Inherently Flame Retardant and Resistant Fibres

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# IFRF - Inherently Flame Retardant and Resistant Fibres

Worldwide research into the cause of fires shows that unsuitable products can contribute considerably towards a fire spreading. Therefore, regulations for fire safety and fire safety standards are applied to protect people against fire.




In the textile industry (see also ISO 4880:1997), a distinction is made between **flame retardant** (FR) and **flame resistant** (FR) fibres. Both of these provide an ideal route for producing FR fabrics. To ensure that the phrase "**inherently FR**" is only used to describe fibres which genuinely have their FR performance built in, a definition of an inherently FR fibre is needed.

The purpose of this document is to present the definition developed by CIRFS; European man-made Fibres association and propose it is adopted as the one definition of inherently FR fibres and to recognise the advantages of inherent FR properties.

Flame retardant or flame resistant fabrics are used to improve personal safety and to reduce the risk of fire and its consequences of heat and flame. Children's nightwear is safer when it does not ignite. Firefighters, soldiers and law enforcement personnel rely on flame resistant fabrics to protect them from the hazards they face. Upholstered furniture, carpets, curtains and soft furnishings are safer when they do not burn easily.

Fabrics for all of these applications can be produced by treating a conventional fabric with flame retardant chemicals. While this can be effective in preventing the fabric from igniting or reducing the rate of burning, there are some disadvantages.

A finish applied to a fabric may affect the handle, texture and moisture management properties of the fabric and hence the comfort of the user. Finishes can be removed from a fabric by washing or abrasion. Applied chemicals may adversely affect human skin by irritation or sensitization and can create an environmental issue.



## Features and Use

The inherent FR performance can be due to:

- the intrinsic properties of the polymer used to make the fibre,
- incorporation of an additive during extrusion, or
- chemical polymer modification during polymerisation, or production of the fibre.

Fibres made by any of these routes can be used either on their own or in blends with other fibres to produce FR fabrics which can:

- Be designed to meet the key flammability standards used in many applications including children's nightwear, protective clothing, curtains and furnishings and transport
- Maintain their FR properties throughout the life of the fabric
- Give excellent comfort for the user
- Be safe in contact with the skin
- Be tough enough for the most demanding of applications
- Do not require the use of expensive or possibly toxic chemicals in fabric finishing
- Minimize environmental impact

An ideal way to produce a flame retardant or flame resistant fabric is to use a fibre with built in FR properties which has been designed to produce fabrics which will not ignite or which will only burn at a greatly reduced rate.

**Fibres that can do this and which retain their FR properties throughout their life are called inherently FR fibres.**





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# Definition and explanatory comment

## "Inherently flame retardant or flame resistant fibres"

**Inherently flame retardant** or **inherently flame resistant fibres** have a low flammability, which is derived from the essential characteristics of the fibre or polymer. This is demonstrated by fabrics made from the fibre meeting the requirements of the appropriate standards for the intended applications.

The inherently flame retardant or inherently flame resistant properties can be reached by:

- The intrinsic polymer properties
- Additives incorporated into the polymer during extrusion, prior to the spinning process that forms the fibre
- Chemical polymer modification during polymerisation, prior to the spinning process that forms the fibre

The inherently flame retardant or inherently flame resistant property is permanent and lasts for the complete life cycle of the product made from the fibre. The process of additional flame retardant or flame resistant after-treatment can therefore be avoided for fabrics and garments made of inherently flame retardant or resistant fibres.



**Notes**

1. A flame retardant or flame resistant fibre is a fibre which is capable of being used alone or in blend with other fibres to make a fabric or other article which is flame retardant or flame resistant and complies with the flammability standards for the intended application as a result of the properties of the fibre.

2. Inherently flame retardant fibres are those which can be used to produce fabrics that have greatly reduced or zero rate of flame spread. Such fabrics would be intended for use as, for example, curtains and other home furnishings, children's nightwear and workwear.

3. Inherently flame resistant fibres are those which can be used to produce fabrics which provide protection from flame and heat. Such fabrics would be intended for use as, for example, protective clothing, firefighters uniforms, upholstery fabrics and welding screens.

4. Most relevant standards specify laundering and/or other care procedures in the section on instructions for use which are used to ensure the permanence of the flame retardance or flame resistance. Compliance with the requirements of the standard for the intended application is adequate evidence that the flame retardant or flame resistant property lasts for the complete life cycle.

5. Fibres which are given flame retardant or flame resistant properties by after-treatment of a fabric can not be described as inherently flame retardant or inherently flame resistant. Treated fabrics are less likely to perform to the required standard, are prone to losing their finish by washing or abrasion and may be more affected by exposure to heat and light than fabrics made using inherently flame retardant or flame resistant fibres.

6. Methods exist for the safe disposal or recycling of fabrics made from inherently flame retardant or flame resistant fibres at the end of their life. The methods vary according to the specific fibre used. Full details of the approved methods can be obtained from the fibre manufacturer

Images supplied courtesy of Trevira.

# Companies Manufacturing IFRF fibres and their products










































# Sources of information about inherently FR fibres

| COMPANY | WEBSITE | PRODUCT |
|---|---|---|
| **AKSA** | www.aksa.com | Armora |
| **DuPont** | www.dupont.com | Nomex ® and Kevlar ® |
| **Glanzstoff** | www.glanzstoff.com | Viscord®FR |
| **Korteks** | www.korteks.com.tr | TAC ® Flame Retardant |
| **Kelheim Fibres** | www.kelheim-fibres.com | Danufil ®BF |
| **Lenzing** | www.lenzing.com | Lenzing FR ® |
| **Radici** | www.radicigroup.com | Radyarn ® FR and Starlight ® FR |
| **Serge Ferrari Tersuisse SA** | www.tersuisse.com | Tersuisse® FR yarn |
| **Sinterama** | www.sinterama.com | Newlife FR |
| **SGL Carbon** | www.sglgroup.com / www.fisipe.pt | PANOX ® |
| **Teijin Aramid** | www.teijinaramid.com | Teijinconex ® and Twaron ® |
| **Trevira** | www.trevira.com | Trevira ® CS |
| **Wellman International** | www.wellman-intl.com | Wellcare ® FR |

# Key Standards for FR fabrics

The standards listed below are indicative of the many that are in use. The list is not exhaustive but aims to show the range of standards where the performance of inherently FR fibres will be of benefit. These standards, as appropriate for the intended application, can be used to verify the flammability performance of a fabric made from an inherently FR fibre.

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## Nightwear for Children

BS 5722 Children's nightwear
CFR Title 16, parts 1615 & 1616

## Upholstery and soft furnishings

| | |
|---|---|
| CEN and ISO | EN 1021-1 and -2 Upholstered Furniture |
| | EN 13773 Curtains & Drapes |
| | EN 13501-1 Building Materials |
| | EN ISO 12952-1 and -2 Textiles for Bedding |
| Germany | DIN 4102 Building Materials |
| United Kingdom | BS 5852 Upholstered Furniture |
| | BS 7176 Upholstered Furniture |
| France | NF P 92-503 to 507 Upholstery |
| Italy | UNI VF 8456 / 8457 and 9174/9175 Curtains & Drapes/Hometextiles |
| USA | USA California TB 117-2013, 133 upholstery |
| | NFPA 701 Curtains & Drapes |
| | NFPA 260 Upholstery |
| | California TB 129 Mattresses for use in public occupancies |
| Russia | Gost 30402 Building Materials |
| | Gost 50810 Decorative Textiles |
| China | GB 20 286 FR products and subassemblies |
| Japan, Korea, Taiwan | JIS L1091 Soft Furnishing & Upholstery |
| Australia/New Zealand | AS/NZS 1530.2/.3 Building Materials |



# Transportation

## Railway

| | |
|---|---|
| CEN and ISO | EN 45545-2 Materials & components (Europe) |
| France | NF F 16-101-2 Materials & components |
| Germany | DIN 5510-2 Materials & components |
| Italy | UNI CEI 11170-1/-3 Materials & components |
| Poland | PN-K-02511 / 02502 Materials & components |
| UK | BS 6853 Materials & components |
| Spain | DT-PCI/5A Materials & components |

## Aviation

FAR/CS 25.853 Materials & components
ABD 0031 Materials & components

## Cruise Ships

FTP Code 2010, Resolution MSC.307 (88) Annex1 (IMO)
Part 5 Test for wallcoverings & carpets
Part 7 Test for textiles & films
Part 8 Test for upholstered furniture
Part 9 Test for bedding components

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# Protective Clothing

| | | |
|---|---|---|
| CEN/ISO | EN ISO 11612 | Protection against heat & flame |
| | EN ISO 11611 | Protective clothing for use in welding and allied processes |
| | EN ISO 9185 | Protective clothing - Assessment of resistance of materials to molten metal splash |
| | EN ISO 14116 | Materials, Combinations & textiles with limited flame spread |
| | EN ISO 6942 | Protective clothing - Protection against heat and fire |
| | EN ISO 14460 | Protective clothing for automobile racing drivers - Protection against heat and flame |
| | EN 367 | Heat transmission |
| | EN 469 | Firefighter's protective clothing |
| | EN 13911 | Protective clothing for firefighters - Requirements and test methods for fire hoods for firefighters; |
| | EN 15614 | Protective clothing for firefighters - Laboratory test methods and performance requirements for wildland clothing. |
| | ISO 11613 | Protective clothing for firefighters - Laboratory test methods and performance requirements |
| | ISO 15384:2003 | Protective clothing for firefighters - Laboratory test methods and performance requirements for wildland firefighting clothing; |
| | ISO 15538 | Protective clothing for firefighters - Laboratory test methods and performance requirements for protective clothing with a reflective outer surface |
| IEC | 61482-2 | Protective clothing against the thermal hazards of an electric arc |
| NFPA | 1971 | Protective ensembles for fire fighting |
| NFPA | 1977 | Protective clothing for Wildland Fire Fighting |



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