



GRAPHITE INDIA LIMITED

SPECIALITY DIVISION

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PROFILE

Graphite India Ltd, established in 1965, began with technical and financial collaboration from the former M/s Great Lakes Carbon Corporation, USA. Over the years, it has grown into a leading manufacturer of graphite and carbon-based products.

The Speciality Division is a direct result of Graphite India's sustained R&D initiatives. This division is dedicated to developing customized graphite and carbon solutions, meeting the specific requirements of a wide range of industrial applications.

Graphite India Ltd is accredited with ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 and AS9100D certifications by TÜV India, reflecting a strong commitment to quality and environmental management systems.

ABOUT SYNTHETIC GRAPHITE

Synthetic graphite offers a unique combination of exceptional properties, making it indispensable across various high-performance industrial applications:

- **High Electrical Conductivity**
- **High Thermal Conductivity**
- **Excellent Thermal Shock Resistance**
- **Low Coefficient of Thermal Expansion**
- **Low Modulus of Elasticity**
- **High Strength at Elevated Temperatures**
- **Chemical Inertness**
- **High Purity**
- **Ease of Machinability**
- **Non-wettability by Molten Metals**

These properties make synthetic graphite ideal for use in industries such as metallurgy, electronics, chemical processing, and energy.



SPECIALTY GRAPHITE GRADE DESCRIPTION

Extruded Graphite Grades

Mini Rods

Graphite India Ltd manufactures fine grain extruded graphite rods with diameters ranging from 3 mm to 65 mm, engineered for high-performance applications across various industries. These rods feature a maximum particle size of 0.2 mm, ensuring a uniform and dense microstructure.

Product Grades

Graphite India offers mini rods with below specialized grade to cater to different operational requirements:

GMMR-50:

Designed for general-purpose applications, this grade provides a balance of strength, machinability, and thermal stability suitable for a wide range of uses.

Extruded Graphite Mold

Available in Blocks and Rods, Graphite India's Extruded Graphite Molds are offered in a range of grades designed to meet diverse industrial requirements—from general-purpose use to high-performance applications requiring superior strength and low porosity.

Extruded Graphite Mold is available in Blocks and Rods having the following grades:

- **BC** – Baked carbon (amorphous), available in various shapes and sizes for basic mold applications.
- **GLM-E** – Cost-effective graphite with fine particles and uniform structure for general use.
- **GLM-50** – Denser and stronger than GLM-E, suited for broader general applications.
- **GLM** – High-density, low-porosity graphite with fine structure for precision machining and versatile use.
- **GLM-S** – Ultra-dense graphite with very low porosity for critical high-performance applications.

Heat Exchanger Tubes

Extruded tubes up to 4000 mm in length, offering excellent heat transfer, mechanical strength, and chemical resistance across all standard sizes.

Moulded Mold Products

Mold Products are high-performance carbon and graphite components manufactured through compression molding. These products feature a fine-grain structure and are known for their superior mechanical strength and dimensional stability, outperforming extruded graphite in demanding applications. They offer excellent thermal conductivity, low electrical specific resistance, and a low coefficient of thermal expansion, making them ideal for use in high-temperature and electrically active environments. Additionally, these grades exhibit outstanding machinability, allowing for precise fabrication of complex shapes and tight tolerances.

Grades:

AMOR – Carbon

XT / DXT– Partially Graphitised

XN - Graphitised

DXN – Denser version of XN

Iso-statically Moulded Graphite

Graphite India's Isostatically Processed Graphite is a fine-grain material engineered for high-performance applications requiring superior consistency and reliability. Produced under high-pressure isostatic pressing, this graphite exhibits excellent isotropy and a homogeneous microstructure, ensuring uniform properties in all directions. It offers high density, exceptional mechanical strength, low specific electrical resistance, and outstanding thermal shock resistance. Its excellent machinability makes it suitable for precision components.

Typical applications include semiconductors, solar equipment, vacuum furnaces, continuous casting, diamond tooling, heat shields, crucibles and electrical discharge machining (EDM).

Machined Components

At Graphite India Ltd, our state-of-the-art machining facilities, combined with a team of skilled and seasoned engineering experts, allow us to assist customers with product design and cost reduction programs. We specialize in the production of high-precision, intricate, and delicate graphite components, tailored to meet the specific needs of various industries. Our custom-made graphite products are crafted to exact specifications, ensuring superior performance and reliability in demanding applications. Below is an indicative list of graphite products that we regularly supply to our customers:

- Degassing Rotors & Shafts
- Canisters
- Extrusion Run Out Tables
- Sealing Jigs
- Heating Elements
- Plates & Slabs

- Sintering Trays
- Rings
- Furnace Linings & Components
- Susceptors
- Boats
- Crucibles
- Moulds
- Plungers & Plates
- Continuous Casting Dies
- Pressure Casting Dies
- Conductor Rolls
- Electrolytic Anodes and Cathodes
- EDM Electrodes
- Heaters for Optical Fiber
- Bushes & Bearings
- Carbon Vanes

In addition to custom-made graphite components, Graphite India Ltd (GIL) also supplies a variety of semi-finished products designed to meet the needs of diverse industrial applications. These products serve as the foundation for further machining or integration into specialized systems. Our range of semi-finished graphite products includes:

- Carbon Rods
- Machined Rods
- Machined Mini Rods & Tubes
- Graphite Blocks (Saw Cut, Plane Finish, Mill Finish)

Carbon / Graphite Bricks

Carbon and Graphite Bricks are ideal lining materials for applications involving acidic and caustic chemicals, especially where ceramic or synthetic plastics may not provide adequate performance. These materials offer exceptional resistance to chemical attacks, high temperatures, and sudden temperature changes, making them highly effective in harsh environments. For instance, alkaline solutions and hydrofluoric acid critical in chemical technologies require carbon-containing materials for lining storage tanks and reactors. Typical applications include baths, reaction vessels, boilers and floor coverings, where durability and resistance to corrosion are paramount.

Carbon-Carbon Composites

Carbon-Carbon composites find application in various fields.



TYPICAL PROPERTIES OF GRAPHITE MINIRODS

SIZE 6 mm TO 65mm		
Grade		GMMR-50
Particle Size (max)	mm	0.25
Apparent Density (min)	g/cc	1.60
Hardness Rockwell (min)	“R”	40
Porosity (max)	%	20
Electrical Resistivity (max)	micro Ohm-m	10
Modulus of Rupture (min)	N/mm ²	18
Tensile Strength (min)	N/mm ²	13
Compressive Strength (min)	N/mm ²	30
Modulus of Elasticity (min)	10 ⁻³ N/mm ²	11
Thermal Conductivity (min)	W/m °C	160
Coefficient of Thermal Expansion (max)	10 ⁻⁷ °C	7

NOMINAL SIZES OF UNMACHINED GRAPHITE MINI RODS

S. No.	Dia(mm)	Min Length(mm)	Max Length(mm)
1	6	-	300
2	10	300	600
3	13	300	600
4	16	300	1200
5	19	300	1200
6	25	300	1200
7	32	300	1800
8	38	300	2500
9	45	300	2500
10	50	300	3600
11	65	300	3600



PRODUCT QUALITY SPECIFICATION FOR GRAPHITE MOLD STOCKS

GRADE □		GLM E	GLM 50	GLM	GLM S
PROPERTIES □					
AD gm/cc (min)		1.57	1.67	1.74	1.78
Rockwell Hardness 'R' (min)		35	45	55	55
Porosity %(max)		28	25	20	18
Resistivity micro-ohm cm (max)	WG	950	850	850	700
	AG	1300	1300	1300	1200
MOR Kg/cm ² (min)	WG	70	160	180	210
	AG	50	120	125	130
CCS Kg/cm ² (min)	WG	120	260	300	370
	AG	100	220	260	310
MOE Kg/mm ² (min)	WG	700	900	1100	1300
	AG	400	550	600	700
Thermal Cond. W/m °C (min)	WG	100	140	160	180
	AG	60	90	120	130
CTE oCx10 ⁻⁷ (max)	WG	12	16	18	22
	AG	30	32	38	45
Tensile Strength Kg/cm ² (min)	WG	40	110	125	150
	AG	30	70	80	90

WG -> With Grain; AG -> Across Grain



NOMINAL SIZES OF UNMACHINED GRAPHITE RODS

Sl. No.	Inches		Millimeters	
	Dia	Length	Dia	Length
1	3	72	75	1800
2	4	72	100	1800
3	5	72	125	1800
4	6	72	150	1800
5	7	72	175	1800
6	8	72	200	1800
7	9	72	225	1800
8	10	72	250	1800
9	11	72	275	1800
10	12	72	300	1800
11	14	72	350	1800
12	16	72	400	1800
13	18	72	450	1800
14	20	72	500	1800
15	22	72	550	1800
16	24	72	600	1800
17	28	72	700	1800
18	30	72	750	1800

NOMINAL SIZES OF UNMACHINED GRAPHITE BLOCKS

Sl. No.	Inches		Millimeters	
	Section	Length	Section	Length
1	16 x 16	72	400 x 400	1800
2	20 x 20	72	500 x 500	1800
3	22 x 22	72	550 x 550	1800
4	24 x 24	72	600 x 600	1800
5	15 x 36	72	375 x 900	1800

*** LENGTH UPTO 3000 MM AVAILABLE AS PER REQUIREMENT**



TYPICAL PROPERTIES OF GRAPHITE TUBE

Properties		GMT		
			HE Tube	Flux Tube
Particle size (max)	mm		0.25	0.25
Apparent Density (min)	g/cc		1.61	1.61
Porosity (max)	%		-	18
Electrical Resistivity (max)	micro Ohm-m	WG	10	10
Modulus of rupture (min)	N/mm ²	WG	18	22
Tensile Strength (min)	N/mm ²	WG	12	13
CCS (min)	N/mm ²	WG	30	32
Modulus of elasticity (min)	10 ⁻³ N/mm ²	WG	-	11
Coefficient of thermal expansion (max)	10 ⁻⁷ °C	WG	-	10

HEAT EXCHANGER TUBES – STANDARD SIZE

Sl. No.	Dia in mm.	Min Length in mm	Max Length in mm
1	32 OD x 22 ID	300	4000
2	37 OD x 25 ID	300	4000
3	25 OD x 16 ID	300	4000
4	51 OD x 38 ID	300	4000
5	35 OD x 22 ID	300	4000
6	35 OD x 24 ID	300	4000

FLUX TUBES – STANDARD SIZE

Sl. No.	Dia in mm.	Min Length in mm	Max Length in mm
1	50 OD x 13 ID	300	4000
2	75 OD x 19 ID	300	3000



MOLDED GRAPHITE

Molding is a discontinuous forming process in which the mold is filled with the material to be molded and is subsequently compacted by a ram to the desired height of the artifact. Very often one works simultaneously with upper and lower rams, since an ejection device is needed anyway in order to release the shape from the mould.

Molding is mostly used for small-dimensioned fine-grained carbon and graphite parts and may be automated in the case of large quantities of the same shape. When the shrinkage in volume, due to subsequent thermal treatment, is properly taken into account, many parts may be manufactured in one step- either pressed to final size or at least to near net shape, so that a subsequent machining process may be partially or even completely omitted.

Molding generates a much less distinctive anisotropy than extrusion. It also calls for very sophisticated tooling when more complicated parts have to be produced.

Grade	Industry	Application
Amor	Mechanical	Steam Seals, Water Turbine Rings, Pump Turbine Rings, Contactless Seals, Carbon Vanes
	Glass	Porous Carbon for production of Hollow and Crystal Glass
XN	Mechanical / Powder Metallurgy	Discs, Plates, Sintering Trays, Bearings, Guide Rings, Piston Rings, Separating Slides, Carbon Vanes, Stripping Components
DXT	Mechanical	Bearings, Guide Rings, Piston Rings, Separating Slides, Carbon Vanes, Stripping Components, Sliding Ring Seals, Steam Seals, Water Turbine Rings, Pump Turbine Rings, Contactless Seals, Contact Seals, Plywood Dryers Bearings, Cast Housing Bearings
DXN	Metallurgy / Non-Ferrous	Melting Crucibles, Moulds, Continuous Casting Dies, Tap Hole Blocks, Spouts



TYPICAL PROPERTIES OF MOLDED MOLD GRAPHITE RODS AND BLOCKS

Grade	Density gm/cc (min)	Porosity (open) % (max)	Brinell Hardness 10/100 (min)	Compressive Strength N/mm ² (min)	Bending Strength N/mm ² (min)	L-CTE, 10-6 /K (max)	Thermal Conductivity W/mk (min)	Ash % (max)	SPR ohm.mm ² /m (min)
Amor	1.58	20	24	75	25	5.5	-	1.5	40
XN	1.75	17	10	50	20	4.5	95	0.25	10
DXT	1.78	11	23	100	35	5.5	20	0.5	25
DXN	1.85	13	14	85	30	5	95	0.2	9

ISOSTATIC MOULD TYPICAL PROPERTIES

GRADE	UOM	GLI A11	GLI A21	GLI A22
Grain size (avg)	µm	40	40	40
Apparent Density (min)	gm/cc	1.75	1.88	1.92
Flexural strength (min)	Mpa	38	44	49
Compressive Strength (min)	Mpa	65	90	105
Porosity (max)	%	10	10	8
Specific Resistance (min)	µΩm	13	13	12
Hardness (Brinell) (min)	BH10/100	18	20	20
Thermal Conductivity (min)	W/mK	125	140	140
Ash (max)	%	0.2	0.2	0.2
Coefficient of thermal expansion(200°C) (max)	(10-6 / °K)	5 Max	5 Max	5 Max

Enquiries related to 15 micron and 10 micron average particle sizes, please contact directly.

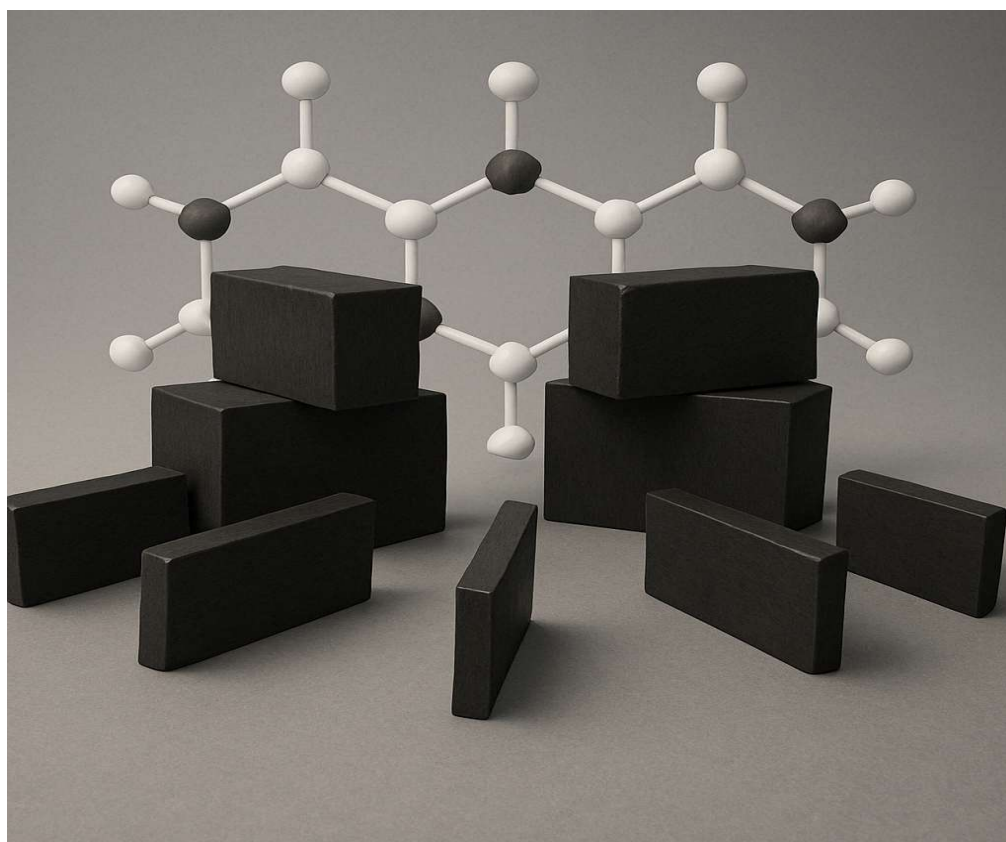


TYPICAL PROPERTIES OF CARBON AND GRAPHITE BRICKS

Sr No	Properties	Unit	GICB A	GICB AX
1	Density (min)	g/cm ²	1.5	1.6
2	Porosity (max)	%	25	15
3	Compressive strength (min)	N/mm ²	35	65
4	Bending strength (min)	N/mm ²	12	20
5	Modulus of elasticity (min)	N/mm ²	1.0X10 ⁴	1.8X10 ⁴
6	Tensile strength (min)	N/mm ²	6	8
7	Linear coefficient of thermal expansion (max)	K-1	3.5X10 ⁻⁶	4X10 ⁻⁶
8	Heat conductivity (min)	W/mK	4	6
9	Temperture stability in air	°C	350	350
10	Ash content (max)	%	1	1
11	Specific electrical resistance (max)	Ωmm ² /m	80	70
12	Stability to temperature changes	Good	Very Good	Very Good

Sizes available: L X W X H: 240 x 114 x 20, 30, 40, 50, 65, 80, 100 mm

These carbon bricks can be graphitized if needed.





PRODUCTION FACILITY

Vertical Machining Centre – Mitsubishi Controlled

X Axis : 2000mm
Y Axis : 900mm
Z Axis : 800mm
Spindle speed : 10000 Rpm



Block cutting machine – VFD Controlled

Max. Length of Block accommodated on table : 3000mm
Max. Width of Block accommodated on table : 1000mm
Max. Height of Block accommodated on table : 1000mm



CNC Turning Centre – Fanuc Controlled

Max. Turning Diameter : 300 mm
Distance Between Centre : 1000mm



Slice Cutting Machine – VFD/ Servo Controlled

Max. Length of Block accommodated on table : 3500mm
Max. Width of Block accommodated on table : 1000mm
Max. Height of Block accommodated on table : 900mm





APPLICATION OF GRAPHITE

Aluminium Industry

- Graphite Fluxing Tubes
- Graphite Impeller Systems for Aluminium Degassing
- Casting Rings for Hot Top Casting or for Gas Slip System
- Graphite Plates and Rolls for Aluminium Extrusion Presses

Metallurgical Industry

- Graphite Plates and Trays for Sintering
- Graphite Boats for Heat Treatment of Powder
- Graphite Crucible for Sintering Furnaces
- Furnace Components and Heating Elements

Steel Industry

- Graphite Heating Rods and Contacts for Steel Degassing

Non-Ferrous Metal Industry

- Graphite Dies for Continuous Casting
- Graphite Rods and Contacts for Resistance Furnace
- Graphite Tubes for Thermocouples
- Stirring Rods, Plugs and Spouts
- Graphite Crucibles for Precious Metals and Dental Alloys
- Graphite Boats and Moulds for Ingots

Chemical Industry

- Carbon Bricks for Chemical Resistant Linings
- Carbon and Graphite Tubes and Nozzles
- Graphite Electrodes for Electrochemistry
- Carbon and Graphite Rings, Seals and Bushes

Glass Industry, Glass fiber-Production, Quartz

- Porous Carbon for Wet blowing Process
- Vacuum Lifters for Automatic Glass Production
- Graphite Insert for Take-Out System
- Graphite Components for Float Glass Process
- Graphite Rolls for Glass fiber Production
- Graphite Rods and Tubes for Quartz Production

Mechanical Engineering Industry

- Bearings and Seals for Pumps – Submersible Pumps
- Bearings for Plywood Dryers
- Rings and Seals for Steam Joints in Paper-Machines
- Turbine Rings for Hydro-Power Stations
- Rings and Vanes for Compressors
- Semi finished Materials for Mechanical Applications