

Hugh Hoagland Consulting, Inc.

ArcWear.com

Electric Arc Exposure Tests

For XM Textiles

Material System

10 oz/yd² 350 g/m² Twill, 100% Cotton

Style: 100C-350FR

Color: Orange

Actual Areal Density (AAD): 11.6 oz/yd² 393 g/m²

Report Number: 1204P03, Revision: 00

April, 2012

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

Electric Arc Exposure Report

ASTM F 1959/F 1959M-06 a⁸¹ 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 a⁸¹ Standard Test Method for Determining the Arc Rating of Materials for Clothing.

Test samples

The test material was received on March 26, 2012. The test material was washed 3 times and dried by ArcWear.com in accordance with requirements of the above standard. This is specified in the standard to allow for minimal shrinkage while removing contaminants from the material manufacturing process. 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 E_i 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 E_i
- 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 E_i
- ignition probability value (if determined during testing)

Rating

Material system specified in the table below received Arc Rating as

(ATPV) = 9.2 cal/cm²

Customer	XM Textiles
Material design	10 oz/yd ² 350 g/m ² Twill, 100% Cotton
Style	100C-350FR
Color	Orange
Actual Areal Density (AAD) as tested	11.6 oz/yd ² 393 g/m ²

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

Requested by: Wu Cong Jun

Approved by Hugh Hoagland
Arcwear.com

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- b) assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this report*
- c)*

Report # K-418406-1204P03

Samples Received:
MARCH 26, 2012

Samples Tested:
April 24, 2012

Test Report

Kinectrics Inc., 800 Kipling Avenue, Unit 2
Toronto, Ontario, Canada
Tel: 416-207-6000, www.kinectrics.com



KINECTRICS
ISO 9001-2008

Tested for

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Contact information for item tested:

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XM Textiles
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Test item description

XM Textiles, Style 100C-350FR, 10 oz/yd² 350 g/m² Twill, 100% Cotton, Orange, AAD 11.6 oz/yd² 393 g/m², ArcWear# 1204P03

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
Distance to Fabric: 30 cm
Arc Gap: 30 cm

Number of samples analysed: 21
Incident Energy Range: 7 to 17 cal/cm²

Arc Rating, ATPV = 9.2 Cal/cm²
Heat Attenuation Factor, HAF = 81%

Summary

The Arc Rating of this material is intended for use as part of a flame resistant garment for workers exposed to electric arcs. The material was 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 requirements 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 conform to quality standards.

Performed by:

Daniel Ferguson
Station Operator
High Current Laboratory
Ph: 416-207-6000

Approved by:

Claude Maurice,
Lab Manager
High Current Laboratory
hcl@kinectrics.com

Date:
April 24, 2012

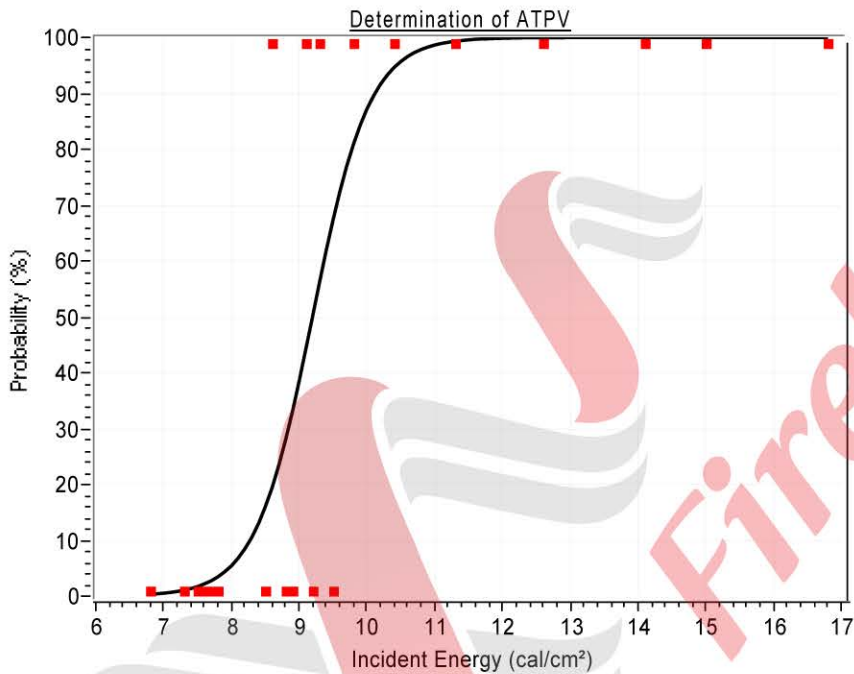
Determination of ATPV by performing logistic regression on panel burn response as indicated in Summary Table

Report #
K-418406-1204P03

Test Performed in accordance with : ASTM F1959/F1959M-06ae1



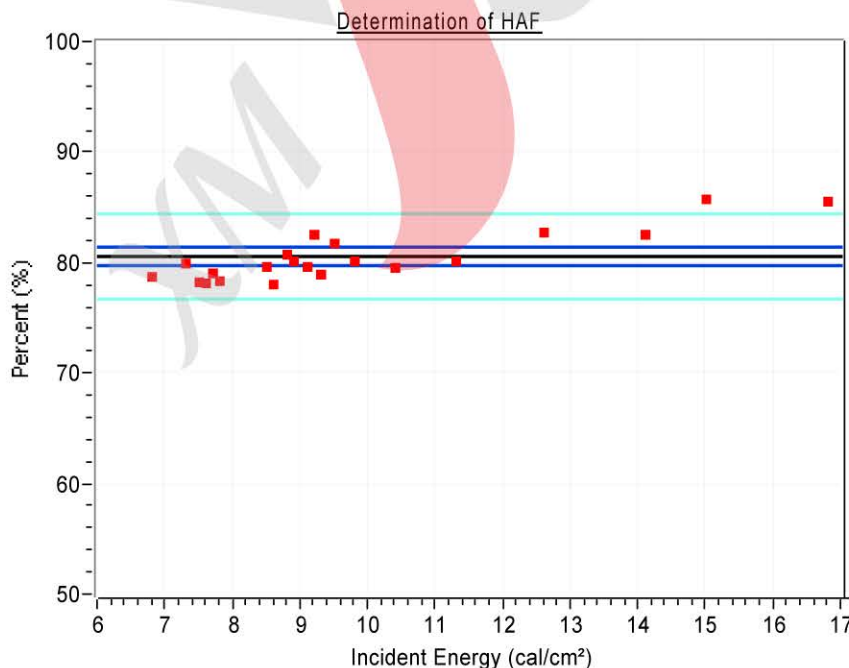
Fabric XM Textiles, Style 100C-350FR, 10 oz/yd² 350 g/m² Twill, 100% Cotton, Orange, AAD 11.6 oz/yd² 393 g/m²,
Description: ArcWear# 1204P03



ATPV = 9.2 cal/cm²

Probability	Ei
5%	8.0
10%	8.3
20%	8.6
30%	8.8
40%	9.0
50%	9.2
60%	9.4
70%	9.6
80%	9.8
90%	10.1

Pts = 21
 # Pts above Stoll = 10
 # Pts Break-Open = 0
 # Pts always >STOLL = 7
 # Pts always <STOLL = 7
 # Pts within 20% = 14
 # Pts in mix zone = 7



HAF = 81 %

Confidence Intervals
 95% CI = 80.2 , 81.8

Data pts

Best Fit

95% CI

95% CI pts

Date:
April 24, 2012

Report #
K-418406-1204P03

Summary Table

Test Performed in accordance with : ASTM F1959/F1959M-06ae1



Fabric Description: XM Textiles, Style 100C-350FR, 10 oz/yd² 350 g/m² Twill, 100% Cotton, Orange, AAD 11.6 oz/yd² 393 g/m², ArcWear# 1204P03

Summary of measured energy and observations

	Test #	Panel	Test Current A	Cycles of 60Hz	Ei Cal/cm ²	SCD Cal/cm ²	HAF %	Burn Y/N	Break Open Y/N	Ablation Y/N	After Flame sec.	Omit Y/N	Comment
1	K-418406-2938	A	8288	18.2	12.6	0.18	82.8	Yes	-	-	-	No	
2	K-418406-2938	B	8288	18.2	14.1	0.4	82.6	Yes	-	-	-	No	
3	K-418406-2938	C	8288	18.2	16.8	0.4	85.6	Yes	-	-	-	No	
4	K-418406-2939	A	8359	15.2	10.4	0.25	79.6	Yes	-	-	-	No	
5	K-418406-2939	B	8359	15.2	11.3	0.3	80.2	Yes	-	-	-	No	
6	K-418406-2939	C	8359	15.2	15.0	0.3	85.8	Yes	-	-	-	No	
7	K-418406-2940	A	8396	10.2	9.5	-0.05	81.8	No	-	-	-	No	
8	K-418406-2940	B	8396	10.2	7.8	-0.1	78.4	No	-	-	-	No	
9	K-418406-2940	C	8396	10.2	7.7	-0.2	79.1	No	-	-	-	No	
10	K-418406-2941	A	8396	12.2	9.1	0.00	79.7	Yes	-	-	-	No	
11	K-418406-2941	B	8396	12.2	9.3	0.1	79.0	Yes	-	-	-	No	
12	K-418406-2941	C	8396	12.2	9.8	0.1	80.2	Yes	-	-	-	No	
13	K-418406-2942	A	8433	9.2	7.5	-0.14	78.3	No	-	-	-	No	
14	K-418406-2942	B	8433	9.2	6.8	-0.3	78.8	No	-	-	-	No	
15	K-418406-2942	C	8433	9.2	7.3	-0.3	80.0	No	-	-	-	No	
16	K-418406-2943	A	8383	11.2	8.9	-0.15	80.2	No	-	-	-	No	
17	K-418406-2943	B	8383	11.2	8.6	0.1	78.1	Yes	-	-	-	No	
18	K-418406-2943	C	8383	11.2	8.8	-0.1	80.8	No	-	-	-	No	
19	K-418406-2944	A	8427	10.7	9.2	-0.17	82.6	No	-	-	-	No	
20	K-418406-2944	B	8427	10.7	7.6	-0.1	78.2	No	-	-	-	No	
21	K-418406-2944	C	8427	10.7	8.5	-0.1	79.7	No	-	-	-	No	
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