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## **Technical Textiles International 2009 - Suppliers Directory**

This gives some of the most important companies operating in the technical textiles industry. The listings include textile machinery manufacturers, fibre producers, yarn manufacturers fabric knitters, nonwovens producers, dyers, finishers, chemical suppliers and other suppliers of goods and services, both to the industry and to end-users.

(For list of manufacturers and their addresses refer <http://www.technical-textiles.net>)

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# **Buyer's guide for the Technical Textiles Industry**

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## **Fiber and fabrics**

### **Fibre information on protective clothing**

**There are two types of flame retardant fabrics:**

- fabrics that are only flame retardant by impregnation, but not inherently flame retardant
- inherently flame retardant

**Examples of fabrics that is only flame retardant by impregnation, but not inherently flame retardant:**

- 100 % cotton FR impregnated
- Cotton-Polyester mix fabric FR impregnated

**Examples of inherently and permanently flame retardant fibres:**

- Nomex® III \*
- Nomex® Comfort (Delta C)\*
- Nomex® Outer shell (Delta T)\*
- Nomex® antistatic (Delta A) \*
- Kevlar® \*
- Kermel® HTA
- PBI® gold
- P 84®
- ProtexM™
- Panox®
- Trevira CS®
- Viscose FR
- \* specially recommended (for a demonstration of durability and quality of flame retardant fibres, especially Nomex-fibres refer to the Thermo-man Test)
- The main properties and advantages of textiles made from inherently flame retardant Fibres can be summarized as follows:
  - Light weight
  - Permanent flame retardant properties
  - Minimum dimensional change in washing and drying
  - High degree of comfort of wear
  - No skin irritation or allergies reactions from flame retardant impregnation as the fabric is inherently flame retardant Durabilit

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## Fabric for protective garments for firefighters

- The protective fabrics for garments of fire-brigades and fire fighters must reflect current scientific and technical knowledge as well as the legal provisions in this field.
- The European Directive 89/686 EEC makes it binding on employers to protect employees in the execution of their duties. Based on this directive the European Norms comprise the minimum requirements for fabrics in various fields of application. After consideration of the standard parameter, the European Norm EN 469 principally pursues the following goals:
  - limited spread of flames (EN 532)
  - heat passage flame/radiation (EN 366/EN 367)
  - residual material stability after heat radiation (EN 366/ISO 5081)
  - sufficient breaking resistance (ISO 5081)
  - sufficient tear growth resistance (ISO 4674) s
  - protection against surface wetting (ISO 4920)
  - small alterations in dimensions (ISO 5077/6330)
  - high waterproof property (EN 20811)
  - protection against penetration of liquid chemicals (EN 368)
  - water vapour permeability (EN 31092)
  - optimal wear comfort
  - easy care handling
  - long wear life

Products should also carry NFPA certificates (National fire protection association – US).

Based on EN 469, the HuPF (Manufacturing and Testing Instructions for Universal Firefighter Protective Garments) or the respective test regulations of the single federal states have come into force in Germany. In order to guarantee that the protective aims of these test regulations or those of any other nations are met. Protective fabrics which are inherently and permanently flame retardant and conform to national and international norms, while attaining the highest standards:

Protective gear as per European Norm 469

Nomex® III

Nomex® III + 1 % addition of high-grade steel

Nomex®Comfort (Delta C)

Nomex® Outershell Tough (Delta T) antistatic Kermel® HTA

PBI®gold

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## **Protective clothing for emergency and rescue services (EMS)**

Dangers arising during emergency and rescue operations have to be eliminated primarily by technical and organizational measures. Where this is not possible, rescue forces must be protected by personal protective clothing.

This principle can be found in the "Generelle Unfallverhütungsvorschrift GUV" (General Regulation Relating to the Prevention of Accidents) 27.10, which stipulates the choice and use of personal protective clothing in organizations carrying out rescue services i.e. emergency rescue and ambulance service. (US - users might also want to refer to NFPA and OSHA)

The personal protective gear which is used must conform to the technical safety requirements stipulated in these regulations or their counterparts regarding other issues.

Protective fabrics are to be designed to meet those requirements or the relevant international regulations of almost all countries.

The following protective properties of clothing for people engaged in emergency services have therefore to be considered:

- protection against bad weather (EN 343)
- protection against heat and flames, requirements for limited spread of flames from burning materials (EN 533)
- protection in accordance with stipulated warning measures in traffic areas through a combination of reflecting stripes as an all-around protection (EN 471)
- protection against splashes of blood

In accordance with these requirements and testing norms, the following inherently flame retardant fabrics for protective clothing can be used partly in combination with liner, integrated garment systems.

- Protex M<sup>TM</sup> - / cotton
- Nomex<sup>®</sup> III
- Nomex<sup>®</sup> Comfort

Protective gear designed for emergency or rescue forces are many like turnout gear, jumpsuits, firegear, coveralls, coats, pants (jackets, trousers)

For further details Refer <http://techtex.ibena.de>

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## **Fabric for protective work wear**

In accordance with legal requirements, the fabrics for garments for industrial workers exposed to heat, fabrics must protect the workers against short-term contact with flames, convective heat, radiant heat as well as the harmful effects of metal splashes.

### **Relevant legal requirements:**

- Protective garments for industrial workers exposed to heat (EN 531 Code A/B/C/D/E)
- Protective garments against heat and flames testing method for limited spread of flames (EN 532)
- Minor alterations to dimensions (ISO 5077)
- Protection against convective heat (EN 367)
- Protection against radiant heat (EN 366)
- Protection against aluminum splashes/iron splashes (EN 373)

Protective fabrics with metallised surfaces are ideal for extreme working conditions like;

- Protection against molten metal splashes
- Reflection of flame and heat through metallized fabrics.

In accordance with these requirements, fabric manufacturer should produce fabrics which can guarantee safety in an industrial environment. The special features of the fabrics to be produced by must have at least following features;

- Special protective properties against metal splashes
- Protection against short-term contact with flames
- Protection against ultraviolet rays
- Protection against radiant heat
- Optimal wearing comfort
- Very good washing and easy-care properties

Following fabrics are suitable for protective fabrics for welding and related processes:

- Nomex® III
- Nomex® Comfort
- Protex M™ - cotton
- Nomex® Basicwear (Nomex® Antistatic / Viscose FR)
- ProFlex4®

Protective clothing for industrial workers exposed to heat as per test norm - EN 531

- Modacryl – Protex M™ - /cotton
- Nomex® III
- Nomex® III + 1 % addition of high-grade steel
- Nomex® Comfort (Delta C)

- Panox®

High visibility clothing as per test norm - EN 471

- Modacryl – Protex M™ - /cotton
- Nomex® III
- Nomex® Comfort (Delta C)

Protective gear for welding and allied processes as per test norm - EN 470

- Panox®
- Modacryl – Protex M® - / cotton
- ProFlex 4®

Thermal protective wear against the dangers of electric arc is gaining increasing importance in regulations for health and work protection as well as insurance liability of employers.

Material for protective wears with electric surface and transition resistance as per test norm - EN 1149 Part 1 and 2

- Nomex® III + 1 % addition of high-grade steel
- Nomex® Comfort (Delta C)
- Nomex® Delta A™ / Viscose FR = Nomex® Basicwear

For further details Refer <http://techtex.ibena.de>

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## **Protective fabric for fireblockers, welding curtains, folding bellows**

Human protection requires various specially designed protective concepts to provide work safety. This includes not only production of inherently flame retardant fabrics for clothing but also for objects that otherwise might cause injury to human being.

Therefore, fabric manufacturers offer inherently flame retardant textiles specially designed for object protection like;

- Welding curtain
- Blanket for splashing protection
- Folding bellow
- Laser channel
- Protective or isolation cover
- Fireblocker in aviation or space-travel
- Various protective textiles in public transport

These are high temperature resistant fabrics to be made from inherently flame retardant fibres as for example:

- NOMEX ®
- KEVLAR ®
- As well as other meta aramids or para aramids
- Preox. Polyacrylnitrilen
- Specially designed fibre mixes

For further details Refer <http://techtex.ibena.de>

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## Chemical Protection

Fabric manufacturer for garments meant for chemical protection may have integrated apparel systems and garments with:

- GORETEX®
- SYMPATEX®
- TETRATEX®
- POLYURETHANE

There are various types of chemical protection fabrics like fabric having good feel, fire, fire & comfort & antistat.

### **Fabric and test specification:**

Example of a typical 3-layer fabric construction for chemical protection garments

<b>Good Feel</b>		
50% Nomex® / 50% Viscose FR	250g/m2	HuPF2+3
<b>Fire</b>		
95% Nomex® / 5% Kevlar® (Nomex® III)	265g/m2	piece dyed
<b>Fire &amp; Comfort &amp; Antistat</b>		
93% Nomex® / 5% Kevlar® / 2% P140 Antistatic carbon fibre (Nomex® Comfort)	220g/m2	EN, HuPF1+4, HuPF2+3, pigmented
	230g/m2	pigmented
	265g/m2	EN pigmented
		pigmented

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## **Fabric for uniforms and military combat gear**

### **(Military protective gear)**

Apart from permanent heat and flame protection, comfort and robustness are crucial for acceptance of military battle or combat gear. (field jackets, uniforms, flak vests as well as flight suits)

For personal protection garments fabric manufacturers should produce fabrics standards conforming textiles according to individual specifications. These include:

US Military specifications based on MilSpec numbers

- MIL-xxx-xxxxxx (available upon request)

MOD (Ministry of Defence) UK - specifications

Austrian clothing regulation ÖBFV

- RL KS – 03 and 04

Technical specifications for supplies to Austrian Bundesheer

TVA, Specifications for suppliers of RNLAf Royal Netherlands Airforce

BWB (Bundesamt für Wehrtechnik und Beschaffung)

- Uniform textiles conform to TL 8305-0020
- Thread conform to TL 8305-0043
- Liner for combat gear conform to TL 8305-0019
- Aramid fabrics for aviation combos conform to TL 8305-0021
- Aramid/viscose FR textiles for protective wear conform to TL 8305-0023
- Pocketing conform to TL 8305-0042
- Aramid/Viscose FR textiles for protective wear conform to TL 8305-0113
- Textiles with shadow print conform to TL 8305-0290 and TL 8305-0297

Protective fabrics used for Military protective garments include:

- BDU jackets
- Flak vests
- flight suits
- pilot coveralls
- patrol uniforms
- field gear
- PT uniforms
- infantry gear
- station uniforms and dress coats
- Anti-riot suits

Textile production follows tight regulation and quality guidelines conform to ISO 9001, taking into consideration special technical and organizational demands conforming to BWB-TL 8305-0011 and AQAP ff. (Allied Quality Assurance Publication).

More requirements of this kind are found in requirements for personal protection in the police, special forces and security services.

- Technical conditions of delivery for the procurement departments of the police
- Procurement by public tender according to VOL (Verdingungsordnung für Leistungen)
- Technical conditions of delivery for the "Bundesministeriums des Innern" (BMI) for protective gear for example "Technisches Hilfswerk (THW) according to BMI-TRL 8305-108 and 8305-109

For further details Refer <http://techtex.ibena.de>

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## **Fabrics resistant to molten metal splash**

There are various types of fabrics resistant to molten splash like fabrics having good feel, safe and flex.

### **Production and testing specifications for fabric resistant to molten metal splash:**

<b>Good Feel</b>		
35% Teijin Conex® 65% Viscose FR	310g/m2	EN
<b>Safe</b>		
55% Modacryl 45% Cotton (Protex M™)	310g/m2	EN piece dyed
<b>Flex</b>		
Meta-Aramid / Para-Aramid / Viscose FR	320g/m2	EN

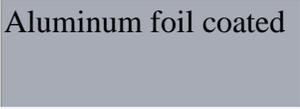
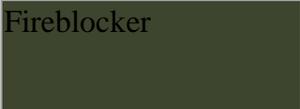
**For further details Refer <http://techtex.ibena.de>**

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## Textiles for extreme heat protection

Production and testing specifications for fabrics for extreme heat protection:

Example of a typical 4-layer fabric construction for extreme heat protection

<b>Preox PAN</b>		
100% Preox PAN	470g/m2	
38% Basofil® 36% Para-Aramid 25% Panox®	300g/m2	EN gold foil coated
<b>Object protection</b>		
100% Preox PAN (Panox®)	340g/m2	
70% Preox PAN (Panox®)/ 30% Para-Aramid (Kevlar®)	700g/m2	
		

For further details Refer <http://techtex.ibena.de>

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## Commercial Technical Textile Products

### Fire and heat retardant fabrics

Various types of “Fire and heat retardant fabrics” are made with addition of several value added characteristics some of them are like;

Safety & protection under worst circumstances

Safety & protection in case of need

Safety & comfort

Safety & visibility

<b>Good Feel</b>		
100% P84® (Polyamid-Imid)	290g/m2	EN, HuPF1+4 pigmented
30% Nomex® / 5% Kevlar® / 65% Viscose FR	150g/m2	
	250g/m2	EN
35% Nomex® / 65% Viscose FR	125g/m2	HuPF2+3
	150g/m2	HuPF2+3
	215g/m2	
	300g/m2	

	300g/m2	HuPF2+3
35% P84® / 65% Viscose FR	120g/m2	HuPF2+3
	150g/m2	
	170g/m2	
35% Teijin Conex® / 65% Viscose FR	150g/m2	
	300g/m2	
	300g/m2	
	310g/m2	EN
	310g/m2	
50% Kermel® / 50% Viscose FR	260g/m2	EN, HuPF2+3
	300g/m2	HuPF2+3
50% Nomex® / 50% Viscose FR	120g/m2	HuPF2+3
	250g/m2	HuPF2+3
<b>Fire</b>		
95% Nomex® / 5% Kevlar® (Nomex® III)	165g/m2	pigmented
	170g/m2	pigmented

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## Weather and High visibility fabric

Fabric manufacturer for garments meant for chemical protection may have integrated apparel-systems and 2- / 3-Layer-Laminates with:

- GORETEX®
- SYMPATEX®
- TETRATEX®
- POLYURETHANE

Example of a typical 3-Layer fabric construction

<b>Fire</b>		
95% Nomex® / 5% Kevlar® (Nomex® III)	180g/m <sup>2</sup>	EN piece dyed
	205g/m <sup>2</sup>	piece dyed
<b>Safe</b>		
55% Modacryl / 45% Cotton (Protex M™)	290g/m <sup>2</sup>	piece dyed

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## **Fabric for protective clothing for firefighters - EN 469**

Requirements for protective clothing for firefighters according to EN 469:

- Limited flame spread (EN 532)
- Radiant heat and heat transmission on exposure to flame (EN 366 / EN 367)
- Remaining material strength after radiant heat
- Tensile strength, residual tensile strength, surface moistening, dimensional change in washing and drying, permeability by liquid chemicals
- Waterproofness
- Permeability by water vapour

Fabrics made from the following fibres have proven suitable and have been certified:

- Nomex® III
- Nomex® III + 1 % Steel fibre addition
- Nomex® Delta C™ = Nomex® Comfort
- Nomex® Delta T™ antistatic = Nomex® Outershell Tough
- Kermel® HTA
- PBI® / para – Aramid

Fabrics certified according to EN 469

For further details Refer <http://techtex.ibena.de>

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## **High Visibility Warning Clothes - EN 471**

High visibility warning clothing should possess following requirements of EN 471

- Colours within specified colour range
- Minimum luminous density factor
  - Fastness to light
  - Colour fastness: abrasion resistance, fastness to perspiration, washing cycles, dry cleaning, hypochlorides, and ironing
- Dimensional change ISO 5077
- Maximum tensile strength / bursting strength

Fabric should be certified according to EN 471

For further details Refer <http://techtex.ibena.de>

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# **HuPF (Manufacturing and Testing Instructions for Universal Firefighter Protective Garments)**

## **HuPF part 1 / 4 fire fighter turnout gear - jackets and trousers**

- Nomex® Outershell Tough
- Kermel® HTA

## **HuPF part 2 / 3 work dress for fire-brigades**

- Nomex® Comfort
- Nomex® Basicwear (Nomex® Antistatic/Viscose FR)
- Kermel®/Viscose FR

## **Manufacturing and testing instructions according the individual regulations of federal states**

- Nomex® III
- Nomex® III + 1 % addition of high-grade steel
- Nomex® Comfort
- Nomex® Basicwear (Nomex® Antistatic/Viscose FR)
- Kermel®/Viscose FR

Specific requirements for garment attachments are agreed upon with our partners and customers - leading international manufacturers of ready-made clothes - conforming to national and international norms

For further details Refer <http://techtex.ibena.de>

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## Standards and Norms and Protective Textile

### Fabrics according to specific norms

#### Firefighters: Testing and certification of personal protective gear

HuPF	Production and testing specification for universal firefighters turn out gear and station wear.	Fabric certified HuPF 1+4 Fabric certified. HuPF 2+3
Bayern Niedersachsen B.- Württemberg	Production and testing specification for universal firefighters turn out gear and station wear according to specific German counties requirements.	Fabric according county specification
EN 469	Protective clothing for firefighters / European norm	Fabric certified EN 469

Products should also carry NFPA certificates (National fire protection association – US).

#### Industrial applications: Relevant European norms for protective clothing and workwear

<b>EN 340</b>	Protective clothing, general requirements	EN 340 certified fabric
<b>EN 342</b>	Protective clothing: protection against cold	EN 342 certified fabric
<b>EN 343</b>	Protective clothing: protection against bad weather	EN 343 certified fabric
<b>EN 348</b>	Protective clothing; determination of behaviour of materials on impact of small splashes of molten metal	EN 348 certified fabric
<b>EN 366</b>	Protective clothing; protection against heat and fire; evaluation of materials and material assemblies when exposed to a source of radiant heat	EN 366 certified fabric
<b>EN 367</b>	Protective clothing; protection against heat and flames determination of heat transmission on exposure to flame	EN 367 certified fabric
<b>EN 368</b>	Protective clothing for use against liquid chemicals; resistance of materials to penetration by liquids	EN 368 certified fabric
<b>EN 369</b>	Protective clothing; protection against liquid	EN 369 certified

	chemicals; resistance of material to permeation by liquids	fabric
<b>EN 373</b>	Protective clothing; assessment of resistance of material to molten metal splash	EN 373 certified fabric
<b>EN 381</b>	Protective clothing for users of hand held chain saws	EN 381 certified fabric
<b>EN 463</b>	Protective clothing - Protection against liquid chemicals - Determination of resistance to penetration by a jet of liquid (Jet-test)	EN 463 certified fabric
<b>EN 464</b>	Protective clothing - Protection against liquid and gaseous chemicals, including liquid aerosols and solid particles, Determination of leak-tightness of gas-tight suits (internal pressure test)	EN 464 certified fabric
<b>EN 465</b>	Protective clothing - Protection against liquid chemicals - Performance requirements for chemical protective clothing with spray-tight connections between different parts of the clothing (Type 4 equipment)	EN 465 certified fabric
<b>EN 466</b>	Protective clothing - Protection against liquid chemicals - Performance requirements for chemical protective clothing with liquid-tight connections between different parts of the clothing (Type 3 equipment)	EN 466 certified fabric
<b>EN 467</b>	Protective clothing - Protection against liquid chemicals - Performance requirements for garments providing chemical protection to parts of the body	EN 467 certified fabric
<b>EN 468</b>	Protective clothing - Protection against liquid chemicals - Determination of resistance to penetration by spray (Spray-Test)	EN 468 certified fabric
<b>EN 470</b>	Protective clothing for use in welding and allied processes - General requirements	EN 470 certified fabric
<b>EN 471</b>	High-visibility warning clothing	EN 471 certified fabric
<b>EN 510</b>	Specifications for protective clothing for use where there is a risk of entanglement with moving parts	EN 510 certified fabric
<b>EN 530</b>	Abrasion resistance of protective clothing material	EN 530 certified fabric
<b>EN 531</b>	Protective clothing for workers exposed to heat	EN 531 certified

		fabric
<b>EN 532</b>	Protective clothing - Protection against heat und flame – Method of test for limited flame spread	EN 532 certified fabric
<b>EN 533</b>	Protective clothing - Protection against heat and flame - Limited flame spread materials and material assemblies	EN 533 certified fabric
<b>EN 1149</b>	Protective clothing - Electrostatic properties	EN 1149 certified fabric
<b>DIN EN 25077</b>	Textiles; determination of dimensional change in washing and drying (ISO 5077)	DIN EN 25077 certified fabric
<b>DIN EN 100015</b>	Basic specification: protection of electrostatic sensitive devices	DIN EN 100015 certified fabric
<b>Test</b>	Protective clothing: protection against electric arc	Fabric according specification / norm

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**German norm for fabric for fire fighter's turn-out gear jackets & trousers and station wear**

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**Specific German federal state requirements for production and testing specification for universal firefighter's turnout gear and station wear**

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## **Fabrics for workers exposed to heat – EN 531**

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**Fabrics for welding and allied processes – EN 470**

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## **Thermo-man test**

A THERMO-MAN Test in the textile research laboratory of DuPont in Meyrin:  
The Test simulates a flash over and registers the likely percentage of 2. and 3. degree burns.

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# Nomex Fabric colours

## Nomex® fabric

Fabrics from pigmented (=producer dyed) Nomex, NomexIII, Nomex III antistatic (Nomex Delta A), Nomex Comfort (Nomex Delta C), are available in the following standard colours. Piece dyed nomex® fabrics are available in any colour upon request.

Yellow N 301 05001		Please note that a correct representation on colours in the internet depends strongly on the calibration of your screen.
Red Orange N 304 PC 05004		
Blue Grey N 301 PC 04013		Our colour palettes here therefore should be just used as orientation.
Sage Green N 307 PC 05001		
Black N 301 PC 02001		We are happy to provide you with exact colour samples upon <b>request</b> .
Royal blue N 302 PC 05002		
Navy Blue N 305 PC 04001		
Paris Blue N 301 PC 02002		
Light Grey N 307 PC 07001		
Deep Red N 307 PC 04014		
Moos green N 307 PC 02007		
Olive Green N 301 PC 08001		
* Red		
* Orange		

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