

**ARCFLASHWEAR**

AUSTRALIAN MANUFACTURED

**PR<sup>97</sup>**<sup>®</sup>

NATURALLY, SUPERIOR PROTECTION

PRODUCT GUIDE

## INTRODUCTION

PR97® is the result of nearly three decades of intensive research and development resulting in a highly engineered FR textile now used around the world in the harshest working environments. PR97® has set new standards in terms of protection and comfort. PR97® is recognised throughout the world as a leading textile for secondary protection in the molten metal industry due to its superior protective properties: uncompromising safety, natural comfort, cost effectiveness and proven performance. Designed specifically as a very high performance hot metal safety textile, PR97® also offers workers protection against other thermal related hazards.



PR97® is comfortable from new and laundering and wear enhance its comfort. The protective properties of PR97® are inherent and cannot be laundered out.

The slightly higher initial costs of garments constructed from PR97® are more than offset by extended lifespans attributable to the fact that the fabric retains its safety features over its entire life span. Garments constructed from PR97® are truly multi-functional and can be used from smelter pot-rooms to maintenance areas to boardrooms.

The dominant fibre in PR97® is Wool, blended with Lenzing™ FR (flame retardant viscose). Wool is one of the oldest known natural fibres and is constantly in demand for its unique natural properties including comfort and inherent fire resistance, properties that science cannot yet replicate. The ability of Wool to absorb 30% of its weight in moisture vapour gives it superior comfort, insulation, anti-static properties and flame resistance. While Wool can absorb moisture, it also repels liquids. Wool has a natural elasticity greater than any other natural fibre, which makes it comfortable to wear as it fits the shape of the body.

In the aluminium industry, blended fabrics such as PR97® are in high demand as they have proven their worth in this complex application. Lenzing™ FR has a special ability that makes molten aluminium and cryolite shed from the fabric. Another advantage is that garments can be made lighter and more comfortable yet offer greater protection when Lenzing™ FR is incorporated into the construction.

Lenzing™ FR is widely employed as the protective fabric of choice throughout the world and has maintained its position as the benchmark standard for the protective textile across smelter environments.

The multi-functionality of PPE constructed from PR97® offers molten metal operatives a complete solution system across the smelter site. PR97® is now endorsed by some of the world's largest smelter corporations as the textile of choice for molten aluminium and cryolite protection and the related thermal related hazards of heat and flame, radiant and convective heat and electric arc.

The video link (1:30) below illustrates the excellent performance of PR97® Ultra™ and PR97® vs FRT Cotton when varying amounts of molten aluminium and molten iron are poured directly onto fabric specimens. The molten aluminium test pours are 200 and 350 grams and the molten iron test pour is 200 grams. The demonstrations illustrate the burn or non-burn rate next to the skin.

<https://youtu.be/9kvYFjNmC9k>

## PR97® FEATURES

### UNCOMPROMISING SAFETY

- Inherently flame retardant with protection that cannot be laundered out over the life of the garment.
- Provides unparalleled splash protection against molten metal, cryolite, iron, steel, copper, magnesium and nickel.
- Provides additional protection against electric arc, heat and flame and radiant and convective heat.

### NATURALLY COMFORTABLE

- The Wool and Lenzing™ FR blend effectively allows for perspiration and vapour to wick or evaporate away from the skin, facilitating the cooling process.
- The fabric is completely breathable, allowing air to circulate without compromising the integral safety.
- PR97® Ultra™ fabric provides additional protection at lighter weights for improved comfort.

### THE COST EFFECTIVE SAFETY SOLUTION

- PR97® provides protection for multifunctional applications.
- PR97® garments can be home or commercially laundered or dry cleaned allowing for a flexible garment/inventory program.
- Inherent protection allows for long garment life cycle.

### PROVEN PERFORMANCE

- PR97® is the result of over 25 years of research and development resulting in a highly engineered FR textile now used around the world in the harshest working environments.
- In the molten metal industry, blended fabrics such as PR97® are in high demand as they have proven their worth in this complex application.
- PR97® is recognised throughout the world as a leading textile for secondary protection in the molten metal industry due to its superior protective properties.

## PR97® FABRIC SELECTION

### PR97®

PR97® 265gsm/7.8oz  
PR97® 320gsm/9.3oz  
PR97® 380gsm/11.2oz

Effectively sheds a range of molten metals.  
  
Inherently flame retardant.  
Made from natural fibres.  
Meets ISO 11612 performance requirements.

### PR97 Ultra™

PR97 Ultra™ 220gsm/6.5oz  
PR97 Ultra™ 250gsm/7.4oz  
PR97 Ultra™ 290gsm/8.6oz  
PR97 Ultra™ 320gsm/9.3oz

Lighter weight with the same level of metal splash protection.  
More comfortable protection.  
Advanced performance.  
Hot climate comfort.

## PR97® and PR97 Ultra™ Composition

### NATURAL WOOL FIBRE



**+** **LENZING™ FR**  
Lenzing™ FR is a trademark of Lenzing AG.

### WOOL

Wool is one of the oldest known natural fibres and is constantly in demand for its unique natural properties including comfort and inherent flame resistance, properties that science cannot yet replicate. The ability of Wool to absorb 30% of its weight in moisture vapour gives it superior comfort, insulation, anti-static properties and flame resistance. While Wool can absorb moisture, it also repels liquids. Wool has a natural elasticity greater than any other natural fibre, which makes it comfortable to wear as it fits the shape of the body.

### LENZING™ FR

Lenzing™ FR is a sustainable, inherently flame retardant cellulosic fibre made using the modal fibre production process. Lenzing™ FR fibres correspond to the definition of inherently difficult and flame-retardant fibres as defined by the European Man-Made Fibres Association, CIRFS. Lenzing™ FR and modal fibres contribute to clothing fabrics offering natural comfort in a wide variety of working environments. Their botanic origin, environmentally responsible production processes and biodegradability reflect Lenzing AG's commitment to sustainability, while the unique physical properties of each fibre cater to the diverse needs of different occupations.

## ISO 9185 PROTECTIVE CLOTHING: ASSESSMENT OF RESISTANCE OF MATERIALS TO MOLTEN METAL SPLASH

The data shown in the following sections apply ONLY to PR97® fabric. It should NOT be read that finished PR97® garments, when tested, will report the same results. It is the end user's responsibility to determine the suitability of a fabric for a particular purpose.

Protection against Molten Metal Splash single layer and multilayer fabrics are tested by pouring measured quantities of molten metal at a specific angle onto a test specimen. The damage is assessed by placing a PVC film (having similar qualities to human skin) underneath the test specimen and noting damage after pouring. Any adherence of metal to the specimen is noted. Fabrics are classified according to the minimum quantity of molten metal required to cause damage to the PVC film.



Fabric	Fabric Weight (gm)	Molten Aluminium (gm)	Molten Iron (gm)
PR97® 265	265	D1	E1
PR97® 320	320	D3	E3
PR97® 380	380	D3	E3
Molten Cryolite – PR97® 265 (75gm), PR97® 320 (85gm), PR97® 380 (> 100 gm)			

Fabric	Fabric Weight (gm)	Molten Aluminium (gm)	Molten Iron (gm)
PR97 Ultra™ 220	220	D1	E1
PR97 Ultra™ 250	250	D2	E1
PR97 Ultra™ 290	290	D3	E3
PR97 Ultra™ 320	320	D3	E3
Molten Cryolite – PR97 Ultra™ 290 (> 100 gm)			

Classification (ISO 11612)	
Molten Aluminium Splash	Al, gm
D1	100 - 200
D2	200 - 350
D3	350 +

Classification (ISO 11612)	
Molten Iron Splash	Fe, gm
E1	60 - 120
E2	120 - 200
E3	200 +

## ISO 15025 PROTECTIVE CLOTHING: PROTECTION AGAINST FLAME – METHOD OF TEST FOR LIMITED FLAME SPREAD

A single layer or multilayer fabric assembly is tested by surface ignition (A1) and/or edge ignition (A2). Limited spread of flame of the specimen is determined when a calibrated flame is applied to the surface (A1) or hemmed edge (A2) of the vertically oriented specimen for 10 seconds. After flame (persistence of flaming material after the ignition source is removed), after flame time (the time duration for which the material continues to flame after the removal of flame) and afterglow (persistence of glowing combustion) are recorded. Molten debris and formation of a hole, if at all, are also reported for classification of the material.



A criterion used to determine the flame resistance provided by FR textiles is the reported Limiting Oxygen Index (LOI) of the fibre(s) used in the textile's composition. This index is the minimum concentration of oxygen, expressed as a percentage, which will support combustion of the material, noting that the oxygen concentration of atmospheric air is 20.95%. PR97® is a blend of Wool and Lenzing™ FR and the reported LOI of each fibre is:

- Wool 25 to 26
- Lenzing™ FR 28
- Result: Wool and Lenzing™ FR do not burn or melt, which means human skin is much safer when next to these fibres.

An LOI of 25 for Wool and 28 for Lenzing™ FR means that a minimum concentration of 25% and 28% oxygen would be required to maintain the combustion of a Wool and Lenzing™ FR sample when each are exposed to a flame in a vertical plane. Since atmospheric air contains 20.95% oxygen, any textile with a greater LOI can be considered as non-flammable. This property prevents combustion and therefore the propagation of fire to a wider environment.

Classification ISO 11612	
Limited Flame Spread – Face Ignition ISO 15025 Procedure A Pass: A1	Limited Flame Spread – Edge Ignition ISO 15025 Procedure B Pass: A2

No flaming to edge  
No hole formation  
No flaming debris  
Mean after flame ≤ 2 seconds  
Mean afterglow ≤ 2 seconds

No flaming to edge  
No flaming debris  
Mean after flame ≤ 2 seconds  
Mean afterglow ≤ 2 seconds

## ISO 6942 PROTECTIVE CLOTHING: PROTECTION AGAINST HEAT AND FLAME – EVALUATION OF MATERIALS AND MATERIAL ASSEMBLIES WHEN EXPOSED TO A SOURCE OF RADIANT HEAT (METHOD B)

This test is carried out on single and multilayer fabrics intended for protection against heat. A heat source for radiant heat is applied to the face of the fabric specimen. A thermal sensor is mounted behind and in contact with the specimen. The rise in temperature (as recorded by the sensor) when a radiant heat source is applied at a heat flux density of  $20 \text{ kW/m}^2$  and the time taken for a temperature rise of  $24^\circ\text{C}$  in the sensor is recorded and expressed as Radiant Heat Transfer Index (RHTI24).



This rise in temperature of  $24^\circ\text{C}$  is the time it takes for second degree burns to occur and it is recorded in seconds for classification.

Classification (ISO 1112)

Radiant Heat ISO 6942 Method B @ $20 \text{ kW/m}^2$

Performance: C1

Level RHTI24, seconds

C1	7 - 20
C2	20 - 50
C3	50 - 95
C4	95 +

## ISO 9151 PROTECTIVE CLOTHING (CONVECTIVE HEAT): PROTECTION AGAINST HEAT AND FLAME – DETERMINATION OF HEAT TRANSMISSION ON EXPOSURE TO FLAME

Heat transmission through clothing largely depends upon the thickness, types of fibres used and fabric construction. Air gaps between layers (in the case of multilayer garments) can also affect heat transmission. This test determines the transmission of heat through a fabric when it is exposed to flames. A horizontally oriented specimen is subjected to a gas flame from a gas burner beneath it. The heat passing through the fabric is measured by means of a thermal sensor. The time taken for the thermal sensor to rise in temperature by 24°C is recorded in seconds for classification. It is expressed as Heat Transfer Index (HTI<sub>24</sub>).



Classification (ISO 11612)  
Convective Heat ISO 9151  
Performance: B1

Level HTI<sub>24</sub>, seconds

B1	4 - 10
B2	10 - 20
B3	20 +

## NFPA 70E STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE (ASTM F1959)

An electric arc flash hazard is a dangerous condition associated with the possible release of energy caused by an electric arc. This hazard may exist when energised electrical conductors or circuit parts are exposed or when they are within equipment in a guarded or enclosed condition and a person is interacting with the equipment in such a manner that could cause an electric arc.



In addition to the risk of electrocution and physical shock, an electric arc flash hazard poses a significant threat to human life through its thermal effect and after flame effect. The thermal effect is measured by attributing a value to fabrics that describe their performance to exposure to an electrical arc discharge.

The Arc Rating is expressed in calories per centimetre squared ( $\text{cal}/\text{cm}^2$ ) and is derived from the Arc Thermal Performance Value (ATPV) or Energy of Break-open Threshold ( $E_{\text{BOT}}$ ) (should a fabric system exhibit a break-open response below the ATPV value). ATPV is described as the incident energy of an electric arc flash that results in sufficient heat transfer through the fabric to cause the onset of a second degree burn. Break-open is evidenced by the formation of one or more holes in the innermost layer of the FR fabric that would allow flame to pass through the fabric. PR97® and PR97® Ultra™ garments provide protection against electric arc flash, either as single or multilayers, by reducing the thermal effect and preventing after flame.

Classification NFPA 70E

PPE Category (Hazard Risk Category)

Calories/Centimetre Squared ( $\text{cal}/\text{cm}^2$ )

0	0 - 4
1	4 - 8
2	8 - 25
3	25 - 40
4	40 +



**National Fire Protection Association**  
The authority on fire, electrical, and building safety

## ARCFLASHWEAR PR97® PREMIUM FR WORKWEAR RANGE

PR97® is an internationally recognised brand, renowned for its superior protective and comfort benefits in protective clothing for the molten metals industry. Developed in conjunction with an internationally recognised research company and launched onto the market in 1997, PR97® was positioned then and still remains the world's best secondary protective clothing fabric for the aluminium smelting and hot metals industry.

**PR97**<sup>®</sup>  
NATURALLY, SUPERIOR PROTECTION

**PR97®/PR97 Ultra™ FR SHIRT 220/250/265/290/320gsm**  
Molten Metal Splash, Flame Resistance, Convective and Radiant  
Heat and PPE CAT 1  
MOQ's Apply



**PR97®/ PR97 Ultra™ FR TROUSER 265/290/320gsm**  
Molten Metal Splash, Flame Resistance, Convective and Radiant  
Heat and PPE CAT 1  
MOQ's Apply



**PR97® FR SMELTER COAT 380gsm**  
Molten Metal Splash, Flame Resistance, Convective and Radiant  
Heat and PPE CAT 1  
Made to Order Only - MOQ's Apply



**PR97® FR SMELTER HOOD 320gsm**  
Molten Metal Splash, Flame Resistance, Convective and Radiant  
Heat and PPE CAT 1  
Made to Order Only - MOQ's Apply



## PR97® CARE AND MAINTENANCE

PR97® garments can be home-washed, commercially laundered or dry-cleaned. They can be effectively repaired or mended using patches and other techniques. However to maximise the service life of PR97® garments and ensure the protective properties of PR97® remain intact, it is important to follow these recommended care guidelines.

### DETERGENT

- Use a pH-neutral detergent or one approved for use with Wool based fabrics by the manufacturer.
- Do not use excessive amounts of detergent and follow the manufacturer's guidelines.
- Never use soaps, bleaches or fabric softeners of any kind.

### WASH

- Always wash PR97® garments in cold to warm water only; a maximum of 40° C is recommended.
- Separate excessively soiled garments from cleaner garments.
- Do not wash PR97® garments with other types of garments.
- Excessively soiled garments should be pre-soaked in cold to warm water using a pH-neutral detergent prior to washing.
- Minimise the number of garments per load, but maximise water levels.
- Use a gentle wash cycle setting and minimise agitation during rinse and wash cycles.

### DRY

- Never dry PR97® garments on hot temperature settings; a maximum of 60° C is recommended.
- Do not tumble dry garments for long periods and do not over dry garments in the drying process, as this could result in excessive shrinkage.
- Do not dry PR97® garments with other types of garments.
- For best results tunnel drying or line drying in the shade is recommended.

### MENDING

- Always repair holes or damage to garments prior to washing.
- If patching over holes, always ensure patches seal tightly to the garment surface.
- There should be no lifting of patches, which could cause catch points for metal splash.

### NOTE

This information is provided as a recommended guide only. In all instances end users must firstly satisfy themselves that these guidelines are suitable for their intended application and monitor best care practice throughout a PR97® garment's service life.

### BEST TO:



Cold/Warm  
Water  
Max. Temp.



No Bleach  
Softener or  
Soap



Tumble Dry  
Max. 60° Avoid  
Excessive Time



Tunnel Dry/  
Line Dry  
in Shade



Iron  
Low Setting



Professional  
Dry Cleaning



Wash  
Separately

MORE INFORMATION

# ARCFLASHWEAR

ArcFlashWear is the Australian Distributor of NASCO ArcWear™, PetroWear™ and Envisage™ Protective Outerwear Solutions and an end user supplier of premium PR97® and UltraSoft® FR Workwear.

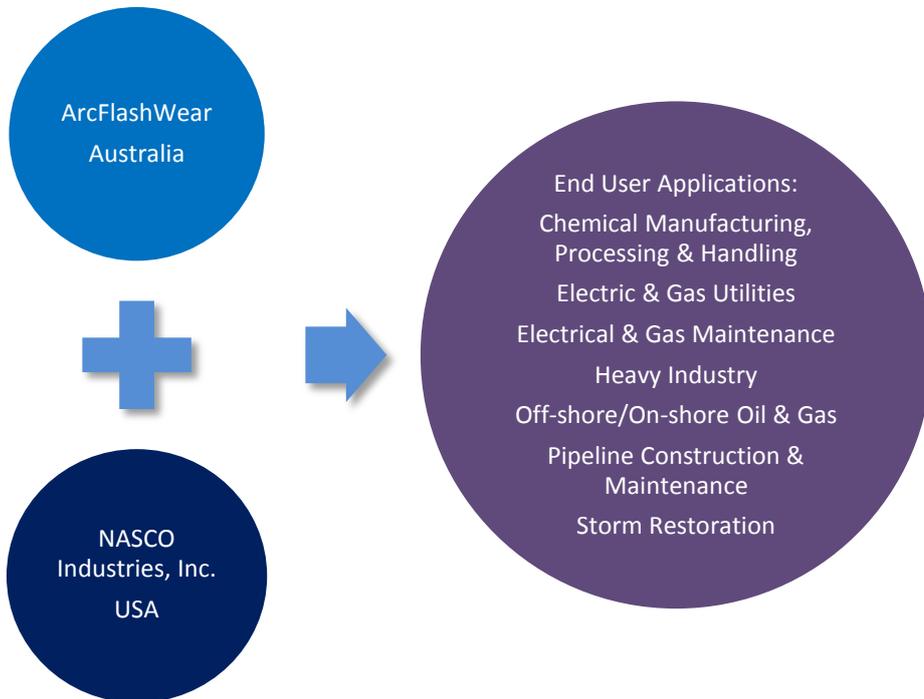
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**ARCFLASHWEAR**

INCORPORATED IN AUSTRALIA

**NASCO**

INCORPORATED IN USA



DuPont™  
**Nomex®**

**3M** Scotchlite™  
Reflective Material

**POLARTEC®**

**Thinsulate**  
INSULATION  
FR