



## 6MS.002 Machinable Graphite

### Applications

- Lubricant
- Electrical and semi-conductor pieces
- Trim for brakes and clutches
- Motor pieces
- Sealing joints
- Paints and coatings
- Stable components for nuclear and armament
- Fuel cells

Physical variables included in this documentation are provided by way of indication only and do not, under any circumstances, constitute a contractual undertaking. Please contact our technical service if you require any additional information.

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### Overview

Machinable blocs of graphite are made from extrusion, vibro-moulding or isostatic pressing. In this last case, the standard surface roughness obtained after machining has a Ra of 0.6 µm.

Machinable graphite pieces resist to thermal applications without being deformed, explode or shrink. They enable to control heat loss and optimize thermal conduction. And are adapted to highly corrosive environments.

Machinable graphite enable to machinate components for plastic processing, glassware, metallurgy or furnaces coating.

#### Example of applications: blown glass

Mould in graphite are used for casting and glass-blowing:

- Gripping supports and inserts
- Support, guide boards
- Wheels and caster wheels of transfer
- Fusion crucible
- Pressing tools
- Furnace insulators

### Machining

We certify a machining quality according to ISO 9001:

- Rectification (plane, cylindrical, turning)
- Milling
- Drilling
- Machining and drilling by ultrasounds
- Polishing (plane, cylindrical)
- Tapping, threading, running-in

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# 6MS.002

## Machinable Graphite

### Range

Range	Production	Notes
<b>HLM</b>	extruded	Standard grain
<b>HLR</b>	extruded	Lower quality than HLM Higher porosity
<b>ET-10</b>	isostatic	High purity Oxidizing resistant
<b>R7340</b>	isostatic	Standard isostatic grade
<b>R7340P30</b>	isostatic	Same as R7340 Higher purity Ashes rate < 30 ppm
<b>R4550</b>	isostatic	Thin grain Very good mechanical resistance
<b>R6650</b>	isostatic	Higher than R4550
<b>R6650P5</b>	isostatic	Same as R6650 Very high purity Ashes rate < 5 ppm
<b>R6710</b>	isostatic	Ultra thin grain Excellent mechanical resistance
<b>R6710P5</b>	isostatic	Same as R6710 Very high purity Ashes rate < 5 ppm For semi-conductor

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### Conditioning

HLR is only used for very large pieces and is available on request.

R7340 is the only grade available that can be directly extruded in bars with standard diameters. The product doesn't need any remachining.

- Length 300 m
- Diameters: Ø 3,2 - Ø 4,8 - Ø 6,4 - Ø 7,9 - Ø 9,5 - Ø 12,7 - Ø 13,8 - Ø 16 - Ø 19 mm

## 6MS.002 Machinable Graphite

### Coatings and impregnations

Coatings and impregnations allow the modifications of the graphite characteristics. They are only available for isostatic fine-grained graphite (< 10 µm).

Composition	Application	Results	Constraint
<b>Pyrolytic carbon</b>	CVD*	Smooth and dense surface Porosities deleted Chemical resistance Thermal resistance	Width from 2 to 30 µm
<b>Silicon carbide</b>	CVD*	Sealing Hardness Better resistance to oxidizing	Width from 75 to 125 µm
<b>PTFE</b>	-	Better resistance to acids Porosities deleted	-
<b>Methacrylic resin</b>	-	Sealing	-
<b>Antimony</b>	-	Better resistance to deterioration	Only for the Carbo-graphite

\*Chemical vapour deposition process, under high temperature and high pressure

**Pyrolytic carbon** (amorphous carbon) coating is composed by 99.9995 % of elemental carbon and is almost without any organic or metallic impurities. It prevents the formation of silicon carbide on contact with silicon and is resistant to almost all acids, including hydrofluoric acid. It doesn't chip off and doesn't split on thermal choc. It can be used on temperatures up to 550 °C in presence of oxygen and up to 2.500 °C under vacuum or inert atmosphere. It is particularly adapted for solar and semi-conductor applications.

**Technical data**

Properties	Unit	Extrusion		Isostatic pressing				
Item N°		HLM		R4550	R6650	R6710	R7340	ET-10
Direction according to the length of the grain		//	⊥	// and ⊥	// and ⊥	// and ⊥	// and ⊥	/
Density	g/cm <sup>3</sup>	1,7		1,83	1,84	1,88	1,72	1,75
Maximal size of the grains	mm	0,8		0,01	0,007	0,003	0,015	/
Open porosities	%	17		10	10	10	15	15
Dielectric resistance	Ω.m	7,3.10 <sup>-6</sup>	9,4.10 <sup>-6</sup>	13.10 <sup>-6</sup>	14.10 <sup>-6</sup>	13.10 <sup>-6</sup>	12.10 <sup>-6</sup>	14.10 <sup>-6</sup>
Young modulus	GPa	10	9	11,5	12,5	13,5	10,5	10,8
Bending resistance (4 points)	MPa	18	17	60	65	85	45	58,8
Compressive strength	MPa	39	35	125	150	170	90	98
Tensile Strength	MPa	13	12	/	/	/	/	34,3
Hardness		/		Rockwell B 95	Rockwell B 95	Rockwell B 110	Rockwell B 80	Shore D 50
Linear dilatation (20/200 °C)	10 <sup>-6</sup> .K <sup>-1</sup>	2,1	3,1	4	3,9	4	2,9	3,8
Thermal conductivity	W.m <sup>-1</sup> .K <sup>-1</sup>	180	140	100	90	100	90	104,4
Ashes rate	ppm	800		20	/	/	200	32

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