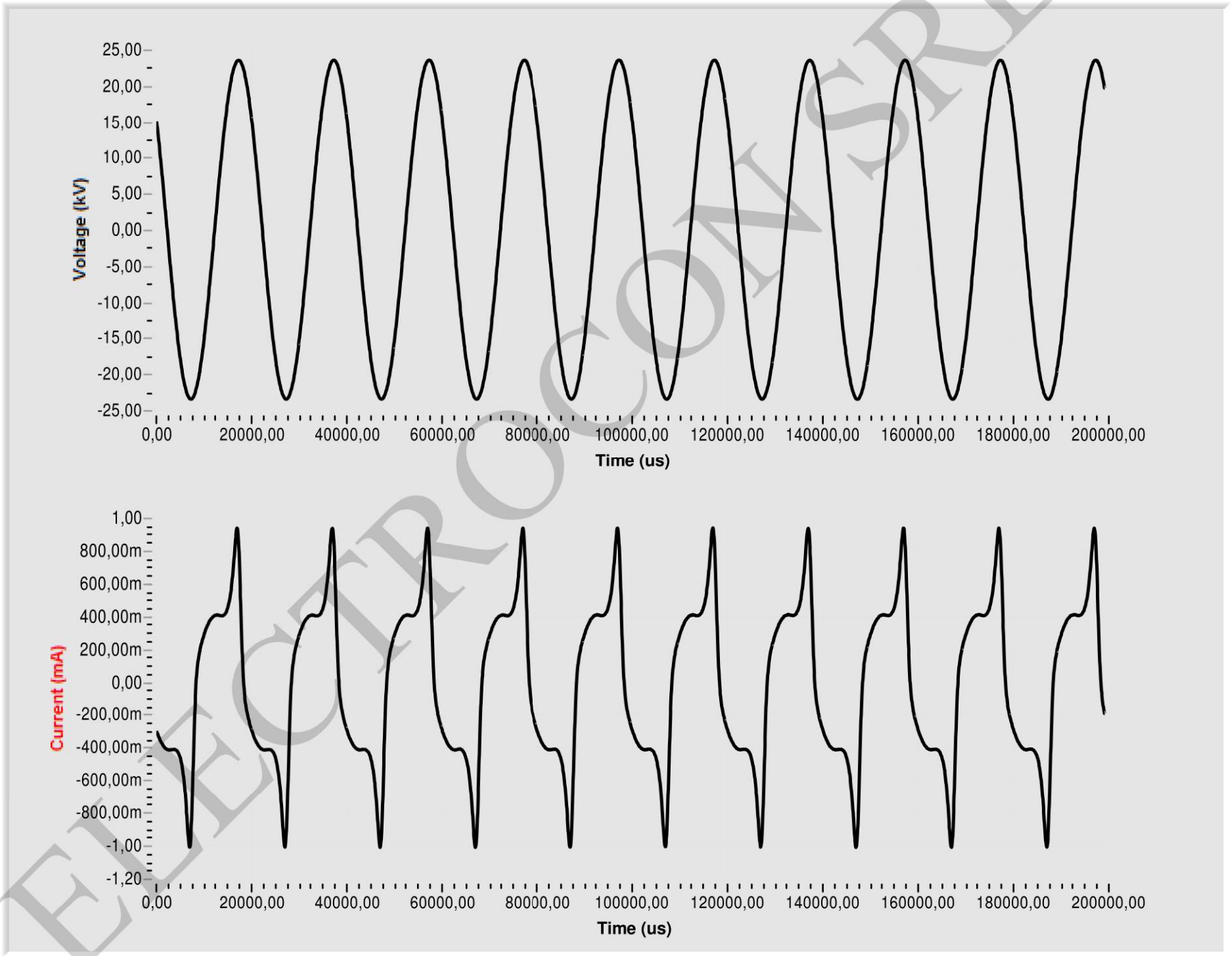

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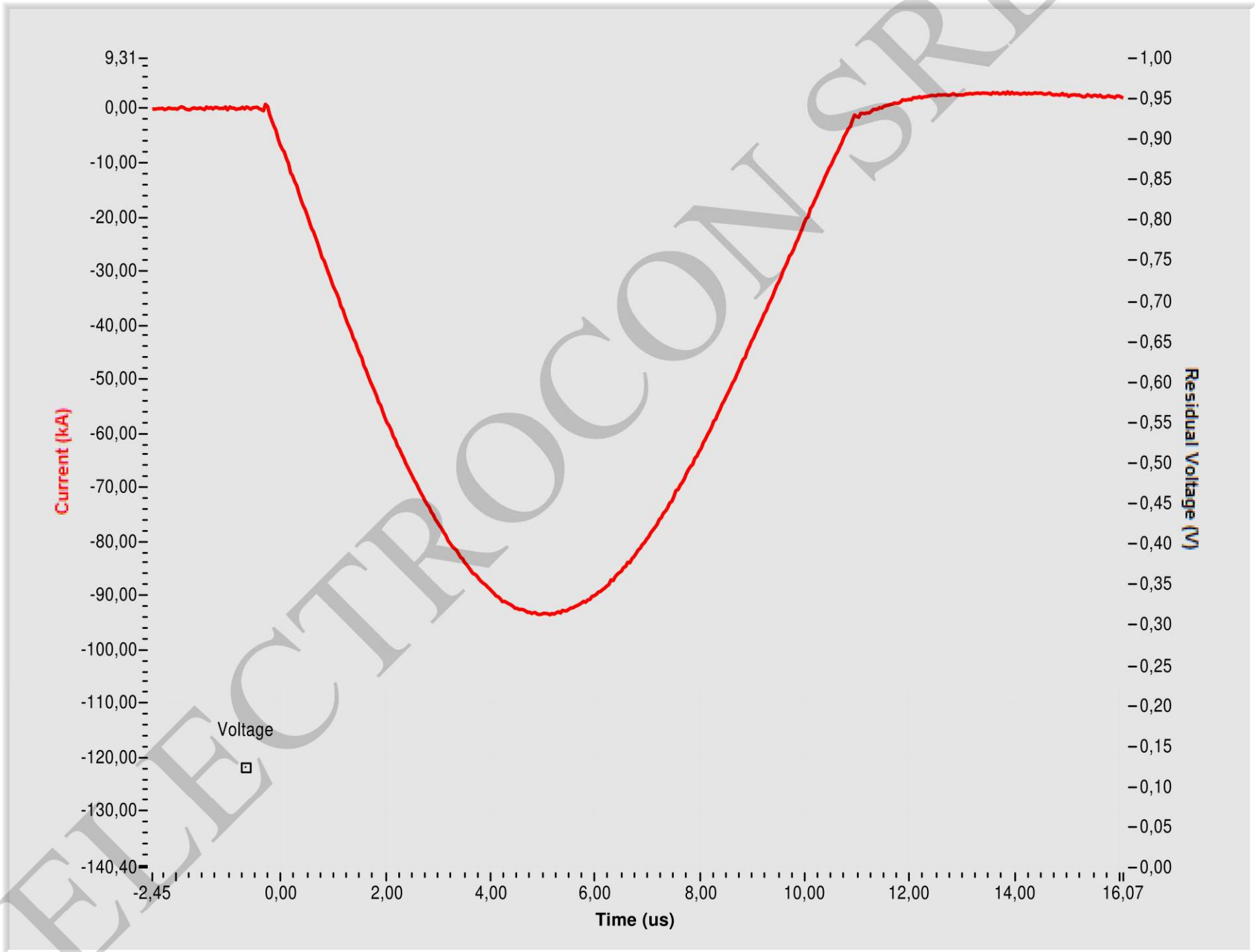

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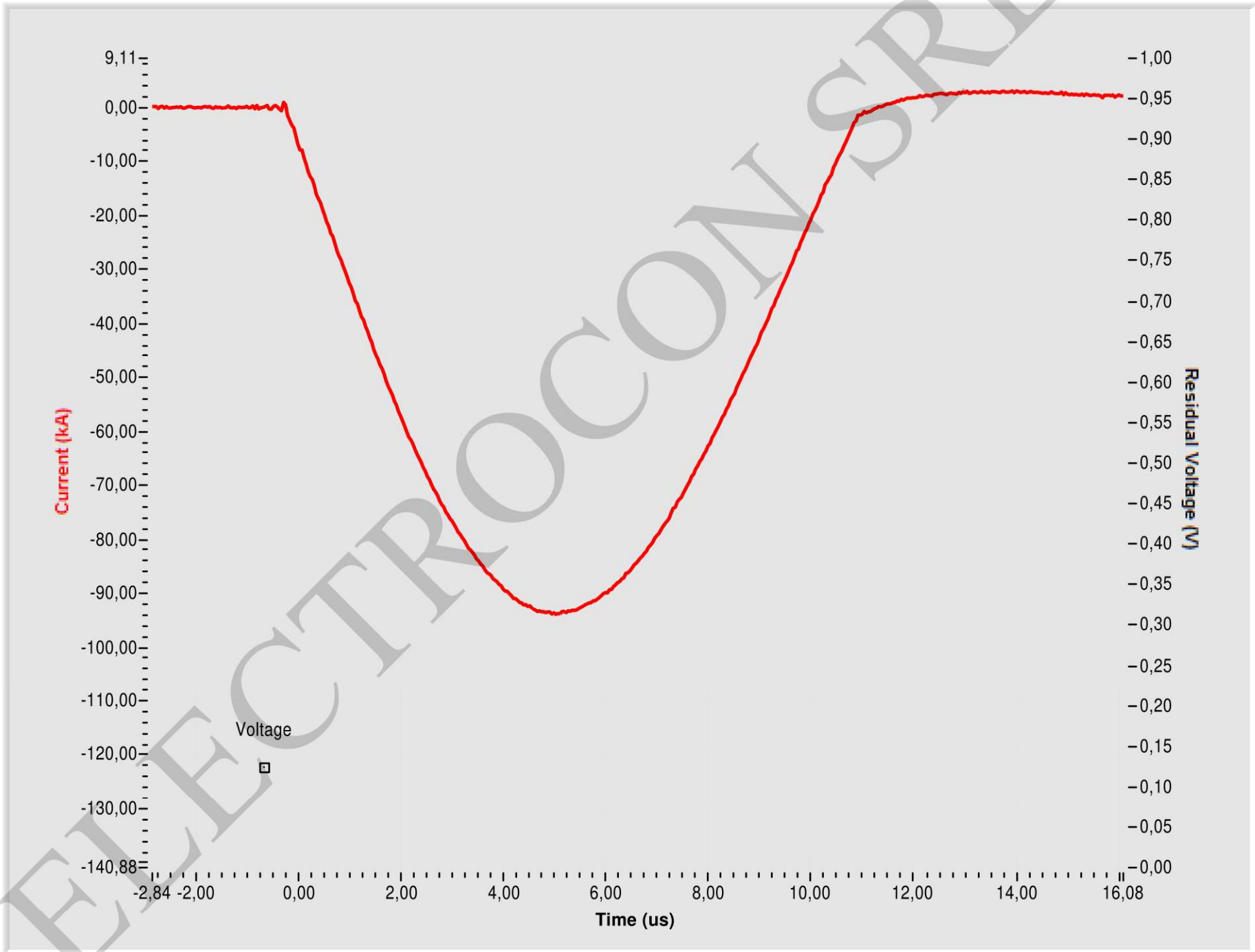

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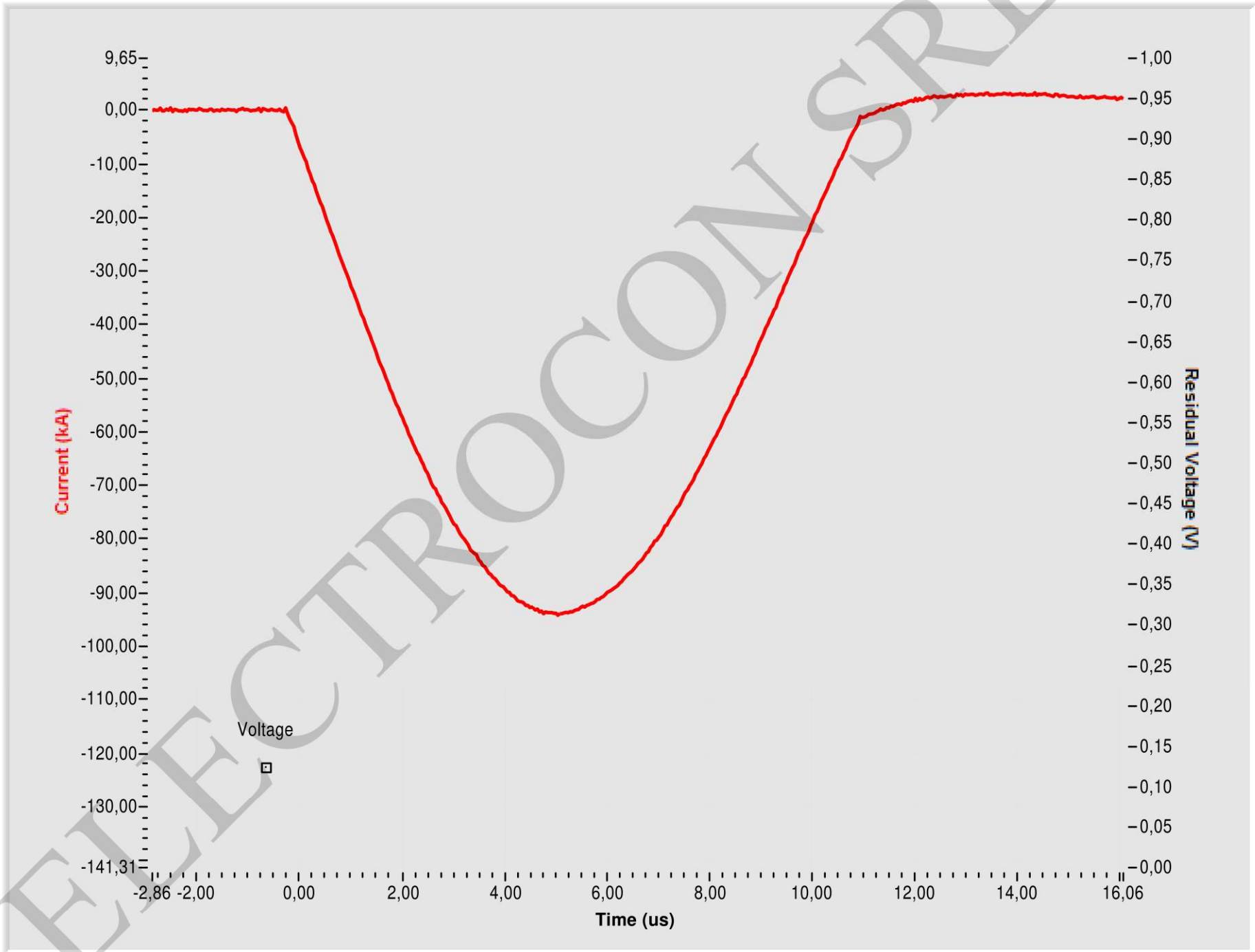

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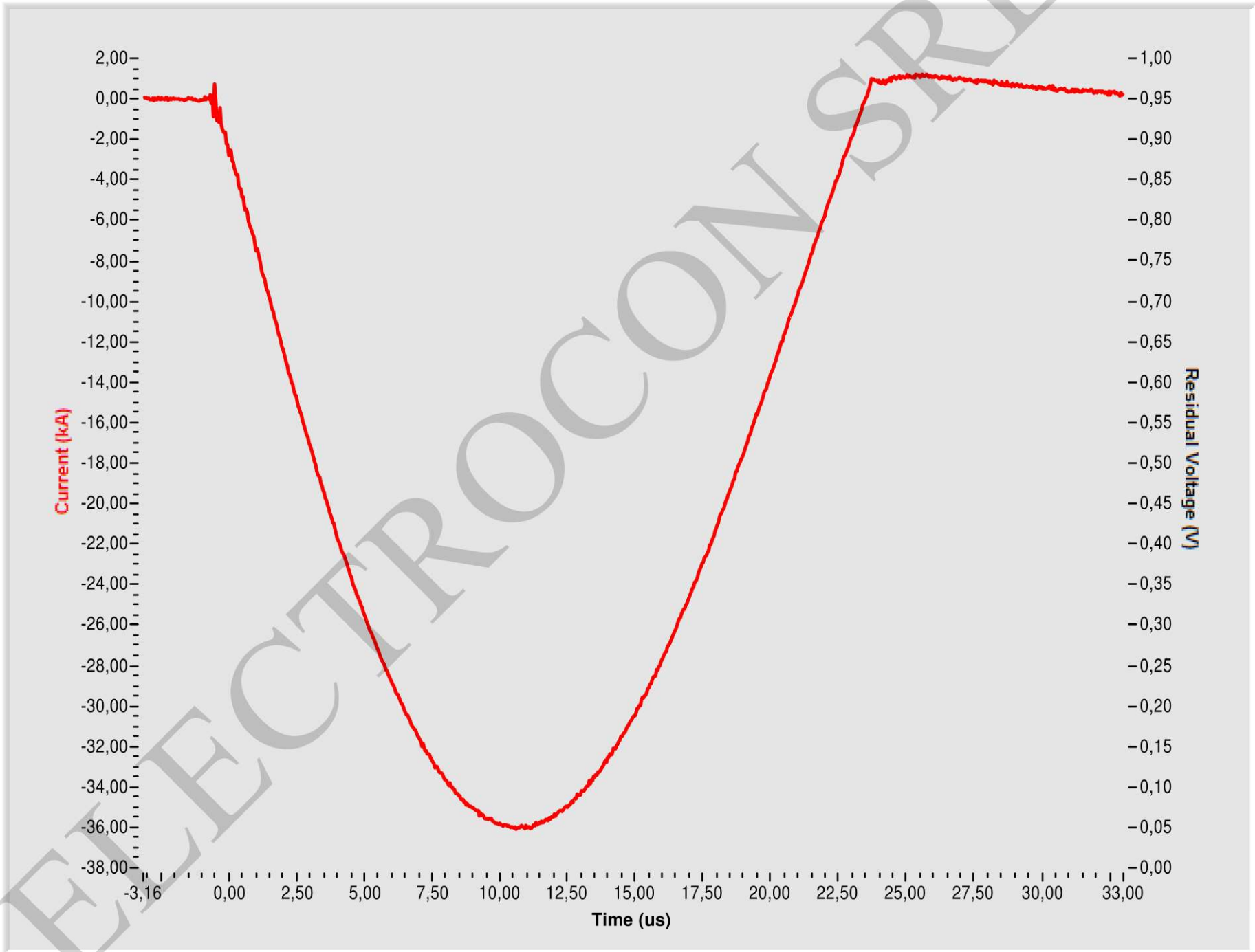

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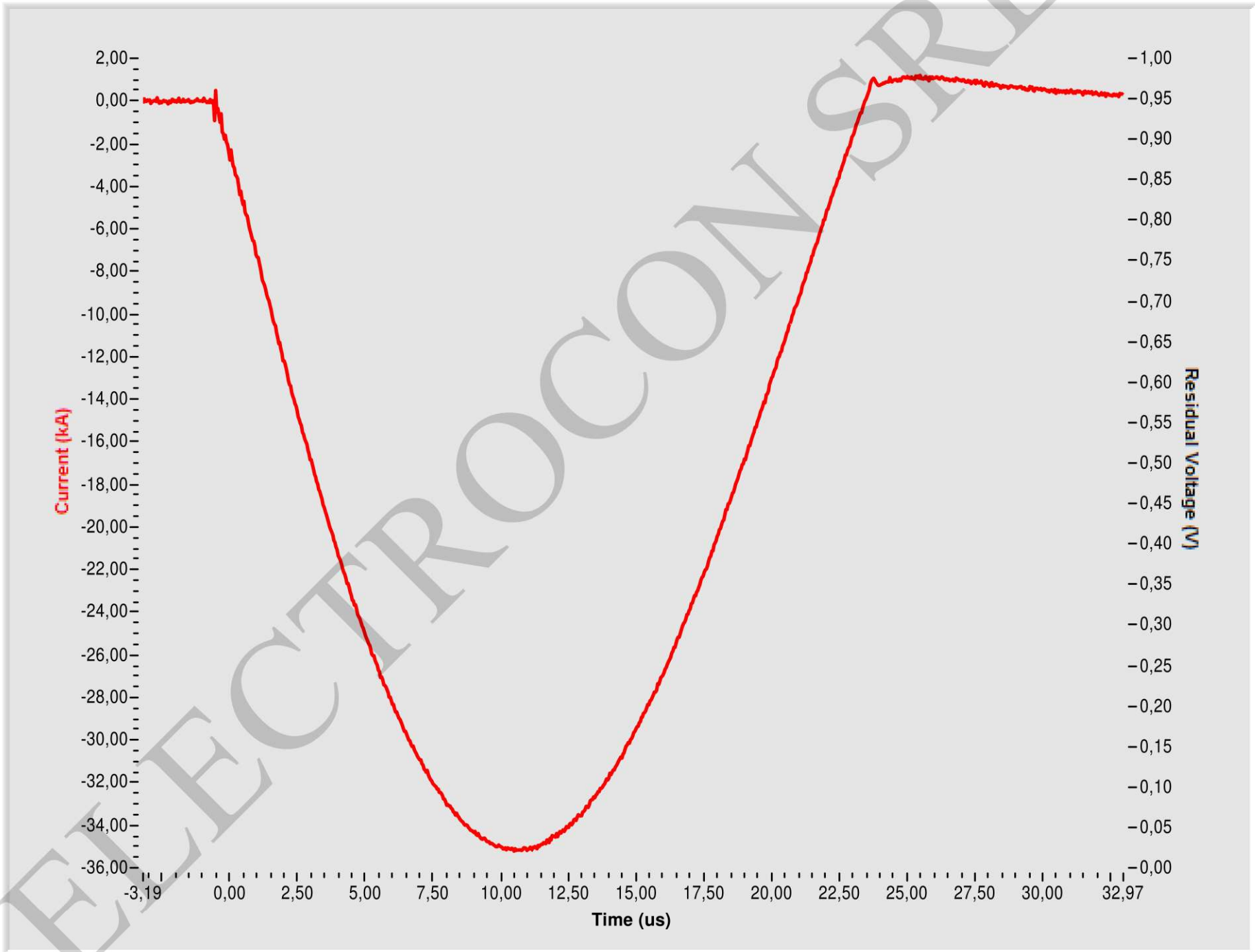

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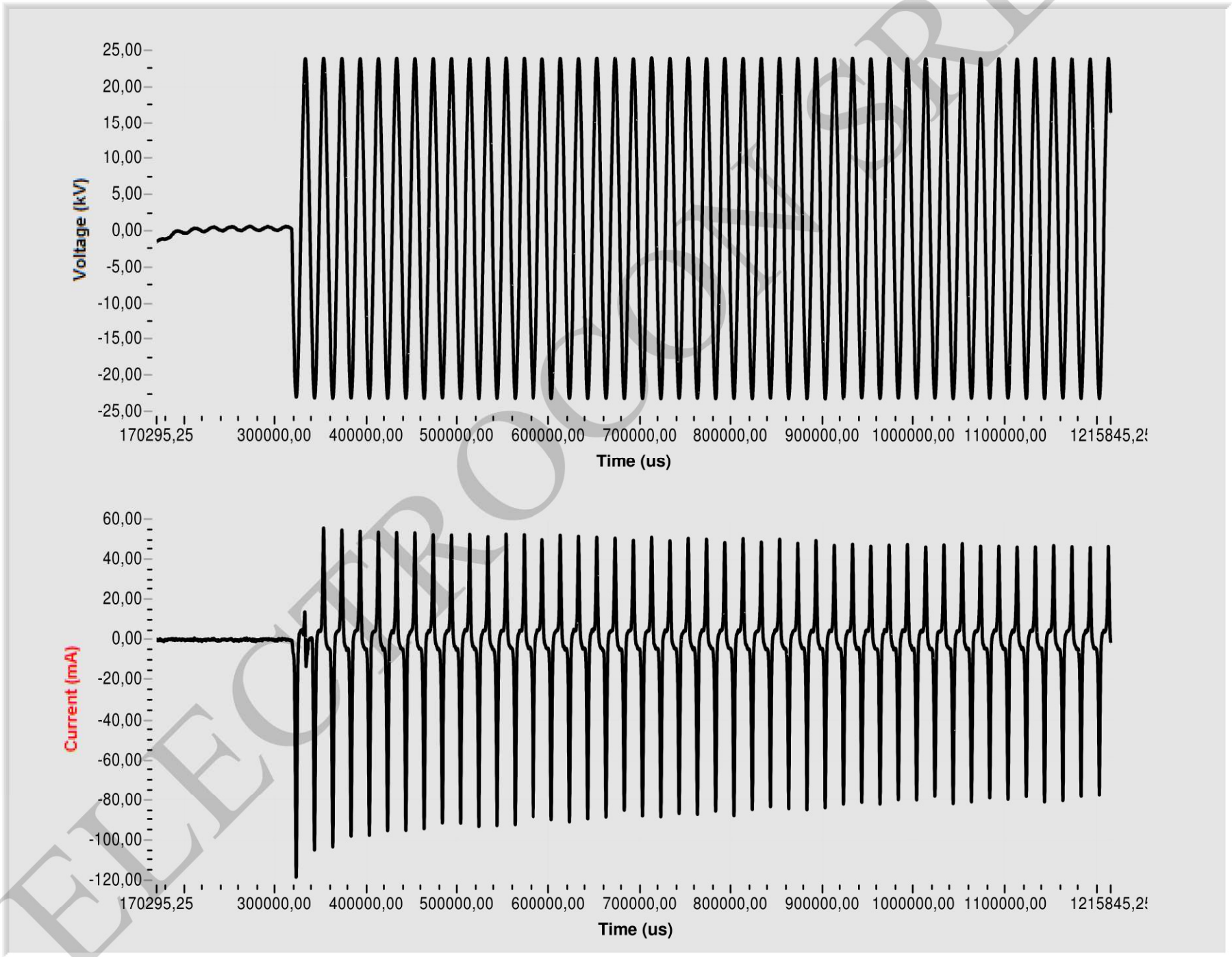

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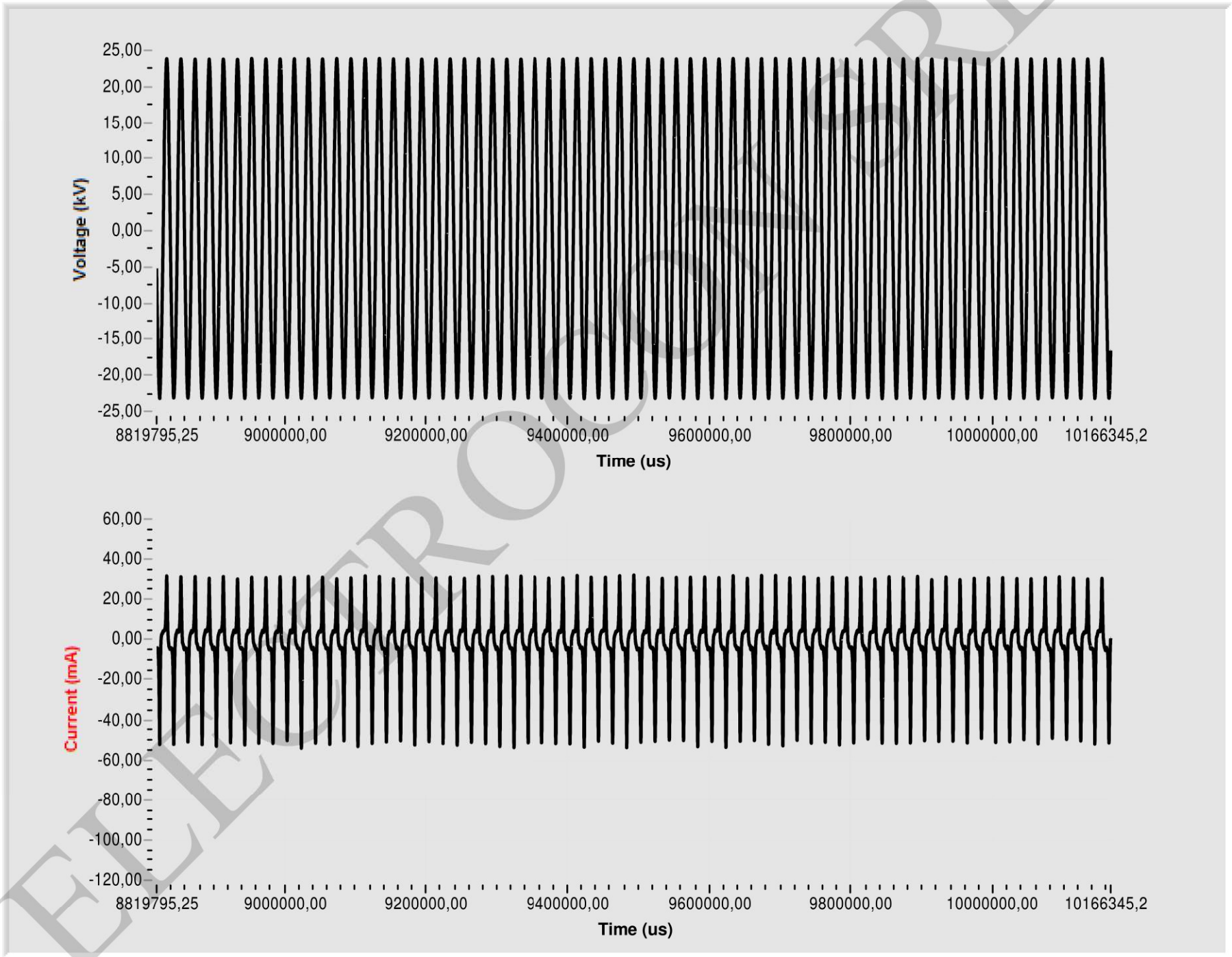

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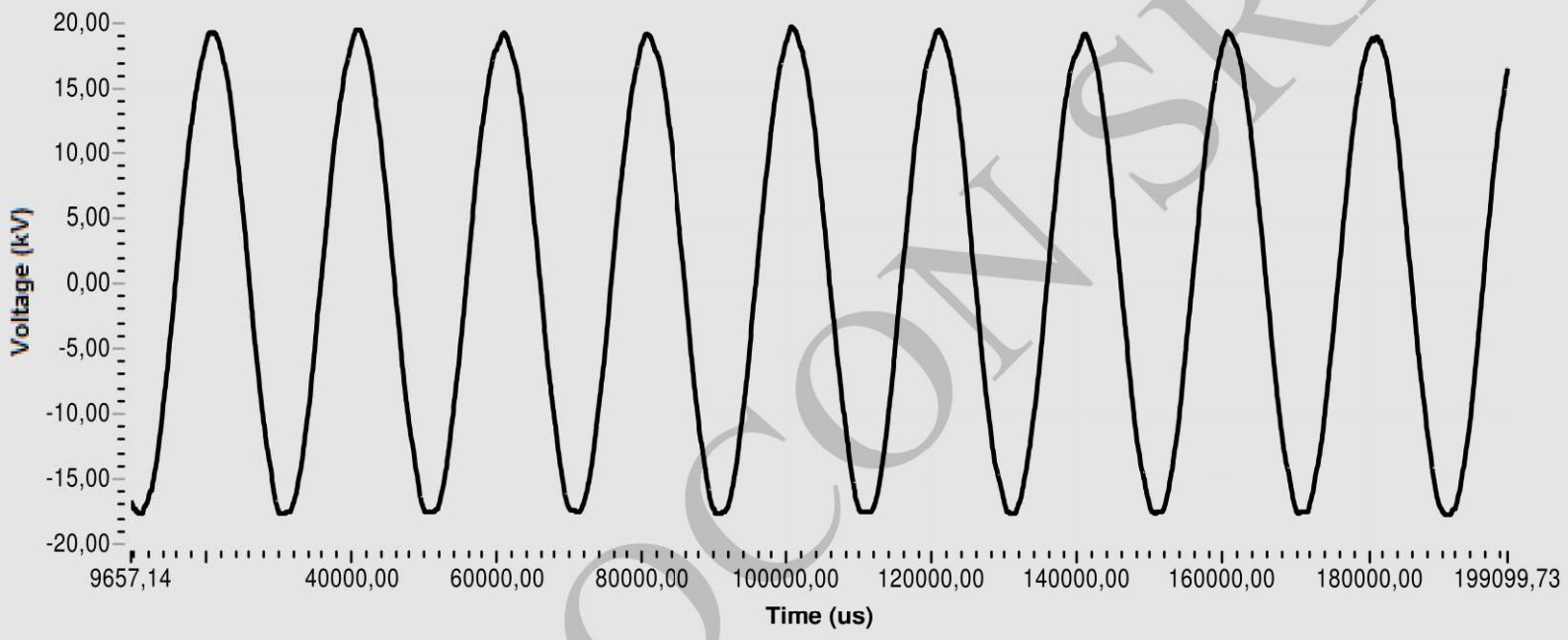

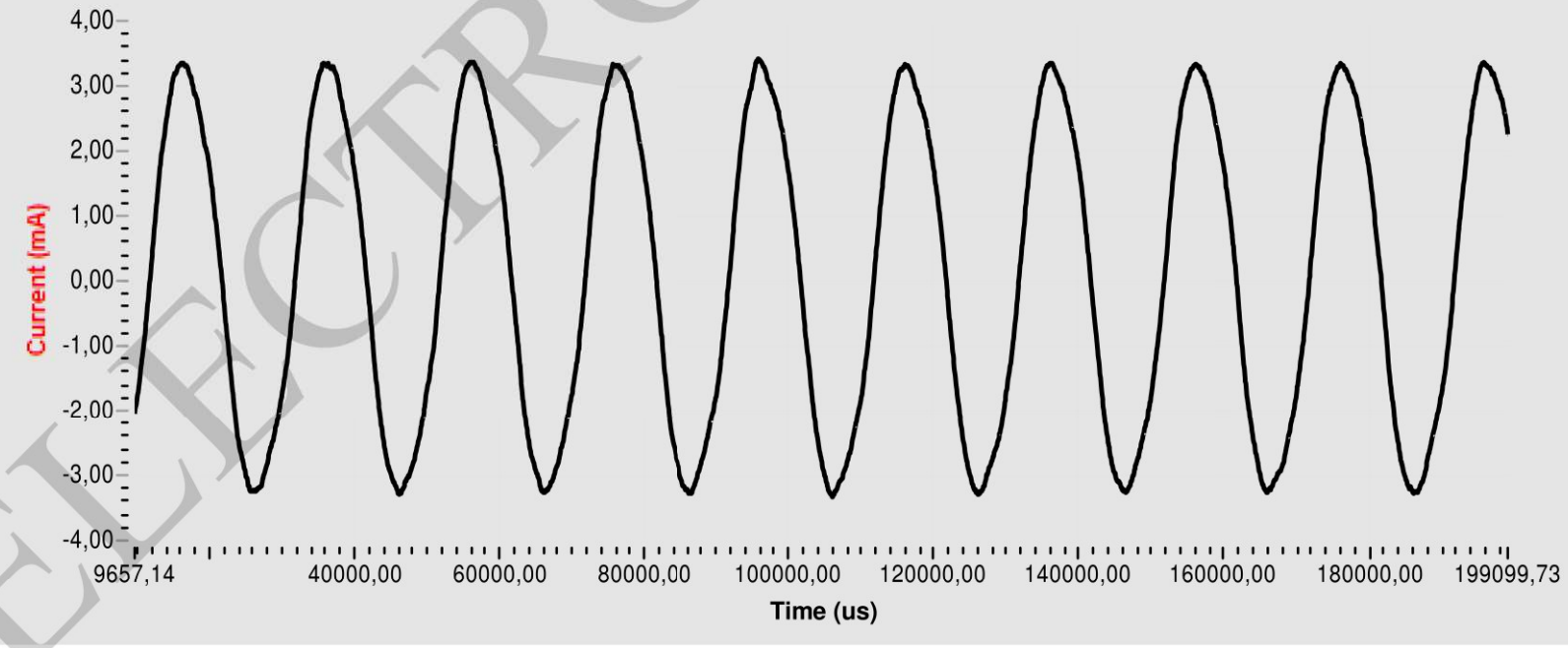

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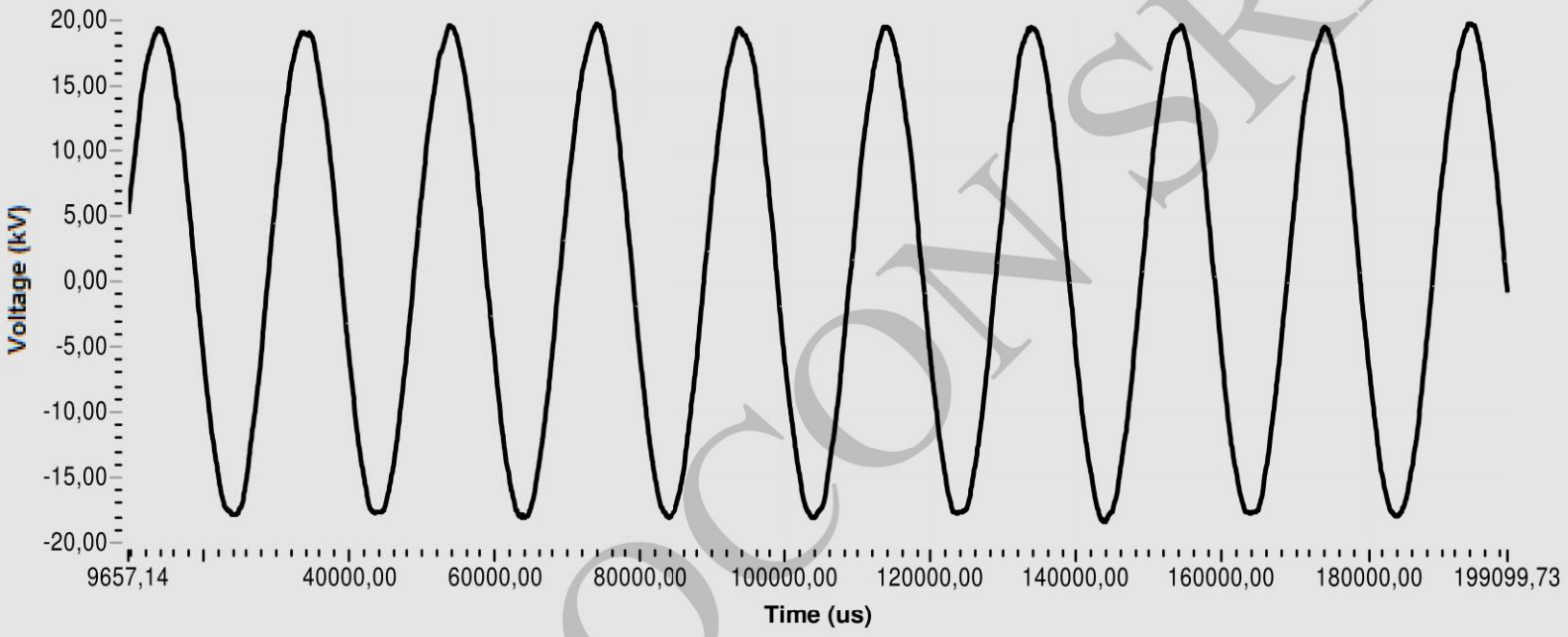

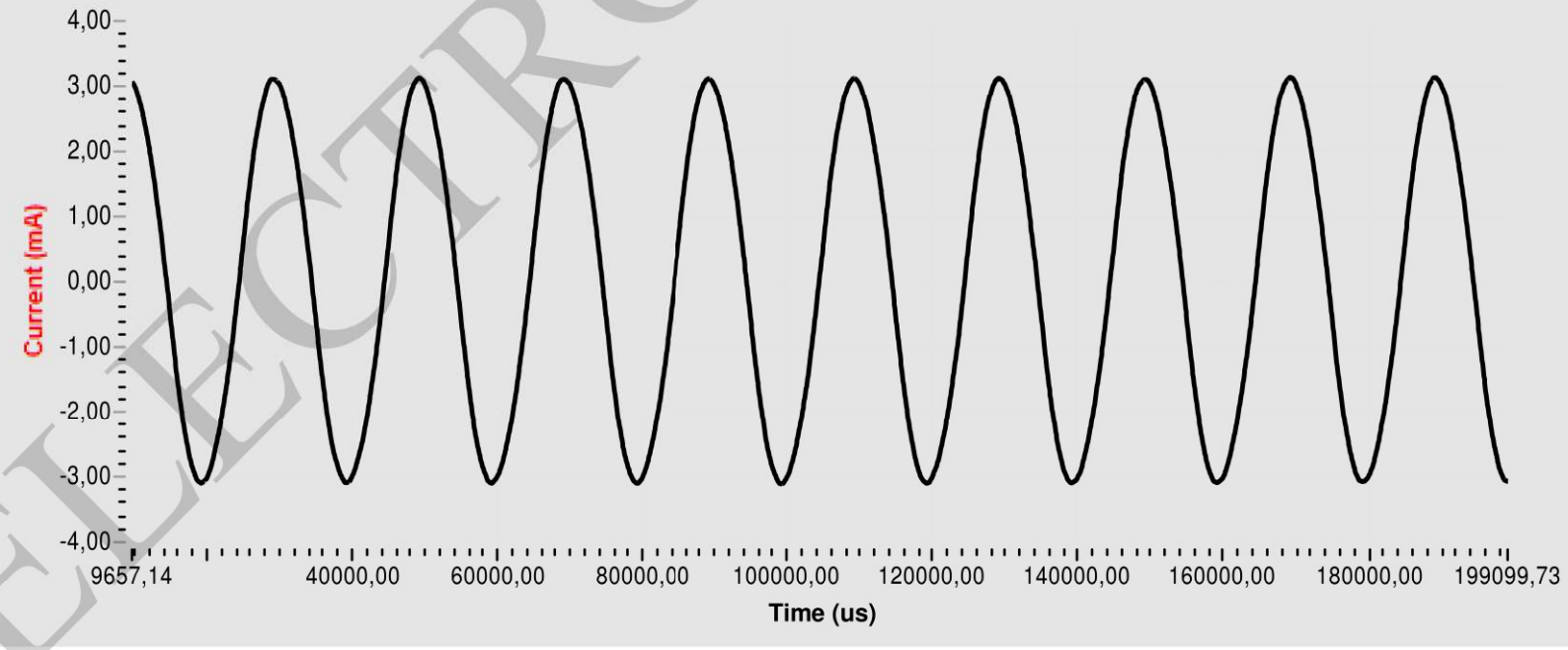

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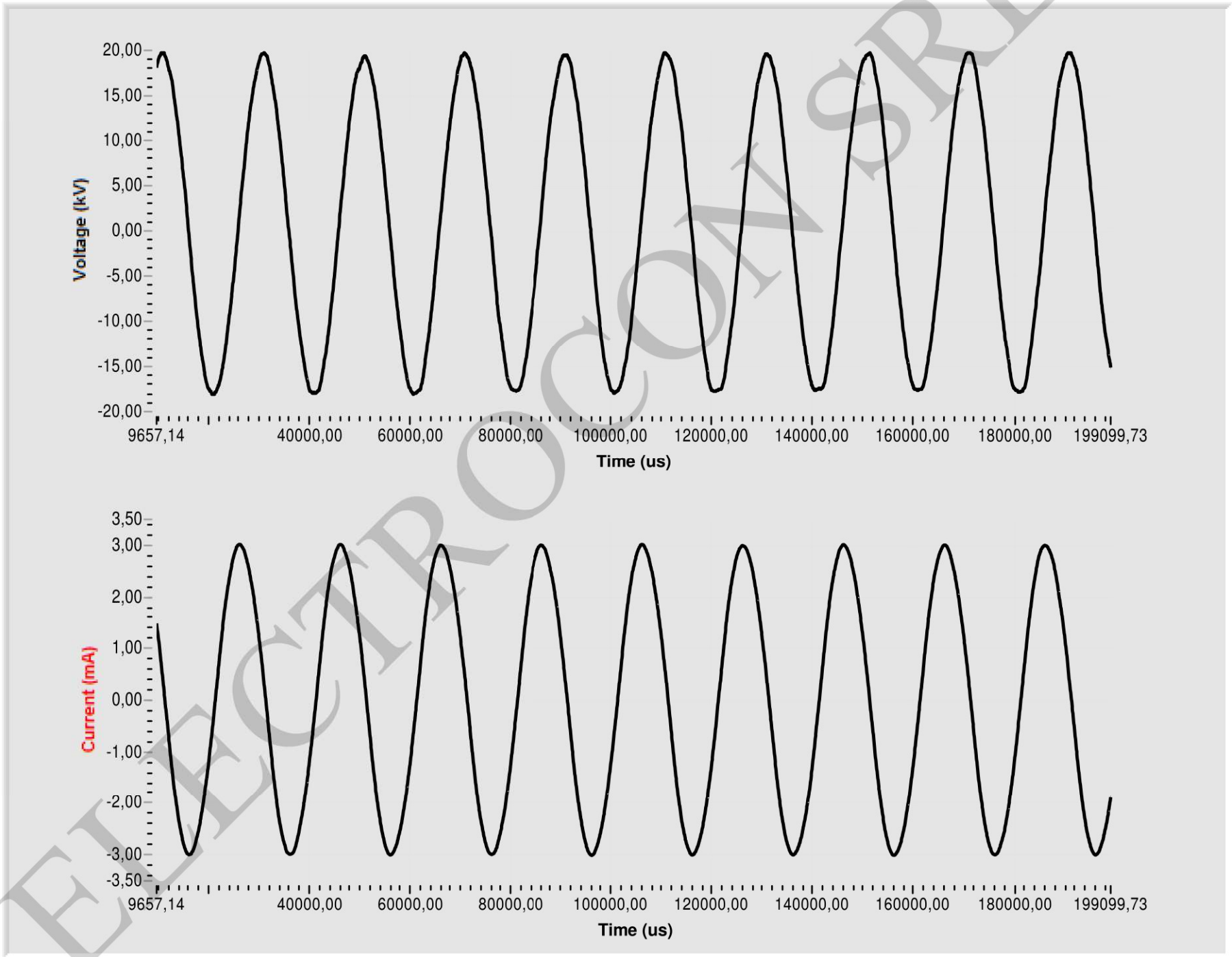

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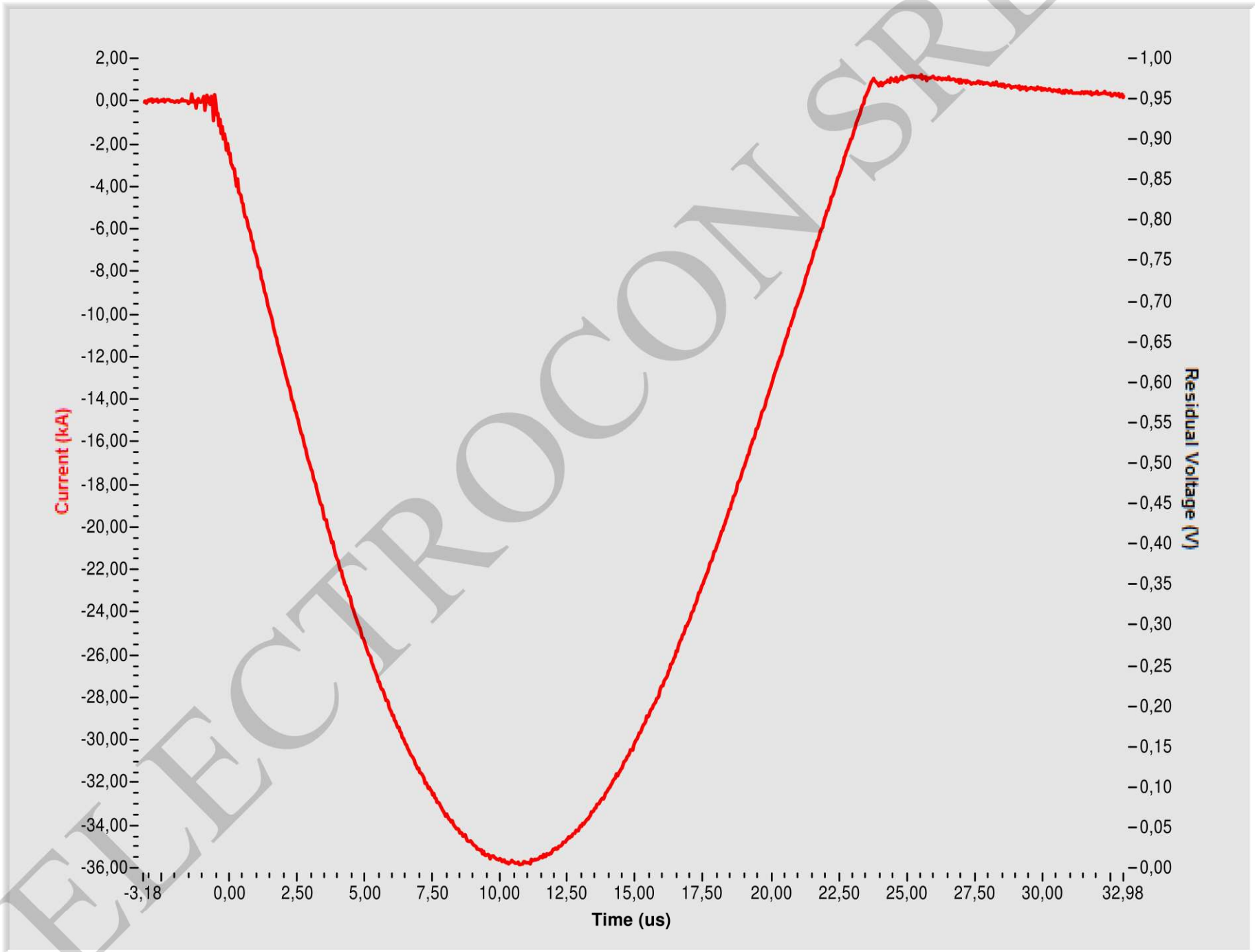

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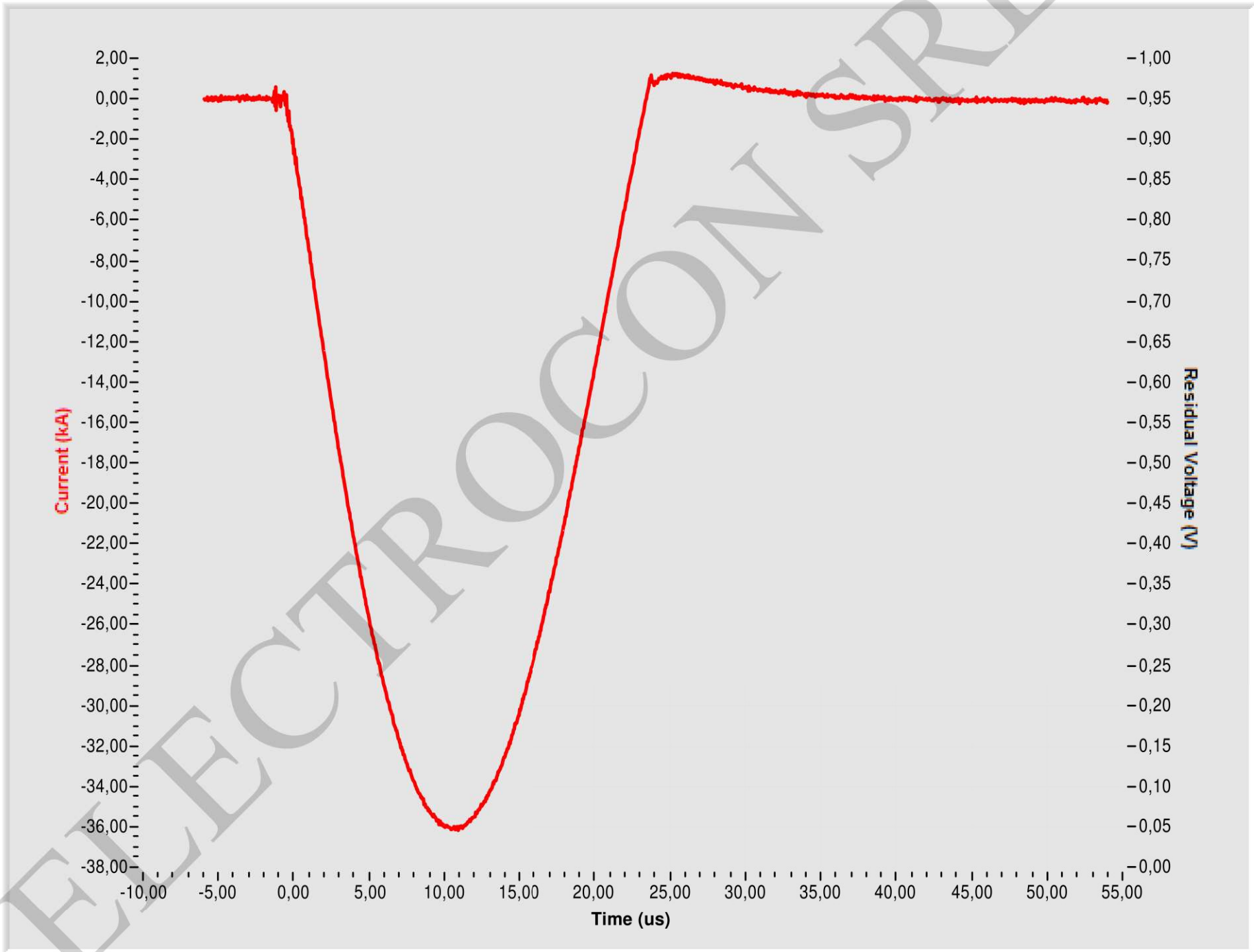

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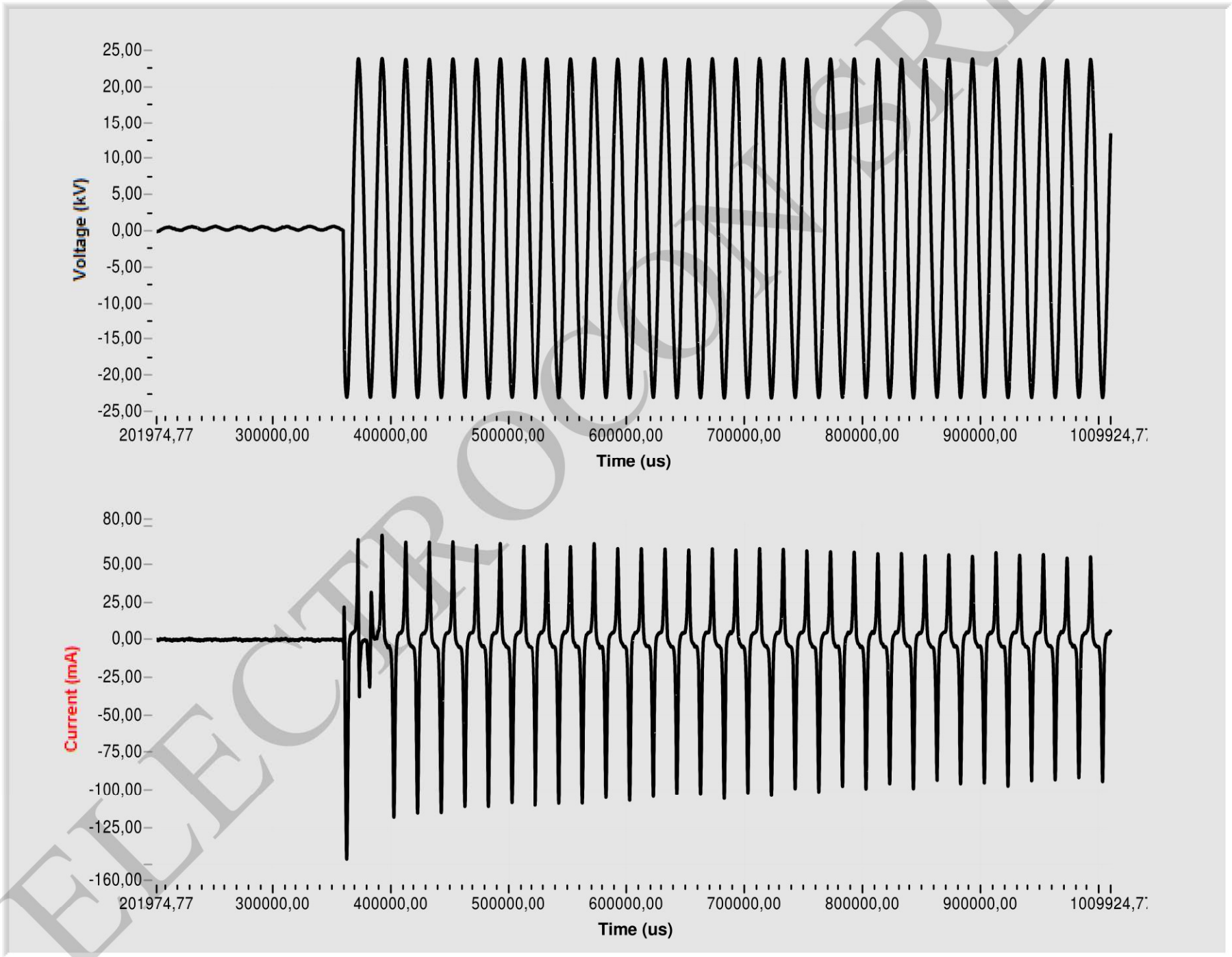

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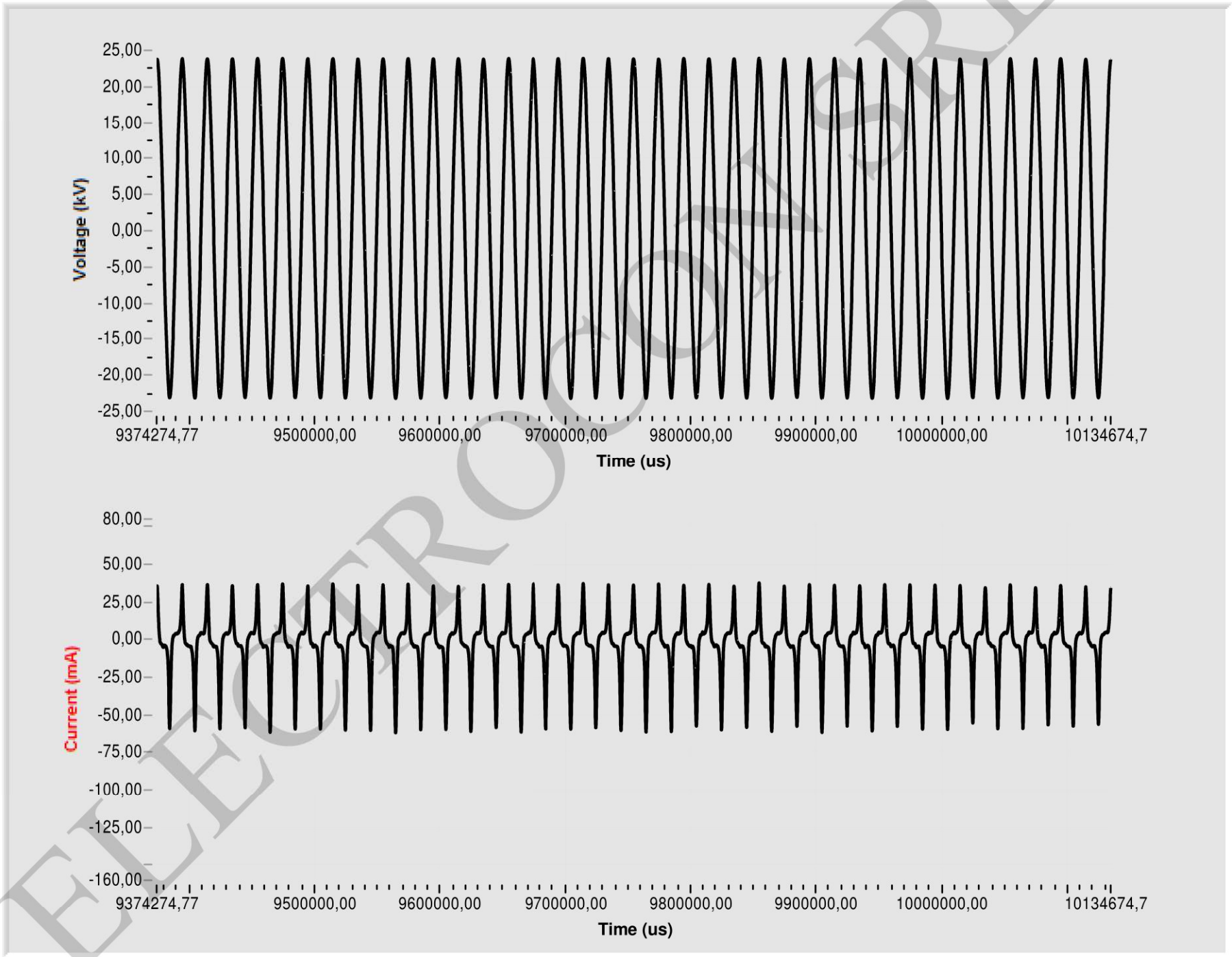

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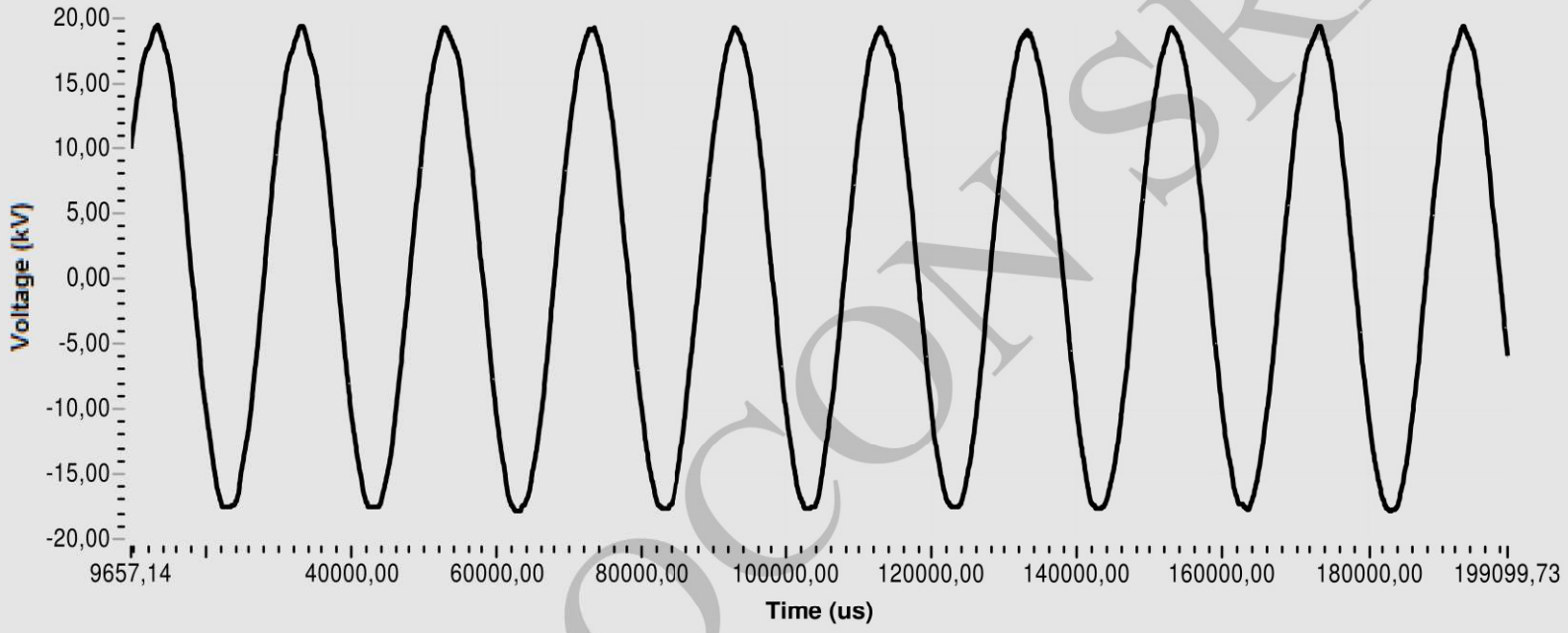

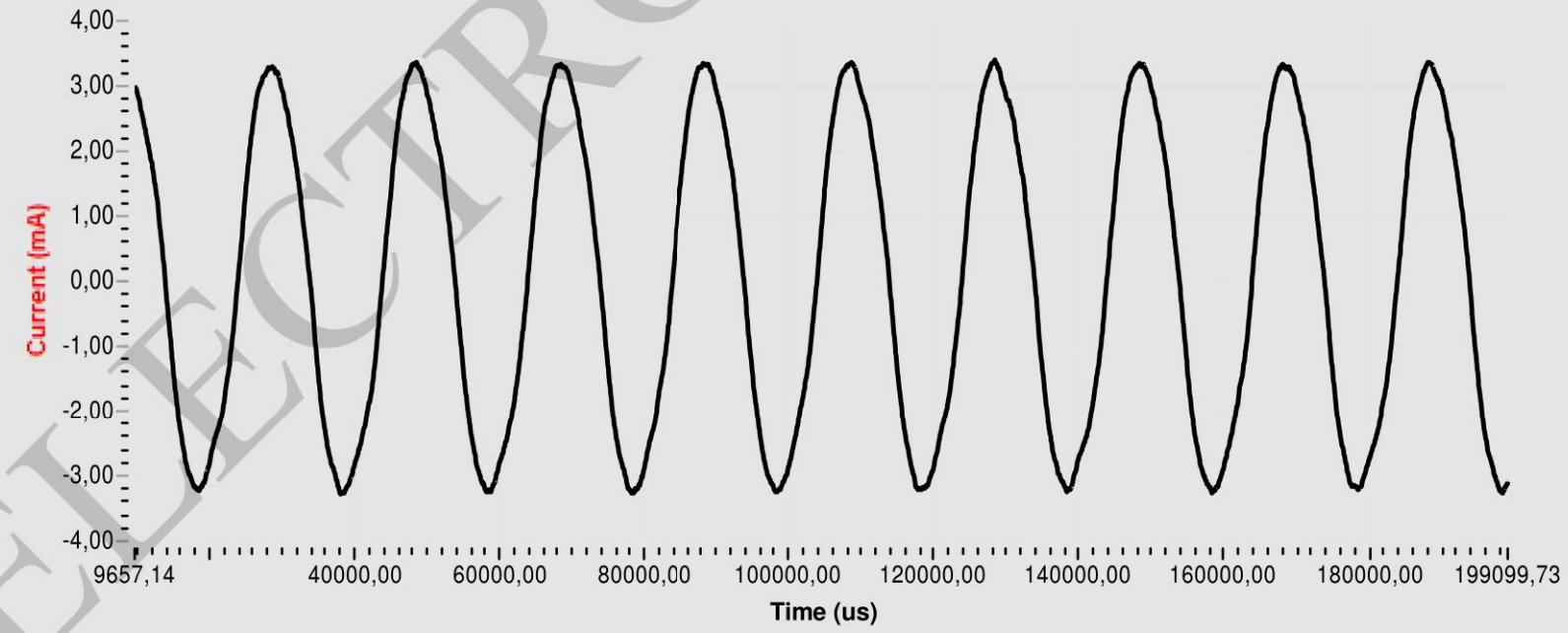

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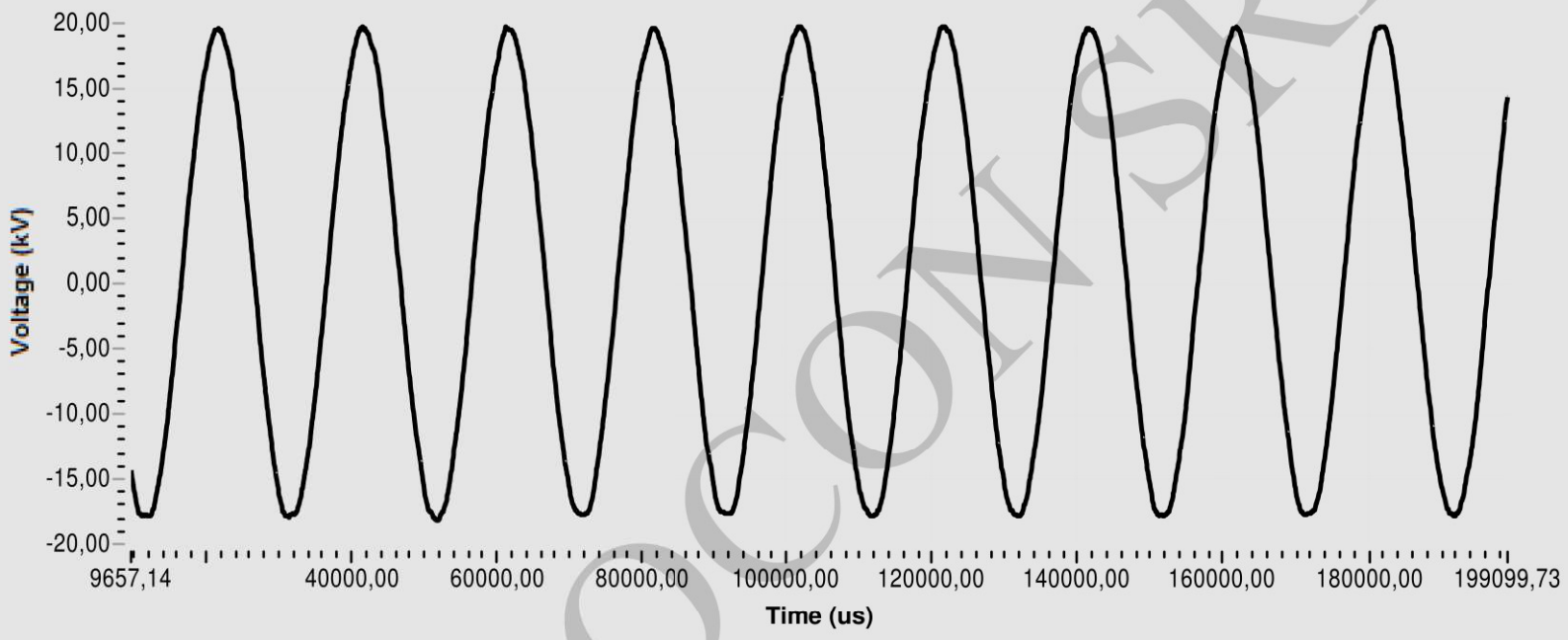
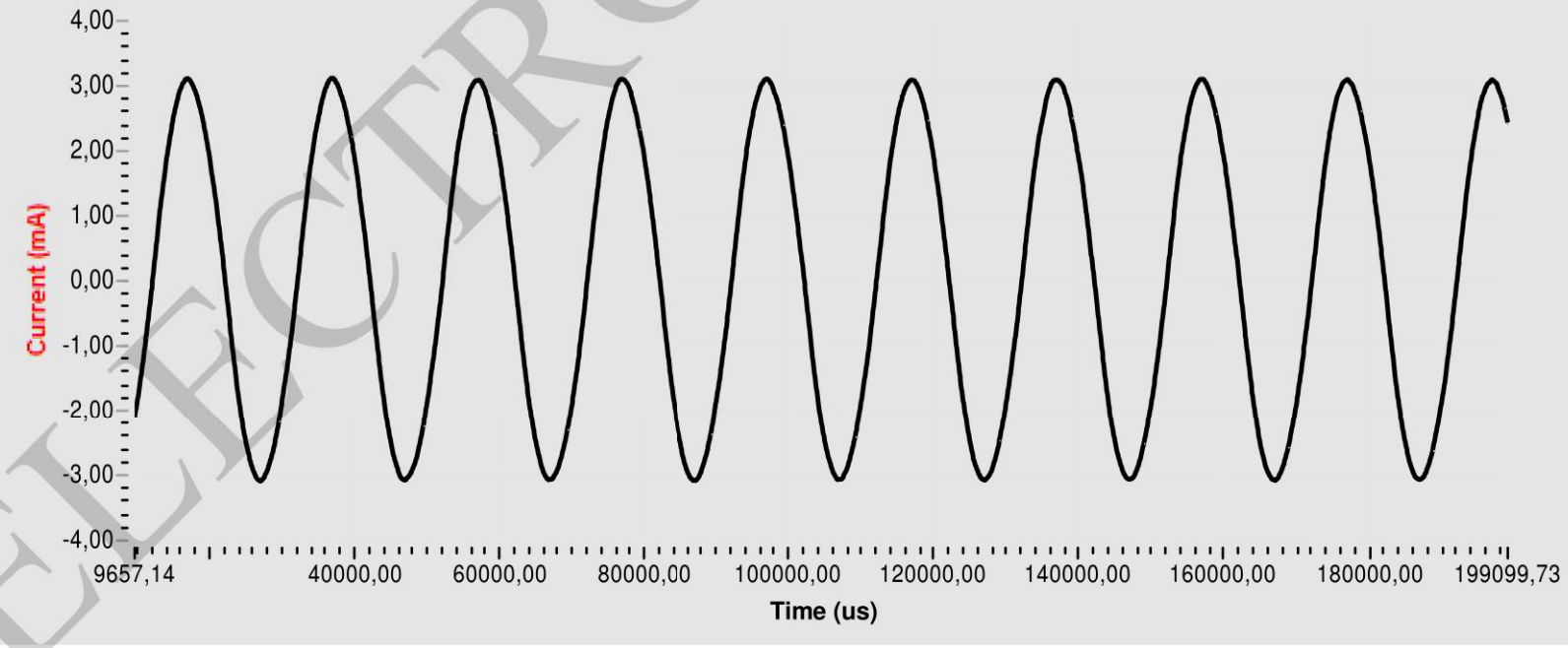
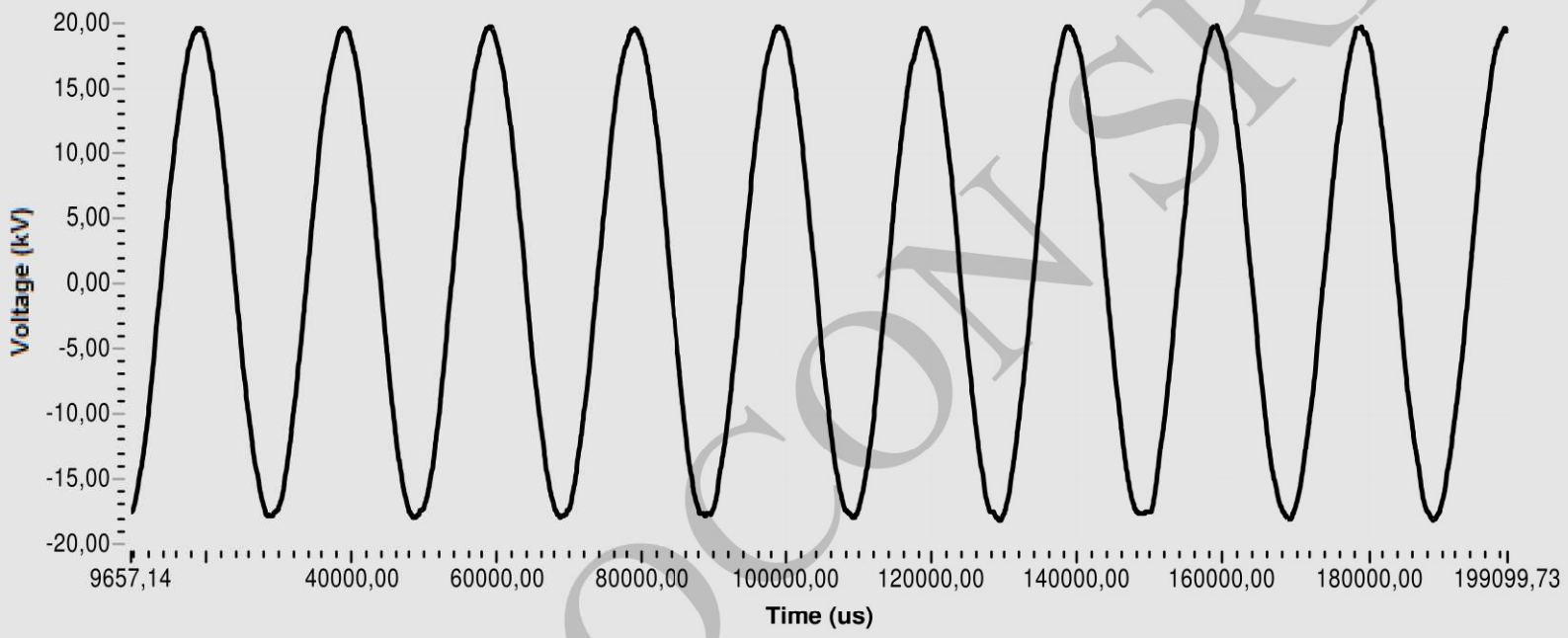
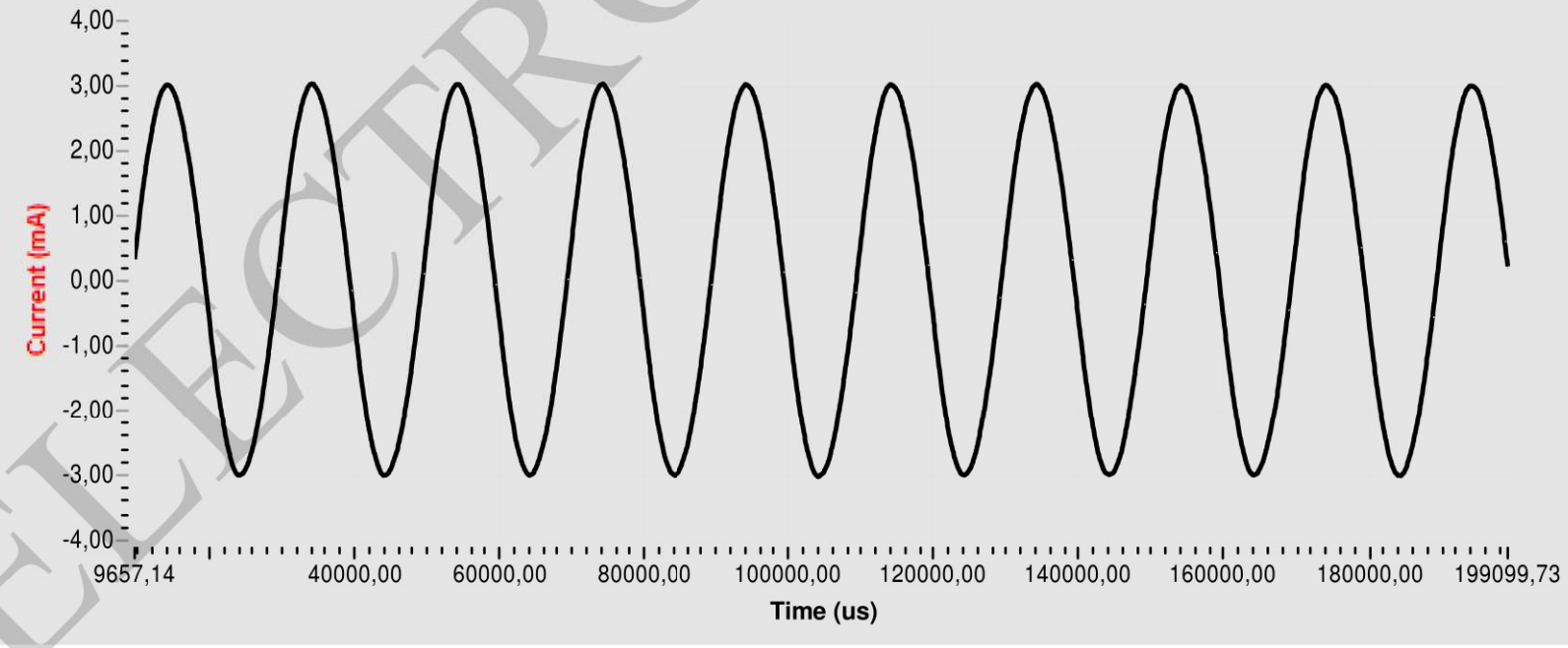


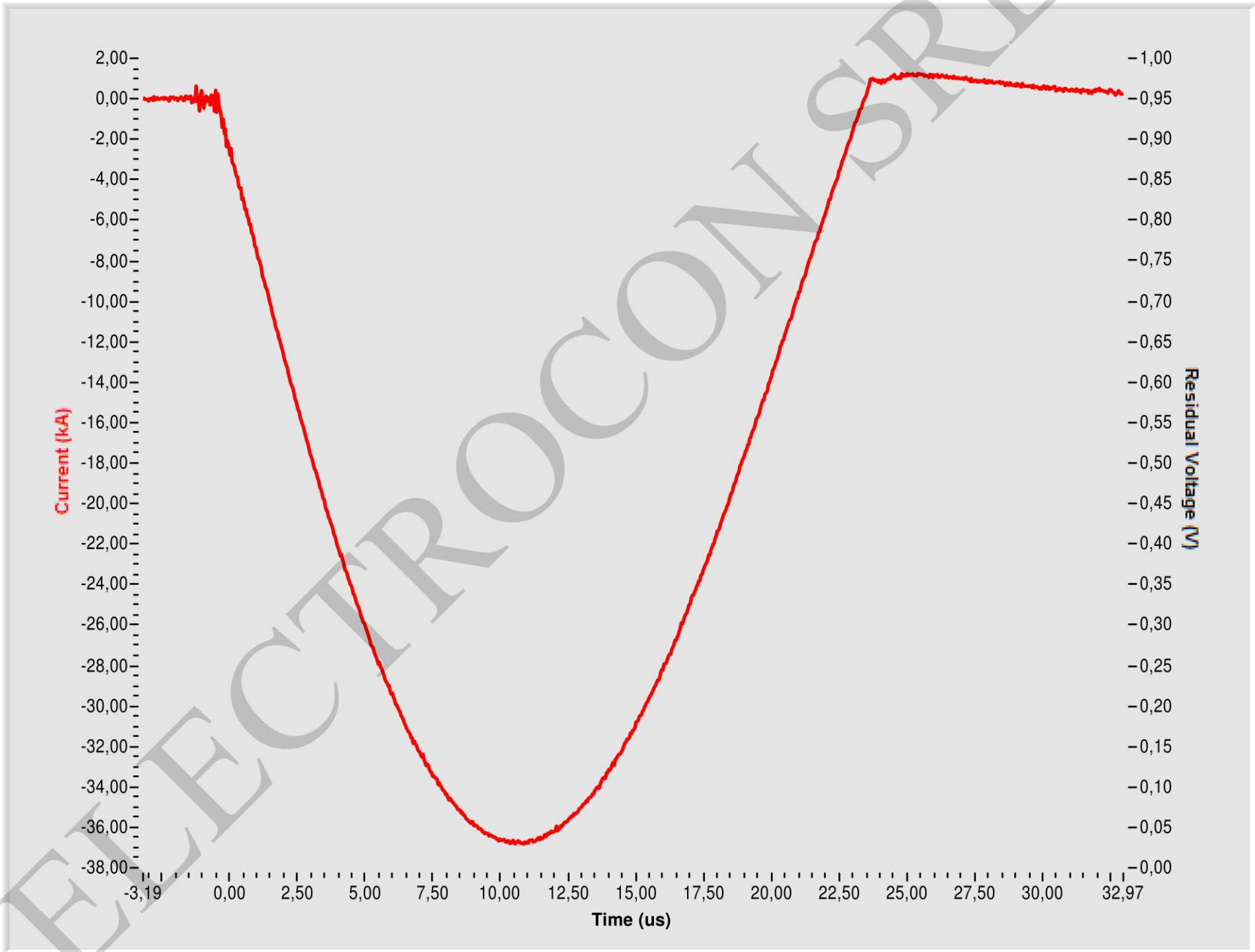


CESI C2016984 Oscillogram n. 23

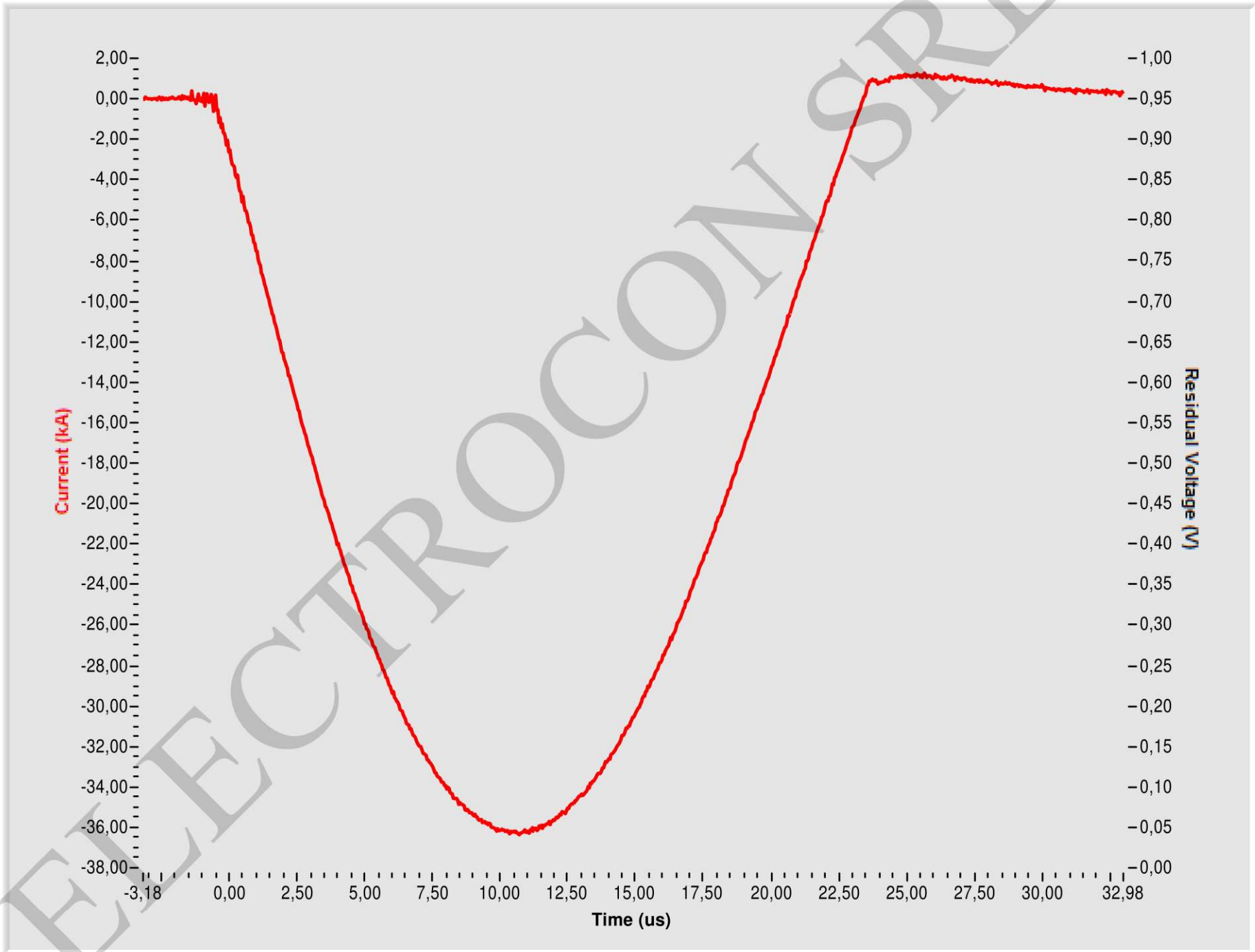




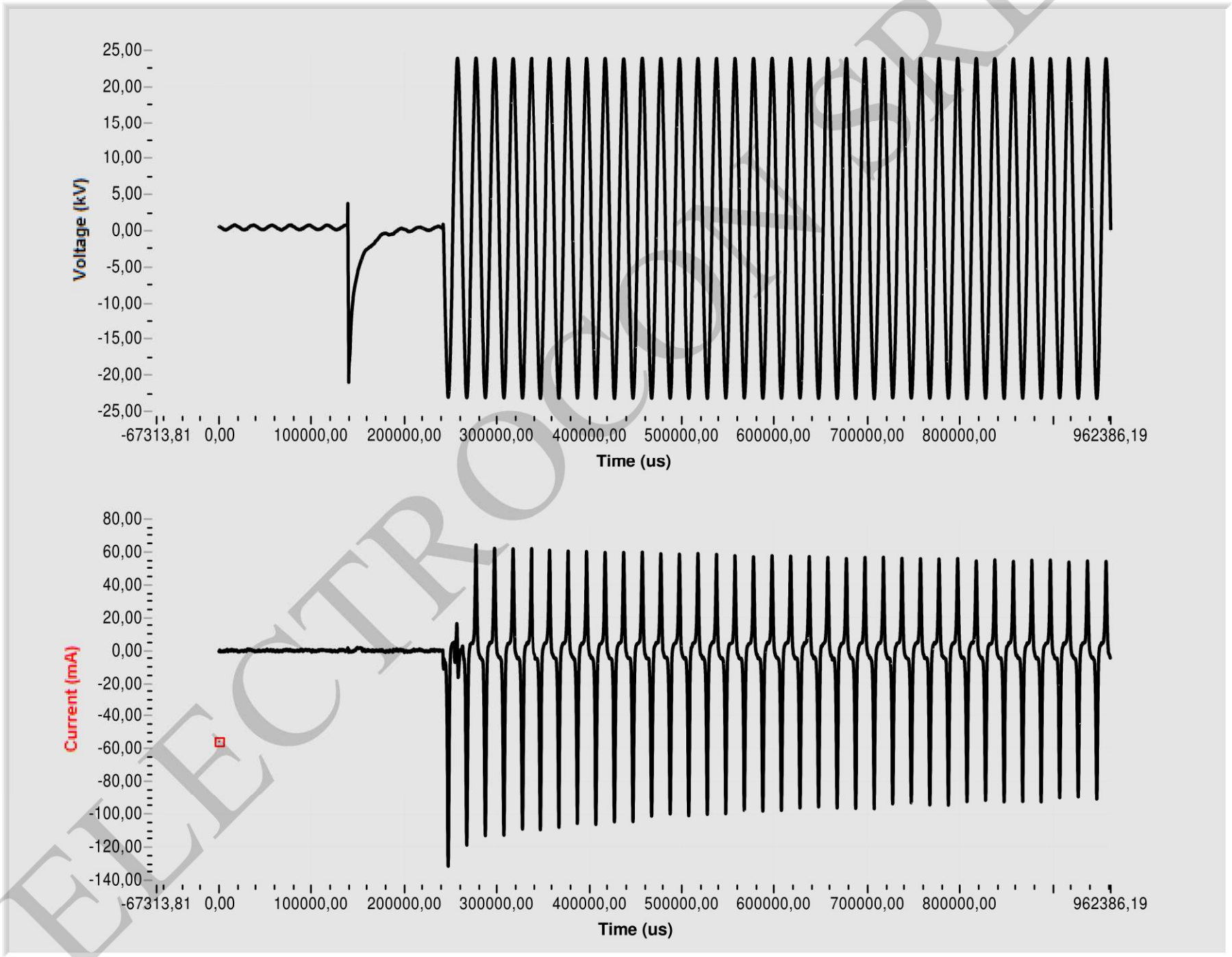
CESI C2016984 Oscillogram n. 24



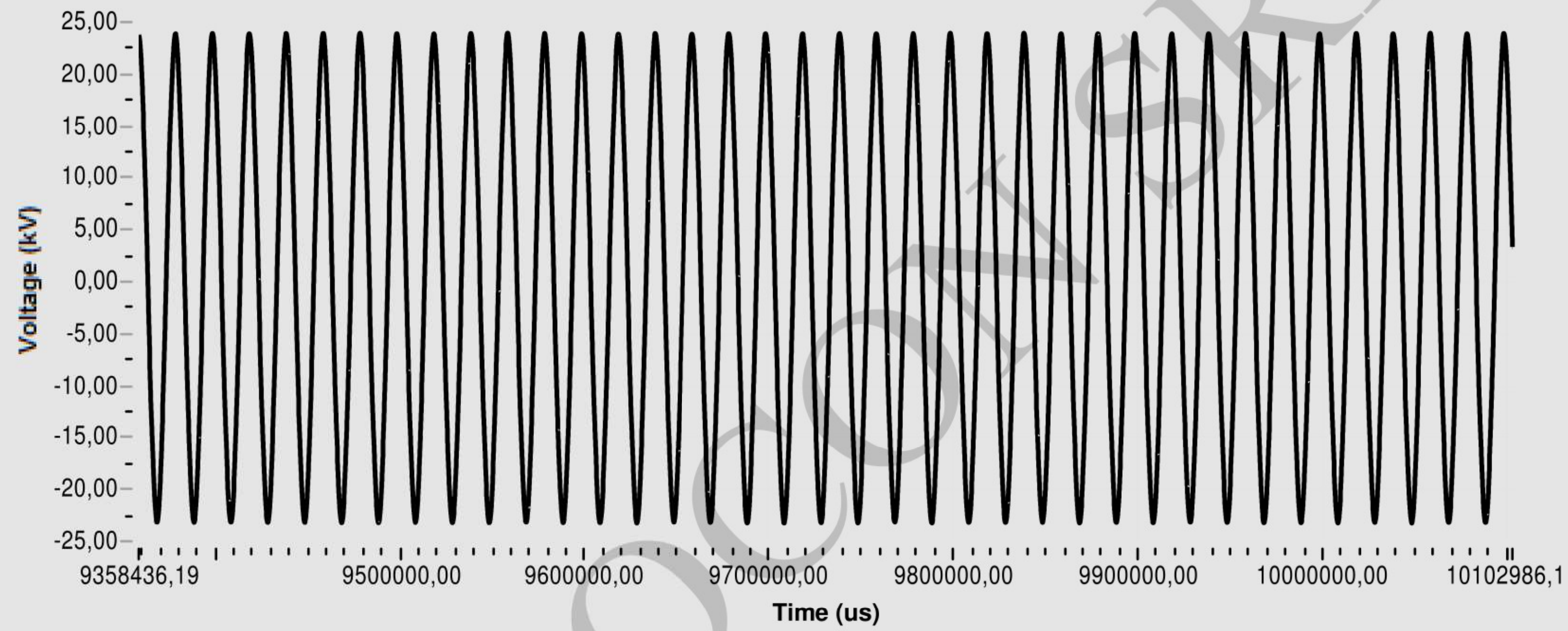
CESI C2016984 Oscillogram n. 25

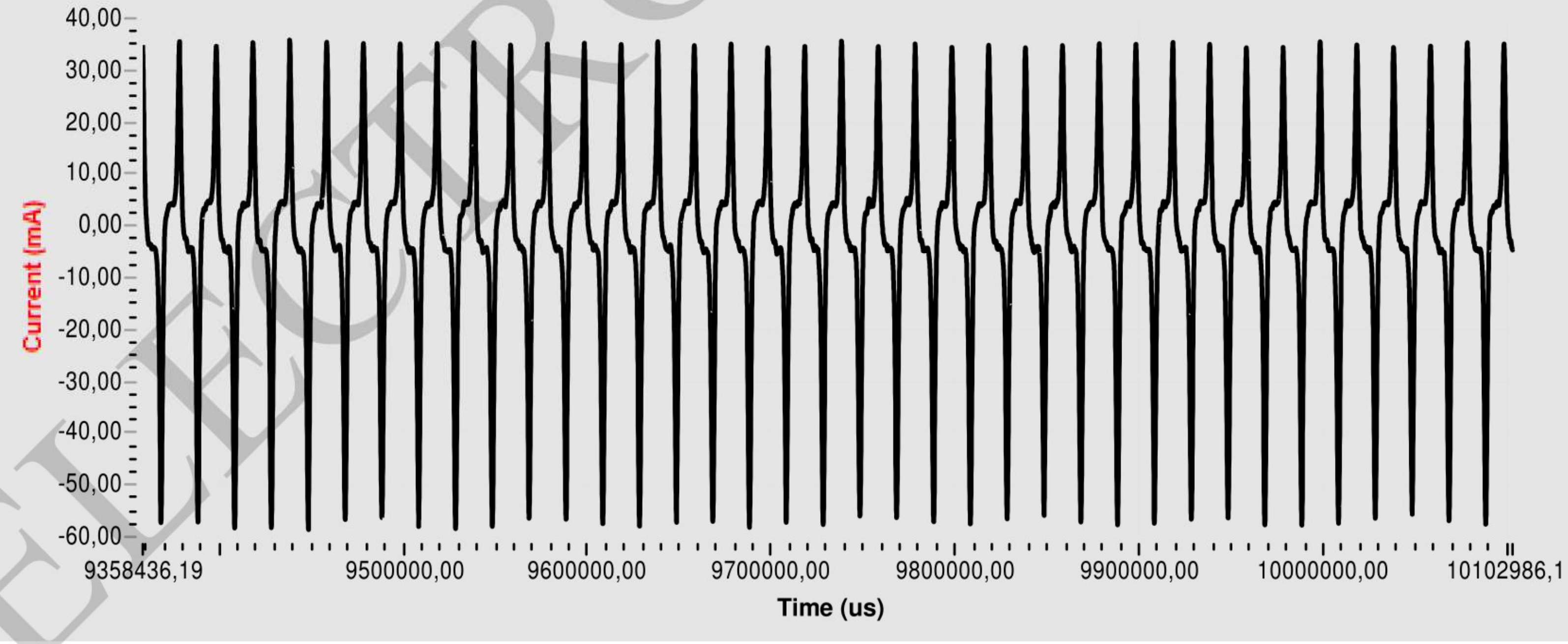


CESI C2016984 Oscillogram n. 26

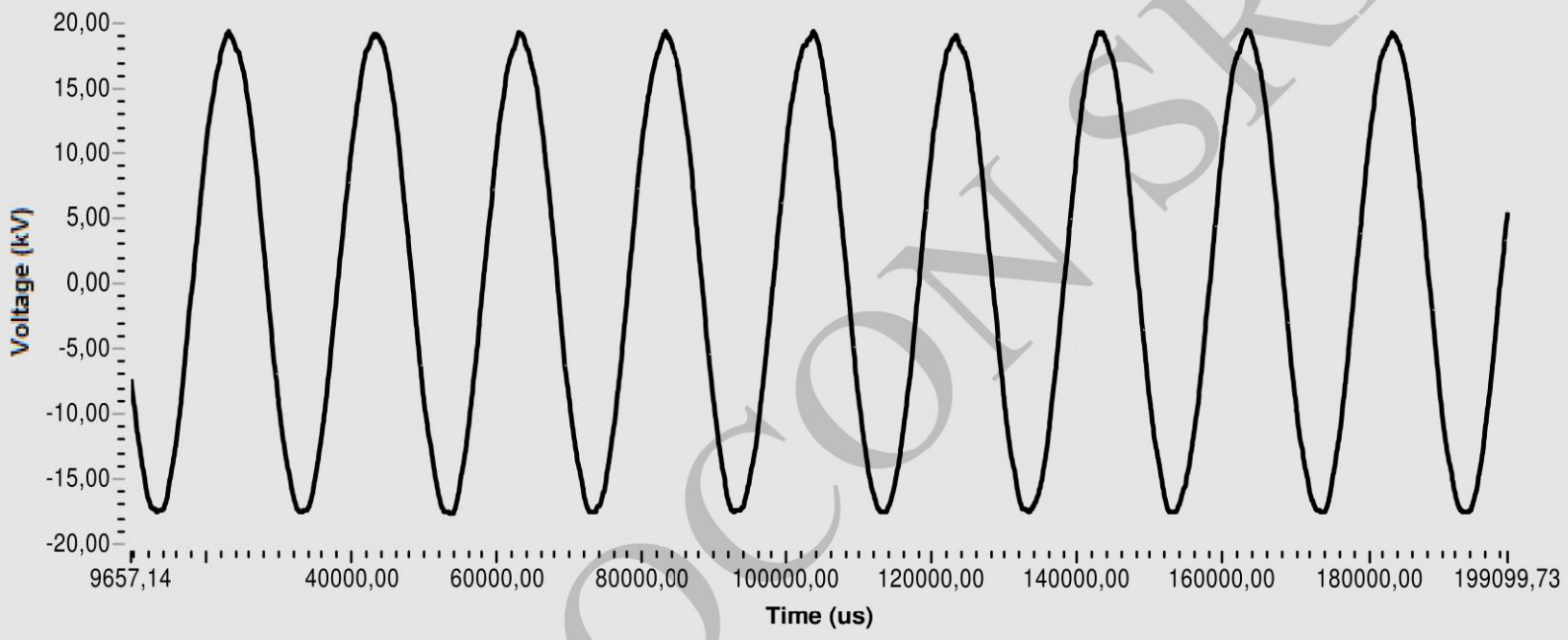


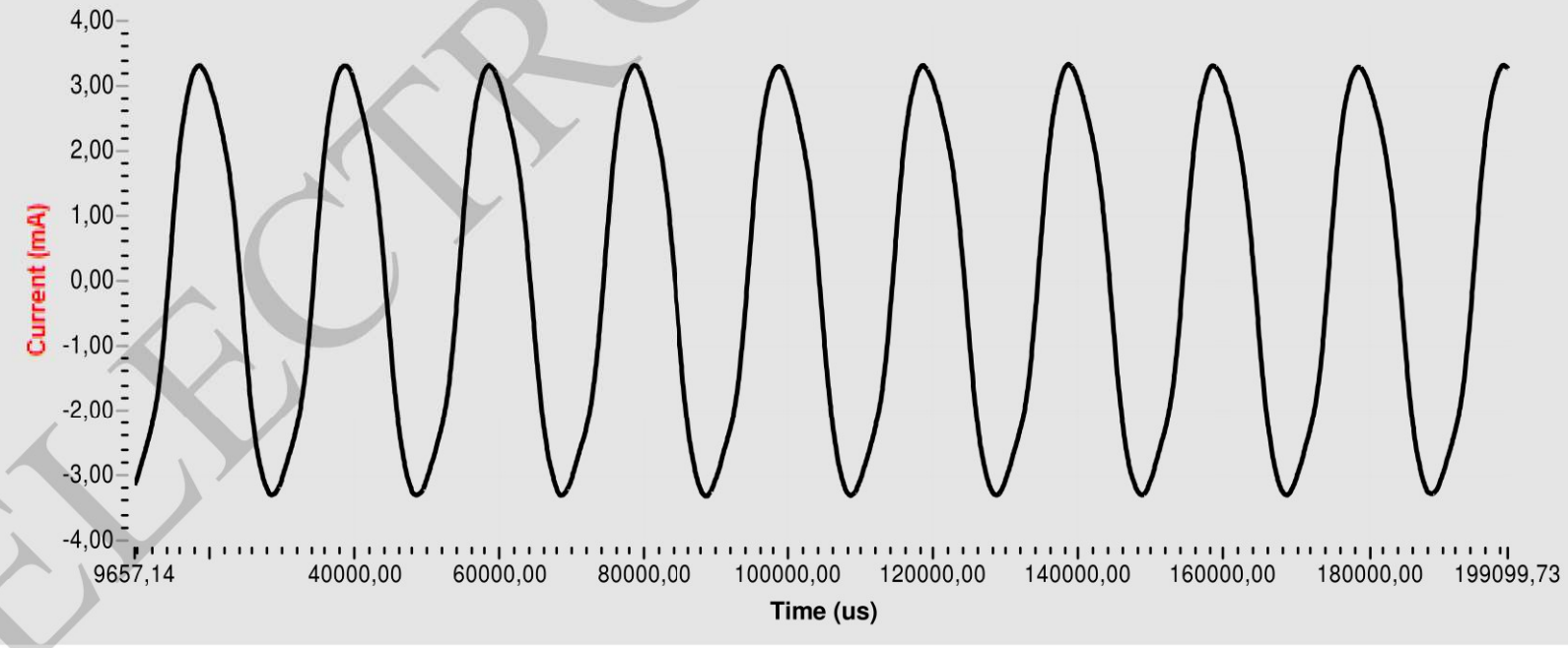
CESI C2016984 Oscillogram n. 27



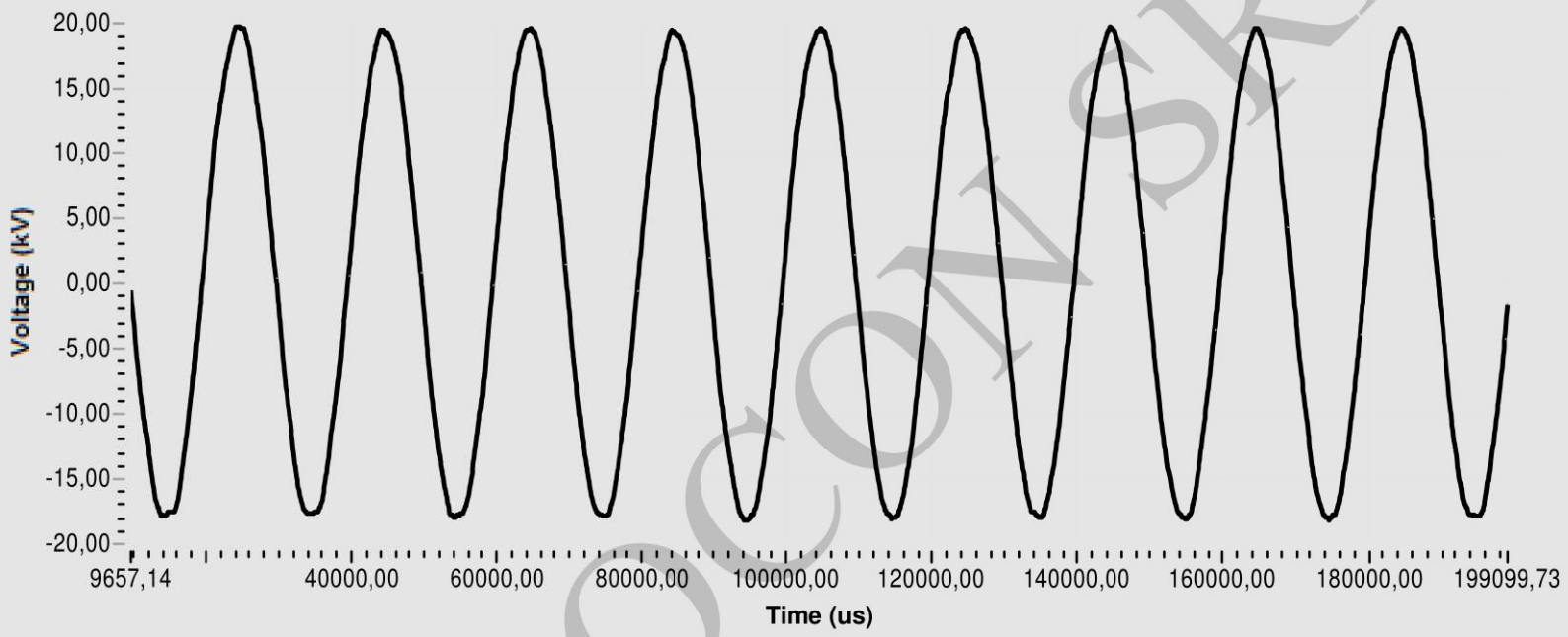


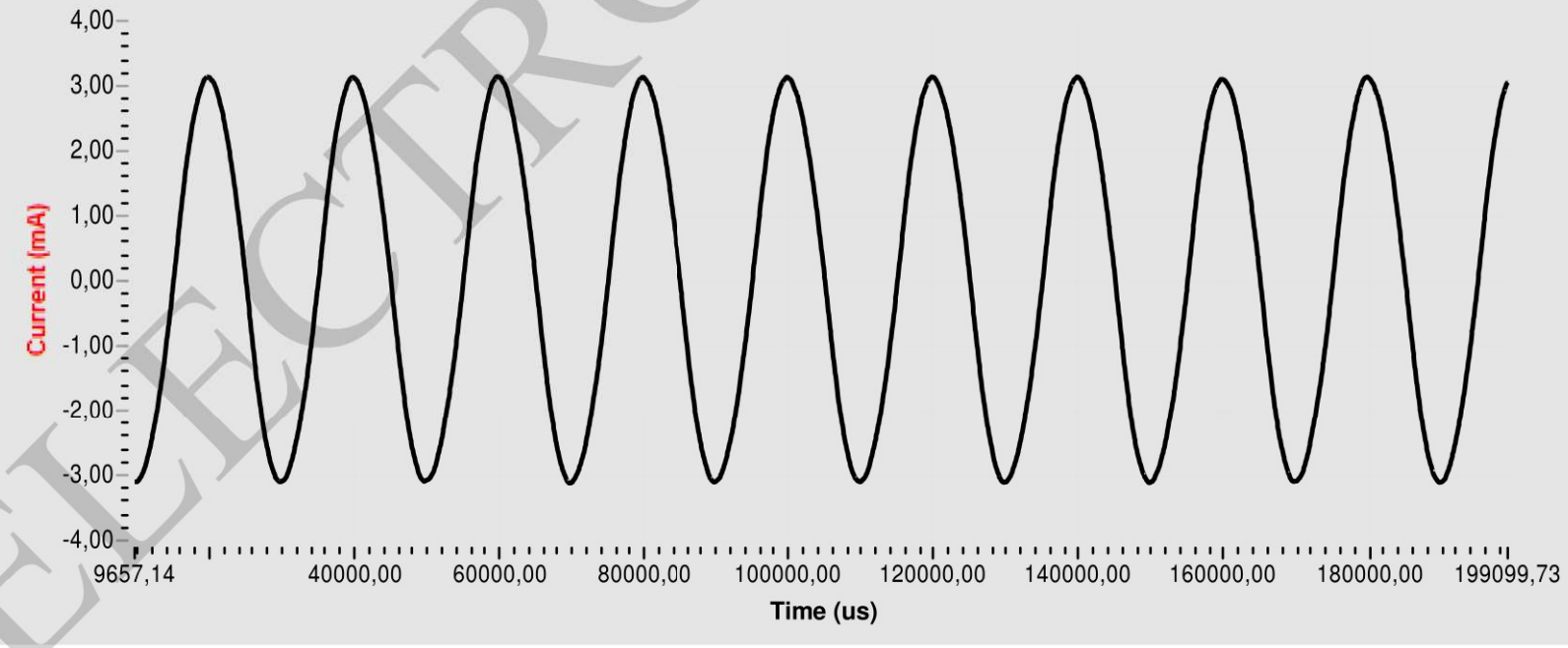
CESI C2016984 Oscillogram n. 28



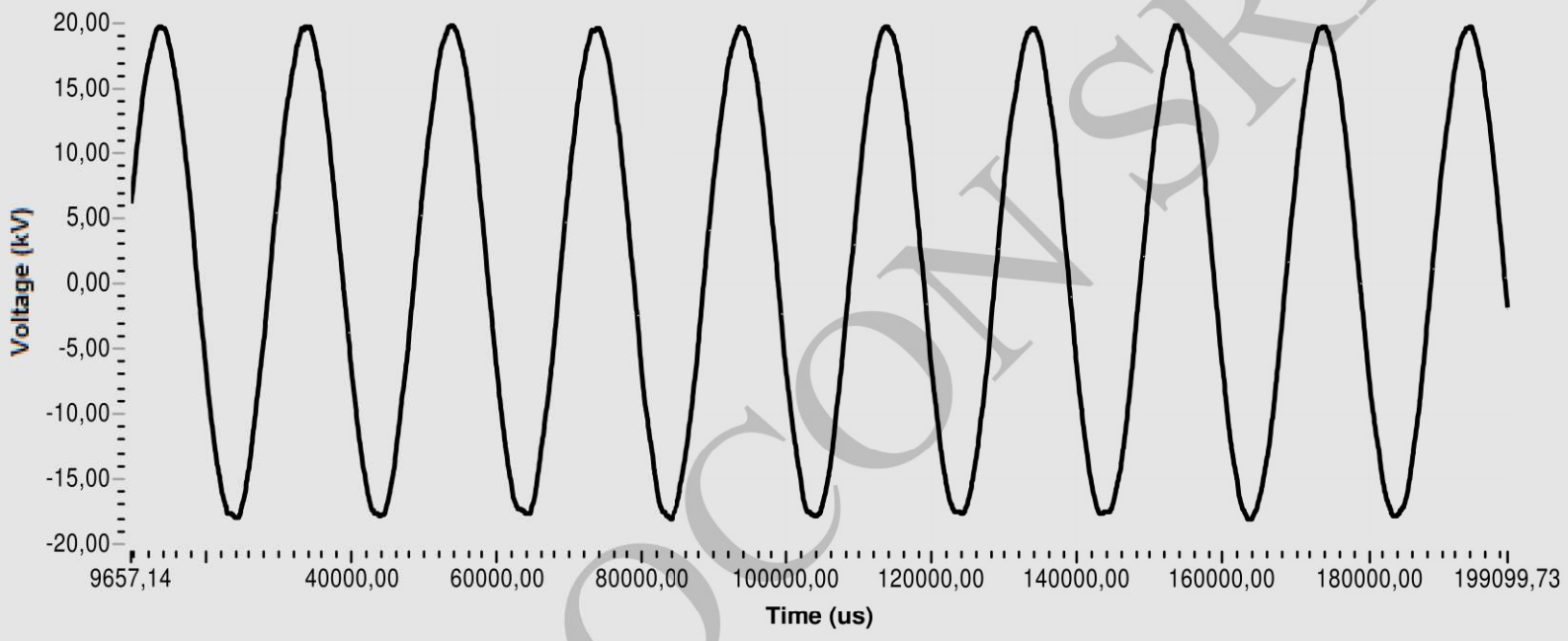


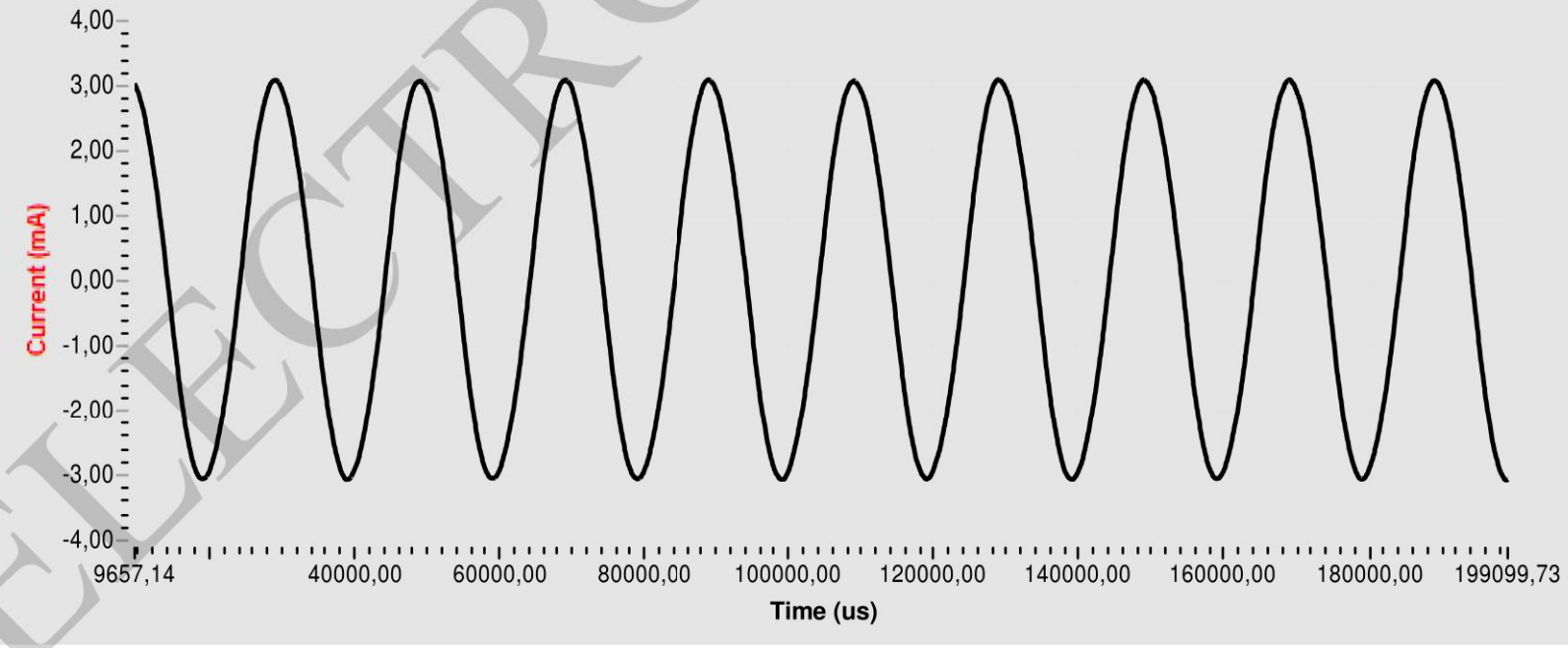
CESI C2016984 Oscillogram n. 29



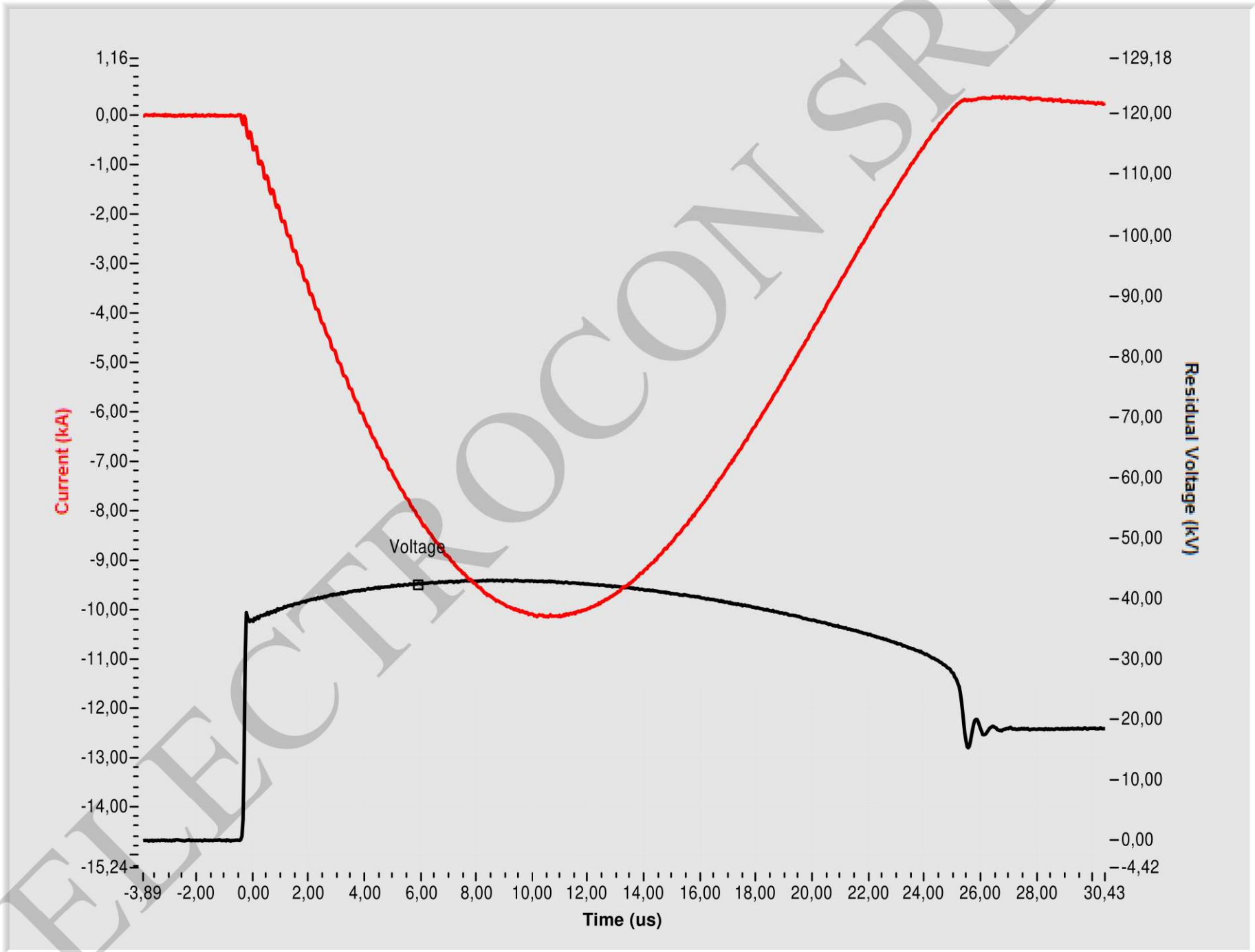


CESI C2016984 Oscillogram n. 30

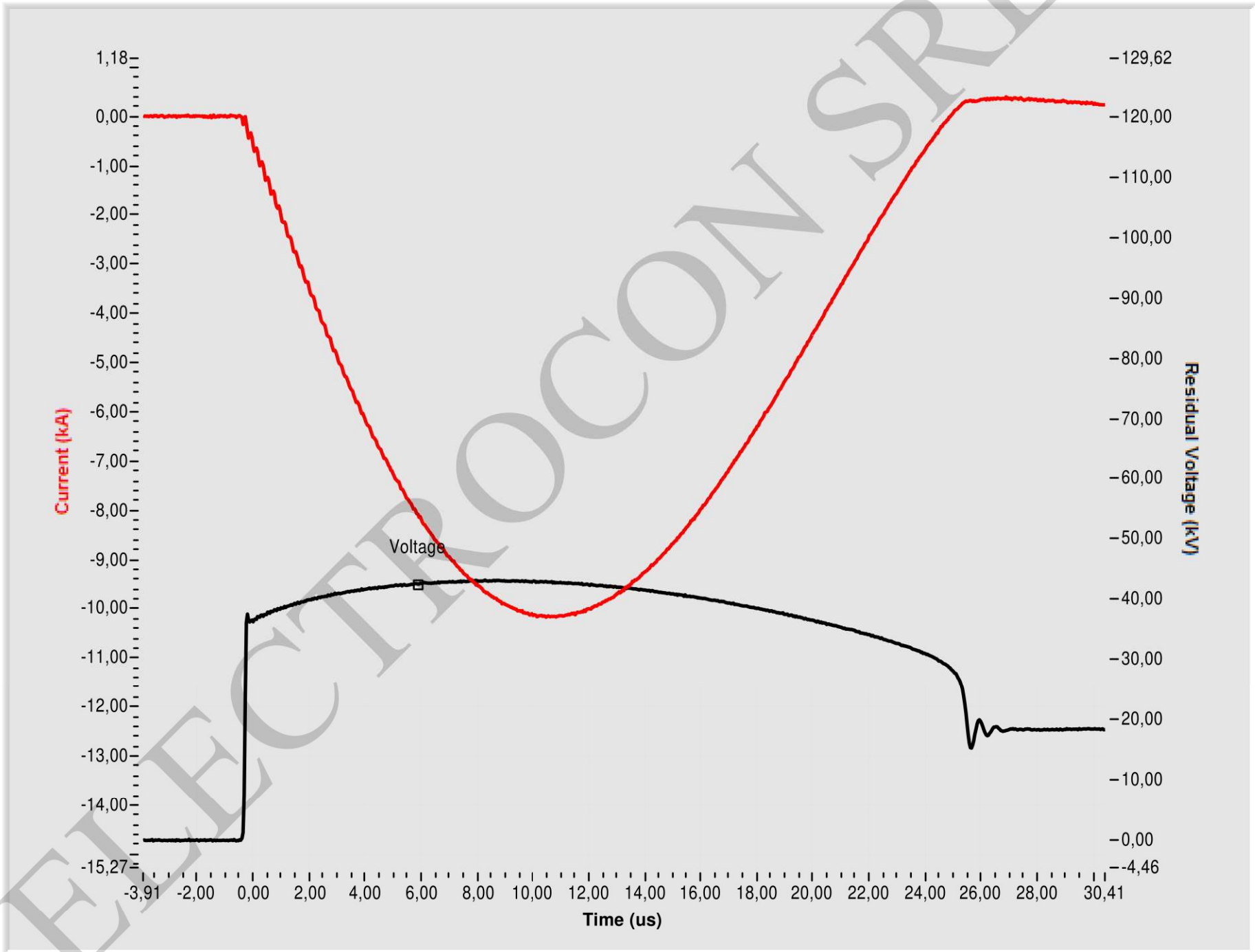




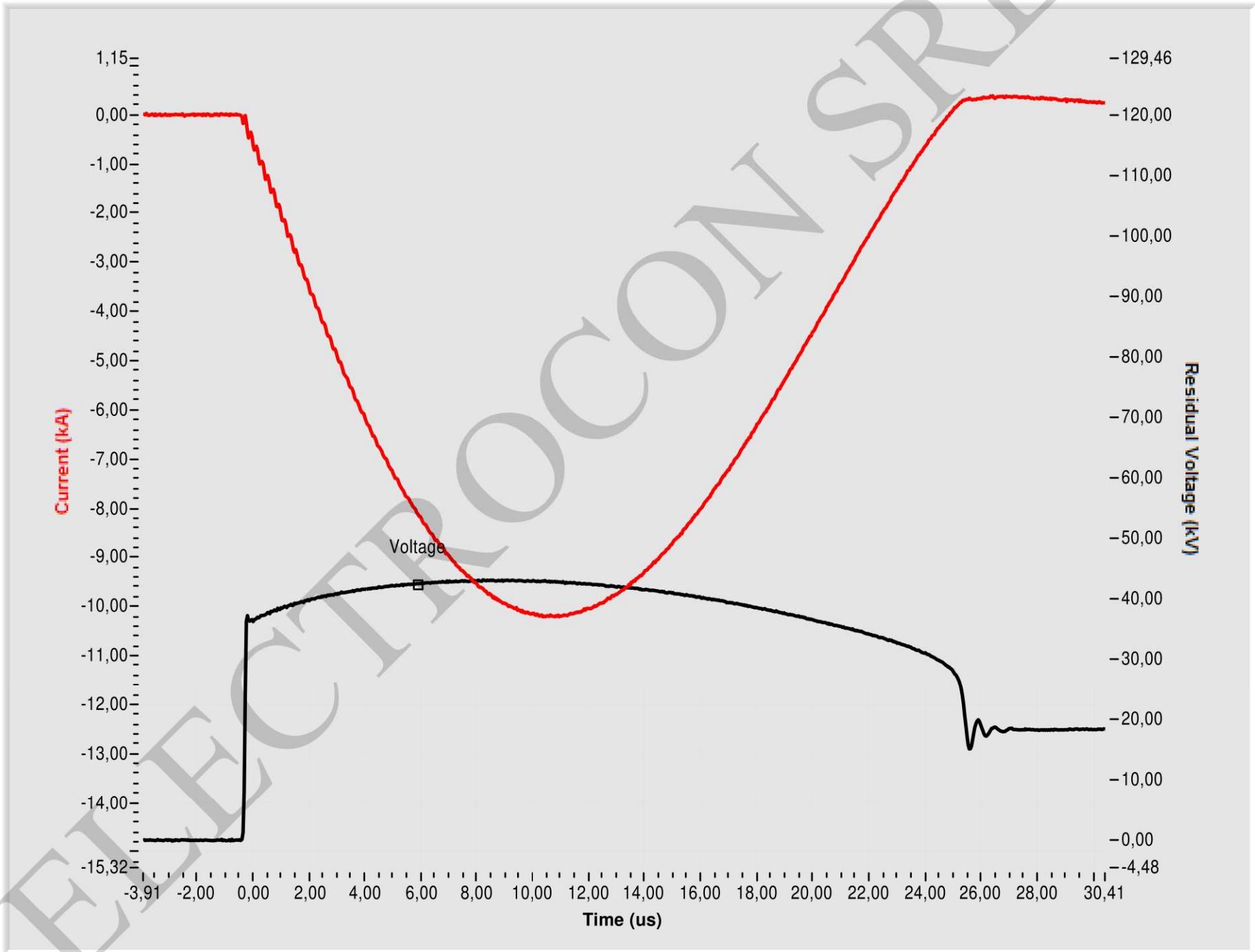
CESI C2016984 Oscillogram n. 31



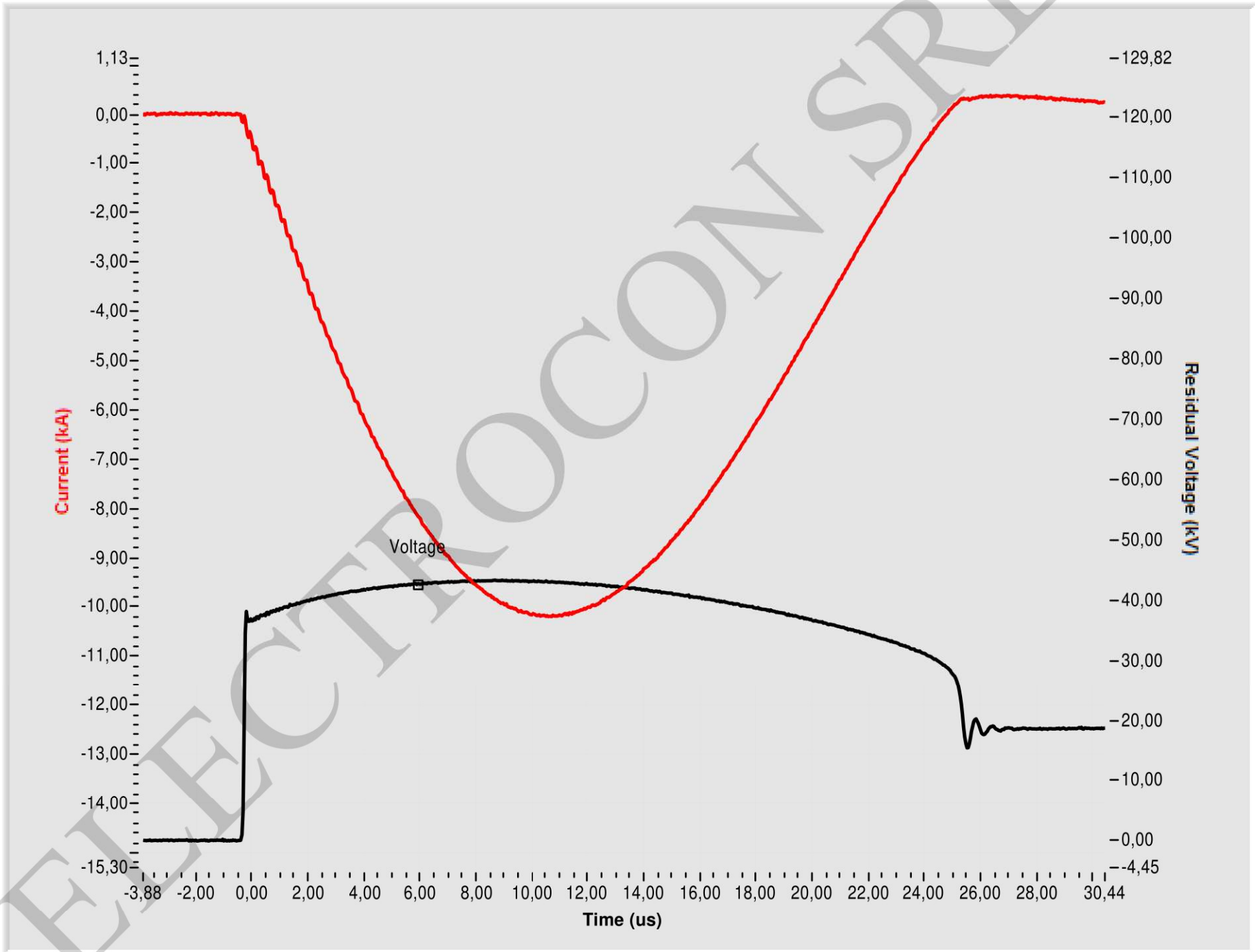
CESI C2016984 Oscillogram n. 32



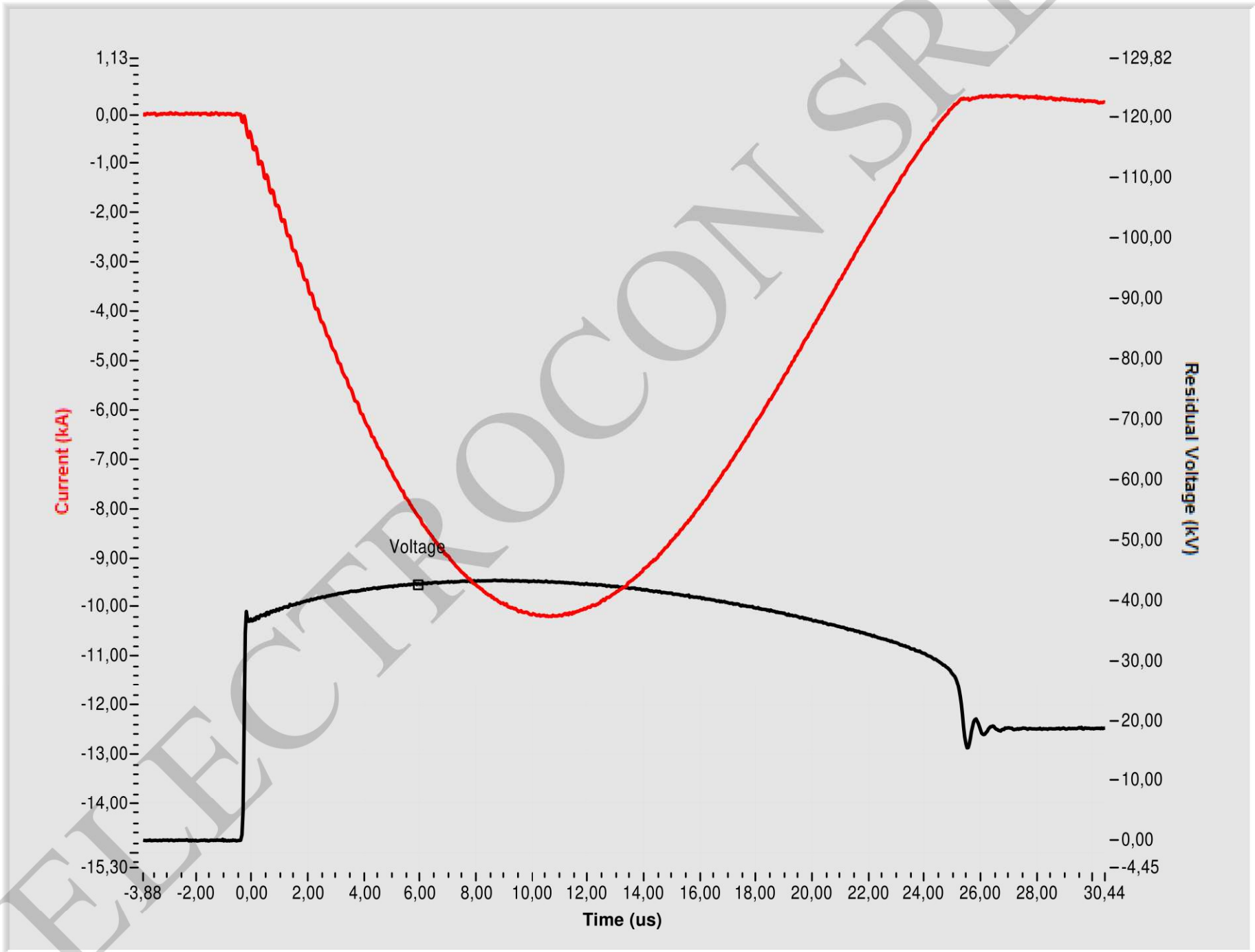
CESI C2016984 Oscillogram n. 33



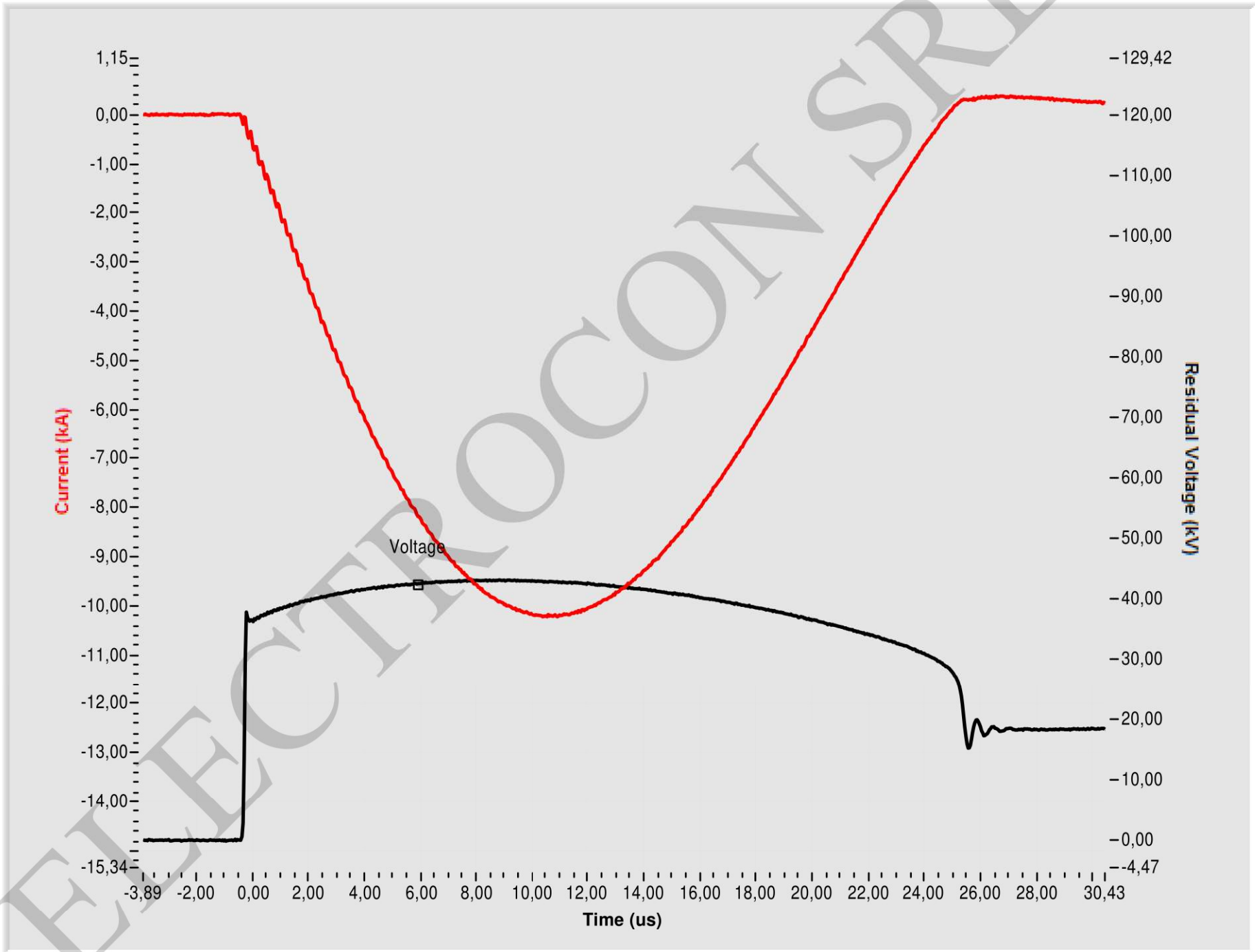
CESI C2016984 Oscillogram n. 34



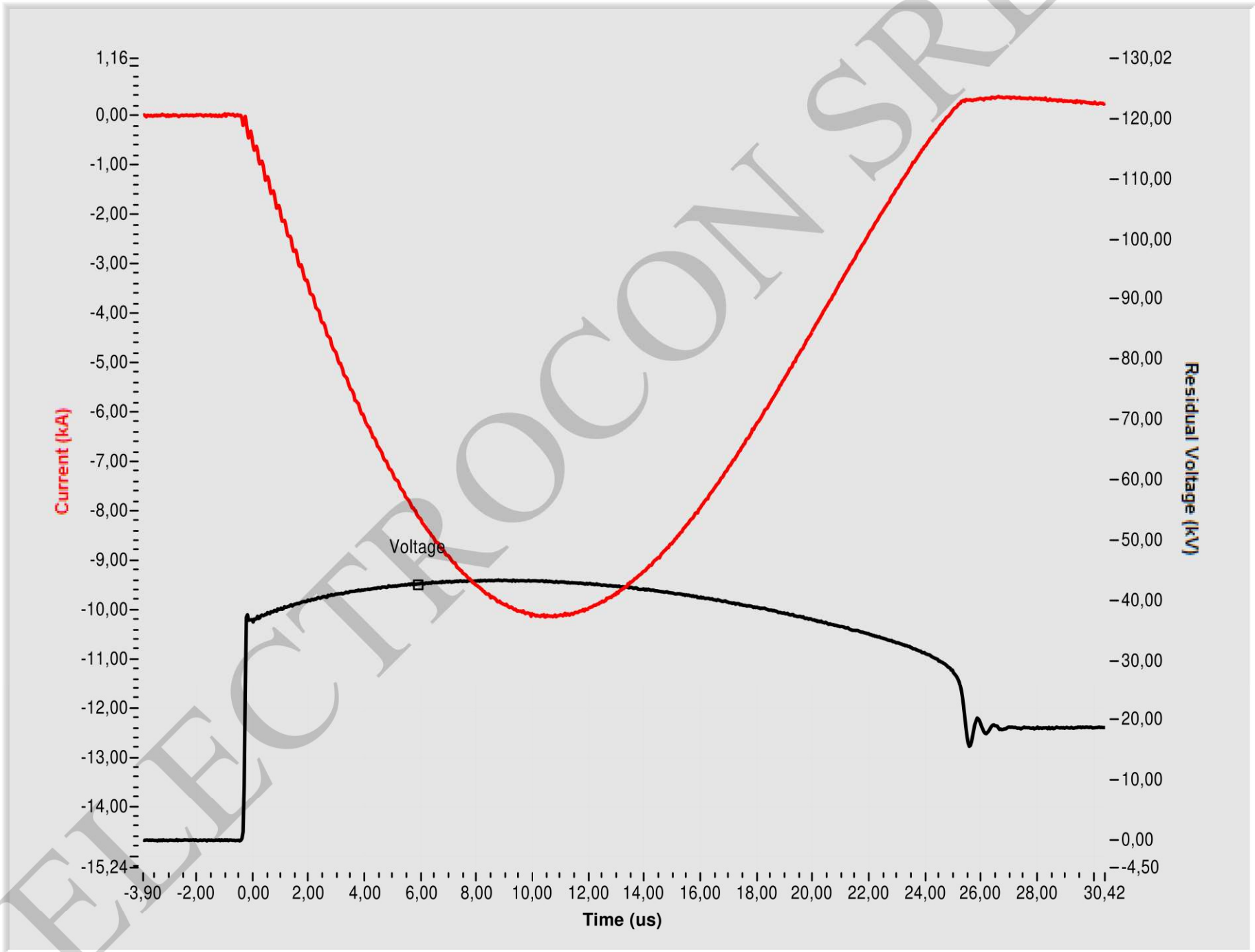
CESI C2016984 Oscillogram n. 35



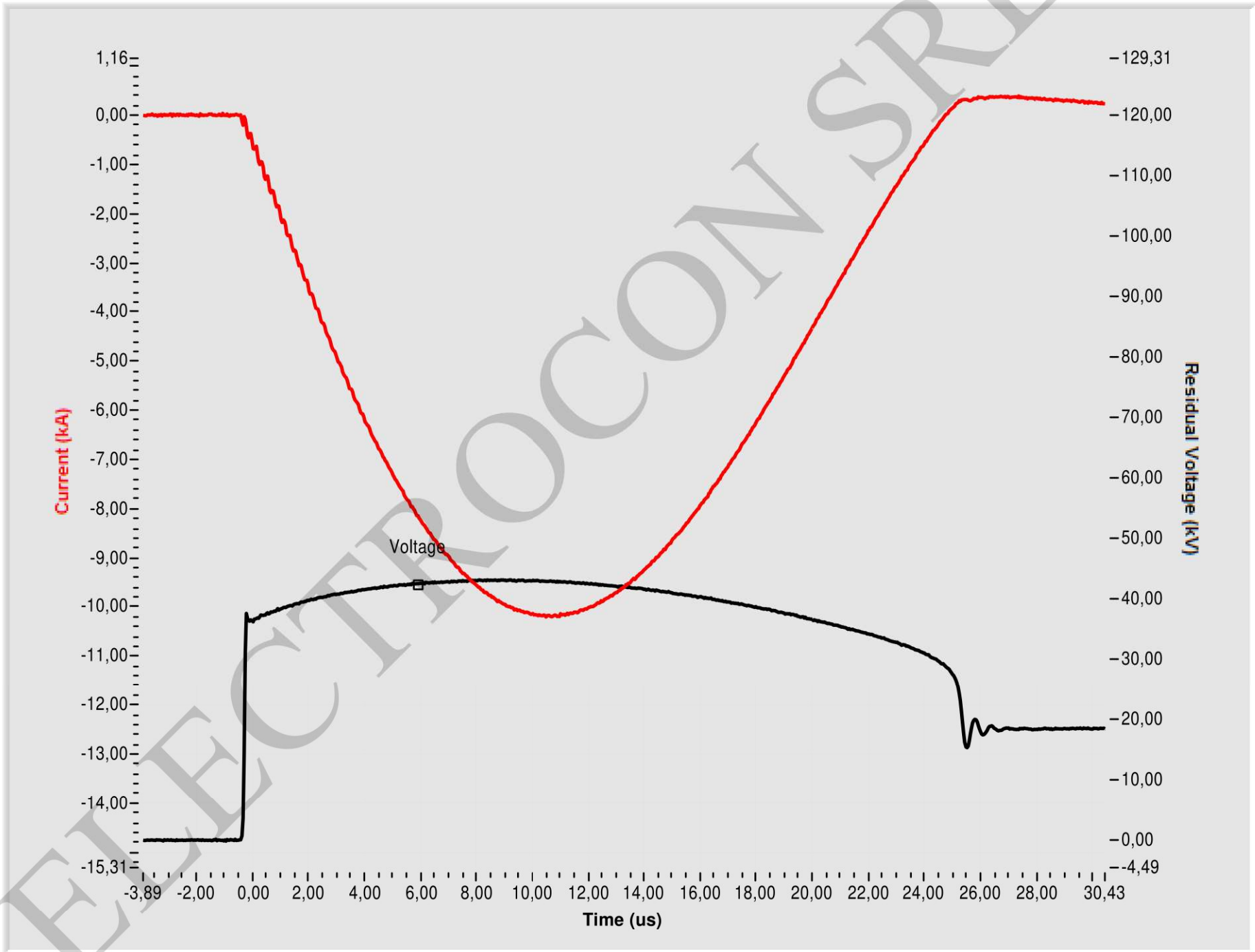
CESI C2016984 Oscillogram n. 36



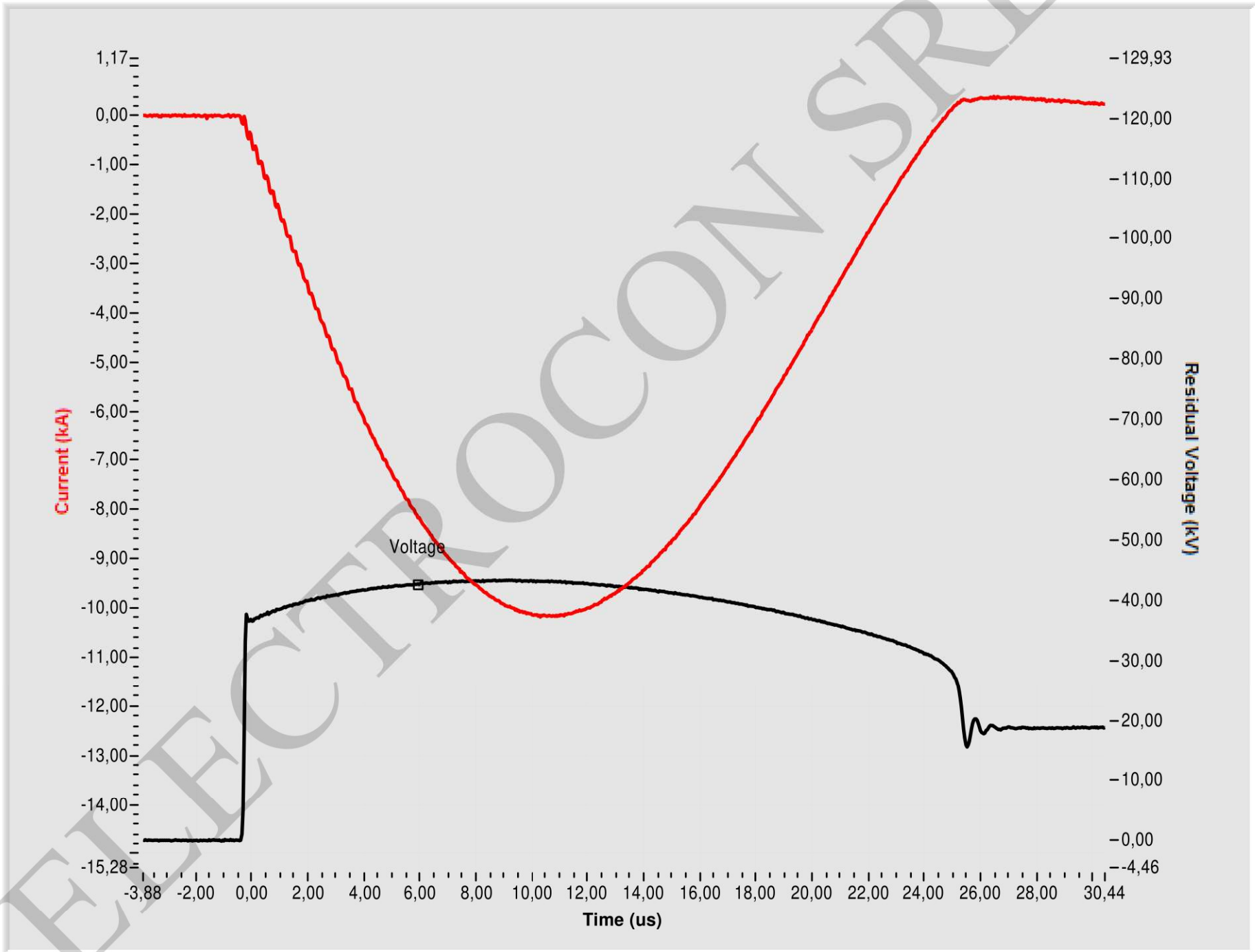
CESI C2016984 Oscillogram n. 37

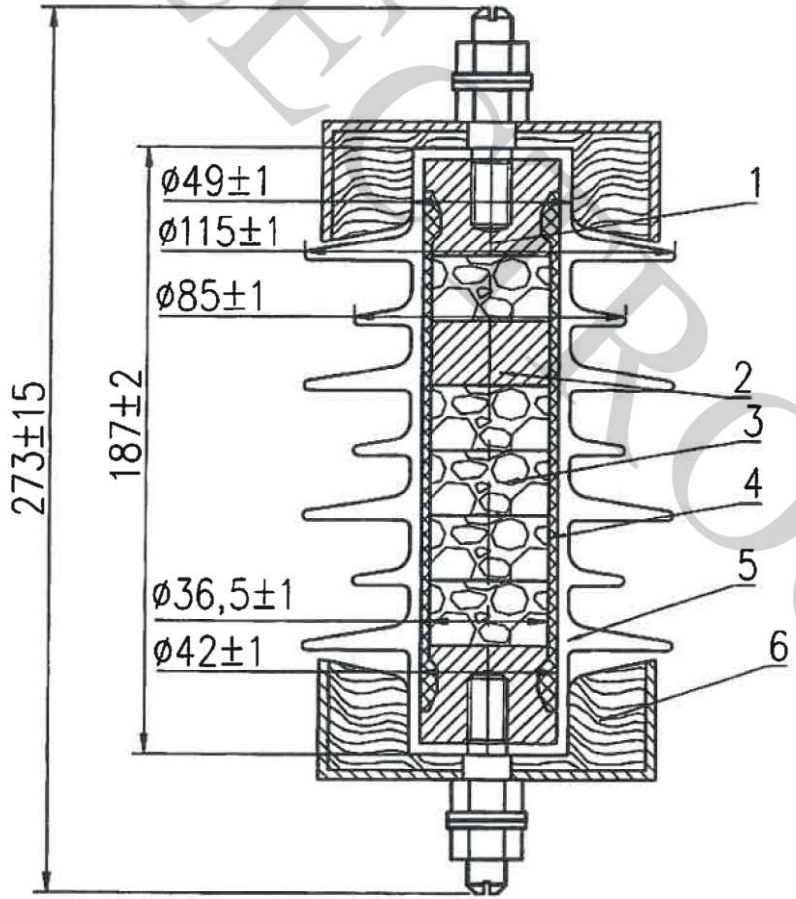


CESI C2016984 Oscillogram n. 38



CESI C2016984 Oscillogram n. 39



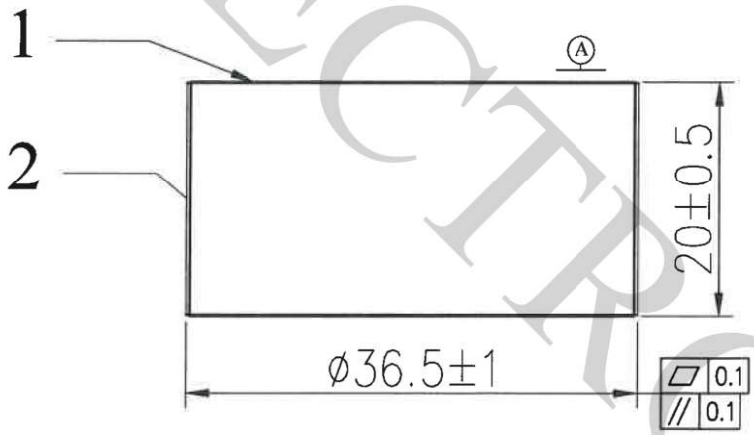


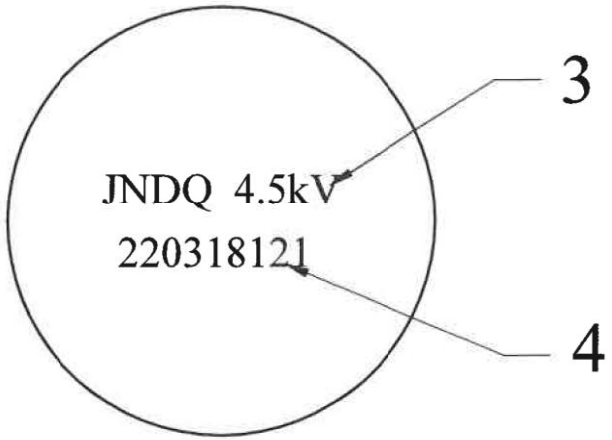
CESI
C3008109-2

No	Item
1	Iron spacer
2	Aluminum pad block
3	zinc oxide varistor D36.5×20
4	glass fibre
5	silicone rubber
6	Insulation cotton

备注Remark:			Metal Oxide lightning arrester YH10W-15	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
	签名Signature	日期Date		单位unit: mm
设计Design	Zhang Yu	14-01-2023	Sections in thermal model	JN-DHBL 49187 1
审核Verify	Huang Long	14-01-2023		
批准Approve	Jade	14-01-2023		

unit:mm





No	Item
1	Aluminum electrode
2	Epoxy resin glaze
3	DC 1mA
4	Batch number

CESI
C3008047

备注Remark:			Metal Oxide Varistor	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
	签名Sigrature	日期Date	D36.5×20	单位unit: mm
设计Design	Zhang Yu	12·10·2022	MO resistor drawing	JNDQ.MO.3620 Q1
审核Verify	Huang Long	12·10·2022		
批准Approve	Jade	12·10·2022		

Type Test Report

Document No.	C2017219	Copy No.	1	Number of pages	17

Apparatus	Polymer-housed surge arrester unit and polymer-housed surge arrester section series type YH10W assembled in thermal model
Designation	---
Serial Number	---
Manufacturer	Nanyang Jinniu Electric Co., Ltd Industry park of Tongbai, Nanyang city, Henan province, China 474750
Client	Nanyang Jinniu Electric Co., Ltd Industry park of Tongbai, Nanyang city, Henan province, China 474750
Tested for	---
Date(s) of tests	November 24, 2022
Tested by	CESI S.p.A. Via Rubattino, 54 20134 Milano – Italy
Test performed	Heat dissipation behaviour of test sample : Test to verify thermal equivalency between complete arrester and arrester section

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this document has been subjected to the series of proving tests in accordance with:

IEC 60099-4 – Edition 3.0 (2014-06)

The results are shown in the record of proving tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standard(s). The ratings assigned by the Manufacturer are listed on the ratings page.
The document applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designations with that tested rests with the Manufacturer.

June 20, 2023

Date	Gregori Marco C2017219 3059 AUT Test Engineer in charge	The Manager - Verhoeven Bas C2017219 3482248 APP Approved by

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
LAB N° 0030 L

The laboratory meets the requirements of the Standard ISO/IEC 17025: 2017 "General requirements for the competence of testing and calibration laboratories". The in force status of the accreditation and the list of accredited tests may be checked in the WEB site: www.cesi.it

测思 Centro Elettrotecnico Sperimentale Italiano

CESI
Shaping a Better Energy Future

Notes

STL-Member

CESI Group members are founder members of the SHORT-CIRCUIT TESTING LIAISON (STL) which has been established in 1969. STL is a forum for voluntary international cooperation of testing organizations.

CESI Group Test Documents description

STL Type Test Certificate of .....

Issued for type tests of high voltage products (> 1 kV_{ac}; > 1,5 kV_{dc}), which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. The STL Type Test Certificate consists of documents unequivocally identifying the test object and describes all conditions under which the tests were conducted. It gives evidence of the unobjectionable behavior of the test object during the tests in line with the normative documents applied as well as of the results of successful testing.

Type Test Certificate of .....

Issued for type tests of high voltage products (> 1 kV_{ac}; > 1,5 kV_{dc}), which have successfully been carried out in full compliance with the relevant specifications or standards valid at the time of the test. The Type Test Certificate consists of documents unequivocally identifying the test object and describes all conditions under which the tests were conducted. It gives evidence of the unobjectionable behavior of the test object during the tests in line with the normative documents applied as well as of the results of successful testing.

Test Certificate of (complete / selected) Type Tests

Issued if type tests of low voltage products (< 1 kV_{ac}; < 1,5 kV_{dc}) requested by the relevant product standard were passed. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Certificate of Design Verification

Issued for passed design verification tests according to IEC 61439. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Type Test Report

Issued for high and low voltage products if parts of selected type tests have been passed; those shall be carried out in full compliance with the relevant standards but (for high voltage products) do not fulfill all STL requirements for issuing a Type Test Certificate. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Test Report

Issued for all other tests on high and low voltage products which have been carried out according to specifications, standards and/or client instructions

On-Site Test Record

Issued as a record of results acquired during the on-site tests / measurements

Test Award

Can be additionally issued for all named types of test documents above if the tests to be referenced were passed

Tests witnessed by:

--- ---

Identification of the object: Requested

The Manufacturer guarantees that the tested object is manufactured according to the submitted drawings.
CESI checked that these drawings adequately represent in shape and dimensions the essential details and the parts of the tested object.
These drawings, identified by CESI and numbered C3008356 No. 1; C3008109 No.1 & C3008047 No. 1 , are annexed to this document.

Test evaluation

Subclause	Test	Test result
IEC 60099-4 (2014-06) – clause 10.8.6	Heat dissipation behaviour verification of test sample	See page 11
The decision rule in conformity assessment is based on the simple acceptance method without considering the measuring uncertainties.		

The reported expanded uncertainties are determined in accordance with the Publication JCGM 100 "Evaluation of measurement data – Guide to the expression of uncertainty in measurement" and are based on a standard uncertainty multiplied by a coverage factor K=2, which for a normal distribution provides a level of confidence of approximately 95%

- Voltage a.c. : **± 3,0%**
- Residual peak voltage (impulse tests) : **± 3,0%**
- Current a.c. : **± 3,0%**
- Peak current (impulse tests) : **± 3,0%**
- Time (impulse tests) : **± 10,0%**
- Time (a.c. tests) : **± 1,5%**

Laboratory information

Receipt date of the sample November 2022

Test location CESI – Via Rubattino 54 – Milan

CESI testing team Mr. L. Podavitte –Mr. S. Bricchetti

Test laboratory P177 (Surge Arrester laboratory)

ODV 7000005391

The sampling of the apparatuses to be tested has been carried out by CESI according to the product Standard

content	page	test date
Test object characteristics	5	
Reference standard	6	
Test carried out and identification of the test object	6	
Test setting for the test	7 ÷ 8	
Test procedure	9	
Summary of test result	10 to 12	November 24, 2022
Instrument used for the test	13	
Technical data	14	
Pages annexed:		
Client's drawing (MO arrester) ; CESI n. C3008047– n.1 page		
Client's drawing (complete arrester) ; CESI n. C3008356 – n.1 page		
Client's drawing (arrester section assembled in thermal model) ; CESI n. C3008109/1– n.1 page		

Rated characteristics of the tested objects assigned by the Client

Polymer-housed surge arrester unit

Manufacturer	Nanyang Jinniu Electric Co., Ltd
Type	YH10W-51
Serial no.	---
Drawing code	JN-DH51.49427.RMX
Arrester class	Distribution
Designation	DH
Rated voltage – U_r	51,0 kV
Continuous operating voltage - U_c	40,8 kV
MO resistors supplier	Nanyang Jinniu Electric Co., Ltd
MO resistor type	D36,5x20
No. of MO resistors fitted	17
Rated frequency	50/60 Hz
Nominal discharge current (8/20 µs impulse shape)	10 kA
Reference current - $I_{ref.}$	1 mA
Year of manufacturer	2022

Polymer-housed surge arrester section assembled in thermal model

Manufacturer	Nanyang Jinniu Electric Co., Ltd
Arrester section type	YH10W-15
MO resistors supplier	Nanyang Jinniu Electric Co., Ltd
Serial no.	----
Drawing code	JN-DHBL.49187
No. of MO resistors fitted	5
MO resistor type	D36,5x20
Arrester class	Distribution
Designation	DH
Rated voltage – U_r	1,000x$U_{ref.}$
Continuous operating voltage - U_c	0,800x$U_{ref.}$
Rated frequency	50/60 Hz
Nominal discharge current (8/20 µs impulse shape)	10 kA
Reference current - $I_{ref.}$	1 mA
Year of manufacturer	2022

Reference Standard

IEC 60099-4 – Edition 3.0 (2014-06)– clause 10.8.6 & Annex B
" Metal-Oxide Surge Arresters without gaps for AC systems

Test carried out and identification of the test objects

Test carried out	Number of test objects	Test object identification
Heat dissipation behaviour of test sample	1	YH10W-51
	1	Section assembled in thermal model YH10W-15

Test setting for the test

Photo no. 1

Complete arrester

Photo no. 2

Arrester section assembled in thermal model

Test procedure on complete arrester

The complete arrester was placed in the testing laboratory (see photograph no.1 on page 7) at still air ambient temperature of 15,8 °C. The ambient temperature was held at 15,8 °C ±3K during the test .
The complete arrester was supplied by the manufacturer and one optical thermal sensor has been installed between 1/2 to 1/3 of the arrester length from the top (see drawing attached on this test report).

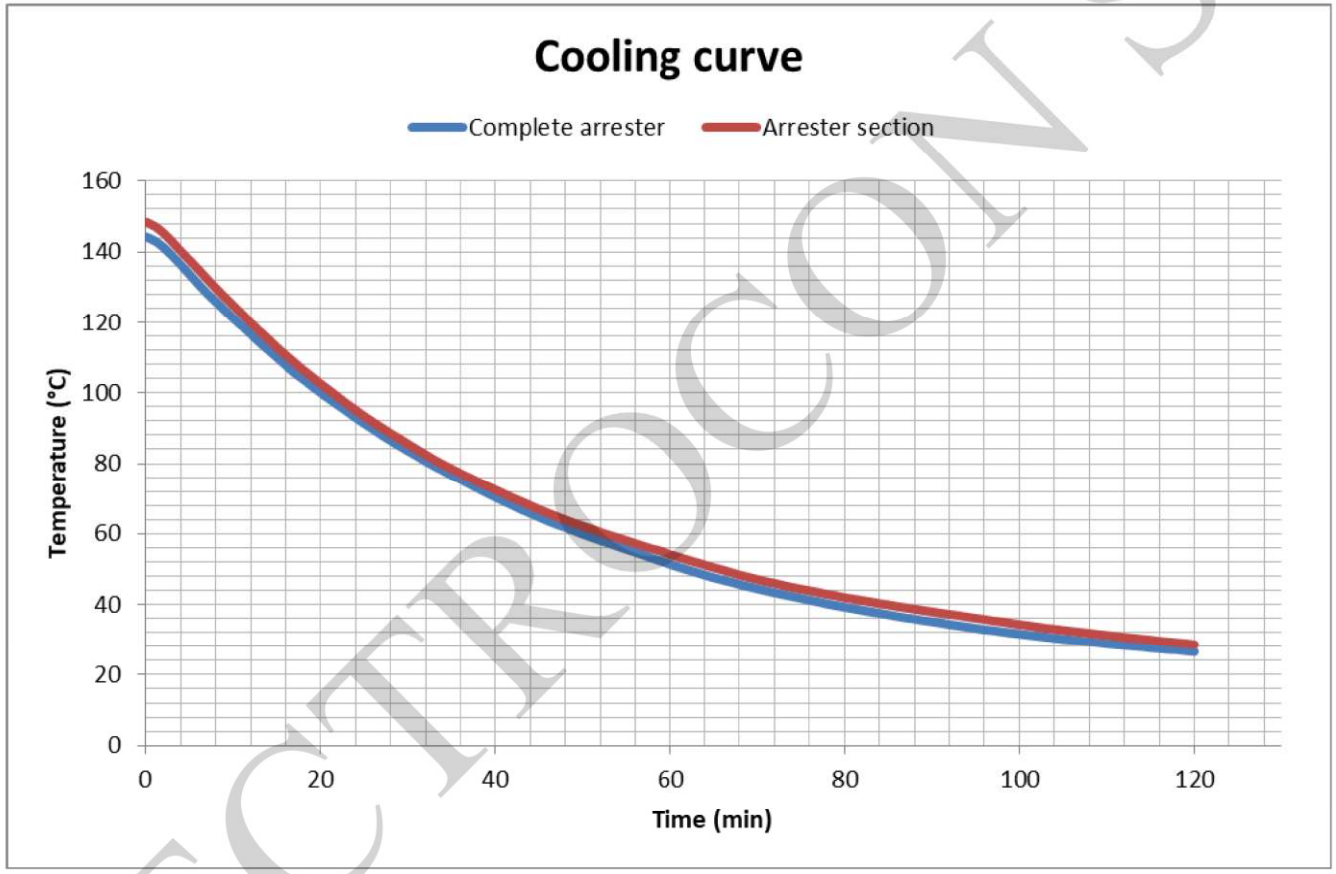
The surge arrester was heated to a temperature of approximately 140 °C by the application of a power frequency overvoltage with an amplitude above the reference voltage.
The heating time was 51 min. (the maximum time according to the reference standard is 60 min.).

When the specified temperature of about 140 °C was reached the voltage source was disconnected and the cooling time curve was determined over a period of not less than 2 hours.

Test procedure on thermally prorated section

The thermally prorated section was placed in the testing laboratory (see photograph no.2 on page 8) at still air ambient temperature of 15,9 °C.
The ambient temperature was held at 15,9°C ± 3K during the test .
The prorated section was supplied by the manufacturer and one optical thermal sensor has been installed (see drawing attached on this test report).

The prorated section with only one MO resistor was heated to a temperature of approximately 140 °C by the application of a power frequency overvoltage with an amplitude above the reference voltage.
The heating time has been of 51 min. (the maximum time according to the reference standard is 60 min.).
When the specified temperature of about 140 °C was reached the voltage source was disconnected and the cooling time curve was determined over a period of not less than 2 hours.



Test result and the calculation of the temperature compensation

The cooling curve (see pag.9) of the arrester section hasn't been for all instants equal or higher than the cooling curve of the arrester. The compensation may be made adding a **ΔT** to the start temperature ϑ_{start} of the prorated section during the preheating (thermal recovery part) for Operating duty test.

Sample	T	T_A	T_0	$T_0 - T_A$	Heating time	Date
Complete arrester	is the measured temperature during cooling every minute	15,80 °C	144,27°C	128,47 K	51 min	November 24, 2022
Arrester section	is the measured temperature during cooling every minute	15,90 °C	148,40°C	132,50 K	51 min	November 24, 2022

Legend:

T is the measured temperature instant by instant
T_A is the average ambient temperature during test
T_0 is the maximum heating temperature
Trel $(T-T_A) / (T_0-T_A)$
ΔT temperature compensation

The two relative temperatures $T_{rel.}$arrester and $T_{rel.}$ arrester section have been plotted (see page 12) for the cooling time (≥7200s).
During the cooling time the difference $T_{rel.}$arrester - $T_{rel.}$ arrester section has been calculated and the max value has to be considered.

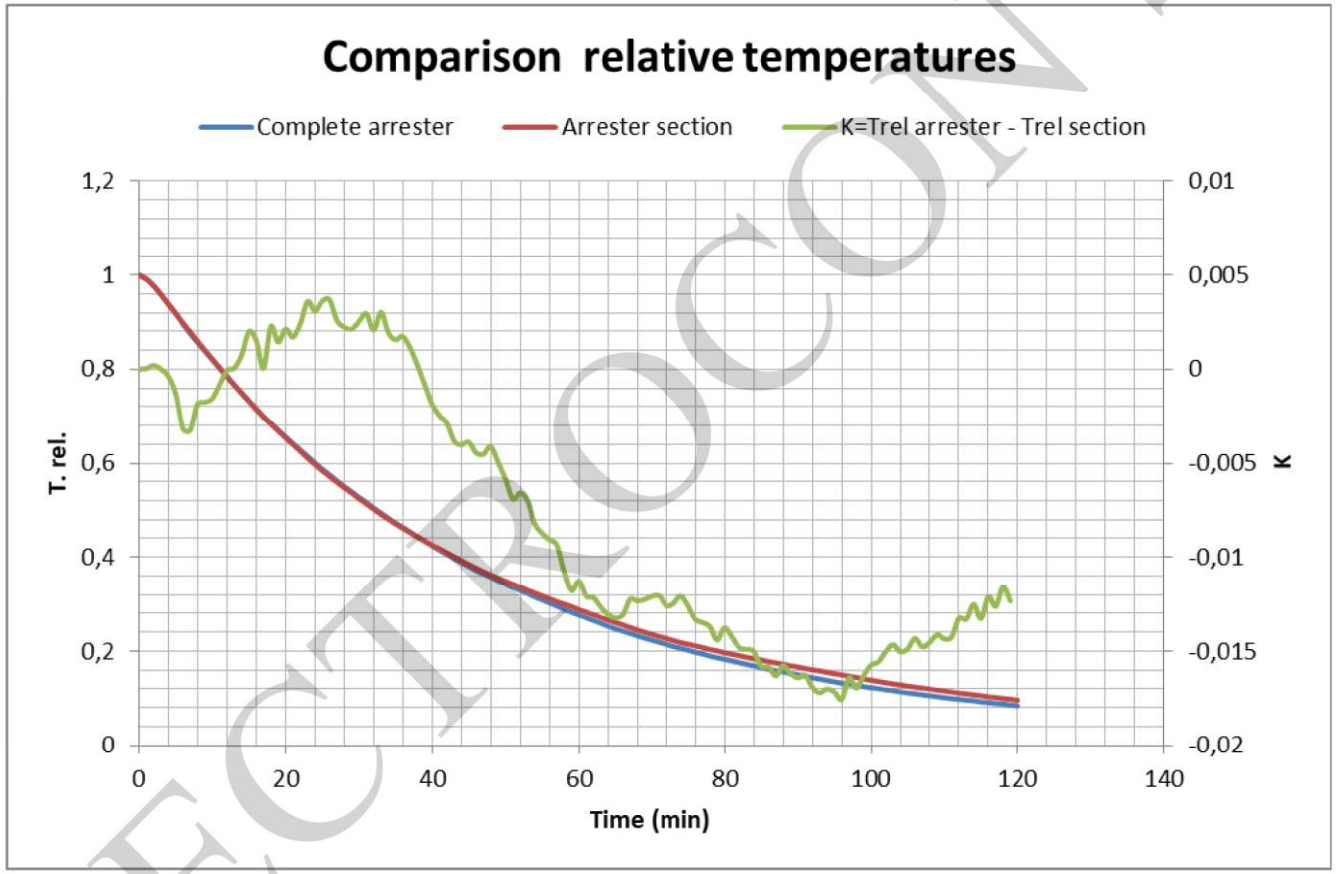
K= max ($T_{rel.}$arrester - $T_{rel.}$ arrester section)= 0,0036844

ΔT= K $(T_0 - T_A)_{max}$= 0,0036844*132,50 =0,488 K

The compensation temperature **ΔT** resulting from the test is 0,49 K.

ϑ_{start} = 60 °C + 0,49 °C = 60,49 °C

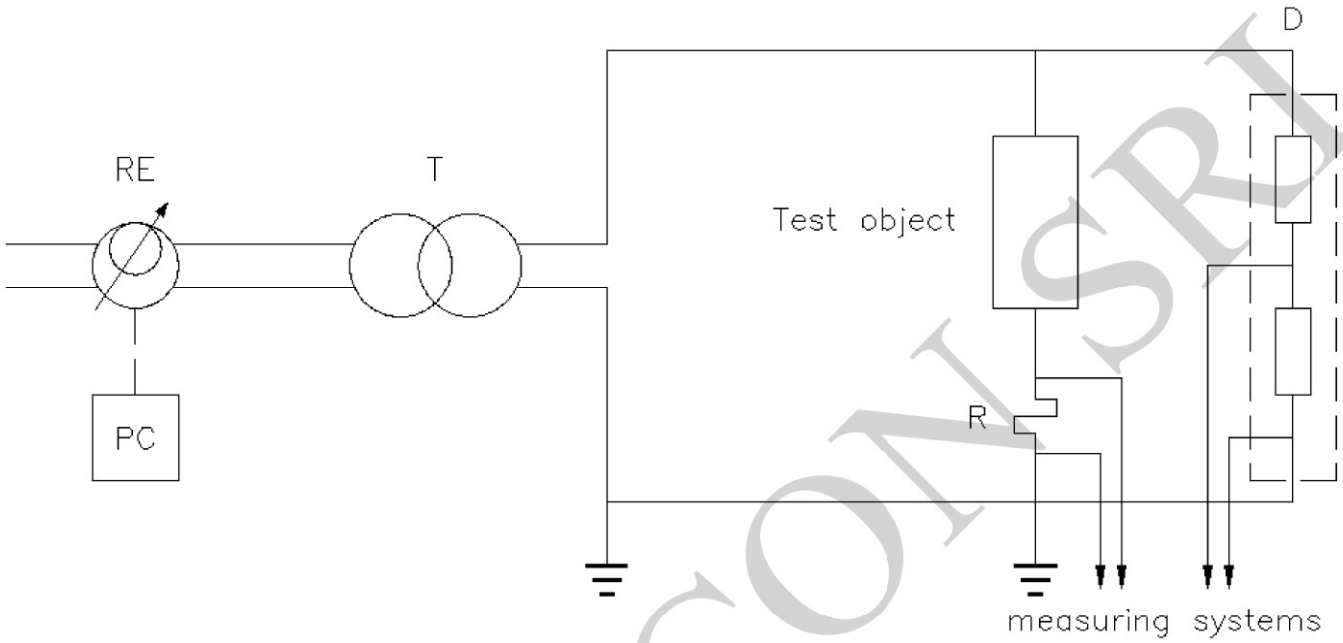
Therefore the ϑ_{start} for thermal recovery test in the Operating duty test is equal to 60,49 °C.



Instruments used for temperature measurement

Instrument type	CESI no.	Note:
FISO	058076 – RX 058080 Temperature Optical sensor	used for complete arrester and the arrester section
FISO	058076 – RX 058991 Temperature Optical sensor	used for ambient temperature

Circuit A0019



Power frequency supply

RE - programmable supply type PACIFIC A.C. Power Source 140 ASX.; CESI no. 0560408
PC - personal computer
T - voltage transformer type SPECIALTRASFO; power 60 kVA; voltage 220 V/200 kV (used for complete arrester)

Current measuring system

R - Current shunt CESI No.31120; R= 941,4 Ω
- Electro optical system CESI No.55829/55828

OSC
- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122;
- CESI No 056227- 0562226 (on channel No.1)

Voltage measuring system

D - Voltage divider SAGI; CESI No.13027 (used for arrester section)
- Voltage divider Scarpa e Magnano; CESI No 5082 (used for complete arrester)
- Electro optical system CESI No.11517/11518

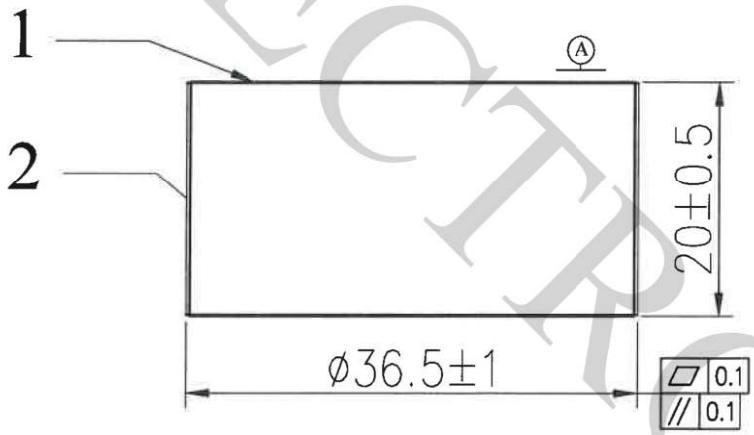
OSC
- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122;
- CESI No 056227- 0562226 (on channel No.2)

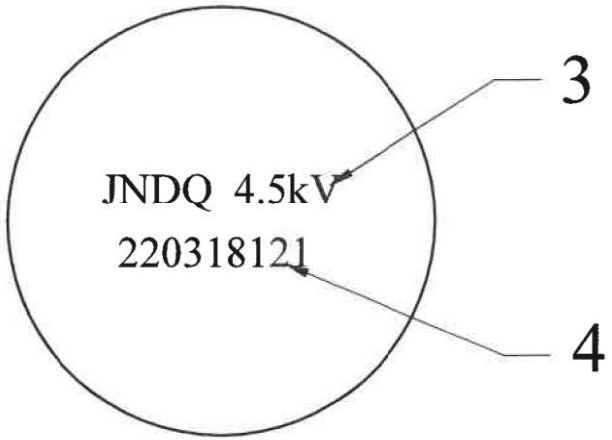
Software system:

SW - S.A.D. Surge arrester version 2.0

END OF THE DOCUMENT

unit:mm



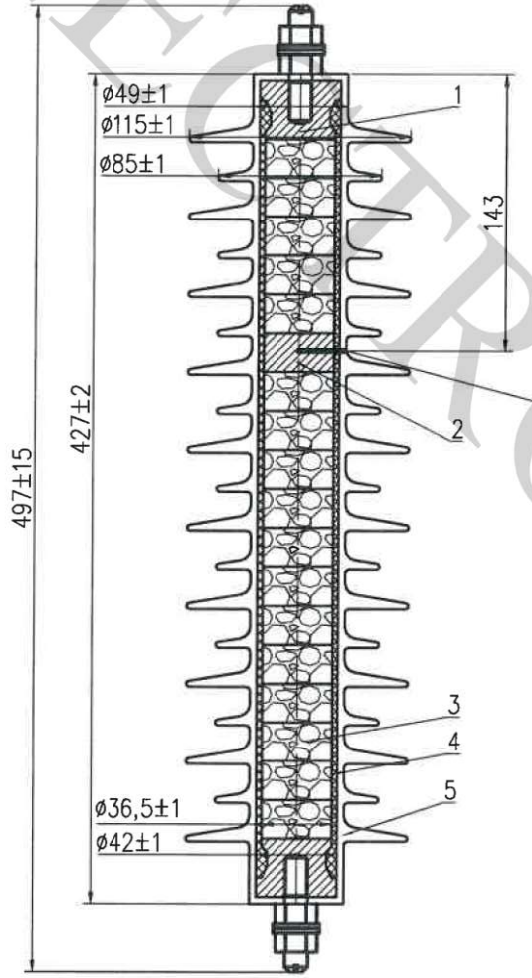


No	Item
1	Aluminum electrode
2	Epoxy resin glaze
3	DC 1mA
4	Batch number

CESI
C3008047

备注Remark:			Metal Oxide Varistor	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
	签名Sigrature	日期Date	D36.5×20	单位unit: mm
设计Design	Zhang Yu	12·10·2022	MO resistor drawing	JNDQ.MO.3620 Q1
审核Verify	Huang Long	12·10·2022		
批准Approve	Jade	12·10·2022		

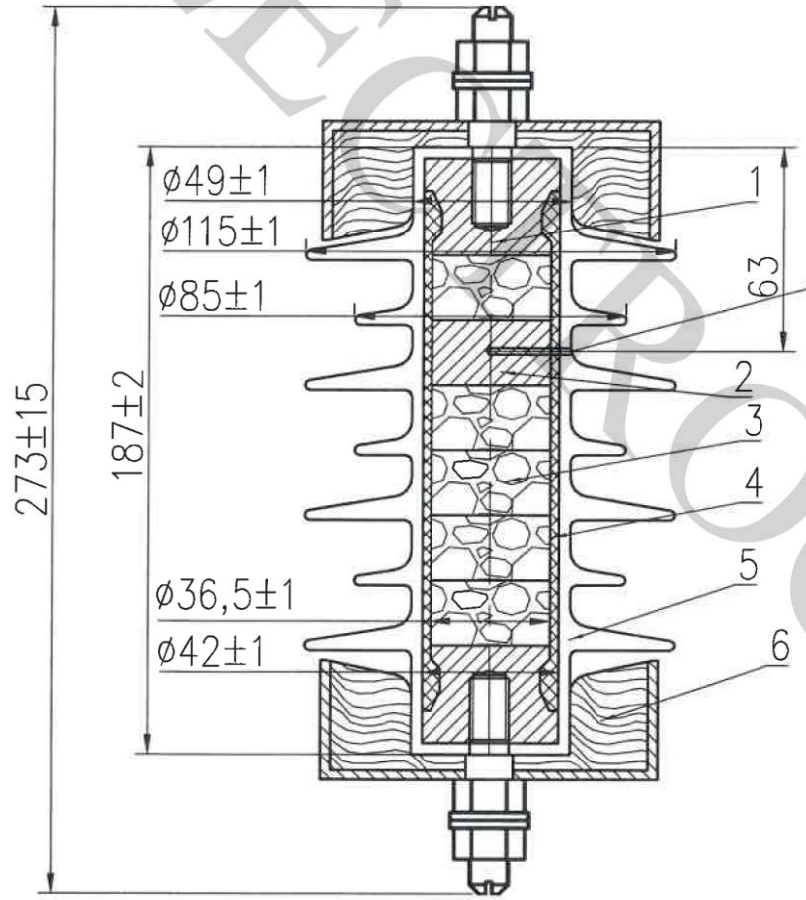
unit:mm



CESI
C3008356

No	Item
1	Iron spacer
2	Aluminum pad block
3	zinc oxide varistor D36.5×20
4	glass fibre
5	silicone rubber

备注Remark:			Metal Oxide lightning arrester YH10W-51	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
	签名Sigrature	日期Date		单位unit：mm
设计Design	Zhang Yu	12·10·2022		JN-DH51.49427.RMX 1
审核Verify	Huang Long	12·10·2022	sections in thermal model	
批准Approve	Jade	12·10·2022		



Thermal sensor mounting hole

No	Item
1	Iron spacer
2	Aluminum pad block
3	zinc oxide varistor D36.5×20
4	glass fibre
5	silicone rubber
6	Insulation cotton

备注Remark:			Metal Oxide lightning arrester	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
	签名Sigrature	日期Date		单位unit: mm
设计Design	Zhang Yu	12·10·2022	Sections in thermal model	JN-DHBL.49187 1
审核Verify	Huang Long	12·10·2022		
批准Approve	Jade	12·10·2022		

Type Test Report

Document No.	C2017220	Copy No.	1	Number of pages	17

Apparatus	Polymer-housed surge arrester unit and polymer-housed surge arrester section series type YH10W assembled in thermal model
Designation	---
Serial Number	---
Manufacturer	Nanyang Jinniu Electric Co., Ltd Industry park of Tongbai, Nanyang city, Henan province, China 474750
Client	Nanyang Jinniu Electric Co., Ltd Industry park of Tongbai, Nanyang city, Henan province, China 474750
Tested for	---
Date(s) of tests	November 24, 2022
Tested by	CESI S.p.A. Via Rubattino, 54 20134 Milano – Italy
Test performed	Heat dissipation behaviour of test sample : Test to verify thermal equivalency between complete arrester and arrester section

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this document has been subjected to the series of proving tests in accordance with:

IEC 60099-4 – Edition 3.0 (2014-06)

The results are shown in the record of proving tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standard(s). The ratings assigned by the Manufacturer are listed on the ratings page.
The document applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designations with that tested rests with the Manufacturer.

June 19, 2023		
Date	Gregori Marco C2017220 3059 AUT Test Engineer in charge	The Manager - Verhoeven Bas C2017220 3482248 APP Approved by

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
LAB N° 0030 L

The laboratory meets the requirements of the Standard ISO/IEC 17025: 2017 "General requirements for the competence of testing and calibration laboratories". The in force status of the accreditation and the list of accredited tests may be checked in the WEB site: www.cesi.it

测思 Centro Elettrotecnico Sperimentale Italiano

CESI

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Notes

STL-Member

CESI Group members are founder members of the SHORT-CIRCUIT TESTING LIAISON (STL) which has been established in 1969. STL is a forum for voluntary international cooperation of testing organizations.

CESI Group Test Documents description

STL Type Test Certificate of .....

Issued for type tests of high voltage products (> 1 kV_{ac}; > 1,5 kV_{dc}), which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. The STL Type Test Certificate consists of documents unequivocally identifying the test object and describes all conditions under which the tests were conducted. It gives evidence of the unobjectionable behavior of the test object during the tests in line with the normative documents applied as well as of the results of successful testing.

Type Test Certificate of .....

Issued for type tests of high voltage products (> 1 kV_{ac}; > 1,5 kV_{dc}), which have successfully been carried out in full compliance with the relevant specifications or standards valid at the time of the test. The Type Test Certificate consists of documents unequivocally identifying the test object and describes all conditions under which the tests were conducted. It gives evidence of the unobjectionable behavior of the test object during the tests in line with the normative documents applied as well as of the results of successful testing.

Test Certificate of (complete / selected) Type Tests

Issued if type tests of low voltage products (< 1 kV_{ac}; < 1,5 kV_{dc}) requested by the relevant product standard were passed. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Certificate of Design Verification

Issued for passed design verification tests according to IEC 61439. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Type Test Report

Issued for high and low voltage products if parts of selected type tests have been passed; those shall be carried out in full compliance with the relevant standards but (for high voltage products) do not fulfill all STL requirements for issuing a Type Test Certificate. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Test Report

Issued for all other tests on high and low voltage products which have been carried out according to specifications, standards and/or client instructions

On-Site Test Record

Issued as a record of results acquired during the on-site tests / measurements

Test Award

Can be additionally issued for all named types of test documents above if the tests to be referenced were passed

Tests witnessed by:

--- ---

Identification of the object: Requested

The Manufacturer guarantees that the tested object is manufactured according to the submitted drawings.
CESI checked that these drawings adequately represent in shape and dimensions the essential details and the parts of the tested object.
These drawings, identified by CESI and numbered C3008356 No. 1; C3008323 No.1 & C3008047 No. 1 , are annexed to this document.

Test evaluation

Subclause	Test	Test result
IEC 60099-4 (2014-06) – clause 10.8.6	Heat dissipation behaviour verification of test sample	See page 11
The decision rule in conformity assessment is based on the simple acceptance method without considering the measuring uncertainties.		

The reported expanded uncertainties are determined in accordance with the Publication JCGM 100 "Evaluation of measurement data – Guide to the expression of uncertainty in measurement" and are based on a standard uncertainty multiplied by a coverage factor K=2, which for a normal distribution provides a level of confidence of approximately 95%

- Voltage a.c. : **± 3,0%**
- Residual peak voltage (impulse tests) : **± 3,0%**
- Current a.c. : **± 3,0%**
- Peak current (impulse tests) : **± 3,0%**
- Time (impulse tests) : **± 10,0%**
- Time (a.c. tests) : **± 1,5%**

Laboratory information

Receipt date of the sample November 2022

Test location CESI – Via Rubattino 54 – Milan

CESI testing team Mr. L. Podavitte –Mr. S. Bricchetti

Test laboratory P177 (Surge Arrester laboratory)

ODV 7000005391

The sampling of the apparatuses to be tested has been carried out by CESI according to the product Standard

content	page	test date
Test object characteristics	5	
Reference standard	6	
Test carried out and identification of the test object	6	
Test setting for the test	7 to 8	
Test procedure	9	
Summary of test result	10 to 12	November 24, 2022
Instrument used for the test	13	
Technical data	14	
Pages annexed:		
Client's drawing (MO arrester) ; CESI n. C3008047– n.1 page		
Client's drawing (complete arrester) ; CESI n. C3008356 – n.1 page		
Client's drawing (arrester section assembled in thermal model) ; CESI n. C3008323/1– n.1 page		

Rated characteristics of the tested objects assigned by the Client

Polymer-housed surge arrester unit

Manufacturer	Nanyang Jinniu Electric Co., Ltd
Type	YH10W-51
Serial no.	---
Drawing code	JN-DH51.49427.RMX
Arrester class	Distribution
Designation	DH
Rated voltage – U_r	51,0 kV
Continuous operating voltage - U_c	40,8 kV
MO resistors supplier	Nanyang Jinniu Electric Co., Ltd
MO resistor type	D36,5x20
No. of MO resistors fitted	17
Rated frequency	50/60 Hz
Nominal discharge current (8/20 µs impulse shape)	10 kA
Reference current - $I_{ref.}$	1 mA
Year of manufacturer	2022

Polymer-housed surge arrester section assembled in thermal model

Manufacturer	Nanyang Jinniu Electric Co., Ltd
Arrester section type	YH10W-6
MO resistors supplier	Nanyang Jinniu Electric Co., Ltd
Serial no.	----
Drawing code	JN-DH6.49187
No. of MO resistors fitted	2
MO resistor type	D36,5x20
Arrester class	Distribution
Designation	DH
Rated voltage – U_r	1,000x$U_{ref.}$
Continuous operating voltage - U_c	0,800x$U_{ref.}$
Rated frequency	50/60 Hz
Nominal discharge current (8/20 µs impulse shape)	10 kA
Reference current - $I_{ref.}$	1 mA
Year of manufacturer	2022

Reference Standard

IEC 60099-4 – Edition 3.0 (2014-06)– clause 10.8.6 & Annex B
" Metal-Oxide Surge Arresters without gaps for AC systems

Test carried out and identification of the test objects

Test carried out	Number of test objects	Test object identification
Heat dissipation behaviour of test sample	1	YH10W-51
	1	Section assembled in thermal model YH10W-6

Test setting for the test

Photo no. 1

Complete arrester

Photo no. 2

Arrester section assembled in thermal model

Test procedure on complete arrester

The complete arrester was placed in the testing laboratory (see photograph no.1 on page 7) at still air ambient temperature of 15,8 °C. The ambient temperature was held at 15,8 °C ±3K during the test .
The complete arrester was supplied by the manufacturer and one optical thermal sensor has been installed between 1/2 to 1/3 of the arrester length from the top).

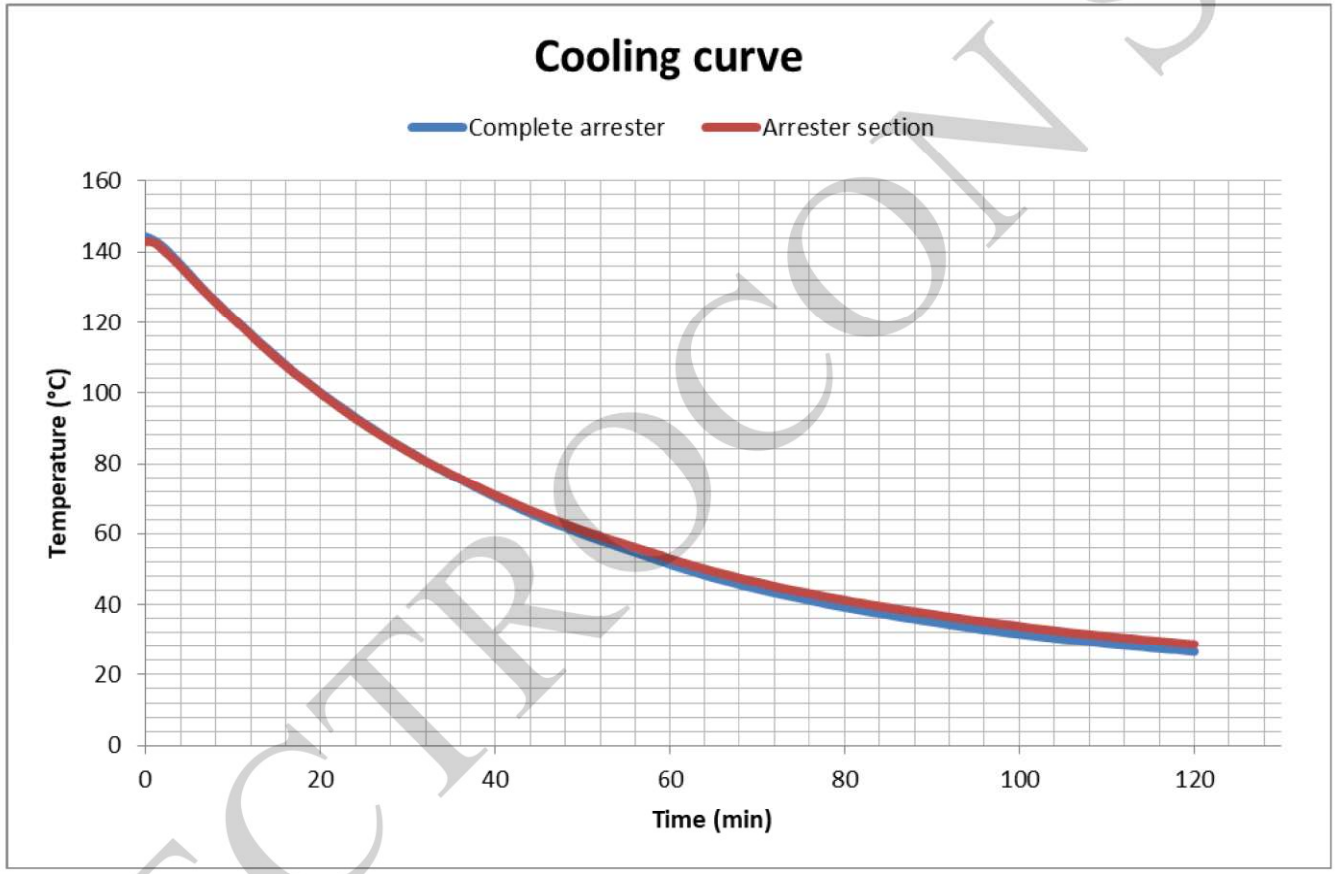
The surge arrester was heated to a temperature of approximately 140 °C by the application of a power frequency overvoltage with an amplitude above the reference voltage.
The heating time was 51 min. (the maximum time according to the reference standard is 60 min.).

When the specified temperature of about 140 °C was reached the voltage source was disconnected and the cooling time curve was determined over a period of not less than 2 hours.

Test procedure on thermally prorated section

The thermally prorated section was placed in the testing laboratory (see photograph no.2 on page 8) at still air ambient temperature of 15,9 °C.
The ambient temperature was held at 15,9°C ± 3K during the test .
The prorated section was supplied by the manufacturer and one optical thermal sensor has been installed (see drawing attached on this test report).

The prorated section with only one MO resistor was heated to a temperature of approximately 140 °C by the application of a power frequency overvoltage with an amplitude above the reference voltage.
The heating time has been of 51 min. (the maximum time according to the reference standard is 60 min.).
When the specified temperature of about 140 °C was reached the voltage source was disconnected and the cooling time curve was determined over a period of not less than 2 hours.



Test result and the calculation of the temperature compensation

The cooling curve (see pag.10) of the arrester section hasn't been for all instants equal or higher than the cooling curve of the arrester. The compensation may be made adding a **ΔT** to the start temperature ϑ_{start} of the prorated section during the preheating (thermal recovery part) for Power-frequency voltage versus time test.

Sample	T	T_A	T_0	$T_0 - T_A$	Heating time	Date
Complete arrester	is the measured temperature during cooling every minute	15,80 °C	144,27°C	128,47 K	51 min	November 24, 2022
Arrester section	is the measured temperature during cooling every minute	15,90 °C	142,93°C	127,03 K	51 min	November 24, 2022

Legend:

T is the measured temperature instant by instant
T_A is the average ambient temperature during test
T_0 is the maximum heating temperature
Trel $(T-T_A) / (T_0-T_A)$
ΔT temperature compensation

The two relative temperatures $T_{rel.}$arrester and $T_{rel.}$ arrester section have been plotted (see page 12) for the cooling time (≥7200s).
During the cooling time the difference $T_{rel.}$arrester - $T_{rel.}$ arrester section has been calculated and the max value has to be considered.

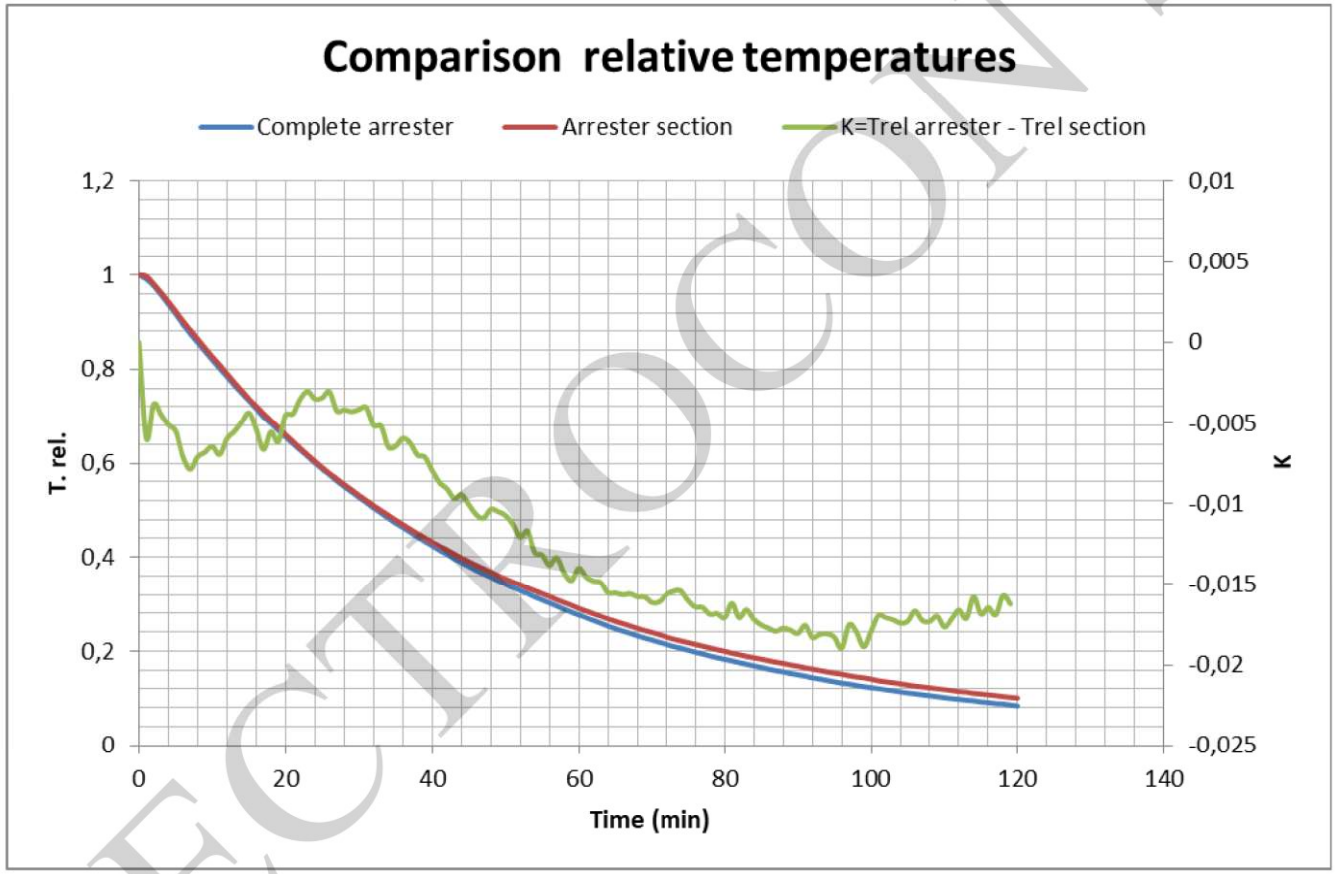
K= max ($T_{rel.}$arrester - $T_{rel.}$ arrester section)= 0,003

ΔT= K $(T_0 - T_A)_{max}$= 0,003*128,47 = 0,385 K

The compensation temperature **ΔT** resulting from the test is 0,39 K.

ϑ_{start} = 60 °C + 0,49 °C = 60,39 °C

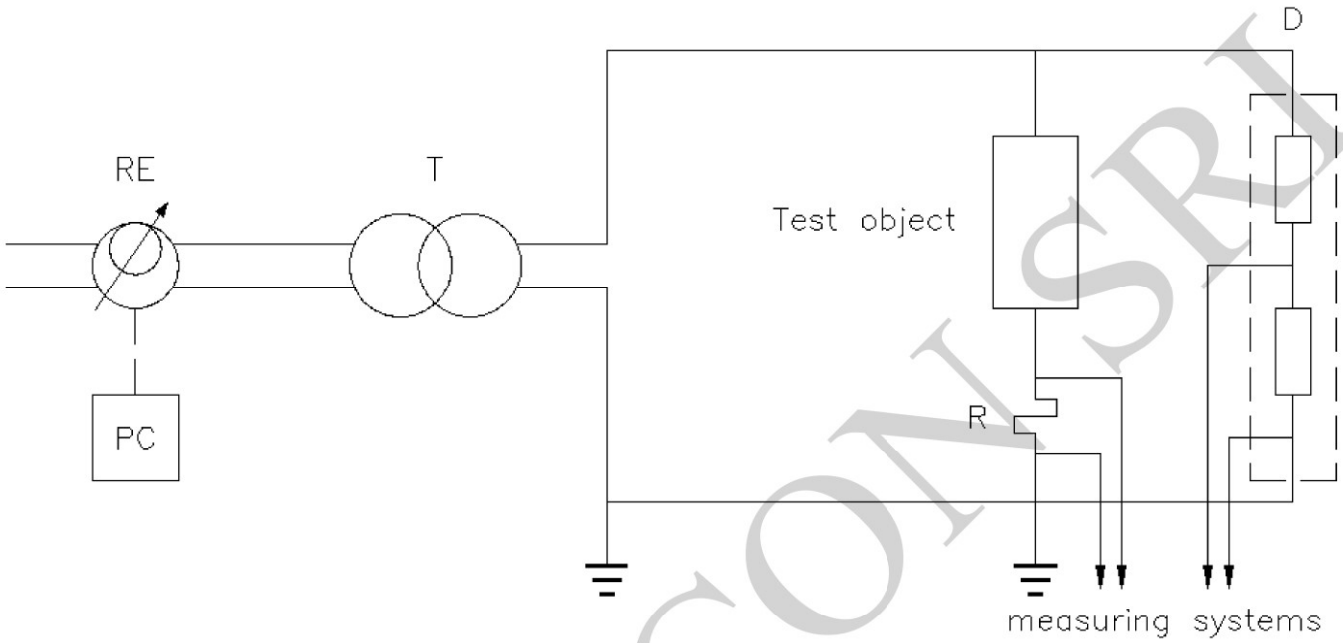
Therefore the ϑ_{start} for thermal recovery test in the Power-frequency voltage versus time test is equal to 60,39 °C.



Instruments used for temperature measurement

Instrument type	CESI no.	Note:
FISO	058076 – RX 058080 Temperature Optical sensor	used for complete arrester and the arrester section
FISO	058076 – RX 058991 Temperature Optical sensor	used for ambient temperature

Circuit A0019



Power frequency supply

RE - programmable supply type PACIFIC A.C. Power Source 140 ASX.; CESI no. 0560408
PC - personal computer
T - voltage transformer type SPECIALTRASFO; power 60 kVA; voltage 220 V/200 kV (used for complete arrester)

Current measuring system

R - Current shunt CESI No.31120; R= 941,4 Ω
- Electro optical system CESI No.55829/55828

OSC
- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122;
- CESI No 056227- 0562226 (on channel No.1)

Voltage measuring system

D - Voltage divider SAGI; CESI No.13027 (used for arrester section)
- Voltage divider Scarpa e Magnano; CESI No 5082 (used for complete arrester)
- Electro optical system CESI No.11517/11518

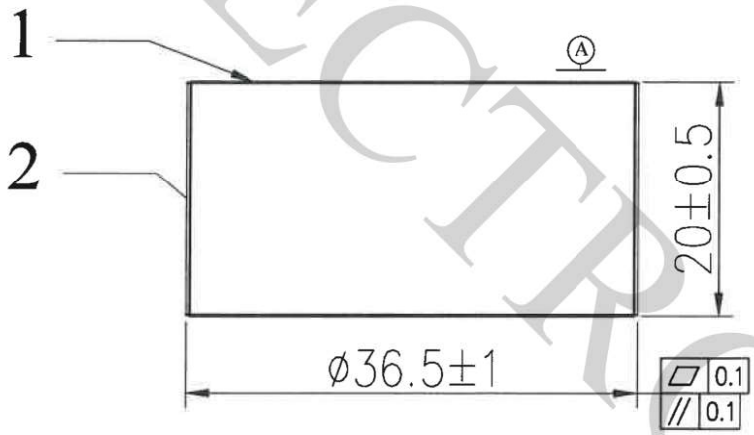
OSC
- Oscilloscope type NATIONAL INSTRUMENT NI PXI-1031/NI-PXI 8108/NI-PXI 5122;
- CESI No 056227- 0562226 (on channel No.2)

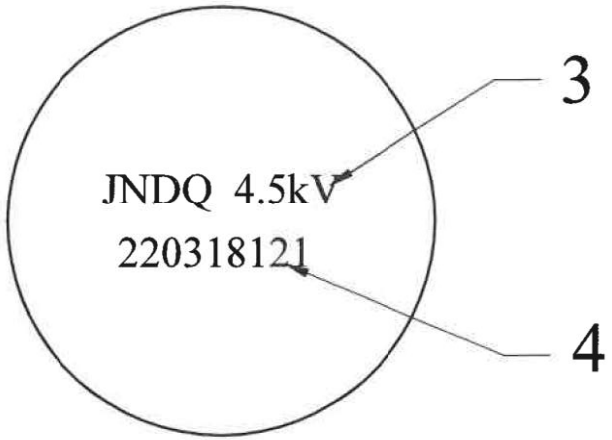
Software system:

SW - S.A.D. Surge arrester version 2.0

END OF THE DOCUMENT

unit:mm



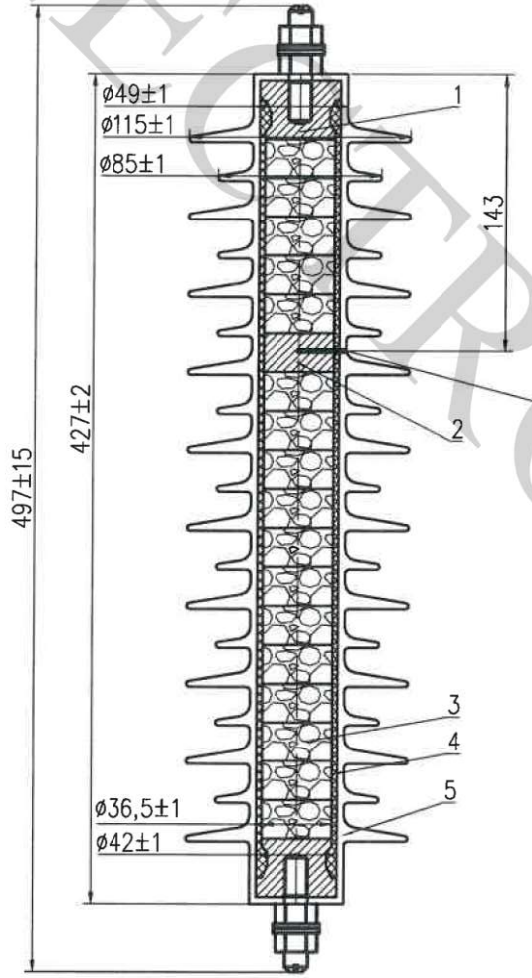


No	Item
1	Aluminum electrode
2	Epoxy resin glaze
3	DC 1mA
4	Batch number

CESI
C3008047

备注Remark:			Metal Oxide Varistor	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
	签名Sigrature	日期Date	D36.5×20	单位unit: mm
设计Design	Zhang Yu	12·10·2022	MO resistor drawing	JNDQ.MO.3620 Q1
审核Verify	Huang Long	12·10·2022		
批准Approve	Jade	12·10·2022		

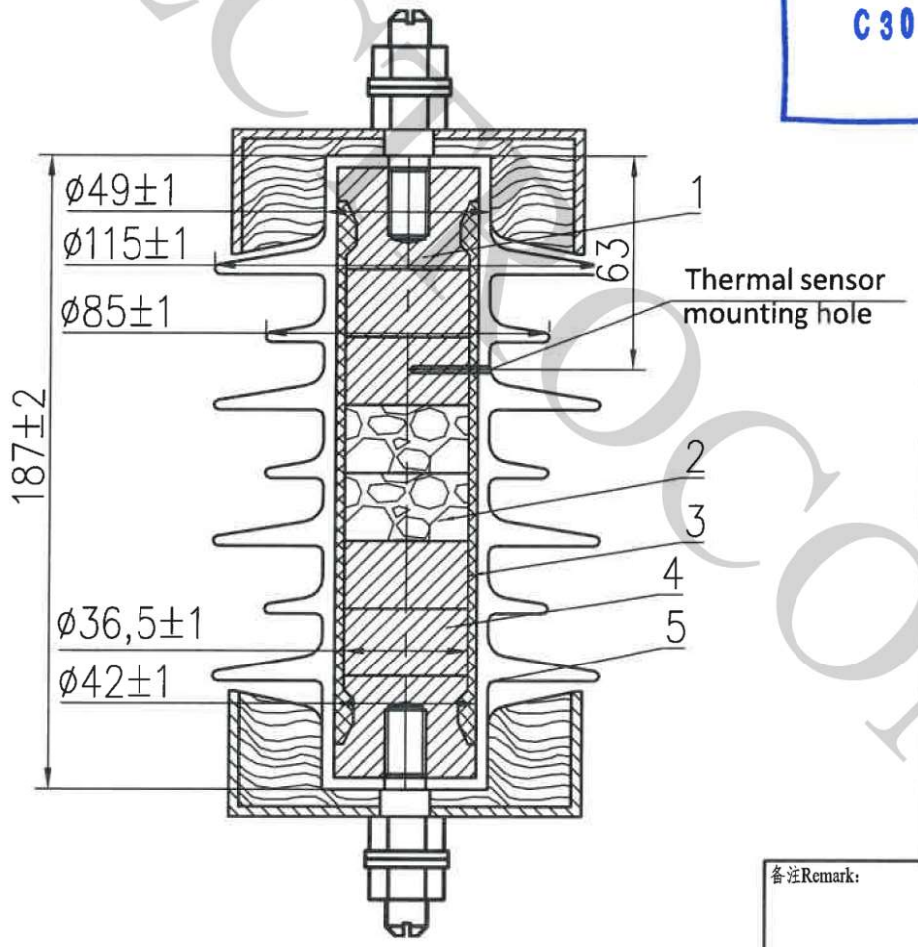
unit:mm



CESI
C3008356

No	Item
1	Iron spacer
2	Aluminum pad block
3	zinc oxide varistor D36.5×20
4	glass fibre
5	silicone rubber

备注Remark:			Metal Oxide lightning arrester YH10W-51	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
	签名Sigrature	日期Date		单位unit：mm
设计Design	Zhang Yu	12·10·2022		JN-DH51.49427.RMX 1
审核Verify	Huang Long	12·10·2022	sections in thermal model	
批准Approve	Jade	12·10·2022		



No	Item
1	Iron spacer
2	zinc oxide varistor D36.5×20
3	glass fibre
4	Aluminum pad block
5	silicone rubber
6	Insulation cotton

备注Remark:		Metal Oxide lightning arrester YH10W-6
	签名Sigrature / 日期Date	
设计Design	Zhang Yu / 24·11·2022	Cross sectional
审核Verify	Huang Long / 24·11·2022	
批准Approve	Jade / 24·11·2022	

南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD

单位unit：mm

JN-DH6.49187 | 1

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TEST REPORT

CONFIDENTIAL APPROVED C3008043

Client	**Nanjang Jinniu Electric Co., Ltd.**
Address of the client	**Sth sect. of Zhongyuan Rd, tongbai Nanjang - China**
Order	**7000003982 – 29 April 2022**
Tested samples/items	**Polymer Housed Arrester**
Tests carried out	**Accelerated weathering test acc. IEC 60099-4:2014, clause 10.8.17.3 on 1 sample of polymer housed arrester: see chapter 2**
Standards/Specifications	**See chapter 2**
Tests date	**from 29 August 2022 to 14 October 2022**

No. of pages 6 **No. of pages annexed** -

Issue date 12 June 2023

Prepared ENC - Cazzuffi Daniele Antonio

Approved ENC - Mozzi Riccardo

Mod. RPRO v. 14

CESI S.p.A.
Via Rubattino 54
I-20134 Milano - Italy
Tel: +39 02 21251
Fax: +39 02 21255440
e-mail: info@cesi.it
www.cesi.it

Capitale sociale € 8.550.000 interamente versato
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P.I. IT00793580150
N. R.E.A. 429222

Table of contents

1 SPECIFIC INFORMATION 3

2 TESTS PERFORMED 4

3 TEST RESULTS 5

1 SPECIFIC INFORMATION

Date of receipt of the test samples/items	1 July 2022
Test location	CESI - Piacenza - Via Nino Bixio 39
Test laboratory	Geosynthetics and Environmental Geotechnics Laboratory
CESI testing team	M. Livelli, E. Curtoni
Test witnessed by	
Reference documents	See chapter 2
Information about sampling	
Sampling date	
Carried out by	The customer
Specimen extraction from the sample	The specimens used for the laboratory tests have been taken from the sample in accordance with the standard UNI EN ISO 9862: 2005
Has the samples/items to be retained?	YES
If YES until 12 August 2023	Two months by the Test Report emission date

2 TESTS PERFORMED

This Test Report contains the results of the tests hereafter listed, also with reference to the standards required in your order.

Table 1 - Polymer Housed Arrester

Type of test	Standard	Year
Accelerated light ageing	IEC 60099-4	2014

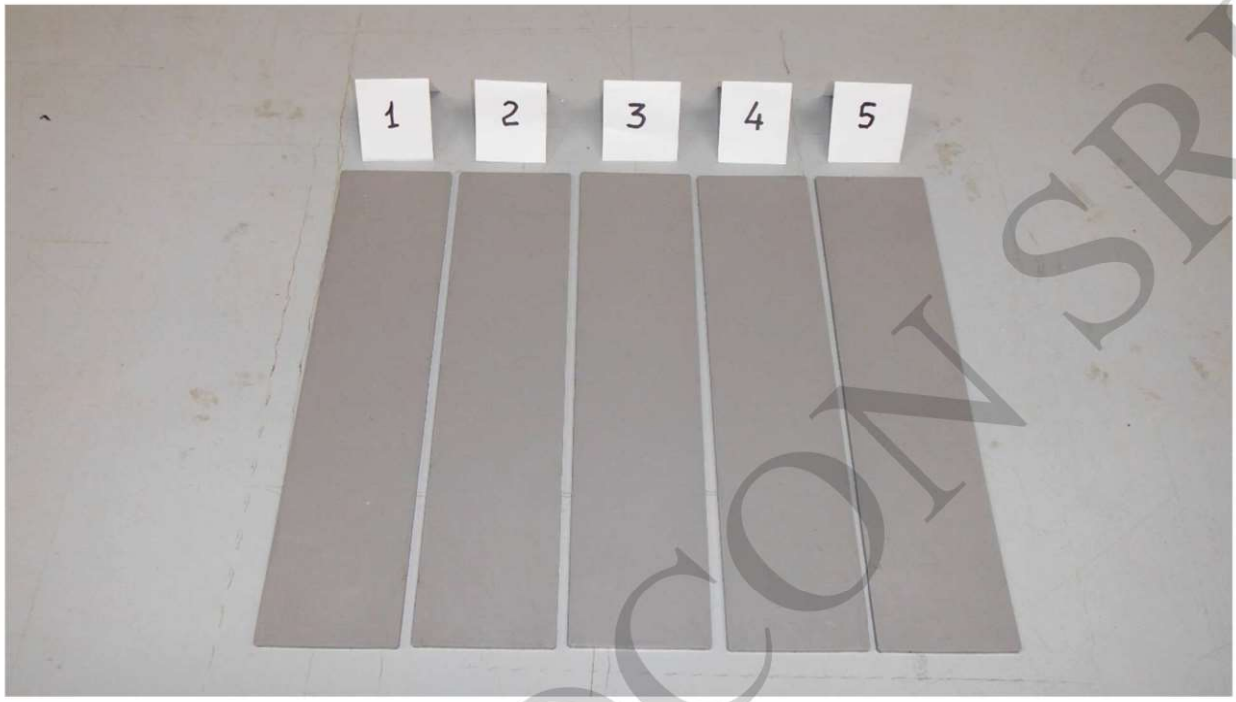
3 TEST RESULTS

Table 1 - Polymer Housed Arrester

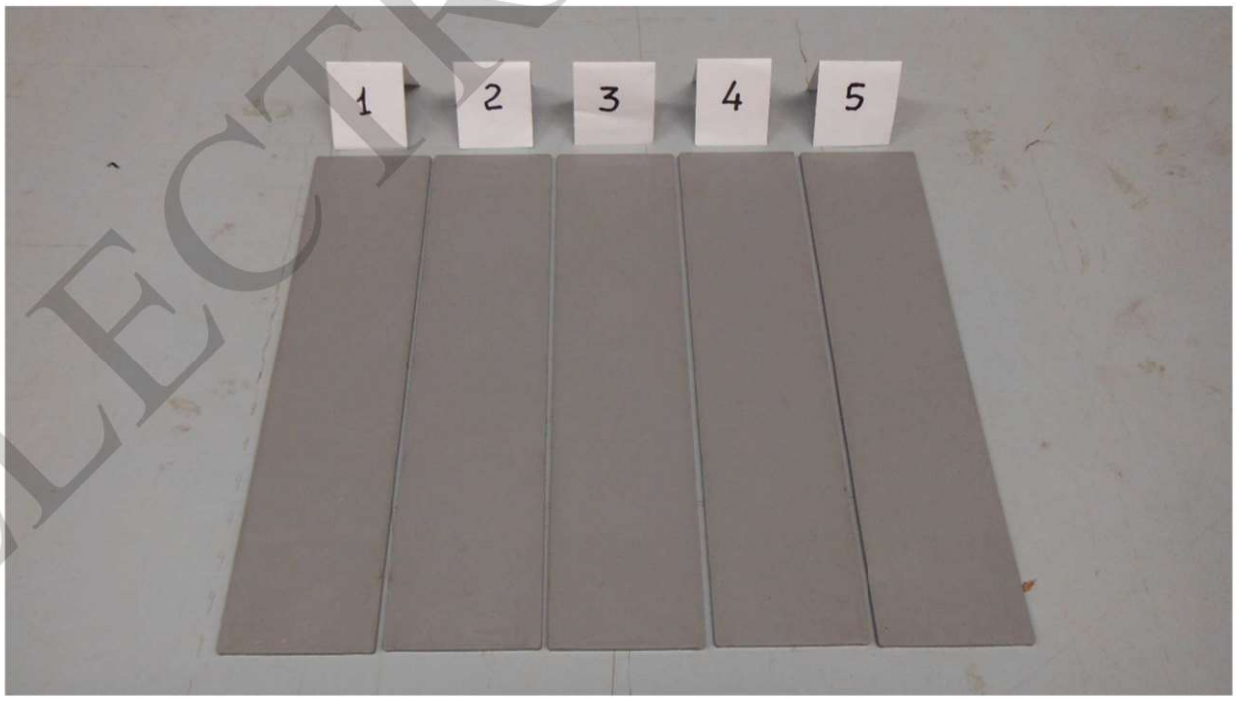
Type of test and measured properties	Standard	Unit	Polymer Housed Arrester
Accelerated light ageing After 1000 hours	IEC 60099-4 : 2014 *(clause 10.8.17.3)*		 No cracks

The sample passed the test

Virgin sample



Sample after accelerated light ageing (1000 hours)



End of Test Report