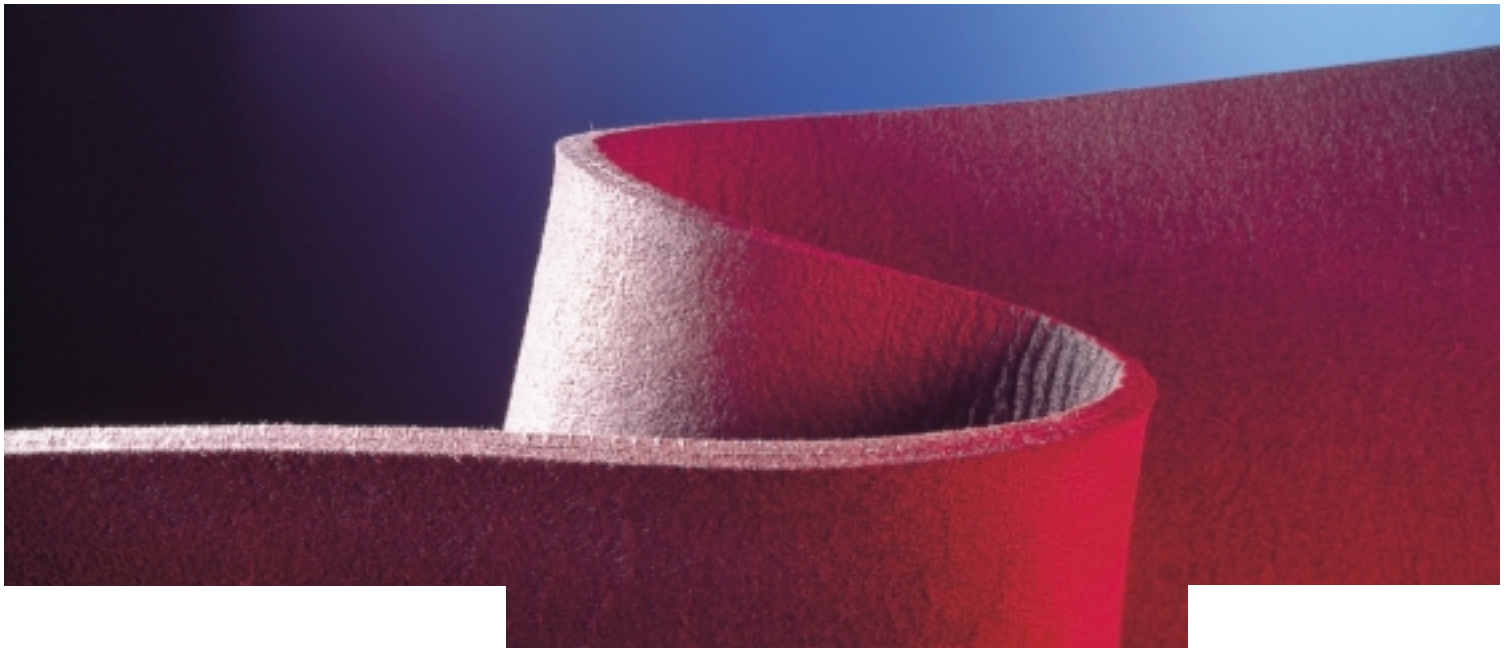
Flexible Carbon and Graphite Felts

for the Thermal Insulation of High-Temperature Furnaces



SGL CARBON GROUP

Graphite Specialties

®SIGRATHERM

is a carbon fiber material in the form of felt and flocks (wool), manufactured by carbonization of natural and synthetic fibers.

Characteristic properties

- **Low thermal conductivity**
Superior to that of loose particle fillings like granular carbon or metal radiation shields (saving in energy up to 75 %).

- **Low specific heat**
Permits rapid heating and cooling of furnace.

- **High thermal stability**
In oxidizing atmosphere up to 350°C, in protective atmosphere or vacuum up to about 3000°C.

- **Favourable resistivity**
Coupling in an inductive field occurs only above 12 kHz.

- **Ease of handling**
Can be cut with scissors or knife. Flexible – adapts to small bending radii.

- **Favourable surface properties**
Unaffected by nearly all molten metals. Small specific surface area – low adsorption capacity; surface may be increased by partial oxidation.

- **High purity**
Low sulphur content – no contamination of pump oil in vacuum operation. Low ash content – no smouldering.

- **Very uniform structure**
Smooth and flat over long lengths (25 m). Uniform thickness, hence constant insulating properties.

- **No electrostatic charging**
No electrostatic charging when used together with plastics in composite materials.

®SIGRAFIL D2-3K carbon cord

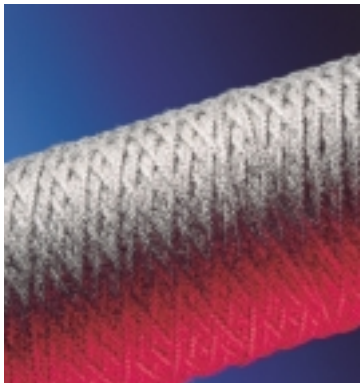
Used for sewing or tying SIGRATHERM felts together.

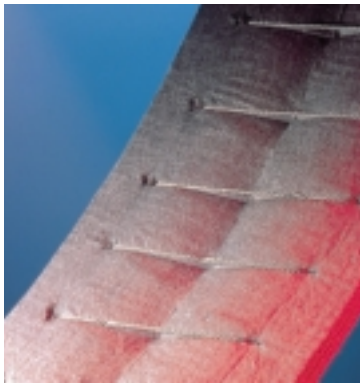
Properties		
Nominal diameter	mm	2.0
Weight/m	g	1.8
Minimum tensile load	N	900
Minimum loop strength	N	600
Minimum knot strength	N	250
Ash content	%	<0.5

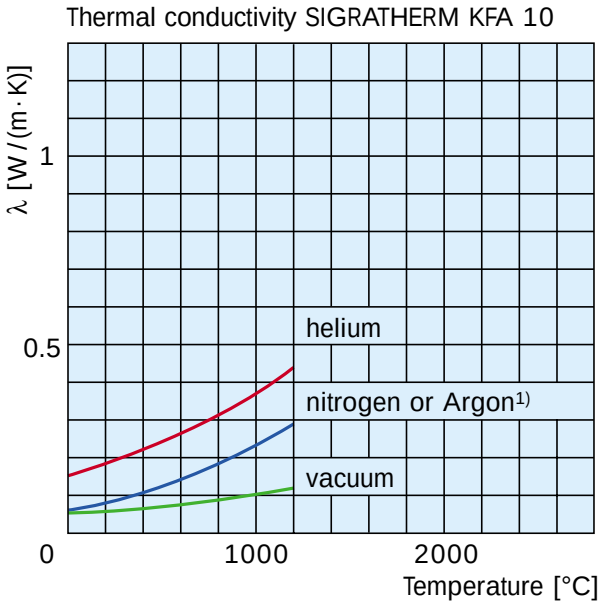
®SIGRATHERM carbon wool

Ash content	mm	10–30
Fiber diameter	µm	10
Ash content	%	0.3
Weight	g/l	35–45

®SIGRATHERM flexible carbon felt





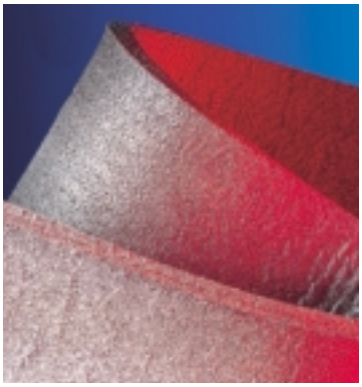


Typical properties			SIGRATHERM type KFA 5	SIGRATHERM type KFA 10
Weight per unit area		g/m²	520–650	1000–1150
Tensile strength	longit. transv.	N/mm² N/mm²	0.12 0.10	0.16 0.12
Elongation at tear	longit. transv.	% %	3 18	4 16
Resistivity	longit. transv.	Ωmm Ωmm	4–6 7–9	3.5–5.5 6–8
Thermal conductivity[1] (1000°C)		W/(m·K)	0.25	0.25
Specific surface area (BET)		m²/g	>1.5	>1.5
Ash content		%	<0.3	<0.3
Sulphur content		%	<0.03	<0.03
Sizes available				
Length		m	25–30	25–30
Width		m	1.2	1.2
Thickness		mm	5.5–6.5	9.5–10.5

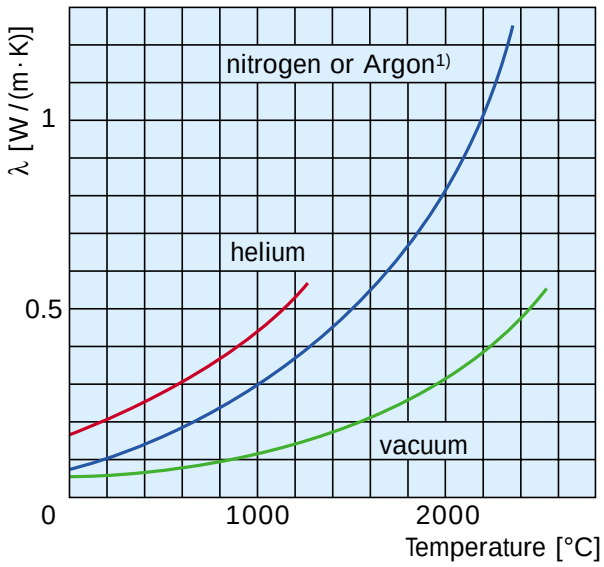
Inquiries concerning special dimensions are invited

®SIGRATHERM flexible graphite felt

is manufactured by the graphitization of SIGRATHERM carbon felt.
This process makes for smaller specific surface areas and greatly reduced pump-down times under high vacuum.
The very low ash content is indispensable for high-purity materials production plants and ensures high oxidation resistance of graphite felts.



Thermal conductivity SIGRATHERM GFA 10



Typical properties			SIGRATHERM type GFA 5	SIGRATHERM type GFA 10
Weight per unit area		g/m²	470–600	950–1100
Tensile strength	longit. transv.	N/mm² N/mm²	0.1 0.06	0.12 0.06
Elongation at tear	longit. ransv.	% %	5 20	3 15
Resistivity	longit. transv.	Ωmm Ωmm	1.5–2.5 3–4	1.5–2.5 3–4
Thermal conductivity1) (1400°C)		W/(m·K)	0.43	0.43
Specific surface area (BET)		m²/g	<1.0	<1.0
Ash content		%	<0.05	<0.05
Sulphur content		%	<0.001	<0.001
Sizes available				
Length		m	25–30	25–30
Width		m	1.2	1.2
Thickness		mm	5.0–6.0	9.0–10.0

Inquiries concerning special dimensions are invited

Applications

The application examples given are based on our present state of knowledge.
SIGRATHERM's unique textile, chemical and thermal properties, however, allow other problems to be solved as well. For this reason, close cooperation with users and processing companies is very important.

- **Thermal insulation**

For resistance- or induction-heated vacuum furnaces and inert gas furnaces, such as degassing furnaces, brazing furnaces, soft and bright annealing furnaces, sintering furnaces for hard metals, carburizing furnaces, laboratory graphitizing furnaces.

For inductively heated melting and holding furnaces, in which a proportion of the ceramic insulating material is replaced by SIGRATHERM in order to increase the electrical efficiency and prevent the liquid metal from coming into contact with the induction coil in the event of crucible fracture (no wetting).

For nuclear reactor technology (small cross-sectional area for neutron absorption).

- **Filters**

For hot and/or corrosive gases and liquids.

For molten metals (no wetting).

- **Catalyst support**

Simplified recovery of the catalyst by heat treatment.

- **Porous electrodes**

For accumulators and fuel cells (see Technical Information sheet on ®SIGRATHERM GFD/KFD).

- **Backing strips for soldering and welding**

No wetting, no smouldering.

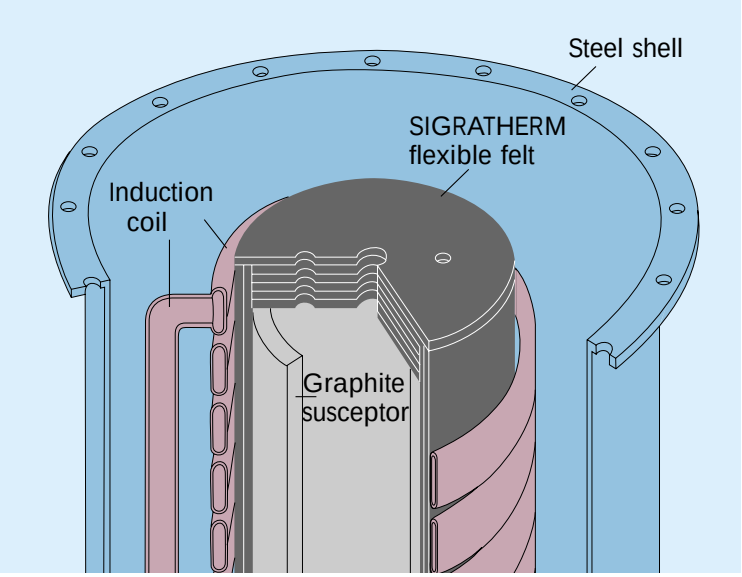
- **Adsorption agent**

Adsorption agent after activation. Surface area increase up to 700 m^2/g.

- **Corrosion-resistant vessel linings**

Used together with corrosion-resistant resins (SIGRATHERM KFD 2 is particularly suitable).

Schematic view of an induction furnace with SIGRATHERM



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