

TEST RECORD

NO. 2315.2130449.0258

THS Industria e Comercio Ltda. Rua Ernesto Biester, 59
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CEP 04777-120 - Sao Paulo

CLIENT

THS Industria e Comercio Ltda. Rua Ernesto Biester, 59

MANUFACTURER

- High-voltage current-limiting fuses
- Expulsion fuses

TEST OBJECT

Limitron - Full Range Fuses 125 A, 15,5 kV Nr. THS-5164
Limitron - Porta -Fusivel 10 A, 15,5 kV Nr. THS-2515
Limitron - Loadbreak Connector Fuse 20 A , 15,5 kV, Nr. THS-E15-20
Limitron - Loadbreak Connector Fuse 10 A , 15,5 kV, Nr. THS-5120
Expulsion Fuse 50A (50K), 15,5kV, Nr. THS-5164/1

TYPE

Test samples

SERIAL NO.

Rated voltage	15,5 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated frequency	50 Hz	
Rated breaking current (current-limiting fuses)	30 kA	
Rated breaking current (expulsion fuses)	6 kA	

- Clients instructions
- IEC 60282-1: 2009-10
- IEC 60282-2: 2008-04

NORMATIVE DOCUMENT

- Breaking tests 15,5 kV 30 kA (symmetrical) for the current-limiting fuses
- Breaking tests 15,5 kV 6 kA (symmetrical) for the expulsion fuses

TEST PERFORMED

24 May 2013

DATE OF TEST

The fuses were capable of correctly breaking

TEST RESULT

This test document comprises 24 sheets.



W. MORITZ
Test engineer in charge

Berlin, 27 May 2013

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The test results relate only to the object tested

Independent test laboratory accredited by the German Accreditation Body DAkkS, Deutsche Akkreditierungsstelle GmbH, in the fields of high-voltage switchgear and their components, cables and conductors as well as industrial low-voltage apparatus.

IPH Institut „Prüffeld für elektrische Hochleistungstechnik“ GmbH (IPH, Berlin) is a subsidiary of CESI S.p.A, Milan.

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1. Present at the test

Mr. Moritz IPH test engineer in charge
 Mr. Kruscha IPH test engineer

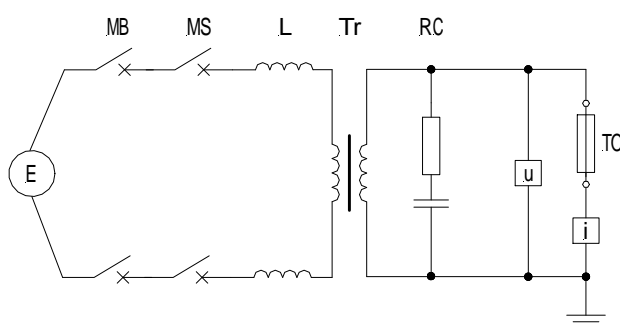
2. Test laboratory

High-power test laboratory, test bay 7

3. Test and measuring circuits

Technical data of test circuits

Test requirement		Breaking tests
Test No.	113	1985 to 1993
Number of phases	(Test circuit)	2
Number of poles/phases	(Test object)	1
Test frequency	Hz	50
Power factor $\cos \varphi$		< 0.15
Earthing conditions	Grid	Not earthed
	Short-circuit transformers	Earthed
Short-circuit power of the test circuit		465 MVA



- | | | | |
|----|---------------------------|----|---------------------|
| E | Power supply | RC | TRV elements |
| MB | Master breaker | TO | Test object |
| MS | Making switch | i | Current measurement |
| L | Current limiting reactor | u | Voltage measurement |
| Tr | Short-circuit transformer | | |

Figure 1: Test circuit diagram

Technical data of measuring circuits

Measuring point	Symbol in the oscillograms	Measuring quantity	Measuring sensor/device
1	i	Breaking current	Shunt
2	u	Voltage	RC divider

Recording instrument: BE 256 multichannel transient recorder system

4. Test results

Test No.	113	1985	1986	1987	1988	1989	1990
Test sample No.		1	2	3	4	5	6
Type		THS-5164	THS-5164	THS-5164	THS-2515	THS-E15-20	THS-5120
Resistance	mΩ	12,97	13,73	18,13	505	73,9	435
Rated current of the fuse link	A	125	125	125	10	20	10
Test voltage	kV	15,5	15,5	15,5	15,5	15,5	15,5
Prospective peak current	kA	44,8	44,8	44,8	44,8	44,8	44,8
Prospective breaking current	kA	30,2	30,2	30,2	30,2	30,2	30,2
Power factor cos φ		0,04	0,04	0,04	0,04	0,04	0,04
Making angle	°el.	80,3	85,5	85,1	85,3	88,9	89,5
Initiation of arcing after voltage zero	°el.	87,7	92,0	91,1	87,7	91,3	91,4
Melting current	kA	5,11	5,34	4,91	1,76	2,17	1,50
Cut-off current	kA	7,92	8,14	7,83	1,90	3,89	1,55
Melting time	ms	0,41	0,36	0,33	0,13	0,13	0,11
Arcing time	ms	4,64	4,16	4,28	0,38	4,26	3,98
Operating time	ms	5,05	4,52	4,61	0,51	4,39	4,09
Melting integral	10 ³ A ² s	3,43	3,69	2,73	0,18	0,28	0,14
Arcing integral	10 ³ A ² s	65,6	65,8	65,6	0,14	8,15	0,20
Operating integral	10 ³ A ² s	68,8	69,2	68,1	0,29	8,38	0,32
Arcing energy	kVAs	274	260	267	2,20	76,7	13,1
Peak switching voltage	kV	32,1	33,0	31,4	49,9	34,5	64,4
Recovery voltage	kV	16,2	16,2	16,2	16,2	16,2	16,0
Evaluation		P	P	P	P	P	P

Notes:

P - The fuse is capable of correctly breaking.

Test results (continued)

Test No.	113	1991	1992	1993
Test sample No.		7	8	9
Type		THS-5164/1	THS-5164/1	THS-5164/1
Resistance		-	-	-
Rated current of the fuse link	A	50	50	50
Test voltage	kV	15,5	15,5	15,5
Prospective peak current	kA	9,35	9,35	9,35
Prospective breaking current	kA	6,00	6,00	6,00
Power factor cos φ		0,03	0,03	0,03
Making angle	°el.	88,6	87,8	88,7
Initiation of arcing after voltage zero	°el.	125	118	120
Melting current	kA	5,14	4,50	4,46
Cut-off current	kA	8,48	8,21	8,35
Melting time	ms	2,03	1,70	1,72
Arcing time	ms	7,59	7,88	7,86
Operating time	ms	9,62	9,57	9,58
Melting integral	10 ³ A ² s	20,6	12,0	12
Arcing integral	10 ³ A ² s	333	317	329
Operating integral	10 ³ A ² s	354	329	341
Arcing energy	kVAs	73,0	76,7	84,4
Peak switching voltage	kV	33,2	55,6	40,1
Recovery voltage	kV	16,1	16,1	16,1
Evaluation		P	P	P

Notes:

P - The fuse is capable of correctly breaking.

5. Photos



Photo 1: Test samples before tests



Photo 2: Test sample 1 (THS-5164) before test 113 1985



Photo 3: Test sample 2 (THS-5164) before test 113 1986



Photo 4: Test sample 3 (THS-5164) before test 113 1987



Photo 5: Test sample 4 (THS-2515) before test 113 1988



Photo 6: Test sample 5 (THS-E15-20) before test 113 1989



Photo 7: Test sample 6 (THS-5120) before test 113 1990



Photo 8: Test sample 7 (THS-5164/1) before test 113 1991



Photo 9: Test sample 8 (THS-5164/1) before test 113 1992



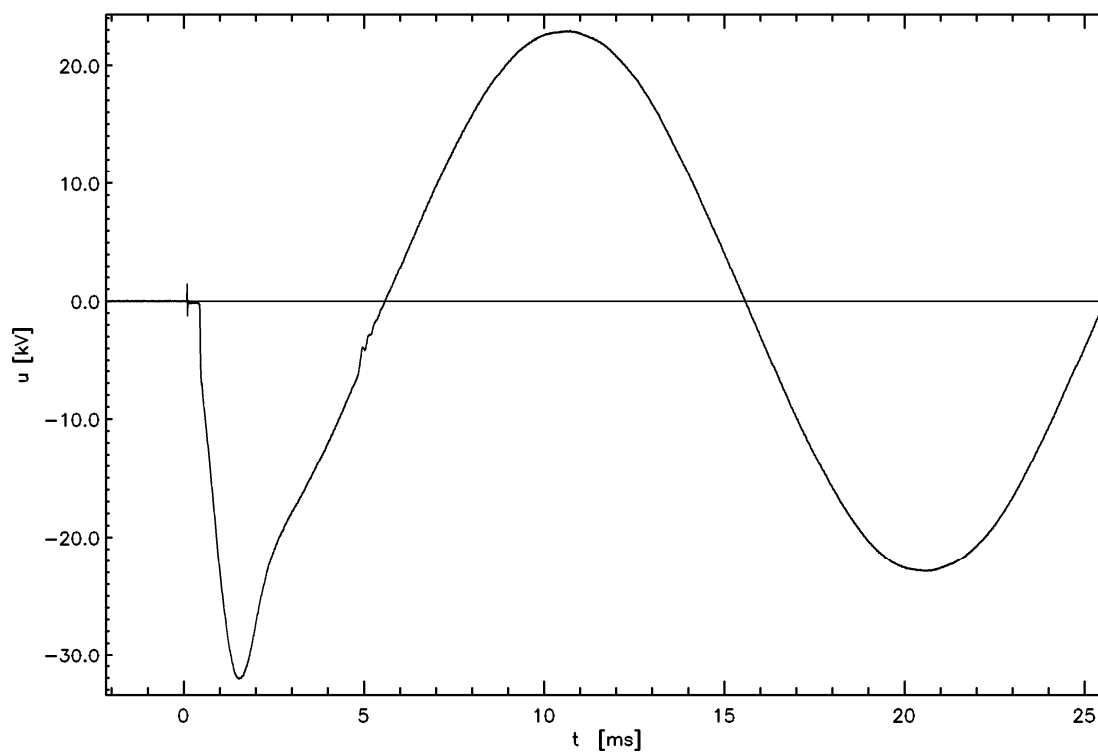
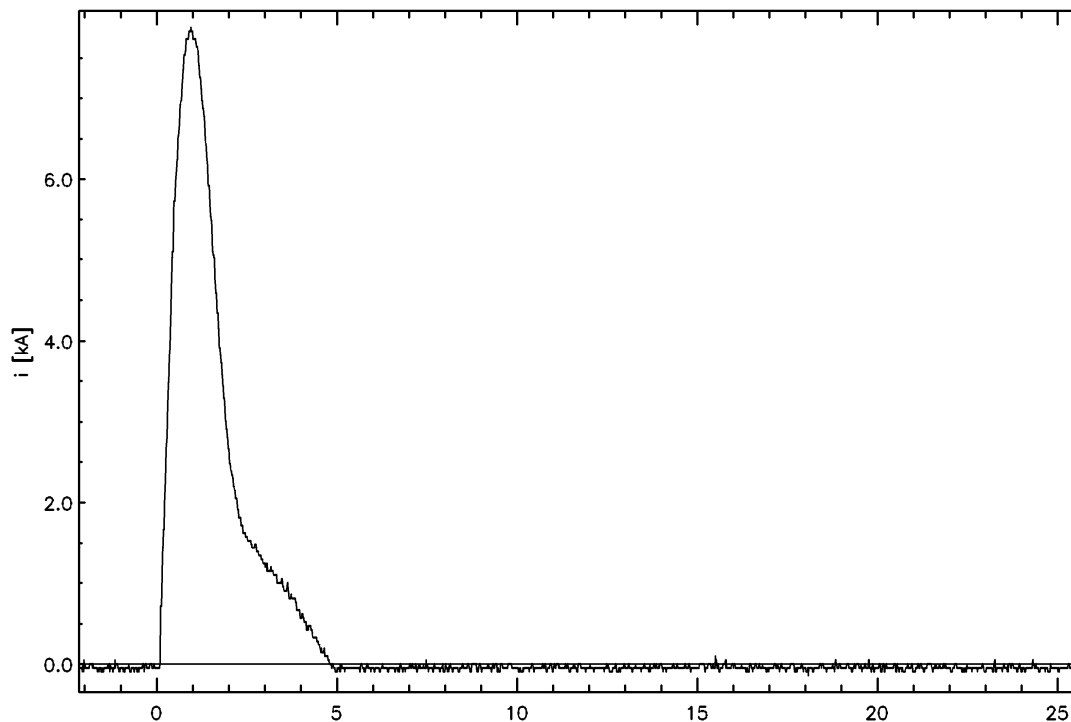
Photo 10: Test sample 9 (THS-5164/1) before test 113 1993



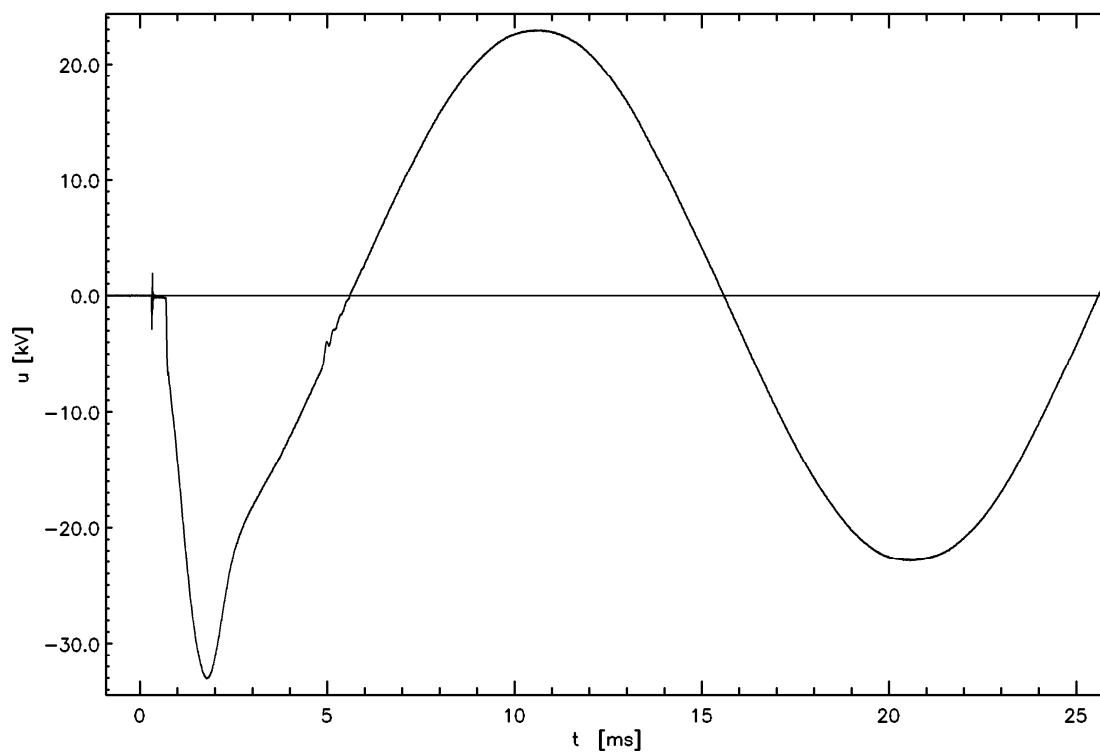
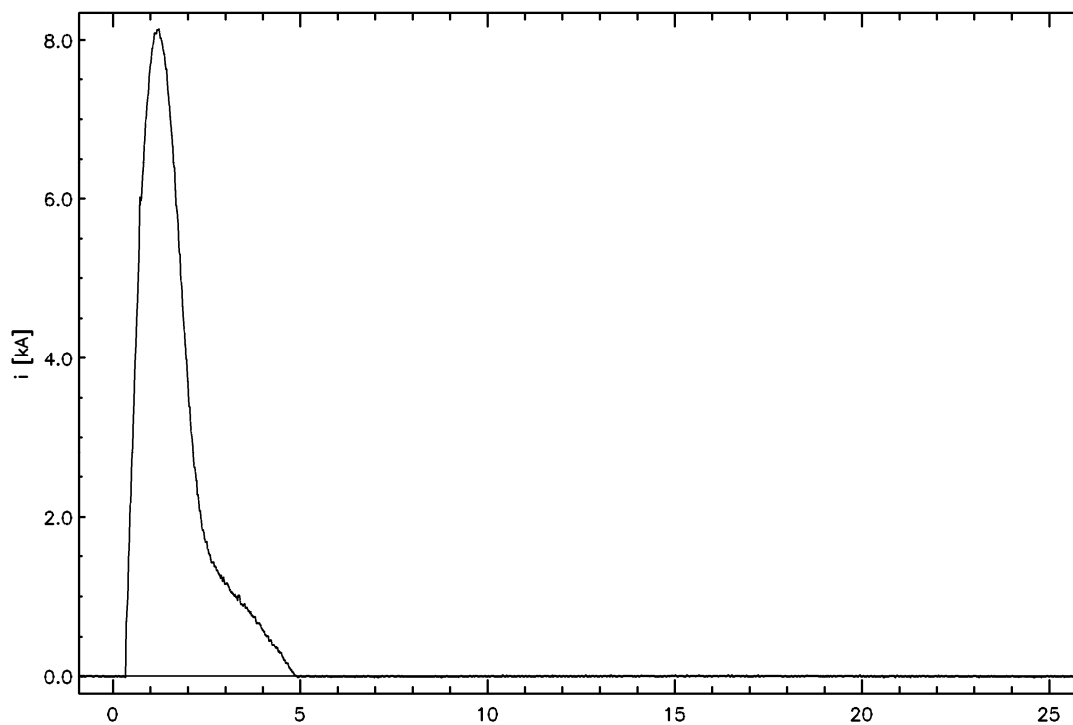
Photo 11: Test sample 9 (THS-5164/1) after test 113 1993

6. Oscillograms

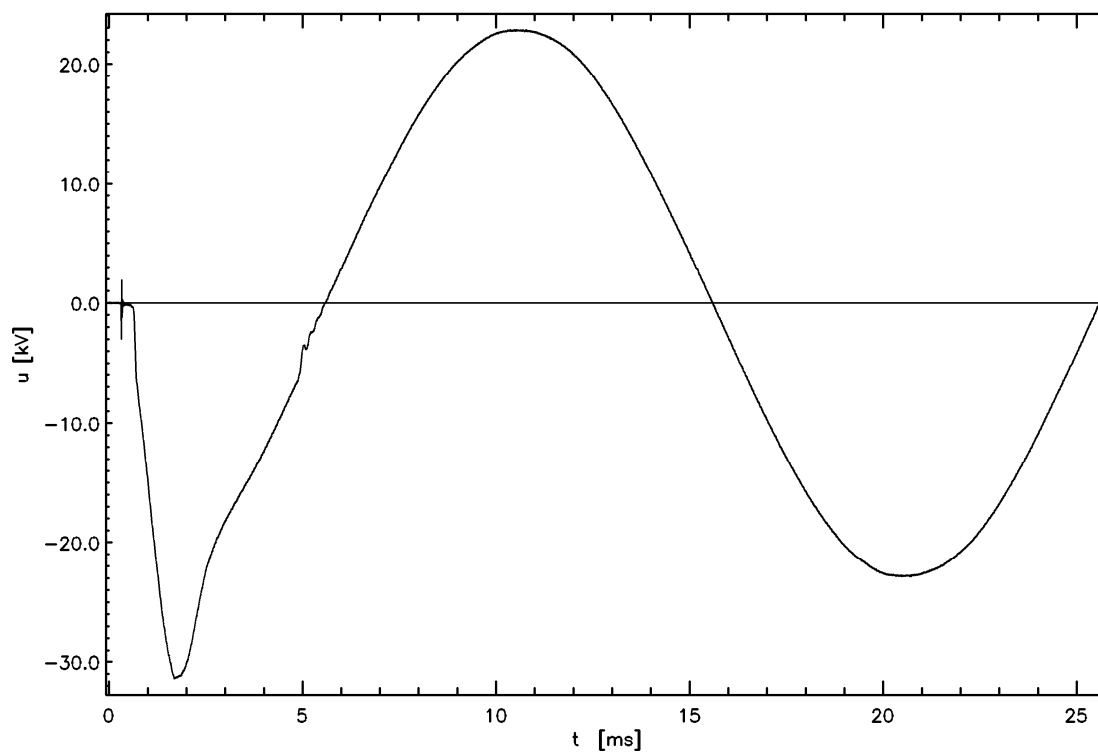
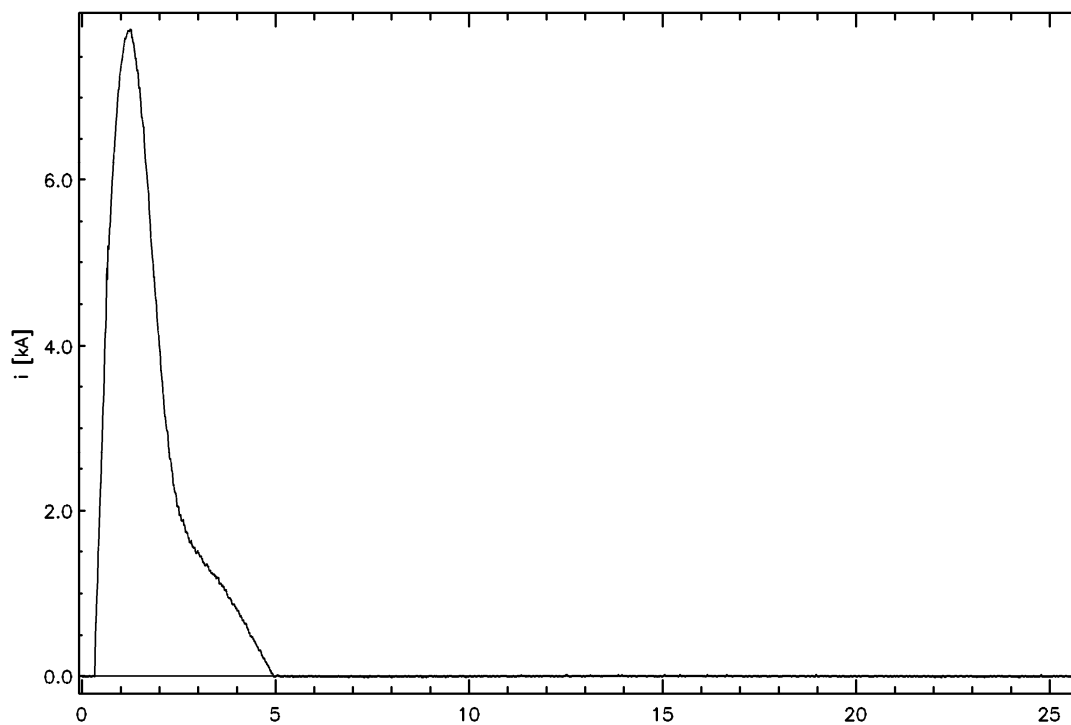
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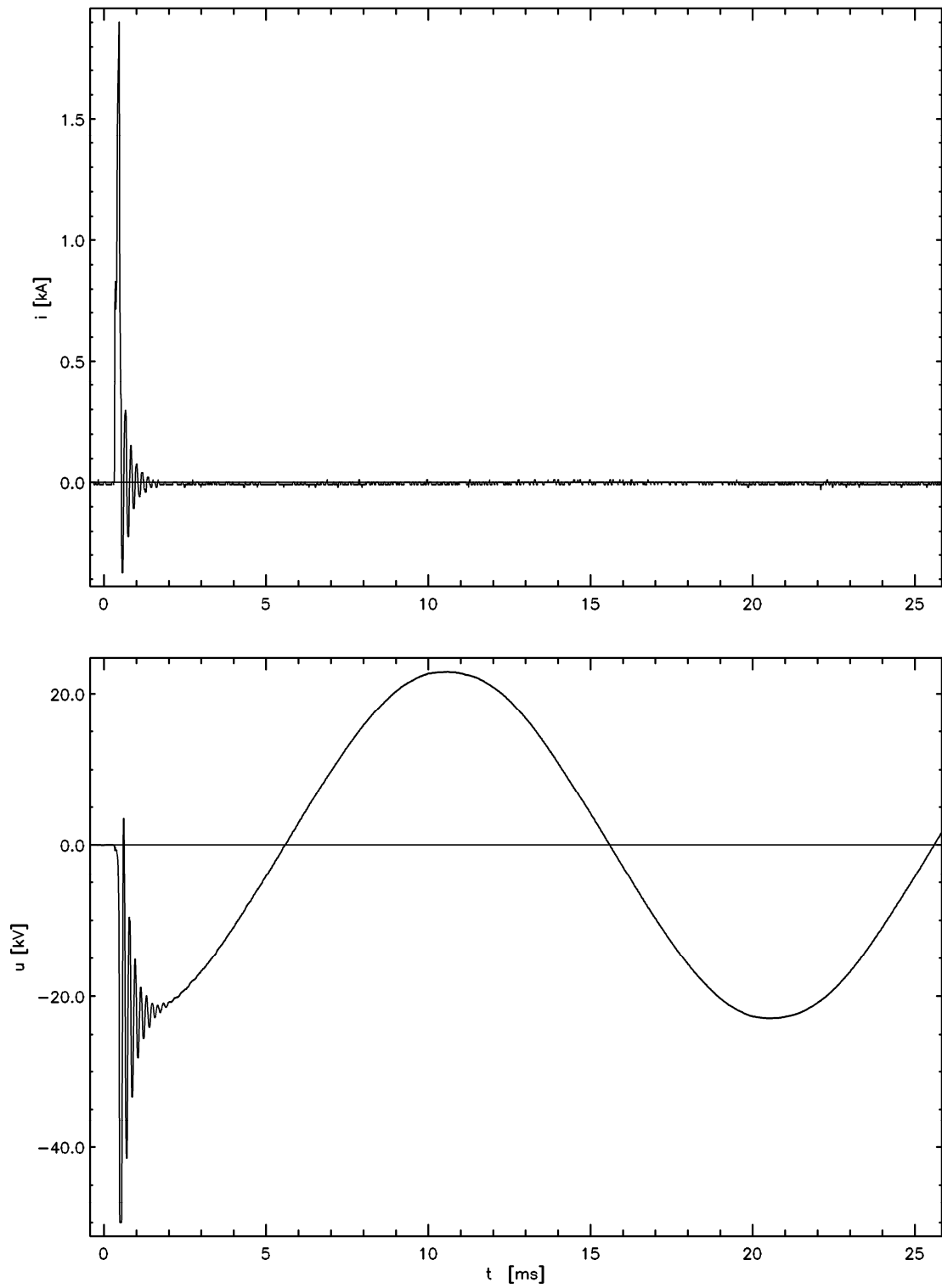
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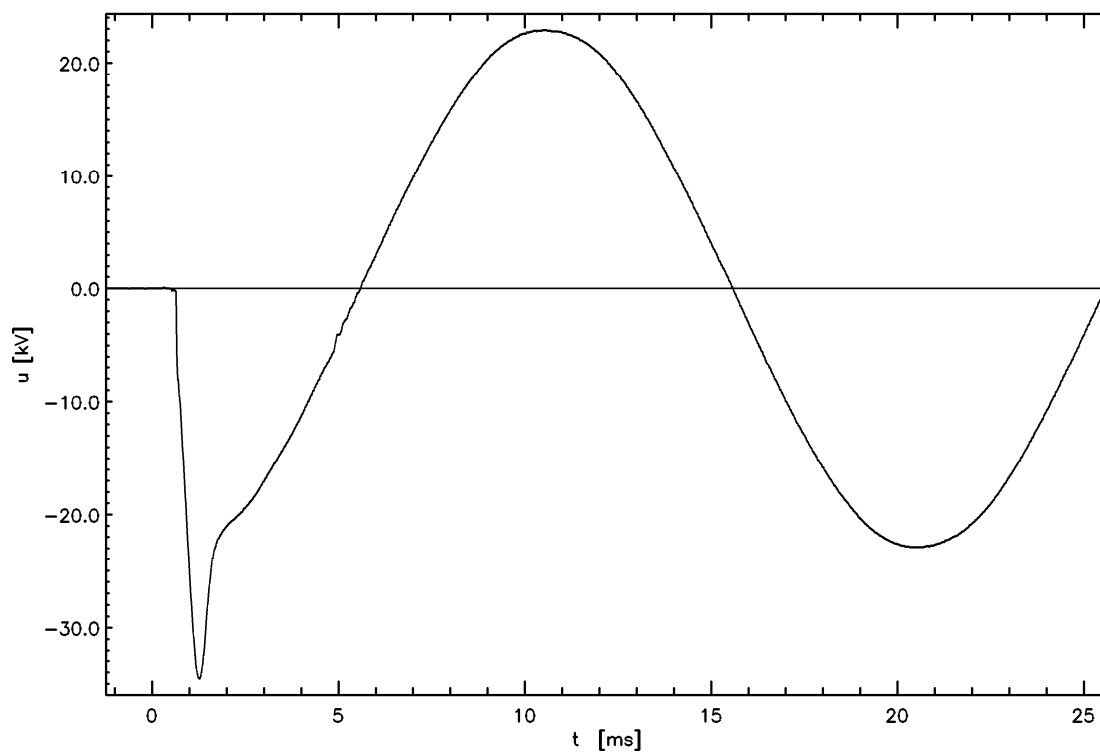
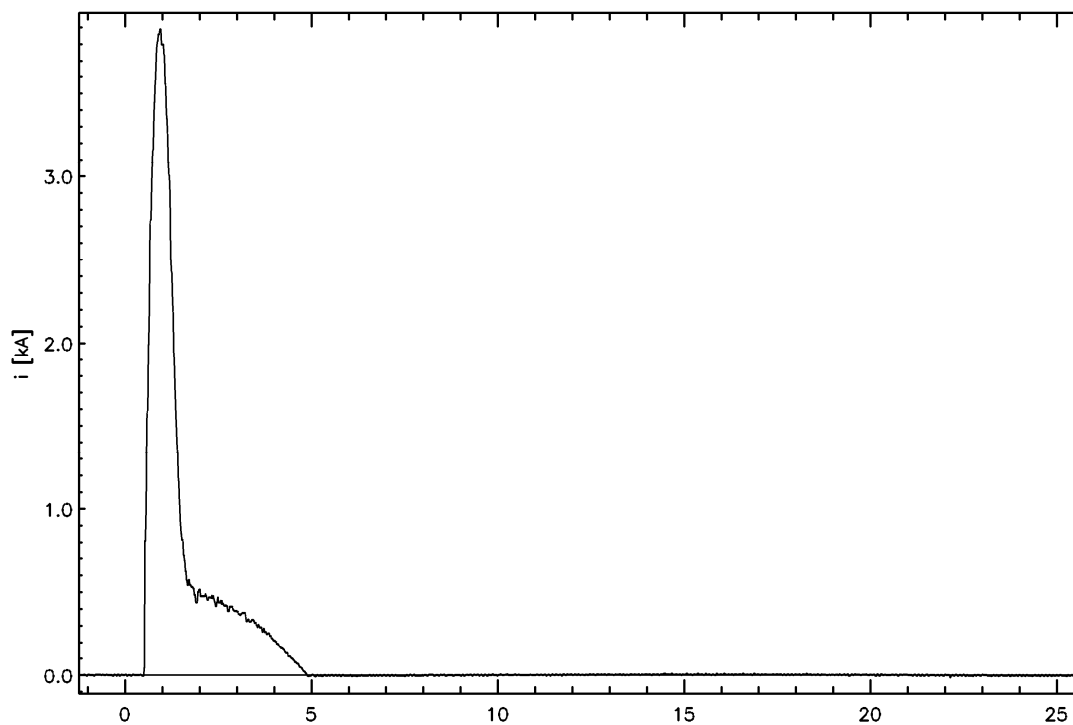
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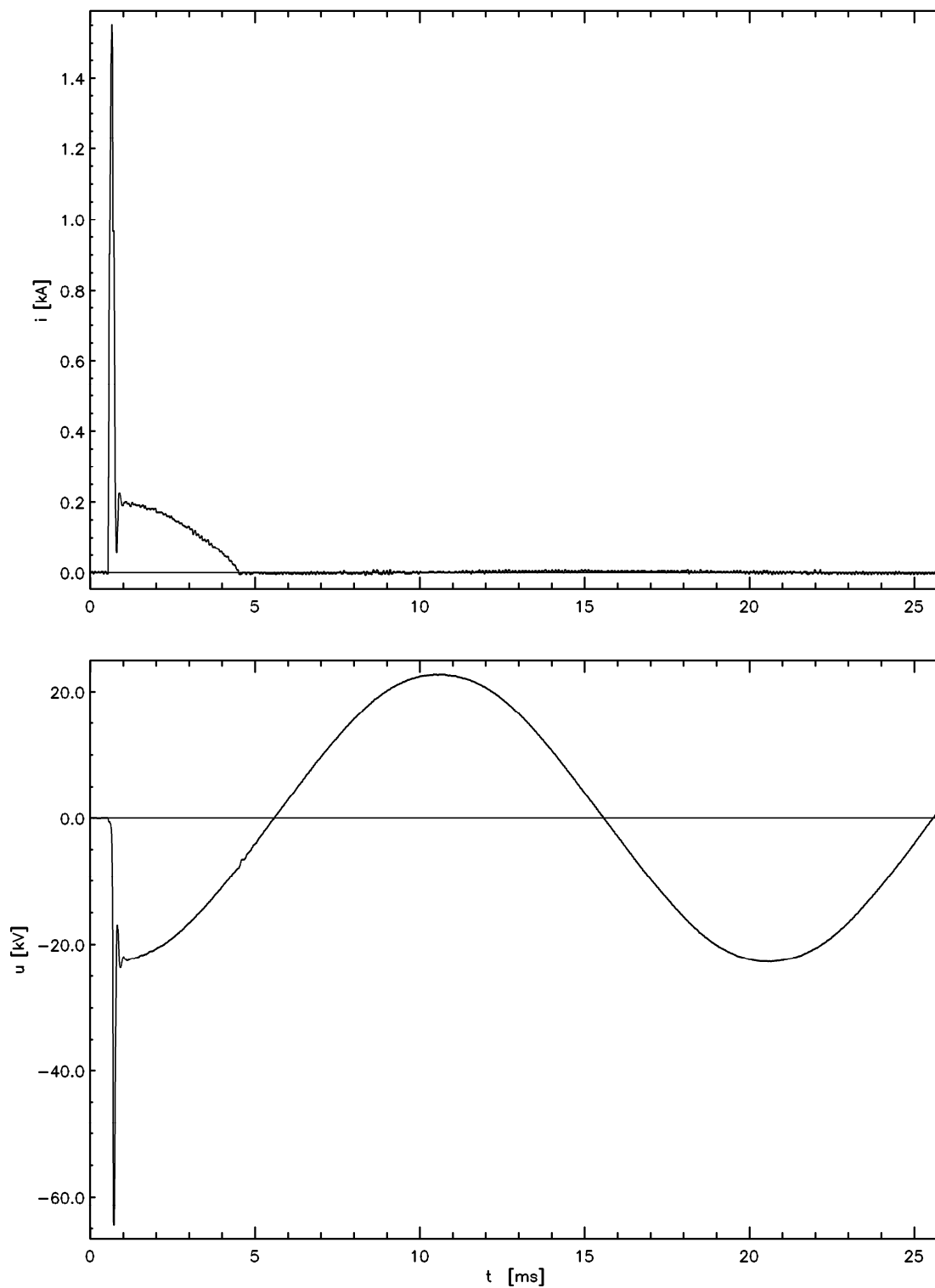
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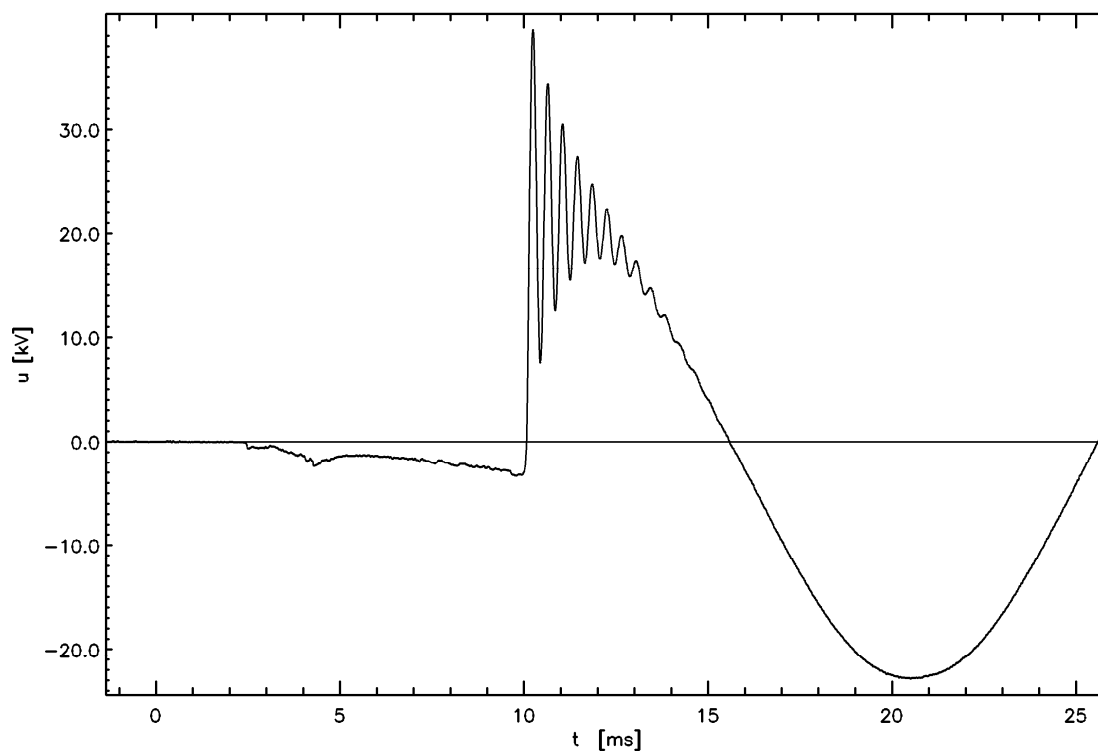
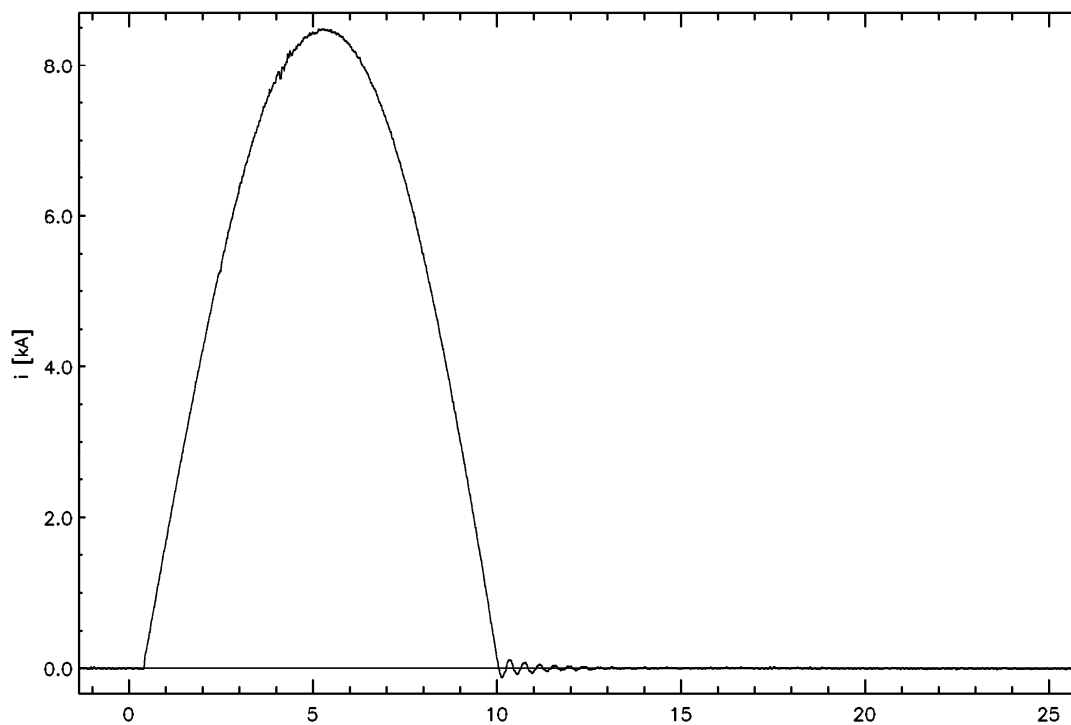
Test-No. 1131989



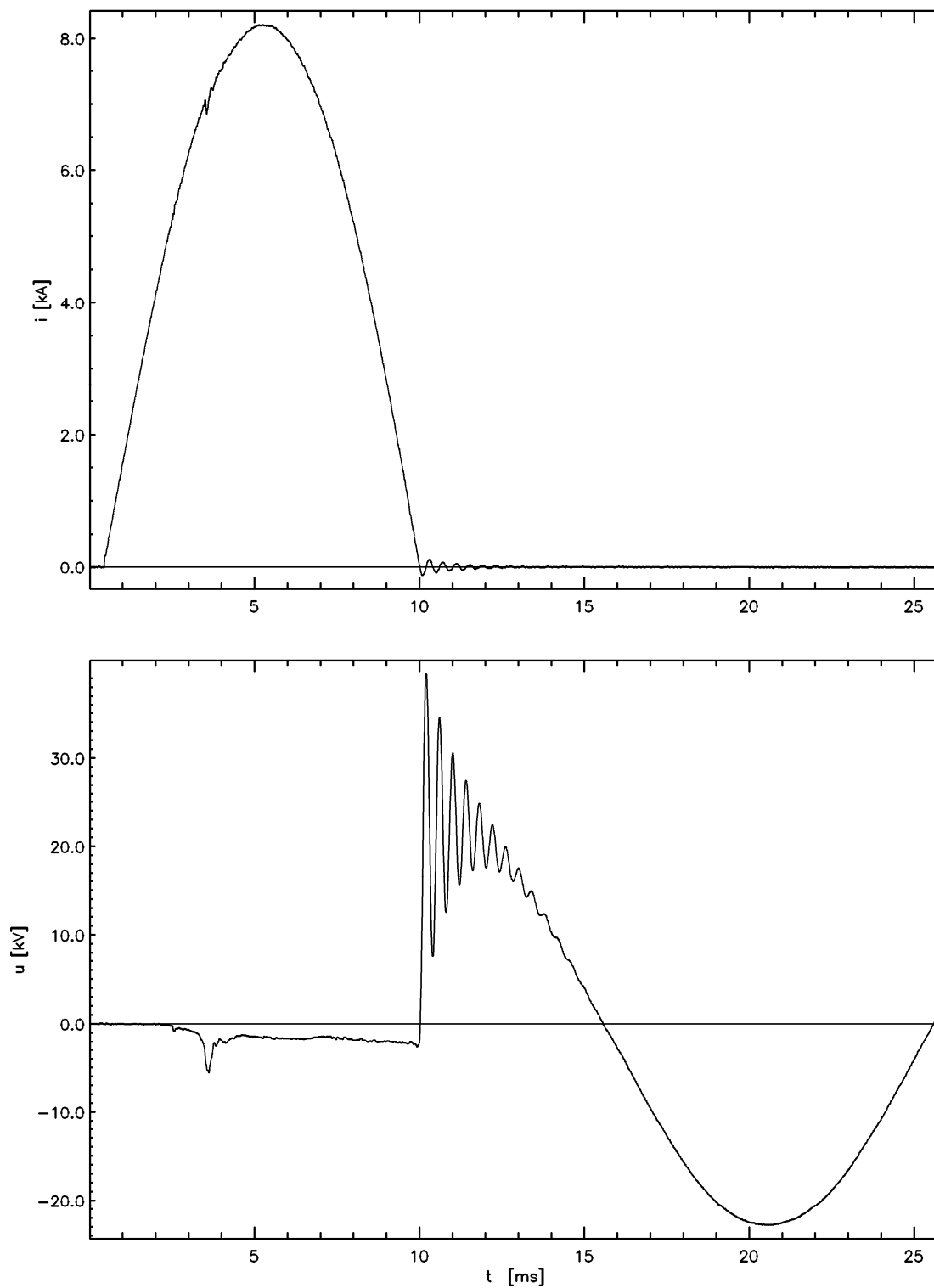
Test-No. 1131990



Test-No. 1131991



Test-No. 1131992



Test-No. 1131993

