Fothergill Engineered Fabrics Ltd

Speciality Woven and Knitted High Performance Textiles

The Company

Founded in 1847, as a partnership between Thomas Fothergill and Alexander Harvey, the company has been producing technical textiles since 1848.

Originally, fabrics were woven from natural fibres such as cotton and the company produced the first khaki drill for servicemen's uniforms.

By 1945, a research unit had been established whilst the company was diversifying away from cotton and into glass and other synthetic fabrics.

The company was amongst the first weavers to produce fabrics from new aramid fibres and during 1972 took advantage of the technology available from the Royal Aircraft Establishment, to weave carbon fibre.

The Fothergill and Harvey Group was acquired by Courtaulds in 1987 and using the technology of Courtaulds commenced production of knitted fabrics.

Fothergill Engineered Fabrics regained its independence as a private limited company in early 1995. With a continuous programme of research and development and a highly-motivated, quality conscious workforce, Fothergill Engineered Fabrics is set to maintain and develop its role as a leading European supplier of woven and knitted high performance textiles.

The current extensive range of fabrics is used by a wide variety of industries, including aerospace, defence (reinforcements and ballistic protection), thermal protection/insulation, filtration, automotive and construction.

Quality and Testing

Certificate GB05/66034

The Company is committed to providing products and services which consistently conform, in all respects, to the specified requirements of our customers.

Registered as complying with the stringent standards of ISO 9001, Fothergill Engineered Fabrics also has the status of an approved supplier to Rolls Royce, British Aerospace, Westland Aerospace, Airbus UK, Det Norske Veritas (DNV) and GE Aviation Dowty Propellers.

Quality control is maintained throughout all stages of manufacture, with the emphasis on prevention of defects rather than detection.

Extensive in-house test facilities allow adherence to relevant international standards. Fully-trained staff carry out the certification of materials in accordance with our ISO 9001 accreditation, to assure customer confidence and satisfaction.

Fabrics for Defence, Aerospace & Reinforcement

Textile products from Fothergill Engineered Fabrics were first supplied to the British Army during the Boer War and were battle-proven during the Gulf, Bosnian and Afghanistan conflicts, where they were employed in helmets, body armour and vehicles.

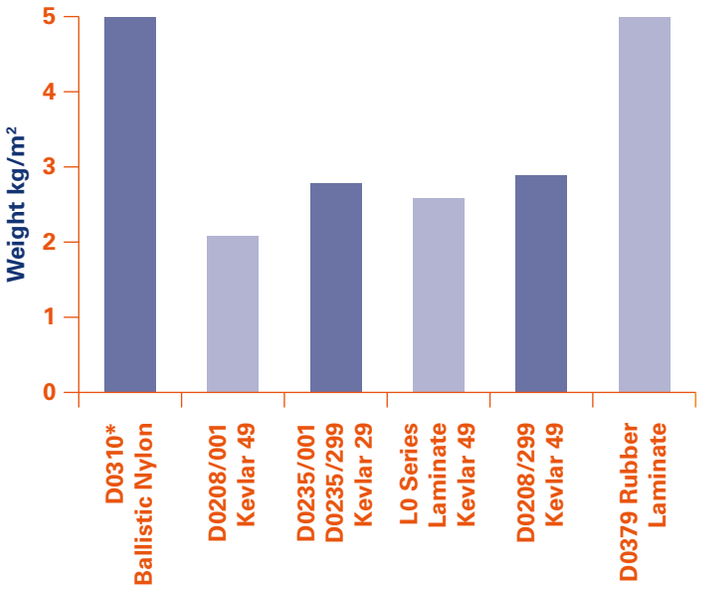
Utilising a wide range of fibres including Carbon, Aramid, Glass, Nylon, PTFE and Polyester, we supply most of Europe's leading non-metallic armour and other defence manufacturers. Fothergill Engineered Fabrics is also one of Europe's largest weaver of S2 Glass for ballistics.

Our output extends from lightweight reinforcements to highly sophisticated anti-ballistic materials, for which Fothergill Engineered Fabrics' woven aramid, a high-modulus fibre of great tensile strength, provides outstanding protection. Flexible and light to wear, it is proven to be five times stronger than steel, weight for weight.

Such is our expertise in developing new solutions for sensitive problems, that we can design fabrics to provide distinctive properties to match our customers' exact applications. From protection for forestry workers and refuse collectors, to primary armour, ballistic laminates and safety screens, our finishing techniques encompass a vast array of specialist characteristics.

In conjunction with Fothergill Polycom (sister company) Fothergill Engineered Fabrics is also able to offer specialist rubber coatings, such as polychloroprene, silicone and natural rubber, all to customer specific requirements.

Weight of material required to give an average v50 of 400m/s using a 1.10g fragment simulating projectile



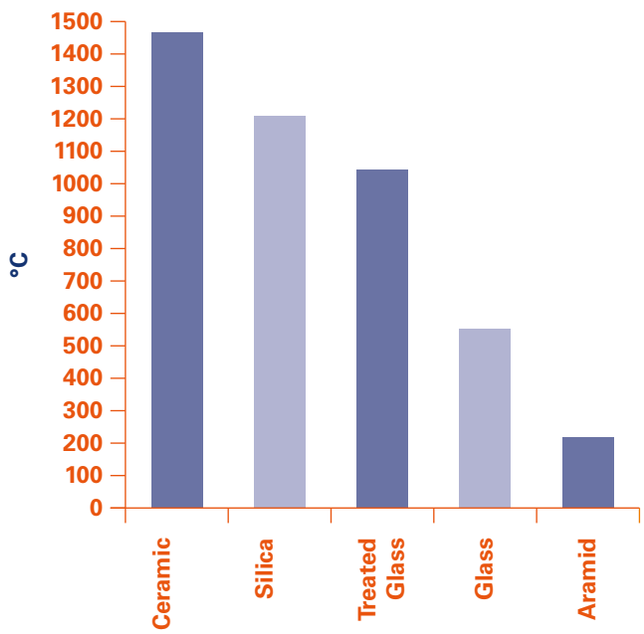
* formerly D0692 and D0701

Photograph by Andrew Linnett © Crown Copyright/MOD, image from www.photos.mod.uk

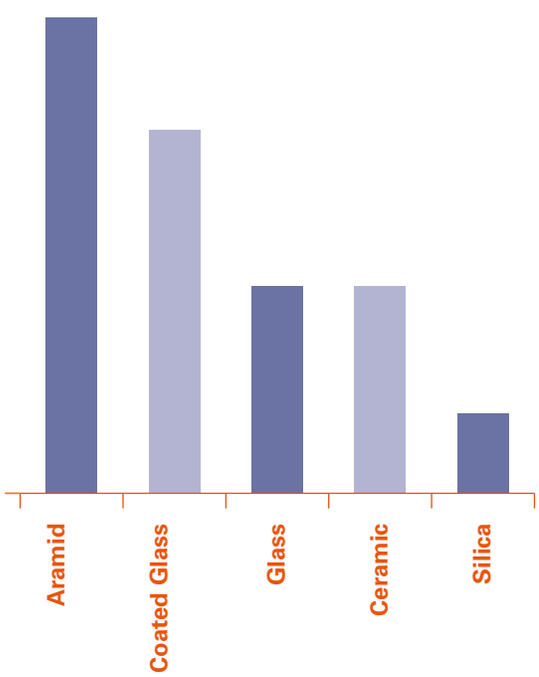
Fabrics for High Temperature Applications

The range of Fothergill Engineered Fabrics' heat resistant materials covers virtually all thermal insulation and thermal protection applications. They provide cost-effective and, in many cases, safer alternatives to fabrics in current use, since they contain no asbestos or respirable fibres.

Comparative Temperature Resistance



Comparative Mechanical resistance



1. Tyglas

Tyglas woven glass fabrics are generally employed as facings for flexible or rigid insulation, having a maximum continuous operating temperature of 550°C. Coated glass fabrics are available for use in the fabrication of flexible ductings, expansion joints and explosion membranes, with differing maximum continuous operating temperatures, depending on the coating. Special coated fabrics have also been developed for fire blankets to BS EN 1869 (Tyglas FB) and for covering insulation mattresses, smoke curtains and valve covers (Tyglas VC). Texturised glass yarns offer better insulation properties, vital for fire barriers and protection during welding operations.

2. Tyglas 1000C

These are woven texturised glass fabrics which have been specially treated and will withstand a blowtorch flame in excess of 1000°C. Providing increased protection from molten metal spatter, their high strength and abrasion resistance makes them eminently suited to fire barrier and welding blanket applications.

3. Tygasil

Produced in woven, knitted and needled mat form, Tygasil silica fabrics have been subjected to a special treatment that increases the silica content to typically >98%, resulting in a fabric which retains flexibility at the maximum recommended operating temperature of 950°C. These fabrics are excellent for furnace curtains, fire barriers, welding screens and blankets.

4. Knitted Tygasil

Combining the features of woven silica with improved flexibility and high insulation properties, knitted Tygasil contains no respirable fibres. Assuring high standards of worker safety and comfort, it provides an efficient and cost effective replacement for refractory ceramic fibres (RCF's) in industrial insulation and heat treatment operations.

5. High Temperature Filtration Products

Filter fabric technology has been a speciality of Fothergill Engineered Fabrics for almost fifty years, since the introduction of manufacturing from monofilament polyester and other yarns. Our technical staff work closely with customers in the development of specially treated glass fabrics for the filtration of molten aluminium. The impetus towards advancing fabric technology often springs from developing materials to satisfy our customers' special requirements. In this manner, aramid, quartz and other yarns are also included in our product range.

6. Hot Gas Filtration Fabrics

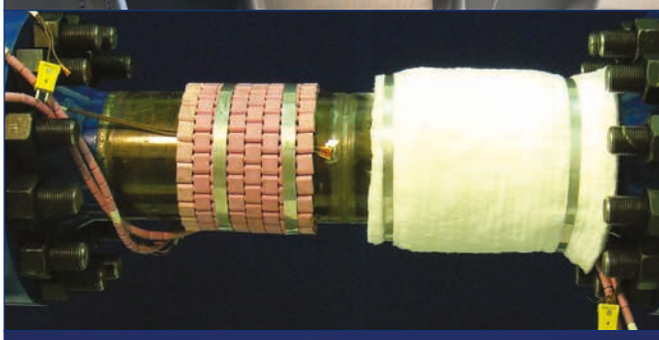
Wherever a production process creates small particles, principally of a chemical nature, the collection of these becomes important if:

(a) They are valuable
(b) They constitute a health hazard
(c) They are a nuisance to surrounding property

Whilst much is still to be learned of the complicated mechanism of filtration from a scientific point of view, Fothergill Engineered Fabrics have, for over 50 years, specialised in the practical application and preparation of glass fabrics for the high temperature filtration industry.

For filtration applications the main attribute of glass yarns is their relatively low degradation and high dimensional stability at elevated temperatures. With a suitable PTFE, silicone and/or graphite finish treatment, fabrics will operate successfully at temperatures up to 290°C. At a lower temperature the life of glass fabrics will be proportionally greater and the normal temperature range for glass fabrics is between 200°C and 260°C. The economic advantages at higher operating temperatures lies in the capital cost of cooling equipment, or a significant reduction in the bleed cooling air. This, in turn, reduces the overall volume of air to be filtered.

Loomstate glass fabrics have poor abrasion, flexing and chemical resistance, and a finish treatment must be applied if filter bags are to have a satisfactory life. Several finishes are available to meet a variety of operating conditions, and advice as to the most suitable finish for a particular application will be given on request.



Alternative Weaves, Finishes and Coatings

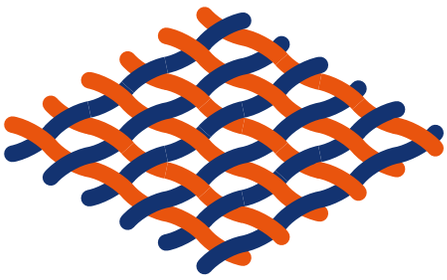
Glass fabrics are generally woven from E-glass yarns, although other types of glass are used for special applications, including quartz and S2 glass for aerospace and defence applications.

A wide variety of chemical treatments are offered to improve fabric properties and/or to make fabrics more suitable for further processing by our customers. Fabrics are offered laminated to aluminium foil or coated with elastomeric or other proprietary coatings. Elastomeric coatings include polychloroprene and silicone rubber. Proprietary coatings include Tyglas VC (an aluminised coating for valve covers, smoke curtains and other insulation applications) and Tyglas FB (developed to satisfy the requirement of BS EN 1869 for fire blankets).

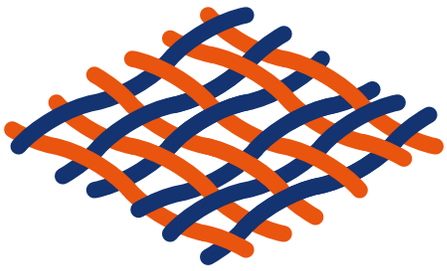
The four principle weaves are:

- **Plain – for abrasion resistance and stability; ideally suited to flat surfaces**
- **Twill – for covering curved surfaces**
- **Satin – more suitable for draping, providing increased flexibility**
- **Matt – similar to plain, but with greater strength**

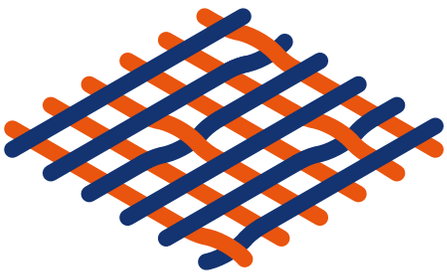
Varying weave constructions produce different physical characteristics, which may be beneficial for a particular usage.



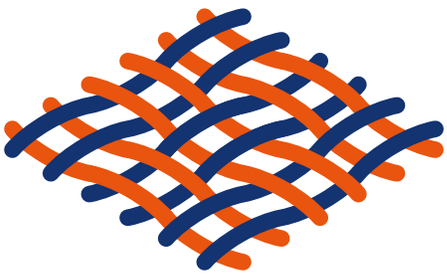
Plain



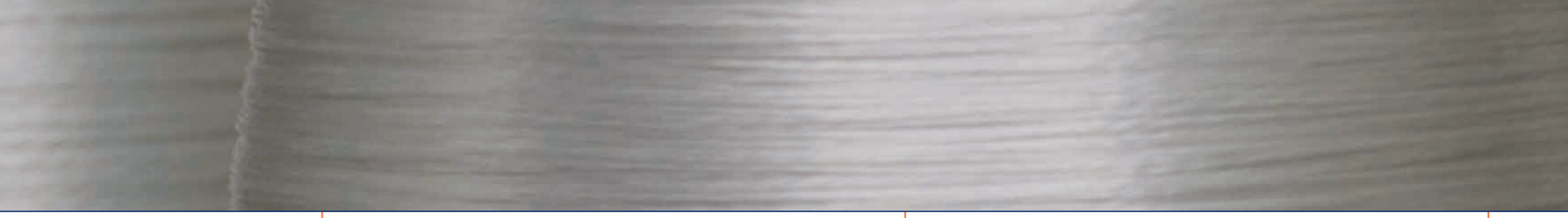
Twill



Satin



Matt



Thermal Products	Principle End Uses
Tygasil Woven, Knitted and Needled Silica Fabrics	Thermal protection and insulation for heavy process industries for welding protection against metal splash, stress relieving, furnace insulation and fire protection. Ideal for applications previously requiring asbestos.
Tyglas, Tygashield, Tyglas 1000C Coated, Laminated and Finished Fabrics	Thermal protection for process industries, including petrochemical and heavy engineering. Fire resistant applications and protection against molten metal splash and sparks.
Tyglas FB	Satisfies the requirement of BS EN 1869 : 1997. Coated fabric for Fire Blankets and light duty welding applications.
Tyglas VC	General insulation, valve covers, smoke curtains.
Fabrics for Ballistic Protection Finished Aramid and Nylon Fabrics	High strength, low weight, high performance for resistance against ballistic threats.
Woven Glass Rovings, including S2	High performance reinforcements for ballistic composites, including vehicle armour and ship's hull reinforcement.
Reinforcements for Advanced Composites Woven Carbon and Hybrid Fabrics	Premium quality woven fabrics for aerospace and other high performance composite applications. Hybrids of carbon, aramid and glass for value engineered and tailored structural properties.
Woven Glass Fabrics	Premium quality woven fabrics for aerospace and other high performance composite applications. Bleed fabrics for moulding applications.
Customised High Performance Fabrics	A wide range of applications addressing specific technical challenges, including high temperature filtration, hose reinforcement, electrical insulation, dry bearing liners, electromagnetic interference (EMI) screening, anti-static processes and microwave transparency.
Fabrics for PTFE Coating	Woven glass and aramid fabrics for use as substrates for PTFE coating, where the criticality of surface characteristics is paramount to successful coating.

Fothergill Engineered Fabrics Ltd

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