ESSPEE

Product Catalogue

ESSPEE ...the home of resistant materials

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WELCOME TO ESSPEE

...the home of resistant materials

Welcome to 'The Home of Resistant Materials' Product Catalogue which contains the most extensive range of resistant materials available from any single source.

Products and Services

As you would expect from a company regarded as "best in class" we offer you the customer, a choice of outstanding products from the Worlds' leading manufacturers whilst also offering our own brand, value equivalents. In addition to our extensive product range, we offer a wide array of additional services:

Manual and CNC Machining... comprehensive machining facilities including slitting, cutting, bending, pressing, punching, drilling, milling and turning.

Bonding, Varnishing and Painting... a variety of size and pressure pneumatic press beds as well as a continuous coating line and spray booth for varnishing and painting.

Casting, Molding and Isostatic Pressing... casting and pressing facilities to cast near net/finished shapes or mould raw dry powder and dough mould materials.

Fabrication... many of the parts produced by Esspee are integrated into modules or sub-systems such as coil boxes, pipe supports and burner assemblies.

Breakdown Service... As you would expect, being the market leader we aim to out-perform all other providers; and we do. Esspee offers a unique 365 day breakdown service providing you with total peace of mind.

Sales Orders, Technical Support and General Contact

We provide a multitude of ways in which you can contact us, including our website messaging service, Facebook Page, Twitter, or more traditional methods (all of which are listed below).

Alternatively, you can always fax, write, or even call in for a coffee.

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Methods of Payment

On Account, Mastercard, Visa, Western Union, Paypal, Worldpay, Cheque or Cash.

COMPANY STATEMENTS

Environmental Statement

The Environmental Policy of Esspee is to ensure (so far as it is reasonably practicable) that its operations will be carried out with a commitment to protecting and enhancing the environment.

The Management of the Company recognises that our activities have an environmental impact and in developing this policy we seek to confirm our commitment to manage environmental issues properly.

This policy has the full support of the Directors. In implementing this commitment to manage our environmental impact properly we will:

- Fully comply with environmental regulations
- Ensure that environmental considerations are integrated into our business decisions
- Ensure that we use risk assessments in order to identify potential environmental risks to our businesses
- Actively pursue opportunities to minimise the environmental impact of our operations, concentrating particularly on the use of energy, waste disposal, and water discharges
- Attempt to develop a wider understanding of environmental issues among our suppliers and employees
- Regularly review our policies to ensure that they remain properly aligned to the need to reduce waste and encourage the most effective utilisation of scarce resources
- Responsibility for implementing this Environmental Policy Statement rests with the Directors

This Environmental Policy Statement will be regularly reviewed and updated as necessary. The management team endorses these policy statements and is fully committed to their implementation.

Mission Statement

We will build a unique portfolio of Resistant Materials and in doing so will strive to surpass our competitors in quality, innovation and value.

We commit to always remain focused on delivering the outstanding quality and service expected from our customers.

Quality Statement

We are committed to providing services and products which meet or exceed our customers' requirements. In order to do so we comply with ISO9001:2008.

Our internal quality management system defines our working procedures and processes which in turn illustrates our commitment to providing quality and excellence in all areas of our company.

We operate a system that regularly evaluates its processes and customer needs. We set quantifiable objectives with plans in place to give continuous improvement of products and services whilst addressing all current and applicable legislation.

The above statements have been approved & authorised by:

Greg Smith
Chairman

ISOQAR QUALITY ASSURED ISO 9001

UKAS QUALITY MANAGEMENT 026

FOREWORD

As market leaders in the field of resistant materials we are proud to present our catalogue of products.

We believe this catalogue contains the most comprehensive range of resistant materials available from any single source. We match this by providing you the customer with excellent service, outstanding technical support and unbeatable machining expertise, delivered through our global distribution network.

Should you require further technical assistance or sales support, please contact us and we will be pleased to help.

Mica
MUSCOVITE & PHLOGOPITE

Mica products come in two basic forms, Phlogopite and Muscovite. Muscovite Mica materials operate up to a maximum temperature of 500˚C whilst the Phlogopite grades operate up to 700˚C.

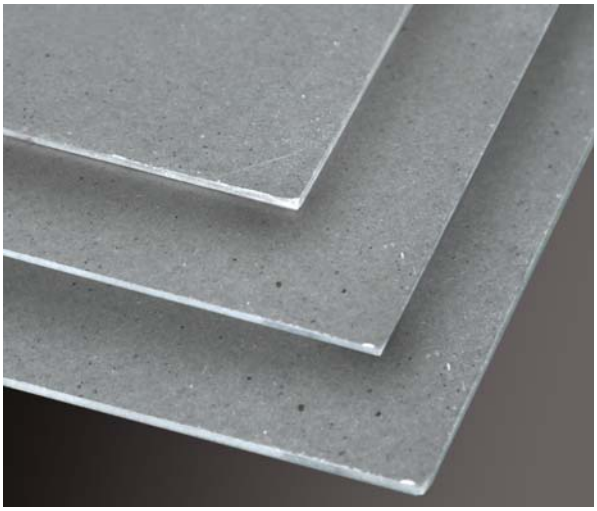
Both grades can be supplied in sheet or paper formats. From these formats we can manufacture tubes and rods or machined shapes. Furthermore, where flexibility is required, both products are available.

These flexible sheets can also be bonded to RCF or RCF Free High Temperature Paper to provide a flexible high temperature insulating material.

In sheet form the mica base is bonded using high temperature resins which typically operate up to a maximum of 300˚C and burn out at higher temperatures leaving the Mica in situ.

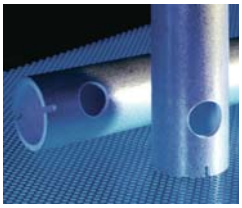
Other benefits include:

- Excellent thermal insulation properties
- Low moisture absorption
- High strength
- Excellent compressive strength
- Excellent electrical insulation properties



USED IN

- Platen Press Insulation
- Thermal Barriers
- Coil Insulation
- Separators
- Switchgear Insulators
- Element Plates
- Isolators



Typical Composition

- Integrated Muscovite or Phlogopite Mica Paper (approx 70-90% by weight)
- Silicone Resin Binders, polymerised under pressure and temperature (approx 10%)
- Retained Solvent < 0.5%
- Woven Glass Cloth, Non-Woven Glass Mat, Bio-Soluble Silica Magnesia Paper, Mineral Wool Paper

KEY DATA

	COLOUR	DENSITY	MAX CONTINUOUS	THERMAL CONDUCTIVITY	COMPRESSIVE STRENGTH @ 200˚C	TENSILE STRENGTH	FLEXURAL STRENGTH
		Kg/m^3	˚C	W/mK	MPa	MPa	MPa
MUSCOVITE	Silver/Grey	2150	500	0.30	250	150	230
PHLOGOPITE	Grey/Green	2300	700	0.30	240	110	170
FLEXIBLE	Silver/Grey	1850	500	0.40	–	–	–
FIBROUS	Grey/White	450	1150	0.10	–	–	–

	WATER ABSORPTION 24hr/23˚C	DIELECTRIC STRENGTH 400˚C/1 hour	TRACKING RESISTANCE	VOLUME RESISTIVITY @ 400˚C	DIELECTRIC LOSS 160˚C	RELATIVE PERMITTIVITY	ARC RESISTANCE
	%	kV/mm	V	Ω/cm	%	400˚C	L3
MUSCOVITE	<1	13	500	>10^{12}	<1	7	2.2.1.0
PHLOGOPITE	<1	13	525	>10^{12}	<1	6.5	2.2.1.0
FLEXIBLE	–	5	–	–	–	–	–
FIBROUS	–	7	–	–	–	–	–

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

SINDANYO®
H91 & L21

Sindanyo® H91 and L21 are portland cement based insulation materials that have been formulated to provide a long campaign life in demanding thermal and electrical applications, where high strength in a machined format is required.

Both products are asbestos free, have good insulation properties and are non-combustible.

H91 & L21 have low thermal conductivity which ensures consistent thermal performance.

Sindanyo® products have good compressive and mechanical strength which is retained when operating towards their maximum service temperatures.

Both grades also have very good impact resistance and toughness and can be easily cut, threaded and machined to make intricate parts.

Other benefits include:

- Asbestos free
- Resistant to most acids/alkalis
- Machinable
- Easily threaded or tapped
- Good wear resistance
- High compressive strength
- Electrically insulating

USED IN

- Top Plates
- End Boards
- Arc Chutes
- Coil Supports
- Brazing and Soldering Plates
- Muffle Plates
- Grippers
- Dead Plates
- Terminal Covers

Typical Composition

- Wollastonite,
- Ordinary Portland Cement (OPC)
- Crystalline Silica
- Quartz
- Glass

KEY DATA

GRADE		H91	L21
DENSITY	kg/m^3	1750	2000
STRENGTH			
Flexural	MPa	13	20
Compressive 24hrs @ 700°C	MPa	37	
MAXIMUM SERVICE TEMPERATURE	°C	700	230
THERMAL CONDUCTIVITY @ 750°C	W/mK	0.5	0.5
ELECTRICAL STRENGTH 90°C in air	kV/mm	2.81	1.7
SURFACE BREAKDOWN 90°C in air	kV	15	

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Transite® HT
CEMENT BOARD

Transite® HT is a portland cement based product reinforced with selected fibres. The material has been developed to exhibit excellent load bearing and mechanical strength. The board is heat treated after manufacture to minimise shrinkage, is non-combustible and asbestos free.

Transite® HT offers good impact resistance and all-round toughness and is a good replacement for asbestos cement based products. To reduce moisture ingress the material can be supplied with a silicone coating.

Other benefits include:

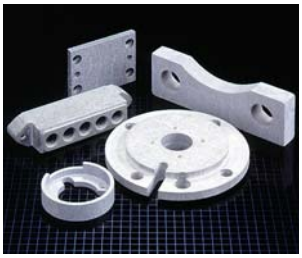
- Asbestos free
- Operates above 500˚C
- Wear resistant
- Resistant to most acids and alkalis
- Good electrical properties
- Mechanically strong

Typical Composition

- Wollastonite,
- Ordinary Portland Cement (OPC)
- Crystalline Silica
- Quartz
- Glass

USED IN

- Base Plates
- Top Plates
- End Boards
- Coil Supports
- Brazing/Soldering Plates
- Muffle Plates
- Support Plates/Rods and Guides
- Grippers/Stops/Pads



KEY DATA

DENSITY Kg/m³	THERMAL CONDUCTIVITY @ 121˚C W/mK	MAX CONTINUOUS ˚C	FLEX STRENGTH @ 100˚C Mpa	SHRINKAGE @ 500˚C %	COMPRESSIVE STRENGTH Kg/cm2
1602	0.34	500	29	0.85	731

MODULUS OF RUPTURE	VOLUME RESISTIVITY	SURFACE RESISTIVITY	ARC RESISTANCE	DIELECTRIC STRENGTH
dry kg/cm²	Ω/cm (ASTM D 257)	Ω/cm (ASTM D 257)	Seconds (ASTM D 495)	volts/mil (ASTM D 495)
183	7.1×10^{10}	7.0×10^{10}	260	35

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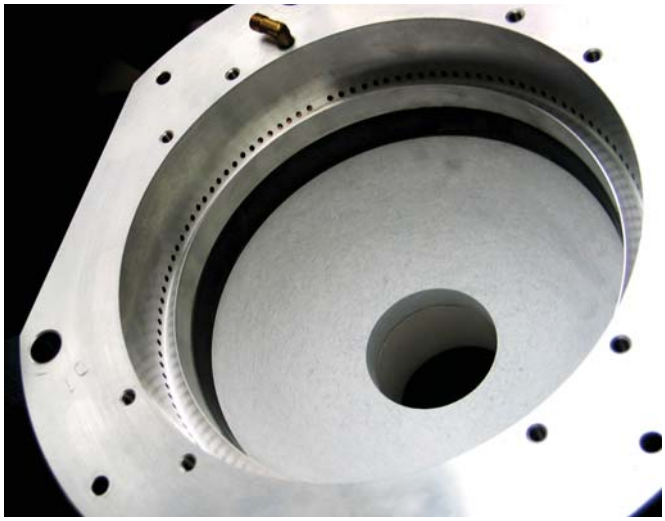
Calcast®
CC100

CALCAST® is a high performance technical ceramic board manufactured from Calcium Silicate.

The non-wetting properties of CALCAST® are ideally suited for use in direct contact with non-ferrous molten metal applications. The higher density grade exhibits extremely low shrinkage – ideal for use in applications which require the product to retain its dimensional integrity.

Densities range from 850kg/m^3 through to 1050kg/m^3 with operating temperatures ranging from 850˚C to 1000˚C, CALCAST® is machined to bespoke shapes in our fully automated CNC shop.

CALCAST® is typically used for applications such as launder sections, troughs, dams, skim-dams, sprue bushes, intermediate tubes, nozzles, down-spouts, plugging sticks, hot-top rings and transition rings. CALCAST® is also ideally suited as a hot-face lining for holding furnaces and as an insulator in various heat treatment equipment.



USED IN

- **Hot Face Lining for direct contact with Molten Aluminum in Dosing/Holding Furnaces**
- **Launders/Troughs**
- **Aluminium Consumables such as Floats, Spouts and Transition Plates**
- **Back-up Insulation for Kilns and Furnaces**
- **Oven and Dryer Shelving**

Other benefits include:

- Non wetting to molten aluminium
- High strength
- Excellent insulation properties
- Energy efficient
- Long lasting
- Machinable

Typical Composition

Non-wetting to most non-ferrous molten metals.

High chemical stability in alkaline media. Reactive in acid media.

- Calcium Silicate - Hydrate
- Wollastonite

KEY DATA

GRADE		CC100	CC150	CC350	CC450
DENSITY	kg/m^3	860	1040	1050	950
STRENGTH					
Flexural	MPa	7	10	13	15
Compressive	MPa	14	20	28	27
HARDNESS	Shore D	55	66	70	65
MAXIMUM SERVICE TEMPERATURE	˚C	1000	1000	1000	1000
SHRINKAGE – (Linear - Width/Thickness) @ 750˚C for 12hrs	%	0.2/0.6	0.05/0.2	0.25/0.8	0.1/0.6
THERMAL CONDUCTIVITY @ 800˚C	W/mK	0.28	0.29	0.29	0.28

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Caltherm
CARBON REINFORCED CALSIL

Caltherm is a carbon-fibre reinforced calcium silicate that has been specifically designed for use in the aluminium smelting/re-melting industry.

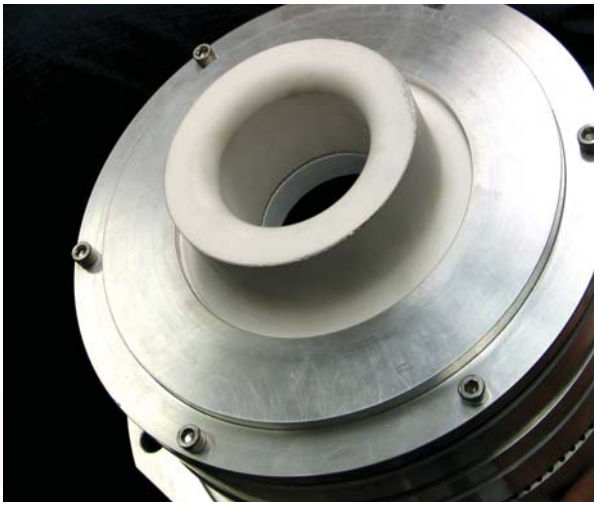
Non-wetting and mechanically strong, Caltherm is highly resistant to thermal shock and exhibits low shrinkage. Caltherm is the material of choice for use as transition rings, hot-top headers and spouts.

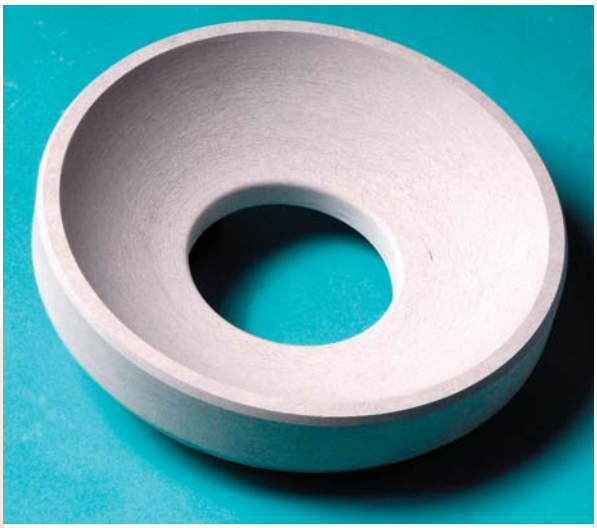
The material is heat treated during the manufacturing process to reduce shrinkage in operation. The carbon fibre reinforcement provides increased strength to ensure the materials tensile and shear strength is much greater than other typical calcium silicate products.

Caltherm is an ideal material for the production of close tolerance machined shapes with high edge definition. Furthermore, its non-wetting characteristics, excellent compressive and flexural strength make it the ideal material for aluminium casting processes.

Other benefits include:

- Excellent thermal shock resistance
- Non-wetting to molten aluminium
- Low shrinkage
- Maximum operating temperature 850˚C
- Machinable to close tolerances





USED IN

- **Holding Furnace Linings**
- **Spouts/Dip Tubes/Stopper Pins**
- **Transition Rings**
- **Hot-Top Heads**
- **Launders & Launder Lids**

Typical Composition

- Calcium Silicate - Hydrate
- Wollastonite
- Carbon Fibres
- Ferric Oxide
- Viscose
- Crystalline Silica

KEY DATA

DENSITY	kg/m^3	814
STRENGTH		
Compressive	N/cm^2	995
MAXIMUM SERVICE TEMPERATURE	˚C	850
SHRINKAGE – Linear @ 750˚C for 24hrs	%	0.19
THERMAL CONDUCTIVITY @ 400˚C	W/mK	0.14

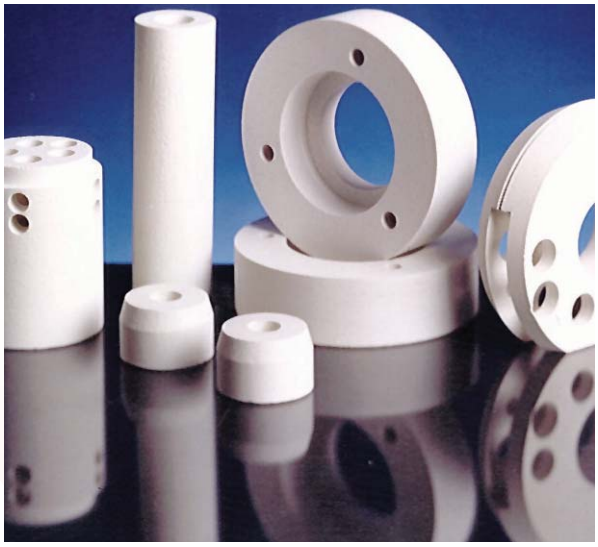
The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Monalite®
M1 & M1A

As an industry standard product within the aluminium industry, MONALITE® M1 is used for the containment and flow control of molten aluminium as well as machined consumable components such as floats, spouts and stopper pins.

MONALITE® M1A is a low shrinkage material ideal for launders, holding tanks, spouts and transition plates.

MONALITE® is formulated without the use of asbestos fibres, is thermally insulating, non-wetting and has excellent low shrinkage properties. With service temperatures of 850˚C or 1000˚C depending on the grade, MONALITE® exhibits low thermal conductivity/thermal capacity and is extremely resistant to thermal shock.



Other benefits include:

- Excellent thermal shock resistance
- Non-wetting to molten aluminium
- Low shrinkage
- Machinable to close tolerances
- High definition machined finish

USED IN

- **Feeder Tips**
- **Floats**
- **Spouts/Dip Tubes**
- **Stopper Pins**
- **Transition Rings**
- **Launders & Holding Furnaces**
- **Oven Shelving**

KEY DATA

GRADE		M1	M1A
DENSITY	kg/m^3	850	970
STRENGTH			
Flexural	MPa	8	10
Compressive	MPa	14	20
HARDNESS	Shore D	60	65
MAXIMUM SERVICE TEMPERATURE	˚C	850	1000
SHRINKAGE – Linear @ 750˚C for 12hrs	%	0.10	0.02
THERMAL CONDUCTIVITY @ 750˚C	W/mK	0.26	0.27
LOSS ON IGNITION	%	3.1	2.7

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Typical Composition

Non-wetting to most non-ferrous molten metals.

High chemical stability in alkaline media. Reactive in acid media.

- Calcium Silicate - Hydrate
- Wollastonite

Monolux®
500 & 800

MONOLUX® 500 and 800 are low thermal conductivity, rigid calcium silicate based insulation materials. The materials are formulated without asbestos and mineral fibres and can be machined to close tolerances. With low shrinkage and good strength, the materials provide effective and stable insulation solutions for a wide range of demanding industrial applications.

With a typical flexible strength of 10MPa, MONOLUX® 800 is a versatile engineering material for arduous use where mechanical and compressive strength is required.

MONOLUX® 500 has excellent rigidity and low thermal conductivity which ensures excellent thermal efficiency when used as a single insulating skin in industrial ovens and dryers.

MONOLUX® 500 and 800 are rigid machinable insulation boards for use as a thermal breaks in a wide range of thermal and engineering applications as well as being commonly used as single skin insulation for ovens and dryers.

The 500 grade is also used as an industry standard for pipe supports within power stations and petro-chemical environments.

MONOLUX® 800 is used in more demanding mechanical applications and is widely used as thermal insulation for use in platen presses and industrial dryers.

Conditioning

All products should be adequately dried and conditioned prior to use at elevated temperatures.

USED IN

- Heat Shields
- Oven and Dryer Lining and Shelving
- Load Bearing Pipe Supports
- Platen Press Insulation
- Thermal Breaks
- Baffle Plates
- Ducts and Trunking

Typical Composition

Monolux® is resistant to most common alkalis and solvents and can be treated to provide increased durability.

- Calcium Silicate – Hydrate
- Wollastonite
- Cellulose
- Vermiculite

Other benefits include:

- Asbestos and ceramic fibre free
- Non-combustible to BS476 Pt 4 1990
- Moisture resistant
- Low thermal conductivity
- Machinable
- High compressive strength

KEY DATA

GRADE		500	800	NOTES
DENSITY	kg/m3	750	920	
STRENGTH				
Flexural	MPa	4.5	6.5	
Compressive	MPa	13.4	27.2	@ 10% compaction
MAXIMUM SERVICE TEMPERATURE	˚C	500	800	
THERMAL CONDUCTIVITY @ 200˚C	W/mK	0.19	0.30	
SHRINKAGE – Linear	%	0.29	0.40	@ 500˚C/800˚C, 4 hrs

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Duratec® XP

Duratec® XP is an advanced high temperature material developed to provide 'near plastic' flexural performance under high temperature conditions. The material is also ideal for use in electrical applications as it is electrically inert.

With outstanding compressive and flexural strength, Duratec® XP is one of only a handful of materials available today with the characteristics to operate in a similar manner to plastic but at elevated temperatures.

Other benefits include:

- Machinable
- Near 'plastic' performance
- Excellent flexural strength
- High electrical resistance
- Electrically inert
- Good physical and mechanical properties
- Good thermal and electrical insulation properties
- Thermally resistant to 600°C

KEY DATA

COMPRESSIVE STRENGTH	(MPa)		> 100
FLEXURAL STRENGTH (MPa)		≤15mm	> 40
		25mm	> 28
MODULUS OF ELASTICITY	(GPa)		4.5
NOMINAL DENSITY	(kg/m³)		1800
HARDNESS (SHORE D)			90
TOUGHNESS	(kJ/m²)	6mm	120
		25mm	70
MAXIMUM SERVICE TEMPERATURE	(°C)		600
		UNITS	**DATA**
FLATWISE ELECTRICAL STRENGTH		kV/mm	1.8
DIN EN 60243-1 (VDE 0303 part 21):1999-03			
ARC RESISTANCE		s	> 420
(Stage 40: 40 mA)			
DIN EN 61621 (VDE 0303 Part 71): 1999 - 01			
VOLUME RESISTIVITY	25°C	Ω/cm	5.2 x 1012
DIN IEC 60093 (VDE 0303 Part 30): 1980-12	600°C	Ω/cm	1.2 x 10 8
SURFACE RESISTIVITY	25°C	Ω	2.4 x 10 13
DIN IEC 60093 (VDE 0303 Part 30): 1980-12	600°C	Ω	2.1 x 10 9
DISSIPATION FACTOR	25°C		0.094
VDE 0303 Part 4: 1969-12 (DIN IEC 60093)			
RELATIVE PERMITTIVITY	25°C		4.05
VDE 0303 Part 4: 1969-12 (DIN IEC 60093)			
COMPARATIVE TRACKING INDEX			600
DIN EN 60112 (VDE 0303 Part 1): 2003-11			
FLAMMABILITY	Material classification:		FH1
DIN EN 60707 (VDE 0304 Part 3): 1999-12			

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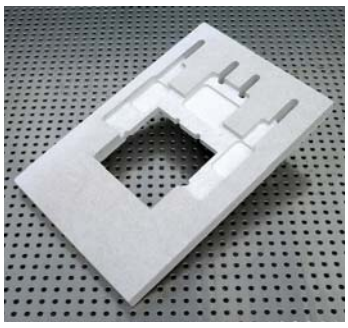
USED IN

- Top Plates
- End Boards
- Coil Supports
- Electrical Insulation
- Arc Chutes

Typical Composition

Duratec XP® is a composite board manufactured from Glass Fibre and reinforced Calcium Silicate.

- Calcium Silicate
- Calcium Aluminate
- Glass Fibre Mat



Duratec®
750 & 1000

Duratec is a non-asbestos, dense calcium silicate based engineering board. Available in 750 and 1000 grades, it exhibits good thermal stability, low shrinkage and excellent mechanical and electrical properties. The 750 grade has been formulated to provide higher strength characteristics and offers improved electrical performance and arc resistance at elevated temperatures.

Both grades can be machined to a high definition and close toleranced finish, allowing for the creation of complex machined components. Where operating as an electrical insulator it is recommended the finished shape is sealed with a high temperature silicate solution to prevent moisture ingress.

Other benefits include:

- Maximum service temperature 1000˚C
- High compressive strength
- Asbestos and ceramic fibre free
- Low out-gassing in vacuum conditions
- Good arc resistance and anti-tracking properties
- Machinable

Typical Composition

- Calcium Silicate – Hydrate
- Wollastonite
- Cellulose

USED IN

- **Induction Furnace Casings**
- **End Plates**
- **Foundry Core Plates**
- **Soldering, Brazing and Welding Jigs**
- **Electrical Insulation Components**
- **Element Supports**
- **Arc Chutes**

KEY DATA

GRADE		750	1000
DENSITY	kg/m^3	1400	1400
STRENGTH			
Flexural	MPa	23	16
Compressive	MPa	55	31
MAXIMUM SERVICE TEMPERATURE	˚C	1000	1000
THERMAL CONDUCTIVITY @ 750˚C	W/mK	0.49	0.37
SHRINKAGE @ 750˚C (length, width/thickness)	%	0.14/1.1	0.12/0.8
LOSS ON IGNITION	%	7.3	5.3
FLATWISE ELECTRICAL STRENGTH	kV/m	7300	4700
ARC RESISTANCE	Stage 40 (40 mA)	>420 seconds	>420 seconds
VOLUME RESISTIVITY @25˚C	Ω/cm	9.0 x 10^{10}	7.5 x 10^{10}
SURFACE RESISTIVITY @25˚C	Ω	10.0 x 10^{10}	4.1 x 10^{10}
RELATIVE RESISTIVITY @25˚C		7.6	4.7
DISSIPATION FACTOR @25˚C		250	640
COMPARATIVE TRACKING INDEX		>500	600

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Calcium Silicate
800, 1000 & 1100

Calcium Silicate is a non-asbestos lightweight material available in sheet, pipe-section or machined formats. Having a low density, Calcium Silicate exhibits excellent thermal insulation properties together with good machinability and handling characteristics.

Its relatively low shrinkage makes it ideal for use as secondary or back-up insulation in high temperature applications such as furnace and launder linings. Similarly, it is well suited as an insulator in insulating lids and pipe supports.

Calcium Silicate is dusty by nature. To reduce dust, the material can be coated with a Sodium Silicate solution before using. When being machined, Calcium Silicate gives off large amounts of dust; suitable extraction equipment and protective clothing should be used.

Other benefits include:

- Lightweight
- Low thermal conductivity
- Low shrinkage
- Excellent machinability
- Non-asbestos

Typical Composition

Autoclaved Calcium Silicate board, reinforced with Cellulose Fibres.

- Calcium Silicate
- Cellulose Fibres

USED IN

- **Steel Industry**
- **Petrochemical**
- **Furnace Back-Up Lining**
- **Food/Brewing Industry**
- **Pipe Insulation/Supports**
- **Secondary Insulation**

KEY DATA

GRADE		800	1000	1100	Notes.
DENSITY	kg/m^3	245	290	285	
STRENGTH					
Flexural	MPa	0.7	0.85	0.85	
Compressive	MPa	1.3	1.5	1.7	@ 10% compaction
MAXIMUM SERVICE TEMPERATURE	˚C	800	1000	1100	
SHRINKAGE – Linear	% @ temp	>2 @ 800	>2 @ 1000	>2 @ 1000	
THERMAL CONDUCTIVITY	W/mK	0.17	0.17	0.18	@ 800˚C

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Graphite & Carbon COMPONENTS

Esspee supply both Carbon and Graphite based products in sheet, felt, tape and machined component formats.

The sheet, vacuum formed or machined range of materials can operate at temperatures of up to 2700˚C and are ideal for use in hot zone applications.

Other benefits include:

- High definition machined edges
- Excellent high temperature characteristics
- Excellent resistance to molten metals
- Long life
- Consistent performance

Typical applications include:

- Vacuum heat treatment
- Vacuum brazing
- Hard metal sintering
- Carbon fibre production
- Silicon wafer manufacture

Metal Processing Applications

- Crucibles
- Rotors and shafts for degassing units
- Molten metal pumps
- Casting rings for billets and moulds
- Continuous casting dies

Typical Composition

- Carbon
- Carbon-Graphite
- Graphite

USED IN

- Scrapers
- Dams
- Sleeves
- Liners
- Paddles
- Bearings
- Pumps

KEY DATA

Due to the extensive range of material grades, technical data is available upon request

Zircar
RSLE57, RS1200 & RS100

RSLE57 is manufactured by utilising a silica matrix composite which means the board has exceptional strength and low expansion properties.

The material works exceptionally well in induction hot press applications and will work up to 1100˚C continuously. The combination of a high density and low expansion ensures the RSLE 57 has superior thermal shock resistance compared to traditional ceramic matrix based materials.

RSLE57 is also 'non-wetting' when in contact with molten aluminium which makes the material ideal for a number of contact applications for aluminium transfer. In addition to the boards' excellent performance in demanding applications, it is also completely 'RCF' free and can be machined to bespoke parts with very close tolerances.

RS1200 and RS100 are manufactured by combining structural alumina with reinforced ceramic fibre. Both products have high flexural and compressive strength comparative to that of silicone and epoxy based engineering plastics. With a maximum operating temperature of 1260˚C and mechanical properties that exceed both asbestos, calcium silicate and cement based boards, RS1200 and RS100 are also non-combustible and completely inorganic. When heated, both products demonstrate very little or no out-gassing combined with excellent impact resistance.

Performance

- High temperature resistance
- Strength at high temperatures
- Very good electrical properties
- High impact and flexural strength
- Asbestos and RCF free
- Non-combustible

USED IN

RS100 & 1200

- Oven Shelving
- Brazing Fixtures
- Coil Plates
- Element Supports
- Terminal Blocks
- Top and Bottom Plates for Induction Furnaces

RSLE57

- Coil Posts
- Insulation Plates
- Coil Liners
- Troughs
- Terminal Blocks
- Glass Pushers
- Top and Bottom Plates for Induction furnaces

KEY DATA

GRADE		RS100	RS1200	RSLE57
DENSITY	kg/m3	2100	2160	2100
POROSITY	%	35	31	31
MAXIMUM SERVICE TEMPERATURE	˚C	1260	1300	
MODULUS OF RUPTURE	MPa	55	31	30
STRENGTH				
Compressive	MPa	69	55	48
LOSS ON IGNITION @ 982 ˚C	%	1-2	1-2	
THERMAL CONDUCTIVITY @ 200˚C	W/mK	0.634	0.62	0.55
SHRINKAGE – Linear @ 1200˚C, 4 hrs	%	1-2	0.7	4.9
VOLUME RESISTIVITY	Ω/cm	7.2×10^{11}	7.2×10^{11}	7.5×10^{9}
SURFACE RESISTANCE	Ω	2.3×10^{11}	2.3×10^{11}	
DIELECTRIC STRENGTH	Volts/mil	71	71	43

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Typical Composition

- Aluminum Oxide
- Silica (Amorphous)
- Calcium Oxide
- Boron Oxide
- Magnesium Oxide

Zircar
RS101 & RS201

RS101 and RS201 cylinders are also manufactured by combining structural alumina with reinforced ceramic fibre, giving a maximum service temperature of 1260˚C.

In cylindrical form the products offer high flexural strength, good electrical insulating properties and moderate thermal conductivity. As with the RS100 and RS1200, their performance will exceed that of conventional asbestos, calcium silicate and cement based products. With high alumina content, they are exceptionally resistant to molten aluminium and exhibit little or no out-gassing on heating. In cylinder form the materials retain their flexural and compressive strength and are readily machinable.

Other benefits include:

- Asbestos free
- Bespoke and stock sizes
- Machinable (producing tight tolerances)
- High strength

USED IN

- **Aluminium Casting**
- **Induction Coil Liners**
- **Thermal and Electrical Insulation**
- **General High Temperature Engineering**

Typical Composition

- Aluminum Oxide
- Silica (Amorphous)
- Calcium Oxide
- Boron Oxide
- Magnesium Oxide

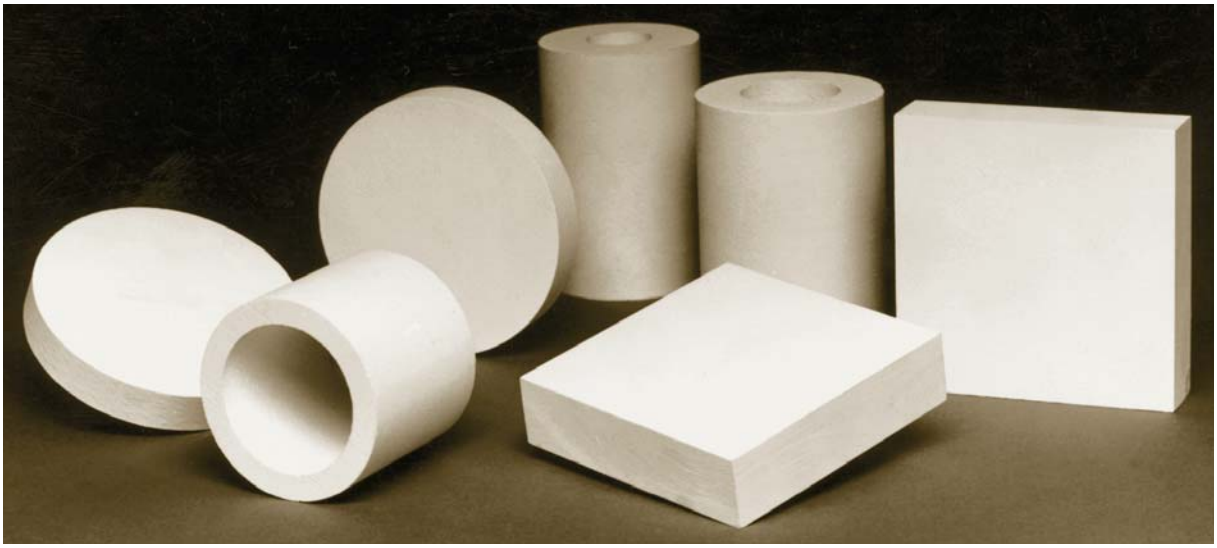
KEY DATA

	COLOUR	DENSITY	MAX CONTINUOUS	MELTING POINT	THERMAL CONDUCTIVITY	SHRINKAGE 24hrs @ 1000˚C
		Kg/m^3	˚C	˚C	@ 1000˚C	%
RS-101	White/Buff	1600	1260	1500	0.47	<1
RS-201	White/Buff	2080	1260	1500	0.55	<1

	COMPRESSIVE STRENGTH	THERMAL EXPANSION	MODULUS OF RUPTURE	DIELECTRIC STRENGTH	VOLUME RESISTIVITY	SURFACE RESISTIVITY
	MPa	˚C	@ 20˚C MPa	volts/mil	Ω/cm	Ω
RS-101	13	8x10^6	16.5	55	7.2x10^{11}	2.3x10^{11}
RS-201	13	8x10^6	16.5	26	1.7x10^{12}	1.3x10^{13}

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Zircar
DD & DM MOLDABLES



Zircar DD and DM

DD & DM are supplied in a thin sheet and are manufactured using high purity structural alumina that is reinforced with a high alumina ceramic fibre.

Zircar DD

DD (initially) is a rigid sheet which when moistened with water becomes a high strength and high temperature moldable. This product is ideally suited to insulate and protect areas that are hard to access where machined parts cannot be used. When formed and dried, the material retains all of its key characteristics.

Zircar DM

DM is another moldable with a higher density than DD and is ideal for forming extremely intricate and complex shapes. As with the DD, the DM retains all of its key operating characteristics after drying.

Other benefits include:

- High strength and high temperature
- Tool and hand moldable
- Machinable

USED IN

- **Asbestos Replacement**
- **Induction Coil Liners and Fixtures**
- **Gasketing**
- **Non-Ferrous Metal Handling**
- **Hot Furnace Repairs**

Typical Composition

- Aluminum Oxide
- Silica (Amorphous)
- Refractory Ceramic Fibre (RCF)
- Organic Binder

KEY DATA

	COLOUR	FORMAT	SHRINKAGE	DENSITY	MAX TEMPERATURE
			%	kg/m^3	℃
DD	White	Rigid	n/a	1300	1200
DM	White	Moldable	10	1400	1200

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Vermiculite
BLOCK & BOARD

Vermiculite is a non-combustible fire resistant material that is supplied in a variety of sheet sizes as well as brick form.

It has excellent insulation properties, high thermal shock resistance whilst retaining its mechanical strength when working at high temperatures. The boards and bricks are pressed and moulded to ensure exact tolerances.

Vermiculite is organic, asbestos-free and is manufactured using an aluminium-magnesium layer silicate, which is combined with lightweight granules during a heating process. Vermiculite can be cut, drilled and machined with wood working tools.

Other benefits include:

- High temperature
- Machinable
- Non-combustible

USED IN

- Night Storage Heaters
- Hearths
- Boilers
- Vessels and Tanks
- Wood Burning Stoves
- Domestic Fire Places

Typical Composition

Vermiculite is manufactured from exfoliated vermiculite and inorganic binders.

KEY DATA

	VERMICULITE 900	VERMICULITE 1050
CLASSIFICATION TEMPERATURE	900°C	1050°C
BULK DENSITY	400 kg/m^3	400 kg/m^3
COLD COMPRESSION STRENGTH 10% deformation	1.0 N/mm^2	1.0 N/mm^2
THERMAL CONDUCTIVITY @ 400°C	0.19 W/mK	0.19 W/mK

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Millboards NEFALIT

Nefalit 7
Nefalit 7 is produced using selected mineral fibres and has a maximum operating temperature of 850˚C. When cut and pressed, Nefalit 7 has low dust emission and offers low wear resistance to tooling which ensures good definition for machined and pressed shapes whilst retaining sufficient mechanical strength for handling and installation.

Nefalit 11
Nefalit 11 is produced using wollastonite fibres and has a maximum temperature of 1100˚C. Nefalit 11 has good electrical properties and offers excellent arc resistance. It can also be used for burner, boiler and dryer gaskets and can be pressed and machined.

Nefalit Bio
Bio Millboard exhibits the same performance properties as other high temperature millboards, but by blending together alternative fibres, binders, and additives Nefalit Bio has a high tensile strength and will operate in aggressive thermal environments with temperatures up to 1200˚C. Nefalit Bio is deemed to be 'Health Safe' and contains no ceramic or asbestos fibres.

BM1000
BM1000 has been formulated to offer a cost effective solution for standard gasketing applications. It is machinable, can be pressed and will withstand temperatures up to 750˚C.

AD1200
AD1200 is calcium silicate based high strength rigid sheet. The board is treated to make it hydrophobic and is ideal for use within the Induction furnace environment. Combining high mechanical strength and flexural strength, it can be formed to fit around various profiles and is available in a large sheet format of 2m x 1m. AD1200 is also extensively used in applications for centrifugal spin casting where high strength at elevated temperatures is essential.

Other benefits include:

Nefalit 7
- Heat shields
- Available in pressed and machined formats
- Fire protection
- Aluminium based coatings available for steam protection and heat reflection.
- Maximum service temperature of 850˚C

Nefalit 11
- Electrical insulation
- Dryers
- Boilers
- Burners
- Actuators
- Maximum service temperature of 1100˚C

BM1000
- Dryers
- Boilers
- Thermal Barriers
- Available in pressed and machined formats

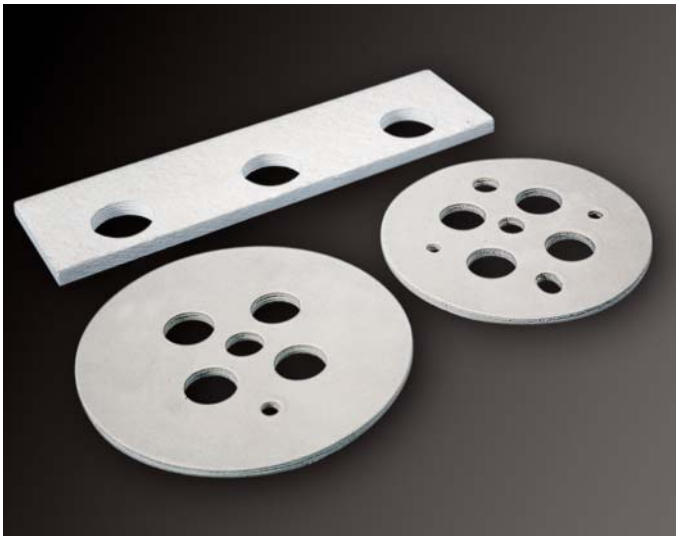
Nefalit Bio
- Health safe (contains no ceramic or asbestos fibres)
- Available in pressed and machined formats
- Maximum service temperature of 1200˚C

AD1200
- Hydrophobic
- Flexible
- Maximum service temperature of 1200˚C
- Easily cut pressed and machined

Typical Composition

- Quartz
- Mineral Wool
- Refractory Ceramic Binders
- Calcium Silicate
- Wollastonite

Millboards
NEFALIT



USED IN

- Furnace Construction
- Steel and Aluminium Smelting
- Electrical
- Thermal
- Chemical
- Pharmaceutical
- Aerospace
- Automotive
- Naval
- Insulating Gaskets
- Spin Casting Gaskets
- Domestic Heating
- Induction Furnace Applications

KEY DATA

		NEFALIT 7	NEFALIT 11	NEFALIT BIO	BM1000	AD1200
COLOUR		Grey/Beige	Yellow	Blue	Yellow/Beige	White
DENSITY	Kg/m^3	850	1100	1100	950	1000
MAX SERVICE TEMPERATURE	˚C	850	1100	1200	1000	1200
THERMAL CONDUCTIVITY @ 400˚C	W/mK	0.10	0.12	0.12	0.15	0.12
HEAT TREATMENT LOSS @ 800˚C	%	15	13	15	14	12
TENSILE STRENGTH						
Longitudinal fibres	Kg/cm^2	40	40	50	40	40
Transversal fibres	Kg/cm^2	40	30	40	30	30
SHRINKAGE @ 750˚C	%	–	–	–	<2	–
@ 800˚C	%	<2	–	–	–	–
@ 1000˚C	%	–	<1	<1	–	–
@ 1150˚C	%	–	–	–	–	<4

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Millboards
BARLAN®

Barlan® is a range of insulating millboards manufactured from non-asbestos mineral fibres in a wet laid process utilising clay binders.

The materials are available in 1000mm x 1000mm sheets in thicknesses ranging from 1.5mm to 12mm. All grades exhibit excellent characteristics at elevated temperatures making them an ideal material for high temperature insulation applications. Barlan® is rigid and strong and can be supplied in cut, machined or pressed pieces.

Other benefits include:

- Heat and fire resistant
- Low ignition loss
- Good thermal insulation
- Good sound deadening
- High compression
- Can be cut and punched
- Adaptable by wet moulding
- Dimensional stability

Typical Composition

- Quartz
- Mineral Wool
- Refractory Ceramic Binders
- Calcium Silicate

USED IN

- Carrier Rollers for Steel and Glass
- Gas Sealing Joints
- Furnace Construction
- Steel Industry
- Metal Casting Industry
- Electrical Appliances
- Hot Air Ducts
- Thermal Insulation
- Electrical Insulation
- Fire Protection

KEY DATA

		BARLAN 850	BARLAN 1100 BIO	BARLAN 1250
DENSITY	g/cm³	0.9 -1.0	0.9 -1.0	0.9 -1.0
ORGANIC CONTENT	%	5	10	5
MAXIMUM TEMPERATURE	˚C	850	1100	1250
TENSILE STRENGTH				
With grain	Kg/cm²	35	32	35
Across grain	Kg/cm²	15	26	15
SHRINKAGE AT 800˚C - 24 HOURS				
With grain	%	1.75	1.75	0.00
Across grain	%	2	2	0.35
SOLUBLES IN HCL AT 20%	%	<50	<40	<14
LEACHABLE CHLORIDES	ppm	100 max	100 max	50 max
pH		7	7	7
COMPRESSION AT 70 Kg/cm²	%	15 - 20	8 - 12	15 - 20
RECOVERY	%	25	23	25

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

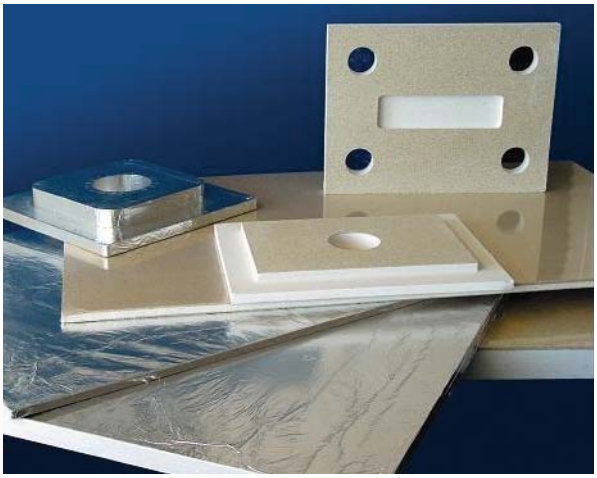
Microporous
RIGID & FLEXIBLE

Microporous products are available in rigid and flexible forms and can also be encapsulated with aluminium foil to further enhance heat reflection.

Microporous products are inorganic, and binder-free. With an exceptionally low thermal conductivity.
The properties of Microporous will enable you to improve thermal efficiency, delivers excellent heat storage whilst being lightweight and machinable.

Typical Composition

- Zircon
- Fumed Silica
- Calcium Silicate



USED IN

- **Rear Lining for Industrial Furnaces and Plant Construction such as Ceramic Kilns, Glass Furnaces, Feeders and Chemical Plants**
- **Pipe Insulation Lining**
- **Turbine and Diesel Engine Exhaust Covers**
- **Thermal Insulation of Steel Casting Ladles and Casting Facilities**
- **Thermal Insulation of household appliances like Boilers, Hearth and Night Storage Heaters**
- **Data Logger Boxes**

Other benefits include:

- Lowest thermal conductivity of all insulating materials
- Excellent thermal resistance
- Organic and asbestos free
- Non-combustible
- Machinable
- Space saving
- Lightweight

KEY DATA

PROMALIGHT®		240	240 FX	320	320 HD
CLASSIFICATION TEMPERATURE					
Microporous core	°C	950	950	950	950
Glass cloth	°C	650	650	–	–
NOMINAL DENSITY (CORE)	kg/m³	200-280	200-280	220-330	320-360
CLOTH NOMINAL WEIGHT	g/m²	220	220	–	–
LINEAR SHRINKAGE AT 900°C	%	1.1	1.1	1.3	1.4
SPECIFIC HEAT CAPACITY	kJ / kgK	1.05	1.05	1.05	1.05
THERMAL CONDUCTIVITY AT MEAN TEMPERATURE OF					
392°F (200°C)	W/mK	0.023	0.023	0.023	0.023
752°F (400°C)	W/mK	0.026	0.026	0.026	0.026
1112°F (600°C)	W/mK	0.030	0.030	0.030	0.030
1832°F (800°C)	W/mK	0.037	0.037	0.036	0.036
TYPICAL COMPOSITION (CORE)					
Silicon Carbide – SiC	%	10-20	10-20	15-20	15-20
Silica – SiO_2	%	70-90	70-90	77-80	77-80
Lime – CaO	%	2-5	2-5	–	–
ORGANIC CONTENT	%	< 2 max	< 2 max	–	–

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Ceramic Fibre BLANKET

Ceramic Fibre Blanket is a soft, lightweight insulating material ideal for use at elevated temperatures of up to 1400˚C.

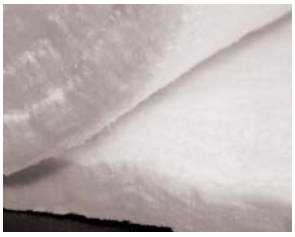
Ceramic Fibre Blanket is produced by laying loose fibres into a continuous mat roll which is then needle punched to improve strength, allowing for greater surface integrity.

Its lightweight construction makes it ideal for handling, in particular for on-site cutting, fitting and fabrication work.

Ceramic Fibre Blanket is available in a wide range of densities, thicknesses, lengths and widths.

Other benefits include:

- Excellent heat storage
- Low thermal conductivity
- Resistant to thermal shock
- Good tensile strength
- Asbestos free



USED IN

- Petrochemical
- Ceramics
- Ferrous and Non-Ferrous Metal Production
- Power Generation
- Furnace and Kiln Linings

KEY DATA

	1100 GRADE	1260 GRADE	1400 GRADE
MAX CONTINUOUS TEMPERATURE ˚C	1000	1260	1425
MAX CONTINUOUS TEMPERATURE ˚F	1800	2300	2600
THERMAL SHRINKAGE (%)			
24 Hrs @ 1000˚C	1.95	–	–
24 Hrs @ 1100˚C	–	1.95	–
24 Hrs @ 1300˚C	–	–	1.95
CHEMICAL ANALYSIS (%)			
AL_2O_3	43 - 46	45 - 48	33 - 38
SiO_2	50 - 60	50 - 55	46 - 51
ZrO_2	–	–	12 - 19
Fe_2O_3	0.6 - 1.5	0.8 - 1.2	0.1 - 0.2
TiO_2	1.4 - 1.9	1.4 - 1.9	0.1 - 0.2
DENSITY	64, 96 & 128 kg/m³ (4, 6 & 8 lbs/ft³)		

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

DIMENSIONS

thickness	length	width
6mm	29.28m	610/1220mm*
13mm	14.64m	610/1220mm*
25mm	7.32m	610/1220mm*
38mm	4.80m	610/1220mm*
50mm	3.66m	610/1220mm*

*1220mm width available to special order.

Typical Composition

Refractory Ceramic Fibre in the form of bulk, chopped, blanket, blanket modules, board and shapes are made from inorganic amorphous glass fibre (RCF).

- Refractory Ceramic Fibre
- Aluminosilicate
- Aluminum Oxide
- Amorphous Silica
- Organic Binder
- Organic Lubricant

Ceramic Fibre PAPER

Ceramic Fibre Paper is produced from Alumina Silicate fibres and selected bonding agents which burn-off on ignition. Ceramic Fibre Papers exhibit good resistance to tearing, are flexible, and resistant to thermal shock.

This lightweight insulating paper is ideal for use at elevated temperatures of up to 1260˚C. Ideal for handling, its flexibility allows it to be used for wrapping pipes as well as complex pressed shapes and gaskets. It can be cut using a knife or normal die-cutting tools.

Other benefits include:

- Low heat storage
- Low thermal conductivity
- Resistant to thermal shock
- Good tensile strength
- Asbestos free
- Resistance to direct flame

Typical Composition

- Refractory Ceramic Fibre
- Aluminosilicate
- Acrylic Latex
- Kaolin
- Aluminum Sulphate
- Silica (Amorphous)
- Acrylamide Cationic Copolymer

USED IN

- Gasketing
- Replacement for Asbestos Paper
- Casting
- Secondary Insulation Lining
- Fire Barriers

KEY DATA

MELTING POINT		1760˚C (3200˚F)		
MAX CONTINUOUS TEMPERATURE		1260˚C (2300 ˚F)		
CHEMICAL ANALYSIS (%)				
Al_2O_3		46.50%		
SiO_2		53.40%		
Others		0.10%		
L.O.I.		6%		
DENSITY kg/m³ (lbs/ft³)		200 +/- 10%		
DIELECTRIC STRENGTH (Volts/mil)		50		
TENSILE STRENGTH – g/in	1/16"	1/10"	1/8"	1/4"
MACHINE DIRECTION	2700	3500	5000	13050
CROSS DIRECTION	2500	3100	5000	8000

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Ceramic Fibre BOARD

Ceramic Fibre Board is a rigid insulating material available in light, medium and heavy densities and manufactured using refined ceramic fibres, fillers and binders.

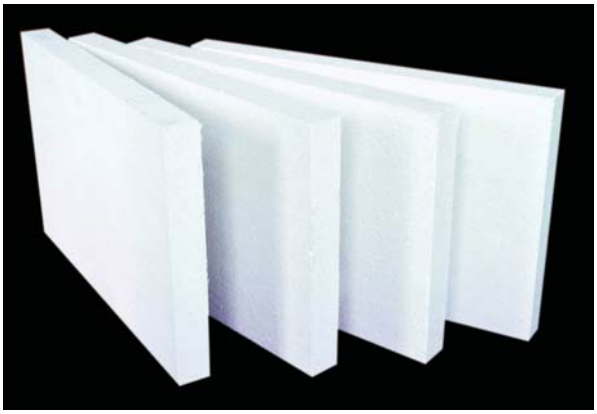
Ceramic Fibre Boards are ideal for use at elevated temperatures of up to 1400°C as they exhibit excellent strength characteristics.

Ceramic Fibre Board is an ideal material for back-up insulation, flue linings, boiler ducts, furnace and kiln linings.

The structure of Ceramic Fibre Board lends itself to high definition machining and production of technically complex machined parts and shapes.

Other benefits include:

- Low heat storage
- Low thermal conductivity
- Outstanding thermal shock resistance
- Good tensile strength
- Asbestos free
- Excellent resistance to direct flame



USED IN

- Furnace/Back-Up Lining
- Metal Transfer/Casting
- Heat/Flame Barriers
- Hot Face Insulation for Burner Quarls
- Expansion Joints
- Combustion Chambers
- Kiln Linings

Typical Composition

Refractory Ceramic Fibre in the form of bulk, chopped, blanket, blanket modules, board and shapes are made from inorganic amorphous glass fibre (RCF).

- Refractory Ceramic Fibre
- Aluminosilicate
- Aluminum Oxide
- Amorphous Silica
- Organic Binder
- Organic Lubricant

KEY DATA

	1260 Low Density	1260 Medium Density	1260 High Density	1400 Low Density	1600 Low Density
MAXIMUM USE LIMIT					
°C	1260	1260	1260	1426	1600
°F	2300	2300	2300	2600	2900
CONTINUOUS USE LIMIT					
°C	1149	1149	1149	1316	1426
°F	2100	2100	2100	2400	2600
MELTING POINT					
°C	1732	1732	1732	1780	1850
°F	3150	3150	3150	3236	3362
DENSITY lbs/ft^3	14 - 18	20 - 24	26 - 30	14 - 18	14 - 18
kg/m^3	225 - 290	320 - 385	415 - 480	225 - 290	225 - 290
THERMAL SHRINKAGE (%)					
24 hours @ 2200 °F	2 - 3	1 - 2	1 - 2	1 - 2	1 - 2
THERMAL CONDUCTIVITY (W/mK)(Btu in/hr ft^2 °F)					
316°C (600°F)	0.06 0.5	0.07 0.6	0.10 0.9	0.06 0.5	0.06 0.5
538°C (1000°F)	0.07 0.6	0.08 0.7	0.11 1.0	0.07 0.6	0.07 0.6
760°C (1400°F)	0.09 0.8	0.10 0.9	0.13 1.2	0.09 0.8	0.09 0.8
1094°C (2000°F)	0.13 1.2	0.13 1.2	0.16 1.4	0.13 1.2	0.13 1.2
CHEMICAL ANALYSIS (%)					
AL_2O_3	39 - 41	45 - 47	43 - 45	48 - 50	63 - 65
SiO_2	52 - 54	44 - 46	47 - 49	45 - 47	32 - 34
Others	2 - 3	2 - 3	2 - 3	1 - 2	1 - 2

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Ceramic Fibre
BULK

Ceramic Fibre Bulk fibres come in a variety of ranges each exhibiting different properties. The ranges available vary by composition, compressed density, fibre length, fibre diameter and lubricity.

The fibres offer excellent resistance to chemical attack, shock and corrosion resistance. They are also unaffected by water or steam and have low moisture absorption properties.

Ceramic Fibre Bulk can be used at elevated temperatures of up to 1400˚C.

The material is ideal as back-up insulation, packing or as a gap filler.

Other benefits include:

- Low heat storage
- Low thermal conductivity
- Outstanding thermal shock resistance
- Good sound resistance
- Asbestos free
- Excellent resistance to direct flame

USED IN

- Furnace Packing
- Vacuum Forming
- Heat Seal for Openings
- Wet Process Feed Stock
- Ladle Insulation
- Filtration Media
- Gap Filling

Typical Composition

- Refractory Ceramic Fibre
- Aluminosilicate

KEY DATA

	1260 Grade	1400 Zirconia	1400 Grade
MAX CONTINUOUS TEMPERATURE ˚C	1260	1425	1482
MAX CONTINUOUS TEMPERATURE ˚F	2300	2600	2700
THERMAL SHRINKAGE (%)			
24 Hrs @ 1000˚C (1800˚F)	2.0	–	–
24 Hrs @ 1100˚C (2000˚F)	–	1.8	–
24 Hrs @ 1300˚C (2400˚F)	–	–	2.0
CHEMICAL ANALYSIS (%)			
AL_2O_3	46-48	33-37	52-54
SiO_2	49-55	47-51	42-46
ZrO_2	–	13-19	–
$Fe2O_3$	0.8-1.2	0.1-0.2	0.1-0.2
TiO_2	1.5-1.9	0.1-0.2	0.1-0.2

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Ceramic Fibre MODULES

CERAMIC FIBRE MODULES are produced using ceramic fibre blanket to create a folded or edge stacked profile.

The modules are supplied pre-fabricated complete with anchors and are specifically designed in industrial furnaces, kilns and heaters. CF module linings help prevent heat loss and can increase a furnaces productivity. They are energy efficient and can help significantly reduce maintenance costs.

Other benefits include:

- Resistance to thermal shock
- Low thermal conductivity and heat storage
- High temperature stability
- Lightweight
- Shorter heat cycling times
- Easy to install
- Resistance to gas flow erosion
- Energy efficient
- Resistant to chemical attack

Typical Composition

- Refractory Ceramic Fibre
- Aluminosilicate
- Aluminum Oxide
- Silica (Amorphous)
- Organic Binder
- Organic Lubricant

USED IN

- Kiln Cars
- Veneers over existing Refractory
- Boiler Insulation
- Furnace Door, Roof and Wall Linings
- Batch Kilns
- Duct Lining
- Incineration and Pyrolysis Linings

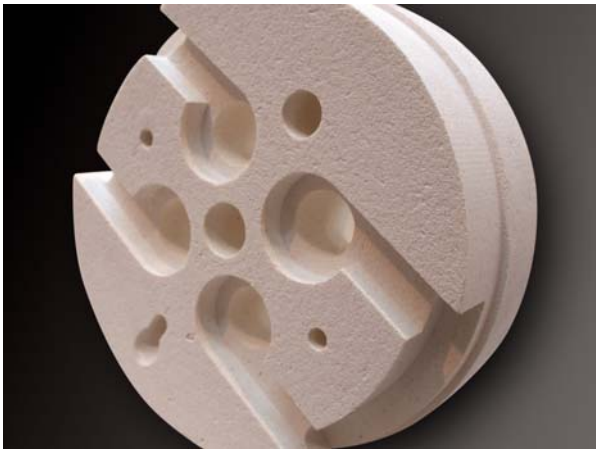
KEY DATA

	RT	HP	HTZ	HT
MAX CONTINUOUS TEMPERATURE ˚C	1260	1315	1425	1482
MAX CONTINUOUS TEMPERATURE ˚F	2300	2400	2600	2700
THERMAL SHRINKAGE (%)				
24 Hrs @ 1000˚C	–	–	–	–
24 Hrs @ 1100˚C	2.0	1.8	–	–
24 Hrs @ 1300˚C	–	–	2.0	2.0
CHEMICAL ANALYSIS (%)				
AL_2O_3	46-48	44-50	33-37	52-54
SiO_2	49-55	50-56	47-51	42-46
ZrO_2	–	–	13-19	–
Fe_2O_3	0.8-1.2	0.1-0.2	0.1-0.2	0.1-0.2
TiO_2	1.5-1.9	0.1-0.2	0.1-0.2	0.1-0.2
DENSITY	160 & 192 kg/m^3 (10 & 12 lbs/ft^3)			

Standard Dimensions: Special sizes are available for specific needs

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Ceramic Fibre
VACUUM FORMED SHAPES



Vacuum Formed Shapes are produced from a slurry of ceramic fibres. The shapes are made to exact customer specifications and the flexibility of the process allows for a wide range of profiles and sizes in assorted grades and densities.

Ceramic Fibre Vacuum Formed Shapes are able to withstand temperatures of up to 1600˚C. Where necessary, it is possible to partially encapsulate the fibres in the finished product by applying a high temperature coating.

Typically, vacuum formed shapes require no finishing after firing. However, where higher edge definition or precision machining is required these shapes can be post-machined.

Typical Composition

Refractory Ceramic Fibre in the form of bulk, chopped, blanket, blanket modules, board and shapes are made from inorganic amorphous glass fibre (RCF).

- Refractory Ceramic Fibre
- Aluminosilicate
- Aluminum Oxide
- Amorphous Silica
- Organic Binder
- Organic Lubricant

USED IN

- Crucibles, Launders and Tundishes
- Industrial Heaters
- Furnace Insulation
- Furnace Door Linings
- Combustion Chambers
- Iron and Steel
- Cupro-Alloys
- Magnesium Alloy Casting
- Peep Holes
- Burner Quarls
- Tap-Out Cones
- Gas Scrubbers

Other benefits include:

- Bespoke
- Lightweight
- High definition
- Resistant to hot gas erosion
- Resistant to chemical attack
- Asbestos free
- Resistant to thermal shock

KEY DATA

There are three main grades available: 1260, 1400 and 1600

Data available on request

Ceramic Fibre ADHESIVE

Ceramic fibre adhesive is a high temperature, air setting cement. It is used mainly as a refractory surface coating but can also be used on ceramic fibre substrates and porous materials such as insulating fire brick and insulating concretes.

The cement sets to form a strong hard film, which develops a ceramic bond at high temperatures while maintaining excellent resistance to thermal shock. The maximum recommended surface temperature is 1400˚C. It can also be used as an adhesive for ceramic fibre products.

Ceramic fibre adhesive can be applied by brushing, dipping or spraying. Surfaces should be free of grease, dirt and dust.

The consistency of the solution can be altered by the addition clean tap water.

Other benefits include:

- Enhances abrasion resistance
- High temperature
- Air setting
- Easy application
- Creates surface hardening increases abrasion resistance

Typical Composition

- Refractory Ceramic Powder
- Liquid Binder
- Refractory Ceramic Colloid
- Water

USED IN

Surface coating
At high temperature the cement forms a hard egg-shell ceramic film on most clean and grease free surfaces. This film is completely stable. The majority of ceramic fibre products may be coated with ceramic fibre adhesive as a protection against high gas velocities or against molten metal contact.

Bonding
Ceramic fibre adhesive is recommended as a high temperature adhesive to bond ceramic fibre products together, or to attach them to porous refractory surfaces such as insulating fire brick or insulating concretes.

KEY DATA

CLASSIFICATION TEMPERATURE	**˚C**	**1260**
PROPERTIES MEASURED @ AMBIENT CONDITIONS		23˚C/50% RH
COLOUR		white
DENSITY	kg/m^3	1840-1950
COMPRESSIVE STRENGTH	MPa	45
HIGH TEMPERATURE PERFORMANCE		
Specific heat capacity at 100-550˚C	kJ/kgK	1.04-1.14
Melting temperature after drying	˚C	1760
Permanent linear shrinkage after 24 hours at		
1000˚C	%	2.15
1260˚C	%	3.2

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Ceramic Fibre
RIGIDISER

Ceramic fibre rigidiser 'firms-up' refractory ceramic fibre, giving it tougher, enhanced abrasion resistant characteristics. It is normally applied after the ceramic fibre is installed.

Rigidiser is applied to the surface of ceramic fibre blanket, or other high temperature ceramic fibre materials by spraying or brushing.

Rigidiser can be shipped in 5 litre or 25 litre plastic drums. 5 litres of rigidiser covers approximately 5m^2 brushed or 10m^2 when sprayed.

USED IN

- Ceramic Furnaces
- Oil Heaters
- Petrochemical Heaters
- Steel Treatment Furnaces
- Molten Metal Transportation

Typical Composition

- Water
- Silica (Amorphous)
- Sulphates
- Chlorides

KEY DATA

	Metric		Imperial
MAXIMUM USE LIMIT	**980˚C**		**1800˚F**
BULK DENSITY - As Shipped	1.21g/cc		75lbs/ft^3
WEIGHT per Gallon (3.7 Litres)	4.5kg		10lb
COVERAGE Per 5 litres		Approximately	
Area brushed	5m^2		50ft^2
Area sprayed	10m^2		100ft^2
COLOUR		Bluish-White	
SPECIFIC GRAVITY	At 25˚C (77˚F)		1.21
VISCOSITY	At 25˚C (77˚F)		5 Centipoise
ph		9.8	
SHELF-LIFE		1 year	
CHEMICAL ANALYSIS (%)			
Silica – SiO_2		+99%	
Alkali – Na_2O		0.32%	
Sulfates as NA_2SIO_4		0.04%	
Chlorides as NaCl		0.01%	

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Ceramic Fibre MASTIC

Ceramic fibre mastic is a multipurpose form of ceramic fibre dispersed in a sticky, cohesive binder system that adheres to most ceramic and metallic surfaces.

Ceramic Fibre Mastic is used to prevent heat loss caused by the deterioration of the existing lining and can be installed using a trowel, caulking gun or pump.

Ceramic fibre mastic is available in two forms, 1260°C and 1600°C.

Mastic is normally applied with a trowel, spatula or other suitable tooling.

Other benefits include:

- Low thermal conductivity
- Low heat storage
- Reduces fume emission around refractory
- Excellent thermal shock resistance
- Resistance to gas velocity
- Easy to install
- Adheres to most ceramic and metallic surfaces
- Excellent corrosion resistance
- Inert to most chemicals
- Impermeable to molten aluminum, zinc, copper and lead
- Contains no asbestos
- Ready to use

Typical Composition

- Kyanite
- Sodium Silicate
- Calcined Clay
- Crystalline Silica (Quartz)
- Water

USED IN

- **Troughs or Liners for non-ferrous metal transfer**
- **Gaskets and Seals around Burner Blocks**
- **Protection of metallic parts from heat**
- **Pump into voids in badly damaged back-up insulation**
- **Gaskets and Seals for Chimneys and Stacks**
- **Boiler Door Seals and Thermal Insulation**
- **Void and Cracks Filling on Refractory Surfaces**

KEY DATA

MAXIMUM CONTINUOUS TEMPERATURE	**1260 °C (2300 °F)**		**1600°C (2912°F)**	
DENSITY (kg/m³)				
Wet	1050 - 1230		1400 - 1600	
Dry	705 - 740		900 - 1100	
THERMAL SHRINKAGE (%)				
24 hrs @ 1093 °C (2000 °F)	2.8		2.6	
THERMAL CONDUCTIVITY	**W/mK**	**BTU-in hr/Ft²°F**	**W/mK**	**BTU-in hr/Ft²°F**
500°F	0.06	0.5	0.06	0.5
1000°F	0.12	1.0	0.12	1.0
1500°F	0.15	1.2	0.15	1.2
CHEMICAL ANALYSIS (%)				
AL_2O_3	40 - 42		66	
SiO_2	55 - 57		33	
Fe_2O_3	Trace		Trace	
MgO	Trace		Trace	
K_2O	Trace		Trace	
Other	2 - 3		Trace	

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

RCF Free MASTIC

Esspee also manufacture a 'health safe' ceramic free mastic which can be used in most applications where CF mastic is currently used.

Other benefits include:

- Ceramic fibre free
- Low thermal conductivity
- Low heat storage
- Reduces fume emission around refractory
- Excellent thermal shock resistance
- Resistance to gas velocity
- Easy to install
- Adheres to most ceramic and metallic surfaces
- Excellent corrosion resistance
- Inert to most chemicals
- Impermeable to molten aluminum, zinc, copper and lead
- Contains no asbestos
- Ready to use

Typical Composition

- Soluble Fibre
- Colloidal Silica
- Water

USED IN

- **Troughs or Liners for non-ferrous metal transfer**
- **Gaskets and Seals around Burner Blocks**
- **Protection of metallic parts from heat**
- **Pump into voids in badly damaged back-up insulation**
- **Gaskets and Seals for Chimneys and Stacks**
- **Boiler Door Seals and Thermal Insulation**
- **Void and Crack Filling on Refractory Surfaces**

KEY DATA

MAXIMUM USE LIMIT	**1200 °C (2192 °F)**	
DENSITY (kg/m³)		
Wet	1050 - 1230	
Dry	705 - 740	
THERMAL SHRINKAGE (%)		
24 hrs @ 1093 °C (2000 °F)	2.8	
THERMAL CONDUCTIVITY	**W/mK**	**BTU-in hr/Ft²°F**
500°F	0.06	0.5
1000°F	0.12	1.0
1500°F	0.15	1.2
CHEMICAL ANALYSIS (%)		
AL_2O_3	40 - 42	
SiO_2	55 - 57	
Fe_2O_3	Trace	
MgO	Trace	
K_2O	Trace	
Other	2 - 3	

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

RCF Free
BODY SOLUBLE BLANKET

Body Soluble Blanket is developed from a unique technology which creates a fibre with excellent mechanical and thermal characteristics that are comparable to ceramic fibres.

Manufactured from a blend of Magnesium and Silica raw materials, the fibre is then laid down to create a roll mat and needled to increase its tensile strength.

Other benefits include:

- Lightweight
- Low thermal conductivity
- High tensile strength
- Good corrosion resistance
- Very low heat storage

Typical Composition

- Amorphous Calcium-Magnesium-Silicate Mixture
- Silicon Dioxide
- Calcium Oxide
- Magnesium Oxide

USED IN

- **Back-up Insulation**
- **Annealing Furnace Linings**
- **Reusable Insulation Pads**
- **Heat Treatment Furnace Lining**
- **Expansion Joints**
- **Aluminium Homogenising Furnaces**

KEY DATA

MAXIMUM CONTINUOUS TEMPERATURE	**1200°C**	**2192°F**
THERMAL SHRINKAGE		**%**
24 Hrs @ 850°C (1562°F)		< 1
24 Hrs @ 1000°C (1832°F)		1.12
24 Hrs @ 1100°C (2012°F)		1.23
CHEMICAL ANALYSIS (%)		
SiO_2		57 - 65
CaO		29 - 35
SiO_2		57 - 65
MgO		3.5 - 5.5
AL_2O_3		0.5 - 0.9
Fe_2O_3		0.2 - 0.6
DENSITY	64, 96 + 128 kg/m^3 (4, 6, 8 lbs/ft^3)	

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

DIMENSIONS

thickness	length	width
6mm	29.28m	610/1220mm*
13mm	14.64m	610/1220mm*
25mm	7.32m	610/1220mm*
38mm	4.80m	610/1220mm*
50mm	3.66m	610/1220mm*

*1220mm width available to special order.

Engineering Textiles
ROPE, TAPE & CLOTH



There are a wide range of textiles available that are produced by converting ceramic/glass fibre as well as processing yarns into a woven format. CF textiles are suitable for use at high temperatures (up to 1400˚C) and maintain their flexibility which means they are ideal for use in forming thermal seals and gap filling applications such as door seals, expansion joints and gland packing.

FORMATS

Yarn
Yarn is manufactured using ceramic fibre and is the base of all the ceramic textile products. The yarn is reinforced with either a glass filament or a fine Inconel wire.

Cloth
Cloth is woven from an Inconel or glass wire reinforced yarn.

Cabled rope (high density)
High density cabled rope is made from yarn which is either glass filament or Inconel wire reinforced. Comprising of 3 pre-twisted strands, each section contains a multiple of yarns which are twisted together to make a product that is flexible with a high density.

Cabled rope (low density)
Low density cabled rope is made from a glass filament reinforced Ceramic extract. Like the high density version, it comprises of 3 pre-twisted strands each containing a multiple of ceramic yarns which are then twisted together to form a flexible, low density rope.

Twisted rope
Twisted rope contains multiple strands of ceramic yarn, which can be either glass filament or Inconel reinforced. They are twisted together to obtain the required diameter. The results give a soft rope product that is easily compressed and is ideal for use where a seal needs to be obtained between uneven surfaces.

Rope lagging
Rope lagging consists of a strip of ceramic blanket that is over braided and combined with a glass yarn. This combination of raw materials makes for a highly insulating product with a medium density, which is also highly compressible and flexible.

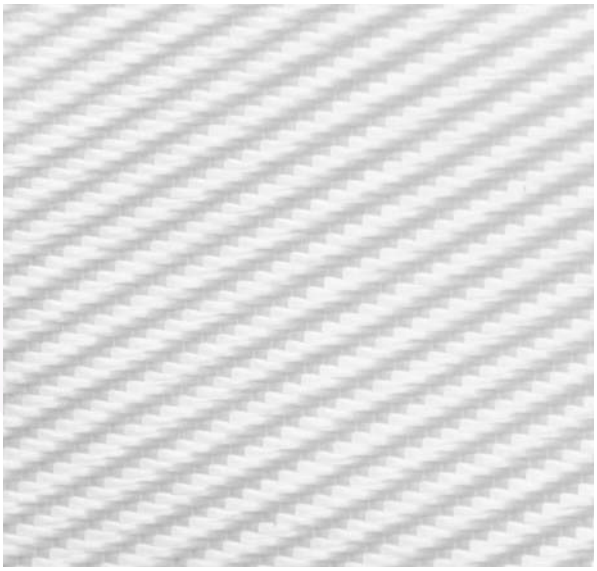
Webbing
Webbing is made from either woven glass or Inconel wire reinforced ceramic yarn.

Ladder tape
Like ceramic webbing, ladder tape is woven from either glass or Inconel wire reinforced ceramic yarn and has similar weave characteristics to cloth on its outer edges but an open weave in the centre. This allows for easy installation over studs and is also ideal as a gasketing material which can be pressed or cut.

Engineering Textiles
ROPE, TAPE & CLOTH

USED IN

- Glass Manufacture
- Electrical Heating
- Powergen
- Aerospace
- Steel and Aluminium Production
- Petrochemical



Typical Composition

- Aluminosilicate Ceramic Fibre
- Fibre Glass (Continuous Glass Filament)
- Viscose Rayon
- Nickel Chrome Wire
- Organic Binders

KEY DATA

SECTION	TWISTED ROPE	CABLED ROPE	CABLED ROPE	ROPE	WEBBING	
mm		(High density)	(Low Density)	Lagging	Width (mm)	Thickness (3mm)
		roll lengths				
4	200	–	–	–	25	25
6	100	**100**	–	–	40	25
9	50	**50**	**50**	25	50	25
12	50	**50**	**50**	–	75	25
13	–	–	–	25	100	25
15	50	**50**	**50**	25		
19	–	–	–	25	LADDER TAPE	
20	25	**25**	**25**	–	Width (mm)	Roll Length (m)
25	–	**25**	**25**	25		
30	–	**25**	**25**	–	25	25
38	–	–	–	–	40	25
40	–	**20**	**20**	–	50	25
50	–	**20**	**20**	25	75	25
75	–	–	–	25	100	25

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Dalfratex®
TEXTILES

DALFRATEX® is a range of inorganic fibres and textiles that are capable of operating continuously at 1000˚C and up to 1600˚C (for limited periods). They will not melt or vaporise until temperature exceeds 1700˚C, and have a high resistance to thermal shock.

DALFRATEX® products also provide flexible electrical insulation at temperatures as high as 1000˚C. Products are available as textile cloths, tapes, sleeving, cords, braided packing, ropes and also as bulk fibres and batts.

DALFRATEX® products are composed of continuous filaments of amorphous silica, which combine the flexibility of fibres and textiles, with the refractory properties of silica.

In order to service the needs of a wide range of applications the majority of DALFRATEX® products are available in two basic forms: standard and pre-shrunk. The standard form shrinks during initial heating and products of this type have letter 'U' incorporated into the code number. As their name implies, the pre-shrunk forms have been factory treated to confer better dimensional stability in high temperature use. In addition to these forms a wide range of sacrificial organic finishes are available which may be applied to particular products where required for specific end uses.

USED IN

- Aerospace (Gas Turbine and Rocket Engines)
- Metallurgical/Steel Production
- Glass Manufacture
- Fire Protection
- Electrical Heating
- Pipeline and Vessel Fabrication
- Gas Production
- Nuclear Power
- Electricity Generation
- Petrochemical

Other benefits include:

- Low thermal conductivity
- Low heat storage
- Reduces fume emission around refractory
- Excellent thermal shock resistance
- Resistance to gas velocity
- Easy to install
- Adheres to most ceramic and metallic surfaces
- Excellent corrosion resistance
- Inert to most chemicals
- Impermeable to molten aluminium, zinc, copper & lead
- Contains no asbestos

Typical Composition

Dalfratex® comprises of continuous or texturised fibres of amorphous silica.

- Silicon Dioxide
- Ferric Oxide
- Calcium Oxide
- Alkalis
- Titanium Dioxide
- Boron Trioxide
- Magnesium Oxide
- Chlorides
- Aluminum Oxide

KEY DATA

BATT DATA	THICKNESS	NOMINAL SURFACE	NOMINAL LENGTH	NOMINAL WIDTH	NOMINAL BULK
CODE NUMBER	DENSITY (mm)	DENSITY (g/m^2)	(m)	(mm)	(kg/m^3)
B-1	3.8	300	2.2	915	80
B-2	6.3	600	2.2	915	96
B-3	9.4	825	2.2	915	88
B-4	12.5	1000	2.2	915	80
B-8	25.0	2000	2.2	915	80
Minimum order quantities apply, details on request					
CLOTH DATA	**NOMINAL**	**NOMINAL WIDTH**	**NOMINAL WEIGHT**	**YARN**	**TYPE OF**
CODE NUMBER	**THICKNESS (mm)**	**(mm)**	**(g/m^2)**	**TYPE**	**WEAVE**
C-H	0.9	825	630	Plain	Satin
C-19	1.6	825	1250	Plain	Satin
UC-H/D	0.9	910	640	Plain	Satin
UC-19/D	1.6	910	1260	Plain	Satin
UC-19/AR	1.7	910	1300	Plain	Satin
Nominal roll length 45m					

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

KEY DATA

ROPE DATA CODE NUMBER	NOMINAL DIAMETER (mm)	NOMINAL WEIGHT (g/m)
R-B3	9	70
R-B4	12	110
R-B6	19	230
R-B8	25	385
R-C10	10	40
R-C13	13	60
R-C25	20 to 25	60
R-C40	40	260

The 'B' Series ropes are supplied in pre-shrunk condition and have a light coating applied to assist manufacture.

The 'C' series ropes are supplied pre-shrunk and without coating.

CORDAGE DATA CODE NUMBER	NOMINAL DIAMETER (mm)	NOMINAL WEIGHT (g/m)	STANDARD PACKAGE	NOMINAL PACKAGE	NOMINAL LENGTH per PACKAGE (m)
D-T3	2.0	4000	100	–	–
D-T4	3.0	6200	50	–	–
D-T2	1.2	1200	–	0.25	210
D-T20	0.9	740	–	0.25	340

All cord can be supplied in pre-shrunk or in natural condition and are coated.

TAPE DATA CODE NUMBER	NOMINAL THICKNESS (mm)	NOMINAL WIDTH (mm)	NOMINAL WEIGHT (g/m)	STANDARD PACKAGE (m)
T-3	0.4	20	6	30
T-5	0.4	30	9	30
T-85	4.0	22	37	–
T-86	4.0	45	75	–
T-105	4.5	70	127	–
UT-124/50	3.5	50	–	–
Self adhesive				
T-H/25	1.0	25	16	–
T-H/50	1.0	50	32	–
T-H/75	1.0	75	48	–
T-19/25	1.6	25	32	–
T-19/50	1.6	50	63	–
T-19/75	1.6	75	94	–
UT-19/50	1.8	50	63	–

SLEEVING DATA CODE NUMBER	NOMINAL BORE (mm)	NOMINAL WALL THICKNESS (mm)	STANDARD PACKAGE (m)	INDICATIVE YIELD AT STATED DIAMETER (m/kg)
S-R4	3.2	0.5	30	–
S-R6	4.8	0.5	30	–
S-R8	6.4	0.6	20	–
S-R25	20.0	1.0	15	–
S-R32	25.0	1.0	15	–
S-F16	10.0	0.4	30	–
S-F20	13.0	0.5	30	–
S-F25	20.0	0.5	20	–
S-F30	25.0	0.5	20	–
S-8	30.0	1.0	–	–
S-47	10.0	5.0	–	–
S-43	50	–	–	9 at 50mm
S-44	65 to 75	–	–	9 at 65mm
S-46	75 to 85	–	–	7 at 75mm

All sleevings can be supplied in pre-shrunk or in natural condition; with or without a coating.

PACKAGING DATA CODE NUMBER	NOMINAL DIMENSIONS (mm) DIAMETER	APPROXIMATE YIELD (m/kg)
UR-K12	12	23
UR-K15	15	11
UR-K19	19	15
UR-K25	25	4.5

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Brick
DENSE FIREBRICKS

Dense firebricks are typically used as linings for kilns, furnaces and boilers because they possess mechanical strength and can be subjected to extreme thermal cycling and thermal shock. Dense fire bricks also have a high thermal mass which ensures they retain heat and provide excellent energy efficiency.

Fire bricks are made by firing a clay based composition until partly vitrified and for specialist applications can also be produced with a glazed finish. Normally fire bricks contain 40-50% alumina depending on the maximum operating temperatures.

We stock a range of profiles and sizes ranging from standard 26 grade bricks to 90% alumina grades which are used in extremely aggressive thermal environments.

KEY DATA		
GRADE		40 - 42
RECOMMENDED SERVICE TEMPERATURE		1600°C
BULK DENSITY	g/cm³	2.2
APPARENT POROSITY	%	22
MODULUS OF RUPTURE	Kg/cm²	90
COLD CRUSHING STRENGTH	Kg/cm²	300
PYROMETRIC CONE EQUIVALENT		32
LINEAR EXPANSION @ 1350°C	%	0.2
REFRACTORINESS UNDER LOAD	°C	1450

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Typical Composition

- Alumina
- Silica
- Titanium Oxide
- Iron Oxide
- Magnesium Oxide
- Lime
- Refractory Binders

USED IN

- Aluminium
- Steel
- Glass
- Incineration
- Crematoria
- Rotary Cement Kilns

Brick
INSULATING (IFB)

Insulating fire bricks are manufactured using high purity refractory clays and selected organic fillers that burn out during the manufacturing process to ensure the brick exhibits a controlled and uniform pore structure.

IFB's have excellent thermal shock resistance, are lightweight, are produced to tight tolerances ensuring that they can be laid quickly and easily.

IFB's also have high insulating characteristics, good compressive strength and low heat storage properties.

Typical Composition

- Alumina
- Silica
- Titanium Oxide
- Iron Oxide
- Magnesium Oxide
- Lime
- Refractory Binders

USED IN

- Primary Hot Face Linings
- Back-up Insulation for Furnaces and Kilns
- Furnaces
- Flues
- Kilns

KEY DATA

GRADE		20	23	26	28	30	32
MAXIMUM APPLICATION TEMPERATURE		1100	1260	1425	1540	1650	1760
DENSITY	kg/m³	560	600	770	880	1040	1200
MODULUS OF RUPTURE	Mpa	0.7	1.0	1.4	1.5	1.7	2.1
COLD CRUSHING STRENGTH	Mpa	0.7	0.9	1.9	2.3	3.0	3.1
PERMANENT LINEAR CHANGE							
24hrs @ soak temperature	℃	-	-	0.1	-	-	-
		-	-	-	0.7	-	-
		-	-	-	-	0.7	-
		-	-	-	-	-	0.4
THERMAL CONDUCTIVITY							
@MEAN TEMPERATURE							
200℃		0.14	0.15	0.23	0.32	0.40	0.55
600℃		0.18	0.20	0.28	0.35	0.41	0.60
800℃		0.24	0.24	0.33	0.36	0.46	0.62
1000℃		0.26	0.27	0.38	0.40	0.47	0.63

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Brick
MOLER

Moler bricks are available in a range of grades and combinations of strength, density and thermal conductivity. They are pre-fired and designed for a maximum service temperature up to 1000˚C (1832˚F).

Esspee's range of Moler bricks exhibit, high mechanical strength, excellent insulating properties and retain their strength at elevated temperatures. They are resistant to thermal shock, have low permeability to gasses and are able to withstand mild acid attacks.

There are two main grades of moler brick which are categorised as follows:

Solid bricks

Solid bricks combine high mechanical strength with good insulating qualities. They are suitable for use up to 1000˚C (1832˚F) and are commonly used as back-up insulation against refractory linings.

Porous

Porous bricks are lightweight and have very low thermal conductivity, moderate mechanical strength, low heat storage and low thermal expansion. Porous grades are suitable for temperatures up to 950˚C (1742˚F) offering low thermal efficiency and cost savings.

Typical Composition

- Alumina
- Silica
- Titanium Oxide
- Iron Oxide
- Magnesium Oxide
- Lime
- Refractory Binders

USED IN

- Aluminium Reduction Cells
- Holding Furnaces
- Chimneys
- Hot Blast Stoves
- Rotary Kilns
- Lime Kilns
- Carbon Bake Furnaces
- Cement Pre-Calciners

KEY DATA

		LN-0.4	LN-0.5	LN-0.6	LN-0.7	LN-0.8
MAXIMUM USE TEMPERATURE	%	900	900	900	900	900
BULK DENSITY	g/cm^3	≤0.4	≤0.5	≤0.6	≤0.7	≤0.8
COLD CRUSHING STRENGTH	Mpa	≥1.0	≥1.5	≥2.0	≥2.5	≥3.0
RE-HEATING LINEAR CHANGE	≤2% ˚C x h	900x8	900x8	900x8	1000x8	1000x8
THERMAL CONDUCTIVITY	W/mK	≤0.14	≤0.15	≤0.16	≤0.18	≤0.22
POROSITY	%	60 - 66	60 - 66	60 - 66	60 - 66	60 - 66
CHEMICAL ANALYSIS						
Iron Oxide – Fe_2O_3	%	≤2.5	≤2.5	≤2.5	≤2.0	≤2.0
Alumina – Al_2O_3	%	≥35	≥38	≥45	≥48	≥50

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Silicon Carbide
NITRIDE BONDED BRICK

Nitride Bonded Silicon Carbide Bricks are dense, hard wearing, high strength materials ideal for the side-wall linings of aluminium reduction cells Blast Furnace linings.

Exhibiting excellent thermal shock and corrosion resistance, the material also has very low thermal expansion.

Other benefits include:

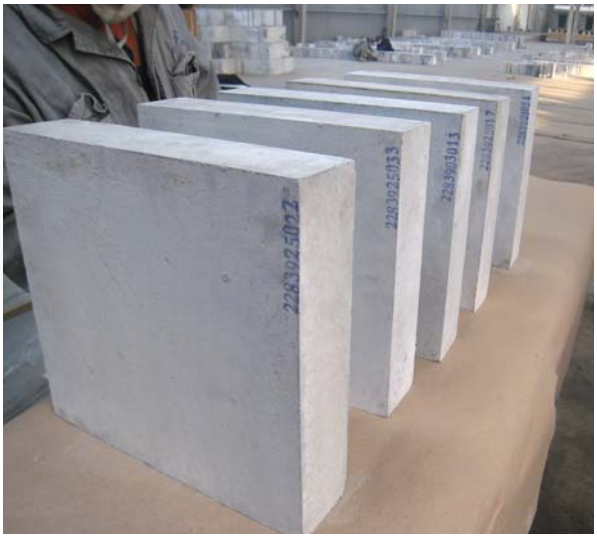
- Excellent heat transfer characteristics
- Good wear resistance
- Excellent oxidisation resistance
- Low thermal expansion

Typical Composition

- Silicon Nitride
- Silicon Carbide
- Iron Oxide

USED IN

- **Pot Room Side Wall Bricks**
- **Blast Furnace Lining**
- **Power Generation**
- **Chimney Insulation**
- **Process Heater Linings**



Silicon Carbide SHAPES

Silicon Nitride ceramics are a range of hard wearing materials capable of withstanding extreme thermal shock and high temperatures.

The range is ideal for use in automotive engines as well as parts for gas turbines and rotors.

Key characteristics

- Good thermal shock resistance
- Creep resistance
- Low density
- High fracture toughness
- High hardness and wear resistance
- Electrical resistivity

Sintered Silicon Nitride Ceramics

SSN is a high purity grade of silicon nitride that is produced by dry or isostatic pressing to create complex net shapes. SSN has excellent thermal shock resistance and outstanding compatibility with non-ferrous molten metals. This lower cost alternative to the fully dense silicon nitride grades can be manufactured to close tolerance without the need for expensive diamond grinding.

Hot Pressed Silicon Nitride Ceramics

HPSN can be formulated into a variety of compositions and offers the highest strength of silicon nitrides.

Finishing Services

- Precision grinding and machining
- CNC machining and grinding
- Lapping, polishing and threading

USED IN

- **Semi-Conductor Handling Parts**
- **Wafer Processing Components**
- **Bearing Balls and Rollers**
- **Nozzles**

Typical Composition

- Silicon Nitride
- Silicon Carbide
- Iron Oxide

KEY DATA

		SCB72	SCB75	SCB89
BULK DENSITY	g/cm^3	≥2.67	≥2.68	≥2.60
APPARENT POROSITY	%	≤17	≤18	≤18
MOR (20˚C)	MPa	≥45	≥50	25
HMOR (1400˚C)	MPa	≥48	≥52	50
CCS	MPa	≥150	≥195	≥110
CONDUCTIVITY (@1000˚C)	W/mK	16	20	17
CHEMICAL ANALYSIS				
SiC	%	≥71.5	≥75.0	≥89.0
Si_3N_4	%	0	≥22.0	0
Iron Oxide – Fe_2O_3	%	0.3	≤0.4	≤0.3

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Brick
MAGNESIA-CHROME

Burnt Magnesia-Chrome bricks are made from high quality Magnesia and Chrome concentrate. The Chromium Oxide (Cr_2O_3) content can be adjusted according to the requirements of the application.

Mag-Chrome bricks exhibit good thermal stability and operate at elevated temperatures. They are widely used in cement kilns, non-ferrous metal furnaces and the like.

High temperature burnt (directly bonded) magnesia-chrome bricks, semi-rebonded magnesia-chrome bricks and rebonded magnesia-chrome bricks are all made from low impurity raw materials. All or part of the raw materials are pre-burnt or electro-fused.

USED IN

- Large Rotary Kilns
- Secondary Refining Units such as RH, VOD & AOD Furnaces
- Non-Ferrous Metal Metallurgical Furnaces
- Glass Tanks

Typical Composition

- Magnesium Oxide
- Chromium Oxide
- Iron Oxide
- Aluminium Oxide
- Silicon Dioxide
- Calcium Oxide

KEY DATA

MAGNESIA-CHROME BRICK GRADE	MGe 8A	MGe 8B	MGu 12A	MGe 12B	MGe I6A	MGe 16B	MGe 20A	MGe 20B	MGe 22
MgO % ≥	65	60	60	55	50	45	45	40	46
Cr_2O_3 % ≥	8	8	12	12	16	16	20	20	22
APPARENT POROSITY % ≤	20	20	20	20	20	23	20	23	20
COLD CRUSHING STRENGTH Mpa ≥	35	30	35	30	35	30	35	30	35
REFRACTORINESS UNDER LOAD C	1620	1550	1620	1580	1620	1580	1640	158O	1580

REBONDED MAGNESIA-CHROME BRICKS GRADE	DMGe 16A	DMGe 16B	DMGe 20A	DMGc 2 0B	DMGe 24	DMGe 26
MgO % ≥	65	60	60	60	52	50
Cr_2O_3 % ≥	16	16	20	20	22	24
SiO_2 % ≤ ≤	1.2	1.6	1.2	1.l	1.2	1.2
APPARENT POROSITY % ≤ ≤	16	16	16	16	16	16
COLD CRUSHING STRENGTH Mpa ≥	45	40	45	40	45	45
REFRACTORINESS UNDER LOAD C	1750	1700	1750	1700	1750	1750

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

TDM Coat
BRICK COAT

TDM Coat is a thermal and corrosion resistant ceramic coating with operational temperatures up to 1900°C. It increases the lifetime of new and existing refractory brick, concrete and fibre linings as well as metal substrates of industrial equipment.

TDM Coat builds up an inert surface which prevents caking, erosion and sintering. TDM Coat has excellent emissivity of up to 0.98 W/mK in comparison to a 'Black Body' which has an emissivity of 1.

Features

- Extends service life of refractories including fibrous linings (up to 5 times).
- Delivers effective sealing of porosity in refractories for protection against chemical and physical attack.
- Prevents internal damage of refractories caused by chemical reactions in process.
- Improves mechanical resistance of fibrous linings.
- Reduces initial shrinkage of fibrous refractories by more than 50%.
- Gives corrosion protection to metals in acidic and high temperature environments.
- Improves heating efficiency by creating a more uniform heat flow.

Benefits

- Fuel consumption reduction (up to 8%)
- Reduction in flue gas temperature in stack (up to 28%)
- Bridge wall temperature reduction (up to 100°C)
- Increased Coil Life
- NOx reduction (up to 50%)
- Reduced flue gas emissions
- Improved oxygen control

Typical Composition

TDM Coat is a water-based ceramic composite system comprising of binders (Colloidal Solution of Silica and Silicon) and the fillers (Chromium Oxide, Mineral Fillers with a pre-mix of Silicon Oxide).

USED IN

- **Protects Bricks, Steel, Monolithics & Castables.**
- **Protects Refractory and Steel Shells in Furnaces, Kilns, Boilers & High Temperature Vessels**

KEY DATA

APPEARANCE /GRADE	GREEN HC	WHITE HC	BLACK HC	EMISSIVE HC	
MELTING POINT (°C)	1900	1500	700	1900	
DENSITY (kg/m³)	2400	2400	3300	3000	
THERMAL CONDUCTIVITY (W/mK)		0.088	0.083	0.189	0.088
POROSITY (@ 20 °C)	<0.1	<0.1	<0.1	<0.1	
THERMAL SHOCK RESISTANCE (K/sec)	>500	>500	>200	>500	

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Anchor Systems

Refractory anchors are manufactured to suit any depth of lining for new build or repair work to customers individual requirements.

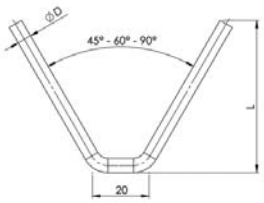
Standard anchors are available for immediate despatch. Large stocks of heat resisting plate, bar, wire and coil enable us to respond to customers immediate requirements.

Other benefits include:

- High temperature applications
- Used to fix hot face linings
- Cost effective

USED IN	
Refractory Anchors	Fabrications and Support Brackets
Brick Anchors	Stainless Steel Fibres
Bricking Shims	Ceramic Anchors and Ceramic Fibre Fixings

CH1



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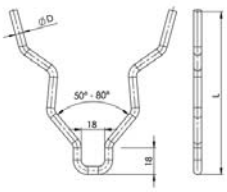

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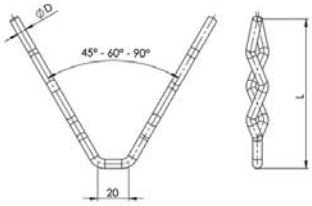

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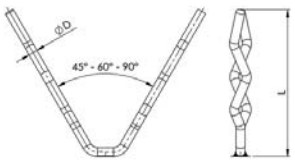

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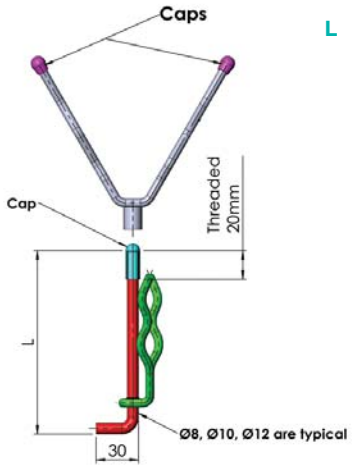

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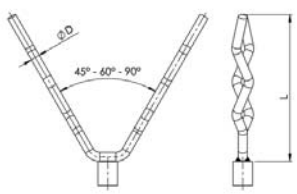

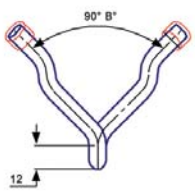

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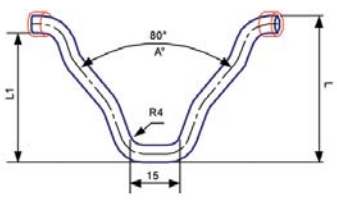

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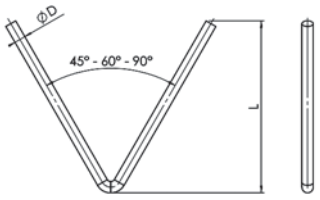

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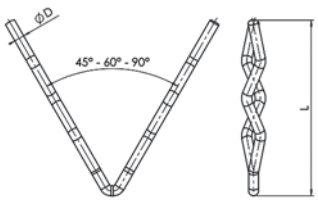

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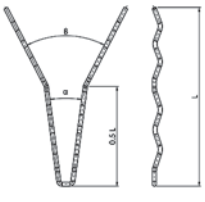

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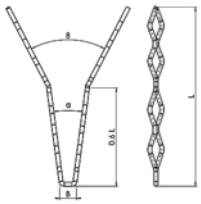

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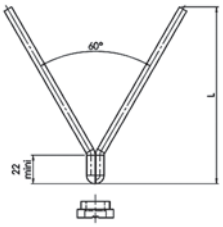

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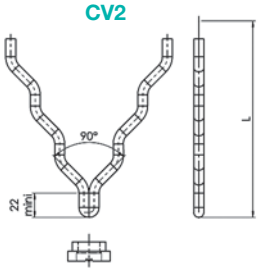

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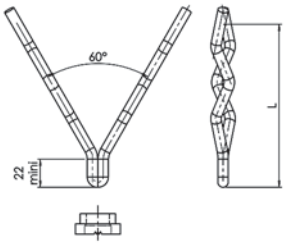

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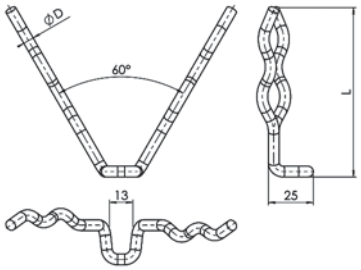

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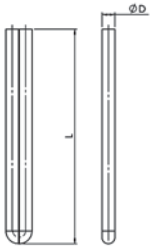

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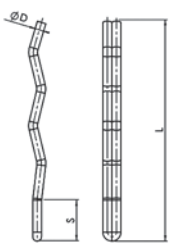

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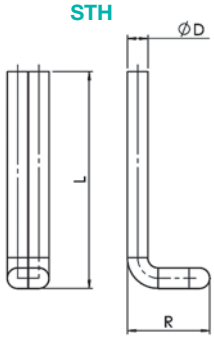

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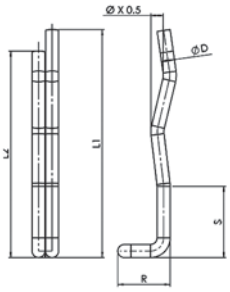

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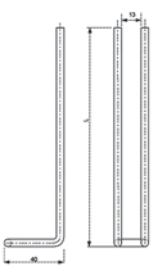

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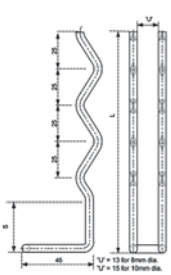

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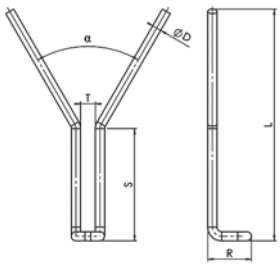

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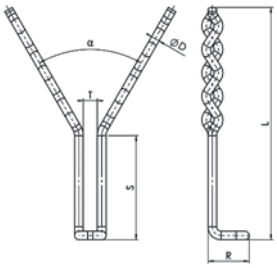

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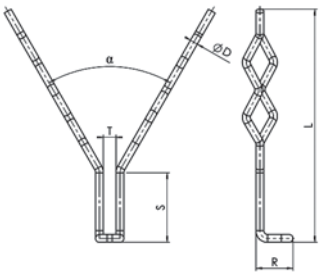

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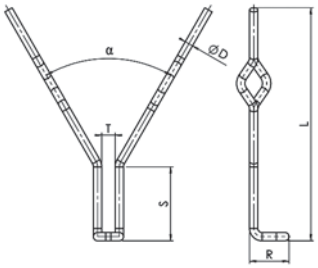
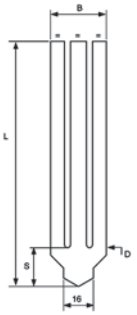
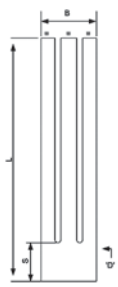


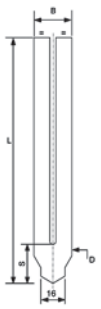
ERA-B-C



EHA-B-C



YRA-B-C



YHA-B-C

Air Setting Cement
SAIRSET®

Sairset® is a wet, high strength air-setting refractory mortar used in kiln building mould/ brick repair and glass fusing applications.

It uses a resin based mortar which is designed for high temperature applications. It is ideal for use with porous materials such as Insulating Fire Brick and Insulating Concretes and will equally enhance their abrasive resistance.

The cement sets to form a strong hard film, which develops superior bond strength at high temperatures while maintaining excellent resistance to thermal shock. Sairset is simple to shape with wet tools or by hand.

Typical Composition

- Silica
- Lime
- Iron Oxide
- Titanium Dioxide
- Alumina
- Magnesium Oxide
- Alkalis

USED IN

- Brick Jointing
- Hot or cold repairs of boiler insulation
- General packing applications
- Coating for metal liners
- Brick lining
- Filling cup-locks
- Patching and repair of refractory fibre

KEY DATA

MAXIMUM RECOMMENDED TEMPERATURE	3100°F / 1700°C
REFRACTORINESS TEST – ASTM C199	
3092°F (1700°C) Test Temperature	No Softening or Flowing
WEIGHT REQUIRED TO LAY 1000 9 x 4 1/2 x 2 1/2	
Brick (229 x 114 x 63mm)	
Dipping consistency	350 Kg
MODULUS OF RUPTURE – ASTM C198	
On brick with ends bonded together	
Using mortar in trowelling consistency	Mpa
Dried at 220°F(105°C)	4.48 - 5.86
WATER RETENTION	
A. R. I. technical bulletin No 60	Minimum of 15 minutes
PARTICLE SIZE – ASTM C92	
Maximum retained on 20 mesh (0.83mm opening)	Less Than 1.0%
Maximum retained on 35 mesh (0.42mm opening)	Less Than 5.0%

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

SIFCA®

SIFCA® (Slurry Infiltrated Fibre Castable) is a patented pre-cast refractory composite comprising of of low cement refractory slurry and stainless steel fibre. It is a combination of up to 16% volume stainless steel fibres and any one of four slurry types.

In certain applications, SIFCA® shapes can operate in temperatures up to 3000˚F (1649˚C). The key characteristics of the material are its thermal impact resistance, shock resistance, compressive strength and refractoriness in comparison to cast iron or steel shapes.

In high temperature applications, SIFCA® can be used to replace cast iron and steel parts that are oxidising as well as being used as a direct replacement for conventional pre-cast refractory shapes in structural or support applications.

Unlike traditional pre-cast shapes, SIFCA® parts can be bolted to the same structure as the steel or cast iron it is replacing.

Other benefits include:

- Wear resistance
- Compressive strength
- Thermal shock resistance
- High impact resistance

Typical Composition

- Aluminium Oxide
- Silicon Dioxide
- Calcium Oxide
- Iron Oxide
- Magnesium Oxide
- Titanium Dioxide
- Potassium Oxide
- Sulphur Trioxide
- Sodium Oxide

USED IN

Iron and steel:

- Steel Ladle Retainer Rings
- Reheat Furnace Door Jambs
- Reheat Furnace Door Perimeters
- Iron Ladle Pour Spouts
- Slag out Sections
- Torpedo Ladle Throats
- Composite Tundish Covers
- Blast Furnace Trough and Runner Covers
- Replacement of Water Cooled Metal Sections

Non-ferrous:

- Sills and Lintels
- Trough and Launder Sections
- Furnace Door Jambs
- Furnace Door Perimeters
- Metal Stirring Tools
- Syphon Tips
- Roof Perimeters
- Skim Blades

KEY DATA

SLURRY CHARACTERISTICS	Low Cement Castable Technology
SLURRY TYPES	SIFCA® High Alumina
	SIFCA® AL High Alumina; Non-Ferrous Metal Resistant
	SIFCA® PLUS SC Silicon Carbide; Non-Ferrous Metal Resistant
SERVICE TEMPERATURE	Up to 3000˚F or 1649˚C
WEIGHT REQUIRED FOR CONSTRUCTION (WITH FIBRE)	169lbs/ft^3 or 2707kg/m^3

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Polycarbonate

Polycarbonate is extremely lightweight and has an impact resistance 200 times greater than glass.

It has exceptional performance for a plastic and is suitable for a wide range of applications which require strength, impact resistance and durability.

Other benefits include:

- Optical clarity
- High strength and impact resistance
- Fire retardant
- Machinable
- Chemical resistance
- Lightweight
- Broad temperature range

USED IN

- Anti-Vandal Secondary Glazing
- Architectural Features
- Machine Guards
- Protective Casings
- Sound Barriers

Typical Composition

Polycarbonate based on Bisphenol A (99.8%)
Ultra-Violet inhibitors (0.1% approx.)

KEY DATA

PROPERTIES	TEST METHOD	UNITS	VALUE
PHYSICAL			
Density	DIN 53479	g/cm^3	1.2
LIGHT TRANSMISSION			
(3mm thick, clear)	DIN 5036	%	90
Refractive index	DIN 53491		1.585
MECHANICAL			
Tensile strength at yield	DIN 53455	N/mm^2	>60
Tensile strength at break	DIN 53455	N/mm^2	>70
Modulus of elasticity	DIN 53457	N/mm^2	2300
Impact strength	DIN 53453	kJ/m2	>30
THERMAL			
Linear expansion coefficient	per°K	65 x 10-6	
Thermal conductivity	DIN 52612	W/mK	0.21
Maximum continuous service temperature	°C	100	

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

PTFE

PTFE is a tough, flexible engineering thermoplastic with exceptional chemical and electrical resistance.

It is stable from temperatures of –250ºC to +250ºC and has the lowest co-efficient of friction of any solid material. It is non-melting and self-extinguishing as well as being repellent to all aqueous solvents which means it will not get wet, dissolve or corrode.

PTFE is also chemically inert and does not react with other chemicals which also ensures resistance to oxidation and chemical erosion.

PTFE is available in sheet, rod and gasket form and can be intricately machined.

Other benefits include:

- Outstanding co-efficient of friction
- Chemically inert
- Hydrophobic
- Excellent electrical insulating capabilities
- Thermally stable over a wide range of temperatures
- Non-flammable even when exposed to prolonged heat
- Resistant to oxidation and UV light
- Machinable

Typical Composition

PTFE is a fluorocarbon solid. It is a high-molecular-weight compound consisting wholly of carbon and fluorine. PTFE is hydrophobic: neither water nor water-containing substances wet PTFE.

USED IN

- Slide Plates/Pipes
- Wear Plates
- Slip Plates
- Chemical /Electrical and Nuclear Engineering
- Sleeving for Pipes, Tanks Valves & Pumps
- Low Friction Bearings
- Bushes, Rollers, Pulleys
- Seals and Gaskets
- Cryogenic Components
- Component Handles

KEY DATA

GRADE		VIRGIN	25% GLASS FILLED
PROPERTIES	**Unit**	**Typical Values (from-to)**	**Typical Values (from-to)**
SPECIFIC GRAVITY	-	2.14 - 2.20	2.18 - 2.23
TENSILE STRENGTH	N/mm^2	20 - 35	15 - 16
ELONGATION AT BREAK	%	210 - 400	200 - 260
COMPRESSIVE STRENGTH @ 1% DEFORMATION	N/mm^2	4.00 - 4.50	7.0
DEFORMATION UNDER LOAD 14 N/mm2 for 24hrs	%	10 - 15	7 - 9
HARDNESS	(shoreD)	50 - 60	60 - 63
FRICTION COEFFICIENT - DYNAMIC	-	0.05	0.07
THERMAL CONDUCTIVITY	W/mK	0.20	0.43
VOLUME RESISTIVITY	Ω/cm	1017	1015
SURFACE RESISTIVITY	Ω	1015	1014

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Polyester Glass
GPO3

GPO3 is a 'Class F' laminate material manufactured from alkali-free E-glass mat and polyester resin. Sheets are formed in a heated platen press under extremely high pressure.

The finished material exhibits good electrical insulation characteristics and low moisture absorption combined with excellent flexural strength.

Fire retardant with good arc and tracking resistance, GPO3 is ideal for use in most electrical applications.

Available in Red, Grey and White colours, GPO3 is suitable for a wide range of insulation applications that require high mechanical strength.

GPO3 can be supplied in sheet, channel or box section and can be cut or machined. For component/machined parts we recommend using our in-house CNC machining service as GPO3 is not easily machined.

For those wishing to machine GPO3 please note, the material is abrasive to normal woodworking or metalworking tools. Also, machinery can be affected by the dust thrown off during the machining process. The dust is abrasive and can affect control gear as well as moving parts. GPO3 should be machined in a dry and well ventilated area.

Typical Composition

- Glass Fibres
- Polyester Resin
- Fillers

USED IN

- Terminal Covers
- Coil Supports
- Busbars
- Wedges
- Control Panels
- Switch Gear
- Gland Plates
- Mounting Blocks

KEY DATA

	Units	Value
FLEXURAL STRENGTH @ AMBIENT	MPa	170
IMPACT STRENGTH	KJ/m²	> 60
BENDING STRENGTH	N	> 3800
DIELECTRIC STRENGTH	MV/m	> 12
ARC RESISTANCE	s	> 180
PROOF TRACKING INDEX	V	600
BREAKDOWN VOLTAGE	KV	46
DENSITY	KG/m³	1850-2100
MAXIMUM WORKING TEMP	℃	155

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Epoxy & Silicone Glass
S7, G7, G10, G11 & EFR4

Esspee supply an extensive range of silicone & epoxy resin glass laminates. The family of materials offers high mechanical strength, low moisture absorption and excellent electrical properties.

Available in sheet rod and tube form, they have good dimensional stability and high wear resistance. Both Silicone and Epoxy glass products can be used in a wide range of applications where stability, strength, and electrical properties are all needed.

Silicone and epoxy based machined parts lend themselves particularly well as electrical insulation in turbine generators, cryogenic superconducting magnets and bolt isolation for structures.

Typical Composition

Woven glass fibre substrate bonded with fully cured/cross-linked epoxy/silicone resin

Other benefits include:

- Machinable
- Good thermal conductivity
- High flexural and compressive strength
- Available in sheet, rod and tube
- Good electrical resistance
- Load bearing

USED IN

- Busbar Supports
- Terminal Supports
- Spacers
- Bolt Isolation
- Phase Barriers
- Connecting Plates
- Slot Wedges
- Pole Washers
- Brush-Holder Supports
- Terminal Boards
- Armature Insulation
- Cable Cleats

KEY DATA

GRADE		G7	G10	G11	EFR4	S7
DENSITY	kg/m^3	1850	1850	1850	1900	1900
STRENGTH						
Compressive	MPa	280	240	250	300	280
MAXIMUM SERVICE TEMPERATURE	℃	155	160	180	130	200
THERMAL CONDUCTIVITY	W/mK	0.28	0.30	0.30	0.42	0.4

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

SRBP & SRBF
P1, P2, P3, F1, F2 & F3

P1, P2 and P3 are versatile electrical insulation materials. They are manufactured using fine layers of phenolic paper and exhibit high strength and excellent electrical properties coupled with low moisture absorption.

There is a choice of grades dependent upon voltage or other water absorption or insulation criteria. P grades are used in low temperature and electrical applications where rigid non-metallic insulation is needed.

F1, F2 and F3 are multi-purpose insulation materials manufactured using coarse, medium and fine weave phenolic cottons. They have excellent strength properties and very good wear resistance characteristics. They are commonly used in general mechanical applications where electrical insulation properties are also required. Medium and coarse weave grades are used for larger and more rugged components with the finer weave utilised for a higher definition machined finish. The finer weave also offers higher strength in lower thicknesses as well as consistent dimensional stability. Both P and F grades are available in sheet tube and rod form.

P Grade features
- Machinable
- Low water absorption properties
- Good electrical Insulation
- Machinable
- High voltage insulation

F Grade features
- Dimensional stability
- Wear resistant
- Machinable
- High impact resistance
- Low voltage insulation

Typical Composition
Cellulose paper/fabric substrate bonded with fully cured/cross-linked phenolic resin.

USED IN

P Grade
- Terminal Plates
- Mounting Plates
- Coil Formers
- Sleeving
- Bushes
- Busbar Supports
- Coil Supports
- Spacers
- High Voltage Insulation

F Grade
- Cams
- Mechanical Insulation
- Wear Plates
- Gears
- Actuating Arms
- Sleeving
- Low Voltage Insulation

KEY DATA

	COLOUR	DENSITY	MAX CONTINUOUS	DIELECTRIC STRENGTH	SHEAR STRENGTH	COMPRESSIVE STRENGTH
		Kg/m³	˚C	KV	MPa	MPa
F1	Brown	1350	120	23	105	350
F2	Brown	1350	120	8	100	320
F3	Brown	1350	120	10	100	315
P1	Brown	1350	100	25	100	300
P2	Brown	1350	100	25	100	320
P3	Brown	1350	100	55	100	350

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Glastherm®
HT200 & HT220

The installation or upgrading of mould base or press platen insulation is one of the highest returning investments a moulding operation can make. Properly insulated moulds require less energy to operate and ensure uniform temperature regulation within the tool.

Glastherm® thermal insulating sheet is an excellent choice for mould insulation applications. Glastherm® sheet offers significant advantages when compared with other materials such as Mica, Cement or Calcium Silicate boards. Glastherm® sheet is an efficient thermal barrier and is strong enough to resist the effects of moulding pressure and rough handling. It is resistant to oil and water absorption and is completely asbestos-free.

Glastherm® Grade HT200

Glastherm Grade HT200 insulating material is ideally suited for reducing heat loss from plastic and zinc die cast moulds with operating temperatures up to 288°C. Its thermal insulating capability provides faster start-ups and increased operating efficiency while its high strength provides long service life. It is completely asbestos-free and able to withstand rough handling during installation. It is machinable using standard metal working equipment.

Other benefits include:

- High 'hot' compressive strength
- Low thermal conductivity
- Oil and moisture resistant
- Reduces heat loss
- Helps control temperature
- Faster mould start-up
- Machinable

Glastherm® Grade HT220

Glastherm Grade HT220 is a thermal insulation sheet that is highly heat resistant and combines low thermal conductivity with very high compressive strength at moulding temperature. HT220 is finished to a close thickness tolerance, and is ideal for use in aggressive moulding applications.

Other benefits include:

- High 'hot' compressive strength
- Low thermal conductivity
- Oil and moisture resistant
- Reduces heat loss
- Machinable
- Helps control temperature
- Faster mould start-up
- Rugged and durable

Typical Composition

- Polymerised Mixture of Unsaturated Vinyl Ester Resins
- Metal Oxides
- Hydroxides
- Carbonate
- Salts
- Fibre Glass and Pigments

HT200 KEY DATA

	PROCEDURE	ENGLISH UNITS	TYPICAL VALUES	METRIC UNITS	TYPICAL VALUES
GENERAL INFORMATION					
Part number			3913 / 3915		3913 / 3915
Standard colour			White or Green		White or Green
Maximum service temperature		℉	550	℃	288
Continuous use temperature		℉	412	℃	200
MECHANICAL PROPERTIES					
Flexural strength	ASTM D 790	Psi	31,000	Mpa	214
Compressive strength					
@75℉ / 24℃	ASTM D 695	Psi	49,000	Mpa	338
@ 302℉ / 150℃	ASTM D 695	Psi	27,000	Mpa	186
@ 392℉ / 200℃	ASTM D 695	Psi	18,000	Mpa	124
@ 550℉ / 288℃	ASTM D 695	Psi	17,000	Mpa	117
Compressive modulus	ASTM D 695	Psi	1,800,000	Mpa	12,411
IZOD Impact strength (notched)	ASTM D 256	Ft. lb. / in.	8	J/cm	4.3
ELECTRICAL PROPERTIES					
Electrical strength – perpendicular S/T in air	ASTM D 149	Vpm	50	kV/mm	2
FLAME RESISTANCE PROPERTIES					
UL subject 94	UL 94	0.094 in.	HB	2.4mm	HB
PHYSICAL PROPERTIES					
Water absorption	ASTM D 570	% by wt.	0.2	% by wt.	0.2
Specific gravity	ASTM D 792	lbs / ft^3	123	g /cm^3	1.97
Thickness tolerance		inches	± 0.002	mm	± 0.05
Coefficient of thermal expansion					
Across thickness	ASTM D 696	In / In / ℃x10^{-5}	11.62	10^{-6}/K	116
Across surface	ASTM D 696	In / In / ℃x10^{-5}	2.21	10^{-6}/K	22
Thermal conductivity	ASTM C 177	BTU/In/Hr/Ft^2/℉	1.9	W/mK	0.27

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

HT220 KEY DATA

	PROCEDURE	ENGLISH UNITS	TYPICAL VALUES	METRIC UNITS	TYPICAL VALUES
GENERAL INFORMATION					
Part number					
Standard colour			Beige		Beige
Maximum service temperature		℉	608	℃	350
Continuous use temperature		℉	450	℃	220
MECHANICAL PROPERTIES					
Flexural strength	ASTM D 790	Psi	52,200	Mpa	360
Compressive strength					
@75℉ / 20℃	ASTM D 695	Psi	72,500	Mpa	500
@ 302℉ / 150℃	ASTM D 695	Psi	55,100	Mpa	380
@ 392℉ / 200℃	ASTM D 695	Psi	40,600	Mpa	280
@ 550℉ / 288℃	ASTM D 695	Psi	35,000	Mpa	250
Compressive modulus	ASTM D 695	Psi	2,610,000	Mpa	18,000
PHYSICAL PROPERTIES					
Water absorption	ASTM D 570	% by wt.	0.2	% by wt.	0.2
Specific gravity	ASTM D 792	lbs / ft^3	115	g /cm^3	1.85
Thickness tolerance		inches	± 0.004	mm	± 0.10
Coefficient of thermal expansion					
Across thickness	ASTM D 696	In / In / ℃x10^{-5}	5.7	10^{-6}/K	5.7
Across surface	ASTM D 696	In / In / ℃x10^{-5}	1.3	10^{-6}/K	1.3
Thermal conductivity	ASTM C 177	BTU/In/Hr/Ft^2/℉	1.75	W/mK	0.25

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Glastherm®
HT250 & GRADE S

Glastherm® Grade HT250

Glastherm® grade HT250 is a high compressive strength, heat resistant composite material.

Finished to a close thickness tolerance, it is ideal for insulation between the fold and the press or within the mould itself.

It is completely asbestos-free and able to withstand rough handling during installation. It can be cut and machined with standard metal working equipment.

Diamond cutting tools are recommended for best machining results.

Other benefits include:

- High 'hot' compressive strength
- Low thermal conductivity
- Oil and moisture resistant
- Reduces heat Loss
- Helps control temperature
- Faster mould start-up
- Machinable

Glastherm® Grade S

Glastherm Grade S is a general purpose insulation sheet with an economical combination of thermal and physical properties. Grade S is recommended for processes where the continuous operating temperature does not exceed 218°C. It is completely asbestos-free, rugged and able to withstand rough handling during installation. It can be cut and machined with standard metal working equipment. Diamond cutting tools are recommended for best machining results.

Other benefits include:

- Good 'hot' compressive strength
- Low thermal conductivity
- Oil and moisture resistant
- Reduces heat loss
- Helps control temperature
- Faster mould start-up
- Machinable

Typical Composition

- Polymerised mixture of Unsaturated Vinyl Ester Resins
- Metal Oxides
- Hydroxides
- Carbonate
- Salts
- Fibre Glass and Pigments

HT250 KEY DATA

		HT250M				HT250Q			
	PROCEDURE	ENGLISH UNITS	TYPICAL VALUES	METRIC UNITS	TYPICAL VALUES	ENGLISH UNITS	TYPICAL VALUES	METRIC UNITS	TYPICAL VALUES
GENERAL INFORMATION									
Part number									
Standard colour			Brown		Brown		Green		Green
Maximum service temperature		˚F	752	˚C	400	˚F	752	˚C	400
Continuous use temperature		˚F	482	˚C	250	˚F	482	˚C	250
MECHANICAL PROPERTIES									
Flexural strength	ASTM D 790	Psi	43,500	Mpa	300	Psi	87,000	Mpa	600
Compressive strength									
@68˚F / 20˚C	ASTM D 695	Psi	87,000	Mpa	600	Psi	87,000	Mpa	600
@ 356˚F / 180˚C	ASTM D 695	Psi	65,200	Mpa	450	Psi	72,500	Mpa	500
ELECTRICAL PROPERTIES									
Electrical strength –	ASTM D 149	Vpm	300	kV/mm	12	Vpm	300	kV/mm	12
perpendicular S/T in air									
PHYSICAL PROPERTIES									
Water absorption	ASTM D 570	% by wt.	0.15	% by wt.	0.15	% by wt.	<0.10	% by wt.	<0.10
Specific gravity	ASTM D 792	lbs / ft^3	125	g /cm^3	2.0	lbs / ft^3	2.0	g /cm^3	2.0
Thickness tolerance	4-50mm	inches	± 0.004	mm	± 0.10	inches	± 0.039	mm	± 0.10
Coefficient of thermal expansion									
Across thickness	ASTM D 696	In / In / ˚Cx10^{-5}	11.6	10^{-6}/K	116	In / In / ˚Cx10^{-5}	11.6	10^{-6}/K	116
Across surface	ASTM D 696	In / In / ˚Cx10^{-5}	1.3	10^{-6}/K	1.3	In / In / ˚Cx10^{-5}	1.3	10^{-6}/K	1.3
Thermal conductivity	ASTM C 177	BTU/In/Hr/Ft^2/˚F	1.54	W/mK	0.23	BTU/In/Hr/Ft^2/˚F	1.54	W/mK	0.23

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

GRADE S KEY DATA

	PROCEDURE	ENGLISH UNITS	TYPICAL VALUES	METRIC UNITS	TYPICAL VALUES
GENERAL INFORMATION					
Part number			3318		3318
Standard colour			Tan		Tan
Maximum service temperature		˚F	425	˚C	218
MECHANICAL PROPERTIES					
Flexural strength	ASTM D 790	Psi	18,000	Mpa	124
Compressive strength					
@75˚F / 24˚C	ASTM D 695	Psi	45,000	Mpa	310
@ 302˚F / 150˚C	ASTM D 695	Psi	16,000	Mpa	110
@ 392˚F / 200˚C	ASTM D 695	Psi	11,500	Mpa	79
@ 550˚F / 288˚C	ASTM D 695	Psi	10,000	Mpa	69
Compressive modulus	ASTM D 695	Psi	1,800,000	Mpa	12,410
IZOD impact strength (notched)	ASTM D 256	Ft . lb. / in.	8	J/cm	4.3
ELECTRICAL PROPERTIES					
Electrical strength – perpendicular S/T in air	ASTM D 149	Vpm	50	kV/mm	2
FLAME RESISTANCE PROPERTIES					
UL subject 94	UL 94	0.094 in.	HB	2.4mm	HB
PHYSICAL PROPERTIES					
Water absorption	ASTM D 570	% by wt.	0.4	% by wt.	0.4
Specific gravity	ASTM D 792	lbs / ft^3	115	g /cm^3	1.84
Hardness	ASTM D 785	Rockwell M	94		94
Thickness tolerance		inches	± 0.002	mm	± 0.005
Coefficient of thermal expansion					
Across thickness	ASTM D 696	In / In / ˚Cx10^{-5}	7.02	10^{-6}/K	70
Across surface	ASTM D 696	In / In / ˚Cx10^{-5}	1.10	10^{-6}/K	11
Thermal conductivity	ASTM C 177	BTU/In/Hr/Ft^2/˚F	1.8	W/mK	0.26

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Acetal
SHEET & ROD

Acetal is a semi-crystaline engineering plastic manufactured by the polymerisation of formaldehyde.

It absorbs very little moisture and thus offers good creep resistance; remaining dimensionally accurate over a long period of time and through differing environments.

Acetal has a high mechanical strength, relative hardness and stiffness that make it ideally suited for the replacement of steel or other metallic component parts. Acetal is one of the best engineering plastics for slip characteristics and has a lower coefficient of friction than Nylon.

Acetal is an outstanding engineering plastic, it is machinable and leaves a very smooth, high quality surface. With excellent dimensional stability, close tolerance components can be produced.
There are two grades available; Copolymer which exhibits slightly better chemical resistance and Homopolymer which exhibits lower thermal expansion, improved mechanical strength, stiffness and hardness.

Other benefits include:

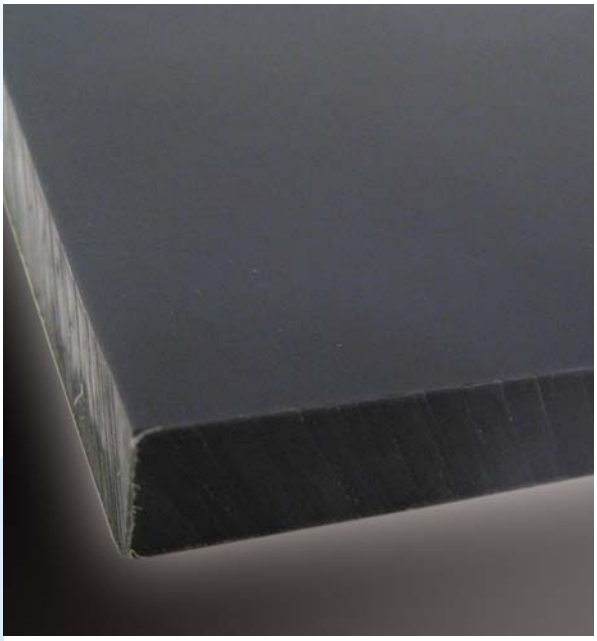
- Maximum continuous operating temperature range of -50˚C to 100˚C
- Maximum short term temperature of 130˚C
- Melt temperature of 165˚C
- Machinable
- Smooth finish
- Low friction
- Hard wearing

USED IN

- **Food Industry**
- **Low Friction Plates/Slides**
- **Bearings and Rollers**
- **Gears**
- **Valve Seats**
- **Electrically Insulating Components**

Typical Composition

- Acetal Polymer
- Polytetrafluoroethylene
- Stabiliser
- Formaldehyde



Acetal
SHEET & ROD

KEY DATA			
PROPERTIES	**UNIT**	**TEST METHOD DIN EN ISO / ASTM**	
MECHANICAL			
Density	g/cm³	527 / D 792	1.41
Tensile strength at yield	MPa	527 / D 638	60
Tensile strength at break	MPa	527 / D 638	
Elongation at break	%	527 / D 638	30
Modulus of elasticity in tension	MPa	527 / D 638	2700
Modulus of elasticity in flexure	MPa	178 / D 790	
Ball indentation hardness	MPa	2039 / 1	145
Impact strength	kJ/m²	179 / D 256	no br.
Creep rupture strength after 1000 hrs with static load	MPa		40
Time yield limit for 1% elongation after 1000 hrs	MPa		13
Coefficient of friction against hardened and ground steel	–		0.32
p = 0.05 N/mm², v = 0.6 m/s			
Wear conditions as above	µm/km		8.9
THERMAL			
Crystalline melting point	°C	DIN 53 736	165
Glass transition temperature	°C	DIN 53 736	-60
Heat distortion temperature			
Method A	°C	R 75	110
Method B	°C	R 75	160
Maximum service temperature			
short term	°C		140
long term	°C		100
Coefficient of thermal conductivity	W/(mK)		0.31
Specific heat	J/(gK)		1.5
Coefficient of thermal expansion	10^{-5}/K	DIN 53 483 / D 696	10
ELECTRICAL			
Dielectric constant at 10^6Hz		DIN 53 483	3.5
Dielectric loss factor at 10^6Hz		DIN 53 483	0.003
Specific volume resistance	Ω/cm	DIN 60093	$>10^{14}$
Surface resistance	Ω	DIN 60093	$>10^{14}$
Dielectric strength 1mm	kV/mm	ASTM 149	>50
Tracking resistance		53 480	KA 3c
MISCELLANEOUS			
Moisture absorption: Equilibrium in standard atmosphere	%	62	<0.3
(23°C/50% relative humidity)			
Water absorption at saturation @ 23°C	%	62	0.5
Resistance to hot water, washing soda			limited resistance
Flammability according to UL standard 94			HB
Resistance to weathering			not resistant

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Polypropylene

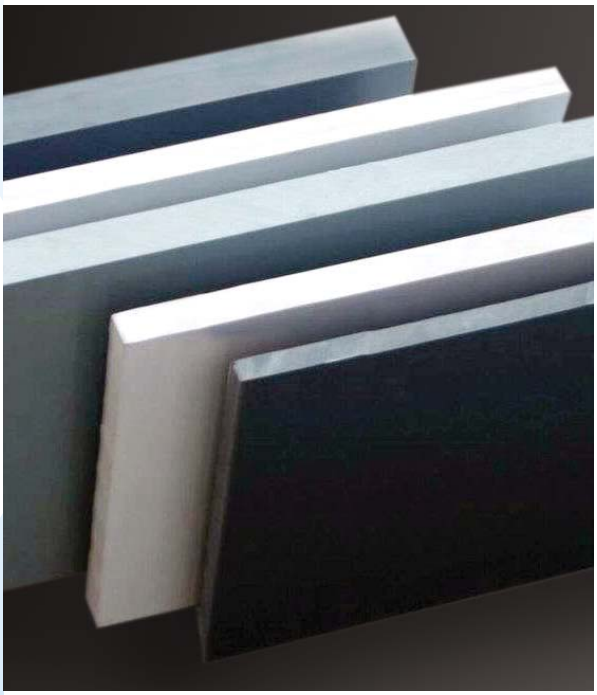
Polypropylene is produced by an extrusion or pressing process and available in two grades - Homopolymer and Copolymer. Homopolymer is the harder and more rigid grade whilst Copolymer is more flexible and has better low temperature impact performance.

Polypropylene is lightweight with a typical density of 910kg/m^3. It has low moisture absorption which can improve product and component stability whilst also helping with bacterial resistance.

The material exhibits excellent acid and chemical resistance and can be easily shaped and formed allowing the material to be used in many varied industries. Polypropylene can be welded with simple welding equipment and a welding rod.

Typical Composition

- Propylene Polymers
- Colourants
- Carbon Black
- Proprietary Colourants



Other benefits include:

- Lightweight
- Excellent impact resistance
- Resistance to chemical or acid attack
- Good electrical insulation
- Machinable
- Low moisture absorption
- Easily formed, welded & machined
- Excellent tensile and compressive strength

USED IN

- Acid or Chemical Tank Linings
- Acid Resistant Seals
- Back/Chopping Boards
- Prosthetic Shapes
- Clean Room Cladding
- Swimming Pools
- Appliance Housings
- Packaging
- Cassette Holders
- Pipes
- Structural Tanks and Linings
- Containers
- Boat Hulls
- Seat Shells and Automotive Parts
- Battery Cases

Polypropylene

KEY DATA			
PROPERTIES	**UNIT**	**TEST METHOD DIN EN ISO / ASTM**	
MECHANICAL			
Density	g/cm³	527 / D 792	0.91
Tensile strength at yield	MPa	527 / D 638	30
Tensile strength at break	MPa	527 / D 638	
Elongation at break	%	527 / D 638	>50
Modulus of elasticity in tension	MPa	527 / D 638	1600
Modulus of elasticity in flexure	MPa	178 / D 790	
Ball indentation hardness	MPa	2039 / 1	80
Impact strength	kJ/m²	179 / D 256	no br.
Creep rupture strength after 1000 hrs with static load	MPa		22
Time yield limit for 1% elongation after 1000 hrs	MPa		4
Coefficient of friction against hardened and ground steel	–		0.3
p = 0.05 N/mm², v = 0.6 m/s			
Wear conditions as above	µm/km		11
THERMAL			
Crystalline melting point	°C	DIN 53 736	165
Glass transition temperature	°C	DIN 53 736	-18
Heat distortion temperature			
Method A	°C	R 75	65
Method B	°C	R 75	105
Maximum service temperature			
short term	°C		130(nat) 140(grey)
long term	°C		100
Coefficient of thermal conductivity	W/(mK)		0.22
Specific heat	J/(gK)		1.7
Coefficient of thermal expansion	10^{-5}/K	DIN 53 483 / D 696	17
ELECTRICAL			
Dielectric constant at 10^6Hz		DIN 53 483	2.25
Dielectric loss factor at 10^6Hz		DIN 53 483	0.0002
Specific volume resistance	Ω/cm	DIN 60093	$>10^{14}$
Surface resistance	Ω	DIN 60093	$>10^{13}$
Dielectric strength 1mm	kV/mm	ASTM 149	>40
Tracking resistance		53 480	KA 3c
MISCELLANEOUS			
Moisture absorption: Equilibrium in standard atmosphere	%	62	<0.1
(23°C/50% relative humidity)			
Water absorption at saturation @ 23°C	%	62	0.03
Resistance to hot water, washing soda			resistant
Flammability according to UL standard 94			HB
Resistance to weathering			not resistant

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

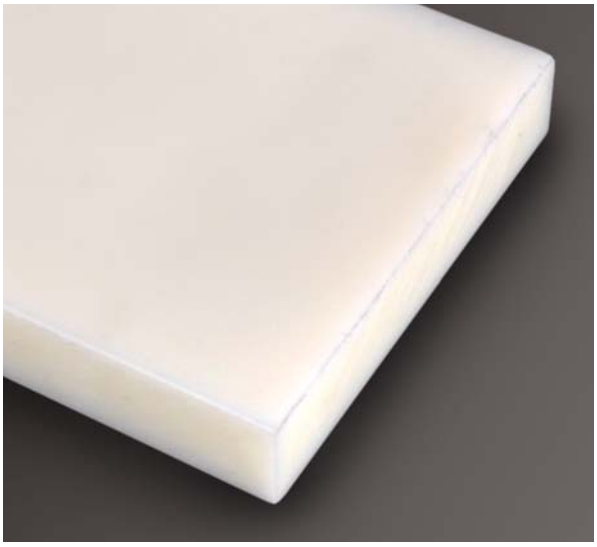
Nylon
ROD & SHEET

Nylon Rod/Sheet is an excellent wear and abrasion resistant material with high mechanical strength and exhibits good sliding properties. The material is resistant to many oils and chemicals.

Nylon rods and sheets are available in different grades including heat stabilised and graphite impregnated to improve friction resistance.

Nylon exhibits excellent machinability thus providing high edge definition and surface smoothness. Nylon sheets, plates, tubes or rods within the polyamides group, are commonly referred to as 'nylon'.

The most notable are: Nylon PA 6, PA 66, PA 11 and PA 12. Nylon 6 is the most commonly used grade due to its good all round performance properties. Ertalon and Nylatron are the brand names for Nylon 6 and Nylon 66 grades.



Other benefits include:

- Excellent wear and abrasion resistance
- Good slip properties
- Machinable
- High mechanical strength
- Good creep stability
- High mechanical strength and toughness
- Good fatigue resistance
- High mechanical damping ability
- Excellent wear resistance
- Good electrical resistance
- High resistance against high energy radiation (gamma and X-rays)

USED IN

- Bearings
- Pulleys
- Bushes
- Rollers
- Spacers
- Wear Components
- Wear Pads
- Gears
- Nozzle

Typical Composition

- Polyamide 66
- Glass Fibre
- Mica
- Non-Regulated: Rubber / Toughener / Impact modifiers
- Bis-(hexachlorocyclopentadiene) Cyclo-Octane (Declorane Plus)
- Antimony Trioxide
- Lubricators and Colourants
- Titanium Dioxide
- Carbon Black
- Polycaprolactam

Nylon
ROD & SHEET

KEY DATA					
PROPERTIES	**UNIT**	**TEST METHOD DIN EN ISO / ASTM**	**6 NATURAL**	**6 BLACK**	**66 NATURAL**
MECHANICAL					
Density	g/cm³	527 / D 792	1.13	1.14	1.14
Tensile strength at yield	MPa	527 / D 638	85 / 60 ***	75	80 / 60 ***
Tensile strength at break	MPa	527 / D 638			
Elongation at break	%	527 / D 638	70 / 200 ***	>25	40 / 150 ***
Modulus of elasticity in tension	MPa	527 / D 638	3000 / 1800 ***	2700	3100 / 2000 ***
Modulus of elasticity in flexure	MPa	178 / D 790			2830
Ball indentation hardness	MPa	2039 / 1	160 / 70 ***	107 / 85 ***	170 / 100 ***
Impact strength	kJ/m²	179 / D 256	no br.	no br.	no br.
Creep rupture strength after 1000 hrs with static load	MPa		45		55
Time yield limit for 1% elongation after 1000 hrs	MPa		4.5	5	8
Coefficient of friction against hardened and ground steel	–		0.38-0.45	0.32-0.37	0.35-0.42
p = 0.05 N/mm², v = 0.6 m/s					
Wear conditions as above	µm/km		0.23	0.16	0.9
THERMAL					
Crystalline melting point	°C	DIN 53 736	220	220	260
Glass transition temperature	°C	DIN 53 736	60 / 5 ***	40	72 / 5 ***
Heat distortion temperature					
Method A	°C	R 75	75	100	100
Method B	°C	R 75	190	195	>200
Maximum service temperature					
short term	°C		160	160	170
long term	°C		100	100	100
Coefficient of thermal conductivity	W/(mK)		0.23	0.23	0.23
Specific heat	J/(gK)		1.7	1.7	1.7
Coefficient of thermal expansion	10^{-5}/K	DIN 53 483 / D 696	8	18	8
ELECTRICAL					
Dielectric constant at 10^6Hz		DIN 53 483	3.7 / 7 ***		3.6-5.0
Dielectric loss factor at 10^6Hz		DIN 53 483	0.031 / 0.3 ***		0.026-0.200
Specific volume resistance	Ω/cm	DIN 60093	$>10^{13}$	6×10^{13}	$>10^{12}$
Surface resistance	Ω	DIN 60093	$>10^{12}$	3×10^{13}	$>10^{10}$
Dielectric strength 1mm	kV/mm	ASTM 149	50 / 20 ***		28 / 30
Tracking resistance		53 480	CTI 600		CTI 600
MISCELLANEOUS					
Moisture absorption: Equilibrium in standard atmosphere	%	62	3	3	2.8
(23°C/50% relative humidity)					
Water absorption at saturation @ 23°C	%	62	9.5	8-9	8.5
Resistance to hot water, washing soda			limited resistance	limited resistance	limited resistance
Flammability according to UL standard 94			HB	HB	V2 (3mm)
Resistance to weathering			not resistant	not resistant	not resistant

**** after storage in a standard 23/50 atmosphere (DIN 50 014) to equilibrium*

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Thermoplastics
PEEK

PEEK is a high performance engineering plastic that can withstand an extreme range of conditions while still retaining its core properties. It has a high operating temperature and low friction characteristics.

PEEK is able to operate at a constant high temperature of 260˚C but can also withstand an intermittent temperature of 300˚C. It also has a fire rating of V-0, this is one of the highest possible classifications and means that PEEK has passed flame tests beyond any other plastic.

PEEK is also very tolerant to most forms of radiation which makes it an ideal material for use within the x-ray departments of hospitals as well as the nuclear industry.

Other benefits include:

- High temperature
- Tough and impact resistant
- Excellent tensile strength
- Low smoke emissions
- Machinable
- Chemically resistant
- Wear resistant
- Resistant to hot water and steam
- Retains mechanical strength at elevated temperatures
- Very low smoke and toxic gas emissions when exposed to flame

USED IN

- **High Temperature Bearings and Rollers**
- **Food Processing Industry**
- **Medical and Implant Industry**
- **Surgical Instruments**
- **Semi-Conductor Machinery Components**
- **Seals**
- **Aerospace Parts**
- **Pump and Valve Components**
- **Bearings and Bushings (Bearing Grade PEEK)**
- **Electrical Components**

Typical Composition

- Polyetheretherketone
- Carbon Black

Thermoplastics
PEEK

KEY DATA			
PROPERTIES	**UNIT**	**TEST METHOD DIN EN ISO / ASTM**	
MECHANICAL			
Density	g/cm³	527 / D 792	1.32
Tensile strength at yield	MPa	527 / D 638	95
Tensile strength at break	MPa	527 / D 638	
Elongation at break	%	527 / D 638	25
Modulus of elasticity in tension	MPa	527 / D 638	3000
Modulus of elasticity in flexure	MPa	178 / D 790	4100
Ball indentation hardness	MPa	2039 / 1	M99
Impact strength	kJ/m²	179 / D 256	no br.
Creep rupture strength after 1000 hrs with static load	MPa		
Time yield limit for 1% elongation after 1000 hrs	MPa		
Coefficient of friction against hardened and ground steel	–		0.3-0.38
p = 0.05 N/mm², v = 0.6 m/s			
Wear conditions as above	µm/km		
THERMAL			
Crystalline melting point	°C	DIN 53 736	343
Glass transition temperature	°C	DIN 53 736	143
Heat distortion temperature			
Method A	°C	R 75	140
Method B	°C	R 75	182
Maximum service temperature			
short term	°C		300
long term	°C		280
Coefficient of thermal conductivity	W/(mK)		0.25
Specific heat	J/(gK)		0.32
Coefficient of thermal expansion	10^{-5}/K	DIN 53 483 / D 696	5.0
ELECTRICAL			
Dielectric constant at 10^6Hz		DIN 53 483	3.2-3.3
Dielectric loss factor at 10^6Hz		DIN 53 483	0.001-0.004
Specific volume resistance	Ω/cm	DIN 60093	$>10^{16}$
Surface resistance	Ω	DIN 60093	$>10^{15}$
Dielectric strength 1mm	kV/mm	ASTM 149	20
Tracking resistance		53 480	
MISCELLANEOUS			
Moisture absorption: Equilibrium in standard atmosphere	%	62	0.1
(23°C/50% relative humidity)			
Water absorption at saturation @ 23°C	%	62	0.5
Resistance to hot water, washing soda			resistant
Flammability according to UL standard 94			V0
Resistance to weathering			not resistant

The data provided is taken from average test results conducted under standard procedures and conditions and should not be used for specification purposes.

Thermoplastics
MATROX®

Matrox® (Ultra High Molecular Polyethylene)
The Matrox® family was specially developed for use as lining material. Matrox® products are made to meet the many and varied requirements of the industry. Thanks to their low coefficients of friction they promote an optimum material flow and represent an excellent solution to wear and corrosion problems.

Format
Compression moulded sheets, skived sheets

Colours
Blue-grey, black, natural, light green

Matrox® is outstanding for its extremely low coefficient of friction and high wear resistance and so optimally meets requirements for the lining of silos and bunkers.

Other benefits include:
- Extremely low coefficient of friction
- Excellent abrasion and wear resistance
- High temperature resistance (up to 110°C)
- High impact strength
- No corrosion
- Very low water absorption
- High chemical resistance

USED IN
- Truck Bed Lining
- Bunker Lining
- Transport Industry
- Mechanical Engineering

Typical Composition
Matrox® is a semi crystalline plastic comprising of:
- Polyethylene
- (Trace) Olefin-Copolymerisate
- Stabiliser
- Additives

Polystone®
PLAY-TEC

Polystone® Play-Tec for creative playground equipment.

Format
Extruded sheets

Colours
Yellow, red, green, black, grey, blue, monochrome or multi-coloured

Polystone® Play-Tec is homogeneously imbued, water-repellent plastic sheeting, which, like Polystone® Safe-Tec L, is especially suited to applications in toy and leisure equipment manufacture. Polystone® Play-Tec has been tested to DIN EN 71-3, -9, -10, -11 (safety for toys) and because of its weathering and scratch resistance it is the better choice for applications where until now painted or glazed plywood or MDF sheets have been used.

Other benefits include:
- No chipping and no risk of injury from splinters
- Physiologically safe
- Water and dirt repellent
- Chemical and UV resistant
- Excellent mechanical strength and rigidity
- Machinable with woodworking tools

Typical Composition
Polystone® Play-Tech is a semi crystalline plastic comprising of:
- Polyethylene
- Stabiliser
- Additives

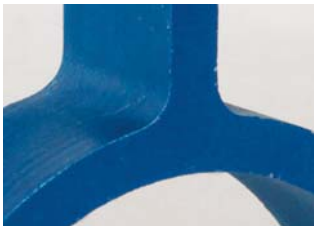
USED IN
- Toy and Leisure Equipment
- Kindergarten Furnishings and Fittings
- Design Elements
- Signs and Displays

Polystone®
MARINE-TEC

Polystone® Marine-Tec is a specially developed material for ship equipment.

Format
Extruded sheets

Colours
White & special colours



Polystone® Marine-Tec is a very highly salt water resistant, easily machined material specially developed for ship's furniture and fittings.
A special version of this material is available, named Polystone® Marine-Teclite. The co-extruded sheets comprise of foamed, closed pore core and two solid outer layers with embossed surfaces. Because of this structure the material is about 20% lighter, while possessing almost identical bending strength.

Other benefits include:

- UV-stabilised and colour stable
- Embossed surface on both sides
- Crack resistant and does not decay
- No water absorption and Seawater resistant
- Heat resistant up to 80˚C
- Good thermal and electrical insulation
- Resistant to mould and fungi
- Low specific gravity
- Excellent dimensional stability
- Machinable

USED IN

- Interior Decoration Furniture
- Steps
- Surfaces
- Coverings
- Instrument Boards
- Edge Protection

Polystone®
SAFE-TEC

Polystone® Safe-Tec is used for step-on surfaces in the chemical industry

Format
Extruded sheets

Colours
Black and special colours

Polystone® Safe-Tec is available in two versions. Polystone® Safe-Tec C was developed for step-on surfaces in the chemical industry and Polystone® Safe-Tec L was developed for the leisure industry. The material offers the greatest possible safety with regard to slip resistance, even under wet conditions.

Other benefits include:

- Slip resistant property tested to DIN 51097 (even with a wet surface)
- Suitable for flat surfaces set at angles of up to 22˚
- Easily processed
- Surface and cut surfaces can be welded together
- Almost no water absorption
- Light and weather resistant
- Warm under foot
- Odour free
- No emission of solvents, plasticisers or stabilisers
- Easy to clean
- Recyclable
- Excellent impact noise insulation
- Excellent vibration damping

USED IN

- Floors and Step-On Surfaces in Chemical Equipment and Container Construction
- Chemical Industry
- Ship's Floors
- Wet Areas in Swimming Pools
- Sanitary Sector
- Leisure Industry

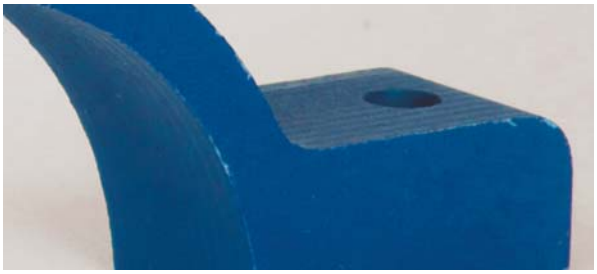
Polystone® FOAMLITE®

Format
Extruded sheets

Colours
Natural and special colours

Polystone® Foamlite® is a closed pore, foamed material. It has excellent mechanical and thermal properties and is lightweight (which makes it ideal for a wide range of applications).

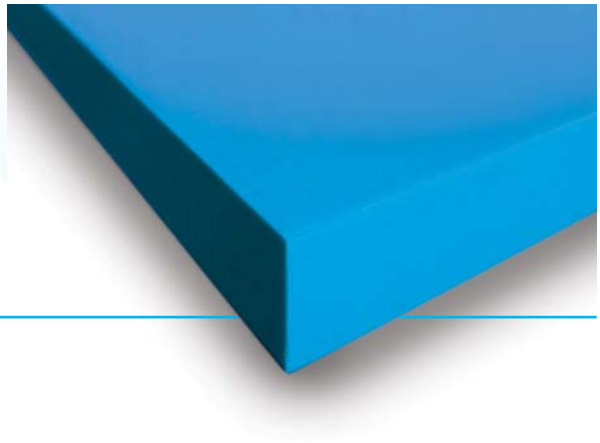
Other benefits include:
- Scratch resistant (due to an embossed surface on both sides)
- Low density
- Excellent mechanical properties
- Almost no moisture absorption
- Noise and heat insulating
- Good weldability
- High flexural fatigue strength



USED IN
- Industry Packing Systems
- Reusable Containers
- Insulating Linings

Typical Composition
Polystone® is a semi crystalline plastic comprising of:
- Polypropylene
- Stabiliser
- Additives

Polystone® MICROBLOC



Polystone® M Microbloc exerts an anti-microbial action against bacteria, viruses, mould, yeasts, fungi and algae without the addition of toxins.

Type of product
Compression moulded sheets, skived sheets, rods and profiles

Colours
Natural and special colours

USED IN
- Catering Trade
- Bottling Industry
- Mechanical Engineering
- Foodstuffs Manufacturing and Packaging
- Dairy Industry
- Meat and Poultry Processing
- Medical Technology and Fittings in Hospitals and Care Facilities

Other benefits include:
- Anti-microbial action against bacteria, viruses, mould, yeasts, fungi and algae
- Consistent and sustained action (due to non-migrating active constituent)
- Outstanding sliding and wearing properties
- Approvals under foodstuffs law (FDA, EPA)
- Smooth surface
- No moisture absorption
- Good chemical resistance

Typical Composition
Polystone® Microbloc is a semi crystalline plastic comprising of:
- Polyethylene
- (Trace) Olefin-Copolymerisate
- Stabiliser
- Additives

Lignostone® Transformerwood®
LAMINATED DENSIFIED WOOD

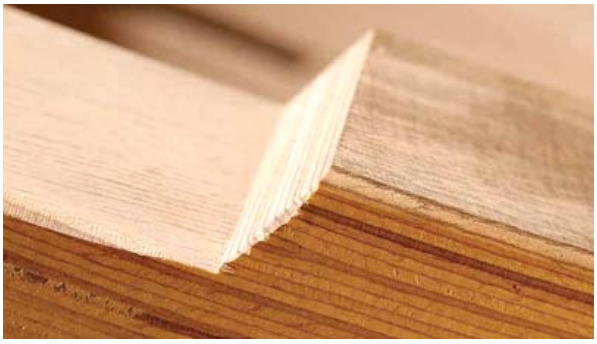
Lignostone® Transformerwood® is a laminated densified wood in accordance with IEC 61061.

It consists of beech veneers (Fagus Sylvatica), which are joined together with thermosetting synthetic resins under pressure and heat.

Transformerwood® can be produced in various densities and strengths.

Other benefits include:

- Good electrical insulation
- Very good oil absorption
- Good dielectric strength
- Low specific weight
- Withstands high mechanical loading
- Low and high temperature resistance
- Resistance to abrasion and wear
- Machinable
- Dimensionally stable



USED IN

- Underbody Skid Boards on Racing Cars
- Tooling in the Aerospace Industry
- Induction Heating Top Plates
- Pipe Support Blocks
- Pipe Shoes and Anchors

Typical Composition

Densified Laminated Wood with Thermoset Phenolic Resins.

KEY DATA

THE REQUIRED GRADE FOR A SPECIFIC APPLICATION IS DEFINED BY:
DENSIFICATION SYMBOLS
L = 0.75 to 1.05 g/cm³
M = 1.10 to 1.25 g/cm³
H = 1.30 to 1.40 g/cm³
LAMINATION
I= parallel
II= crosswise
X= tangential
VENEER THICKNESS
1 = veneers < 2 mm
2 = veneers ≥ 2 mm
TYPE OF RESIN
without character = mechanical types
E3 = electrical types

An example for identification of one of the standard types:
LII/2-E3 = Low density – crosswise lamination – with ≥ 2.0 mm veneer – electrical type

Varnishes
INSULATING

There are various types and grades of insulating varnishes developed for applications that require exceptional performance and reliability. They include dipping and impregnating varnish for transformers, coils and rotating equipment as well as saturating and bonding varnish for motor, transformer and coil windings.

Insulating resins are also ideal for electrical equipment that is designed for operation at continuous or intermittent high temperatures, or where moisture or corrosive atmospheres are encountered such as transformers, AC motor stator coils, AC/DC armature and field coils.

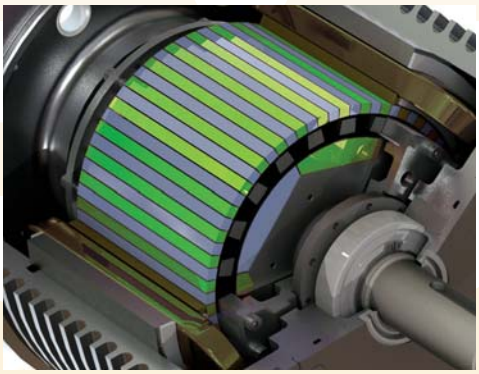
Product Name	Resin Type	Application	Description
SP120EP	Epoxy Phenolic	Hermetic Motors	Epoxy phenolic varnish with excellent Freon gas resistance
SP130EP	Epoxy Phenolic	Hermetic Motors	Epoxy phenolic varnish with high flash solvent which declassifies the material as flammable
SP250P	Modified Polyester	Transformers/Motors	Fast curing multi-purpose varnish
SP270P	Phenolic mod Polyester	Motors/General Purpose	UL recognised multi-purpose varnish
SP320A	Alkyd	Transformers/LV Motors/ Coils	Quick drying, low viscosity sealing varnish for transformers and small motors
S3460SA	Silicone mod Alkyd	Motors/Transformers	Class H air setting varnish. Available in various pigments
SP601A	Acrylic	PCB	Fast drying acrylic coating that conforms to BSEN61086 & MIL-I-46058C
SP610CA	Cellulose Acetate	Masking Compound	Quick drying blue masking lacquer
SPR6P	Polyester	Transformers, Ferrite Cores	Flexible polyester resin for application by VPI in transformers
SP700PU	Unsaturated Polyester	Motors/Transformers	Low odour, high flash point single component resin for VPI, roll and immersion applications
U SP750P	Unsaturated Polyester	Transformers	Pigmented coating for transformers (available in most RAL colours)
SP800PI(d)	Polyester Imide in Diacrylate	Motors/Transformers	Low VOC impregnation by dip/roll/VPI of motors/transformers where fast, low temperature process is required
SP801UP	Unsaturated Polyester	Rotors/Stators	Single component trickle resin for easy processing and quick cure of stators and rotors
SP802UP	Unsaturated Polyester	Rotors/Stators	General purpose two part resin

Varnishes
EPOXY BASED IMPREGNATING RESINS

Epoxy varnishes penetrate and saturate extremely well, giving outstanding moisture resistance and high bond strength.

Epoxy resins are also quick drying and possess excellent electrical insulating properties coupled with good heat resistance and are easily applied.

Our comprehensive range of varnishes fully compliment our engineering plastics and are available from stock at our UK warehousing facility.



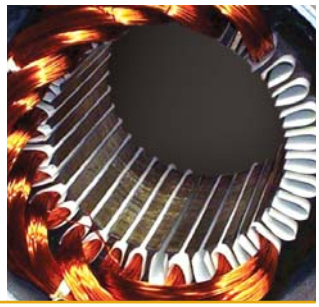
Product Name	Resin Type	Application	Description
SP5901E	Epoxy	Transformers/Motors	Epoxy impregnation applied by roll/dip/VPI to general purpose transformers and motors
SP5902E	Epoxy	Traction Motors/MV	Multi-purpose VPI resin that offers all the benefits of epoxy resin
SP57E	Epoxy	MV Generators/Motors	Silica filled epoxy resin for VPI impregnation of random wound rotors and stators
SP948EW	Epoxy	Wound Cores	Used for flexible void free impregnation of cut cores and transformers
SP950EW	Epoxy	Wet winding of Field Coils/End Windings	Wet winding resin that cures to give an excellent bond and heat transfer

Varnishes
WATER BASED

Esspee's range of water based varnishes are Class H, VOC compliant with high bond strength even when used at low solid levels.

Product Name	Resin Type	Application	Description
SP4(WP)	Polyester	Transformers/Motors	General purpose water based varnish (VOC compliant)
SP6 (WPC)	Phenolic Copolymer	Multi-purpose	Water based varnish with excellent bond strength (VOC compliant)

Varnishes
EPOXY POTTING COMPOUND



Product Name	UL	Special Property
SP0030	n/a	Class F – low viscosity, resistant to thermal shock
SP0043	n/a	Trowelling compound
SP0032	UL94 V0	General purpose
SP002C	UL94 V0	Flame retardant and used with electronic transformers
SP0056	UL94 V0	Class H – with high thermal conductivity
SP008A	n/a	Class F – flame retardant and resistant to thermal shock
SP006D	UL94 HB	Class H – good thermal conductivity and resistant to thermal shock
SP0040	n/a	Flexible for large castings and resistant to thermal shock

Varnishes
POLYURETHANE POTTING COMPOUNDS

Our polyurethane electrical grade potting compounds display an excellent glass-like finish.

They have very low viscosity levels which results in a resin system that is flame retardant and exhibits exceptional adhesion coupled with low stress thermal cycling characteristics.

Product Name	UL	Special Property
SP11PPC	n/a	Low to medium viscosity and general purpose
SP16APPC	n/a	low to medium viscosity, flame retardant and multi-purpose
SP025	UL94 V0	Low viscosity and flame retardant. Used where high thermal conductivity and high levels of elasticity are required
SP028	n/a	Low to medium viscosity and general purpose
SP3PPC	n/a	Medium to low viscosity, semi rigid and multi-purpose
SPR35PPC	UL94 V0	Flame retardant, general purpose
SP33PPC	n/a	Low viscosity, rigid compound
SP17PPC	n/a	Flame retardant with good heat dissipation
SP9PPC	n/a	High thermal conductivity
SP6PPC	n/a	UV stable, clear and low viscosity

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CONDITIONS OF SALE

1. General - Quotations made by the Company are made on the following terms and conditions and do not constitute offers by the Company. All orders placed on the Company are subject to acceptance by the Company in writing on the following terms and conditions and no alterations or modifications hereof or terms inconsistent herewith shall have effect unless such alteration or modification or term is expressly accepted in writing by a duly authorised officer of the Company.

2. Drawings, Quantities etc - Any drawings or details of quantities or other information supplied by the Company must be treated as approximate and shall be subject to verification by the customer and in the event of any alteration, modification or amendment thereto offer quotation the Company reserves the right to alter, modify or amend its quotation accordingly.

3. Prices - the Company reserves the right to vary its prices without notice and unless otherwise agreed in writing prices shall be those ruling at the date of delivery. This condition does not apply to Fixed Price quotations expressed as such which shall specifically exclude any increase in the Company's prices that may be occasioned by the increase or imposition of any duty or tax or by adjustments or alterations in currency rates of exchange.

4. Delivery

(a) All delivery dates or periods given by the Company whether before or after acceptance of the order are given in good faith but the Company shall be under no liability whatsoever for any failure or delay in despatch or delivery not for any loss or damage arising in connection therewith.

(b) Should despatch or delivery of the goods or part of them be delayed or prevented from any cause whatsoever beyond the Company's control or for a reason attributable to the customer or its customers or agents then, at the Company's option either the contract or any unfilled part thereof shall be terminated or the Company may extend the time of delivery until a reasonable period after such cause shall have ceased, in which event the customers shall be responsible for all storage and other costs incurred by the Company in connection therewith. Any such termination shall not prejudice the rights and obligations of either party in respect of any part of the contract already completed.

(c) Unless otherwise agreed delivery shall take place at the works of the customer or at a site nominated by the customer or on a hard road as close as possible thereto. The customer shall be responsible for providing labour and facilities at the delivery point for the unloading of goods ordered by him, and shall indemnify the Company against all claims whatsoever arising from such unloading operations. The Company reserves the right to its drivers and carriers to refuse to take their vehicles on to a nominated site if in the opinion of the driver or carrier the site conditions are such as to constitute a danger to the vehicle, the goods or any persons or property.

5. Risk - the risk in the goods shall pass to the customer upon delivery provided that no liability is accepted for goods damaged in transit unless notice is given to the Company and to the carriers within three days of delivery and an opportunity is given in respect the same.

6. In the case of contracts for the sale of goods and materials outside the United Kingdom delivery shall take place and property and risk shall pass to the customer as specifically agreed between the Company and the customer but in all other aspects these terms and conditions shall apply.

7. Payment - unless otherwise agreed invoices must be paid within 30 days following the date on which delivery was made.

8. Cancellation - Once an order has been duly accepted by the Company cancellation by the customer will only be accepted in the sole discretion of the Company subject to the Company being indemnified against all charges for work carried out, and for expenses incurred relating to the order prior to acceptance of the cancellation and against any loss (including loss of profit) which may be occasioned by such cancellation.

9. Lien and Termination - without prejudice to any common law or statutory rights which the Company reserves the right to determine contract (in relation to the whole or part thereof remaining unfulfilled) forthwith if:

(a) any payment shall be overdue in respect to this or any other contract between the customer and the Company provided that the Company may at its opinion and without prejudice to its rights terminations, delay or suspend deliveries hereunder whilst any such payment shall be outstanding.

(b) If the customer shall commit any act of bankruptcy or shall suffer any execution or distress to be levied on his goods or (being a company) shall enter into liquidation (whether compulsory or voluntary save for the purpose of and followed by reconstruction or amalgamation) or shall have a receiver appointed provided that in any such event and without prejudice to the right of termination the Company shall also have a general lien on all materials or goods of the customer by the Company under this or any other contract with the Company.

(c) the customer fails to take delivery of the goods delivered to him in accordance with the terms of this contract.

10. Storage etc - all goods and materials supplied to the customer hereunder shall be stored and fixed in accordance with the manufacturers instructions set out in the latest written recommendations of the Company and the Company shall be under no liability for loss or damage which may arise as a result of the failure to adhere to such recommendations in all respects.

11. Guarantee - Subject to condition 9 hereof and to the terms of this condition the Company will repair free of charge or, at its option, replace goods containing any defect which are solely attributable to manufacture or material and which appear within six months of delivery provided that the customer notifies the Company immediately any such defects are detected and at the Company's request returns the goods at his own expense to the Company. If such defects are confirmed such expenses will be refunded by the Company.

This guarantee does not include:-

(a) defects caused by vandalism, accidental damage, negligence or incorrect storage or,

(b) defects caused by fair wear and tear and save as provided in the Condition no warranty, guarantee or condition express or implied (by common law, statute or otherwise) as to quality or fitness for any purpose shall apply to any sale of goods hereunder and the Company shall not be liable for any consequential loss or damage of any description whether caused by the negligence of its servants or agents or otherwise.

12. For the avoidance of doubt it is declared that all sales of the Company's goods and material shall be on these terms and conditions only to the exclusion of any conditions proposed by or purported to be imposed by the customer whether or not such conditions shall have been expressly rejected or refused by the Company.

13. Applicable Law - all contracts governed by these terms and conditions shall be subject to English Law and any dispute shall be settled by the English Courts.

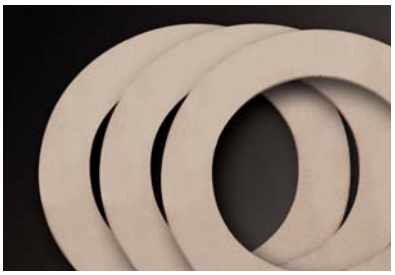
14. The property in the goods shall not pass to the customer until the complete price has been paid to the Company.

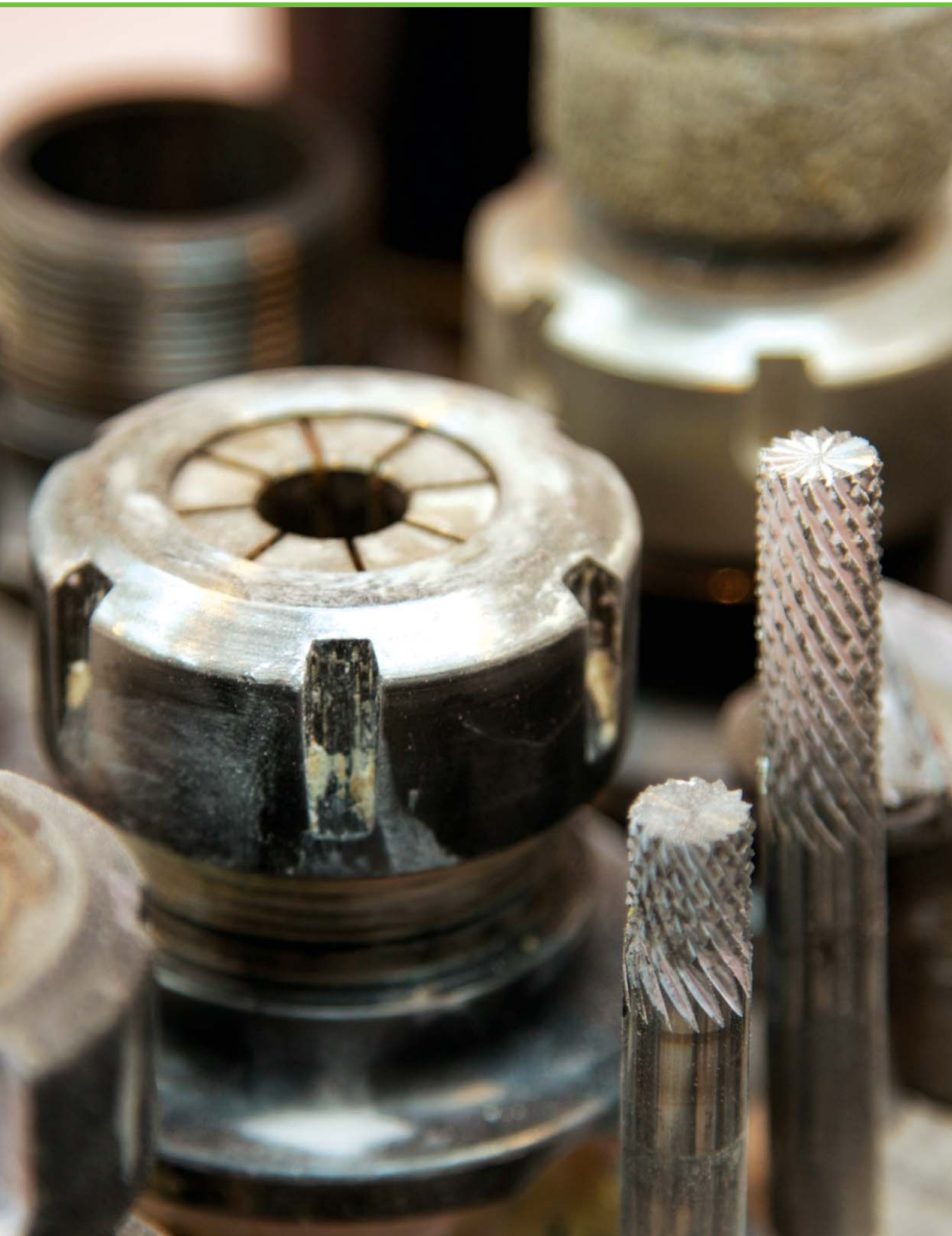










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