

ARITEKS BOYACILIK TICATET VE SANAYI AS
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REPORT ISSUED BY THE RESEARCH ASSOCIATION OF THE TEXTILE
INDUSTRY, AITEX
N° 2019EP1479

Tests marked with * are not included within the scope of the ENAC accreditation

1/31

The test was carried out at High Current Laboratory located at Polígono Industrial Fuente del Jarro. C/ Ciudad de Gibraltar, 5; 46988 - Paterna (Valencia); which property is shared at 50% between research institutes AITEX and ITE.

Applicant

ARITEKS BOYACILIK TICATET VE SANAYI AS

Date of reception

28/05/2019

Date tested

Starting: 31/05/2019

Ending: 11/06/2019

Identification of samples

- "FABRIC REF. ARAMID D1 210-4837"

Test Carried out

- PRE-TREATMENT FOR DOMESTIC WASHING AND DRYING PROCEDURES FOR TEXTILE TESTING
- MASS PER UNIT AREA
- ELECTRIC ARC EXPOSURE TEST: DETERMINATION OF THE ARC RATING (ATPV/EBT500R ELIM) OF FLAME RESISTANT MATERIALS FOR CLOTHING

RESULTS

PRE-TREATMENT FOR DOMESTIC WASHING AND DRYING PROCEDURES FOR TEXTILE TESTING

Standard

ISO 6330:2012

Standard deviation

Reference

Sample1 FABRIC REF. ARAMID D1 210-4837

Units

1

Equipment

Wascator 13369E12

Dryer machine

ELECTROLUX
13425E12

Washing procedure 3N **Washing cycles** 5

Drying procedure

F (tumble dryer)

Washing powder

ECE detergent 98 + sodium perborate + TAED

Units	Dry mass of the samples	Equipment
1	2,10 Kg	Wascator 13369E12

Start and finish date

31/05/2019 - 03/06/2019

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RESULTS

MASS PER UNIT AREA

Standard

UNE-EN 12127:1998; pto. 8.3

Conditioning date

03/06/2019

Test date

04/06/2019

Atmosphere for conditioning and testing

Temperature (20±2) °C

Relative Humidity (65±4) %

Pretreatment

5 cycles of washing at 30 °C, according ISO 6330:2012, method 3N and F drying

Reference	Mass per unit area (g/m ²)	CV (%)
FABRIC REF. ARAMID D1 210-4837	213	0.55

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RESULTS

ELECTRIC ARC EXPOSURE TEST: DETERMINATION OF THE ARC RATING (ATPV/E_{BT50}OR ELIM) OF FLAME RESISTANT MATERIALS FOR CLOTHING

Standard

MT61482-1-1_N121_FDIS 2018.01.29 panel test (Method A)

Test results

The test program includes minimum of twenty individual panel arc trials.

The following test data was recorded for each trial:

Arc exposure electrical conditions: arc trial number, RMS arc current, peak arc current, arc voltage, arc duration, energy dissipated in arc, plots of arc current and arc voltage.

Temperature rise response from two monitor sensors for each panel in each trial, plot of average responses from two monitor sensors.

Pictures after arc exposure.

Video

Essential test data and test results are presented in the following pages as follows:

Arc rating: ATPV or E_{BT50} or ELIM or both and plots of the burn injury probability (ATPV) or break open probability (E_{BT50}) or both versus E_i.

Test specimen description and order of layer.

Distance from an arc center line to the panel surface.

Subjective evaluation.

Pictures after arc exposure.

Ignition probability value (if determined during testing).

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RESULTS

Test conditions	
Date test	11/06/2019
Arc current	(8 ± 0,5) kA
Stainless steel electrodes, gap of the electrodes	(300 ± 5) mm
Distance between the electrodes and sample	(300 ± 5) mm
Distance between the electrodes and monitor sensors	(340 ± 5) mm
Fuse wire	0.5 mm
Number of samples tested	21
Starting and ending pre-treatment date	31/05/2019 - 03/06/2019
Starting and ending conditioning date	10/06/2019 - 11/06/2019
Conditioning	24 h; 21 ± 1°C, 65 ± 2 % Hr.

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RESULTS

Reference FABRIC REF. ARAMID D1 210-4837

Sample description according to the information supplied by the customer

Navy woven fabric style ARAMID D1 210-4837, 93% m-aramid, 5% p-aramid, 2%Carbon, 210 +- 10 g/m², manufacturer Ariteks.

Pre-treatment

5 washing cycles at 30°C, according to standard UNE-EN ISO 6330:2012, method 3N and type F drying

Washed sample weight before test

213 g/m²

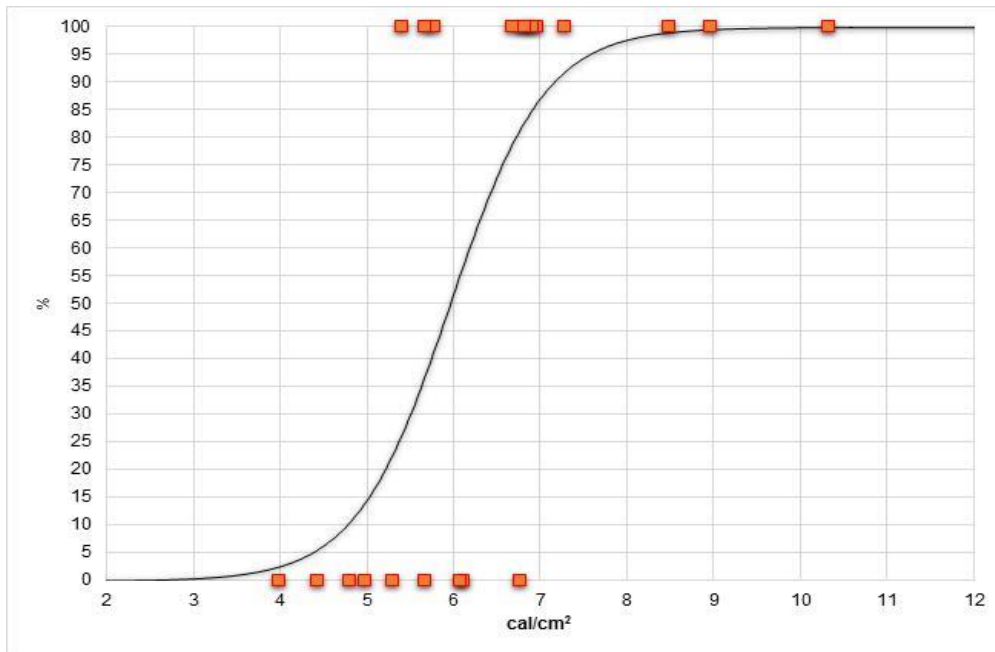
Deviation from the standard

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RESULTS

Determination of ATPV, 50% of Probability of 2nd degree burn

ATPV	5,95 cal/cm ²
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Probability %	5	10	20	30	40	50	60	70	80	95
E _i cal/cm ²	4,3	4,8	5,2	5,5	5,7	6,0	6,2	6,4	6,7	7,6

ATPV points above	8
ATPV points 20%	15
ATPV points below	5
ATPV points mix zone	8

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RESULTS

Summary of measured energy and subjective evaluation:

Test	Time (ms)	Cycles 50Hz	Ei cal/cm ²	SCD cal/cm ²	Burn	Break Open
1-A	163,6	8,18	8,5	0,8	Y	N
1-B	163,6	8,18	10,3	0,46	Y	N
1-C	163,6	8,18	6,8	0,29	Y	N
2-A	80,6	4,03	4,4	-0,55	N	N
2-B	80,6	4,03	5,7	-0,24	N	N
2-C	80,6	4,03	4,0	-0,53	N	N
3-A	103,8	5,19	6,8	-0,17	N	N
3-B	103,8	5,19	5,3	-0,43	N	N
3-C	103,8	5,19	4,8	-0,46	N	N
4-A	133,6	6,68	6,7	0,12	Y	N
4-B	133,6	6,68	6,1	-0,15	N	N
4-C	133,6	6,68	5,8	0,2	Y	N
5-A	123,6	6,18	7,0	0,02	Y	N
5-B	123,6	6,18	6,1	-0,46	N	N
5-C	123,6	6,18	5,7	0,33	Y	N
6-A	123,6	6,18	6,9	0,52	Y	N
6-B	123,6	6,18	6,8	0,33	Y	N
6-C	123,6	6,18	5,0	-0,2	N	N
7-A	133	6,65	7,3	0,06	Y	N
7-B	133	6,65	9,0	0,57	Y	N
7-C	133	6,65	5,4	0,26	Y	N

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RESULTS

Summary of measured energy and subjective evaluation:

Test	After flame (s)	Ablation	Melting	Dripping	Charring	Embrittlement
1-A	0	N	N	N	Y	Y
1-B	0	N	N	N	Y	Y
1-C	0	N	N	N	Y	Y
2-A	0	N	N	N	Y	Y
2-B	0	N	N	N	Y	Y
2-C	0	N	N	N	Y	Y
3-A	0	N	N	N	Y	Y
3-B	0	N	N	N	Y	Y
3-C	0	N	N	N	Y	Y
4-A	0	N	N	N	Y	Y
4-B	0	N	N	N	Y	Y
4-C	0	N	N	N	Y	Y
5-A	0	N	N	N	Y	Y
5-B	0	N	N	N	Y	Y
5-C	0	N	N	N	Y	Y
6-A	0	N	N	N	Y	Y
6-B	0	N	N	N	Y	Y
6-C	0	N	N	N	Y	Y
7-A	0	N	N	N	Y	Y
7-B	0	N	N	N	Y	Y
7-C	0	N	N	N	Y	Y

Y Yes N No

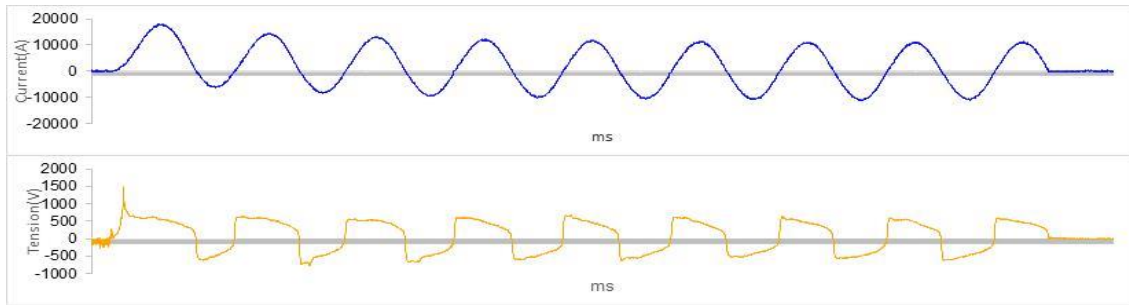
>>>

RESULTS

Electrical current and response sensor response:

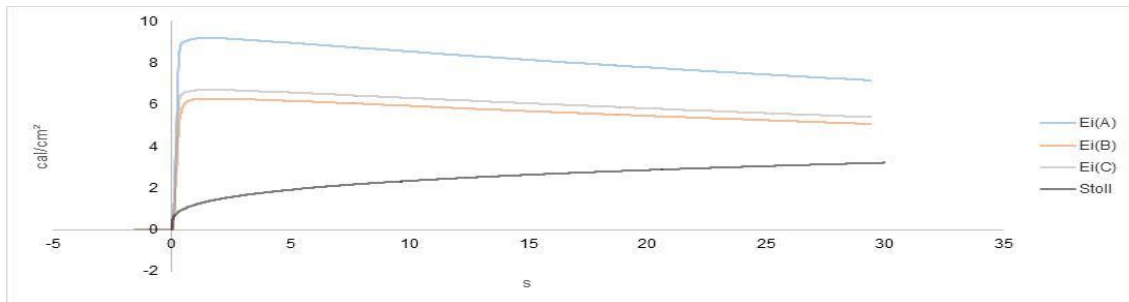
Calibration shot

INITIAL CALIBRATION

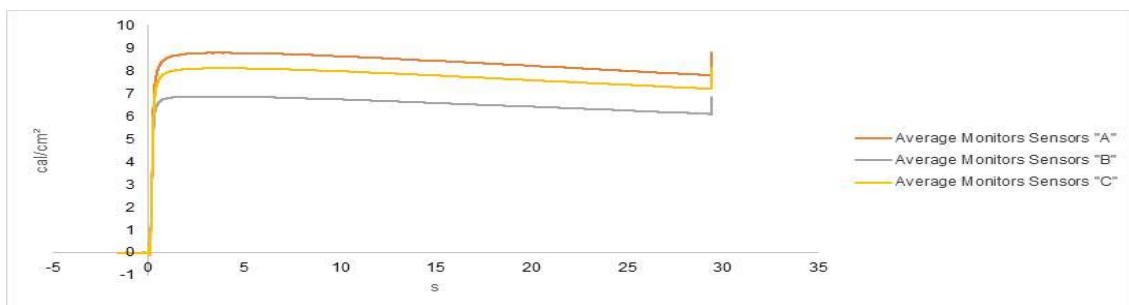


Ei Panel A	8,8 cal/cm²	Ei Panel B	6,9 cal/cm²	Ei Panel C	8,1 cal/cm²
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Average panel sensors response Vs. Stoll plot



Average monitor sensors plot

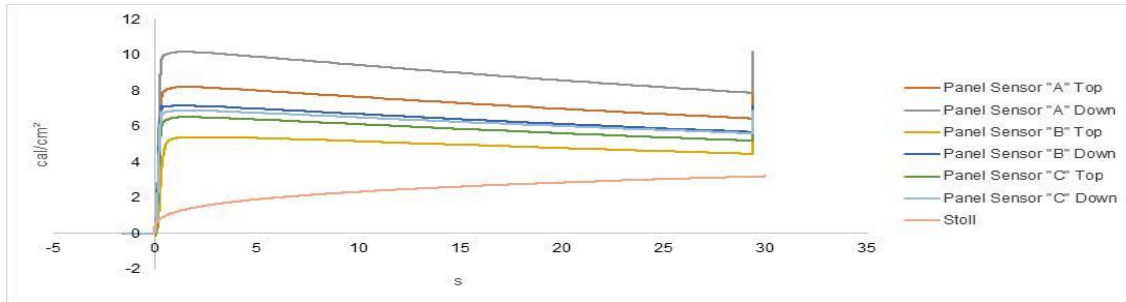


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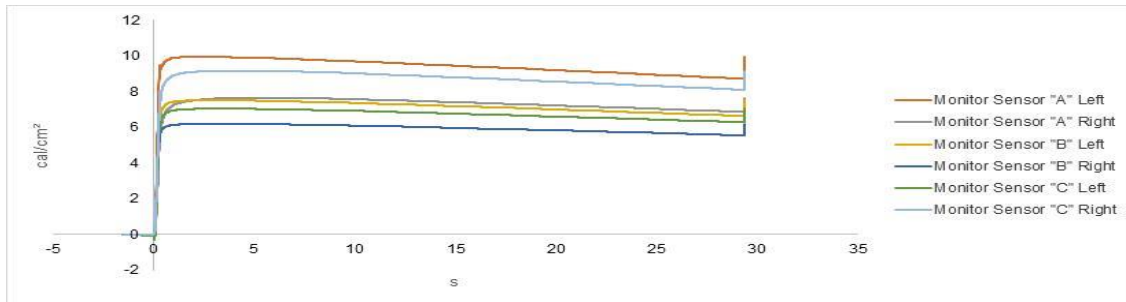
RESULTS

Electrical current and response sensor response:

Panel sensors Vs. Stoll plot



Monitor sensors plot



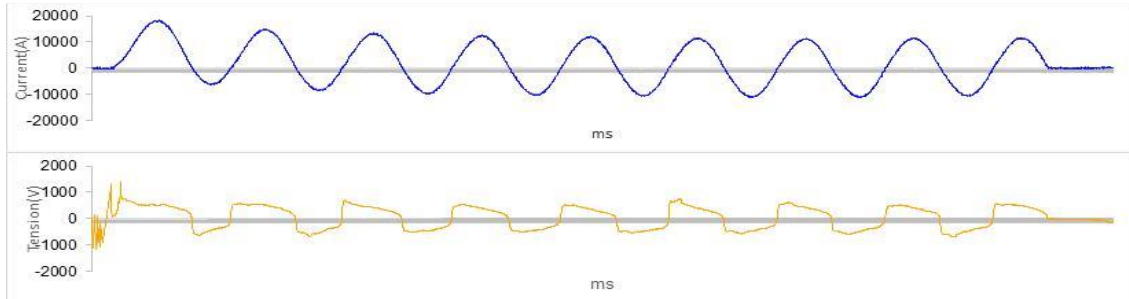
Current Total RMS (kA)	8,1	Current Peak (kA)	17,9	Arc Voltage (V)	1488,0
Duration (cycles n°)	8,7	Duration (ms)	173,8	Arc Energy (kJ)	591,0
Arc Voltage (kJ)	476,0				

Average incident energy at same level: 8,0
 Highest incident energy: 10,2
 Lowest incident energy: 6,2

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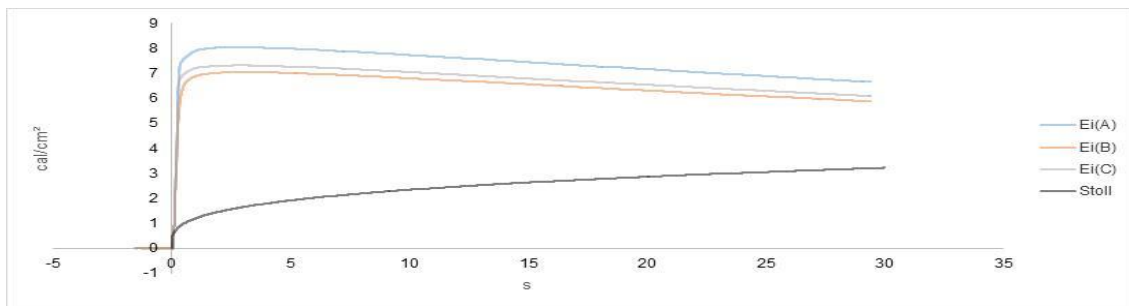
RESULTS

FINAL CALIBRATION

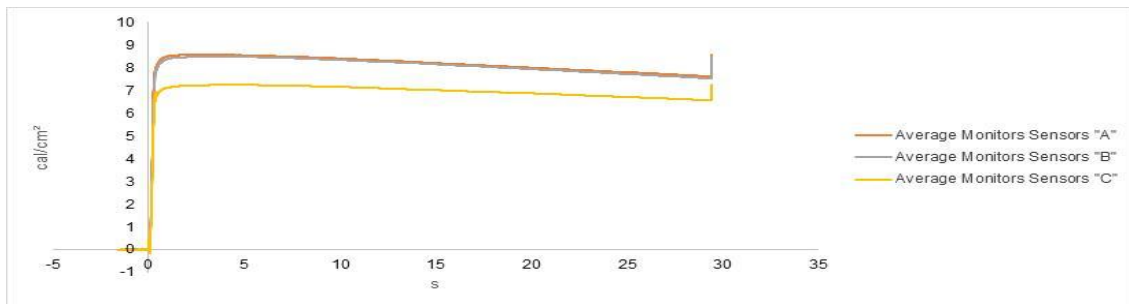


Ei Panel A	8,6 cal/cm²	Ei Panel B	8,5 cal/cm²	Ei Panel C	7,2 cal/cm²
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Average panel sensors response Vs. Stoll plot



Average monitor sensors plot

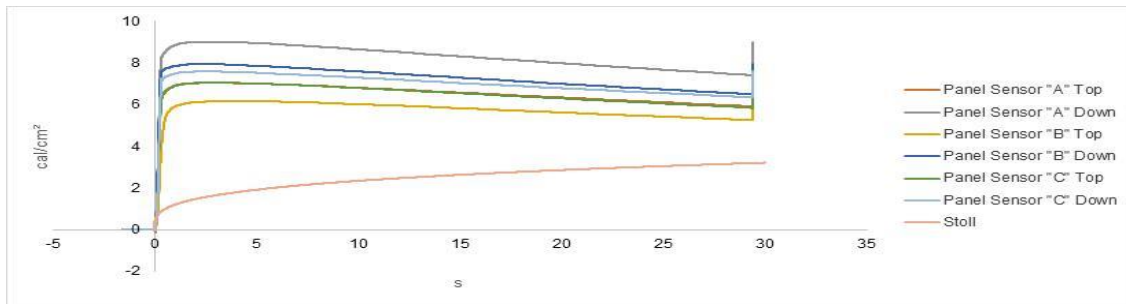


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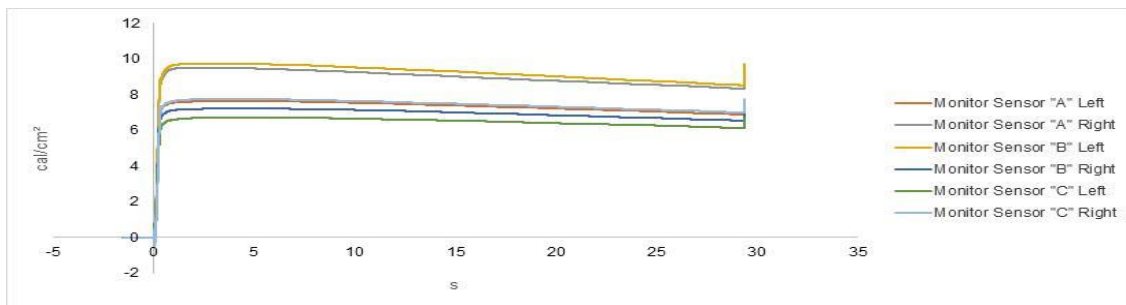
RESULTS

Electrical current and response sensor response:

Panel sensors Vs. Stoll plot



Monitor sensors plot



Current Total RMS (kA)	8,3	Current Peak (kA)	18,4	Arc Voltage (V)	1512,0
Duration (cycles nº)	8,7	Duration (ms)	173,2	Arc Energy (kJ)	558,7
Arc Voltage (kJ)	443,3				

Average incident energy at same level: 8,1
 Highest incident energy: 9,8
 Lowest incident energy: 6,7

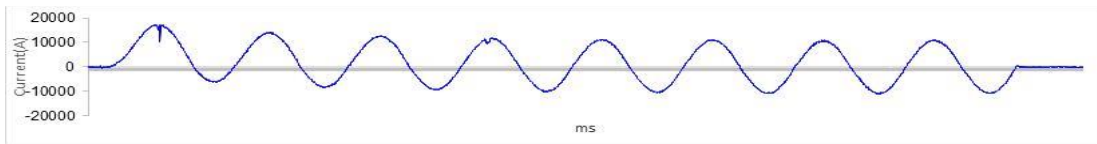
>>>

RESULTS

Electrical current and response sensor response:

Shot 1

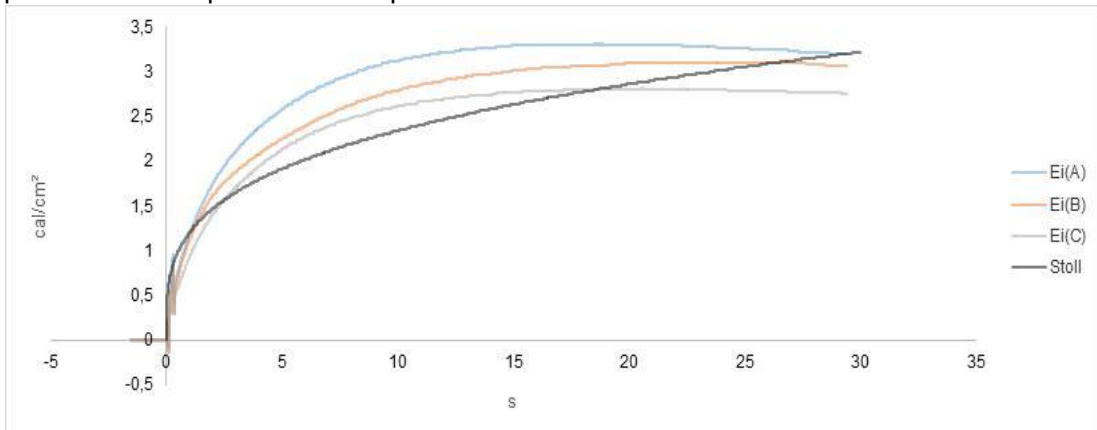
Current Plot



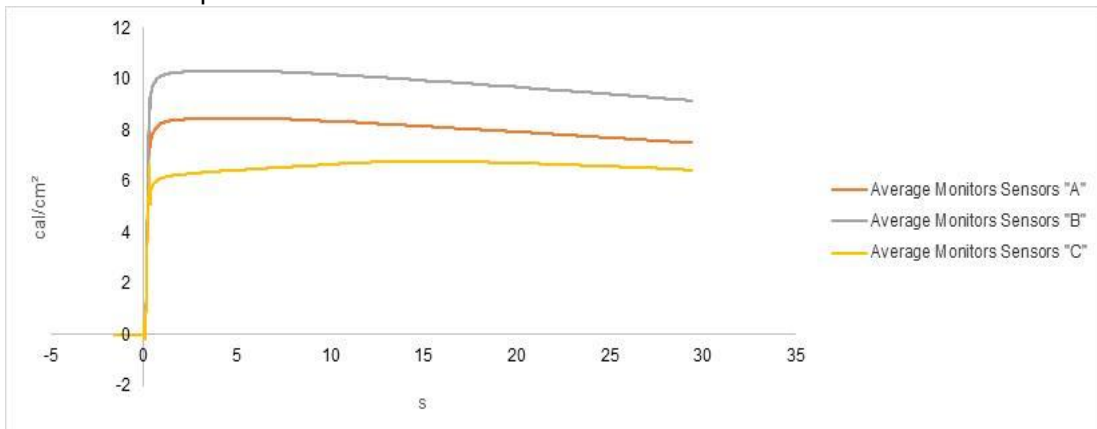
Voltage Plot



Average panel sensors response Vs. Stoll plot



Average monitor sensors plot



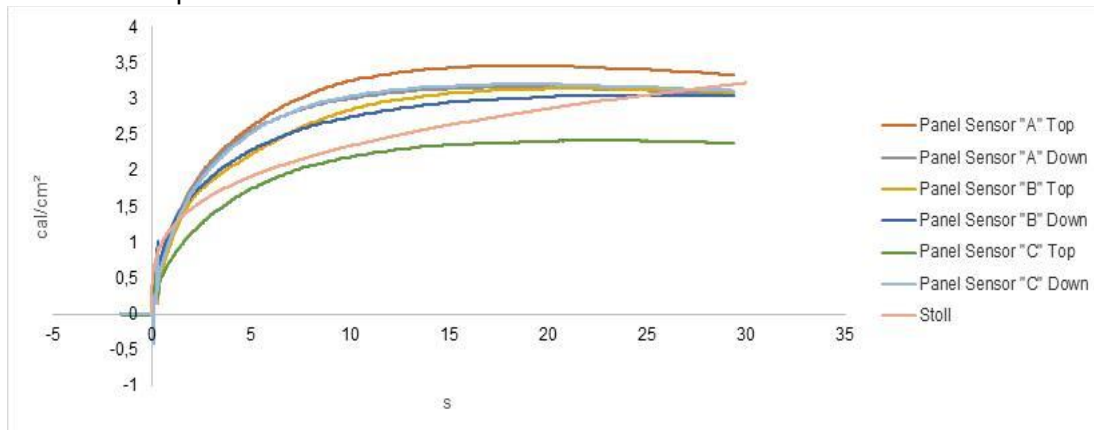
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RESULTS

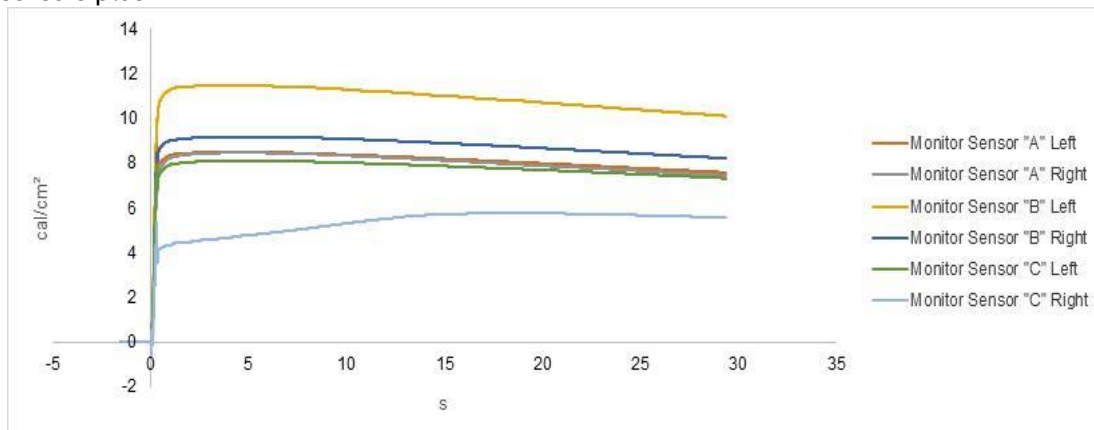
Electrical current and response sensor response:

Shot 1

Panel sensors Vs. Stoll plot



Monitor sensors plot



Current Total RMS (kA)	8,0	Current Peak (kA)	17,4	Arc Voltage (V)	1500,0
Duration (cycles n°)	8,2	Duration (ms)	163,6	Arc Energy (kJ)	422,5
Arc Voltage (kJ)	387,2				

sensor response	PANEL A	PANEL B	PANEL C
Ei	8,48 cal/cm ²	10,33 cal/cm ²	6,79 cal/cm ²
SCD	0,80 cal/cm ²	0,46 cal/cm ²	0,29 cal/cm ²

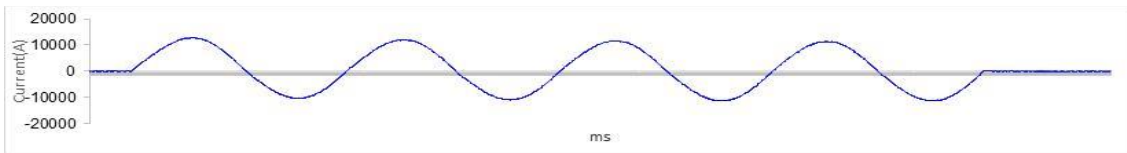
>>>

RESULTS

Electrical current and response sensor response:

Shot 2

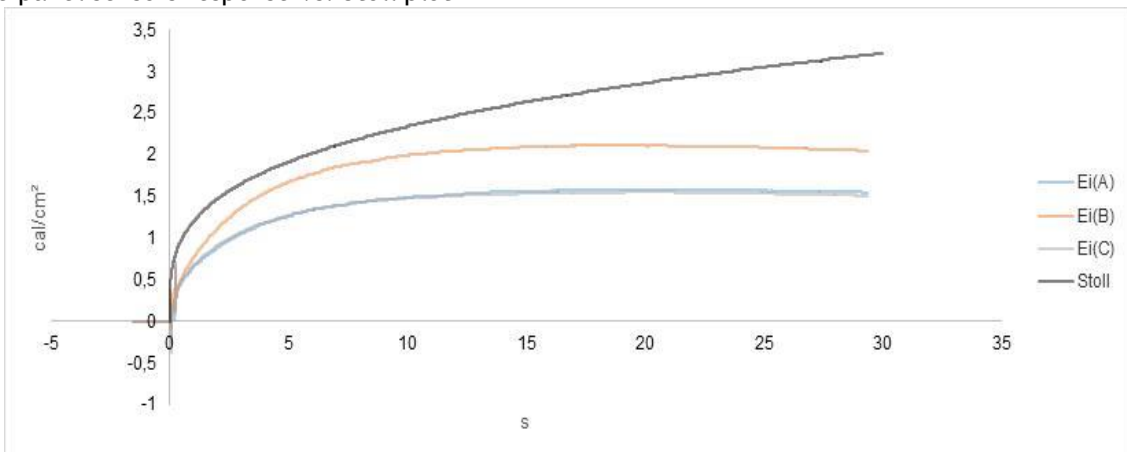
Current Plot



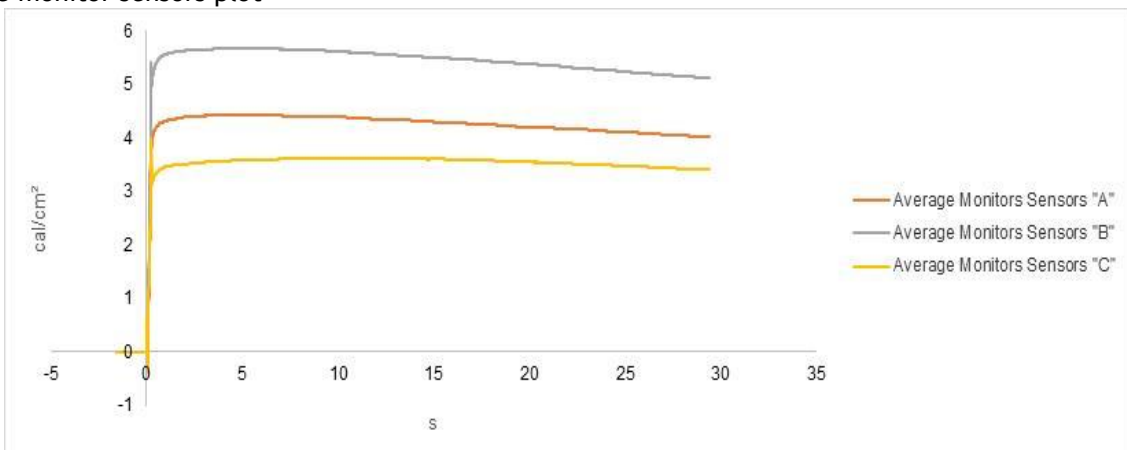
Voltage Plot



Average panel sensors response Vs. Stoll plot



Average monitor sensors plot



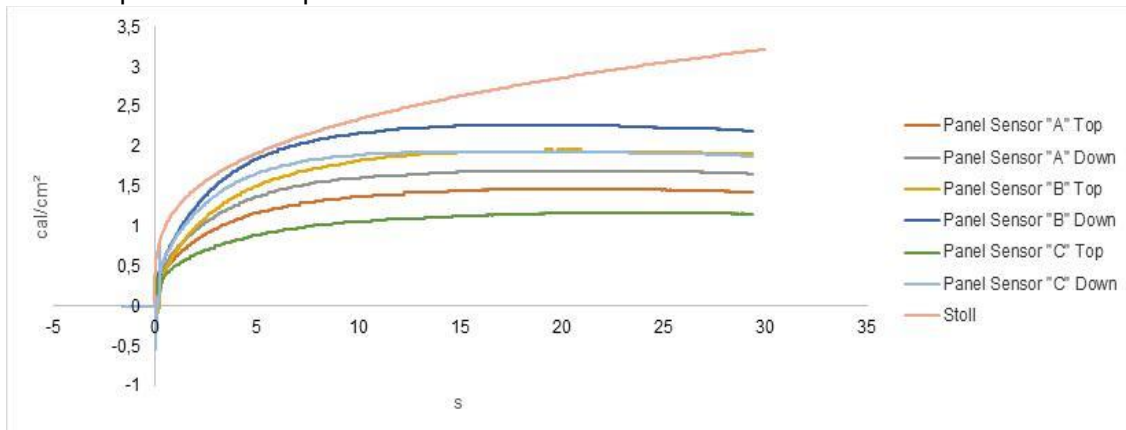
>>>

RESULTS

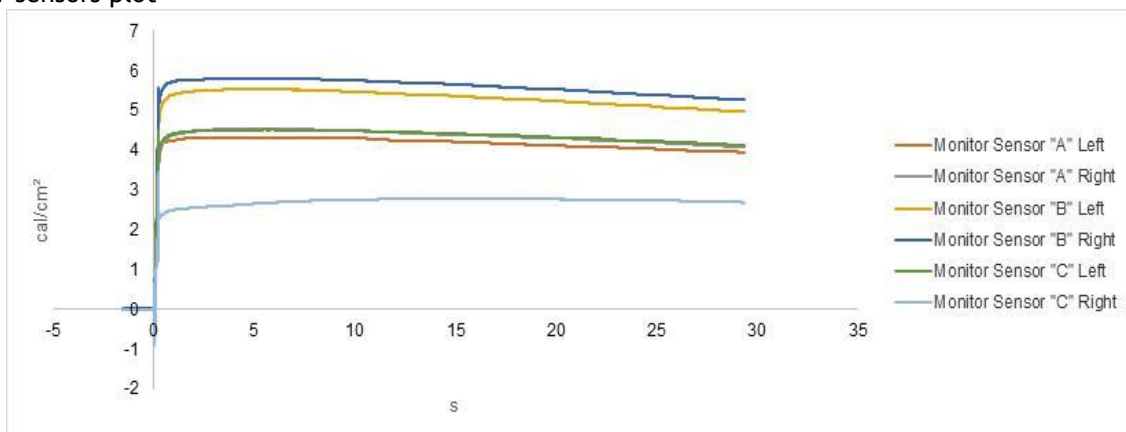
Electrical current and response sensor response:

Shot 2

Panel sensors response Vs. Stoll plot



Monitor sensors plot



Current Total RMS (kA)	8,0	Current Peak (kA)	12,8	Arc Voltage (V)	1524,0
Duration (cycles n°)	4,0	Duration (ms)	80,6	Arc Energy (kJ)	267,1
Arc Voltage (kJ)	453,4				

sensor response	PANEL A	PANEL B	PANEL C
Ei	4,43 cal/cm ²	5,66 cal/cm ²	3,98 cal/cm ²
SCD	-0,55 cal/cm ²	-0,24 cal/cm ²	-0,53 cal/cm ²

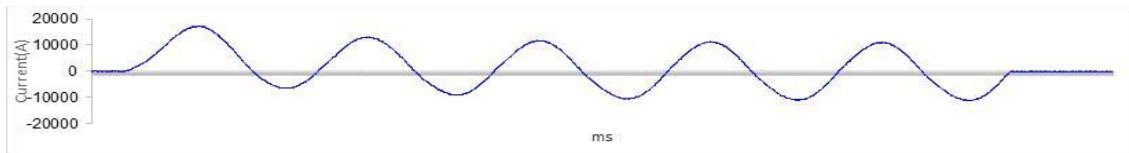
>>>

RESULTS

Electrical current and response sensor response:

Shot 3

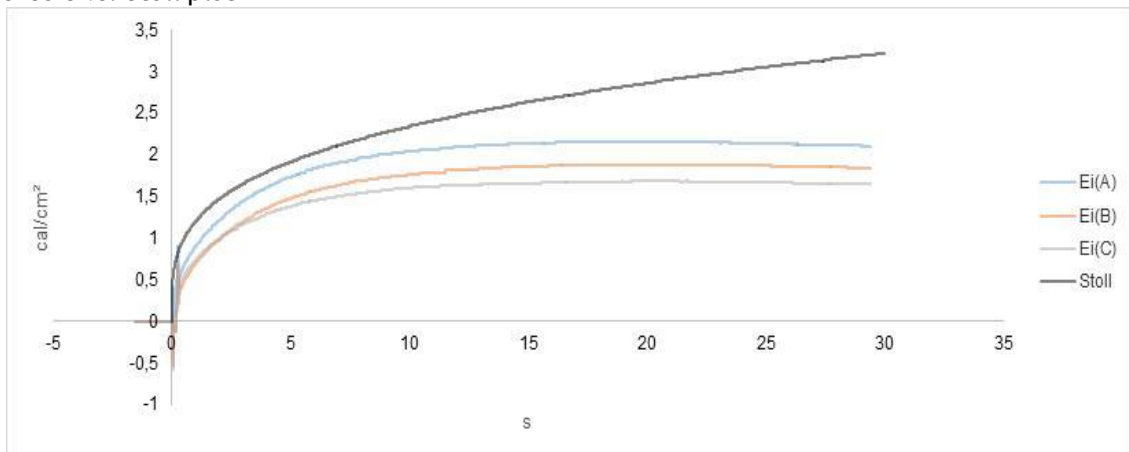
Current Plot



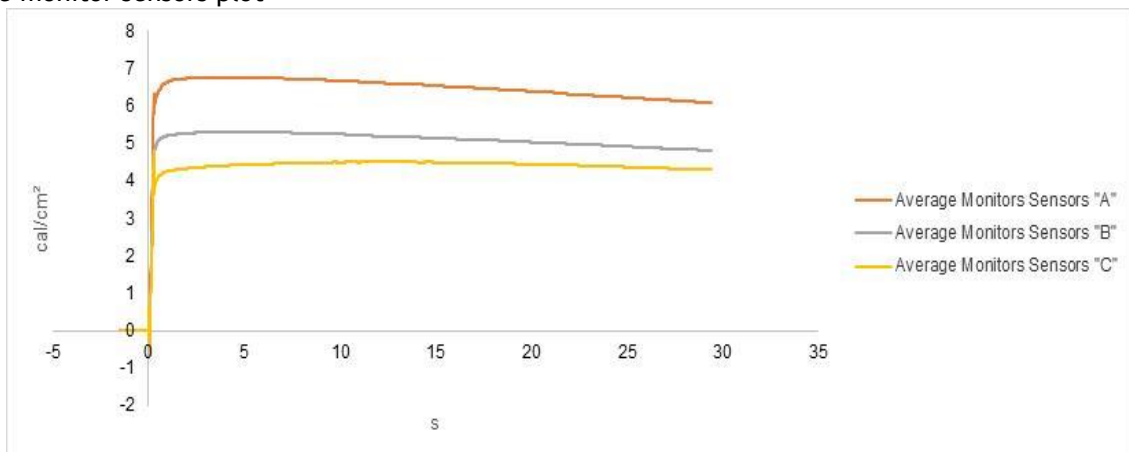
Voltage Plot



Panel sensors vs. Stoll plot



Average monitor sensors plot



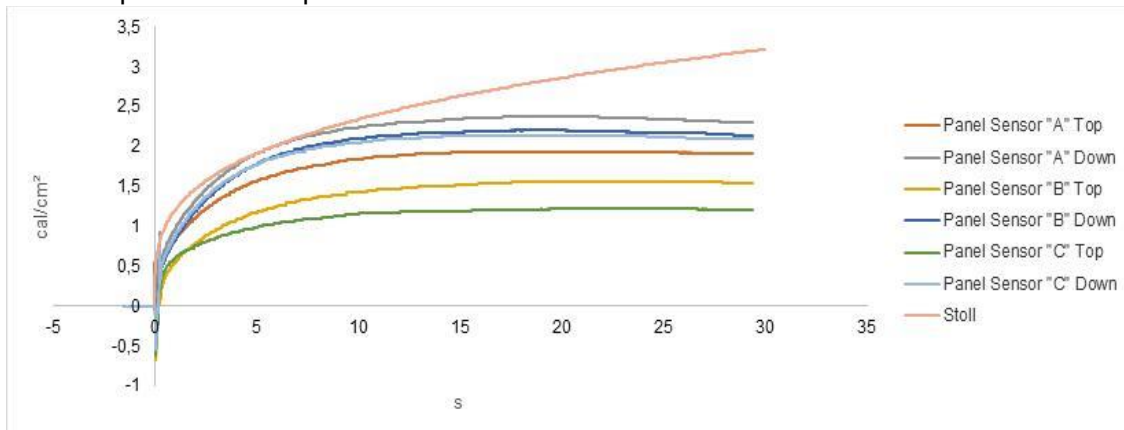
>>>

RESULTS

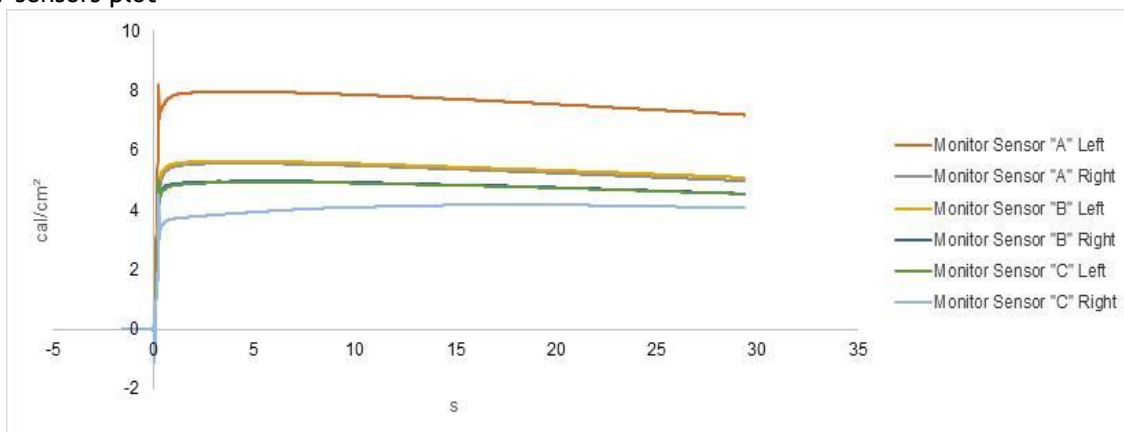
Electrical current and response sensor response:

Shot 3

Panel sensors response Vs. Stoll plot



Monitor sensors plot



Current Total RMS (kA)	8,1	Current Peak (kA)	17,2	Arc Voltage (V)	1521,0
Duration (cycles n°)	5,2	Duration (ms)	103,8	Arc Energy (kJ)	360,0
Arc Voltage (kJ)	470,5				

sensor response	PANEL A	PANEL B	PANEL C
Ei	6,77 cal/cm ²	5,29 cal/cm ²	4,79 cal/cm ²
SCD	-0,17 cal/cm ²	-0,43 cal/cm ²	-0,46 cal/cm ²

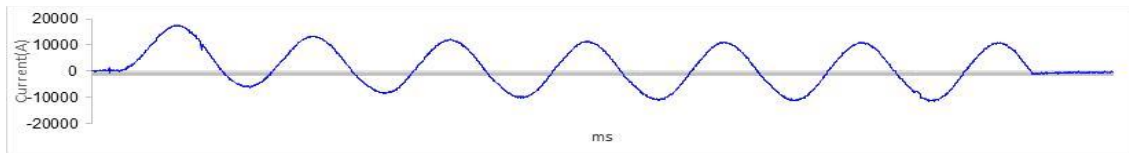
>>>

RESULTS

Electrical current and response sensor response:

Shot 4

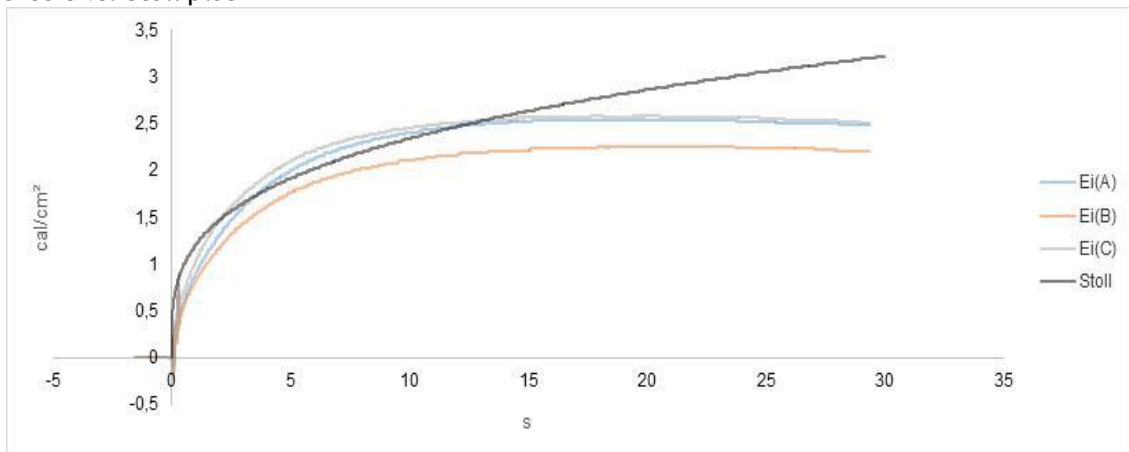
Current Plot



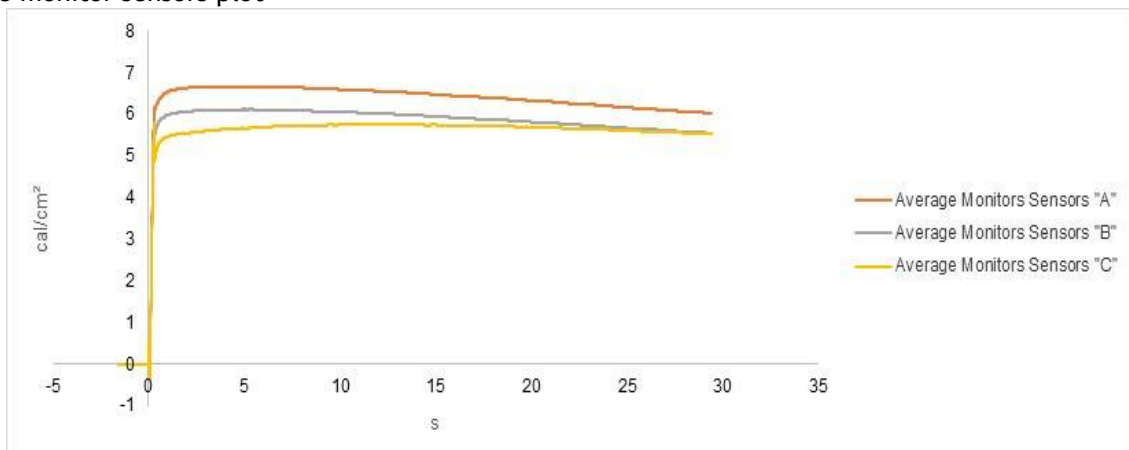
Voltage Plot



Panel sensors vs. Stoll plot



Average monitor sensors plot



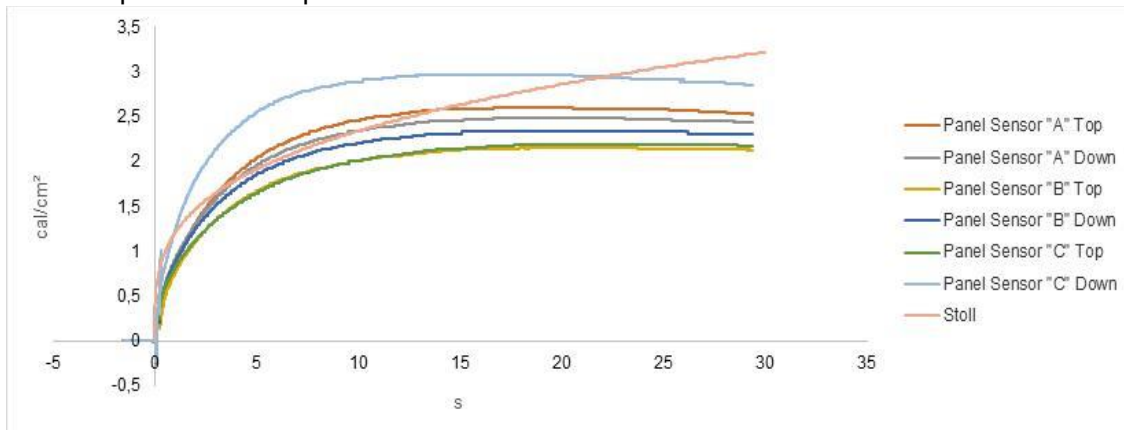
>>>

RESULTS

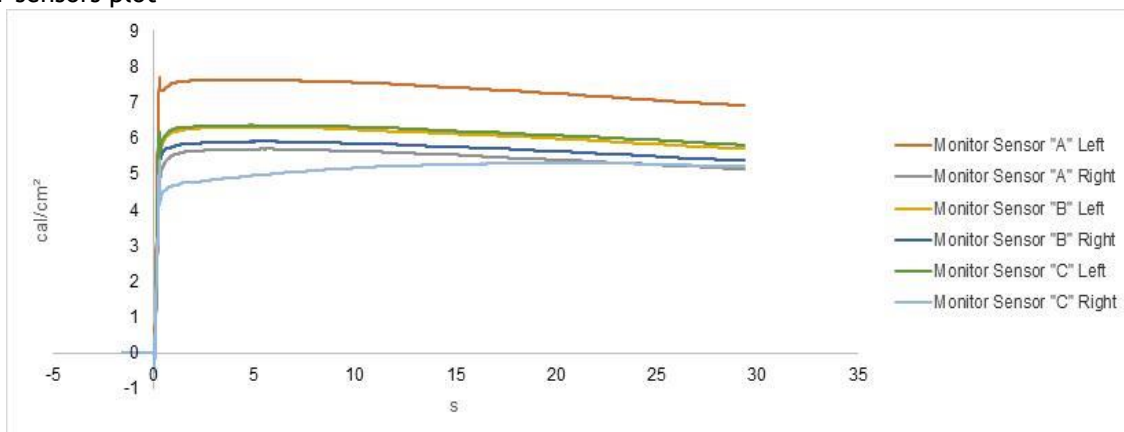
Electrical current and response sensor response:

Shot 4

Panel sensors response Vs. Stoll plot



Monitor sensors plot



Current Total RMS (kA)	8,0	Current Peak (kA)	17,7	Arc Voltage (V)	1269,0
Duration (cycles n°)	6,7	Duration (ms)	133,6	Arc Energy (kJ)	424,1
Arc Voltage (kJ)	441,7				

sensor response	PANEL A	PANEL B	PANEL C
Ei	6,67 cal/cm ²	6,11 cal/cm ²	5,77 cal/cm ²
SCD	0,12 cal/cm ²	-0,15 cal/cm ²	0,20 cal/cm ²

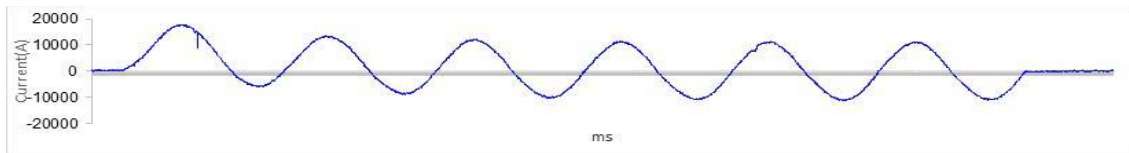
>>>

RESULTS

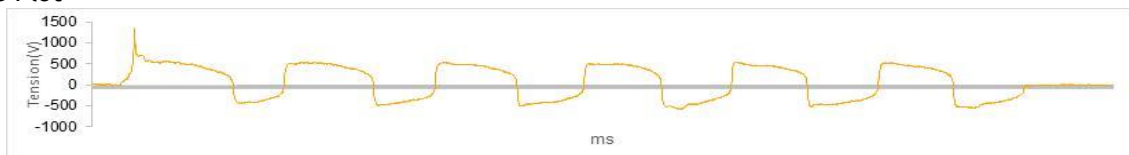
Electrical current and response sensor response:

Shot 5

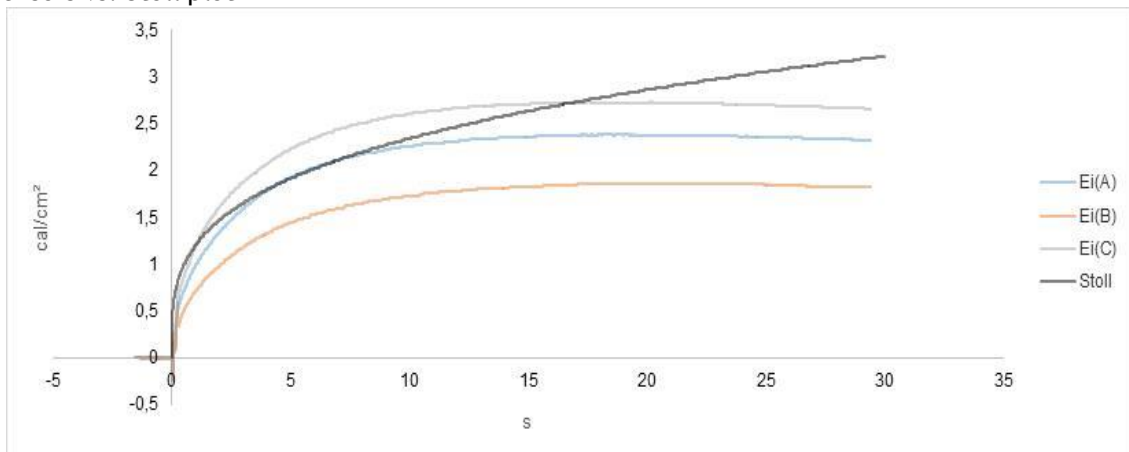
Current Plot



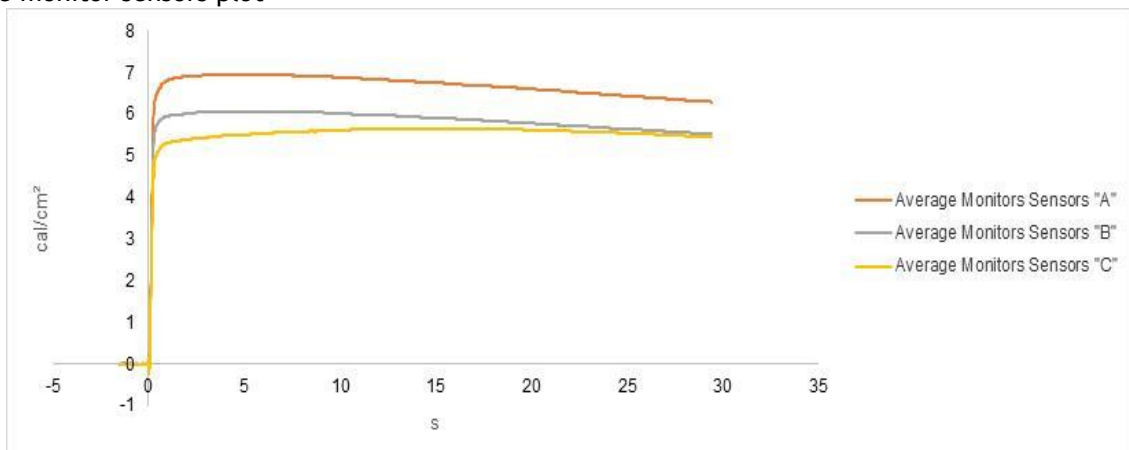
Voltage Plot



Panel sensors vs. Stoll plot



Average monitor sensors plot



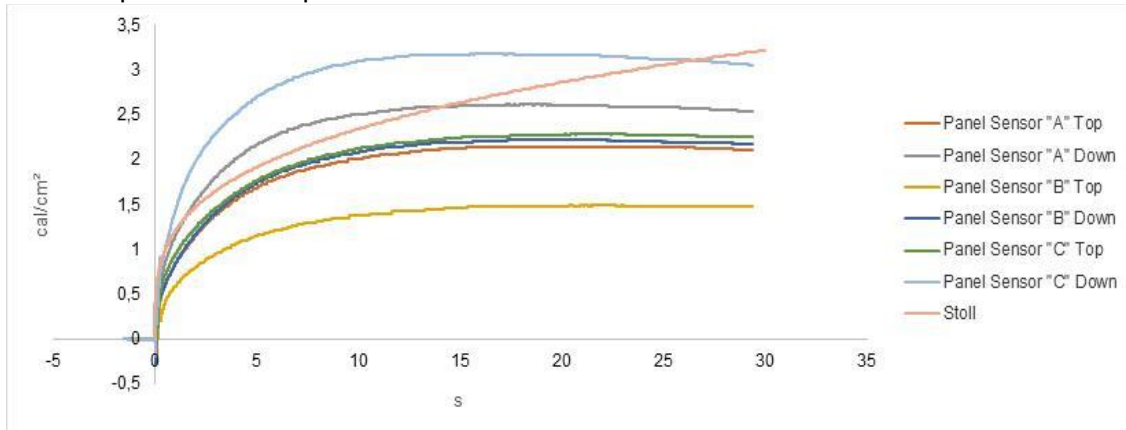
>>>

RESULTS

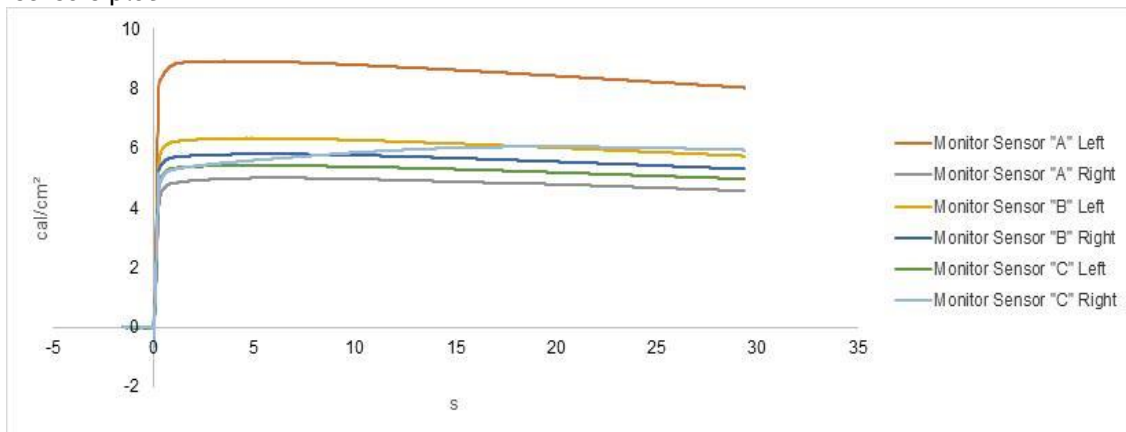
Electrical current and response sensor response:

Shot 5

Panel sensors response Vs. Stoll plot



Monitor sensors plot



Current Total RMS (kA)	8,1	Current Peak (kA)	17,8	Arc Voltage (V)	1353,0
Duration (cycles n°)	6,2	Duration (ms)	123,6	Arc Energy (kJ)	385,7
Arc Voltage (kJ)	428,3				

sensor response	PANEL A	PANEL B	PANEL C
Ei	6,96 cal/cm ²	6,07 cal/cm ²	5,66 cal/cm ²
SCD	0,02 cal/cm ²	-0,46 cal/cm ²	0,33 cal/cm ²

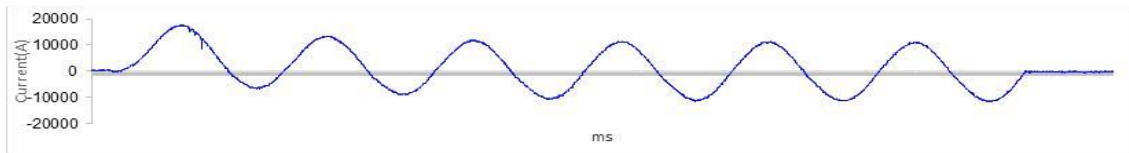
>>>

RESULTS

Electrical current and response sensor response:

Shot 6

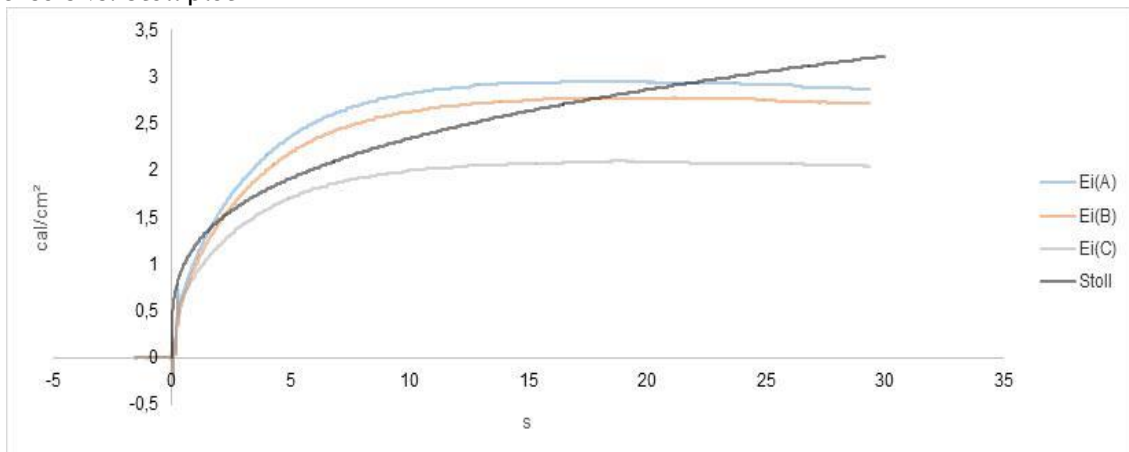
Current Plot



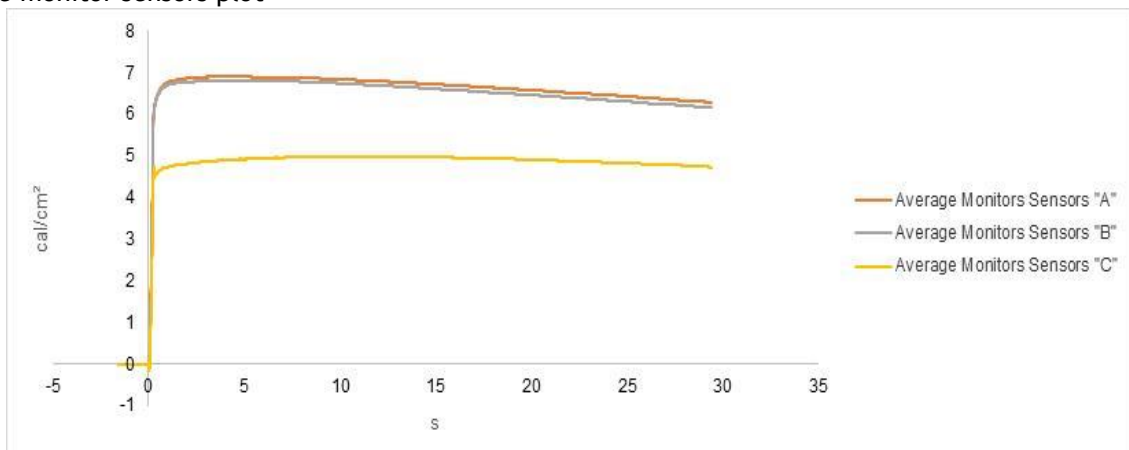
Voltage Plot



Panel sensors vs. Stoll plot



Average monitor sensors plot



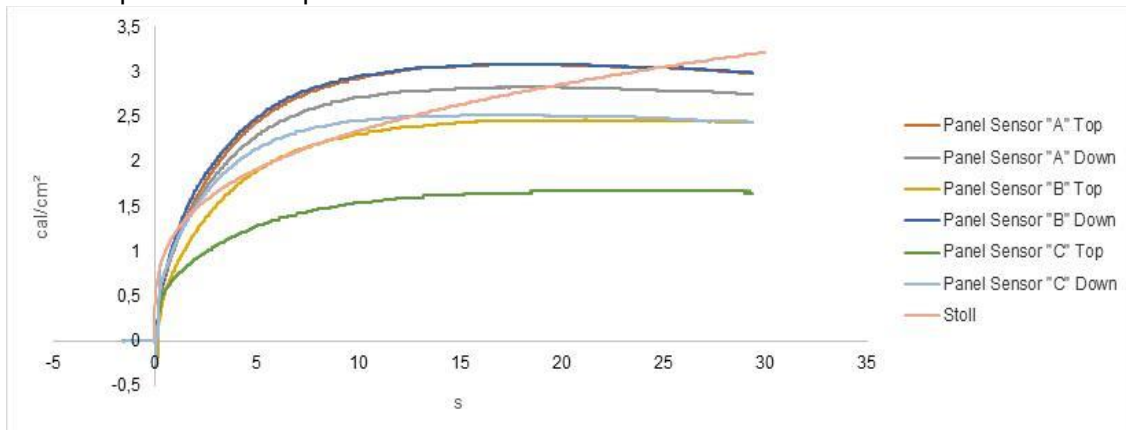
>>>

RESULTS

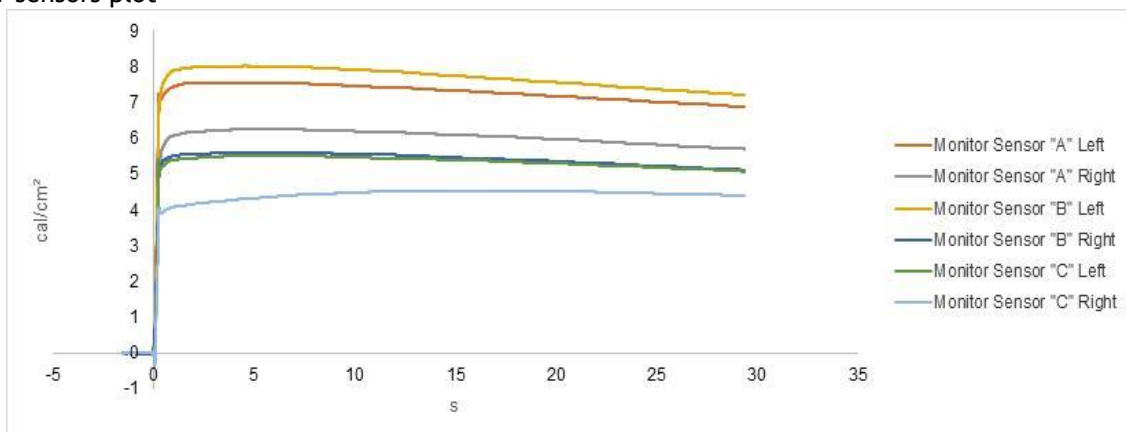
Electrical current and response sensor response:

Shot 6

Panel sensors response Vs. Stoll plot



Monitor sensors plot



Current Total RMS (kA)	8,1	Current Peak (kA)	17,7	Arc Voltage (V)	1485,0
Duration (cycles n°)	6,2	Duration (ms)	123,6	Arc Energy (kJ)	378,2
Arc Voltage (kJ)	423,8				

Sensor response	PANEL A	PANEL B	PANEL C
Ei	6,90 cal/cm ²	6,81 cal/cm ²	4,98 cal/cm ²
SCD	0,52 cal/cm ²	0,33 cal/cm ²	-0,20 cal/cm ²

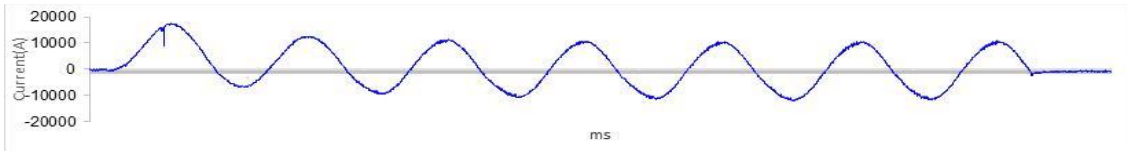
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RESULTS

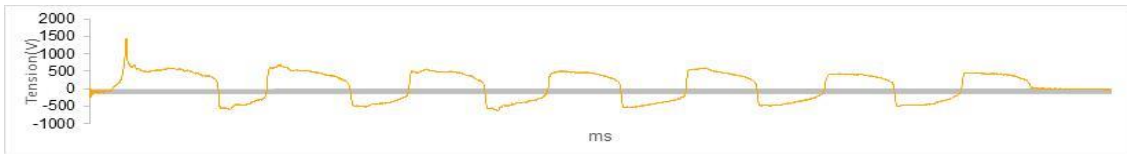
Electrical current and response sensor response:

Shot 7

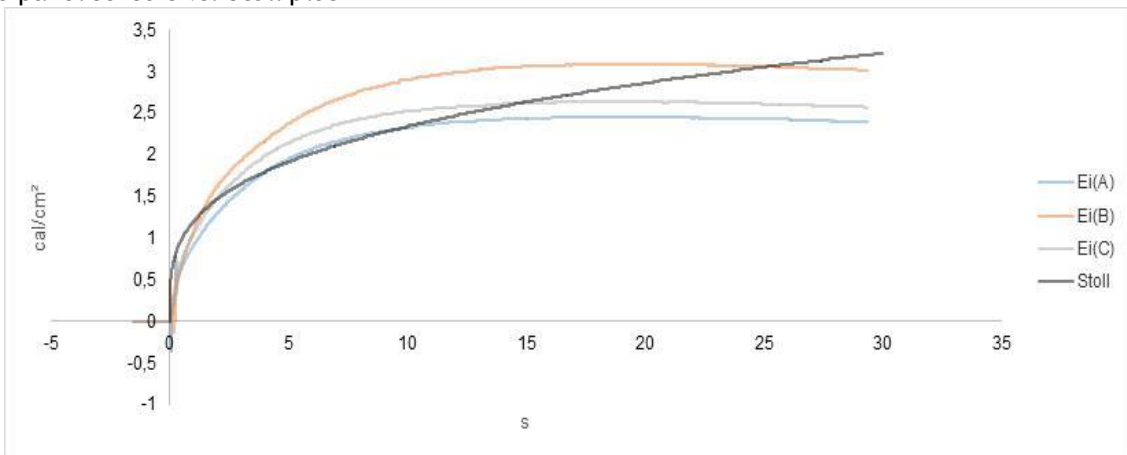
Current Plot



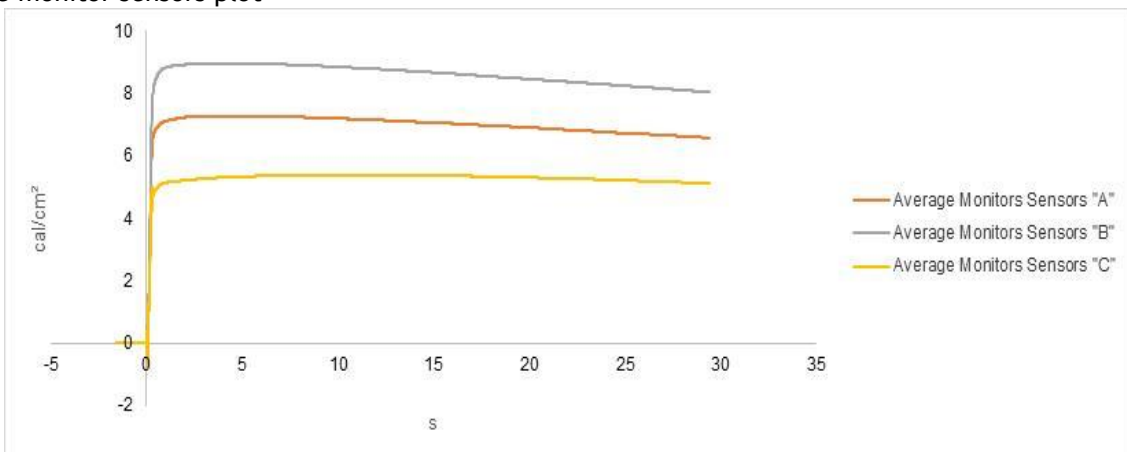
Voltage Plot



Average panel sensors vs. Stoll plot



Average monitor sensors plot



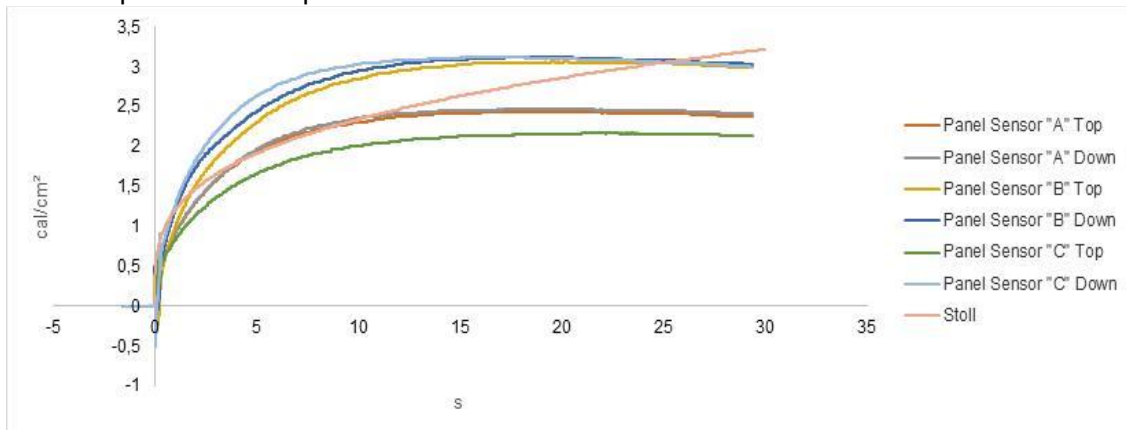
>>>

RESULTS

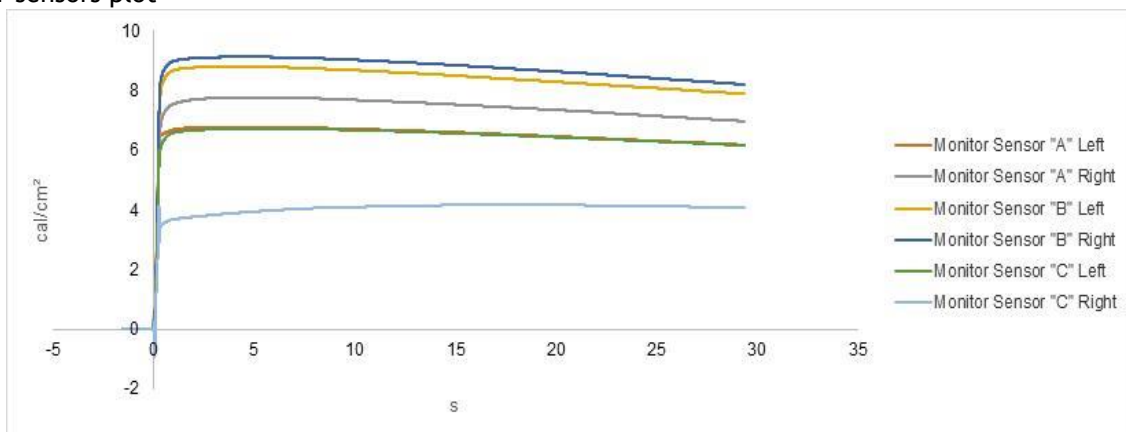
Electrical current and response sensor response:

Shot 7

Panel sensors response Vs. Stoll plot



Monitor sensors plot



Current Total RMS (kA)	7,9	Current Peak (kA)	17,4	Arc Voltage (V)	1440,0
Duration (cycles n°)	6,6	Duration (ms)	132,9	Arc Energy (kJ)	409,1
Arc Voltage (kJ)	435,6				

sensor response	PANEL A	PANEL B	PANEL C
Ei	7,27 cal/cm ²	8,96 cal/cm ²	5,39 cal/cm ²
SCD	0,06 cal/cm ²	0,57 cal/cm ²	0,26 cal/cm ²

>>>

RESULTS

Tested material pictures:

Original

Shot 1

Shot 2



Shot 3

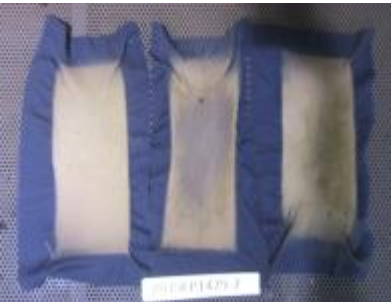
Shot 4

Shot 5



Shot 6

Shot 7



>>>

RESULTS

Summary of results:

ATPV	5,9 cal/cm ²
ELIM	5,0 cal/cm ²

FABRIC TESTED ACCORDING TO THE STANDARD MT61482-1-1_N121_FDIS 2018.01.29 prueba de panel (Método A)
ARC RATING (ATPV)
5,9 cal/cm ²

Note 1

The values of ATPV, EBT and/or ELIM, reported in clause 13.2 or 13.3 as resulting from testing according to either Procedure A or B, when given in units of cal/cm², shall be rounded down to the first digit after the decimal point, in case of the value being less than 10 cal/cm² and shall be rounded down to the last digit before the decimal point, in case of the value being greater than 10 cal/cm².

Note 2

1 kJ/m² = 1 kW.s/m² = 0,1 J/cm² = 0,023 9006 cal/cm²

1 cal/cm² = 41,840 kJ/m² = 41,840 kW.s/m²

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Lucia Martinez
Head of PPE and Ballistics department

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- 12.- This report may only be sent or delivered by hand to the applicant or to a person duly authorised by the same.
- 13.- The results of the tests and the statement of compliance with the specification in this report refer only to the test sample as it has been analyzed / tested and not the sample / item which has taken the test sample.
- 14.- The client must attend at all times, to the dates of the realization of the tests.
- 15.- According to Resolution EA (33) 31, the test reports must include the unique identification of the sample, and any brand or label of the manufacturer may be added. It is not allowed to re-issue test reports of untested sample names (references), they can only be re-issued for error correction or inclusion of omitted data that were already available at the time of the test. The laboratory can not assume responsibility for declaring that the product with the new trade name / trademark is strictly identical to the one originally tested; This responsibility belongs to the client.

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