EMERSON & CUMING MICROWAVE PRODUCTS

RoHS Compliant

ECCOSORB® MF500F

High Temperature, Magnetic Waveguide Absorber

Material Characteristics

- Rigid, completely solid, magnetically loaded, high temperature absorber
- Physical and electrical properties are the same as those of the corresponding members of the ECCOSORB® MF series.
- ECCOSORB® MF500F can be used for short periods at 500°F (260°C) permitting use at high ambients and/or high power levels. Exposure to high temperatures should be limited.
- For complete properties and design considerations, see the ECCOSORB® MF technical bulletin
- Moisture absorption is insignificant
- Can be machined via many operations, *see Machining Recommendations*
- Does not support fungal growth per MIL-STD-810E

Applications

- ECCOSORB® MF500F is widely used as an absorber, attenuators, and terminations in waveguides and coaxial lines
- It has also been successfully used as a high-Q inductor-core material in such devices as slug tuners. It is also useful in many other magnetic components.

Instructions for Use

- Exposure to high temperatures should be limited. Slow change in physical and electrical properties occurs at temperatures above about 350°F (177°C)
- For complete properties and design considerations, see the ECCOSORB® MF technical bulletin

Availability

- Standard stock sizes are available in the following:
- Sheets 12" x 12" (30.5cm x 30.5cm) in thicknesses of 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 1.0, 1.5, 2.0, 2.5 & 3.0" (0.32, 0.64, 0.95, 1.27, 1.59, 1.91, 2.54, 3.81, 5.08, 6.35, 7.62 cm).
- Rods 12" long (30.5cm) in diameters of 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 1.0, 1.5, 2.0, 2.5 & 3.0" (0.32, 0.64, 0.95, 1.27, 1.59, 1.91, 2.54, 3.81, 5.08, 6.35, 7.62 cm).
- Bars 12" long (30.5cm) in squares of 1/4, 3/8, 1/2, 5/8, 3/4, 1.0, 1.5 & 2.0" (0.64, 0.95, 1.27, 1.59, 1.91, 2.54, 3.81, 5.08 cm).
- Other sizes, shapes, thicknesses, and configurations are available on special order

Standard Loadings

- ECCOSORB® MF500 is available in six standard loadings. In general, as the frequency of operation increases, the MF500 loading series decreases.

MF500-110	MF500-116
MF500-112	MF500-117
MF500-114	MF500-124

Typical Properties

Frequency Range	1-18 GHz
Color	Dark Gray
Short Time Service Temperature, °F (°C)	<500 (<260)

Typical Electrical Properties

	GHz	10^{-7}	10^{-6}	10^{-5}	10^{-4}	10^{-3}	10^{-2}	10^{-1}	1.0	3.0	8.6	10.0	18.0
MF500-110	dB/cm	0	0	0	0	0	0	0.01	0.09	0.26	2	2.2	6.6
MF500-112	dB/cm	0	0	0	0	0	0	0.02	0.16	0.59	4.9	5.6	10.1
MF500-114	dB/cm	0	0	0	0	0	0	0.04	0.57	2.2	10.8	13.2	24.9
MF500-116	dB/cm	0	0	0	0	0	0	0.09	1.3	5	21	32	57
MF500-117	dB/cm	0	0	0	0	0	0.03	0.27	2.8	11	46	56	119
MF500-124	dB/cm	0	0	0	0	0	0.03	0.48	6.5	20	63	67	149

*Note: Attenuation is a theoretical property calculated from the Complex Permittivity and Complex Permeability of a lossy material and is strictly a means of comparing one absorbing material to another. The attenuation properties are not an indication of how the material will perform inside a microwave device. The frequencies of use recommended for ECCOSORB® MF500 in the Typical Properties Table of this bulletin are based on application experience at Emerson & Cuming Microwave Products Inc.

Machining Recommendations

Most of the discussion below applies not only to the basic ECCOSORB® MF500 series of materials, but also to several high temperatures, castable and molding-powder equivalents. ECCOSORB® MF500 can be formed readily to close tolerances with standard metal-working machine tools, i.e.: lathes, milling machines, drills, saws, grinders, generally using conventional techniques but observing the precautions and limitations described below.

Tooling

- For turning, milling, drilling and tapping, carbide tools should be used, for example Type 883, a general purpose carbide that works well under most conditions. Use solid carbide taps for long life. Standard size tap drills should be satisfactory.
- External threads are formed best, not with conventional thread-cutting dies but by lathe turning or grinding, with light feeds and shallow cuts.
- Sawing can be done with best finish and tolerance using circular saws, 8 to 10 inches (20.3 to 25.4 cm) diameter, with grinding coolant and high RPM. Thin carborundum wheels, (e.g.: 1/32" [0.079 cm] thick) or carbide saws may be used where requirements are less stringent. Best results are attained by moving the saw and keeping work stationary, with saw rotating so it tends to climb into the work.
- Surface finishing of flat sheets, etc. is best performed with a Blanchard grinder. ECCOSORB® MF500 is held readily with magnetic chucks. Sheet size is limited by the size of the machine.

Coolants

- Use of a coolant liquid is recommended, especially for all close tolerance operations. Commercial grinding fluid is preferred, or water-soluble oil, with rust-resisting properties to protect the machines. Spark producing operations in particular must not be run dry, since smoldering fires might result.
- Where coolant run-off is collected for recirculation, a two-cavity recovery system should be used to minimize pick-up of grinding dust, sawdust or chips by the coolant pump. Where a recirculating system is not available, best results will be obtained with air-powered spray or mist equipment.

Use of tapped metal inserts should be considered where electrical performance will not be degraded. Inserts may be cast in place, or bonded with castable material of suitable composition

Suggested Speeds and Feed Rates

The following speeds and feed rates are suggested to be modified as necessary to suit job conditions:

OPERATION	SPEED	FEED
Sawing, turning	70 - 90 ft/minute (21.3 - 27.4 m)/min.	.005 - .008 in/revolution (0.13 - 0.20 mm)
External threading	70 - 90 ft/minute (21.3 - 27.4 m)/min.	.001 in/pass (0.038 mm/pass)
Tapping	450 rpm	Tapping Head
Milling	70 - 90 ft/minute (21.3 - 27.4 m)/min.	.0015 - .003 in/tooth (0.038 - 0.076 mm)/tooth