

**SPECIALITY GRAPHITE
MATERIALS FOR SINTERING**



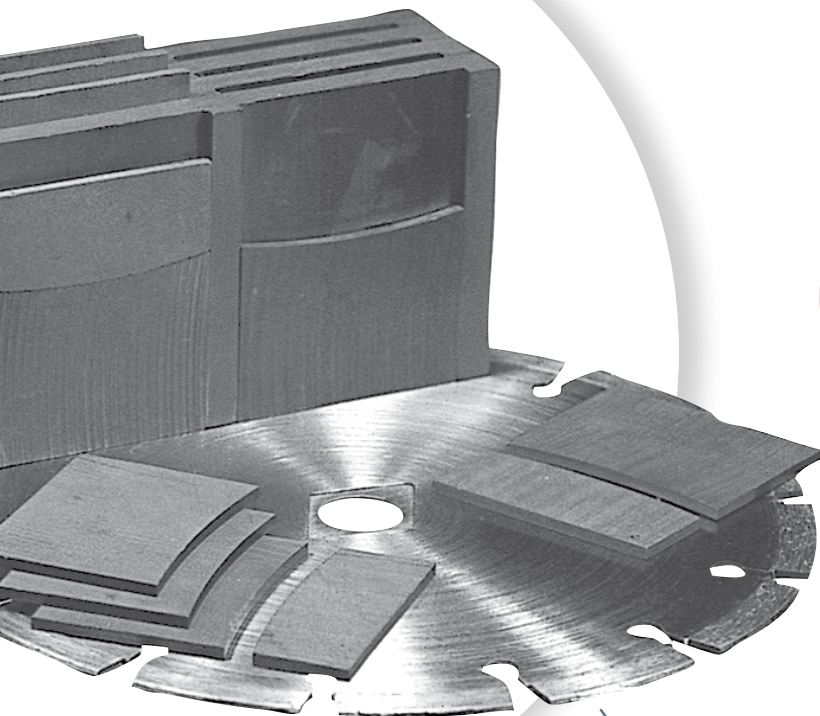
MERSEN

PRESSURE SINTERING

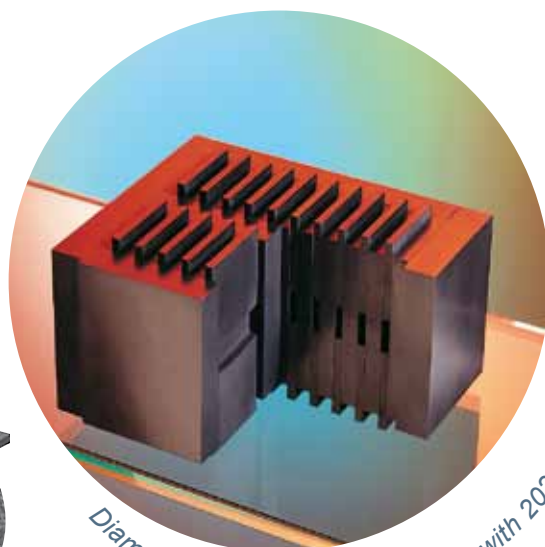
Mersen graphite is being used extensively throughout the pressure sintering industry to produce molds for diamond saw segments, diamond core drills, ceramic cutting tool inserts, and ceramic armor plates. Our technologically advanced, isostatically molded graphite materials provide superb performance in the hostile environment of extreme heat and pressure which is inherent in the manufacture of metal, ceramic, and diamond tooling.



Mersen materials combine high thermal conductivity with low coefficients of thermal expansion, resulting in the dimensional stability required for ceramic molds.

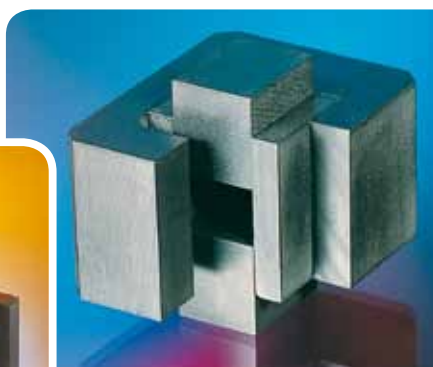


Masonry saw blade with graphite segment mold.



Diamond saw segment mold made with 2020.

“Graphite is the mold designer’s material of choice, and our experienced engineering staff will help you find the right material for your application”.



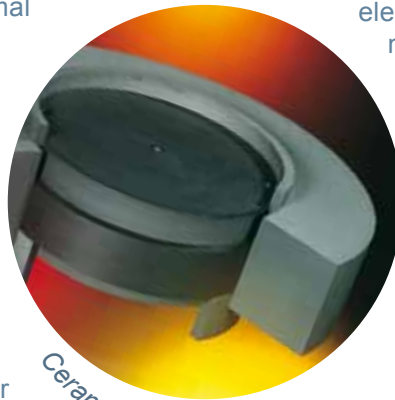
THE SELECTION OF THE BEST GRAPHITE GRADE FOR YOUR APPLICATION...

... depends largely on the environmental conditions and process parameters in which the graphite will be used. Grade 2020 is used in diamond segment die bodies and punches where relatively high electrical resistivity is needed to shorten the time required to reach operating temperatures.

Grade 2191 is used where properties similar to 2020 are required, but higher thermal conductivity is desired.

Grade 2124 is used where strength and density requirements of the application are at the highest.

Ceramic dressing rolls require a contour machined on the inner diameter of a cylinder. Diamonds are hand set on this diameter and the inside is filled with a metal matrix. The body of the dressing roll can be made by sintering, infiltrating, or reverse plating techniques. Both 2020 and 2191 will work because they are able to be machined to tight tolerances with good surface finish.



Ceramic tools inserts, armor plates, and sputtering targets are all classic “punch and die” hot pressing applications. Where very large cross section dies are required, grade 2020 will be the material of choice. For high strength parts, grades 2124 and 2333 are often chosen.

Grades 2715 and 2720, with their high electrical resistivity, are recommended for many resistance heating applications. High operating temperatures can be achieved in shorter times using high resistance grades for the mold components carrying the current.

In many cases, the best way to select an optimal grade is through actual trials. Throughout the world, Mersen maintains local sales offices where our experienced customer service and engineering staffs are always available to help you find the most suitable grade for your application.

RECOMMENDED GRADES

	2191	2020	2124	2715	2720	2333
Diamond wheel Segments	●	●	●	●	●	●
Ceramic Tools	●	●	●	●	●	●
Dressing Rolls	●	●				●
Armor Plate		●	●			●
SPS (Spark Plasma Sintering)						●

PARAMETERS CRITICAL TO ADVANCED CERAMIC APPLICATIONS ARE:

- Bulk density
- Strength of the material
- Coefficient of thermal expansion
- Thermal and electrical conductivity

TYPICAL CHARACTERISTICS

Property	Unit	2191	2020	2124	2715	2720	2333
Density	g/cm ³	1.75	1.77	1.84	1.82	1.80	1.86
Porosity	%	12	9	8	10	10	6
Hardness	Rockwell	80 (L)	95 (L)	80 (H)	100 (H)	85 (L)	95 (H)
Flexural strength	MPa psi	44 6,400	45 6,500	58 8,400	55 8,000	53 7,700	76 11,000
Compressive strength	MPa psi	97 14,100	99 14,300	124 18,000	121 17,600	117 16,900	167 24,200
Coefficient of thermal expansion	$\times 10^{-6}$ /°C /°F	4.2 2.3	4.3 2.4	5.5 3.1	6.5 3.6	5.0 2.8	6.0 3.3
Electrical resistivity	μ cm in	1,090 0.00043	1,550 0.00061	1,140 0.00045	2,300 0.00091	2,157 0.00085	1,600 0.00063
Thermal conductivity	W/m°C BTU-Ft/F ² Hr°F	116 67	85 49	112 65	56 32	60 35	81 47
Average grain size	μ m in	15 0.0006	15 0.0006	13 0.0005	13 0.0005	13 0.0005	5 0.0002
Standard block size	mm nominal in	545 x 545 x 1,830 ø 356 x 1,830 21.4 x 21.4 x 72 ø 14 x 72	530 x 635 x 1,830 1,030 x 1,080 x 325 ø 643 x 1,830 20 x 24 x 72 40.5 x 42.5 x 12.8 ø 24 x 72	308 x 620 x 1,830 12 x 24 x 72	308 x 620 x 915 12 x 24 x 36	305 x 305 x 915 12 x 12 x 36	152 x 308 x 620 6 x 12 x 24



Diamond dressing rollers hot molded from 2020 die.

(Photograph courtesy of CITCO Division, Western Atlas)

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Our materials are in conformity with the RoHS-Directive (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment). Besides Mersen guarantees the application of the European Community REACH-Regulation (Registration, Evaluation, Authorisation and Restriction of Chemical substances) to all its plants located in Europe.



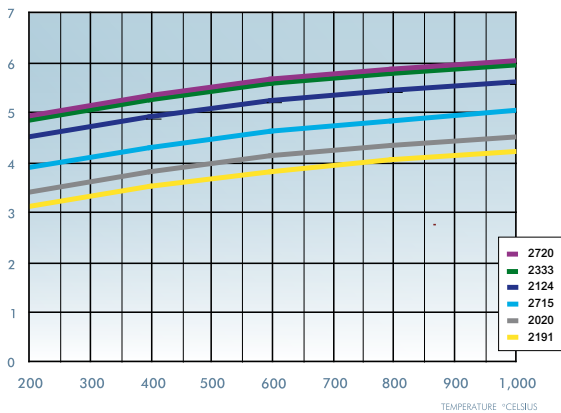
Single and multi-point dressing tools.

(Photograph courtesy of CITCO Division, Western Atlas)

GRAPHITE IS WELL ADAPTED FOR USE AS CONTINUOUS CASTING DIES BECAUSE OF ITS UNIQUE PHYSICAL CHARACTERISTICS:

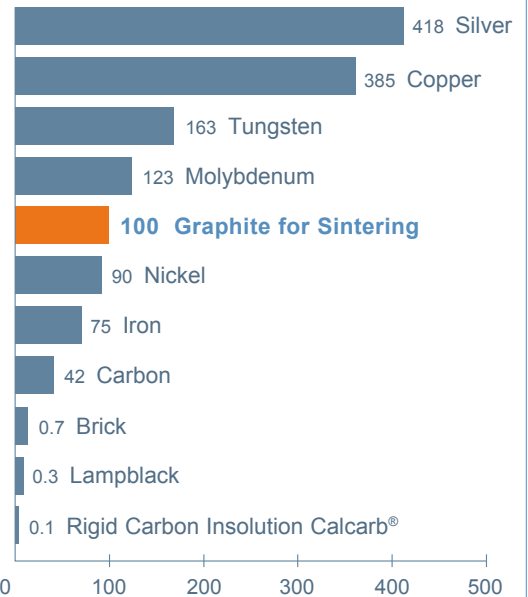
Coefficient of Thermal Expansion is important in mold design to compensate for growth as temperature increases. In order to design a mold to be used at an elevated operating temperature, knowledge of the expansion coefficient is necessary to predict the initial room temperature dimensions.

COEFFICIENT OF THERMAL EXPANSION



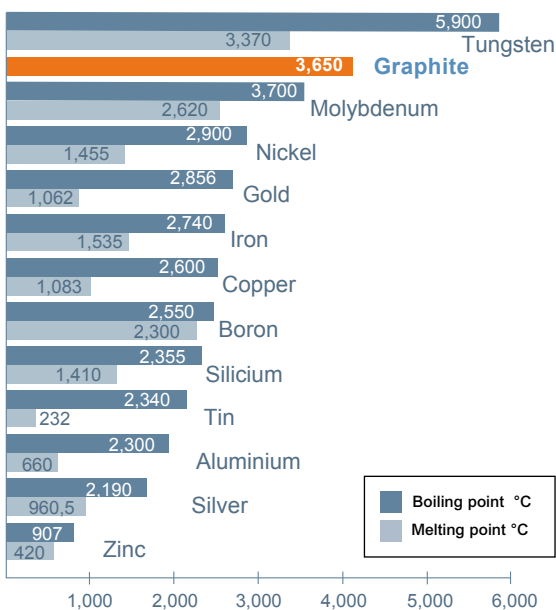
High thermal conductivity.

TYPICAL VALUES OF THERMAL CONDUCTIVITY MATERIAL W/M.° K

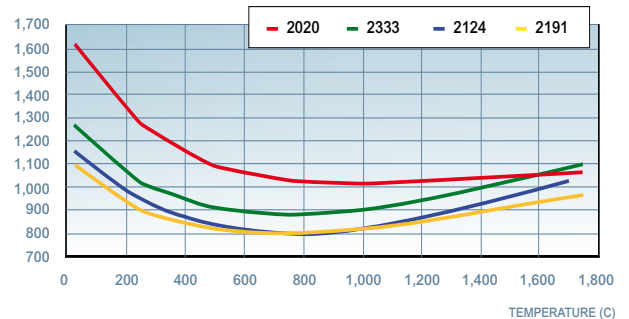


Capable of withstanding molten metal temperatures. Graphite sublimates at 3,650°C and atmospheric pressure.

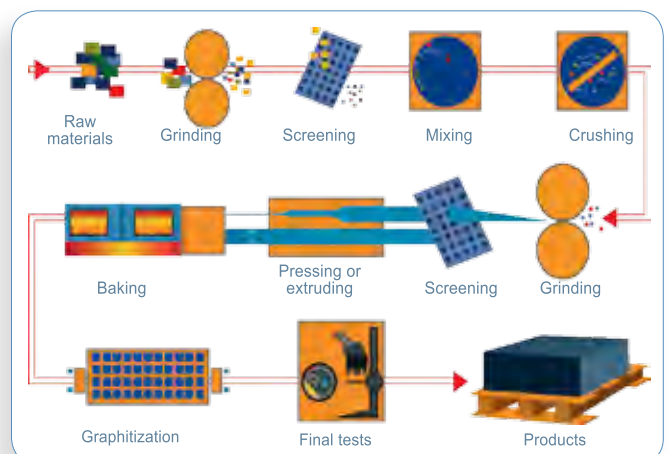
MELTING AND BOILING POINTS



TYPICAL ELECTRICAL RESISTIVITY VS TEMPERATURE



Graphite manufacturing.



Easy to machine and to polish.



A WORLD EXPERT
in materials and solutions
for high temperature processes

A GLOBAL PLAYER

Global expert in materials and solutions for extreme environments as well as in the safety and reliability of electrical equipment Mersen designs innovative solutions to address its clients specific

needs to enable them to optimize their manufacturing process in sectors such as energy, transportation, electronics, chemical, pharmaceutical and process industries.

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