



Arc Flash Protective Clothing



ARC FLASH PROTECTIVE CLOTHING

Introduction to Arc Flash Protection

Arc Flash

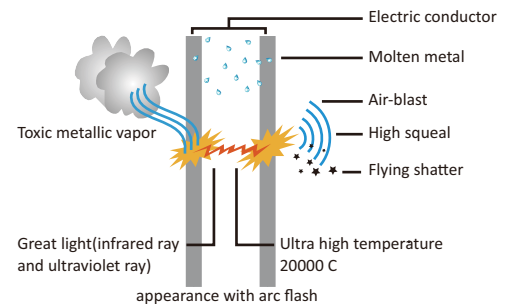
- An arc flash is the light and heat produced from an electric arc supplied with sufficient electrical energy to cause substantial damage, harm, fire, or injury.

Arc Flash Hazard

- Arc flash temperatures can reach or exceed 35,000 °F (19,400 °C) at the arc terminals. The massive energy released in the fault rapidly vaporizes the metal conductors involved, blasting molten metal and expanding plasma outward with extraordinary force.
- A typical arc flash incident can be inconsequential but could conceivably easily produce a more severe explosion. The result of the violent event can cause destruction of equipment involved, fire, and injury not only to an electrical worker but also to bystanders.

Arc Flash Accident

- According to NFPA report, 5-10 accidents happen in United States every day, and more than 2000 deaths in Arc Flash accident every year.
- Average annual electrical accidents in France are more than 125 cases. Arc flash accident accounted for 77%, permanent disability accounted for 21%, and deaths from 30 cases.



Important Safety Recommendations: NFPA70E

Hazard Level 1



Garment description:
FR Shirt and FR
pants or FR
Coverall.

ATPV: 4-8 cal/cm²

Hazard Level 2



Garment description:
Cotton underwear,
FR Shirt and FR
pants.

ATPV: 8-25 cal/cm²

Hazard Level 3



Garment description:
Cotton underwear,
FR shirt, pants or
cotton underwear
plus two FR
coveralls.

ATPV: 25-40 cal/cm²

Hazard Level 4



Garment description:
Cotton
underwear, FR
shirt, FR pants,
Multilayer arc
flash suit.

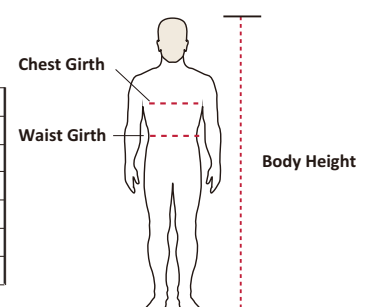
ATPV: >40 cal/cm²

cal/cm² ----- Thermal Units
1 cal ----- 1 gram of water temperature rises to 1°C .
1cal/cm² ----- Equivalent to put a finger on the energy released by
burning a cigarette for 1 second.
1~2cal/cm² energy can cause second degree burns.

ATPV (Arc Thermal Performance Value)
-----used to characterize arc flash protection capability
of fabrics. If the energy produced from electric arc in
accident is less than ATPV of the fabric, the garment
can protect workers from second and above burns.

Sizes: (cm)

	XS	S	M	L	XL	2XL	3XL
Body Height	153-158	158-163	163-168	168-173	173-178	178-183	183-188
Sleeve Length	56	57	58	59	60	61	62
Chest Girth	112	116	120	124	128	132	136
Shoulder Breadth	44	46	48	50	52	54	56
Outseam	98	100	102	104	106	108	110
Waist Girth	78	82	86	90	94	98	102



ARC FLASH PROTECTIVE CLOTHING

Selection Guide for Arc Flash Protective Garment

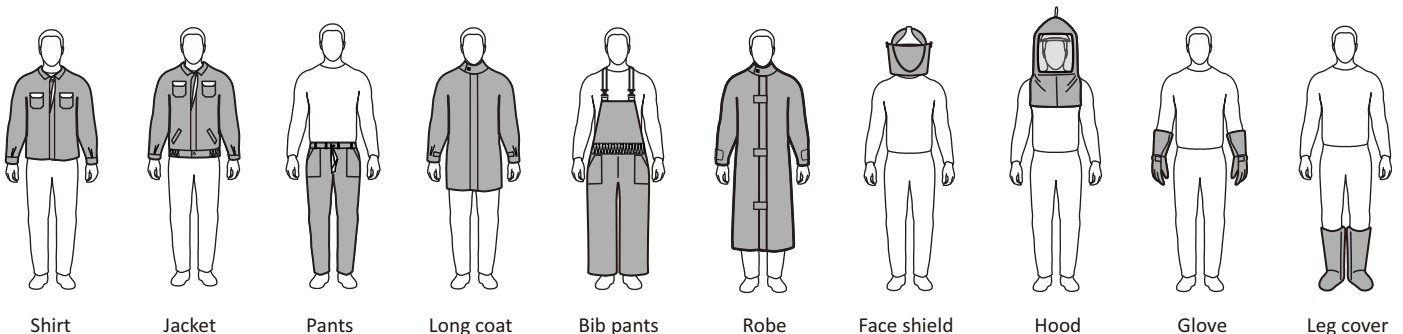
Lakeland Arc Flash Protective Garment is made of high standard of arc flash resistant fabric.

- **Lenzing Arc Stopper (LAS)** ---- LAS fabric is made of Lenzing FR fiber and aramid fiber. Lenzing FR fiber is produced from nature raw material, which offers protection against heat and flame in a variety of different applications with the features of comfort, soft, breathability and skin-friendliness. It meets the requirements of USDA and Oeko-Tex Standard 100.
- **Tecasafe Plus (TSP)**---- TSP fabric is made of 48% FR-modacrylic, 37% Lyocell and 15% aramid, which offers inherent protection with the features of comfort, softness and breathability. It's tested according to ASTM F 1959 and meets the requirements of NFPA 70E.
- **Indura Ultra Soft (IUS)** ---- IUS fabric is made of 88% FR cotton and 12% which has high arc protective performance with the features of softness and durability. It's tested according to ASTM F 1959 and meets the requirements of NFPA 70E.
- **DH**----- DH fabric is made of 48% Tencel, 40% modacrylic and 12% aramid. It's a dual-hazard fabric that protects against both flash fire and electric arc, which meets the requirements of NFPA 2112.

Hazard Level and Fabric Introduction

	CAT Level	Fabric Introduction	Fabric Description(OZ)	ATPV(cal/cm ²)
AR8	CAT2		7.7 oz LAS	8
AR8	CAT2		6.5 oz DH	8.9
AR8	CAT2		7.0 oz TSP	9
AR12	CAT2		9.0 oz IUS	12.4
AR16	CAT2		8.3 oz LAS	16
AR26	CAT3		6.5 oz DH+6.5 oz DH	26
AR33	CAT3		7.0 oz TSP+7.0 oz TSP	33.2
AR43	CAT4		7.0 oz TSP+7.0 oz TSP+7.0 oz TSP	43
AR48	CAT4		6.5 oz DH+6.5 oz DH+6.5 oz DH	48

Style:



Color: Navy  Royal 



ARC FLASH PROTECTIVE CLOTHING

Arc Flash Protective Face Shield



- Made from high polymer and manufactured by injection molding.
- With helmet bracket and buckle.
- 8cal/cm² without mandibular protection, 10cal/cm² and 12cal/cm² with mandibular protection.
- Ultra-wide field of view (shield size: 7.25"~10" x 18.5"~20", thickness: 0.06"~0.75").
- Up to 60% Visible Light Transmittance.
- Harmful ultraviolet radiation can be absorbed.
- With anti-fog coating.
- Adequate facial space for head movement and neck protection.

Product Code	ATPV	Description
ARC-SK2-8	8cal/cm ²	Without mandibular protection. With visor bracket and elastic belt.
ARC-FS-12	12cal/cm ²	With mandibular protection. With visor bracket and slot adaptor.
ARC-APS-12	12cal/cm ²	Highly Transparent Arc Flash Protection kit with small profile transparent chin protector & cap bracket for slotted & non-slotted caps.

Arc Flash Protective Hood



- Above HRC3.
- Arc shield and fabric are connected by flame retardant buckle. Easy to clean.
- With hanging ring on the top for easy storage.
- With helmet bracket and buckle, helmet can be assembled inside the hood.
- Anti-fog coating.
- Adequate space for head movement.
- Hood overlapped the coat for safety.
- ATPV value is on the lower left corner of front side.

Product Code	ATPV	Description
AR26HD	25cal/cm ²	Arc shield 50cal/cm ² , fabric 26cal/cm ²
AR33HD	33.2cal/cm ²	Arc shield 50cal/cm ² , fabric 33.2cal/cm ²
AR43HD	43cal/cm ²	Arc shield 50cal/cm ² , fabric 43cal/cm ²
AR48HD	48cal/cm ²	Arc shield 50cal/cm ² , fabric 48cal/cm ²

Arc Flash Protective Shirt



- Three protective levels: 8cal/cm², 8.9cal/cm², 9cal/cm².
- Soft, breathable and very comfortable.
- Two chest pockets, ATPV value above the left chest pocket.
- Resin buttons, curved hem.
- Suitable for spring and summer.

Product Code	ATPV	Description
AR8-S-LAS	8cal/cm ²	7.7 oz Lenzing Arc Stopper
AR8-S-DH	8.9cal/cm ²	6.5 oz DH
AR8-S-TSP	9cal/cm ²	7.0 oz Tecasafe plus

Arc Flash Protective Jacket



Different protective levels:

- 8cal/cm², 8.9cal/cm², 9cal/cm², 12.4cal/cm², 16cal/cm², 26cal/cm², 33.2 cal/cm².
- Sewed with Nomex.
- Double closure, covered button under outer closure.
- Hard resin zipper.
- Sandwich design on the front side.
- Two chest pockets.
- ATPV value above the left chest pocket.
- Two side pockets.
- Hem elastic design.
- Without arc induced metal accessories.

Product Code	ATPV	Description
AR8-J-LAS	8cal/cm ²	7.7 oz Lenzing Arc Stopper
AR8-J-DH	8.9cal/cm ²	6.5 oz DH
AR8-J-TSP	9cal/cm ²	7.0 oz Tecasafe plus
AR12-J-IUS	12.4cal/cm ²	9.0 oz Indura Ultra Soft
AR16-J-LAS	16cal/cm ²	8.3 oz Lenzing Arc Stopper
AR26-J-DH	26cal/cm ²	2 layers 6.5 oz DH
AR33-J-TSP	33.2cal/cm ²	2 layers 7.0 oz Tecasafe plus

Arc Flash Protective Pants



Different protective levels:

- 8cal/cm², 8.9cal/cm², 9cal/cm², 12.4cal/cm², 16cal/cm², 26cal/cm², 33.2 cal/cm².
- Sewed with Nomex.
- Two side pockets, two back pockets, ATPV value on the right back pocket.
- Used in conjunction with Arc Flash Protective Jacket.
- Without arc induced metal accessories.

Product Code	ATPV	Description
AR8-P-LAS	8cal/cm ²	7.7 oz Lenzing Arc Stopper
AR8-P-DH	8.9cal/cm ²	6.5 oz DH
AR8-P-TSP	9cal/cm ²	7.0 oz Tecasafe plus
AR12-P-IUS	12.4cal/cm ²	9.0 oz Indura Ultra Soft
AR16-P-LAS	16cal/cm ²	8.3 oz Lenzing Arc Stopper
AR26-P-DH	26cal/cm ²	2 layers 6.5 oz DH
AR33-P-TSP	33.2cal/cm ²	2 layers 7.0 oz Tecasafe plus

ARC FLASH PROTECTIVE CLOTHING

Arc Flash Protective Robe



Different protective levels:

- 12.4cal/cm², 16cal/cm², 26cal/cm², 33.2cal/cm², 43cal/cm², 48cal/cm² . • 5cm wide FR velcro front closure with 3 cross Velcro for reinforcement. • Stand-up collar for better protection. • Velcro closure cuff of sleeves. • Can be used with our arc protective hood, gloves and boot covers. • No metal accessories which may induce arc flash accident.

Product Code	ATPV	Description
AR12-R-IUS	12.4cal/cm ²	9.0 oz Indura Ultra Soft
AR16-R-LAS	16cal/cm ²	8.3 oz Lenzing Arc Stopper
AR26-R-DH	26cal/cm ²	2 layers 6.5 oz DH
AR33-R-TSP	33.2cal/cm ²	2 layers 7.0 oz Tecasafe plus
AR43-R-TSP	43cal/cm ²	3 layers 7.0 oz Tecasafe plus
AR48-R-DH	48cal/cm ²	3 layers 6.5 oz DH

Arc Flash Protective Long Coat and Bib Pants

Long Coat

Different protective levels:

- 26cal/cm², 33.2cal/cm², 43cal/cm², 48cal/cm² . • 32" length for full coverage. • Stand-up collar for better protection. • FR velcro front closure. • Raglan sleeves design offers superior freedom of movement. • No metal accessories which may induce arc flash accident.

Bib Pants

Different protective levels:

- 26cal/cm², 33.2cal/cm², 43cal/cm², 48cal/cm² . • Bib style for comfort wearing. • Adjustable loop and buckles on bib strap. • Tear drop style swing pockets hold plenty items. • Velcro leg openings with gussets make for easy on and off. • No metal accessories which may induce arc flash accident.



Long Coat

Bib Pants

Product Code		ATPV	Description
Long Coat	Bib Pants		
AR26SC	AR26BO	26cal/cm ²	2 layers 6.5 oz DH
AR33SC	AR33BO	33.2cal/cm ²	2 layers 7.0 oz Tecasafe plus
AR43SC	AR43BO	43cal/cm ²	3 layers 7.0 oz Tecasafe plus
AR48SC	AR48BO	48cal/cm ²	3 layers 6.5 oz DH

Arc Flash Protective Gloves and Leg covers

- 40cm length gloves for full coverage with sleeves. • Leg covers can be used with boots or insulated shoes. • Gloves and Leg covers can be used with coat and pants.



Gloves

Leg covers

Product Code		ATPV	Description
Gloves	Leg covers		
AR16-G-LAS	AR16-C-LAS	16cal/cm ²	8.3 oz Lenzing Arc Stopper
AR43-G-TSP	AR43-C-TSP	43cal/cm ²	3 layers 7.0 oz Tecasafe plus
AR48-G-DH	AR48-C-DH	48cal/cm ²	3 layers 6.5 oz DH

Color:

- 16cal: Navy Blue ●
 43cal: Navy Blue ●
 48cal: Navy Blue, Royal Blue ● ●

ARC FLASH PROTECTIVE CLOTHING

Lakeland can supply different grades of arc flash protective suits made of different fabric, which can meet the requirements of arc flash protection in different workplaces.

Fabric Recommendation

- DH: inherently FR fabric. Soft and comfortable. Excellent protection against arc flash. Low cost.
- Tecasafe Plus(TSP): inherently FR fabric. Excellent protection against arc flash.

CAT and ATPV

CAT3: 26cal/cm² (2 layers 6.5oz DH fabric) 33cal/cm² (2 layers 7.0oz TSP)
 CAT4: 43cal/cm² (3 layers 7.0oz TSP) 48cal/cm² (3 layers 6.5oz DH fabric)

Arc Flash Protective Hood

- Arc shield and fabric are connected by flame retardant buckle.
- Easy to clean. With hanging ring on the top for easy storage.
- With helmet bracket and buckle, helmet can be assembled inside the hood.
- Anti-fog coating.
- Adequate space for head movement.
- Hood overlapped the coat for safety.
- ATPV values on the lower left corner of front side.



Long Coat

- 32" length for full coverage. Stand up collar for better protection.
- FR Velcro front closure.
- Raglan sleeve design offers superior freedom of movement.
- No metal accessories which may induct arc flash accident.



Bib Pants

- Bib style for comfort wearing.
- Adjustable loop and buckles on bib strap.
- Tear drop style swing pockets hold plenty items.
- Velcro leg openings with gussets make for easy on and off.
- No metal accessories which may induct arc flash accident.



Arc Flash Protective Gloves

- 40cm length gloves for full coverage with sleeves.
- Can be used with coat.



Arc Flash Protective Leg covers

- Leg covers can be used with boots or insulated shoes.
- Can be used with pants.



Carry Bag

Arc flash protective suit can be put into the carry bag.



ArcWear

3018 Eastpoint Parkway, Louisville, KY 40223. 502-333-0510, www.ArcWear.com

Sampling and Specimen Preparation - Arc Testing

Date: July 6, 2015

Report #: 1506P18-SP

Client: Springfield LLC
320 Wamsutta Dr
Lyman, SC 29365
864-949-2295

At request of: Quentin Bonner

Sample Identified By Client As:

Springfield LLC, 3 Layers of Style Springfield DH TW w/o 628332-1, 6.5 oz/yd² 220 g/m² Twill, 48% Tencel 40% Modacrylic 12% Aramid, 10119Q Navy Premier, AAD 7.1 oz/yd² 241 g/m², ArcWear# 1506P18

Sample received on: June 3, 2015

Test Procedure:

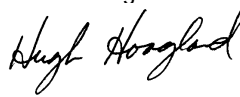
The samples were laundered 3 times in accordance with Section 8.2.1 of ASTM F1959/F1959M-14 *Standard Test Method for Determining the Arc Rating of Materials for Clothing* and AATCC Test Method 135, Procedure 3, IV, Aiii. The post-laundered aerial density was determined and test specimens were cut, assembled, and prepared for testing in accordance with Section 8 of ASTM F1959/F1959M-14 *Standard Test Method for Determining the Arc Rating of Materials for Clothing*. The total weight per load of the specimens and ballast (if used) was 8 lbs.

This is a design test which is required as a part of the compliance with ASTM F1506-10a. Other tests and ongoing testing are required for full compliance. ArcWear recommends asking for reports of ongoing testing from the manufacturer of the garment or fabric. Of special importance is vertical flammability but other test requirements may also be desired as proof that the product meets the full performance specification.

The results of testing to ASTM F1959/F1959M-14* have been documented in Kinectrics Report Number K-418806-1506P18. Based on this test report, this sample received a final performance value of

Arc Rating: ATPV = 48 cal/cm²

Signed for the Company by:

 Digitally signed by Hugh
Hoagland
Date: 2015.07.06 16:14:43
-04'00'

Hugh Hoagland
President



TESTING CERT #3570.01

*ASTM F1959/F1959M-14 is performed at Kinectrics and is on their scope of accreditation (SCC Accredited Lab # 610). ASTM F1959 is not on ArcWear's scope of accreditation.