Test Report

Document No.	12070-20-0197	Copy No.	1	Number of pages	17
Apparatus	High-voltage current-limiting fuse				
Designation	HH Current limiting fuse HH Full Range Fuse HH Beckup Fusivel				
Serial Number	413/414/417/5944/5945				
Manufacturer	THS Industria e Comercio Ltda. Rua Sargento Francisco Rodrigues da Rosa, 534 Cajuru do Sul 18105-008 Sorocaba - Sao Paulo BRAZIL				
Client	THS Industria e Comercio Ltda. Rua Sargento Francisco Rodrigues da Rosa, 534 Cajuru do Sul 18105-008 Sorocaba - Sao Paulo BRAZIL				
Date(s) of test(s)	29 April 2020				
Tested by	IPH Institut „Prüffeld für elektrische Hochleistungstechnik" GmbH Landsberger Allee 378A 12681 Berlin GERMANY				
Test(s) performed	Breaking tests in test duty 1				

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:

According to client´s instructions based on IEC 60282-1: 2009-10 + AMD1: 2014-07

The results are documented in this test report. 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.

Date	Christian Kruscha Test Engineer in charge	Hannes Zinnbauer Approved by
20 May 2020		

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DAkkS Deutsche Akkreditierungsstelle D-PL-12107-01-00

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Notes

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CESI Group Test Documents description

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 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

Ratings and characteristics assigned by the manufacturer

Description		Rating
Rated voltage		15.5 kV
Rated current of the fuse-link		30 bis 180 A
Rated frequency		50 Hz
Rated breaking current		50 kA
Transient recovery voltage	u_c/t_3	0.367 kV/µs
	u_c	26.7 kV

Contents **Sheet**

1. Present at the test

Mr. Kruscha IPH test engineer in charge

2. Test performed

Breaking tests in test duty 1

3. Identity of the test object

3.1 Technical data and characteristics

Test object:	High-voltage current-limiting fuse
Type:	HH Current limiting fuse HH Full Range Fuse HH Beckup Fusivel
Manufacturer:	THS Industria e Comercio Ltda., Brazil
Serial No.:	413/414/417/5944/5945
Year of manufacture:	2020

Characteristics and Further data:

see Data sheets

3.2 Identity documents

The manufacturer confirms that the test object has been manufactured in compliance with the drawings given in this document. IPH did not verify this compliance in detail.
The identity of the test object is fixed by the following drawings and data submitted by the client:

Name of drawing	Drawing No.	Date of drawing	Author	Notes
Fusivel Limitator de Corrente Tipo HH H.V. HRC Fuse-link	--	--	THS	Sheet 16

Entry of test object at IPH: April 2020

4. Breaking tests

4.1 Test laboratory

IPH, High-power test laboratory, test bay 7

4.2 Normative document

According to client´s instructions based on
IEC 60282-1: 2009-10 + AMD1: 2014-07, Sub-clause 6.6

4.3 Required test parameters

			Test duty
			1
Power-frequency recovery voltage		kV	13.5
Prospective current		kA	50 kA
Power factor			0.07 to 0.15
Test frequency		Hz	50
Prospective TRV	u_c	kV	27
	u_c / t_3	kV/µs	0.35
Maintained voltage after breaking		s	≥15

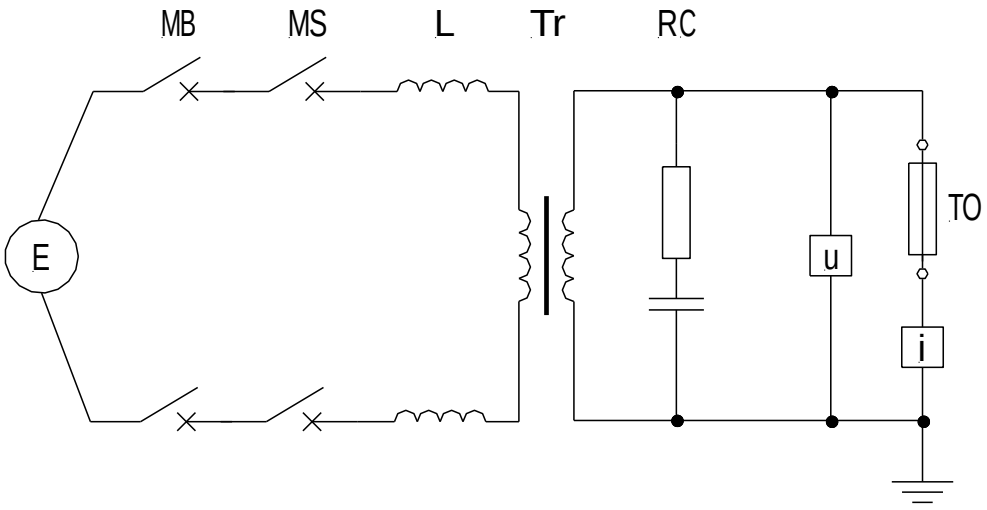
4.4 Test arrangement

The breaking tests were performed with single-phase alternating current and with single fuses.
The fuses to be tested were mounted on a rigid earthed metal structure in the normal service position according to IEC 60282-1, Sub-clause 6.3.2.

4.5 Test and measuring circuits

Technical data of test circuits

Test requirement		Breaking tests in test duties 1 and 2
Test No.	Test duty 2	120 1340 to 120 1344
Number of phases	(Test circuit)	2
Number of poles/phases	(Test object)	1
Test frequency	Hz	50
Power factor cos φ		‹ 0.15
Earthing conditions	Generator, grid	Not earthed
	Short-circuit transformers	Earthed
Short-circuit power of the test circuit		1300 MVA



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

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: AD3000 multichannel transient recorder system			

4.6 Test results

Test No.		120	1340	1341	1342	1343	1344
Test sample No.			413	414	5944	5945	417
Type			HH 63A	HH 100A	HH 30A	HH-Beckup 100A	HH 180A
Resistance		mΩ	14.5	9.79	31.9	11.4	6.31
Test voltage		kV	13.5	13.5	13.5	13.5	13.5
Prospective peak current		kA	139	139	139	139	139
Prospective breaking current		kA	52.0	52.0	52.0	52.0	52.0
Power factor cos φ			‹0.1	‹0.1	‹0.1	‹0.1	‹0.1
Making angle		°el.	62	72	68	67	68
Initiation of arcing after voltage zero		°el.	70	85	74	82	85
Melting current i_s		kA	11.0	15.8	7.5	14.2	21.1
Cut-off current		kA	11.9	17.1	7.9	15.0	22.3
Melting time		ms	0.48	0.71	0.33	0.66	0.96
Arcing time		ms	4.16	4.02	2.37	4.26	4.40
Operating time		ms	4.64	4.72	2.40	4.92	5.35
Melting Joule integral	10^3	A^2s	19.0	53.6	5.76	40.3	130
Arcing Joule integral	10^3	A^2s	37.6	149	10.1	71.4	293
Operating Joule integral	10^3	A^2s	56.9	203	15.9	112	423
Arcing energy	10^6	VAs	145	385	64	212	567
Peak switching voltage		kV	42.3	33.4	40.8	42.3	35.0
Recovery voltage		kV	14.0	14.0	14.0	14.0	14.0
Duration of power frequency recovery voltage		s	15	15	15	15	15
Fuse operated correct		y/n	y	y	y	y	y
Switching voltage us ≤ permissive value		y/n	y	y	y	y	y
Current limiting: (id ≤ Cut-off characteristics)		y/n	y	y	y	y	y
Emission of flames or sand		y/n	n	n	n	n	n
Damages (external)		y/n	n	n	n	n	n
Operation of striker correct		y/n	y	y	y	y	y
Evaluation			OK	OK	OK	OK	OK

Notes:

OK - Passed

Condition of test object after test:

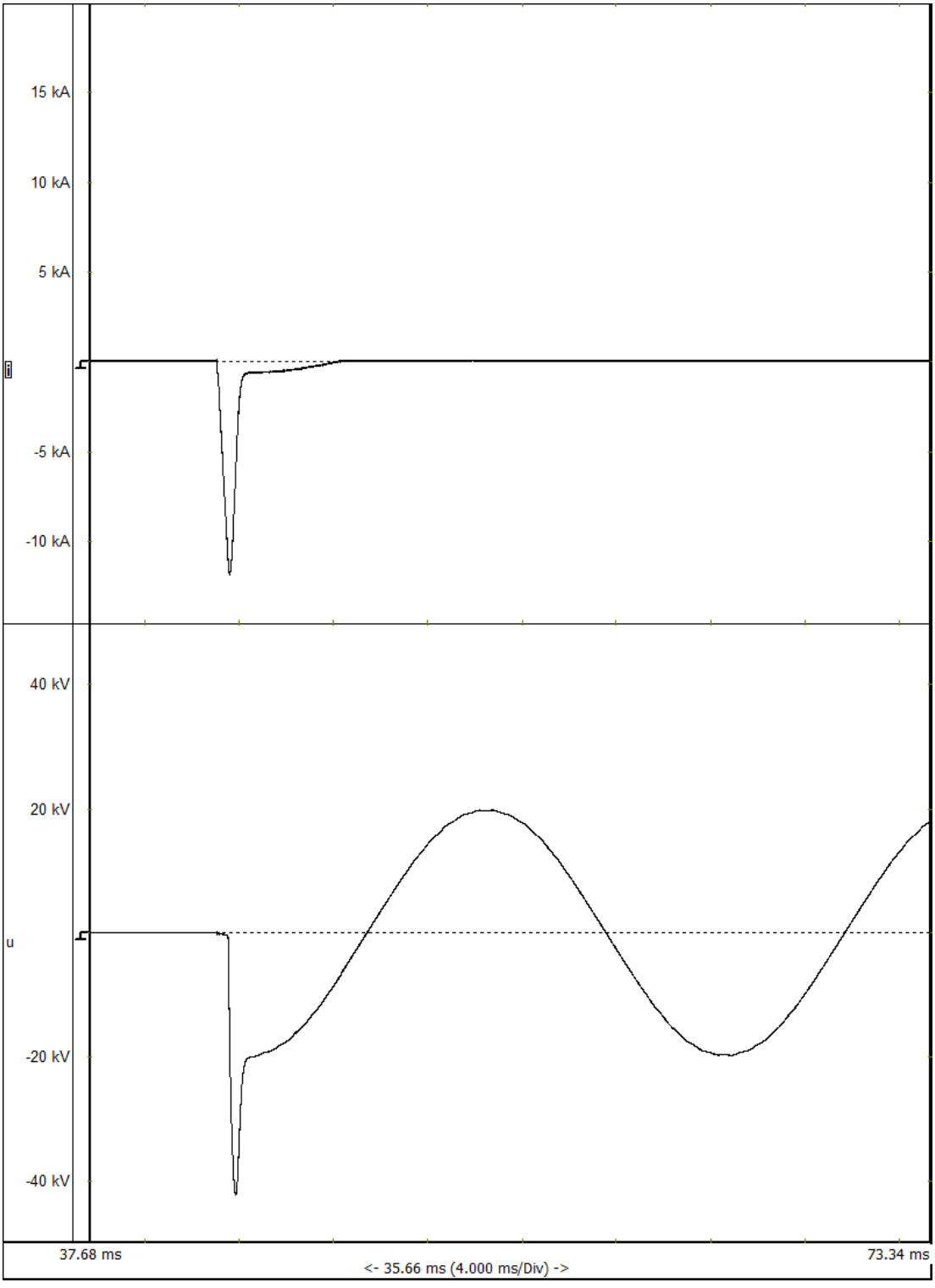
It was possible to remove the fuse-link in one piece after operation.
(See Photo 1, Sheet 10)

5. Photos

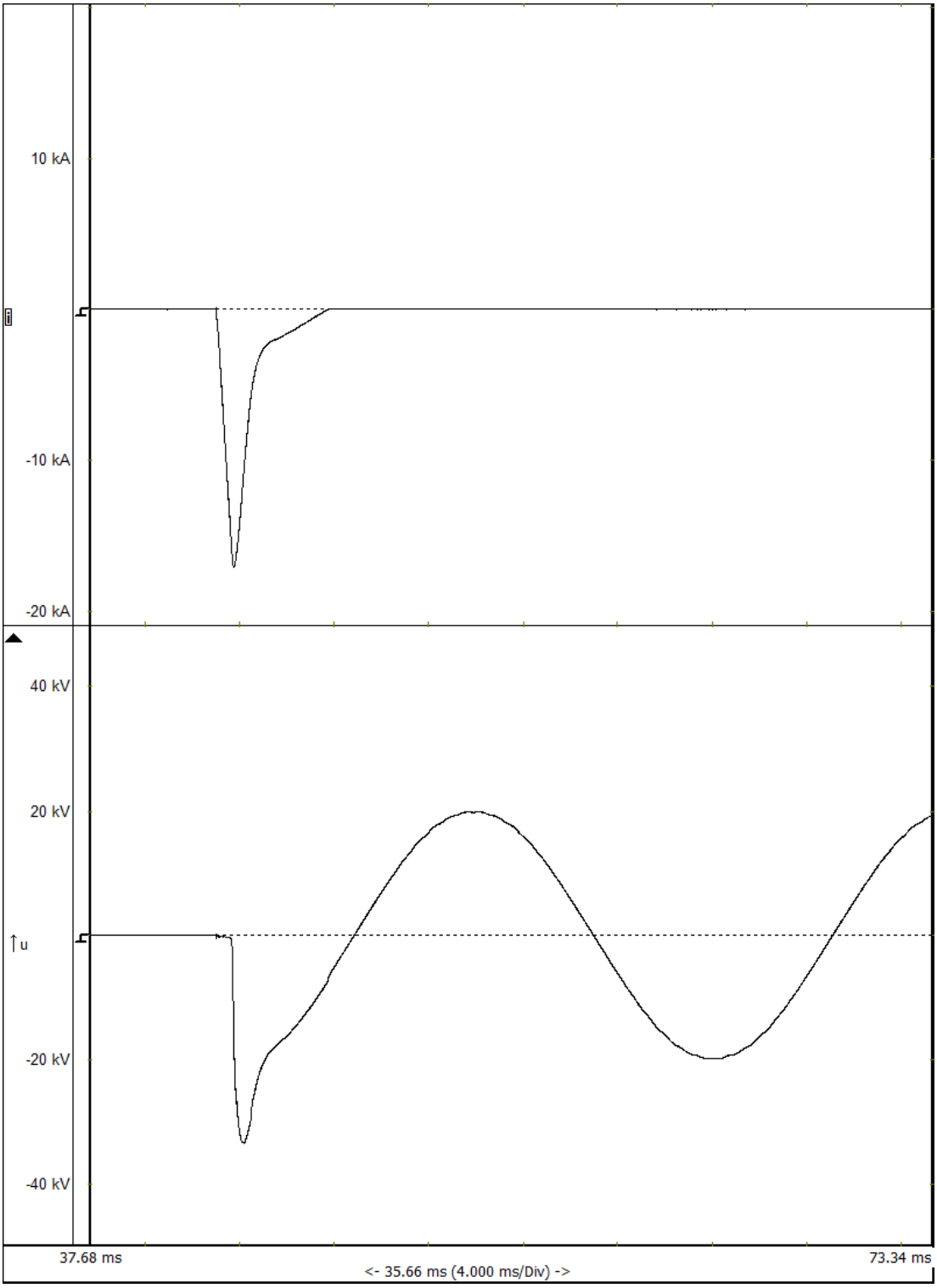
Photo 1: Test samples after test duty 1

6. Oscillograms

Test No: 1201340



Test No: 1201341



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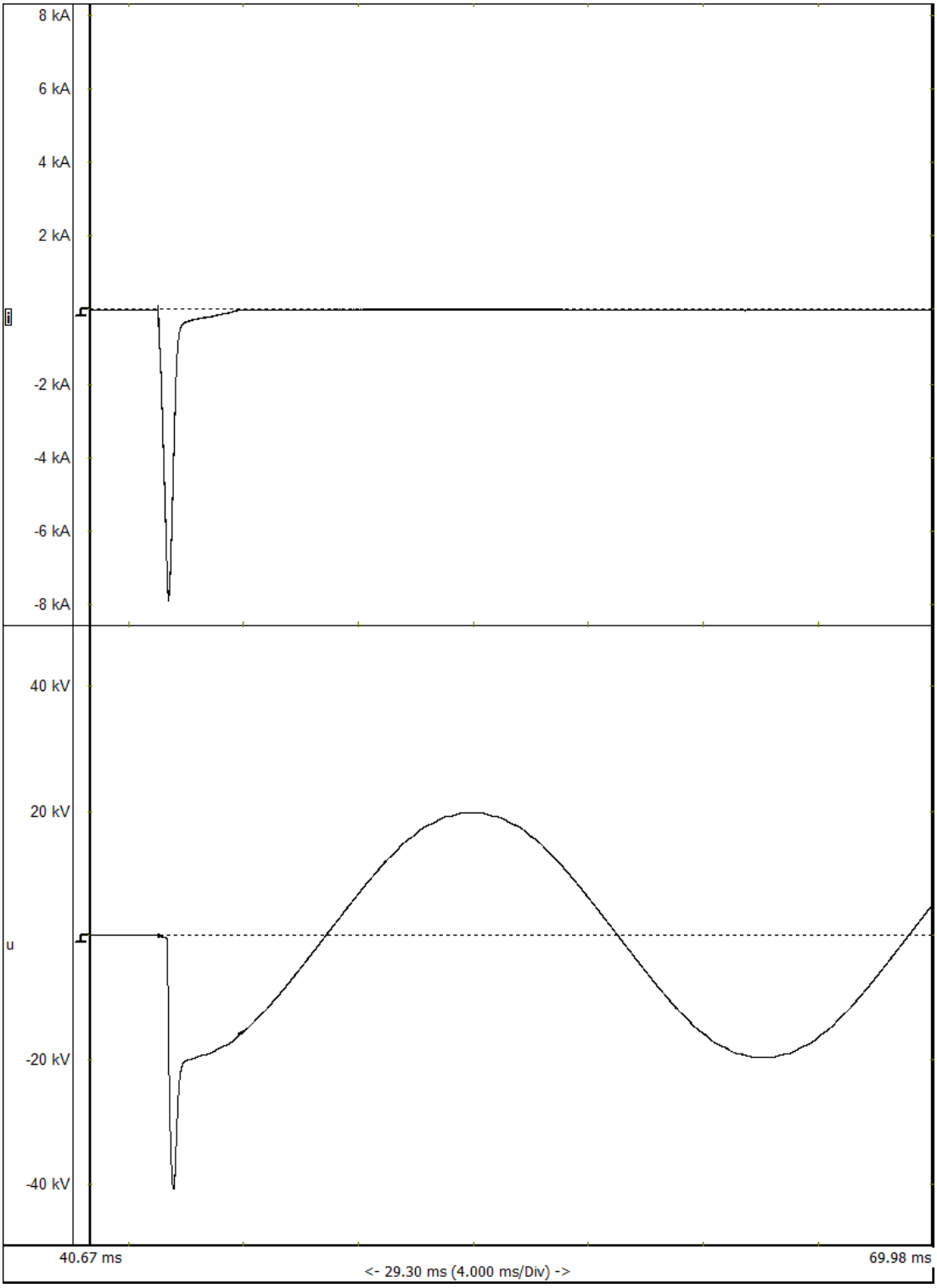

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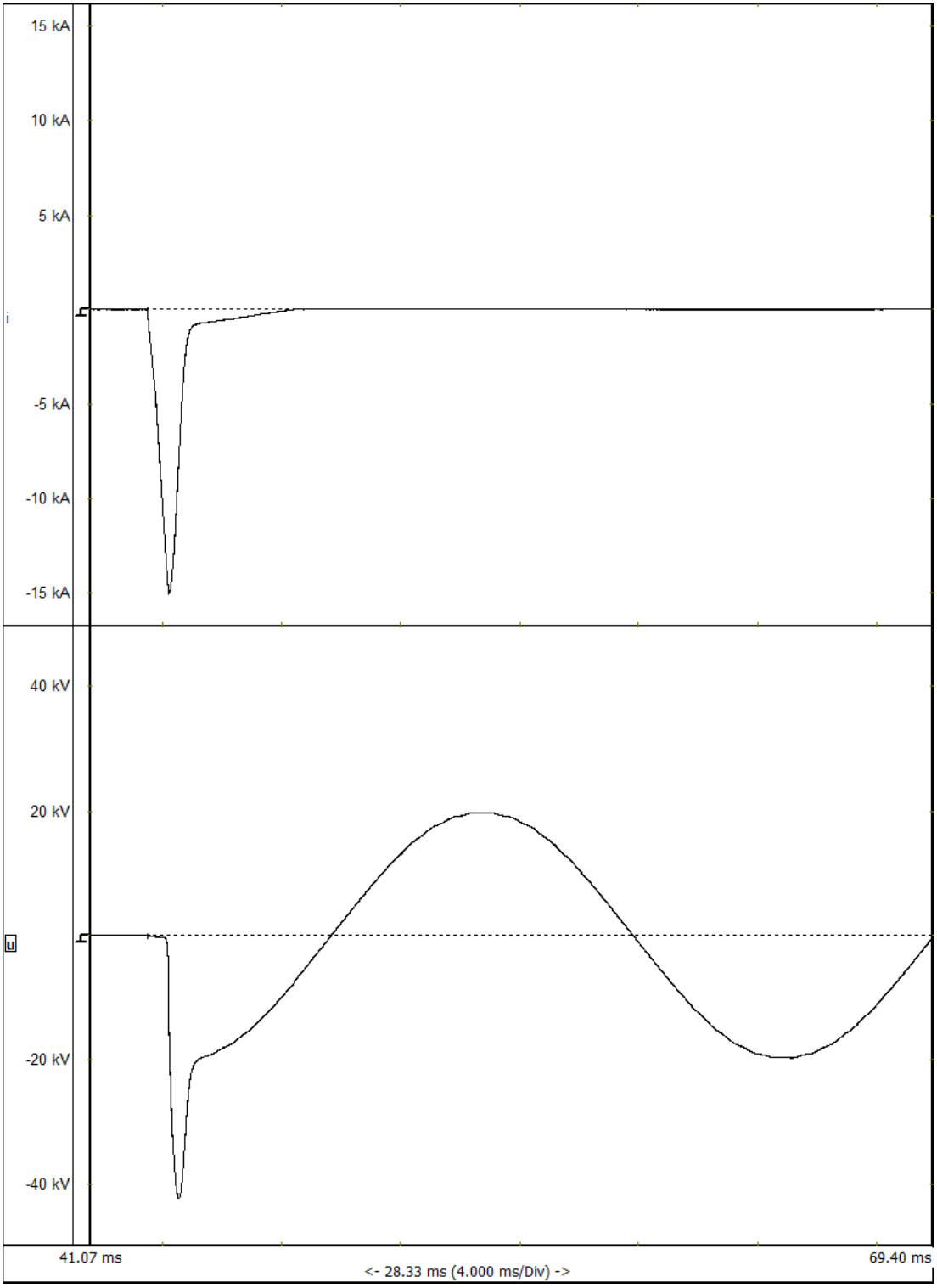

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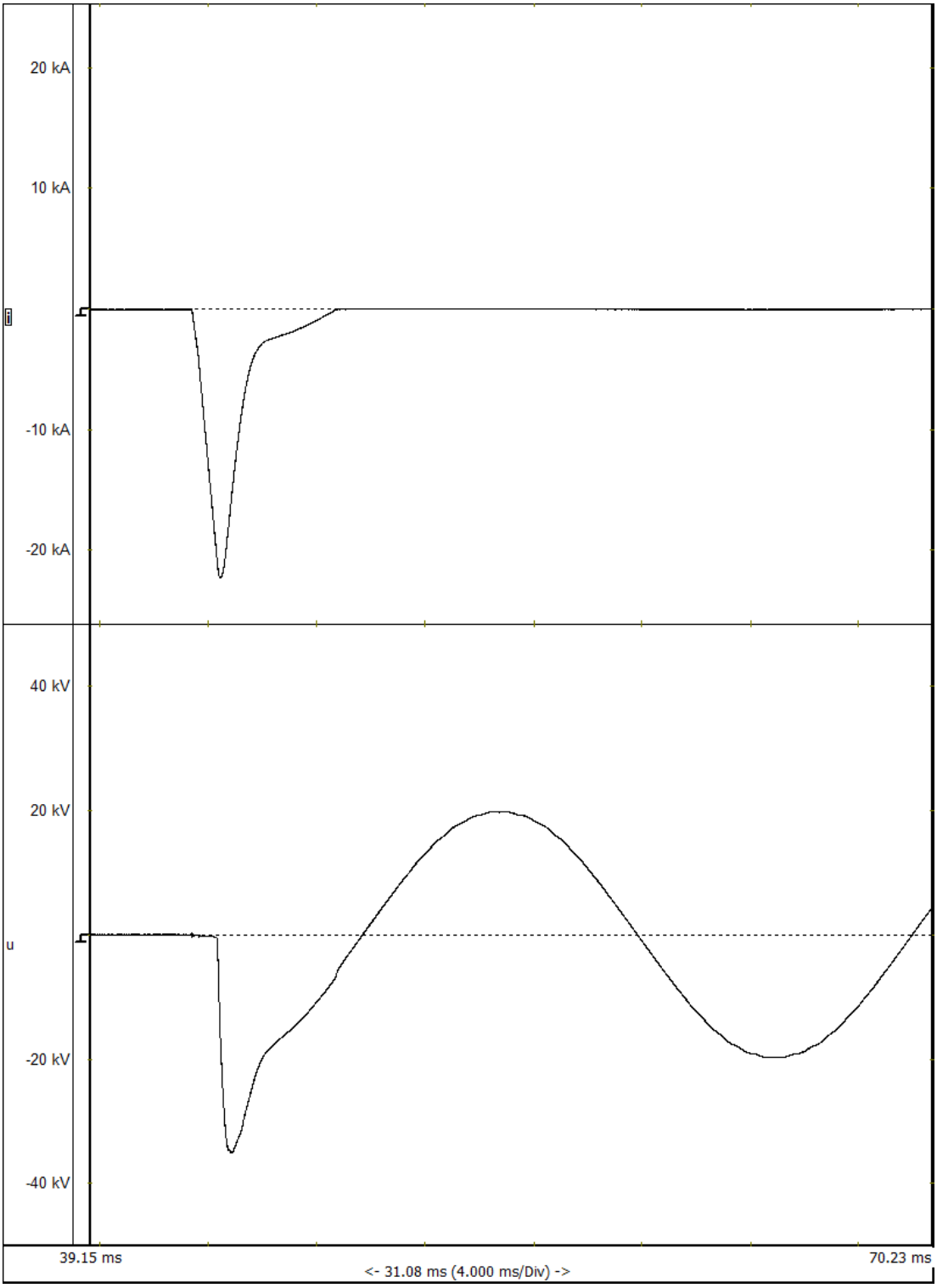


7. Drawing

Fusivel Limitador de Corrente Tipo HH / H.V. HRC Fuse - links

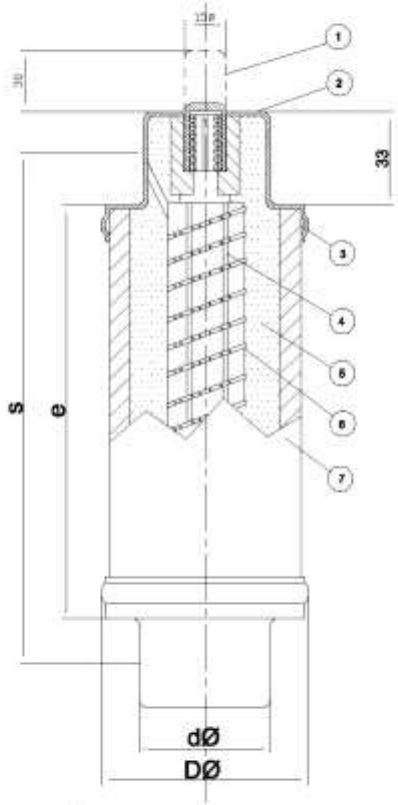
Conf. VDE 0670, EN 60644, IEC 60282-1, IEC 60644
IEC 60787, DIN 43625 e ANSI C37.

Standart VDE 0670, EN 60644, IEC 60282-1,
IEC 60644 and IEC 60787, DIN 43625, ANSI C37.

"Fuses offer unique advantages compared to other protective devices."

-alta cap. de ruptura / high breaking capacity
-limitador de corrente / high current limiting
-baixa voltagem de arco / low switching voltage
-tempo de deslig. U.R. / extremely short times
-baixa perda / low power dissipation

Diagrama Força x Percurso
Striker characteristics



Back-up Fuses Estile/Style DIN 43625

Voltagem Voltage	Corrente Current	Nr. Ref. Number	Dimensões Dimensions			
KV	A	—	DØ	s	e	dØ
15.5	2 a 63	5945	85	325	292	45
15.5	80 a 180	5945/1	85	475	442	45

Full-Rang Fuses Estile/Style DIN 43625

Voltagem Voltage	Corrente Current	Nr. Ref. Number	Dimensões Dimensions			
KV	A	—	DØ	s	e	dØ
15.5	2 a 80	5944	66	325	292	45

Estile Alemão / German Style DIN 43625

Voltagem Voltage	Corrente Current	Nr. Ref. Number	Dimensões Dimensions			
KV	A	—	DØ	s	e	dØ
7.2	2 a 20	400	66	225	192	45
7.2	25 a 63	401	66	225	192	
7.2	80 a 125	402	85	225	192	
7.2	2 a 20	403	66	325	292	
7.2	25 a 63	404	66	325	292	
7.2	80 a 125	405	85	325	292	
7.2	160 a 250	406	85	325	292	
7.2	315 a 400	407	85	325	292	
7.2	2 a 125	408	66	475	442	
7.2	80 a 500	409	85	475	442	
17.5	2 a 20	412	66	325	292	
17.5	25 a 63	413	66	325	292	
17.5	80 a 125	414	85	325	292	
17.5	2 a 20	415	66	475	442	
17.5	25 a 63	416	66	475	442	
17.5	80 a 125	417	85	475	442	
17.5	160 a 250	418	85	570	537	
24	2 a 10	419	66	475	442	
24	12 a 30	420	66	475	442	
24	32 a 63	421	85	475	442	
24	80 a 100	422	85	475	442	
36	2 a 10	423	66	570	537	
36	12 a 30	424	66	570	537	
36	32 a 63	425	85	570	537	
36	80 a 100	426	85	570	537	

Idem / Ref.	Material / Mararial
1	Disparador 12 Kg / Spring Striker 120 N
2	Terminal de Cobre / Copper - contact
3	Epoxi / Epoxy
4	Tubo Estrela / Star cor
5	Areia / Granular Quartz
6	Elemento / Fuse elements
7	Tubo Ceramica / Porcela barrel


THS
HH Backup Fuselvi
100A - 15,5KV I.R.50KA
DIN 43625 - Nr.5945
THS
HH Full - Rang
30A - 15,5KV
DIN 43625