

CGC KLEIN

Carbon Graphite Consulting

Carbon and Graphite in the Industry



Graphite

Carbon

CFC - material

Graphite – soft felt

Graphite – rigid felt

Graphite - foil

CGC KLEIN
Talstrasse 60
57076 Siegen
Germany

Tel.: +49 (0)271 3130071
Fax: +49 (0)271-3130072
Mail: info@cgc-klein.de
URL: www.cgc-klein.de

Graphite for Vacuum furnace and Hardening plant

Graphite

- round bars, blocks and plates from isostatic and extruded die molded qualities

Graphite rigid felts

- coated by graphite foil or CFC
- one and double-sided

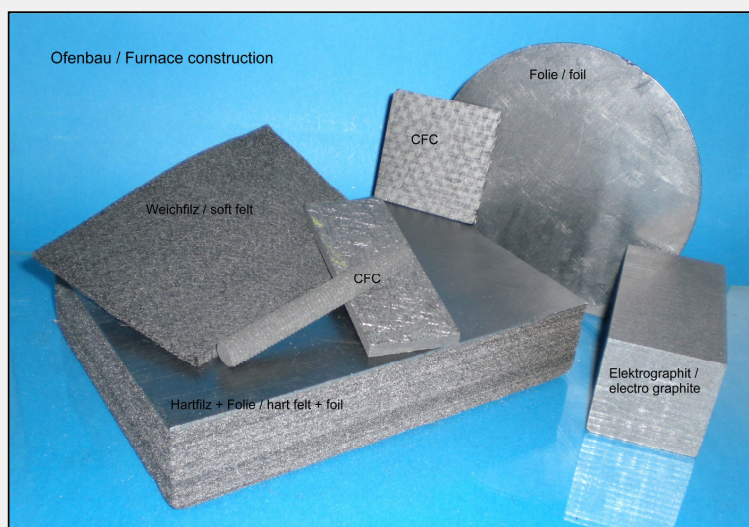
Graphite soft felt

- on PAN- and Rayon basis

Carbon fiber composites (CFC)

- screws and nuts
- U- and angular profile
- charging racks
- plates

Graphite foils



**ELEKTROGRAPHIT IM OFENBAU
ELECTRO GRAPHITE IN FURNACE CONSTRUCTION****PHYSIKALISCHE DATEN
PHYSICAL DATAS**

GRADE QUALITÄT	<u>CG 1530</u>	<u>CG 1537</u>	<u>CG 1538</u>	<u>CG 1594</u>	<u>CG 1596</u>	<u>CG 1598</u>
DENSITY DICHTe g/cm ³	1.885	1,88	1,91	1.80	1,88	1,90
HARDNESS HÄRTE shore	46	68	70	49.0	58,0	60,0
SPEC. ELECTR. RESISTANCE SPEZ. ELEKTR. WIDERSTAND μ OHM m	10	12	12	15	14	12
FLEXURAL STRENGTH BIEGEBRUCHFESTIGKEIT N/mm ²	45	55	61	47.0	48,0	55,0
COMPRESSIVE STRENGTH DRUCKFESTIGKEIT N/mm ²	90	125	135	89.0	80,0	95,0
TENSILE STRENGTH ZUGFESTIGKEIT N/mm ²				25.0	30.1	35.1
YOUNG'S MODULUS E-MODUL N/mm ²	10.000	11.000	12.000	10.000	10.000	10.500
THERMAL EXPANSION THERMISCHE AUSDEHNUNG K ⁻¹ x10 ⁻⁶	5	3,9	3,9	5,2	5,0	4,8
THERMAL CONDUCTIVITY WÄRMELEITFÄHIGKEIT W/mK	116	105	110	85.0	98,0	98,0
GRAIN SIZE KORNGRÖSSE μØ	12	7	8	26	20	15
POROSITY POROSITÄT %	12	12	11	15.0	12	10
PRESSING METHOD PRESSVERFAHREN	Asche Ash <20 ppm	ISOSTATIC ISOSTATISCH				

The values of physical properties shown above are approximate, which can be less variable, also purified available
 Die oben angegebenen Qualitäten können auch in abbrandverminderter Qualität geliefert werden.
 Vorgenannte Daten sind Mittelwerte. welche sich geringfügig verändern können.

ELEKTROGRAPHIT, STRANGGEPRESST ELECTRO GRAPHITE, EXTRUDED

- PHYSIKALISCHE DATEN - - PHYSICAL DATAS -

QUALITÄT / GRADE	<u>CG 1715</u>	<u>CG 1720</u>	<u>CG 1730</u>	<u>CG 1740</u>
DICHTE / DENSITY g/cm ³	1.74	1.63	1.73	1.75
HÄRTE / HARDNESS shore	34.0	40.0	40.0	35
SPZ. ELEKT. WIDERSTAND/ SPC. ELECTR. RESISTANCE μ OHM m	8.0	8.7	6.5	8.0
BIEGEBRUCHFESTIGKEIT / FLEXURAL STRENGTH N/mm ²	21.0	20.0	20.0	24.5
DRUCKFESTIGKEIT / COMPRESSIVE STRENGTH N/mm ²	41.0	40.0	35/55	48/50
ZUGFESTIGKEIT / TENSILE STRENGTH N/mm ²	-	10/14	14.0	15
E-MODL MODULUS OF ELASTICITY N/mm ²	-	10.000	10.000	10.000
THERM. AUSDEHNUNG / THERM. EXPANSION K ⁻¹ ×10 ⁻⁶	3.2	3.6	1.1	3.3
WÄRMELEITZAHL / THERMAL CONDUCTIVITY W/mK	158.0	120.0	172.0	174
KORNGRÖSSE / GRAIN SIZE μØ	<0.1 mm	800	800	650
PRESSVERFAHREN / PRESSING METHOD	STRANGGEPRESST EXTRUDED			

Angegebene Daten sind Mittelwerte, welche sich geringfügig verändern können.
The values of physical properties shown above are approximate, which can be less changable

KOHLEFASERVERSTÄRKTER KOHLENSTOFF (CFC)

CARBON FIBER COMPOSITE (CFC)

PHYSIKALISCHE DATEN

PHYSICAL DATAS

Qualität / GRADE	CG 1170CF	CG 1400CF	CG 3026CF	CG 3110CF	CG 3120CF
DICHTE / BULK DENSITY g/cm ³	1.48	1,45	1,50	1,45 – 1,75	1,45 – 1,55
SPEZ. ELEKTR WIDERSTAND / SPEC. THERM. RESISTANCE μ OHM m	26.0	23.0	25		
BIEGEBRUCHFESTIGKEIT / FLEXURAL STRENGTH N/mm ²	170	140	120		175
DRUCKFESTIGKEIT / COMPRESSIVE STRENGTH N/mm ²		90		160 - 200	250
ZUGFESTIGKEIT / TENSILE STRENGTH N/mm ²	100	95		80 - 120	170
THERMISCHE AUSDEHNUNG / COEFF. THERM: EXPANSION K ⁻¹ x10 ⁻⁶	2.8	0,4 ⊥ 9,0		1,2 – 2,8	0,7 ⊥ 7,1
WÄRMELEITZAHL / THERMAL CONDUCTIVITY W/mK		23 ⊥ 17	40 ⊥ 5		35 ⊥ 3
TEMPERATURBESTÄNDIGKEIT TEMPERATURE RESISTANCE °C	2.200	2.200	2.200	1.400	2.200
Verfügbare Abmessung Available Size mm	1200 x1000 x 2 - 10	1000 x 900 x2 – 40	1000x1000 x 2 -14	1500x1500 x 2 - 20	1500 x 1500 x 2 – 20

Angegebene Daten sind Mittelwerte, welche sich geringfügig verändern können.

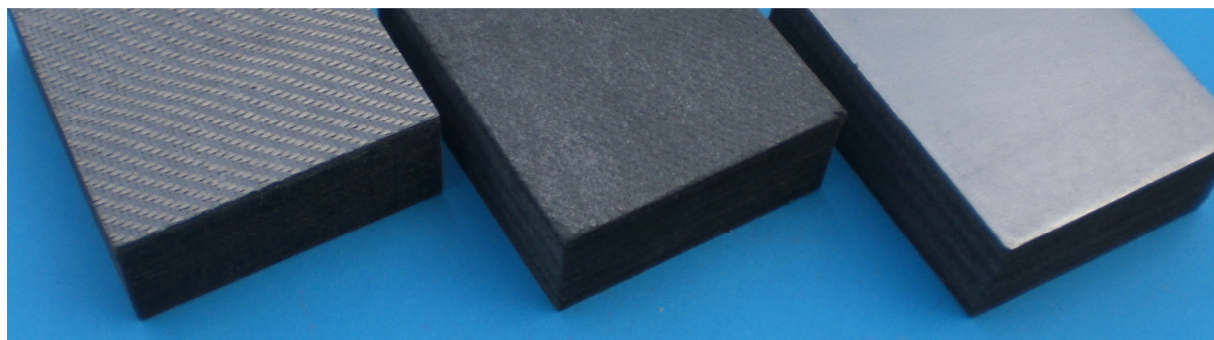
The values of physical properties shown above are approximate, which can be less changable

Weitere Qualitäten und Abmessungen auf Anfrage.

More grades and dimensions on request.

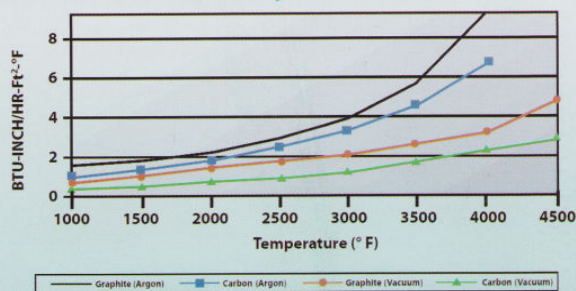
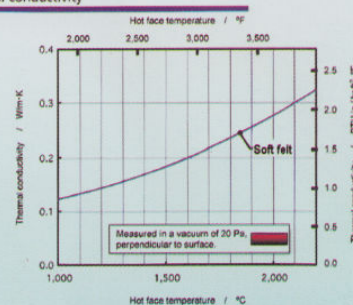
Product Information	Graphite Rigid Felt
---------------------	---------------------

ITEM		High Temperature Products		High Purity Products	
Products		Rigid Graphite Board		Rigid Graphite Board	
		Cover graphite foil	Cover CFC	Cover graphite foil	Cover CFC
Trademark		CG PSR-1		CG PSR-2	
Material		PAN-CF	PAN-CF	PAN-CF	PAN-CF
Bulk density (g/cm³)		0,23	0,23	0,15	0,15
Carbon (%)		≥99	≥99	≥99,5	≥99,5
Thermal conductivity (W/mk)		0,20 – 0,30	0,20 – 0,30	0,20 – 0,25	0,20 – 0,25
Folding strenghtt (MPa)		1,5 – 3,2	1,8 – 3,4	1,3 -3,0	1,7 – 3,2
Flexural strength (MPa)		1,0 – 2,5	1,5 – 3,0	1,0 – 2,5	1,5 – 3,0
Crushing stress at 5% compression (MPa)		0,6	0,8	0,4	0,7
Ash (ppm)		≤500	≤500	≤200	≤200
Prozessing temperature		2300°C		2500°C	
Operating condition	in air	≤400°C		≤400°C	
	in Vacuum	≥1800°C		≥2200°C	
	in Inert- atmosphere	≥3000°C		≥3200°C	
Dimension boards	Length (mm)	1000 , 1500 , 1800			
	Width (mm)	1000 , 1200 , 1300			
	Thickness (mm)	20 - 350			
Dimension cylinder/ tubes	Diam. (mm)	Ø200 - 2000			
	Walll thickness (mm)	30 - 350			
	Height (mm)	300 - 3000			



The values of physical properties shown above are approximate, which can be less changable
Stand 01/2013

Product Information		Soft Felt			
Products		PAN based graphite felt	Rayon based graphite felt	PAN based carbon felt	PAN based carbon felt
Trademark		CG PGF-1	CG RGF-1	CG PCF-1	CG PCF-2
Material		PAN-CF	Rayon-CF	PAN-CF	PAN-CF
Bulk density (g/cm ³)		0.13	0.09	0.14	0.10
Carbon (%)		≥99	≥99	≥98	≥99
Thermal conductivity (W/mk) 1150°C W/mk		0.12 – 0.14	0.10 – 0.15	0.12 – 0.16	0.10 – 0.15
Tensile strength (MPa)		0.14	0.1	0.15	0.13
Crushing stress at 10% compression (MPa)		8 - 10	5 – 8	8 – 12	6 - 10
Ash (ppm)		≤50	≤50	≤500	≤500
Processing temperature		2300°C	2300°C	1200°C	2300°C
Operating condition	in air	≤400°C	≤400°C	≤400°C	≤400°C
	in Vacuum	≥2300°C	≥2300°C	≥1500°C	≥2300°C
	in Inert-atmosphere	≥3300°C	≥3300°C	≥2300°C	≥3300°C
Dimension boards	Length (m)	10 - 20			
	Width (mm)	1000 - 1350			
	Thickness (mm)	3, 5, 6, 8, 10, 12			

**Thermal Conductivity of Felt****Thermal conductivity**

The values of physical properties shown above are approximate, which can be less changable
Stand 01/2013

GRAPHIT - FOLIEN GRAPHITE - FOILS

- PHYSIKALISCHE DATEN - - PHYSICAL DATAS -

QUALITÄT / QUALITY	<u>CG-FLEX 98</u>	<u>CG-FLEX 99</u>
DICHTE / BULK DENSITY g/cm ³	0,7 – 1,1	0,7 – 1,2
TEMPERATURBESTÄNDIGKEIT HEAT RESISTANCE °C	AIR 550 INERT GAS 3000	AIR 550 INERT GAS 3000
SPEZ. ELEKTR. WIDERSTAND / SPC. ELECTR. RESISTANCE μ OHM m	8 – 10	8 - 10
DRUCKFESTIGKEIT / COMPRESSIVE STRENGTH N/mm ²	***	>78,5
ZUGFESTIGKEIT / TENSILE STRENGTH N/mm ²	>4	>4
THERMISCHE AUSDEHNUNG / COEFF. THERM. EXPANSION K ⁻¹ x10 ⁻⁶	1,0	1,0
WÄRMELEITZAHL / THERMAL CONDUCTIVITY W/mK	PARALLEL 140 – 160 VERTICAL 4 – 6	PARALLEL 140 – 160 VERTICAL 4 – 6
KOHLENSTOFFGEHALT / CARBON CONTENT %	98	99,85
ASCHEGEHALT ASH CONTENT %	<2,0	<0,15

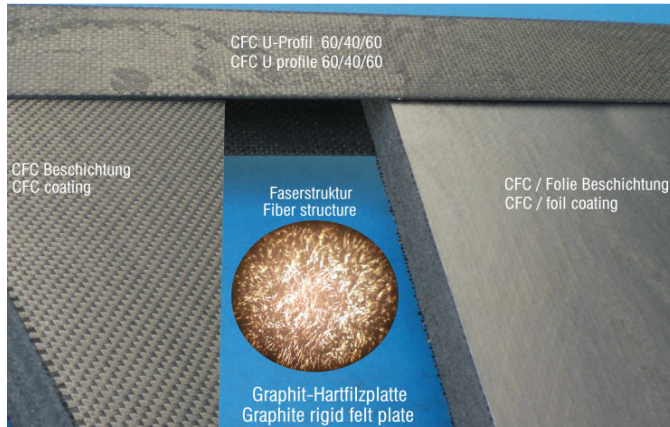
ABMESSUNGEN / DIMENSIONS

DICKE / THICKNESS	0,35 – 3,0 mm	0,20 – 2,0 mm
BREITE / WIDTH	500 / 1000 mm	500 / 1000 mm
LÄNGE / LENGTH	50 – 100 m	50 – 100 m

Angegebene Daten sind Mittelwerte, welche sich geringfügig verändern können.

The values of physical properties shown above are approximate, which can be less changeable

Typische Produkte Typical products



Graphit-Hartfilz , CFC Profil
Graphite rigid felt , CFC profile



Graphit Hartfilz : Isolation für Ofentür
Graphite rigid felt: isolation for furnace door



Propeller aus CFC
Propeller from CFC



CFC U- , L- und h-Profile
CFC U- , L- and h profiles



Heizer aus Graphit und CFC
Heating elements from graphite and CFC