

## TEST REPORT

**2022US0054**

### DATE OF RECEPTION

23/06/2022

### DATE TESTS

Starting: 23/06/2022

Ending: 01/07/2022

### APPLICANT

OBERON Company  
375 Faunce Corner Road, Unit E  
MA-02747 North Dartmouth

Att. ZAC TWIGHT

### IDENTIFICATION AND DESCRIPTION OF SAMPLES

#### REFERENCES

TCG40 Gloves

### TESTS CARRIED OUT

- SAMPLE IDENTIFICATION.
- ELECTRIC ARC EXPOSURE TEST: DETERMINATION OF THE ARC RATING (ATPV OR EBT50) OF FLAME RESISTANT MATERIAL OF HAND PROTECTIVE PRODUCTS.

The test was carried out 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.

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



## RESULTS

### SAMPLE IDENTIFICATION

#### Reference

TCG40 Gloves



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## RESULTS

### **ELECTRIC ARC EXPOSURE TEST: DETERMINATION OF THE ARC RATING (ATPV or E<sub>BT50</sub>) OF FLAME RESISTANT MATERIAL OF HAND PROTECTIVE PRODUCTS**

#### **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<sub>BT50</sub> or both and plots of the burn injury probability (ATPV) or break open probability (E<sub>BT50</sub>) or both versus E<sub>i</sub>.

Heat attenuation factor (HAF) and plot of HAF on E<sub>i</sub>.

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

**Standard**

ASTM F2675/F2675M – 22e1

Test conditions	
Date test.	28/06/2022
Arc current	(8 ± 1) kA
Stainless steel electrodes, gap of the electrodes	(300 ± 5) mm
Distance between the electrodes and sample	(300 ± 5) mm
Fuse wire	0.5 mm
Number of samples tested	24
Face test	Base product: Palm. For verification ignition withstand: Back.

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## RESULTS

**Reference** TCG40 Gloves

**Sample type**

Fabric gloves.

**Colour**

Black.

**Size**

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**Composition**

Multilayer system:

Layer 1: Black woven fabric style 1016, structure twill, 99% Aramid, 1% Anti-static, 170 g/m<sup>2</sup>, manufacturer Oberon Company.

Layer 2: Yellow non woven fabric style 995Q, structure quilted twill, manufacturer Oberon Company, fiber composition and nominal weight not supplied by the customer.

Layer 3: Black woven fabric, 99% Aramid, 1% Anti-Static, 193 g/m<sup>2</sup>.

**Upper and lower thickness samples before tests**

Average, maximum, and minimum thickness was measured over population of 8 gloves

Max: 1,15 mm. – Min: 1,04 mm. – Average: 1,1 mm.

**Deviation from the standard**

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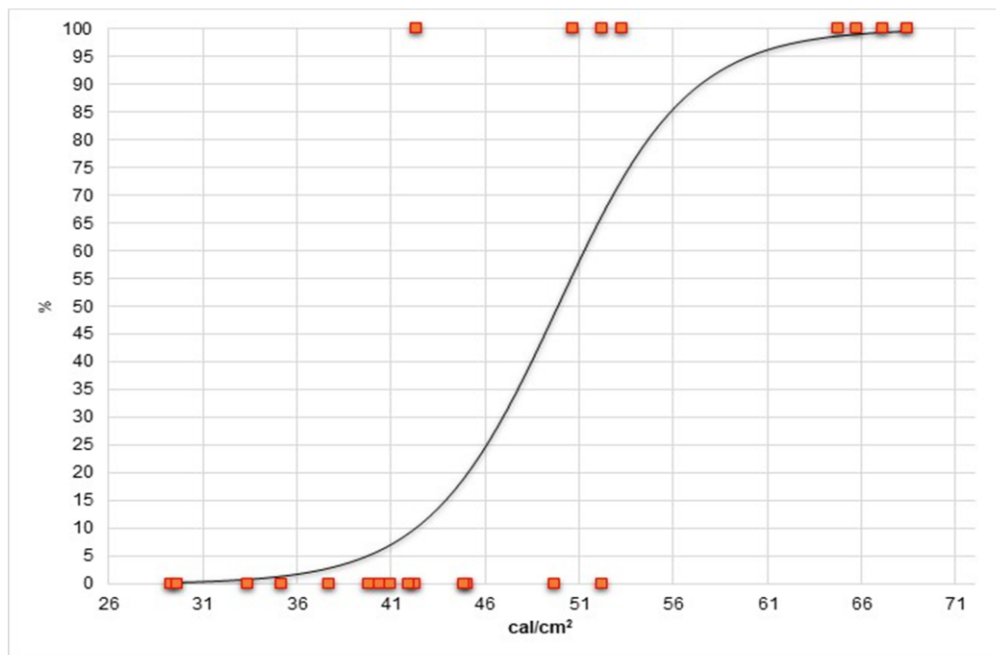
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## RESULTS

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

ATPV	49,9 cal/cm <sup>2</sup>
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ATPV points above	3
ATPV points 20%	12
ATPV points below	10
ATPV points mix zone	7

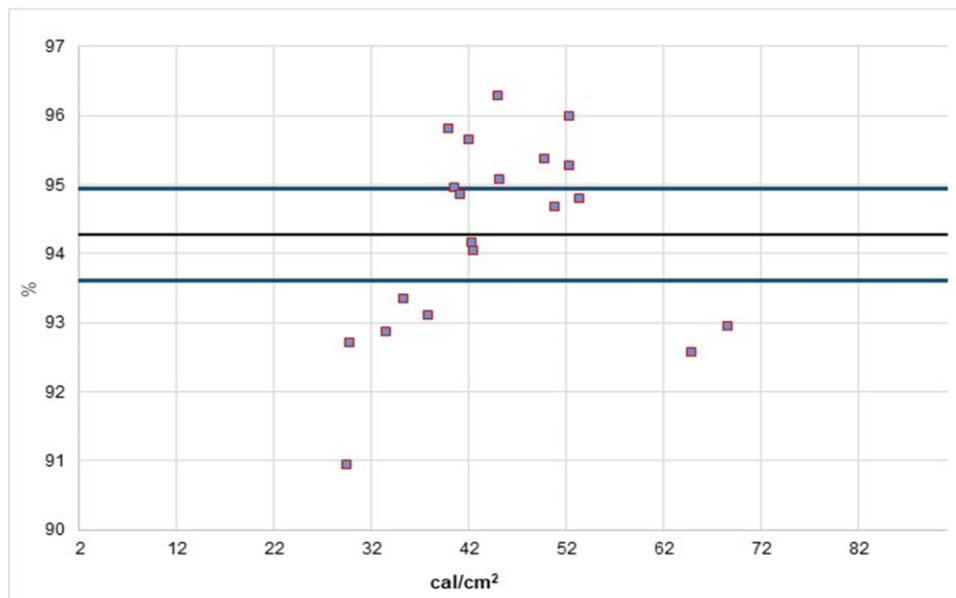
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## RESULTS

Determination of HAF, confidence Intervals 95%

HAF	94,3 %
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% HAF value :	94,3
Upper Confidence Level %:	94,9
Lower Confidence Level %:	93,6
Points above:	8
Points below:	7
Points between:	5
Total Points:	20

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## RESULTS

Summary of measured energy and subjective evaluation:

Test	Time (ms)	Cycles 50Hz	Ei cal/cm <sup>2</sup>	SCD cal/cm <sup>2</sup>	HAF %	Burn	Break Open
1-A	930,4	46,52	50,7	0,4	94,7	Y	N
1-B	930,4	46,52	42,3	-0,23	94,2	N	N
1-C	930,4	46,52	37,7	-0,14	93,1	N	N
1-D	930,4	46,52	42,3	0,02	94,0	Y	N
2-A	890	44,5	52,2	-0,03	96,0	N	N
2-B	890	44,5	45,1	-0,28	95,1	N	N
2-C	890	44,5	40,4	-0,33	95,0	N	N
2-D	890	44,5	41,9	-0,47	95,6	N	N
3-A	1099,8	54,99	68,5	2,46	93,0	Y	N
3-B	1099,8	54,99	64,8	2,42	92,6	Y	N
3-C	1099,8	54,99	53,3	0,37	94,8	Y	N
3-D	1099,8	54,99	52,2	0,03	95,3	Y	N
4-A	900,2	45,01	49,7	-0,04	95,4	N	N
4-B	900,2	45,01	44,9	-0,47	96,3	N	N
4-C	900,2	45,01	39,9	-0,72	95,8	N	N
4-D	900,2	45,01	41,0	-0,32	94,9	N	N
5-A	650	32,5	35,2	-0,63	93,4	N	N
5-B	650	32,5	33,4	-0,63	92,9	N	N
5-C	650	32,5	29,3	-0,27	90,9	N	N
5-D	650	32,5	29,6	-0,83	92,7	N	N
6-A	1449,8	72,49	87,5	3,7	93,0	Y	N
6-B	1449,8	72,49	76,7	2,14	93,7	Y	N
6-C	1449,8	72,49	67,2	0,28	95,7	Y	N
6-D	1449,8	72,49	65,8	0,58	94,9	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	Y	N	N	Y	Y
1-B	0	Y	N	N	Y	Y
1-C	0	Y	N	N	Y	Y
1-D	0	Y	N	N	Y	Y
1-A	0	Y	N	N	Y	Y
2-B	0	Y	N	N	Y	Y
2-C	0	Y	N	N	Y	Y
2-D	0	Y	N	N	Y	Y
3-A	0	Y	N	N	Y	Y
3-B	0	Y	N	N	Y	Y
3-C	0	Y	N	N	Y	Y
3-D	0	Y	N	N	Y	Y
4-A	0	Y	N	N	Y	Y
4-B	0	Y	N	N	Y	Y
4-C	0	Y	N	N	Y	Y
4-D	0	Y	N	N	Y	Y
5-A	0	Y	N	N	Y	Y
5-B	0	Y	N	N	Y	Y
5-C	0	Y	N	N	Y	Y
5-D	0	Y	N	N	Y	Y
6-A	0	Y	N	N	Y	Y
6-B	0	Y	N	N	Y	Y
6-C	0	Y	N	N	Y	Y
6-D	0	Y	N	N	Y	Y

Y Yes N No

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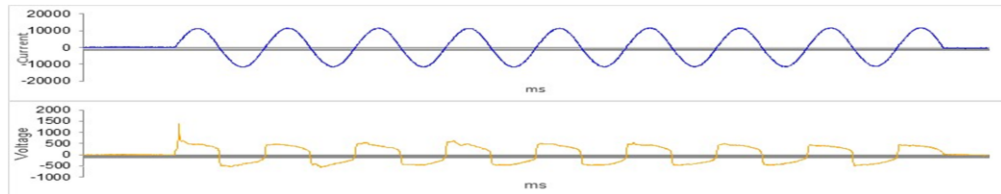


## RESULTS

Electrical current and response sensor response:

Calibration shot

### INITIAL CALIBRATION



<b>Ei Panel A</b>	7,7 cal/cm <sup>2</sup>	<b>Ei Panel B</b>	6,6 cal/cm <sup>2</sup>	<b>Ei Panel C</b>	6,0 cal/cm <sup>2</sup>	<b>Ei Panel D</b>	6,4 cal/cm <sup>2</sup>
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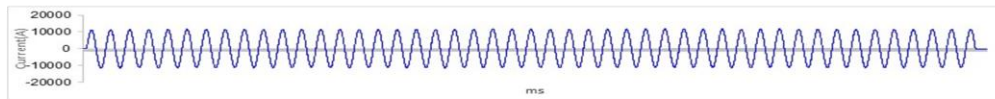


## RESULTS

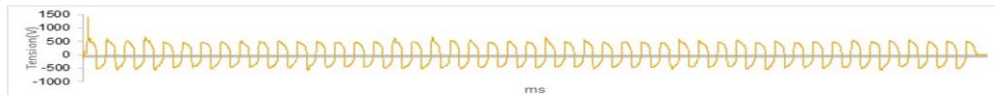
### Electrical current and response sensor response:

Shot 1

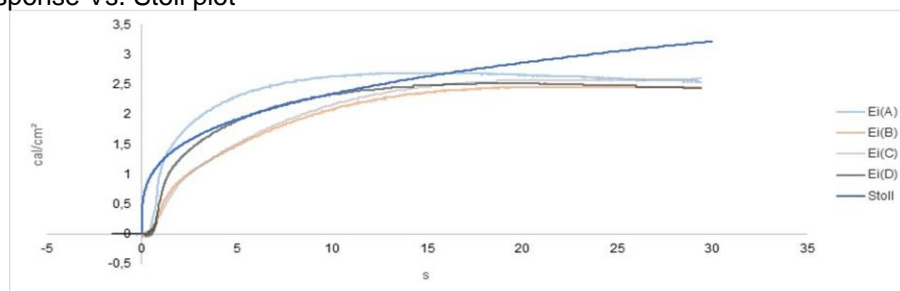
Current Plot



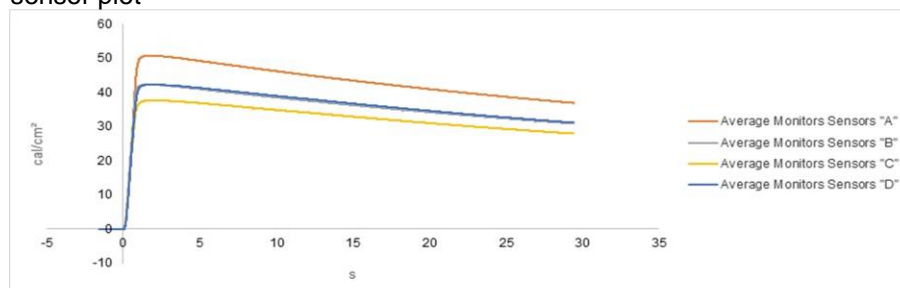
Tension Plot



Panel sensor response Vs. Stoll plot



Average monitor sensor plot



<b>Current Total RMS (kA)</b>	8,0	<b>Current Peak (kA)</b>	11,8	<b>Arc Voltage (V)</b>	1398,0
<b>Duration (cycles nº)</b>	46,5	<b>Duration (ms)</b>	930,5	<b>Arc Energy (kJ)</b>	2757,0

sensor response	PANEL A	PANEL B	PANEL C	PANEL D
<b>Ei</b>	50,69 cal/cm <sup>2</sup>	42,26 cal/cm <sup>2</sup>	37,73 cal/cm <sup>2</sup>	42,34 cal/cm <sup>2</sup>
<b>SCD</b>	0,40 cal/cm <sup>2</sup>	-0,23 cal/cm <sup>2</sup>	-0,14 cal/cm <sup>2</sup>	0,02 cal/cm <sup>2</sup>
<b>HAF</b>	94,69 %	94,17 %	93,11 %	94,05 %

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## RESULTS

Shot 2

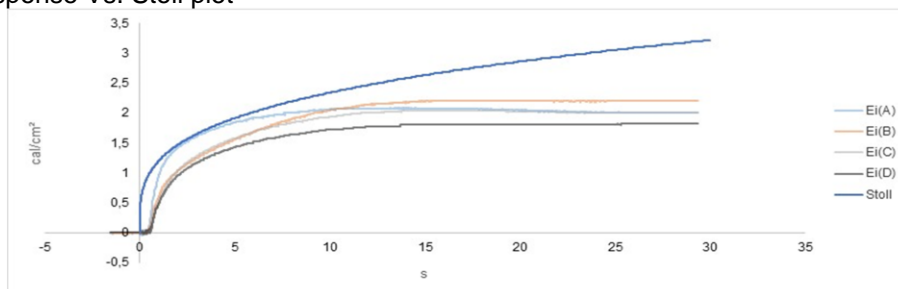
Current Plot



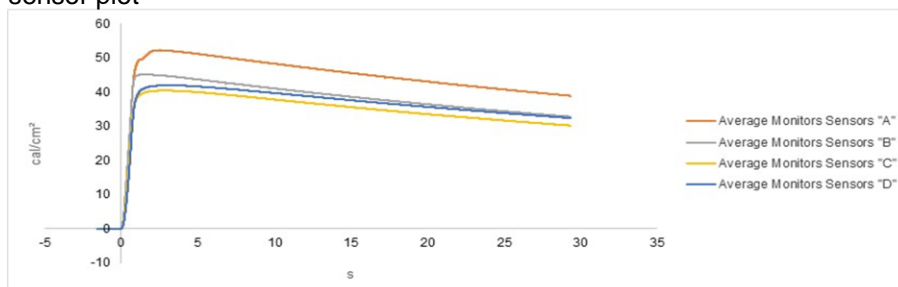
Tension Plot



Panel sensor response Vs. Stoll plot



Average monitor sensor plot



<b>Current Total RMS (kA)</b>	8,0	<b>Current Peak (kA)</b>	11,8	<b>Arc Voltage (V)</b>	1524,0
<b>Duration (cycles nº)</b>	44,5	<b>Duration (ms)</b>	890,0	<b>Arc Energy (kJ)</b>	2728,0

sensor response	PANEL A	PANEL B	PANEL C	PANEL D
<b>Ei</b>	52,24 cal/cm <sup>2</sup>	45,09 cal/cm <sup>2</sup>	40,41 cal/cm <sup>2</sup>	41,92 cal/cm <sup>2</sup>
<b>SCD</b>	-0,03 cal/cm <sup>2</sup>	-0,28 cal/cm <sup>2</sup>	-0,33 cal/cm <sup>2</sup>	-0,47 cal/cm <sup>2</sup>
<b>HAF</b>	96,00 %	95,09 %	94,96 %	95,65 %

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## RESULTS

Shot 3

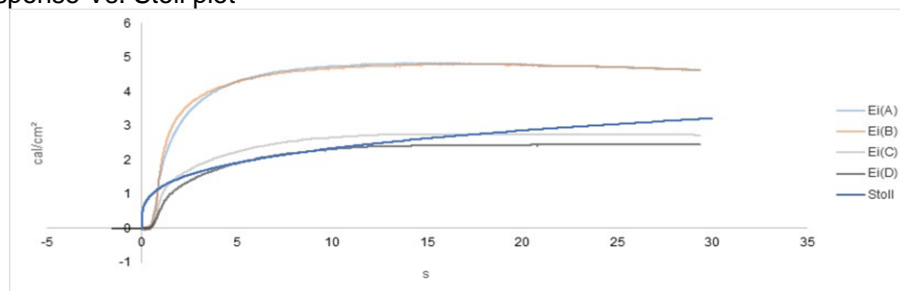
Current Plot



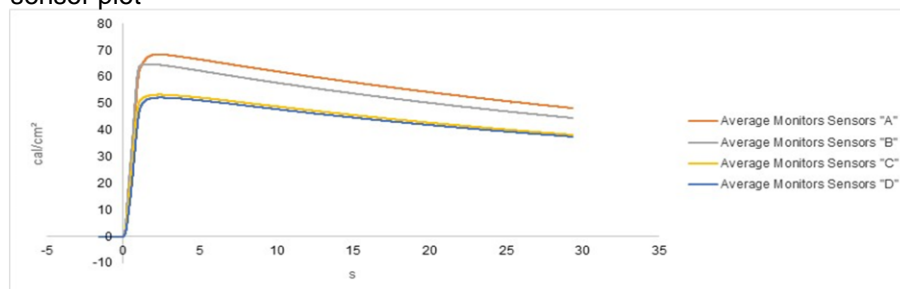
Tension Plot



Panel sensor response Vs. Stoll plot



Average monitor sensor plot



<b>Current Total RMS (kA)</b>	8,0	<b>Current Peak (kA)</b>	11,8	<b>Arc Voltage (V)</b>	1500,0
<b>Duration (cycles n°)</b>	55,0	<b>Duration (ms)</b>	1099,9	<b>Arc Energy (kJ)</b>	3475,2

sensor response	PANEL A	PANEL B	PANEL C	PANEL D
<b>Ei</b>	68,46 cal/cm <sup>2</sup>	64,76 cal/cm <sup>2</sup>	53,29 cal/cm <sup>2</sup>	52,19 cal/cm <sup>2</sup>
<b>SCD</b>	2,46 cal/cm <sup>2</sup>	2,42 cal/cm <sup>2</sup>	0,37 cal/cm <sup>2</sup>	0,03 cal/cm <sup>2</sup>
<b>HAF</b>	92,96 %	92,58 %	94,81 %	95,27 %

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## RESULTS

Shot 4

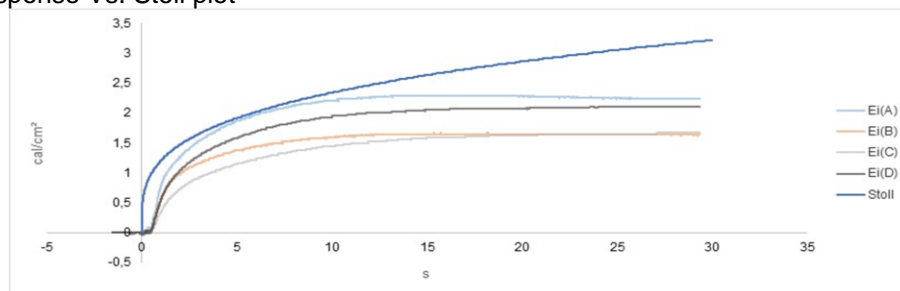
Current Plot



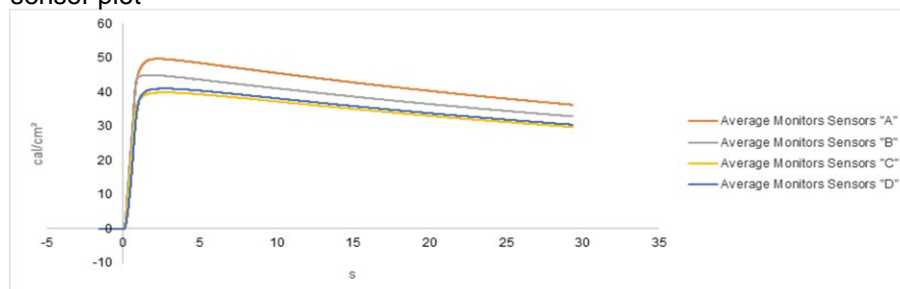
Tension Plot



Panel sensor response Vs. Stoll plot



Average monitor sensor plot



<b>Current Total RMS (kA)</b>	8,1	<b>Current Peak (kA)</b>	12,0	<b>Arc Voltage (V)</b>	1461,0
<b>Duration (cycles nº)</b>	45,0	<b>Duration (ms)</b>	900,2	<b>Arc Energy (kJ)</b>	2691,8

sensor response	PANEL A	PANEL B	PANEL C	PANEL D
<b>Ei</b>	49,68 cal/cm <sup>2</sup>	44,89 cal/cm <sup>2</sup>	39,88 cal/cm <sup>2</sup>	40,99 cal/cm <sup>2</sup>
<b>SCD</b>	-0,04 cal/cm <sup>2</sup>	-0,47 cal/cm <sup>2</sup>	-0,72 cal/cm <sup>2</sup>	-0,32 cal/cm <sup>2</sup>
<b>HAF</b>	95,38 %	96,29 %	95,82 %	94,86 %

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## RESULTS

Shot 5

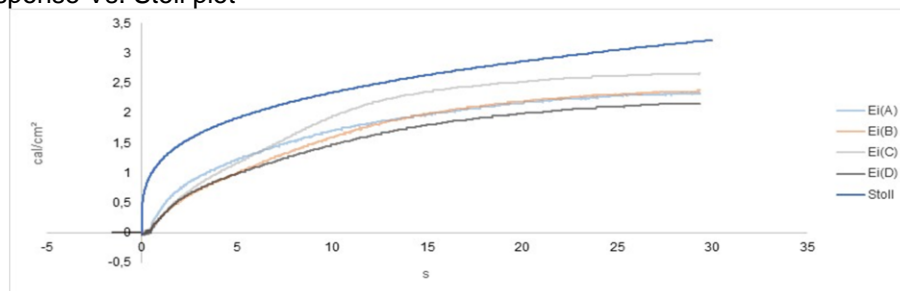
Current Plot



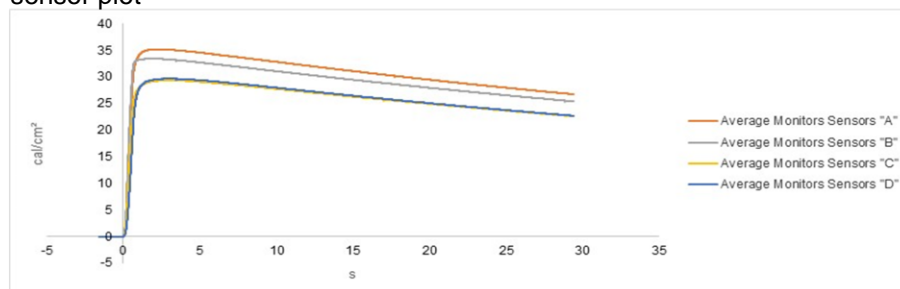
Tension Plot



Panel sensor response Vs. Stoll plot



Average monitor sensor plot



<b>Current Total RMS (kA)</b>	8,0	<b>Current Peak (kA)</b>	11,8	<b>Arc Voltage (V)</b>	1455,0
<b>Duration (cycles nº)</b>	32,5	<b>Duration (ms)</b>	650,1	<b>Arc Energy (kJ)</b>	2048,7

sensor response	PANEL A	PANEL B	PANEL C	PANEL D
<b>Ei</b>	35,16 cal/cm <sup>2</sup>	33,40 cal/cm <sup>2</sup>	29,34 cal/cm <sup>2</sup>	29,65 cal/cm <sup>2</sup>
<b>SCD</b>	-0,63 cal/cm <sup>2</sup>	-0,63 cal/cm <sup>2</sup>	-0,27 cal/cm <sup>2</sup>	-0,83 cal/cm <sup>2</sup>
<b>HAF</b>	93,35 %	92,88 %	90,94 %	92,71 %

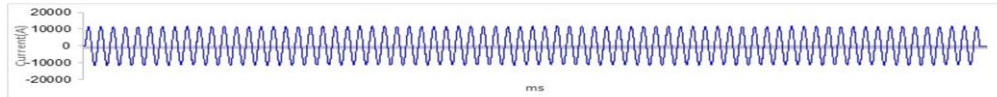
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## RESULTS

### VERIFICATION SHOT – IGNITION WITHSTAND LEVEL

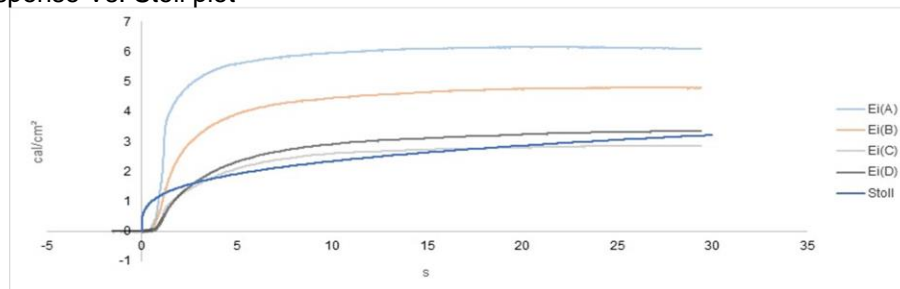
Current Plot



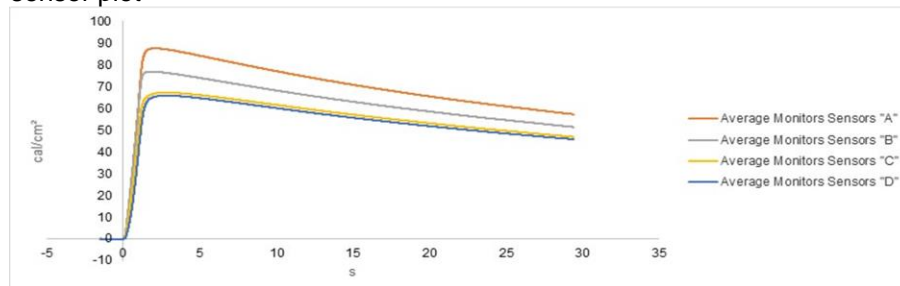
Tension Plot



Panel sensor response Vs. Stoll plot



Average monitor sensor plot



<b>Current Total RMS (kA)</b>	8,0	<b>Current Peak (kA)</b>	12,1	<b>Arc Voltage (V)</b>	1458,0
<b>Duration (cycles n°)</b>	72,5	<b>Duration (ms)</b>	1449,8	<b>Arc Energy (kJ)</b>	4479,7

Sensor response	PANEL A	PANEL B	PANEL C	PANEL D
<b>Ei</b>	87,47 cal/cm <sup>2</sup>	76,68 cal/cm <sup>2</sup>	67,17 cal/cm <sup>2</sup>	65,79 cal/cm <sup>2</sup>
<b>SCD</b>	3,70 cal/cm <sup>2</sup>	2,14 cal/cm <sup>2</sup>	0,28 cal/cm <sup>2</sup>	0,58 cal/cm <sup>2</sup>
<b>HAF</b>	92,97 %	93,74 %	95,74 %	94,89 %

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## RESULTS

### Tested material pictures:

Original



Shot 1



Shot 2



Shot 3



Shot 4



Shot 5



Ignition withstand verification -  
Original



Ignition withstand verification –  
After exposure



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## RESULTS

### Summary of results:

ATPV	50 cal/cm <sup>2</sup>
HAF	94,3 %

#### HAND PROTECTIVE PRODUCTS TESTED ACCORDING TO THE STANDARD ASTM F2675/F2675M:22e1

ARC RATING (ATPV)

50 cal/cm<sup>2</sup>

The verification shot at ignition withstand level meet with the criteria and do not exhibit ignition in any sample.

Arc Flash PPE category according to standard NFPA70E Edition 2021 Table 130.7 (C) (16) - Personal Protective Equipment (PPE)

PPE Category	Minimum Arc Rating (cal/cm <sup>2</sup> )
1	4
2	8
3	25
4	40

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**Lucia Martinez**  
**Head of PPE and Ballistics department**

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