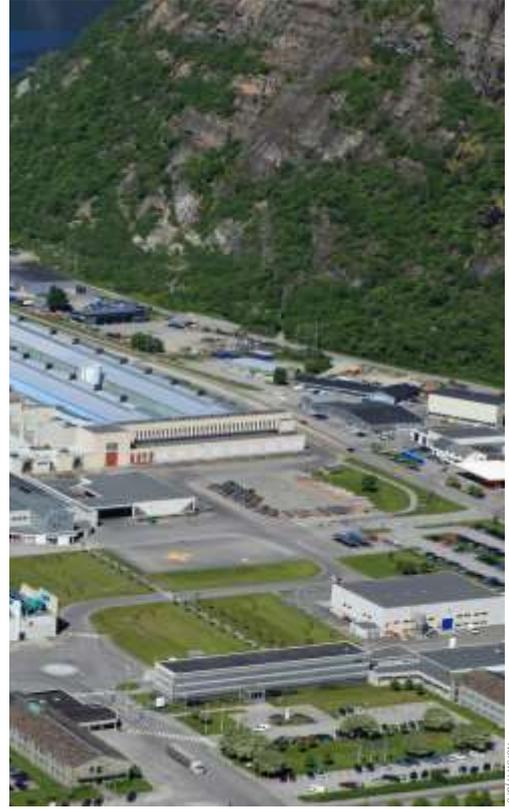




TENMAT

ADVANCED MATERIALS



FIREFLY SINDANYO **NITRASIL**
REFRAVER *FEROFORM*

SOLUTIONS FOR THE ALUMINIUM INDUSTRY

EXCEPTIONAL

PEOPLE

At **TENMAT**, we strongly believe that it takes exceptional people to invent, design and create the outstanding products necessary to constantly exceed industry standards and meet the demands of our customers' challenging applications.

Our highly skilled workforce is essential to **TENMAT**'s success, and through significant investment in recruitment, training, and personal development we continue to strengthen our position as one of the leading developers and manufacturers of advanced materials and components.

PRODUCTS

TENMAT's diversified range of exceptional materials and components includes composite wear parts and bearing materials, high temperature resistant materials, engineering ceramics, hard metals, and passive fire protection solutions.



PERFORMANCE

As a result of **TENMAT**'s engineering expertise and strong tradition of innovation, many of our products are market leaders in terms of wear performance and extreme temperature resistance.

TENMAT's advanced materials combine high strength with excellent wear characteristics and durability, delivering exceptional performance in even the most demanding applications.

FULL PROCESS SOLUTIONS

Specialising in alumina reduction, transporting molten, casting, and rolling,
TENMAT is your one-stop supplier for critical solutions in aluminium.



Electrolysis Potroom

World leading thermal & electrical insulation materials with structural integrity

[More Information on Page 3](#)



Molten Transportation

Improve ease and efficiency of molten aluminium transport

[More Information on Page 4](#)



Casting

High performance materials, improving casthouse efficiency

[More Information on Page 5](#)



Rotary Degassing

Protect rotating graphite shafts with outstanding solutions

[More Information on Page 5](#)



Rolling

High performance roller coverings giving longer life and improved surface quality of aluminium strip

[More Information on Page 7](#)



Hot Gas Filtration

Filter elements that do not tear and reduce maintenance of heat exchangers

[More Information on Page 8](#)

ELECTROLYSIS POT ROOM

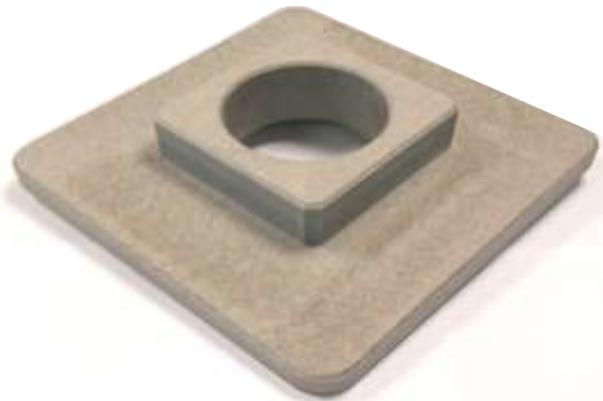


The electrolysis pot is the first stage in a primary aluminium smelter, in which alumina (aluminium oxide) is separated. Electrolysis pots have several components that are common for all technology types.

pipework of an electrolysis pot and is resistant to the flue gases (usually Fluorides). It is also used as crust breaker bushings.

TENMAT insulation materials are found in several applications in and around the electrolysis pot (reduction cell) in a primary aluminium smelter.

SINDANYO high quality cement boards are both excellent thermal and electrical insulators, making them ideal materials to function around the electrolysis pot. In addition to these qualities, **SINDANYO** cement boards are also highly machinable, making it an adaptable material to adapt to any technology type that is used in an aluminium smelter.



SINDANYO L23 designed as a busbar/ superstructure insulator for VENALUM (Venezuela).

SINDANYO materials have been used with the following technology types:

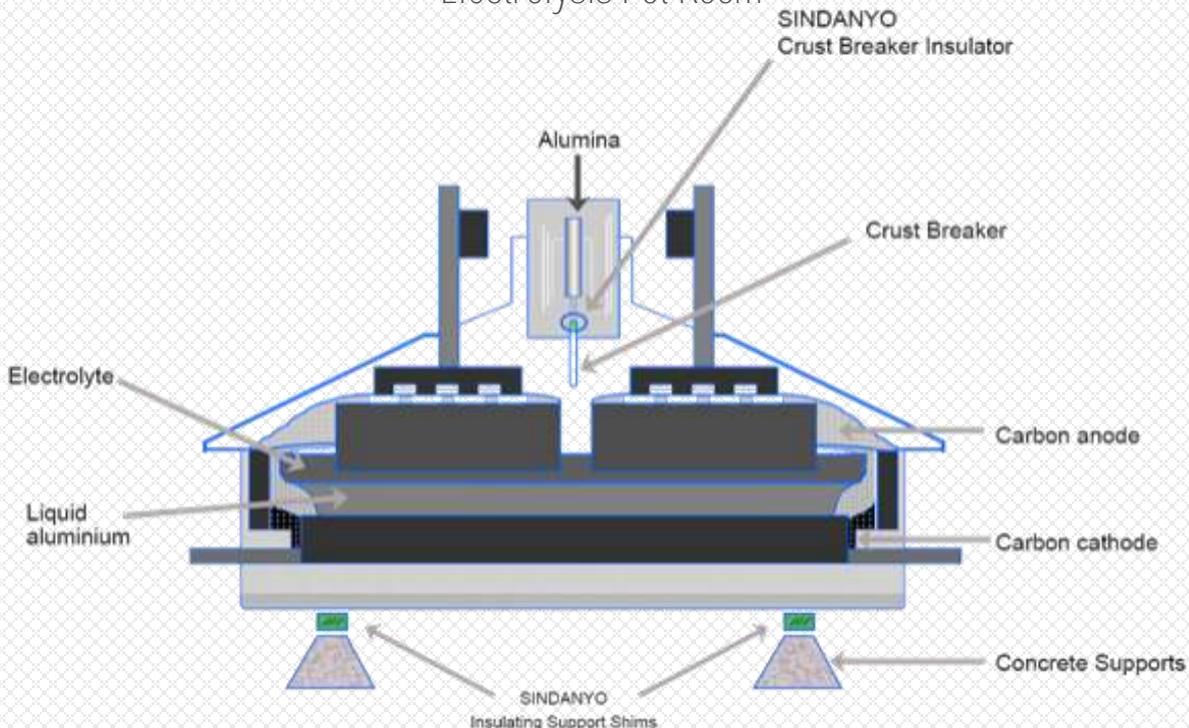
- Hydro
- Pechiney
- Alcoa
- RUSAL
- Alba
- Alcan

REFRAVER is used as an electrically insulating tube in the fume

Applications:

- Superstructure Insulators
- Busbar Insulators
- Crust Breaker Insulators and Bushings
- Fume Hood Insulation

Electrolysis Pot Room



SIPHON AND CRUCIBLE



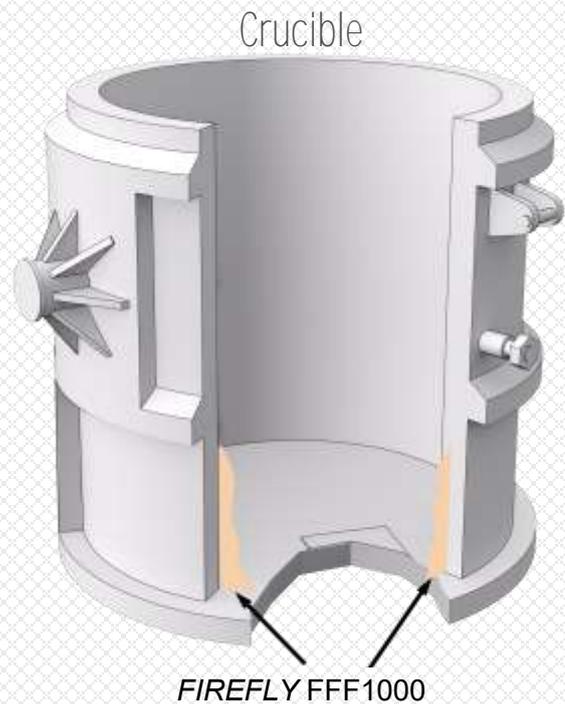
The next stage in the manufacturing process is to transport the molten aluminium from the pot room to the casthouse for casting into ingots.

FIREFLY millboards are widely used in gasketing applications and in the transportation process the **FIREFLY** gaskets are found in the siphon hose.

FIREFLY 700 has a very high operating temperature of 1000°C that makes it ideal for this application due to the high temperature of the molten aluminium.

FIREFLY Flexible 1000 is used as a crucible back-up insulator, absorbing heat that is transferred between the refractory lining and steel crucible shell.

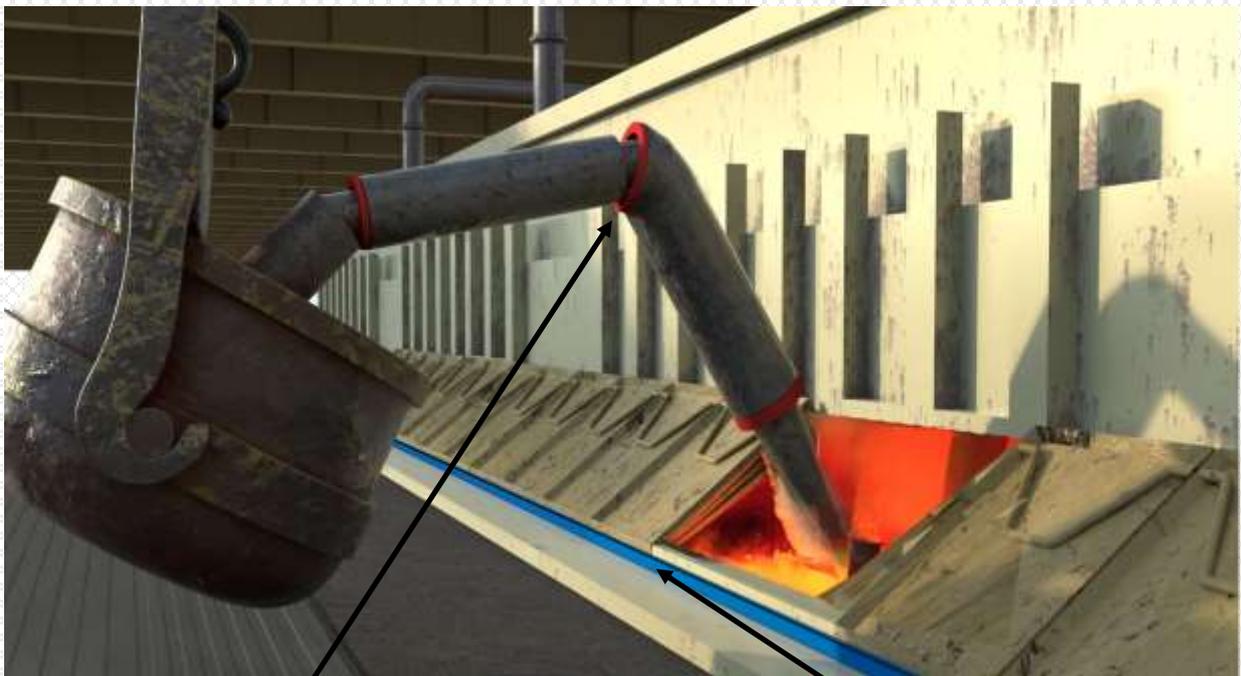
TENMAT millboards are based on exonerated fibres and does not contain refractory ceramic fibres.



Applications:

- Siphon Hose Gaskets
- Crucible Back-up Insulation

Siphon

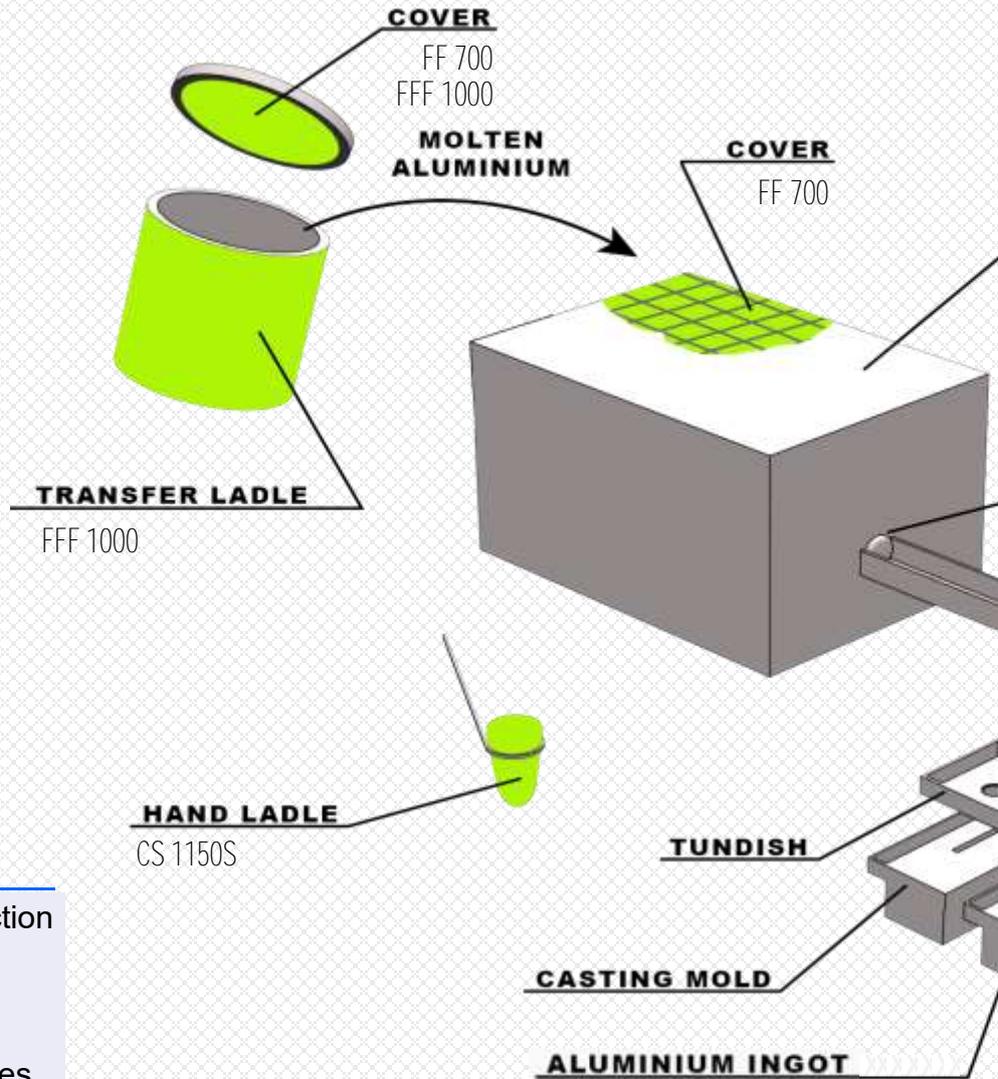


FIREFLY 700 Millboard Gaskets (RED)

SINDANYO Insulation Strips (Blue)



The casthouse is located in a separate facility to the pot room, and it is where molten aluminium is cast in moulds to form either ingots or rods of aluminium ready for either sale or a fabrication process. The casting process starts with de-gassing.



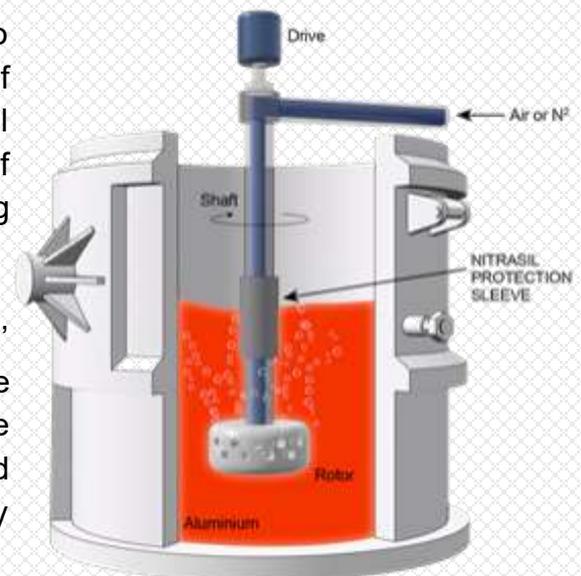
Rotary Degassing

Applications:

- Rotary Degasser Shaft Protection Sleeve
- Pump Components
- Thermocouple Protection Tubes

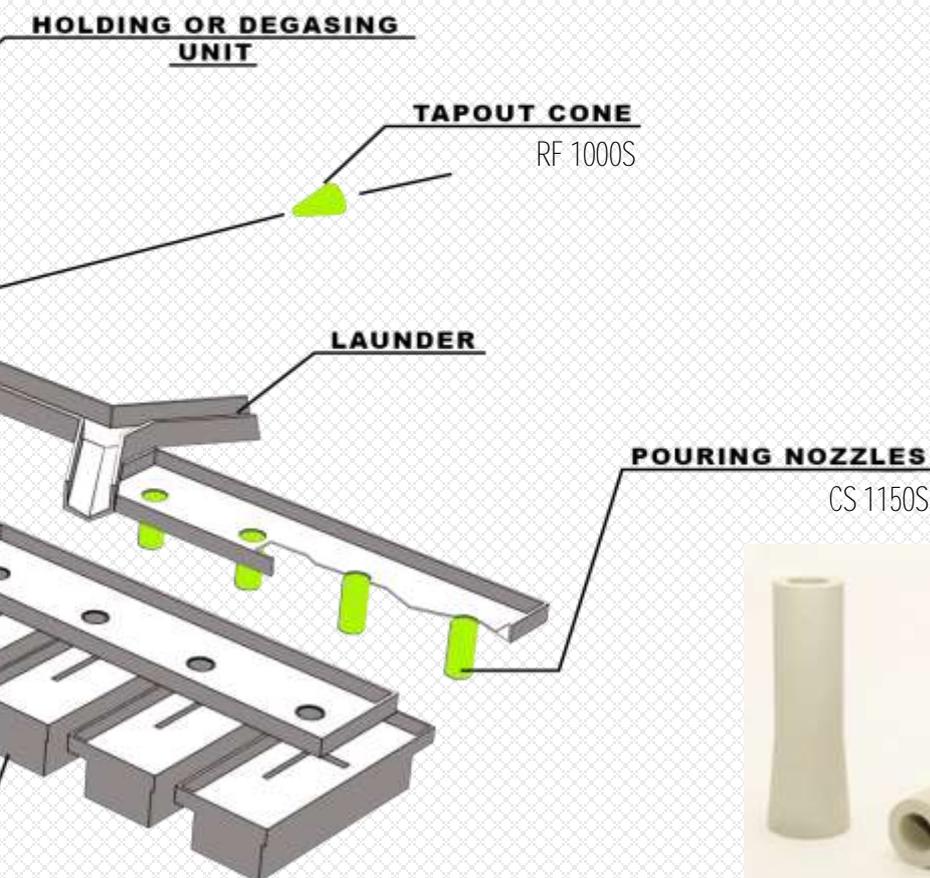
TENMAT NITRASIL is an excellent thermal insulator, also exhibiting great resilience to oxidation up to temperatures of 1350°C. **NITRASIL**'s non-wetting properties and general inertness, makes it an ideal solution to the problem of oxidation of the graphite shafts found in rotary degassing equipment.

NITRASIL sleeves are typically positioned at the 'melt line' of the aluminium as there is excessive oxidation of the graphite shaft in this area. Oxidation is enhanced by the high levels of turbulence as the molten aluminium is rotated at high speed and using **NITRASIL** sleeves the shaft is fully protected.



PROCESSES

Since the casting process is a batch process, the flow of aluminium from the holding furnace to the casting moulds must be controlled sufficiently to ensure that the molten aluminium does not lose its temperature and begin to solidify before reaching the mould.



Laundry System

Applications:

- Tap Out Cones
- Pouring Nozzles
- Hand ladles



FIREFLY RF1000S Tap Out Cones are used in cast houses world wide to control the flow of molten aluminium out of the holding furnace.

FIREFLY RF1000S is ideal as it is not overly rigid, allowing it to be plugged into any hole size/shape. This is a key feature as more rigid materials will likely induce leakage from the holding furnace.

FIREFLY CS1150S is used widely as pouring nozzles in the casting process. These are used to avoid splashing of aluminium as the molten metal flows from the launder system in to the casting moulds. Being insulating, they prevent unwanted cooling of the aluminium before it reaches the moulds.

FIREFLY CS1150S is an ideal material for this application due to its ability to withstand temperatures of up to 1000°C, it is a lightweight yet strong material allowing easy installation and it is also able to come in to contact with molten metal without exhibiting excessive wetting. Further the material has excellent thermal shock resistance.

ROLLING



As an expert in the manufacturing of advanced composites, **TENMAT** developed a unique blend of high performance fibres to build an extremely tough and resilient material for the aluminium rolling industry. FEROFORM F57 is the ideal choice for hot and cold rolling applications, providing a long-lasting, maintenance free wear surface.

This innovative material replaces steel and Polyurethane rollers. Steel rollers are infamous for scratching or indenting the delicate surface of the aluminium. Polyurethane rollers suffer from poor high temperature capabilities and short wear life.

In modern aluminium rolling mills, the quality of rolled aluminium is critical for successful use in demanding applications. The surface finish of the rolled aluminium is dependent on the rollers. FEROFORM F57 provides a durable, high temperature resistant surface that protects the aluminium during both the hot and cold rolling processes.

FEROFORM F57 is successfully used by major aluminium manufacturers around the world, eliminating the need for grinding and regular cleaning of the production lines.



Customer Benefits

- No marking of the aluminium
- No pick up of contaminants
- Maintenance free – no roller cleaning
- Long life
- High impact strength
- Easy fit – simple replacement of steel rollers

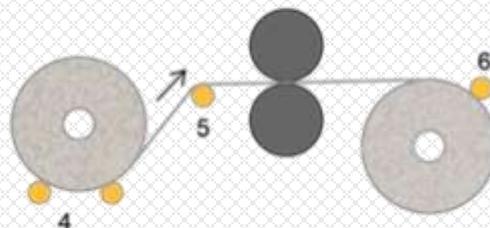
Roller Applications

● = F57 Application



Feroform F57 is successfully used in aluminium plants world wide in the following applications:

1. Breakdown hot rolling mill roller table
2. Hot rolling deflector rollers
3. Hot rolling tensioning rollers
4. Coil support rollers
5. Cold rolling deflector rollers
6. Cold rolling ironing rollers



HOT GAS FILTERS

TENMAT FIREFLY hot gas filter elements are manufactured from bio-soluble materials and inorganic bonds, enabling them to be used at temperatures in excess of 1000°C.

FIREFLY filter elements are designed to remove particulate pollutants from hot gases, such as those found in the aluminium industry. *FIREFLY* filters operate at temperatures and efficiencies higher than those achievable with any conventional filtration systems. Other chemical pollutants such as acid gases and dioxins, can be removed with the use of selective reagents or sorbents. The high temperature capabilities enable the filter system to be installed prior to gas coolers, allowing heat exchangers to work with a clean gas and higher efficiency.

FIREFLY filter elements can capture particles less than 1 micron in diameter. The resultant emission levels are typically lower than 1 mg/m³. They are proven to offer cleaner emissions compared to electrostatic precipitators or wet scrubbers.

The filter elements are self supporting and do not require metal cages, which saves time on installation. This is also of value in corrosive environments.

Customer Benefits

- Do not tear
- Emission level below 1 mg/m³
- No need for gas cooling
- No need for metal cages
- Reduce energy consumption
- Protect vital components
- Non-ceramic
- Cleaned with reverse-pulse

Key Features

- Resistance in excess of 1000°C
- 99.99% filtration efficiency
- 100% spark-proof
- Self-supporting
- High strength
- High chemical resistance



Availability

	Candle Elements			"Big Tube" Elements		
External Diameter (mm)	60	60	60	150	150	150
Internal Diameter (mm)	40	40	40	110	110	110
Length (mm)	1000	1250	1500	1800	2400	3000
Flange Diameter (mm)	80	80	80	190	190	190
Surface Area (m ²)	0.19	0.23	0.28	0.83	1.11	1.40

QUALITY



TENMAT operates an ISO 9001:2015 Quality Management System for the design, development and manufacture of specialised high performance engineering materials and components.

Here at **TENMAT**, we have always made the quality and consistency of our products a top priority and are working continuously on exceeding our customers' expectations.

TENMAT's product quality is consistently monitored by our in-house quality control engineers and regularly tested and qualified by independent third party testing facilities and classification authorities.

TENMAT has won international manufacturing awards to recognise our commitment to the development of high quality products and innovative materials.



MATERIAL TECHNICAL DATA

FIREFLY

Lightweight, strong millboards which are 100% non-hazardous.

Strong, flexible millboards with very low shrinkage at 1000 °C, to provide outstanding thermal insulation performance. 100% non-hazardous refractory fibres, thus can be handled freely.

PROPERTY	UNITS	FF 700	FFF 1000	CS1150S	RF1000FL
Classification temperature	°C	1,000	1,000	1,150	1,000
Thermal conductivity @ 400°C	W / mK	0.21	0.09	0.08	0.07
Linear shrinkage @ 1000 °C	%	2.3	4	2	4 (@ 850°C)
Flexural strength @ ambient	MPa	7	8	2.5	-
Compression @ 21 MPa	%	36	-	-	-
Available thicknesses	mm	1.5 - 12	4 - 8	≤ 45	5 - 75

SINDANYO REFRAVER

High strength, machineable cement-based engineering boards.

100% asbestos-free cement-fibre-composite insulation materials which exhibit high mechanical strength at temperatures up to 700°C, excellent electrical insulation and very low thermal conductivity.

PROPERTY	UNITS	SINDANYO	REFRAVER
Max. operating temperature	°C	700	700
Thermal conductivity @ 200 °C @ 700°C	W / mK	0.33 0.43	- 0.66
Compressive strength @ ambient after 24 hours @ 350 °C	MPa	90 38	72 -
Flexural strength @ ambient after 24 hours @ 350 °C	MPa	30 16	32 -
Electric surface breakdown @ 90 °C	KV in air	15	11

FEROFORM

Interwoven aramid fibre / synthetic fibre reinforced rollers.

Friction modified composites of cured phenolic resin matrices reinforced with impact-resistant fibres. *FEROFORM* material is supplied in various forms, depending on individual requirements.

PROPERTY	UNITS	F57
Max. operating temperature	°C	500
Coefficient of friction (oiled)	-	0.35
Hardness	Shore D	36
Compressive strength	MPa (ambient)	380
Impact strength	kJ/m ²	63
Shear strength	MPa (ambient)	115



FEROFORM **RAILKO** **FEROGLIDE** **FEROBIDE**

REFRAVER **REFEL** **ARCLEX**

FIREFLY **NITRASIL** **SINDANYO**

TENMAT is committed to the highest standards in customer service and our international staff is looking forward to assist you.

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