Hugh Hoagland Consulting, Inc.

ArcWear.com

Electric Arc Exposure Tests

For XM Textiles

Material System

7.7 oz/yd² 260 g/m² Twill 3/1 88% Cotton 12% Nylon
Style: 88C/12N-260FR Selene-7
Color: Grey
Actual Areal Density (AAD): 8.0 oz/yd² 271 g/m²
Report Number: 1210P34 Revision: 00

October/November, 2012

Tests Conducted by Kinectrics High Current Laboratory
Toronto, Ontario, Canada

Electric Arc Exposure Report

ASTM F 1959/F 1959M-06 aε1 Standard Test Method for Determining the Arc Rating of Materials for Clothing

General

At the request of Wu Cong Jun, electric arc exposure tests were conducted on textile systems for XM Textiles. Wu Cong Jun arranged with ArcWear.com to facilitate testing by the High Current Laboratory of Kinectrics in Toronto and to review test data.

The tests documented in this report were conducted in accordance with ASTM International Standard F 1959/F 1959M-06 aε1 Standard Test Method for Determining the Arc Rating of Materials for Clothing.

Test samples

The test material was received on October 11, 2012. The test material was washed 3 times and dried by ArcWear.com in accordance with requirements of the above standard. Following the washing procedure, material was cut into panel test specimens.

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 and two panel sensors for each panel in each trial, plot of average responses from two panel and two monitor sensors, plot of Incident energy distribution *Ei* from bare shot analysis
- photographs of exposed material panels
- video

Above mentioned test data is part of report and is available for download from ArcWearOnline.com arc testing website. Test data is accessible only to and protected with XM Textiles unique password.

Essential test data and test results are presented in the table below and on the attached data pages as follows:

- arc rating ATPV or EBT or both and plots of the burn injury probability (ATPV) or breakopen probability (EBT) or both versus *Ei*
- test specimen description and order of layer
- distance from an arc center line to the panel surface
- subjective evaluation
- heat attenuation factor (HAF) and plot of HAF on *Ei*
- ignition probability value (if determined during testing)

Rating

Material system specified in the table below received Arc Rating as

ATPV=11 cal/cm²

Customer	XM Textiles
Material design	7.7 oz/yd² 260 g/m² Twill 3/1, 88% Cotton 12% Nylon
Style	88C/12N-260FR Selene-7
Color	Grey
Actual Areal Density (AAD) as tested	8.0 oz/yd² 271 g/m²

The order of layering is numbered starting from the outer layer listed first.

Requested by: Wu Cong Jun

ArcWear Incorporated KY 063770 Louisville, Kentucky

Approved by Hugh Hoagland
Arcwear.com

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Report # K-418465-1210P34	Test Report
Samples Received: OCT 11, 2012 / Samples Tested: NOV 2, 2012	Kinectrics Inc., 800 Kipling Avenue, Unit 2, Toronto, Ontario, Canada Tel: 416-207-6000, www.kinectrics.com

KINECTRICS
ISO 9001-2008

Tested for

Hugh Hoagland
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Test item description

XM Textiles, Style 88C/12N-260FR Selene-7, 7.7 oz/yd² 260 g/m² Twill 3/1, 88% Cotton 12% Nylon, Grey, AAD 8.0 oz/yd² 271 g/m², ArcWear# 1210P34

Reference Standard

ASTM F1959/F1959M-06ae1
Standard Test Method for Determining Arc Thermal Performance of Textile Materials for Clothing by Electric Arc Exposure Method

Test Parameters: Test current: 8 kA; Arc Gap: 30 cm; Distance to Fabric: 30 cm; Number of samples analysed: 21; Incident Energy Range: 8 to 13 cal/cm²

Arc Rating, ATPV = 11 Cal/cm²
Heat Attenuation Factor, HAF = 78%

Summary

The Arc Rating of this material is intended for use as part of a flame resistant garment or system for workers exposed to electric arcs. The samples were tested by Kinectrics as received. The test result is applicable only to the Test Item, other material or color may have different protection level. Actual performance of the complete garment may vary depending on the final design and assembly of the garment. The Arc Rating was calculated based on the data obtained and analysed in accordance with the latest version of the applicable standards. The individual test sheets, graphs, photographs of the samples and video of every test are provided in digital format to the Client for review.

As of August 1, 2010, the arc testing performed to the above mentioned Standard is accredited by the Standards Council of Canada to conform to the requirments of CAN-P-4E (ISO/IEC 17025:2005) by QMI, a division of SAI Global and North America's leading QMS registrar. Adherence to this standard provides one of the strongest assurances of service quality available. As a minimum, since July 1998 all work at Kinectrics is performed to meet the requirements of ISO 9001.

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Note
- The test performed does not apply to electrical contact or electrical shock hazard.
- An unsigned copy of this report is an unofficial reporting of information. Report must be signed to validate test data and comform

Performed by:

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Station Operator
High Current Laboratory
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Kinectrics Incorporated 1612086 Ontario, Canada

Approved by:

Claude Maurice,
Lab Manager
High Current Laboratory
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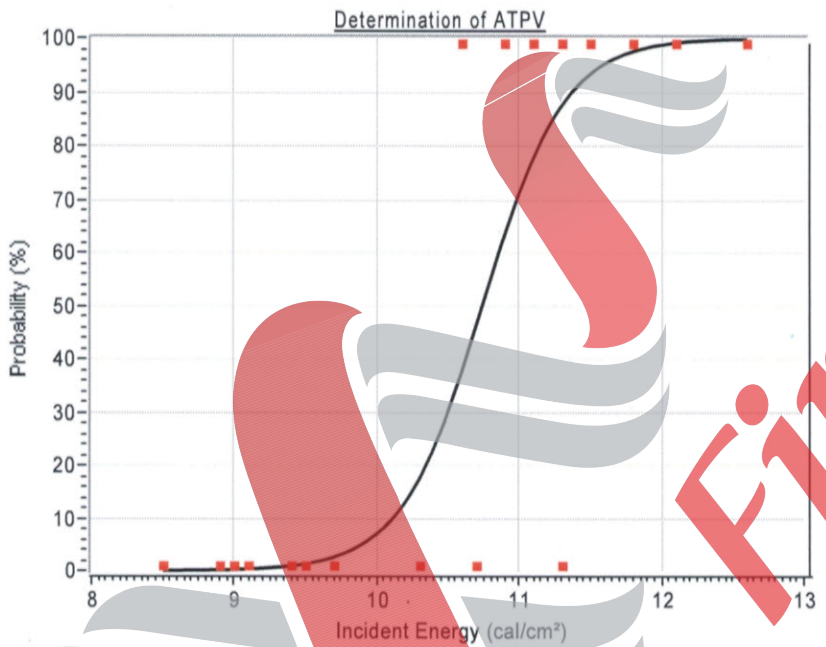
Date: NOV 2, 2012	Determination of ATPV by performing logistic regression on panel burn response as indicated in Summary Table	KINECTRICS ISO 9001-2008
Report # K-418465-1210P34	Test Performed in accordance with : ASTM F1959/F1959M-06ae1	

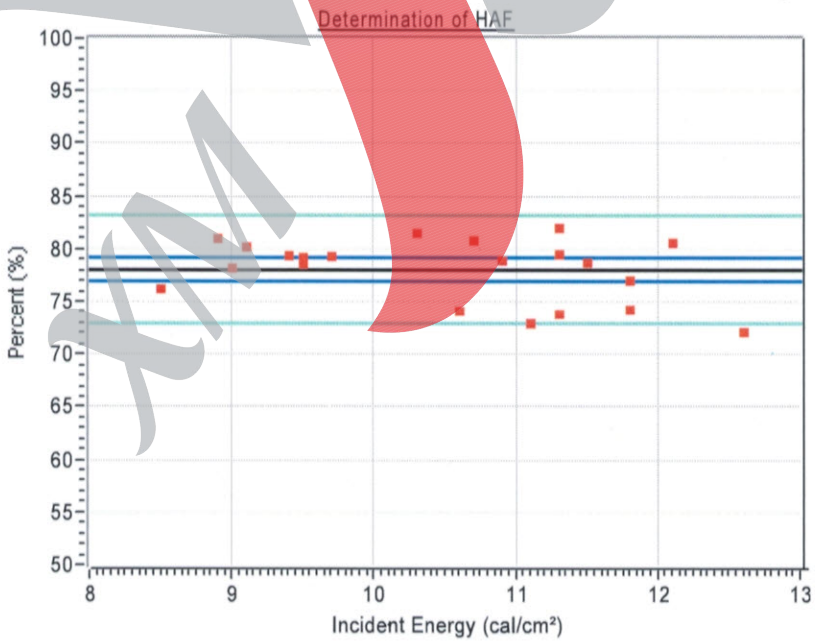
Fabric Description: XM Textiles, Style 88C/12N-260FR Selene-7, 7.7 oz/yd² 260 g/m² Twill 3/1, 88% Cotton 12% Nylon, Grey, AAD 8.0 oz/yd² 271 g/m², ArcWear# 1210P34



ATPV = 11 cal/cm²

Probability	Ei
5%	9.9
10%	10.1
20%	10.3
30%	10.5
40%	10.6
50%	10.7
60%	10.9
70%	11.0
80%	11.1
90%	11.4

 # Pts = 21
 # Pts above Stoll = 10
 # Pts Break-Open = 0
 # Pts always >STOLL = 7
 # Pts always <STOLL = 9
 # Pts within 20% = 20
 # Pts in mix zone = 4



HAF = 78 %

Confidence Intervals
95% CI = 76.9 , 79.1

Date: NOV 2, 2012	Summary Table	KINECTRICS ISO 9001-2008
Report # K-418465-1210P34	Test Performed in accordance with : ASTM F1959/F1959M-06ae1	

Fabric Description: XM Textiles, Style 88C/12N-260FR Selene-7, 7.7 oz/yd² 260 g/m² Twill 3/1, 88% Cotton 12% Nylon, Grey, AAD 8.0 oz/yd² 271 g/m², ArcWear# 1210P34

Summary of measured energy and observations

	Test #	Panel	Test Current A	Cycles of 60Hz	Ei Cal/cm²	SCD Cal/cm²	HAF %	Burn Y/N	Break Open Y/N	Ablation Y/N	After Flame sec.	Omit Y/N	Comment
1	K-418465-8127	A	8315	11.2	9.1	-0.29	80.2	No	-	-	-	No	
2	K-418465-8127	B	8315	11.2	9.5	-0.1	78.6	No	-	-	-	No	
3	K-418465-8127	C	8315	11.2	8.9	-0.4	81.0	No	-	-	-	No	
4	K-418465-8128	A	8317	13.1	12.1	0.29	80.6	Yes	-	-	-	No	
5	K-418465-8128	B	8317	13.1	9.4	-0.2	79.4	No	-	-	-	No	
6	K-418465-8128	C	8317	13.1	10.7	-0.2	80.8	No	-	-	-	No	
7	K-418465-8129	A	8271	15.2	11.1	0.77	72.9	Yes	-	-	-	No	
8	K-418465-8129	B	8271	15.2	12.6	1.4	72.1	Yes	-	-	-	No	
9	K-418465-8129	C	8271	15.2	11.8	0.8	74.2	Yes	-	-	-	No	
10	K-418465-8130	A	8217	14.1	11.8	0.50	77.0	Yes	-	-	-	No	
11	K-418465-8130	B	8217	14.1	11.5	0.2	78.7	Yes	-	-	-	No	
12	K-418465-8130	C	8217	14.1	11.3	0.8	73.8	Yes	-	-	-	No	
13	K-418465-8131	A	8206	13.7	10.6	0.57	74.1	Yes	-	-	-	No	
14	K-418465-8131	B	8206	13.7	8.5	-0.3	76.2	No	-	-	-	No	
15	K-418465-8131	C	8206	13.7	11.3	0.1	79.5	Yes	-	-	-	No	
16	K-418465-8132	A	8247	12.2	9.0	-0.18	78.2	No	-	-	-	No	
17	K-418465-8132	B	8247	12.2	10.3	-0.3	81.5	No	-	-	-	No	
18	K-418465-8132	C	8247	12.2	10.9	0.0	78.9	Yes	-	-	-	No	
19	K-418465-8133	A	8168	12.7	9.5	-0.24	79.2	No	-	-	-	No	
20	K-418465-8133	B	8168	12.7	9.7	-0.3	79.3	No	-	-	-	No	
21	K-418465-8133	C	8168	12.7	11.3	-0.2	82.0	No	-	-	-	No	
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