

HiPer-tex™ fibre for light weight, cost effective blast and ballistic protection solutions



ballistic protection

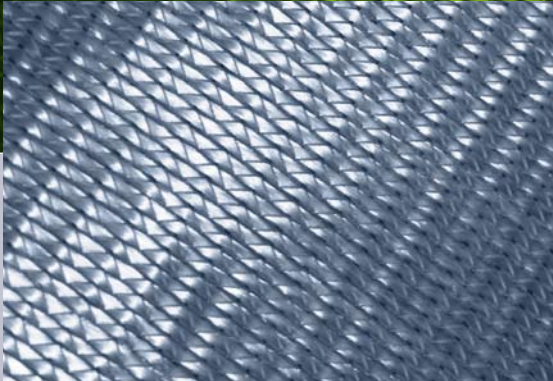


ballistic protection

blast protection



taking glass fibre to a higher level



HiPer-tex™ fibre: taking glass fibre to a higher level

What distinguishes HiPer-tex™ fibre is its high strength, high modulus and high elongation at break. And, thanks to a breakthrough development in manufacturing technology, these high performance glass fibre reinforcements are produced at a commercially attractive cost.

HiPer-tex™ fibre is not only based on completely new glass formulation, melting fibrerizing and sizing technologies, but also utilizes a high capacity production platform for scale economy.

When compared to traditional E-Glass, the benefits of HiPer-tex™ fibres are clear:

- 30% higher strength
- 17% higher stiffness
- 45% higher strain energy
- 30% lower coefficient of linear thermal expansion
- 110°C higher temperature resistance
- 10 times greater resistance to fatigue
- Higher corrosion resistance

HiPer-tex™ fibre, in continuous filament form, serves as the base material for fabrics and woven roving tissues.

discover your fibreglass world



protection you can depend on

HiPer-tex™ fibre: protection you can depend on

The ever increasing needs for safety and security are driving the demand for armor solutions capable of countering present and future threats. But optimal protection needs to be achieved without compromising practical constraints such as weight and cost reductions.

HiPer-tex™ fibre's high elongation at break, high modulus and high strength make it the ideal reinforcement solution for reducing weight and for combating increasing threats. HiPer-tex™ fibre meets the Class B strength requirement of military specification MIL-DTL-64154B with a fibre strength of no less than 400,000 psi (2758 MPa).

These properties are essential elements in the energy absorbing mechanism needed to defeat dynamic ballistic impact or to mitigate blast. This makes HiPer-tex™ fibre the material of choice for:

- Blast panels that protect against land mines
- Engineered ballistics panels (either stand-alone or as part of a combined solution)
- Spall liners

By combining HiPer-tex™ fibre with an appropriate resin matrix system – typically phenolic or polyester – essential mechanical and physical properties can be engineered into the composite. These include:

- Fire resistance
- Low smoke and low toxicity
- Thermal stability over a wide temperature range
- Structural integrity
- UV resistance
- Moisture resistance



Secondary protection, in the event of an overmatch situation resulting in armor penetration, is also an important advantage of HiPer-tex™ fibre. Softer behind-armor composite debris significantly reduces the risk of injury and fire propagation inside vehicles – compared to the typical hard behind-armor debris from aluminum and steel.

Use of HiPer-tex™ fibre is therefore recommended in:

- Hard composite armor for military and law enforcement vehicles
- Hard composite armor for government and civilian vehicles and for CITs
- Hard composite armor for naval vessels

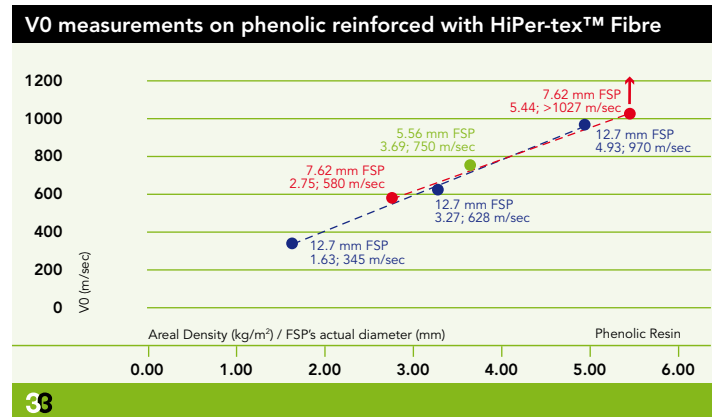


fibre in figures

HiPer-tex™ Fibre in Figures

- **V50 Comparison** on polyester laminates reinforced with E-Glass, S2-Glass® and HiPer-tex™ fibre.
- 5.56 mm FSP
- Tested at Banc Officiel d'Epreuve of St Etienne (France)
- S2-Glass® is a register trademark of AGY
- Courtesy of VonRoll

- **V0 measurements** on phenolic laminates reinforced with HiPer-tex™ Fibre
- Tested at Banc Officiel d'Epreuve of St Etienne (France)
- V0 of 7.62 mm FSP & 12.7 mm FSP measured 2.5m before impact
- V0 of 5.56 mm FSP measured 5m before impact

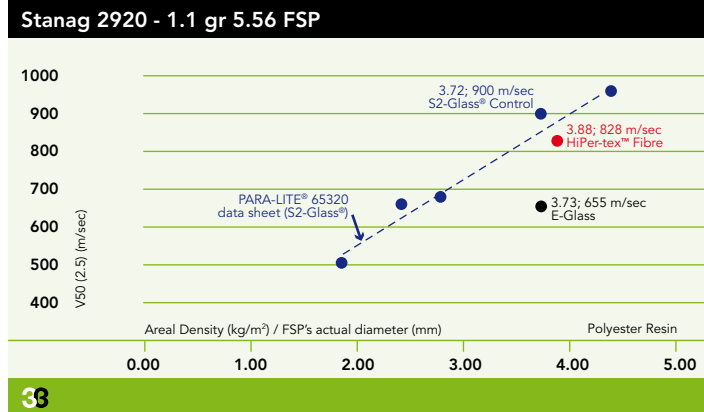


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- **V0 comparison** on phenolic laminates reinforced with S2-Glass®, E-Glass and HiPer-tex™ Fibre.
- .44 Mag ammunition
- Tested at Banc Officiel d'Epreuve of St Etienne (France)
- S2-Glass® is a register trademark of AGY
- Courtesy of VonRoll

	S2-Glass®	HiPer-tex™ Fibre	E-Glass
Panel Thickness (mm)	8.79	8.73	10
Areal Density (kg/m²)	17.71	18.25	21.5
V0 assessment (m/sec)	493<V0<511	474<V0<503	456<V0<465



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fibre made solutions

HiPer-tex™ Fibre made Solutions

3B the fibreglass company, is continuously working with its partners and customers to develop solutions that meet their needs for high performance, cost effective blast and ballistic protection.

The examples shown below are proven HiPer-tex™ solutions, either in stand-alone or combined with ceramic tiles applications; in accordance with standards such as MIL-STD, EN-1522 and STANAG-4569.

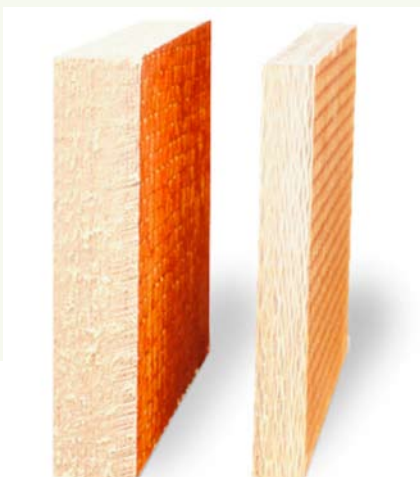
Further information on these solutions is available on request from 3B: 3B.info@3b-fibreglass.com

Military Applications:

Class B Code 2 spill liner as per MIL-DTL-64154B specification:

HiPer-tex™ fibre fabric reinforced phenolic laminate.

- HiPer-tex™ fibre is compliant with Class B chemical composition range
- Thickness: 0.507 inches - Areal density: 5.4 lbs/sq.ft
- Tested at University of Dayton Research Institute, Dayton OH, USA, according to MIL-STD-662 - 7.62 mm FSP
- Impact Obliquity 0 degree
- Extreme Spread: 53 ft/sec; V50=2455 ft/sec
- V50 protection ballistic limit in accordance with ballistic resistance of Class B Code 2 MIL-DTL-64154B



Add-on armor STANAG 4569 Level 4

HiPer-tex™ fibre passed STANAG 4569 level 4 test (14.5mm API) as a backing for vehicle add-on armour, in combination with TenCate Liba ceramic strike face.

The stiffness of HiPer-tex™ fibre-based backing, combined with the elasticity of TenCate Liba ceramic system, enables good multi-impact resistance to be achieved, even when the point of impact is close to the armour's edge.

The vehicle's steel hull was not perforated and showed very limited damage.

Courtesy of TenCate Advanced Armour.

TenCate Liba is patented light weight armour technology based on ceramic pellets embedded in a rubber matrix.



Paramilitary and Civilian Applications:

Protection against small arms fire

- HiPer-tex™ fibre fabric reinforced phenolic laminate.
- Thickness: 8.73 mm - Areal density: 18.25 kg/m²
- EN-1522 Level FB4 Certified by Banc Officiel d'Épreuve of St Etienne (France)
- Courtesy of VonRoll.





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formance. The user, by accepting the products described herein, agrees to be responsible for thoroughly testing any application to determine its suitability before committing to production. It is important for the user to determine the properties of its own commercial compounds when using this or any other reinforcement.

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