

**Hugh Hoagland Consulting, Inc.**

# ArcWear.com

## Electric Arc Exposure Tests

### For XM Textiles

#### Material System

**9.4 oz/yd<sup>2</sup> 320 g/m<sup>2</sup> Satin 4/1 100% Cotton**

**Style: 99C/1AS-320FR-S**

**Color: Navy**

**Actual Areal Density (AAD): 9.59 oz/yd<sup>2</sup> 325 g/m<sup>2</sup>**

**Report Number: 1207P06 Revision: 00**

July, 2012

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

# Electric Arc Exposure Report

## ASTM F 1959/F 1959M-06 aE1 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 aE1 Standard Test Method for Determining the Arc Rating of Materials for Clothing.

### Test samples

The test material was received on June 29, 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  $E_i$  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](http://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=16 cal/cm<sup>2</sup>**

Customer	XM Textiles
Material design	9.4 oz/yd <sup>2</sup> 320 g/m <sup>2</sup> Satin 4/1, 100% Cotton
Style	99C/1AS-320FR-S
Color	Navy
Actual Areal Density (AAD) as tested	9.59 oz/yd <sup>2</sup> 325 g/m <sup>2</sup>

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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Report # K-418406-1207P06

## Test Report

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



KINECTRICS  
ISO 9001-2008

Samples Received:  
Jun 29, 2012

Samples Tested:  
Jul 20, 2012

### Tested for

Hugh Hoagland  
ArcWear.com  
502-333-0510  
arctestng@arcwear.com

### Contact information for item tested:

Wu Cong Jun  
XM Textiles  
+86 21 52362201  
vit@xinmeng.com.br

### Test item description

XM Textiles, Style 99C/1AS-320FR-S, 9.4 oz/yd<sup>2</sup> 320 g/m<sup>2</sup> Satin 4/1, 100% Cotton, Navy, AAD 9.59 oz/yd<sup>2</sup> 325 g/m<sup>2</sup>, ArcWear# 1207P06

### 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: 10 to 21 cal/cm<sup>2</sup>

**Arc Rating, ATPV = 16 Cal/cm<sup>2</sup>**  
**Heat Attenuation Factor, HAF = 84%**

### 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:

Joe Ogrodowczyk  
Station Operator  
High Current Laboratory  
Ph: 416-207-6000

Approved by:

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

Date:  
Jul 20, 2012

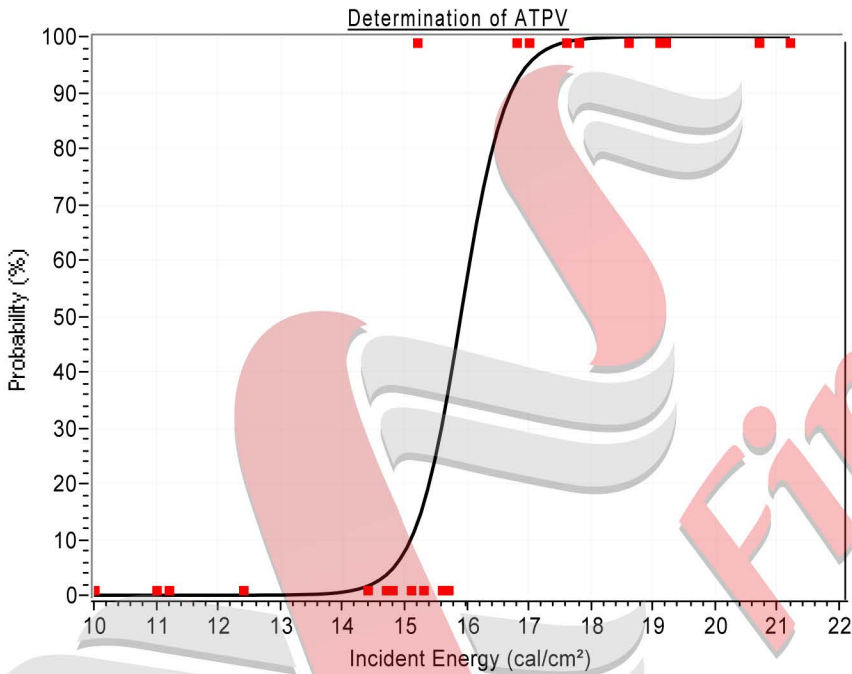
Determination of ATPV by performing logistic regression on panel burn response as indicated in Summary Table



Report #  
K-418406-1207P06

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

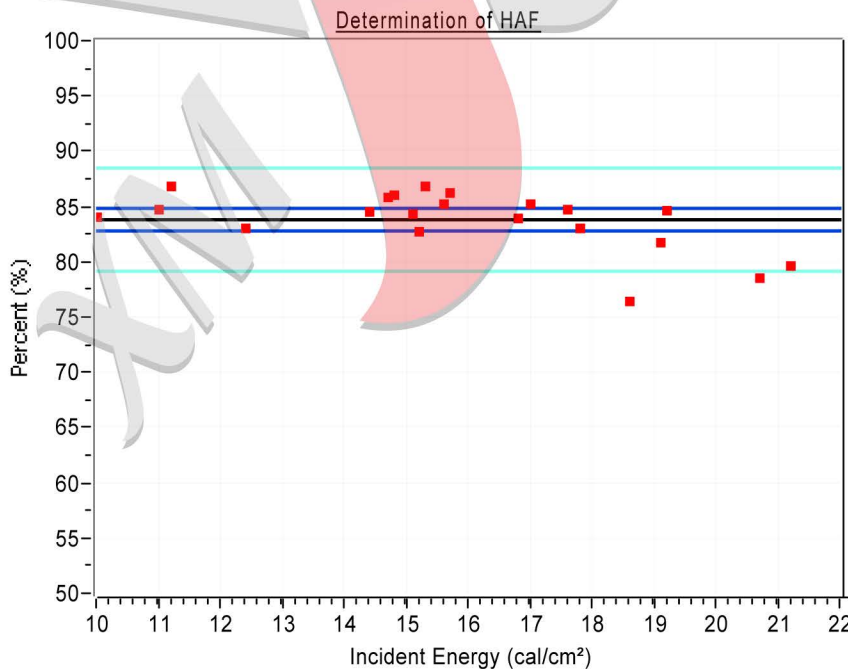
**Fabric** XM Textiles, Style 99C/1AS-320FR-S, 9.4 oz/yd<sup>2</sup> 320 g/m<sup>2</sup> Satin 4/1, 100% Cotton, Navy, AAD 9.59 oz/yd<sup>2</sup> 325 g/m<sup>2</sup>, ArcWear# 1207P06



**ATPV = 16 cal/cm<sup>2</sup>**

Probability	Ei
5%	14.8
10%	15.1
20%	15.4
30%	15.6
40%	15.8
50%	15.9
60%	16.1
70%	16.2
80%	16.4
90%	16.7

- # Pts = 21
- # Pts above Stoll = 10
- # Pts Break-Open = 1
- # Pts always >STOLL = 9
- # Pts always <STOLL = 8
- # Pts within 20% = 13
- # Pts in mix zone = 4



**HAF = 84 %**  
Confidence Intervals  
95% CI = 83.0 , 85.0

- Data pts
- Best Fit
- 95% CI
- 95% CI pts

Date:  
Jul 20, 2012

Report #  
K-418406-1207P06

### Summary Table

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



**Fabric Description:** XM Textiles, Style 99C/1AS-320FR-S, 9.4 oz/yd<sup>2</sup> 320 g/m<sup>2</sup> Satin 4/1, 100% Cotton, Navy, AAD 9.59 oz/yd<sup>2</sup> 325 g/m<sup>2</sup>, ArcWear# 1207P06

#### Summary of measured energy and observations

	Test #	Panel	Test Current A	Cycles of 60Hz	Ei Cal/cm <sup>2</sup>	SCD Cal/cm <sup>2</sup>	HAF %	Burn Y/N	Break Open Y/N	Ablation Y/N	After Flame sec.	Omit Y/N	Comment
1	K-418406-5438	A	8286	13.2	11.0	-0.41	84.8	No	-	-	-	No	
2	K-418406-5438	B	8286	13.2	10.0	-0.5	84.1	No	-	-	-	No	
3	K-418406-5438	C	8286	13.2	11.2	-0.5	86.9	No	-	-	-	No	
4	K-418406-5440	A	8128	25.2	21.2	2.27	79.7	Yes	-	-	-	No	
5	K-418406-5440	B	8128	25.2	18.6	2.3	76.5	Yes	-	-	-	No	
6	K-418406-5440	C	8128	25.2	20.7	2.5	78.6	Yes	Y	-	1.5	No	
7	K-418406-5441	A	8123	20.2	15.6	-0.06	85.3	No	-	-	-	No	
8	K-418406-5441	B	8123	20.2	14.8	-0.4	86.1	No	-	-	-	No	
9	K-418406-5441	C	8123	20.2	19.1	1.2	81.8	Yes	-	-	-	No	
10	K-418406-5442	A	8178	21.2	17.6	0.31	84.8	Yes	-	-	-	No	
11	K-418406-5442	B	8178	21.2	15.1	-0.1	84.4	No	-	-	-	No	
12	K-418406-5442	C	8178	21.2	19.2	0.6	84.7	Yes	-	-	-	No	
13	K-418406-5443	A	8123	19.2	15.7	-0.22	86.3	No	-	-	-	No	
14	K-418406-5443	B	8123	19.2	14.4	-0.2	84.6	No	-	-	-	No	
15	K-418406-5443	C	8123	19.2	16.8	0.3	84.0	Yes	-	-	-	No	
16	K-418406-5444	A	8190	20.7	17.0	0.03	85.3	Yes	-	-	-	No	
17	K-418406-5444	B	8190	20.7	15.2	0.2	82.8	Yes	-	-	-	No	
18	K-418406-5444	C	8190	20.7	17.8	0.7	83.1	Yes	-	-	-	No	
19	K-418406-5445	A	8184	18.2	14.7	-0.28	85.9	No	-	-	-	No	
20	K-418406-5445	B	8184	18.2	12.4	-0.3	83.1	No	-	-	-	No	
21	K-418406-5445	C	8184	18.2	15.3	-0.4	86.9	No	-	-	-	No	
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