
Air Permeable Material

METAPOR[®] - HD 210 AL

Technical Bulletin



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Innovative Tooling Materials for Thermoforming

General

METAPOR[®] is a composite material made of aluminum granules and epoxy resin. The material is air-permeable over the entire surface due to its micro-porous structure allowing for unique design considerations for prototype and production thermoform tools. In contrast to sintered materials, the pores do not close off after machining allowing excellent definition and surface quality.

Thermoformers have seen some of the following advantages:



- High Definition and Accuracy
- Faster Air Evacuation
- Improved Surface Quality
- Reduced Machine Time
- Trapped Air Elimination
- Improved Mold Detail

METAPOR[®] - HD 210 AL

METAPOR[®] - HD 210 AL is the high temperature grade of the product. It can be used with polymer sheet most commonly thermoformed today such as PS, ABS, PVC, PET and PE, but is also suitable polymers processing at higher temperatures such as polycarbonate and acrylic. Its upper operating temperature limit is 410 °F (210 °C).

Physical properties at 67°F (20 °C)

Property	Value (Eng)	Value (SI)
Density	118.6 lb/ft ³	1.9 g/cm ³
Hardness Shore D	82	82
Flexural Strength	6,239 psi	43 N/mm ²
Flexural Modulus	1,567 ksi	10,800 N/mm ²
Impact strength	5.2 ft-lb/in ²	11 kJ/m ²
Coefficient of thermal expansion 25 °C -125°C (77 - 257 °F)	17.6 x 10 ⁻⁶ in/in/°F	32 x 10 ⁻⁶ mm/mm/°C
Thermal conductivity: at 100°C (212 °F)	10.2 BTU/ hr-ft-°F	19 W / m-°C
Martens Dimensional Stability	410 °F	210 °C
Mean pore diameter	.0005 in	12 μm
Total porosity (by volume)	16 %	16 %

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Design and Handling

For detailed information on Handling, Machining and Adhesive bonding of METAPOR[®], please refer to the "Handling Guidelines" brochure.

Storage

Store dry, protect against jolts and impacts. Avoid contact with grease and fluids.

Machining

The machining properties of METAPOR[®] are excellent and are comparable with rapid machinable aluminium. METAPOR[®] **must be machined dry and should not be in contact with any cooling liquids.** In order to avoid any closure of pores, sharp tools made of HSS or carbide with edge angles as for aluminium must be used. It is recommended to use dust extraction. Avoid contact with grease and fluids

Cutting speed up to 3300 ft/min can be applied. The forward feed can be set up to 0.004 in/ tooth; in areas of thin walls the forward feed should be reduced.

Grinding/Polishing

Grinding and polishing of the machined surfaces can be made by hand or with a vibrating grinder. Use corundum paper with grains of 400 / 600 / 1200 in the ascending order. METAPOR[®] **has to be polished dry and without any polishing paste!**

Air Flow Rates

The numbers are average values for calculating air consumption for overpressure or under pressure applications. Specification is in cubic inches per minute per in².

Pressure difference in psi	Plate thickness in Inches							
	0.39	0.59	0.79	0.98	1.18	1.57	2.36	3.94
2.9	82.6	66.9	43.3	35.4	27.5	23.6	15.7	3.9
4.4	98.3	82.6	51.1	47.2	35.4	27.5	19.7	7.9
5.8	114.1	98.3	62.9	55.1	43.3	35.4	23.6	11.8
7.3	129.8	110.1	70.8	62.9	51.1	43.3	27.5	11.8
8.7	149.5	125.9	78.7	70.8	59.0	47.2	35.4	15.7
10.2	165.2	141.6	90.5	78.7	62.9	55.1	39.3	19.7
11.6	180.9	153.4	98.3	90.5	70.8	59.0	43.3	23.6
13.1	196.7	169.1	106.2	98.3	78.7	66.9	47.2	27.5
14.5	212.4	180.9	118.0	106.2	86.5	70.8	55.1	31.5
29.0	357.9	314.6	200.6	184.9	149.5	129.8	98.3	62.9
43.5	487.7	428.7	279.2	251.7	208.4	180.9	141.6	90.5
58.0	601.7	527.0	346.1	314.6	259.6	224.2	177.0	118.0
72.5	696.1	613.5	401.2	369.7	302.8	263.5	212.4	145.5
87.0	774.8	684.3	448.4	413.0	338.2	298.9	239.9	169.1

Available Sizes

METAPOR[®] is manufactured in blocks of 500 x 500 x 400 mm, (~20" x 20" x 16"), and cut into slabs of any required thickness. After the cutting process, the air permeability of the slab surface is reduced due to partial closure of the pores. It is essential to **mill both surfaces of the slab** by cutting off approx. 0.5 mm, (0.02"), providing complete air permeability.