

**Diamorph** 

**Composite  
& Polymer  
Materials**

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# Materials



Material ↓

# Fibre Composites

## Synthetic Resin Bonded Fabric

Diamorph's range of composite materials (also known as Synthetic Resin Bonded Fabric, or SRBF) include world renowned composites FEROFORM®, TUFNOL, PERMAGLASS® and RAILKO™.

Diamorph materials are extremely versatile and suitable for the most demanding applications in the most arduous environments.

Our composites are made with various fibre materials including, but not limited to, Aramids, Cotton, Glass, carbon and Polyethylene.



Defence



Aerospace



Rail



Electrical



Marine



General Engineering



Material ↓

# Polymers

## Polymer Sheets & Films

Diamorph's polymer materials include Tuftane® branded thermoplastic polyurethane (TPU) elastomeric film, machined components from a variety of polymers (PE, Nylon, PEEK, PC, PP, PTFE, PVDF etc.), pressed polymer sheets and our propriety slip coat material formulation.

- Automotive
- Medical
- Offshore
- Construction
- Pumps
- Electrical
- General Engineering



Material ↓

# Metal Composites

## Ferobide & Ferosafe

Tenmat's proprietary Ferobide and Ferosafe hard metal materials are innovative tungsten carbide composite materials that combine high level of wear resistance and toughness with the ease and reliability of a weldable material.

### Ferobide

A weldable composite material that effectively resists high power angle grinders and drills.

### Ferosafe

Arduous wear applications, but with increased resistance to cutting and drilling.



Agriculture



Mining



Physical  
Security



General  
Engineering



Material ↓

# Technical Ceramics

## Refel

Diamorph offers a range of engineering ceramic materials with superb inert properties for hard wearing, as well as high temperature applications.

### Refel

Engineered reaction bonded silicone carbide ceramic with a fine grain structure.

Pumps

Valves

Marine

General  
Engineering

# Processes





Processes ↓

# Impregnation

## Specialist Pre-Preg Materials

Diamorph's extensive in-house manufacturing and finishing capabilities include Prepreg. Glass and/or Aramid fibre epoxy or phenolic preregs, supplied on a roll or as 'cut to size' sheets.

Standard and bespoke prepreg grades manufactured using in-house resin formulations for specific markets.

Diamorph has proven preregs for producing composite sheet laminates used in demanding mass transport rail and aircraft applications, meeting regulatory standards such as: electrical insulation (BS 2782 Part 2 tests); flame spread & fire, smoke and toxic fumes (FST) resistance (UL 94-V0; FAR/CS 25 flammability; BS EN 45545-2:2013; RSE/STD/013 & 014 Part 1: Issue A).



Glass Phenolic



Polyester Epoxy



Glass Epoxy



Polyester Phenolic



Aramid Phenolic



Cotton Phenolic



Paper Phenolic



Bespoke Chemistries



Processes ↓

# Pressing

## Bonded construction production

Bonded construction production of all Diamorph FRP composite laminates based on Diamorph epoxy phenolic and polyester sheets.

High pressure pressing of glass, aramid, paper, cotton, and other woven materials, including specialty UHMWPE fibre reinforced flat panels. Pressed sheet dimensions dependent on resin type, but most sheet laminate grades available from 0.5mm up to 75mm thick.

Contract pressing/compression moulding of 'bought-in' raw materials (thermosets and thermoplastics). Toll manufacturing of customer supplied 'free issue' raw material (virgin & recycled blends).

Pressure up to 9000psi

Up to 4.5 metre sheets

Up to 75mm Thickness

Temperature up to 200°C

Up to 7 daylight

600mm daylight



Processes ↓

# Moulding

## Composite Moulding

Using a variety of composite moulding techniques in both open and closed moulding allows us to manufacture high quality precision parts for a variety of sectors including aerospace, defence and automotive. Composites, such as FRP laminate sheeting from epoxy and phenolic liquid resin systems, require high-level expertise to fulfil contracts for military and medical sectors. These often demand stringent fire performance, high-strength characteristics and precision dimensional requirements.

Our moulding processes allow us to provide customers with optimum materials moulded to complex shapes and dimensions across all sectors.

Diamorph uses a wide variety of composite moulding processes, from RTM (Resin Transfer Moulding) to VARTM (Vacuum Assisted Resin Transfer Moulding), which are used to form complex FRP parts. These are formulated with a variety of additives, depending on requirements of regulatory standards.

Glass Polyester

Aramid Epoxy

Glass Phenolic

Natural Fibres PFA

Bespoke Combinations

Thick Sections +40mm



Processes ↓

# Precision Machining

## CNC Machining & Milling

### CNC Machining

CNC machining is ideal for medium to high volume production. CNC machines provide efficient, highly accurate and repeatable results.

Using a full suite of CAD CAM software Diamorph provides tailored machining solutions for its customers.

Diamorph's extensive CNC capabilities includes pattern cutting, sanding, milling, turning and boring to tolerances of +/- 0.05mm.

Precision CNC machining is supported by state of the art CMM inspection capabilities.



5 Axis



3 Axis



Bed Size up to 4 x 4 x 1 metres



2D Ply Cutting



Multi-Axis Water Jet Cutting

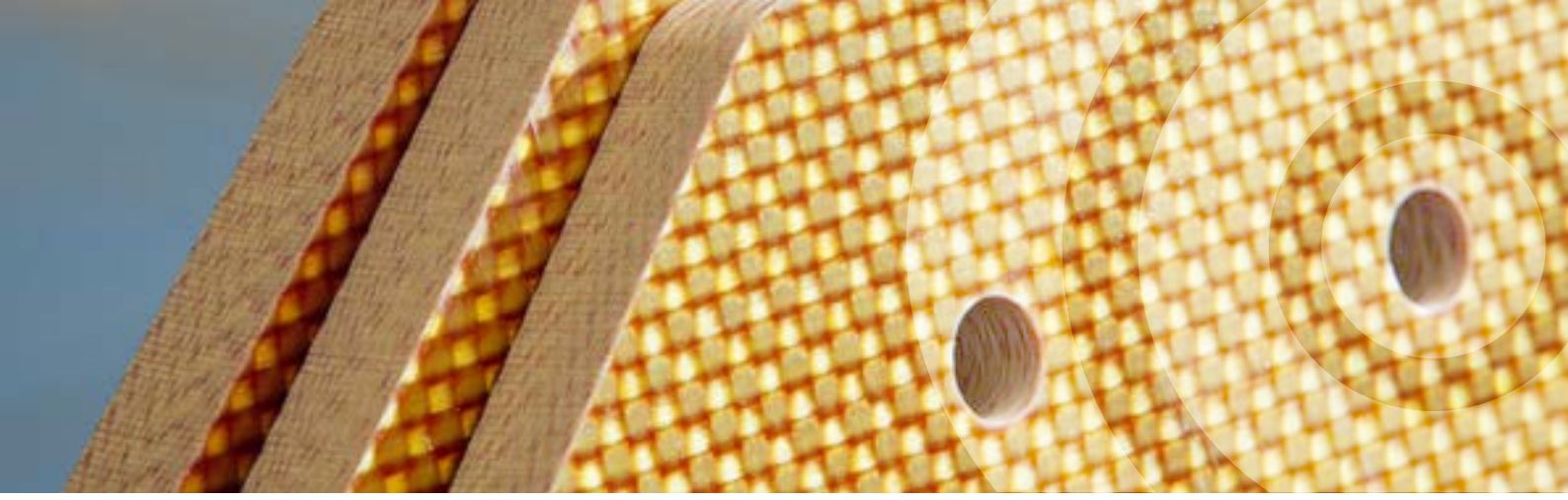


Large Diameter Vertical Boring

Diamorph ©

# Products

The science of protection.



Products ↓

 Tenmat

 TUFNOL

PERMALI



# Composite Components

A wide range of fibre reinforced laminates

Diamorph manufactures an extensive range of fibre reinforced laminates with various resin systems.

Specifically developed to meet the technical requirements of demanding engineering applications, Diamorph composite properties include:

- Exceptional strength to weight ratios
- Low and high operating temperatures
- High corrosion and chemical resistance
- Excellent electrical and arc resistance

Diamorph specialises in the manufacture of precision machined composite components and assembled systems. Tight tolerance levels often require key tools to manufacture materials precisely and to a high performing quality. With specialist CNC machinery technology and expertise, Diamorph can design and manufacture precision machined parts for a range of applications, from bearings to Motorsport planks.

The science of protection.



Products ↓

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# Composite Bearings & Bushes

## Highly durable bearings & bushes

Diamorph bearing materials are widely used where tough, wear-resistant components are needed. They offer excellent durability under a wide range of operating conditions.

Our range includes a well-known cotton fabric phenolic bearing grades for lubricated applications, plus many specially developed types with friction-modifying additives.

Diamorph's composites are ideally suited to applications lubricated with water, or with a water-based process fluid. In many applications, this allows the design to be simplified by eliminating the need for a sealed bearing with oil or grease inside.

Diamorph Marine Bearings are fully approved by all major class societies for water and oil lubrication.



Products ↓

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 RAILKO

# Rods & Tubes

## Highly durable Rods & Tubes

All Diamorph materials can be machined via our highly skilled & equipped in house machine shop. We do also supply material grades in base tube, sheet and rods form as follows;

### Tenmat & Railko base material dimensional capability:

- Sheets pressed up to 185mm thickness
- Tubes pressed up to 1200mm outside diameter
- Rods pressed up to 160mm outside diameter

### Tufnol base material dimensional capability:

- Sheets pressed up to 230mm thickness
- Tubes pressed up to 250mm outside diameter
- Rods pressed up to 228mm outside diameter





Products ↓

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 RAILKO

# Composite Rotor Vanes

## High Quality Rotor Blades

Diamorph advanced materials are used extensively in rotary vane vacuum pumps and compressors throughout the world. Diamorph high quality rotor blades are available in different grades and customized sizes according to customer specific applications and environmental conditions.

Our rotor vanes are used in:

- Medium Duty Vacuum Pumps
- Heavy Duty Vacuum Pumps and Compressors
- High Vacuum Pumps
- High Vacuum Oil Sealed Vacuum Pumps
- Dry Running Pumps



Products ↓

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PERMALI

RAILKO

# Ballistic Protection

## Land, Sea & Air Defence

Diamorph has developed a reputation for providing high performance lightweight composite ballistic protection to improve **survivability** against a range of threat levels, specific examples include:

### Spall Lining

Spall Liners prevent metal fragmentation spalling injuries to the occupants of military armoured vehicles from land mines/IEDs or attack by an opponent with superior fire power. Battle proven technologies including:

- Woven and non-woven S2 and E glass fibre fabrics
- Kevlar® and Twaron® aramid fibres
- Ballistic grade UHMWPE fibres, including DSM Dyneema® and Honeywell Spectra Shield®

### Appliqué Armour

Lightweight add-on armour for enhanced ballistic protection Diamorph's appliqué armour is designed to be fitted to light or heavy military vehicles to enhance protection from ballistic threats up to STANAG Level 4.

In many cases it is used on AFVs where the existing vehicle hull does not offer sufficient protection. Diamorph's appliqué armour systems can be retrofitted to existing vehicles or supplied for new build vehicles at the design stage.

# Sectors



Sectors ↓



# Aerospace & Space

## Aerospace Engineering

Diamorph have a proud history of supplying into the aerospace sector, having done so for over 50 years. Our composite materials are used on a wide range of commercial passenger airliners including Airbus A320, Boeing 737 and Boeing 757, and continue to offer outstanding quality and reliability in one of the most safety critical and heavily regulated engineering industries.

Supported by our AS9100 accredited quality management system, the range of products designed and manufactured for this sector are selected by our customers to protect against damage caused by wear and impact, meeting demanding fire performance (FAR/CS25), while reducing weight, and meeting precision manufacturing tolerances.

Materials supplied include aramid phenolic FRP composites, epoxy and phenolic GRP laminates, and structural foams.

Cockpit Door Armour

Cockpit Window Frame

Cargo Bay Liners

Fuel Line Rib Clamps

Ballistic bulkhead protection

Composite hard fixing points



Sectors ↓

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 TUFNOL

 PERMALI

 RAILKO

# Automotive

## Automotive & Motorsport

Diamorph offer various high performance synthetic fibre reinforced Permaglass® composite sheet materials that are custom moulded to provide the high durability and lightweight performance needed for demanding automotive applications, while delivering strength to weight ratios that help vehicle designs reduce weight and improve efficiency. Every F1 design team uses Permaglass®.

The range of Tuftane® TPU solutions available offers designers a wide choice of properties from very soft, highly flexible grades to harder, stiffer options, with enhanced properties using specialty additive formulations. Grade options offer excellent abrasion wear, tear strength and puncture resistance, even at low temperatures, as well as outstanding environmental resistance to gases, ozone, water, oil and chemicals.

- NVH Engineering Components
- Drive-Dynamic Seat Systems
- Headliners and Interior Trim Components
- Slip Coats & Bearings
- Planks



Sectors ↓



# Electrical Energy

## Composites for Energy

Diamorph customers in the energy sector have benefited from the high performance capabilities of proven Permaglass® electrical insulation grades.

Permaglass® sheet grades offer halogen-free, fire retardant electrical insulation and resistance against arcing and tracking, with excellent mechanical properties, thermal insulation and easy machinability.

Diamorph's paper based phenolic, fine weave cotton epoxy, and woven glass epoxy grades all possess excellent dielectric strength in extremely demanding environments.

Tuftane® TPU Films are also recommended for Personal Protection Equipment.

Insulation Tubes

Standoff Insulators

Slot Wedges

Busbars Supports

Electrical Insulation Components

Transformer Panels

Arc Boxes & Insulation Barriers

Switch Gear Panels

Electromagnetic Motors / Rotating Machines

Gloves, Headwear and Safety Boots



Sectors ↓



# Heavy Machinery & General Engineering

## Wear Parts & Bearings

Diamorph's sliding wear pads give low friction, ease of movement and long life in equipment such as stacker trucks, container lifts and sliding booms.

The high abrasion resistance of Diamorph heavy equipment wear parts and bearings gives long life in arduous applications, such as stone crushers and graders.

Diamorph engineering bearings are also used in examples such as slaughtering machines, packaging equipment, escalators, and glass bottle cleaning equipment where they show long life with low wear rates which reduces operating cost.

Earth Moving Equipment

Lifting Equipment

Forestry Gripping Arms

Tunnel Boring Machines

Hydraulic Cylinders

Decanter Centrifuges

Crushers

Escalator Chains

Packaging Equipment

Food Processing Machines



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# Healthcare

## Polyurethane Film Solutions for Medical

Diamorph formulates and manufactures a wide variety of biocompatible Tuftane® thermoplastic polyurethane (TPU) films. Tuftane® Films are both flexible and elastomeric, with outstanding physical and mechanical properties. Diamorph's Tuftane® TPU films are specified in bio-medical products, protective apparel and medical device applications for the professional and consumer healthcare markets.

Tuftane® products are used as laminating films, transparent membranes, fabric protective liners, barrier films, functional surface treatments, puncture resistant transparent bags, inflatable bladders and many other applications.

- PPE
- Tourniquet Systems
- Breathable Bandages
- Compression Gel Pads
- Colostomy Bags
- Artificial Heart Components
- Bio-Medical Components
- Respirator Equipment
- Blood Plasma Bags
- Surgical gowns / drapes





Sectors ↓

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# Land, Sea & Air Defence

## Solutions for Defence

### Land Defence

Diamorph light weight passive anti-ballistic, spall and blast protection materials and systems. Appliqué armour panels, underfloor blast resistant armour and internal spall liner panels are all designed to NATO STANAG 4569 and AEP 55 standards.

### Sea Defence

Diamorph's proven ballistic and spall protection has been applied to produce naval composite armour systems. Composite stanchions have also been developed for quick release and manual or automated hydraulic drop-down systems, which can be deck or hull mounted.

### Air Defence

For air defence combat and transport military aircraft, Diamorph specialises in innovative, lightweight, high performance, anti-ballistic armour protection systems for helicopters and fixed wing aeroplanes.

Ballistic Protection

Appliqué Armour

Spall Liners

Stanchions

Dust Skirts

Flight Deck Nets

The science of protection.



Sectors ↓



# Marine

## Marine Bearings

FEROFORM and RAILKO are advanced engineering composite materials, exclusively manufactured by Diamorph, and are widely recognised as the industry standard for demanding applications such as stern tube, rudder and prop shaft bearings, steering gear, cranes, davits and many other applications. Fitted in over 8000 vessels worldwide, FEROFORM and RAILKO marine bearings offer ship owners, shipyards, designers and OEM's considerable benefits in terms of performance, reliability, ease of use, availability and design.

All of Diamorph resin based materials are unaffected by sea water and have a low swell rate which is very predictable so that they can be very precisely designed and the stress accurately calculated. The bearings are water-lubricated so there is no need for additional lubrication or 'environmentally un-friendly' oils to be used.

- Propeller Shaft Bearings
- Tanker Pads
- Rudder Bearing / Steering Gear
- Deck Equipment
- Insulation Sleeves
- Feroball® Bearings
- Stern Bearings
- Prop Shafts
- Stern Tubes Bearings
- Bow Thruster Bearings
- Stave Bearings



Sectors ↓



# Mining

## Ferobide in Mining

Ferobide is a reliable solution for protecting mining wear parts during difficult open pit or underground mining operations. Ferobide is trusted across the globe to help users by minimising equipment downtime, reducing costs by preventing mining wear part damage and extending service life to deliver long-lasting results.

Ferobide is the ideal protection for mining operations which depend on wear-resistant linings that are used in chutes, buckets, conveyors, augers, dumpers and more. Being extremely wear-resistant, Ferobide is an optimal choice for reinforcing hard-wearing areas of larger systems to reach a balanced life.

- Mixer paddles and scrapers
- Chutes
- Decanter Centrifuge Flights
- Mill Liners
- Rippers, ploughs and drills
- Chain Conveyors
- Fan blade and housing liners
- Guide Rails and Pads
- Hammers
- Screw Conveyors
- Buckets and dump truck bodies



Sectors ↓



# Offshore, Hydro & Renewable Energies

## Bearings & Wear Parts

Diamorph have worked in many oil & gas applications where high performance and complete reliability are of the utmost importance. Diamorph grades are well suited to these harsh environments as decades of experience has proven the success of Diamorph engineering composites.

Our composite materials are heavy duty, wear resistant, impact resistant, have a high compressive strength and last longer, ensuring little maintenance is required in a challenging environment.

Diamorph materials are chemically resistant, offer excellent abrasion resistance, and can efficiently operate in dirty or sandy water, removing the need for costly water filtration packages. This makes them ideal for the Hydro sector.

Other applications include sliding pads and bushes in wind turbines.

Guard Rail & Safety Nets

Davit, sheave & winch bushes

Anchor Chain Guide Bushes

Lifeboat release bearings

Cylinder rod end bushes

Riser, Turret & Mooring Pads

Hydro Turbine Bearings

Turbine Shaft Bearings

Sliding Pads

Wind Turbine Bushes



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# Pumps & Valves

## High Performance Bearings

Diamorph composites are used as bushes, neck rings, wear rings, and thrust plates in pumps conveying all manner of fluids. The materials have low coefficient of friction and high abrasion resistance giving long life performance, and chemical resistance. FEROFORM T127 bushes are used in vertical turbine pumps for the seawater lift and cooling pumps for power stations. Other applications include horizontal pumps and centrifugal pumps.

FEROFORM T127 is particularly suited for the bearings for vertical pumps where it can run dry at start up on the top bearings. Railko RG2 and Railko RG12 are used for the thrust plates and bearings of vertical pumps due to their strength and resistance to heat. FEROFORM PR18 is used for mainline shaft bearings in water lubricated pumps as a superior alternative to rubber bearings, offering superb wear resistance, improved pump performance and reliability as well as reducing stick slip.

Axial Piston Pumps

Rotor Vanes

Valve Bearings

Pump Bearings



Sectors ↓



# Physical Security

## Unrivalled Angle Grinder Resistance

Ferosafe was developed from the Ferobide material platform that has proven itself in arduous wear applications, but with added increased resistance to cutting and drilling. It is the next generation material for defending security products from physical threats.

Ferosafe is a weldable composite material that effectively resists high power angle grinders and drills at lower thicknesses and weights than what is possible with conventional materials. The material is therefore well suited to increase security performance on safes, locks and any other security devices without increasing weight or altering overall dimensions.

Being weldable with standard welding equipment ensures a high degree of flexibility, cost efficient manufacturing and secure fastening with no specialist training required.

- Safes
- Security Doors
- Container Lockboxes
- ATMs
- Car Security
- Secure Storage
- Bike Locks



Sectors ↓



# Rail

## Freight, Passenger & Light Rail Solutions

Diamorph offers bearings and wear components to a wide variety of rail industries.

Our Fabric Laminates are primarily used in Passenger Rail applications. Due to the exceptional electrical insulation properties of the material, it is also perfect for railway infrastructure and track insulation.

Diamorph's RAILKO material is particularly suited to Freight and Passenger Rail Bogie applications. The durable nature of the material makes it an excellent choice for bushes, bearings and Centre Pivot Liners, decreasing maintenance intervals and increasing longevity.

Permaglass® solid laminate sheet are specified for demanding safety critical applications on rolling stock. Developed to meet the highest standards in fire and arc protection for current collection systems for underground and overground passenger trains.

Freight Components

High Speed Rail Components

Commuter Rail Components

Metro, Tram & Light Rail Components

Insulating shoe beams and arc shields

Contact us

Starting a new project or  
want to collaborate with  
us? Let's talk!

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